Lightning Components Developer Guide

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@salesforcedocs

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CHAPTER 1 What is the Lightning Component Framework?

In this chapter ...

The Lightning Component framework is a UI framework for developing dynamic web apps for mobile and desktop devices. It's a modern framework for building single-page applications engineered for growth.

The framework supports partitioned multi-tier component development that bridges the client and server. It uses JavaScript on the client side and Apex on the server side.

What is Salesforce Lightning?

Lightning includes the Lightning Component Framework and some exciting tools for developers. Lightning makes it easier to build responsive applications for any device.

Lightning includes these technologies:

- Lightning components give you a client-server framework that accelerates development, as well as app performance, and is ideal for use with the Salesforce1 mobile app and Salesforce Lightning Experience.
- The Lightning App Builder empowers you to build apps visually, without code, quicker than ever before using off-the-shelf and custom-built Lightning components. You can make your Lightning components available in the Lightning App Builder so administrators can build custom user interfaces without code.

Using these technologies, you can seamlessly customize and easily deploy new apps to mobile devices running Salesforce1. In fact, the Salesforce1 mobile app and Salesforce Lightning Experience are built with Lightning components.

This guide provides you with an in-depth resource to help you create your own standalone Lightning apps, as well as custom Lightning components that can be used in the Salesforce1 mobile app. You will also learn how to package applications and components and distribute them in the AppExchange.

Why Use the Lightning Component Framework?

The benefits include an out-of-the-box set of components, event-driven architecture, and a framework optimized for performance.

Out-of-the-Box Component Set

Comes with an out-of-the-box set of components to kick start building apps. You don't have to spend your time optimizing your apps for different devices as the components take care of that for you.

Rich component ecosystem

Create business-ready components and make them available in Salesforce1, Lightning Experience, and Communities. Salesforce1 users access your components via the navigation menu. Customize Lightning Experience or Communities using drag-and-drop components on a Lightning Page in the Lightning App Builder or using Community Builder. Additional components are available for your org in the AppExchange. Similarly, you can publish your components and share them with other users.

Performance

Uses a stateful client and stateless server architecture that relies on JavaScript on the client side to manage UI component metadata and application data. The client calls the server only when absolutely necessary; for example to get more metadata or data. The server only sends data that is needed by the user to maximize efficiency. The framework uses JSON to exchange data between the server and the client. It intelligently utilizes your server, browser, devices, and network so you can focus on the logic and interactions of your apps.

Event-driven architecture

Uses an event-driven architecture for better decoupling between components. Any component can subscribe to an application event, or to a component event they can see.

Faster development

Empowers teams to work faster with out-of-the-box components that function seamlessly with desktop and mobile devices. Building an app with components facilitates parallel design, improving overall development efficiency.

Components are encapsulated and their internals stay private, while their public shape is visible to consumers of the component. This strong separation gives component authors freedom to change the internal implementation details and insulates component consumers from those changes.

Device-aware and cross browser compatibility

Apps use responsive design and provide an enjoyable user experience. The Lightning Component framework supports the latest in browser technology such as HTML5, CSS3, and touch events.

Open Source Aura Framework

The Lightning Component framework is built on the open source Aura framework. The Aura framework enables you to build apps completely independent of your data in Salesforce.

The Aura framework is available at `https://github.com/forcedotcom/aura`. Note that the open source Aura framework has features and components that are not currently available in the Lightning Component framework. We are working to surface more of these features and components for Salesforce developers.

The sample code in this guide uses out-of-the-box components from the Aura framework, such as `aura:iteration` and `ui:button`. The `aura` namespace contains components to simplify your app logic, and the `ui` namespace contains components for user interface elements like buttons and input fields. The `force` namespace contains components specific to Salesforce.

Components

Components are the self-contained and reusable units of an app. They represent a reusable section of the UI, and can range in granularity from a single line of text to an entire app.

The framework includes a set of prebuilt components. You can assemble and configure components to form new components in an app. Components are rendered to produce HTML DOM elements within the browser.

A component can contain other components, as well as HTML, CSS, JavaScript, or any other Web-enabled code. This enables you to build apps with sophisticated UIs.

The details of a component's implementation are encapsulated. This allows the consumer of a component to focus on building their app, while the component author can innovate and make changes without breaking consumers. You configure components by setting the named attributes that they expose in their definition. Components interact with their environment by listening to or publishing events.

SEE ALSO:

Creating Components

Events

Event-driven programming is used in many languages and frameworks, such as JavaScript and Java Swing. The idea is that you write handlers that respond to interface events as they occur.

A component registers that it may fire an event in its markup. Events are fired from JavaScript controller actions that are typically triggered by a user interacting with the user interface.

There are two types of events in the framework:

- **Component events** are handled by the component itself or a component that instantiates or contains the component.
- **Application events** are handled by all components that are listening to the event. These events are essentially a traditional publish-subscribe model.

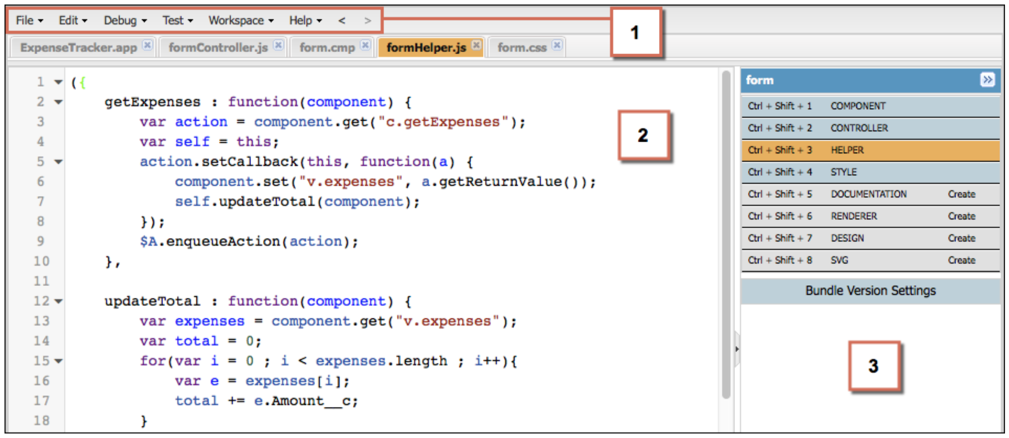
You write the handlers in JavaScript controller actions.

SEE ALSO:

- Communicating with Events
- Handling Events with Client-Side Controllers

Using the Developer Console

The Developer Console provides tools for developing your components and applications.


File
Edit
Debug
Test
Workspace
Help
ExpenseTracker.app
formController.js
form.cmp
formHelper.js
form.css
1
2
3
form
Ctrl + Shift + 1 COMPONENT
Ctrl + Shift + 2 CONTROLLER
Ctrl + Shift + 3 HELPER
Ctrl + Shift + 4 STYLE
Ctrl + Shift + 5 DOCUMENTATION Create
Ctrl + Shift + 6 RENDERER Create
Ctrl + Shift + 7 DESIGN Create
Ctrl + Shift + 8 SVG Create
Bundle Version Settings

```
({
    getExpenses : function(component) {
        var action = component.get("c.getExpenses");
        var self = this;
        action.setCallback(this, function(a) {
            component.set("v.expenses", a.getReturnValue());
            self.updateTotal(component);
        });
        $A.enqueueAction(action);
    },

    updateTotal : function(component) {
        var expenses = component.get("v.expenses");
        var total = 0;
        for(var i = 0 ; i < expenses.length ; i++){
            var e = expenses[i];
            total += e.Amount__c;
        }
```

The Developer Console enables you to perform these functions.

- Use the menu bar (1) to create or open these Lightning resources.
  - Application
  - Component
  - Interface
  - Event
  - Tokens
- Use the workspace (2) to work on your Lightning resources.
- Use the sidebar (3) to create or open client-side resources that are part of a specific component bundle.
  - Controller
  - Helper
  - Style
  - Documentation
  - Renderer
  - Design
  - SVG

For more information on the Developer Console, see The Developer Console User Interface.

SEE ALSO:

Salesforce Help: Open the Developer Console

Create Lightning Components in the Developer Console

Component Bundles

Online Content

This guide is available online. To view the latest version, go to:

`https://developer.salesforce.com/docs/atlas.en-us.lightning.meta/lightning/`

Go beyond this guide with exciting Trailhead content. To explore more of what you can do with Lightning Components, go to:

Trailhead Module: Lightning Components Basics

Link: https://trailhead.salesforce.com/module/lex_dev_lc_basics

Learn with a series of hands-on challenges on how to use Lightning Components to build modern web apps.

Quick Start: Lightning Components

Link: https://trailhead.salesforce.com/project/quickstart-lightning-components

Create your first component that renders a list of Contacts from your org.

Project: Build an Account Geolocation App

Link: https://trailhead.salesforce.com/project/account-geolocation-app

Build an app that maps your Accounts using Lightning Components.

Project: Build a Restaurant-Locator Lightning Component

Link: https://trailhead.salesforce.com/project/workshop-lightning-restaurant-locator

Build a Lightning component with Yelp's Search API that displays a list of businesses near a certain location.

Project: Build a Lightning App with the Lightning Design System

Link: https://trailhead.salesforce.com/project/slds-lightning-components-workshop

Design a Lightning component that displays an Account list.

CHAPTER 2 Quick Start

In this chapter ...

The quick start steps you through building and running two simple apps: a standalone Lightning app for tracking expenses and a Lightning component to manage selected contacts in Salesforce1. You'll create all components from the Developer Console. A standalone app is directly accessible by going to the URL:

`https://<myDomain>.lightning.force.com/<namespace>/<appName>.app`, where `<myDomain>` is the name of your custom Salesforce domain

The standalone app you're creating accesses a custom object and displays its records. It enables you to edit a field on the records, capturing changes in a client-side controller and passing that information using a component event to an Apex controller, which then persists the data.

The Lightning component you're creating accesses the contact object and displays its records in Salesforce1. You'll use built-in Salesforce1 events to create or edit contact records, and view related cases.

Before You Begin

To work with Lightning apps and components , follow these prerequisites.

1. Create a Developer Edition organization
2. Define a Custom Salesforce Domain Name

Note: For this quick start tutorial, you don't need to create a Developer Edition organization or register a namespace prefix. But you want to do so if you're planning to offer managed packages. You can create Lightning components using the UI in **Enterprise**, **Performance**, **Unlimited**, **Developer** Editions or a sandbox. If you don't plan to use a Developer Edition organization, you can go directly to Define a Custom Salesforce Domain Name.

Create a Developer Edition Organization

You need an org to do this quick start tutorial, and we recommend you don't use your production org. You only need to create a Developer Edition org if you don't already have one.

1. In your browser, go to `https://developer.salesforce.com/signup?d=70130000000td6N`.
2. Fill in the fields about you and your company.
3. In the `Email` field, make sure to use a public address you can easily check from a Web browser.
4. Type a unique `Username`. Note that this field is also in the *form* of an email address, but it does not have to be the same as your email address, and in fact, it's usually better if they aren't the same. Your username is your login and your identity on `developer.salesforce.com`, so you're often better served by choosing a username such as `firstname@lastname.com`.
5. Read and then select the checkbox for the `Master Subscription Agreement` and then click **Submit Registration**.
6. In a moment you'll receive an email with a login link. Click the link and change your password.

Define a Custom Salesforce Domain Name

A custom domain name helps you enhance access security and better manage login and authentication for your organization. If your custom domain is *`universalcontainers`*, then your login URL would be `https://universalcontainers.lightning.force.com`. For more information, see My Domain in the Salesforce Help.

Create a Standalone Lightning App

This tutorial walks you through creating a simple expense tracker app using the Developer Console.

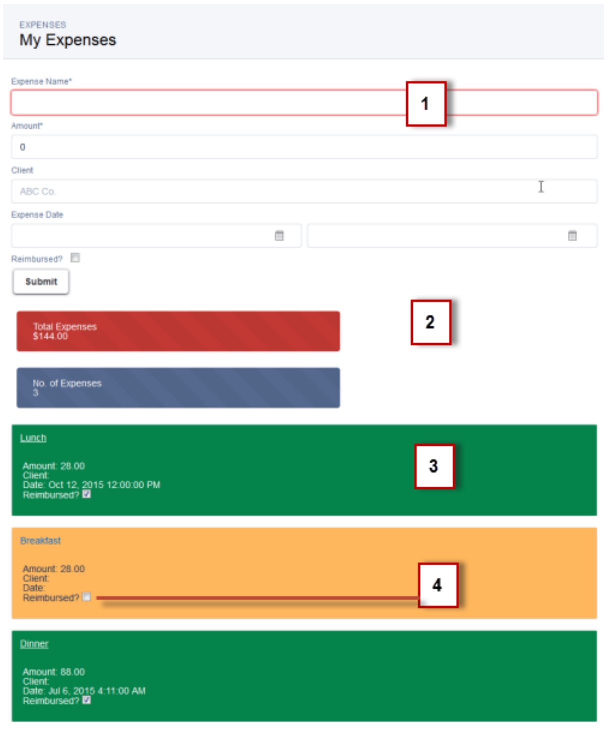
The goal of the app is to take advantage of many of the out-of-the-box Lightning components, and to demonstrate the client and server interactions using JavaScript and Apex. As you build the app, you'll learn how to use expressions to interact with data dynamically and use events to communicate data between components.

Make sure you've created the expense custom object shown in Create an Expense Object on page 10. Using a custom object to store your expense data, you'll learn how an app interacts with records, how to handle user interactions using client-side controller actions, and how to persist data updates using an Apex controller.

After you create a component, you can include it in Salesforce1 by following the steps in Add Lightning Components as Custom Tabs in Salesforce1 on page 100. For packaging and distributing your components and apps on AppExchange, see Distributing Applications and Components on page 302.

Note: Lightning components can be added to the Salesforce1 navigation menu, the App Launcher in Lightning Experience, as well as a standalone app. To create components that utilize Salesforce1-specific components and events that can be used only in Salesforce1 and Lightning Experience, see Create a Component for Salesforce1 and Lightning Experience on page 30.

The following image shows the expense tracker as a standalone app.



Total Expenses
$144.00

No. of Expenses
3

Lunch
Amount: 28.00
Client:
Date: Oct 12, 2015 12:00:00 PM
Reimbursed? ✓

Breakfast
Amount: 28.00
Client:
Date:
Reimbursed? ☐

Dinner
Amount: 88.00
Client:
Date: Jul 6, 2015 4:11:00 AM
Reimbursed? ✓

1. The form contains Lightning input components (1) that update the view and expense records when the **Submit** button is pressed.
2. Counters are initialized (2) with total amount of expenses and number of expenses, and updated on record creation or deletion. The counter turns red when the sum exceeds $100.
3. Display of expense list (3) uses Lightning output components and are updated as more expenses are added.
4. User interaction on the expense list (4) triggers an update event that saves the record changes.

These are the resources you are creating for the expense tracker app.

Resources	Description
expenseTracker Bundle	
`expenseTracker.app`	The top-level component that contains all other components
Form Bundle	
`form.cmp`	A collection of Lightning input components to collect user input
`formController.js`	A client-side controller containing actions to handle user interactions on the form
`formHelper.js`	A client-side helper functions called by the controller actions
`form.css`	The styles for the form component

Resources	Description
expenseList Bundle	
`expenseList.cmp`	A collection of Lightning output components to display data from expense records
`expenseListController.js`	A client-side controller containing actions to handle user interactions on the display of the expense list
Apex Class	
`ExpenseController.apxc`	Apex controller that loads data, inserts, or updates an expense record
Event	
`updateExpenseItem.evt`	The event fired when an expense item is updated from the display of the expense list

Optional: Install the Expense Tracker App

If you want to skip over the quick start tutorial, you can install the Expense Tracker app as an unmanaged package. Make sure that you have a custom domain enabled in your organization.

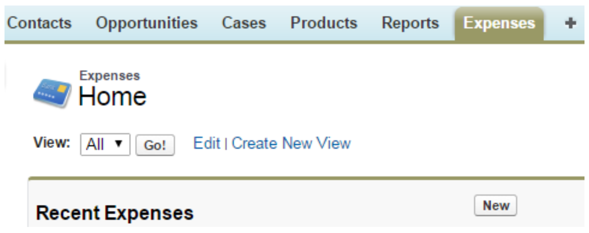
A package is a bundle of components that you can install in your org. This packaged app is useful if you want to learn about the Lightning app without going through the quick start tutorial. If you're new to Lightning components, we recommend that you go through the quick start tutorial. This package can be installed in an org without a namespace prefix. If your org has a registered namespace, follow the inline comments in the code to customize the app with your namespace.

Note: Make sure that you have a custom domain enabled. Install the package in an org that doesn't have any of the objects with the same API name as the quick start objects.

To install the Expense Tracker app:

1. Click the installation URL link: https://login.salesforce.com/packaging/installPackage.apexp?p0=04t1a000000EbZp
2. Log in to your organization by entering your username and password.
3. On the Package Installation Details page, click **Continue**.
4. Click **Next**, and on the Security Level page click **Next**.
5. Click **Install**.
6. Click **Deploy Now** and then **Deploy**.

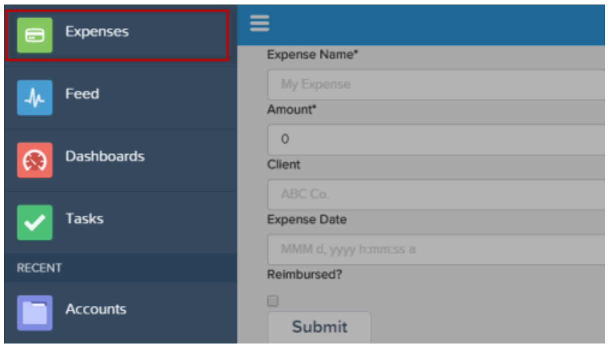
When the installation completes, you can select the **Expenses** tab on the user interface to add new expense records.



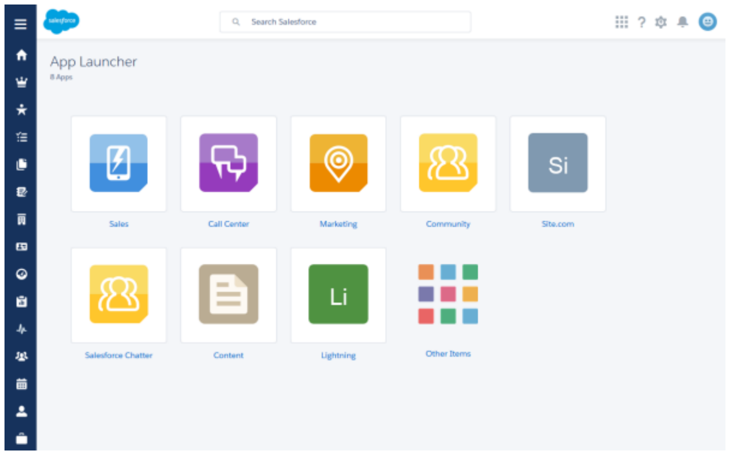
The Expenses menu item on the Salesforce1 navigation menu. If you don't see the menu item in Salesforce1, you must create a Lightning Components tab for expenses and include it in the Salesforce1 navigation menu. See Add Lightning Components as Custom Tabs in Salesforce1 for more information.

Note: The Lightning component tab isn't available if you don't have a custom domain enabled in your org. Verify that you have a custom domain and that the Expenses tab is available in the Lightning Components Tabs section of the Tabs page.

Salesforce1 Navigation.



For Lightning Experience, the Expenses tab is available via the App Launcher in the custom app titled "Lightning".



Next, you can modify the code in the Developer Console or explore the standalone app at `https://<myDomain>.lightning.force.com/<namespace>/expenseTracker.app`, where `<myDomain>` is the name of your custom Salesforce domain.

Note: To delete the package, from Setup, enter *`Installed Package`* in the `Quick Find` box, select **Installed Package**, and then delete the package.

Create an Expense Object

Create an expense object to store your expense records and data for the app.

You'll need to create this object if you're following the tutorial at Create a Standalone Lightning App on page 7.

1. From your management settings for custom objects, if you're using Salesforce Classic, click **New Custom Object**, or if you're using Lightning Experience, select **Create** > **Custom Object**.
2. Define the custom object.
   - For the *`Label`*, enter *`Expense`*.
   - For the *`Plural Label`*, enter *`Expenses`*.

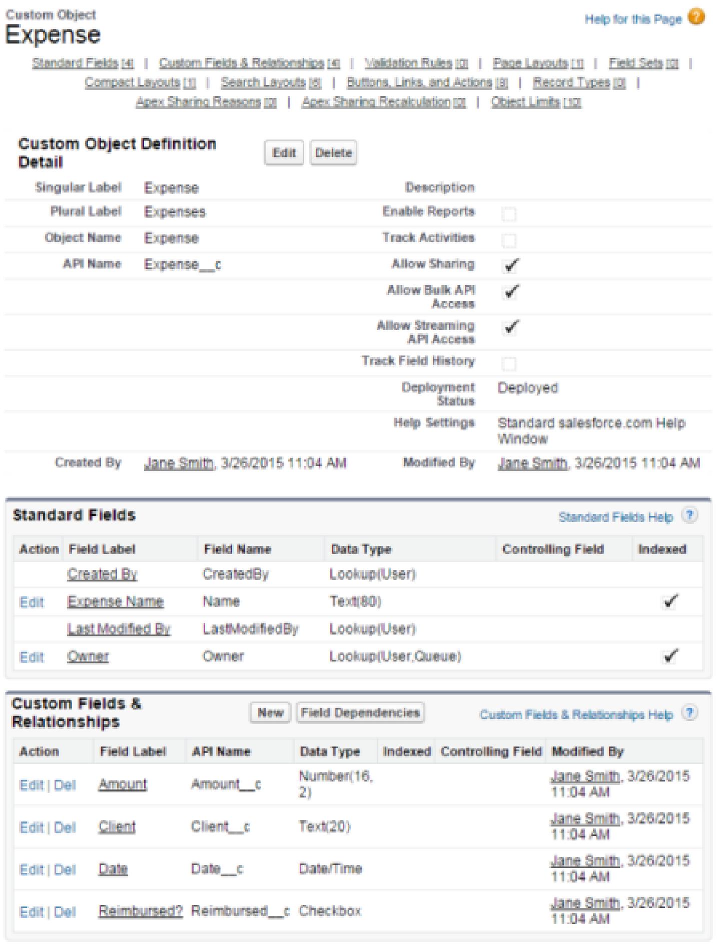
3. Click **Save** to finish creating your new object. The Expense detail page is displayed.

   Note: If you're using a namespace prefix, you might see `namespace__Expense__c` instead of `Expense__c`.

4. On the Expense detail page, add the following custom fields.

Field Type	Field Label
Number(16, 2)	Amount
Text (20)	Client
Date/Time	Date
Checkbox	Reimbursed?

When you finish creating the custom object, your Expense definition detail page should look similar to this.


Custom Object

Expense

Help for this Page

Standard Fields [4] | Custom Fields & Relationships [4] | Validation Rules [0] | Page Layouts [1] | Field Sets [0] | Compact Layouts [1] | Search Layouts [6] | Buttons, Links, and Actions [8] | Record Types [0] | Apex Sharing Reasons [0] | Apex Sharing Recalculation [0] | Object Limits [10]

Custom Object Definition Detail Edit Delete

Singular Label	Expense	Description	
Plural Label	Expenses	Enable Reports	☐
Object Name	Expense	Track Activities	☐
API Name	Expense__c	Allow Sharing	✓
		Allow Bulk API Access	✓
		Allow Streaming API Access	✓
		Track Field History	☐
		Deployment Status	Deployed
		Help Settings	Standard salesforce.com Help Window
Created By	Jane Smith, 3/26/2015 11:04 AM	Modified By	Jane Smith, 3/26/2015 11:04 AM

Standard Fields Standard Fields Help

Action	Field Label	Field Name	Data Type	Controlling Field	Indexed
	Created By	CreatedBy	Lookup(User)		
Edit	Expense Name	Name	Text(80)		✓
	Last Modified By	LastModifiedBy	Lookup(User)		
Edit	Owner	Owner	Lookup(User,Queue)		✓

Custom Fields & Relationships New Field Dependencies Custom Fields & Relationships Help

Action	Field Label	API Name	Data Type	Indexed	Controlling Field	Modified By
Edit | Del	Amount	Amount__c	Number(16, 2)			Jane Smith, 3/26/2015 11:04 AM
Edit | Del	Client	Client__c	Text(20)			Jane Smith, 3/26/2015 11:04 AM
Edit | Del	Date	Date__c	Date/Time			Jane Smith, 3/26/2015 11:04 AM
Edit | Del	Reimbursed?	Reimbursed__c	Checkbox			Jane Smith, 3/26/2015 11:04 AM

5. Create a custom object tab to display your expense records.
   a. From Setup, enter *`Tabs`* in the `Quick Find` box, then select **Tabs**.

b. In the Custom Object Tabs related list, click **New** to launch the New Custom Tab wizard.
   - For the `Object`, select `Expense`.
   - For the `Tab Style`, click the lookup icon and select the `Credit Card` icon.

c. Accept the remaining defaults and click **Next**.

d. Click **Next** and **Save** to finish creating the tab.

   In Salesforce Classic, you should now see a tab for your Expenses at the top of the screen. In Lightning Experience, click the App Launcher icon (⁝⁝⁝) and then the `Other Items` icon. You should see `Expenses` in the Items list.

6. Create a few expense records.

   a. Click the Expenses tab and click **New**.

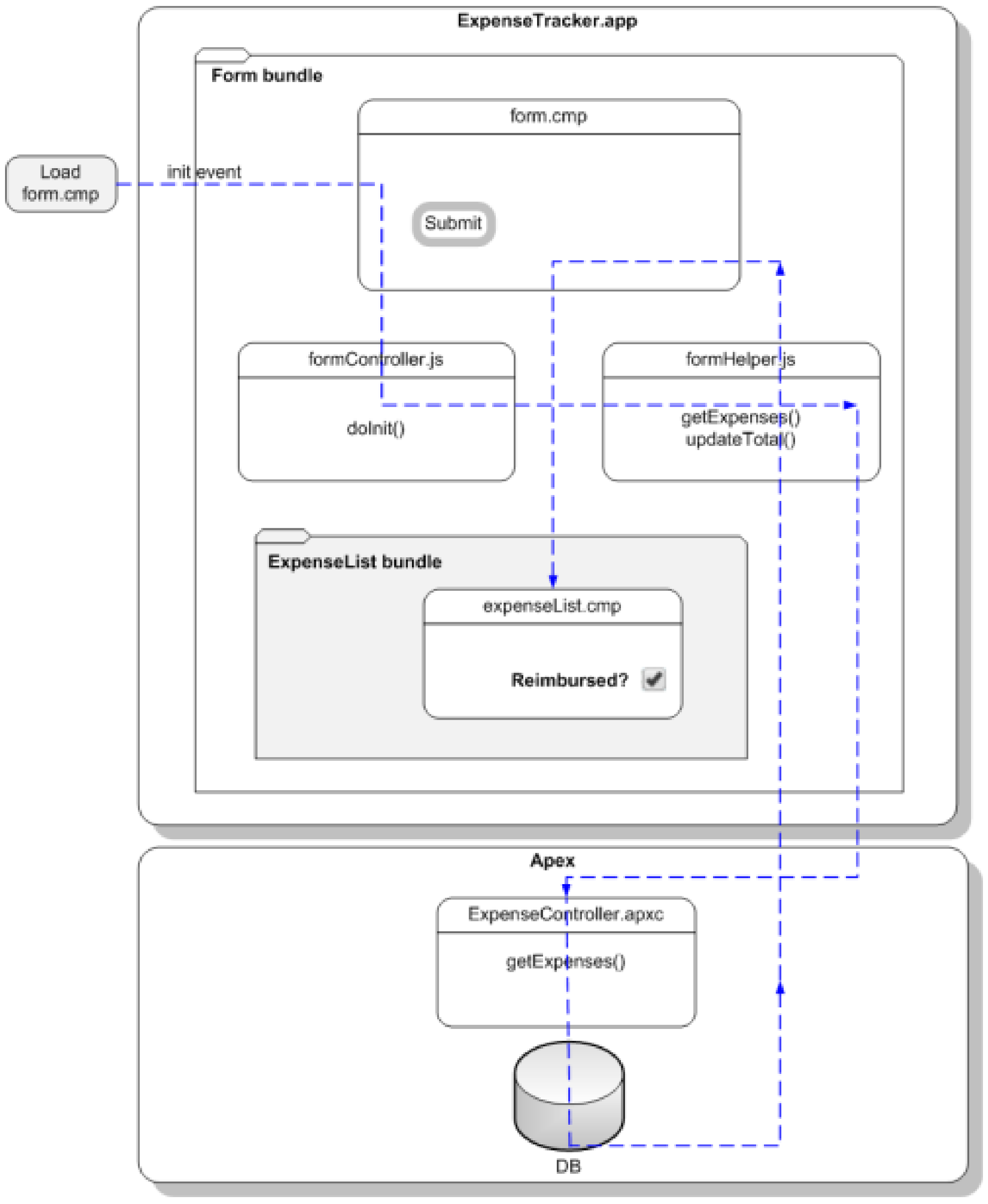
   b. Enter the values for these fields and repeat for the second record.

Expense Name	Amount	Client	Date	Reimbursed?
Lunch	21		4/1/2015 12:00 PM	Unchecked
Dinner	70	ABC Co.	3/30/2015 7:00 PM	Checked

Step 1: Create A Static Mockup

Create a static mockup in a `.app` file, which is the entry point for your app. It can contain other components and HTML markup.

The following flowchart summarizes the data flow in the app. The app retrieves data from the records through a combination of client-side controller and helper functions, and an Apex controller, which you'll create later in this quick start.



This tutorial uses Lightning Design System styling, which provides a look and feel that's consistent with Lightning Experience.

1. Open the Developer Console.
   a. In Salesforce Classic, click `Your Name` > **Developer Console**.
   b. In Lightning Experience, click the quick access menu (⚙), and then **Developer Console**.
2. Create a new Lightning app. In the Developer Console, click **File** > **New** > **Lightning Application**.
3. Enter *`expenseTracker`* for the `Name` field in the New Lightning Bundle popup window. This creates a new app, `expenseTracker.app`.

4. In the source code editor, enter this code.

```
<aura:application extends="force:slds">
    <div class="slds">
        <div class="slds-page-header">
          <div class="slds-grid">
            <div class="slds-col slds-has-flexi-truncate">
              <p class="slds-text-heading--label">Expenses</p>
              <div class="slds-grid">
                <div class="slds-grid slds-type-focus slds-no-space">
                  <h1 class="slds-text-heading--medium slds-truncate" title="My
Expenses">My Expenses</h1>
                </div>
              </div>
            </div>
          </div>
        </div>
    </div>
</aura:application>
```

An application is a top-level component and the main entry point to your components. It can include components and HTML markup, such as `<div>` and `<header>` tags. Your app automatically gets Lightning Design System styles if it extends `force:slds`.

5. Save your changes and click **Preview** in the sidebar to preview your app. Alternatively, navigate to `https://<myDomain>.lightning.force.com/<namespace>/expenseTracker.app`, where `<myDomain>` is the name of your custom Salesforce domain. If you're not using a namespace, your app is available at `/c/expenseTracker.app`.
You should see the header `My Expenses`.

SEE ALSO:

Salesforce Help: Open the Developer Console

aura:application

Using the Salesforce Lightning Design System in Apps

Step 2: Create A Component for User Input

Components are the building blocks of an app. They can be wired up to an Apex controller class to load your data. The component you create in this step provides a form that takes in user input about an expense, such as expense amount and date.

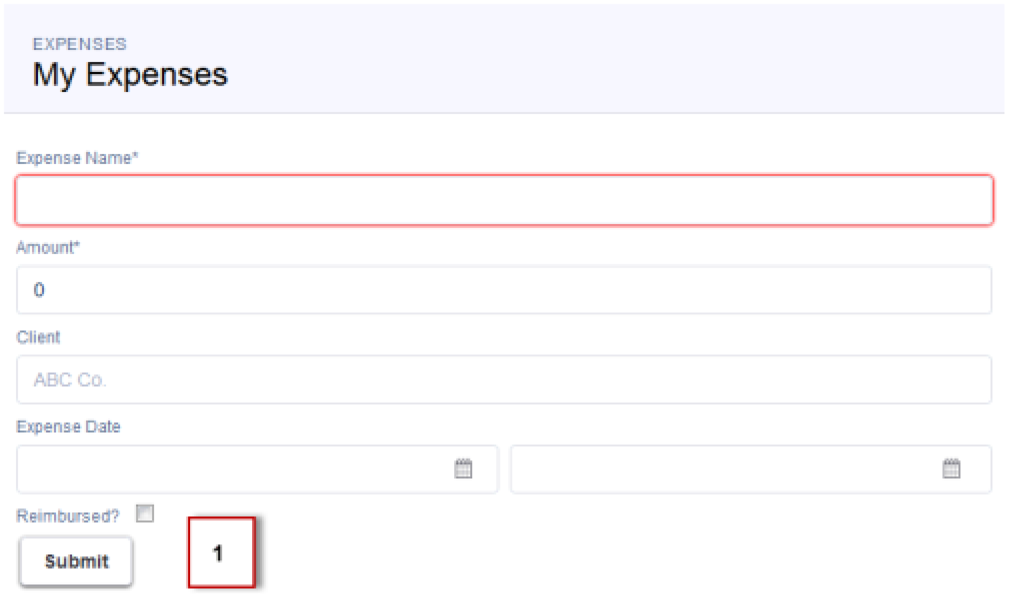
1. Click **File** > **New** > **Lightning Component**.
2. Enter *form* for the `Name` field in the New Lightning Bundle popup window. This creates a new component, `form.cmp`.
3. In the source code editor, enter this code.

Note: The following code creates an input form that takes in user input to create an expense, which works in both a standalone app, and in Salesforce1 and Lightning Experience. For apps specific to Salesforce1 and Lightning Experience, you can use `force:createRecord` to open the create record page.

```
<aura:component implements="force:appHostable">
  <aura:attribute name="expenses" type="Expense__c[]"/>
  <aura:attribute name="newExpense" type="Expense__c"
         default="{ 'sobjectType': 'Expense__c',
                         'Name': '',
                         'Amount__c': 0,
                         'Client__c': '',
                         'Date__c': '',
                         'Reimbursed__c': false
                       }"/>
  <!-- If you registered a namespace, replace the previous aura:attribute tags with the
 following -->
  <!-- <aura:attribute name="expenses" type="myNamespace.Expense__c[]"/>
  <aura:attribute name="newExpense" type="myNamespace__Expense__c"
               default="{ 'sobjectType': 'myNamespace__Expense__c',
                          'Name': '',
                          'myNamespace__Amount__c': 0,
                          'myNamespace__Client__c': '',
                          'myNamespace__Date__c': '',
                          'myNamespace__Reimbursed__c': false
                         }"/> -->
  <!-- Attributes for Expense Counters -->
  <aura:attribute name="total" type="Double" default="0.00" />
  <aura:attribute name="exp" type="Double" default="0" />

  <!-- Input Form using components -->
  <div class="container">
    <form class="slds-form--stacked">
      <div class="slds-form-element slds-is-required">
        <div class="slds-form-element__control">

       <!-- If you registered a namespace,
            the attributes include your namespace.
            For example, value="{!v.newExpense.myNamespace__Amount__c}" -->

          <ui:inputText aura:id="expname" label="Expense Name"
                        class="slds-input"
                        labelClass="slds-form-element__label"
                        value="{!v.newExpense.Name}"
                        required="true"/>
         </div>
       </div>
       <div class="slds-form-element slds-is-required">
         <div class="slds-form-element__control">
           <ui:inputNumber aura:id="amount" label="Amount"
                           class="slds-input"
                           labelClass="slds-form-element__label"
                           value="{!v.newExpense.Amount__c}"
                           placeholder="20.80" required="true"/>
          </div>
        </div>
        <div class="slds-form-element">
          <div class="slds-form-element__control">
            <ui:inputText aura:id="client" label="Client"
                          class="slds-input"
                          labelClass="slds-form-element__label"
                          value="{!v.newExpense.Client__c}"
                          placeholder="ABC Co."/>
           </div>
         </div>
         <div class="slds-form-element">
           <div class="slds-form-element__control">
             <ui:inputDateTime aura:id="expdate" label="Expense Date"
                               class="slds-input"
                               labelClass="slds-form-element__label"
                               value="{!v.newExpense.Date__c}"
                               displayDatePicker="true"/>
            </div>
          </div>
          <div class="slds-form-element">
            <ui:inputCheckbox aura:id="reimbursed" label="Reimbursed?"
                              class="slds-checkbox"
                              labelClass="slds-form-element__label"
                              value="{!v.newExpense.Reimbursed__c}"/>
            <ui:button label="Submit"
                       class="slds-button slds-button--neutral"
                       labelClass="label"
                       press="{!c.createExpense}"/>
           </div>
    </form>
  </div><!-- ./container-->

  <!-- Expense Counters -->
  <div class="container slds-p-top--medium">
        <div class="row">
            <div class="slds-tile ">
                <!-- Make the counter red if total amount is more than 100 -->
                <div class="{!v.total >= 100
                     ? 'slds-notify slds-notify--toast slds-theme--error
slds-theme--alert-texture'
                     : 'slds-notify slds-notify--toast slds-theme--alert-texture'}">
                    <p class="slds-tile__title slds-truncate">Total Expenses</p>
                    $<ui:outputNumber class="slds-truncate" value="{!v.total}"
format=".00"/>
                </div>
            </div>
            <div class="slds-tile ">
                <div class="slds-notify slds-notify--toast slds-theme--alert-texture">
                      <p class="slds-tile__title slds-truncate">No. of Expenses</p>
                      <ui:outputNumber class="slds-truncate" value="{!v.exp}"/>
                  </div>
            </div>
        </div>
    </div>
          <!-- Display expense records -->
          <div class="container slds-p-top--medium">
              <div id="list" class="row">
                 <aura:iteration items="{!v.expenses}" var="expense">

                     <!-- If you're using a namespace,
                          use the format
                          {!expense.myNamespace__myField__c} instead. -->
                     <p>{!expense.Name}, {!expense.Client__c},
                        {!expense.Amount__c}, {!expense.Date__c},
                        {!expense.Reimbursed__c}</p>
                </aura:iteration>
              </div>
          </div>
</aura:component>
```

Components provide a rich set of attributes and browser event support. Attributes are typed fields that are set on a specific instance of a component, and can be referenced using an expression syntax. All `aura:attribute` tags have name and type values. For more information, see Supported aura:attribute Types on page 325.

The attributes and expressions here will become clearer as you build the app. `{!v.exp}` evaluates the number of expenses records and `{!v.total}` evaluates the total amount. `{!c.createExpense}` represents the client-side controller action that runs when the **Submit** button (1) is clicked, which creates a new expense. The `press` event in `ui:button` enables you to wire up the action when the button is pressed.



The expression `{!v.expenses}` wires up the component to the expenses object. `var="expense"` denotes the name of the variable to use for each item inside the iteration. `{!expense.Client__c}` represents data binding to the client field in the expense object.

Note: The default value for `newExpense` of type `Expense__c` must be initialized with the correct fields, including `sobjectType`. Initializing the default value ensures that the expense is saved in the correct format.

4. Click **STYLE** in the sidebar to create a new resource named `form.css`. Enter these CSS rule sets.

```
.THIS .uiInputDateTime .datePicker-openIcon {
   position: absolute;
    left: 45%;
    top: 45%;
}

.THIS .uiInputDateTime .timePicker-openIcon {
   position: absolute;
    left: 95%;
    top: 70%;
}

.THIS .uiInputDefaultError li {
  list-style: none;
}
```

Note: `THIS` is a keyword that adds namespacing to CSS to prevent any conflicts with another component's styling. The `.uiInputDefaultError` selector styles the default error component when you add field validation in Step 5: Enable Input for New Expenses on page 23.

5. Add the component to the app. In `expenseTracker.app`, add the new component to the markup.

   This step adds `<c:form />` to the markup. If you're using a namespace, you can use `<myNamespace:form />` instead. If you haven't set a namespace prefix for your organization, use the default namespace `c` when referencing components that you've created.

```
<aura:application extends="force:slds">
    <div class="slds">
        <div class="slds-page-header">
          <div class="slds-grid">
            <div class="slds-col slds-has-flexi-truncate">
              <p class="slds-text-heading--label">Expenses</p>
              <div class="slds-grid">
                <div class="slds-grid slds-type-focus slds-no-space">
                  <h1 class="slds-text-heading--medium slds-truncate" title="My
Expenses">My Expenses</h1>
                </div>
              </div>
            </div>
          </div>
        </div>

        <div class="slds-col--padded slds-p-top--large">
            <c:form />
        </div>
    </div>
    </aura:application>
```

6. Save your changes and click **Update Preview** in the sidebar to preview your app. Alternatively, reload your browser.

   Note: In this step, the component you created doesn't display any data since you haven't created the Apex controller class yet.

Good job! You created a component that provides an input form and view of your expenses. Next, you'll create the logic to display your expenses.

SEE ALSO:

Component Markup

Component Body

Step 3: Load the Expense Data

Load expense data using an Apex controller class. Display this data via component attributes and update the counters dynamically.

Create the expense controller class.

1. Click **File** > **New** > **Apex Class** and enter *`ExpenseController`* in the **New Class** window. This creates a new Apex class, `ExpenseController.apxc`.
2. Enter this code.

```
public with sharing class ExpenseController {
    @AuraEnabled
    public static List<Expense__c> getExpenses() {

        // Perform isAccessible() check here
        return [SELECT Id, Name, Amount__c, Client__c, Date__c,
        Reimbursed__c, CreatedDate FROM Expense__c];
    }
}
```

   The `getExpenses()` method contains a SOQL query to return all expense records. Recall the syntax `{!v.expenses}` in `form.cmp`, which displays the result of the `getExpenses()` method in the component markup.

   Note: For more information on using SOQL, see the *Force.com SOQL and SOSL Reference*.

   `@AuraEnabled` enables client- and server-side access to the controller method. Server-side controllers must be static and all instances of a given component share one static controller. They can return or take in any types, such as a List or Map.

   Note: For more information on server-side controllers, see Apex Server-Side Controller Overview on page 248.

3. In `form.cmp`, update the `aura:component` tag to include the `controller` attribute.

```
<aura:component controller="ExpenseController">
```

   Note: If your org has a namespace, use `controller="myNamespace.ExpenseController"` instead.

4. Add an `init` handler to load your data on component initialization.

```
<aura:component controller="ExpenseController">
  <aura:handler name="init" value="{!this}" action="{!c.doInit}" />
  <!-- Other aura:attribute tags here -->
  <!-- Other code here -->
</aura:component>
```

   On initialization, this event handler runs the `doInit` action that you're creating next. This `init` event is fired before component rendering.

5. Add the client-side controller action for the `init` handler. In the sidebar, click **CONTROLLER** to create a new resource, `formController.js`. Enter this code.

```
({
    doInit : function(component, event, helper) {
       //Update expense counters
       helper.getExpenses(component);
    },//Delimiter for future code
})
```

During component initialization, the expense counters should reflect the latest sum and total number of expenses, which you're adding next using a helper function, `getExpenses(component)`.

Note: A client-side controller handles events within a component and can take in three parameters: the component to which the controller belongs, the event that the action is handling, and the helper if it's used. A helper is a resource for storing code that you want to reuse in your component bundle, providing better code reusability and specialization. For more information about using client-side controllers and helpers, see Handling Events with Client-Side Controllers on page 138 and Sharing JavaScript Code in a Component Bundle on page 223.

6. Create the helper function to display the expense records and dynamically update the counters. Click **HELPER** to create a new resource, `formHelper.js` and enter this code.

```
({
  getExpenses: function(component) {
        var action = component.get("c.getExpenses");
        action.setCallback(this, function(response) {
            var state = response.getState();
            if (component.isValid() && state === "SUCCESS") {
                component.set("v.expenses", response.getReturnValue());
                this.updateTotal(component);
            }
        });
        $A.enqueueAction(action);
  },
  updateTotal : function(component) {
      var expenses = component.get("v.expenses");
      var total = 0;
      for(var i=0; i<expenses.length; i++){
          var e = expenses[i];

          //If you're using a namespace, use e.myNamespace__Amount__c instead
          total += e.Amount__c;
      }
      //Update counters
      component.set("v.total", total);
      component.set("v.exp", expenses.length);
  },//Delimiter for future code

})
```

`component.get("c.getExpenses")` returns an instance of the server-side action. `action.setCallback()` passes in a function to be called after the server responds. In `updateTotal`, you are retrieving the expenses and summing up their amount values and length of expenses, setting those values on the `total` and `exp` attributes.

Note: `$A.enqueueAction(action)` adds the action to the queue. All the action calls are asynchronous and run in batches. For more information about server-side actions, see Calling a Server-Side Action on page 250.

7. Save your changes and reload your browser.

   You should see the expense records created in Create an Expense Object on page 10. The counters aren't working at this point as you'll be adding the programmatic logic later.

Your app now retrieves the expense object and displays its records as a list, iterated over by `aura:iteration`. The counters now reflect the total sum and number of expenses.

In this step, you created an Apex controller class to load expense data. `getExpenses()` returns the list of expense records. By default, the framework doesn't call any getters. To access a method, annotate the method with `@AuraEnabled`, which exposes the data in that method. Only methods that are annotated with `@AuraEnabled` in the controller class are accessible to the components.

Component markup that uses the `ExpenseController` class can display the expense name or id with the `{!expense.name}` or `{!expense.id}` expression, as shown in Step 2: Create A Component for User Input on page 14.

Beyond the Basics

Client-side controller definitions are surrounded by brackets and curly braces. The curly braces denotes a JSON object, and everything inside the object is a map of name-value pairs. For example, `updateTotal` is a name that corresponds to a client-side action, and the value is a function. The function is passed around in JavaScript like any other object.

SEE ALSO:

CRUD and Field-Level Security (FLS)

Step 4: Create a Nested Component

As your component grows, you want to break it down to maintain granularity and encapsulation. This step walks you through creating a component with repeating data and whose attributes are passed to its parent component. You'll also add a client-side controller action to load your data on component initialization.

1. Click **File** > **New** > **Lightning Component**.
2. Enter *`expenseList`* in the New Lightning Bundle window. This creates a new component, `expenseList.cmp`.
3. In `expenseList.cmp`, enter this code.

Note: Use the API name of the fields to bind the field values. For example, if you're using a namespace, you must use `{!v.expense.myNamespace__Amount__c}` instead of `{!v.expense.Amount__c}`.

```
<aura:component>
    <aura:attribute name="expense" type="Expense__c"/>
    <!-- Color the item blue if the expense is reimbursed -->
    <div class="slds-card">
    <!-- If you registered a namespace,
                use v.expense.myNamespace__Reimbursed__c == true instead. -->
    <div class="{!v.expense.Reimbursed__c == true
                       ? 'slds-theme--success' : 'slds-theme--warning'}">
          <header class="slds-card__header slds-grid grid--flex-spread">
              <a aura:id="expense" href="{!'/' + v.expense.Id}">
                  <h3>{!v.expense.Name}</h3>
              </a>
          </header>

       <section class="slds-card__body">
           <!-- If you registered a namespace,
                use v.expense.myNamespace__Reimbursed__c instead. -->

          <div class="slds-tile slds-hint-parent">
              <p class="slds-tile__title slds-truncate">Amount:
                  <ui:outputNumber value="{!v.expense.Amount__c}" format=".00"/>
              </p>
        <p class="slds-truncate">Client:
            <ui:outputText value="{!v.expense.Client__c}"/>
        </p>
        <p class="slds-truncate">Date:
            <ui:outputDateTime value="{!v.expense.Date__c}" />
        </p>
        <p class="slds-truncate">Reimbursed?
            <ui:inputCheckbox value="{!v.expense.Reimbursed__c}" click="{!c.update}"/>
        </p>
    </div>
        </section>
    </div>
    </div>
</aura:component>
```

Instead of using `{!expense.Amount__c}`, you're now using `{!v.expense.Amount__c}`. This expression accesses the `expense` object and the `amount` values on it.

Additionally, `href="{!'/' + v.expense.Id}"` uses the expense ID to set the link to the detail page of each expense record.

4. In `form.cmp`, update the `aura:iteration` tag to use the new nested component, `expenseList`. Locate the existing `aura:iteration` tag.

```
<aura:iteration items="{!v.expenses}" var="expense">
    <p>{!expense.Name}, {!expense.Client__c}, {!expense.Amount__c}, {!expense.Date__c},
 {!expense.Reimbursed__c}</p>
</aura:iteration>
```

Replace it with an `aura:iteration` tag that uses the `expenseList` component.

```
<aura:iteration items="{!v.expenses}" var="expense">
    <!--If you're using a namespace, use myNamespace:expenseList instead-->
    <c:expenseList expense="{!expense}"/>
</aura:iteration>
```

Notice how the markup is simpler as you're just passing each `expense` record to the `expenseList` component, which handles the display of the expense details.

5. Save your changes and reload your browser.

You created a nested component and passed its attributes to a parent component. Next, you'll learn how to process user input and update the expense object.

Beyond the Basics

When you create a component, you are providing the definition of that component. When you put the component in another component, you are create a reference to that component. This means that you can add multiple instances of the same component with different attributes. For more information about component attributes, see Component Composition on page 51.

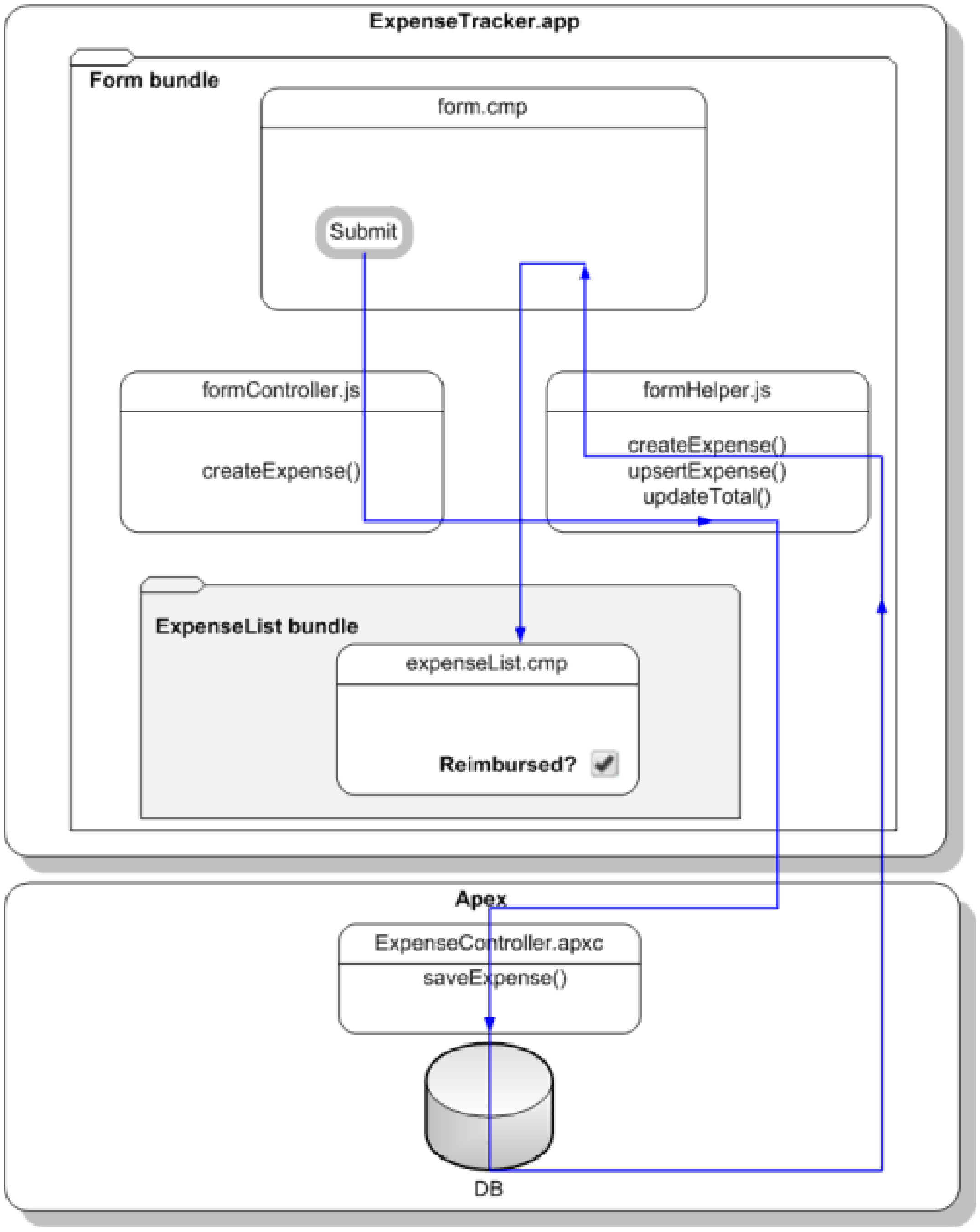
SEE ALSO:

Component Attributes

Step 5: Enable Input for New Expenses

When you enter text into the form and press Submit, you want to insert a new expense record. This action is wired up to the button component via the `press` attribute.

The following flowchart shows the flow of data in your app when you create a new expense. The data is captured when you click the **Submit** button in the component `form.cmp`, processed by your JavaScript code and sent to the server-side controller to be saved as a record. Data from the records is displayed in the nested component you created in the previous step.



First, update the Apex controller with a new method that inserts or updates the records.

1. In the `ExpenseController` class, enter this code below the `getExpenses()` method.

```
@AuraEnabled
public static Expense__c saveExpense(Expense__c expense) {

    // Perform isUpdateable() check here
    upsert expense;
    return expense;
}
```

The `saveExpense()` method enables you to insert or update an expense record using the `upsert` operation.

Note: Fore more information about the `upsert` operation, see the *Apex Developer Guide*.

2. Create the client-side controller action to create a new expense record when the **Submit** button is pressed. In `formController.js`, add this code after the `doInit` action.

```
createExpense : function(component, event, helper) {
    var amtField = component.find("amount");
    var amt = amtField.get("v.value");
    if (isNaN(amt)||amt==''){
        amtField.set("v.errors", [{message:"Enter an expense amount."}]);
    }
    else {
        amtField.set("v.errors", null);
        var newExpense = component.get("v.newExpense");
        helper.createExpense(component, newExpense);
    }
},//Delimiter for future code
```

`createExpense` validates the amount field using the default error handling of input components. If the validation fails, we set an error message in the `errors` attribute of the input component. For more information on field validation, see Validating Fields on page 230.

Notice that you're passing in the arguments to a helper function `helper.createExpense()`, which then triggers the Apex class `saveExpense`.

Note: Recall that you specified the `aura:id` attributes in Step 2: Create A Component for User Input on page 14. `aura:id` enables you to find the component by name using the syntax `component.find("amount")` within the scope of this component and its controller.

3. Create the helper function to handle the record creation. In `formHelper.js`, add these helper functions after the `updateTotal` function.

```
createExpense: function(component, expense) {
    this.upsertExpense(component, expense, function(a) {
        var expenses = component.get("v.expenses");
        expenses.push(a.getReturnValue());
        component.set("v.expenses", expenses);
        this.updateTotal(component);
      });
},
upsertExpense : function(component, expense, callback) {
    var action = component.get("c.saveExpense");
    action.setParams({
        "expense": expense
    });
    if (callback) {
      action.setCallback(this, callback);
    }
    $A.enqueueAction(action);
}
```

`createExpense` calls `upsertExpense`, which defines an instance of the `saveExpense` server-side action and sets the `expense` object as a parameter. The callback is executed after the server-side action returns, which updates the records, view, and counters. `$A.enqueueAction(action)` adds the server-side action to the queue of actions to be executed.

Note: Different possible action states are available and you can customize their behaviors in your callback. For more information on action callbacks, see Calling a Server-Side Action.

4. Save your changes and reload your browser.
5. Test your app by entering a new expense record with field values: `Breakfast, 10, ABC Co., Apr 30, 2014 9:00:00 AM`. For the date field, you can also use the date picker to set a date and time value. Click the Submit button. The record is added to both your component view and records, and the counters are updated.

   Note: To debug your Apex code, use the Logs tab in the Developer Console. For example, if you don't have input validation for the date time field and entered an invalid date time format, you might get an INVALID_TYPE_ON_FIELD_IN_RECORD exception, which is listed both on the Logs tab in the Developer Console and in the response header on your browser. Otherwise, you might see an Apex error displayed in your browser. For more information on debugging your JavaScript code, see Enable Debug Mode for Lightning Components on page 304.

Congratulations! You have successfully created a simple expense tracker app that includes several components, client- and server-side controllers, and helper functions. Your app now accepts user input, which updates the view and database. The counters are also dynamically updated as you enter new user input. The next step shows you how to add a layer of interactivity using events.

SEE ALSO:

Handling Events with Client-Side Controllers

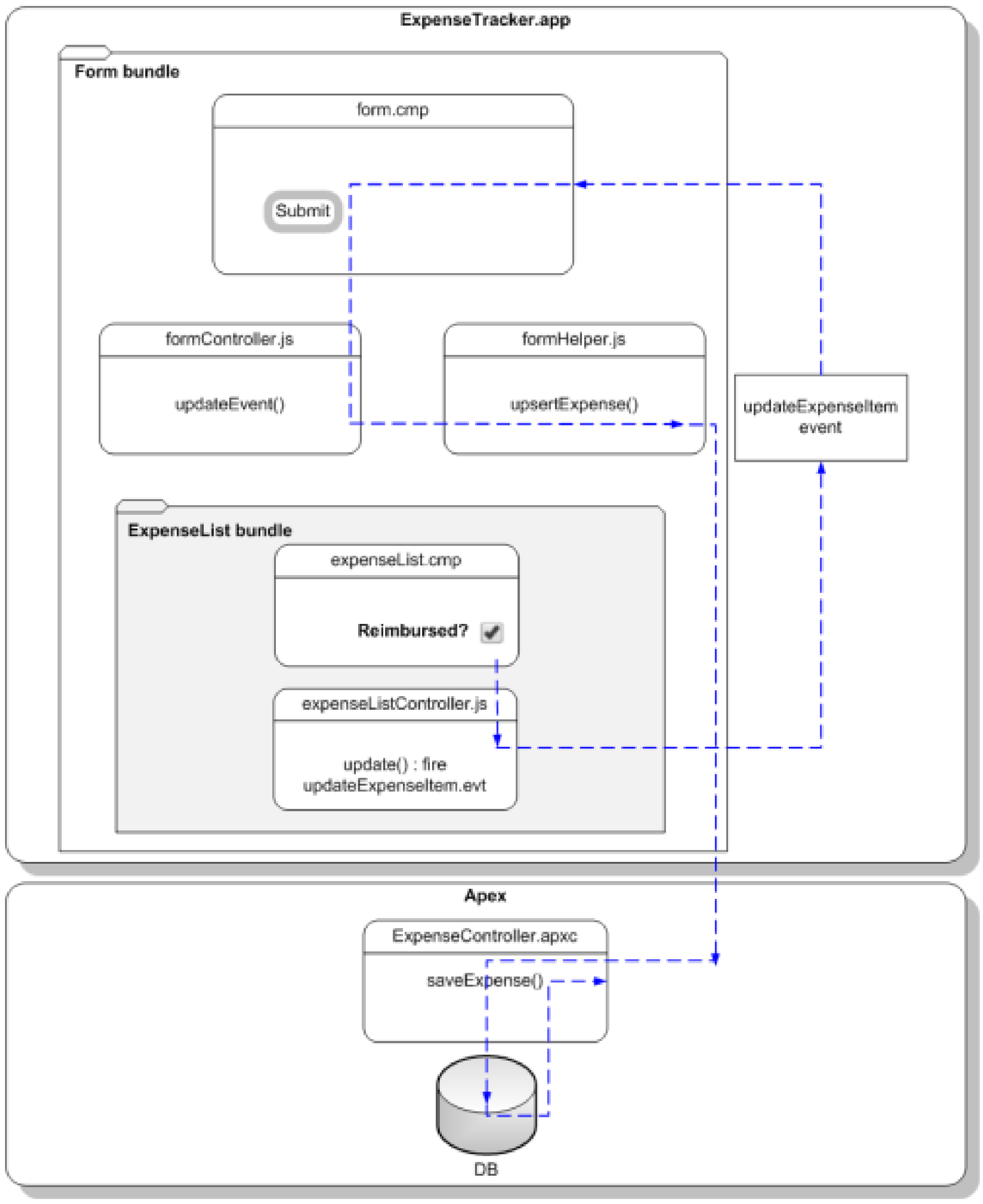
Calling a Server-Side Action

CRUD and Field-Level Security (FLS)

Step 6: Make the App Interactive With Events

Events add an interactive layer to your app by enabling you to share data between components. When the checkbox is checked or unchecked in the expense list view, you want to fire an event that updates both the view and records based on the relevant component data.

This flowchart shows the data flow in the app when a data change is captured by the selecting and deselecting of a checkbox on the `expenseList` component. When the **Reimbursed?** checkbox is selected or deselected, this browser click event fires the component event you're creating here. This event communicates the expense object to the handler component, and its controller calls the Apex controller method to update the relevant expense record, after which the response is ignored by the client since we won't be handling this server response here.



Let's start by creating the event and its handler before firing it and handling the event in the parent component.

1. Click **File** > **New** > **Lightning Event**.
2. Enter *`updateExpenseItem`* in the New Event window. This creates a new event, `updateExpenseItem.evt`.
3. In `updateExpenseItem.evt`, enter this code.

   The attribute you're defining in the event is passed from the firing component to the handlers.

```
<aura:event type="COMPONENT">
    <!-- If you're using a namespace, use myNamespace.Expense__c instead. -->
    <aura:attribute name="expense" type="Expense__c"/>
</aura:event>
```

The framework has two types of events: component events and application events.

Note: Always try to use a component event instead of an application event, if possible. Component events can only be handled by components above them in the containment hierarchy so their usage is more localized to the components that need to know about them. Application events are best used for something that should be handled at the application level, such as navigating to a specific record. Application events allow communication between components that are in separate parts of the application and have no direct containment relationship.

We'll use a component event. Recall that `expenseList.cmp` contains the **Reimbursed?** checkbox.

4. Update `expenseList.cmp` to register that it fires the event. Add this tag after the `<aura:attribute>` tag.

```
<aura:registerEvent name="updateExpense" type="c:updateExpenseItem"/>
```

The **Reimbursed?** checkbox is wired up to a client-side controller action, denoted by `change="{!c.update}"`. You'll set up the `update` action next.

5. In the `expenseList` sidebar, click **CONTROLLER**. This creates a new resource, `expenseListController.js`. Enter this code.

```
({
    update: function(component, evt, helper) {
      var expense = component.get("v.expense");
      // Note that updateExpense matches the name attribute in <aura:registerEvent>
      var updateEvent = component.getEvent("updateExpense");
      updateEvent.setParams({ "expense": expense }).fire();
    }
})
```

When the checkbox is checked or unchecked, the `update` action runs, setting the `reimbursed` parameter value to `true` or `false`. The `updateExpenseItem.evt` event is fired with the updated `expense` object .

6. In the handler component, `form.cmp`, add this handler code before the `<aura:attribute>` tags.

```
<aura:handler name="updateExpense" event="c:updateExpenseItem" action="{!c.updateEvent}"
 />
```

This event handler runs the `updateEvent` action when the component event you created is fired. The `<aura:handler>` tag uses the same value of the `name` attribute, `updateExpense`, from the `<aura:registerEvent>` tag in `c:expenseList`

7. Wire up the `updateEvent` action to handle the event. In `formController.js`, enter this code after the `createExpense` controller action.

```
updateEvent : function(component, event, helper) {
    helper.upsertExpense(component, event.getParam("expense"));
}
```

This action calls a helper function and passes in `event.getParam("expense")`, which contains the expense object with its parameters and values in this format: `{ Name : "Lunch" , Client__c : "ABC Co." , Reimbursed__c : true , CreatedDate : "2014-08-12T20:53:09.000Z" , Amount__c : 20}`.

8. Save your changes and reload your browser.

9. Click the **Reimbursed?** checkbox for one of the records.

   Note that the background color for the record changes. When you change the reimbursed status on the view, the `update` event is fired, handled by the parent component, which then updates the expense record by running the server-side controller action `saveExpense`.

That's it! You have successfully added a layer of interaction in your expense tracker app using a component event.

The app you just created is currently accessible as a standalone app by accessing `https://<myDomain>.lightning.force.com/<namespace>/expenseTracker.app`, where `<myDomain>` is the name of your custom Salesforce domain. To make it accessible in Salesforce1, see Add Lightning Components as Custom Tabs in Salesforce1 on page 100. To package and distribute your app on AppExchange, see Distributing Applications and Components on page 302.

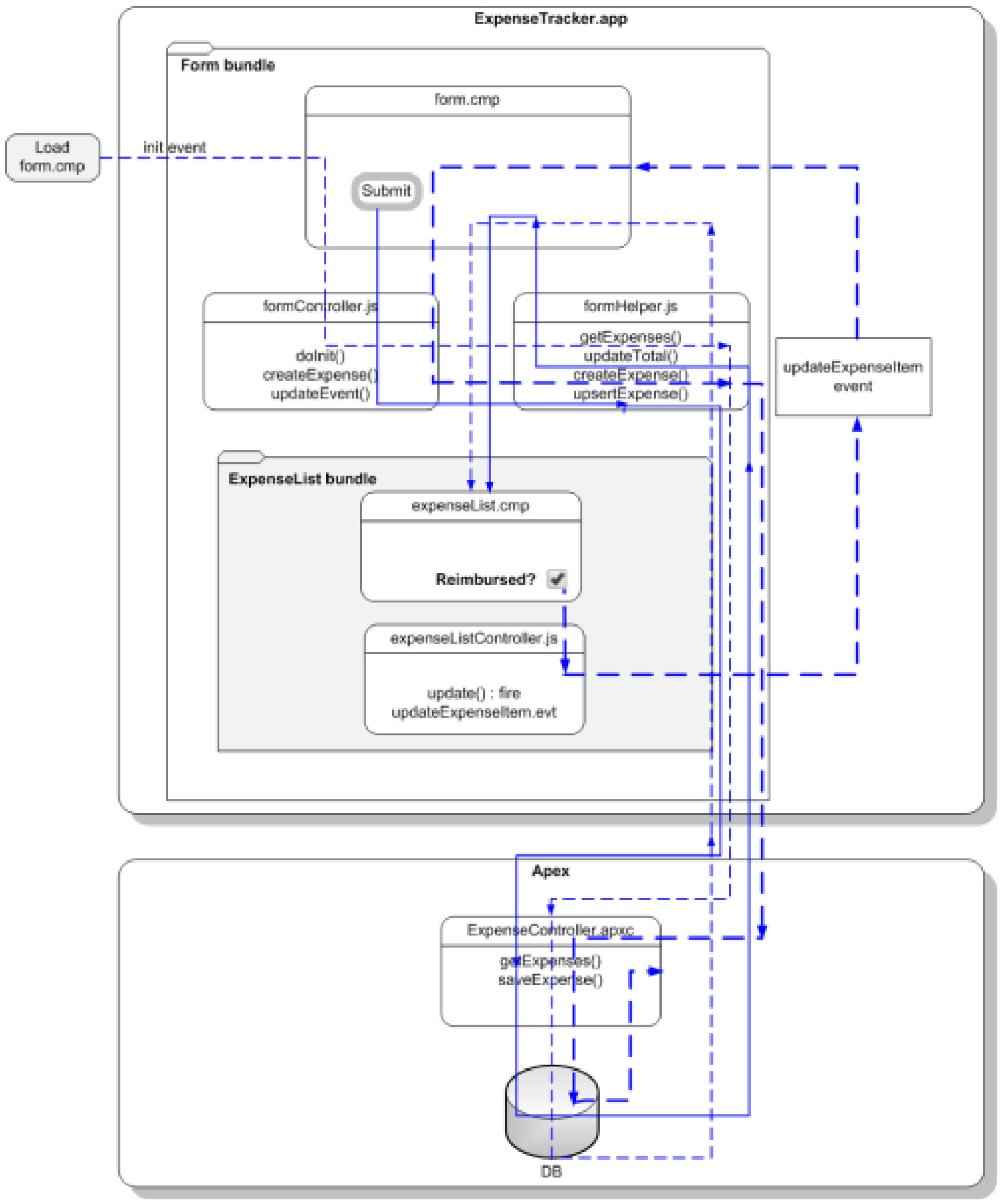
SEE ALSO:

Component Events

Event Handling Lifecycle

Summary

You created several components with controllers and events that interact with your expense records. The expense tracker app performs three distinct tasks: load the expense data and counters on app initialization, take in user input to create a new record and update the view, and handle user interactions by communicating relevant component data via events.



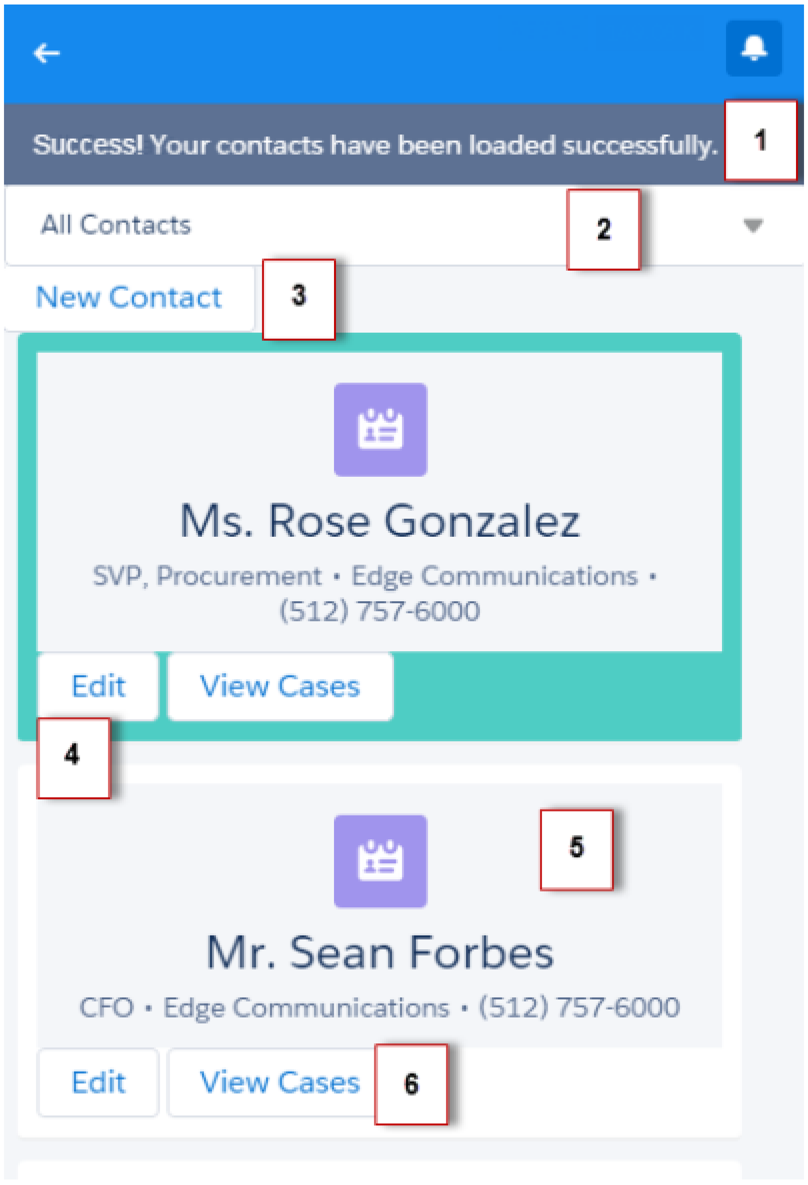
When `form.cmp` is initialized, the `init` handler triggers the `doInit` client-side controller, which calls the `getExpenses` helper function. `getExpenses` calls the `getExpenses` server-side controller to load the expenses. The callback sets the expenses data on the `v.expenses` attribute and calls `updateTotal` to update the counters.

Clicking the **Submit** button triggers the `createExpense` client-side controller. After field validation, the `createExpense` helper function is run, in which the `upsertExpense` helper function calls the `saveExpense` server-side controller to save the record. The callback pushes the new expense to the list of expenses and updates the attribute `v.expenses` in `form.cmp`, which in turn updates the expenses in `expenseList.cmp`. Finally, the helper calls `updateTotal` to update the counters represented by the `v.total` and `v.exp` attributes.

`expenseList.cmp` displays the list of expenses. When the **Reimbursed?** checkbox is selected or deselected, the `click` event triggers the `update` client-side controller. The `updateExpenseItem` event is fired with the relevant expense passed in as a parameter. `form.cmp` handles the event, triggering the `updateEvent` client-side controller. This controller action then calls the `upsertExpense` helper function, which calls the `saveExpense` server-side controller to save the relevant record.

Create a Component for Salesforce1 and Lightning Experience

Create a component that loads contacts data and interacts with Salesforce1 and Lightning Experience. Some of the events that are used in this tutorial are not supported for standalone apps.


Success! Your contacts have been loaded successfully.
1
All Contacts
2
New Contact
3
Ms. Rose Gonzalez
SVP, Procurement • Edge Communications • (512) 757-6000
Edit
View Cases
4
5
Mr. Sean Forbes
CFO • Edge Communications • (512) 757-6000
Edit
View Cases
6

The component has these features.

- Displays a toast message (1) when all contacts are loaded successfully
- Use a nested component that displays all contacts or displays all primary contacts that are colored green when the input select value (2) is changed

- Opens the create record page to create a new contact when the New Contact button (3) is clicked
- Opens the edit record page to update the selected contact when the Edit button (4) is clicked
- Navigates to the record when the contact (5) is clicked
- Navigates to related cases when the View Cases button (6) is clicked

You'll create the following resources.

Resource	Description
Contacts Bundle	
`contacts.cmp`	The component that loads contact data
`contactsController.js`	The client-side controller actions that loads contact data, handles input select change event, and opens the create record page
`contactsHelper.js`	The helper function that retrieves contact data and display toast messages based on the loading status
contactList Bundle	
`contactList.cmp`	The contact list component
`contactListController.js`	The client-side controller actions that opens the edit record page, and navigates to a contact record, related cases, and map of contact address
`contactList.css`	The styles for the component
Apex Controller	
`ContactController.apxc`	The Apex controller that queries the contact records

Load the Contacts

Create an Apex controller and load your contacts.

Your organization must have existing contact records for this tutorial. This tutorial uses a custom picklist field, `Level`, which is represented by the API name `Level__c`. This field contains three picklist values: `Primary`, `Secondary`, and `Tertiary`.

1. Click **File** > **New** > **Apex Class**, and then enter *`ContactController`* in the **New Class** window. This creates a new Apex class, `ContactController.apxc`. Enter this code and then save.

   If you're using a namespace in your organization, replace `Level__c` with `myNamespace__Level__c`.

```
public with sharing class ContactController {
@AuraEnabled
    public static List<Contact> getContacts() {
        List<Contact> contacts =
                [SELECT Id, Name, MailingStreet, Phone, Email, Level__c FROM Contact];

        //Add isAccessible() check
        return contacts;
    }

    @AuraEnabled
    // Retrieve all primary contacts
    public static List<Contact> getPrimary() {
        List<Contact> primaryContacts =
             [SELECT Id, Name, MailingStreet, Phone, Email, Level__c FROM Contact WHERE
 Level__c = 'Primary'];

        //Add isAccessible() check
        return primaryContacts;
    }
}
```

`getPrimary()` returns all contacts whose `Level__c` field is set to `Primary`.

2. Click **File** > **New** > **Lightning Component**, and then enter *`contactList`* for the `Name` field in the New Lightning Bundle popup window. This creates a new component, `contactList.cmp`. Enter this code and then save.

```
<aura:component>
    <aura:attribute name="contact" type="Contact"/>
    <!-- If you're using a namespace,
         use {!v.contact.myNamespace__Level__c} instead -->
    <div class="{!v.contact.Level__c == 'Primary'
                 ? 'row primary' : 'row '}" >

        <div onclick="{!c.gotoRecord}">
            <force:recordView recordId="{!v.contact.Id}" type="MINI"/>
        </div>

        <!-- Open the record edit page when the button is clicked -->
        <ui:button label="Edit" press="{!c.editRecord}"/>
        <!-- Navigate to the related list when the button is clicked -->
        <ui:button label="View Cases" press="{!c.relatedList}"/>
    </div>
</aura:component>
```

3. In the **contactList** sidebar, click **STYLE** to create a new resource named `contactList.css`. Replace the placeholder code with the following code and then save.

```
.THIS.primary{
    background: #4ECDC4  !important;
}

.THIS.row {
    background: #fff;
    max-width:90%;
    border-bottom: 2px solid #f0f1f2;
    padding: 10px;
    margin-left: 2%;
    margin-bottom: 10px;
    min-height: 70px;
    border-radius: 4px;
}
```

4. Click **File** > **New** > **Lightning Component**, and then enter *contacts* for the `Name` field in the New Lightning Bundle popup window. This creates a new component, `contacts.cmp`. Enter this code and then save. If you're using a namespace in your organization, replace `ContactController` with `myNamespace.ContactController`.

```
<aura:component controller="ContactController" implements="force:appHostable">
    <!-- Handle component initialization in a client-side controller -->
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>

    <!-- Dynamically load the list of contacts -->
    <aura:attribute name="contacts" type="Contact[]"/>

    <!-- Create a drop-down list with two options -->
    <ui:inputSelect aura:id="selection" change="{!c.select}">
        <ui:inputSelectOption text="All Contacts" label="All Contacts"/>
        <ui:inputSelectOption text="All Primary" label="All Primary"/>
    </ui:inputSelect>

    <!-- Display record create page when button is clicked -->
    <ui:button label="New Contact" press="{!c.createRecord}"/>

    <!-- Iterate over the list of contacts and display them -->
    <aura:iteration var="contact" items="{!v.contacts}">
        <!-- If you're using a namespace, replace with myNamespace:contactList -->
        <c:contactList contact="{!contact}"/>
    </aura:iteration>
</aura:component>
```

5. In the **contacts** sidebar, click **CONTROLLER** to create a new resource named `contactsController.js`. Replace the placeholder code with the following code and then save.

```
({
    doInit : function(component, event, helper) {
        // Retrieve contacts during component initialization
        helper.getContacts(component);
    },//Delimiter for future code
})
```

6. In the **contacts** sidebar, click **HELPER** to create a new resource named `contactsHelper.js`. Replace the placeholder code with the following code and then save.

```
({
    getContacts : function(cmp) {
        // Load all contact data
        var action = cmp.get("c.getContacts");
        action.setCallback(this, function(response) {
            var state = response.getState();
            if (cmp.isValid() && state === "SUCCESS") {
                cmp.set("v.contacts", response.getReturnValue());
            }

            // Display toast message to indicate load status
            var toastEvent = $A.get("e.force:showToast");
            if (state === 'SUCCESS'){
                toastEvent.setParams({
                    "title": "Success!",
                    "message": " Your contacts have been loaded successfully."
                });
            }
            else {
                toastEvent.setParams({
                        "title": "Error!",
                        "message": " Something has gone wrong."
                });
            }
            toastEvent.fire();
        });
         $A.enqueueAction(action);
    }
})
```

7. Create a new Lightning Component tab by following the steps on Add Lightning Components as Custom Tabs in Salesforce1 on page 100. Make sure you include the component in the Salesforce1 navigation menu.

Finally, you can go to the Salesforce1 mobile browser app to check your output. When your component is loaded, you should see a toast message that indicates your contacts are loaded successfully.

Next, we'll wire up the other events so that your input select displays either all contacts or only primary contacts that are colored green. We'll also wire up events for opening the create record and edit record pages, and events for navigating to a record and a URL.

Fire the Events

Fire the events in your client-side controller or helper functions. The `force` events are handled by Salesforce1.

This demo builds on the contacts component you created in Load the Contacts on page 31.

1. In the **contactList** sidebar, click **CONTROLLER** to create a new resource named `contactListController.js`. Replace the placeholder code with the following code and then save.

```
({
    gotoRecord : function(component, event, helper) {
        // Fire the event to navigate to the contact record
        var sObjectEvent = $A.get("e.force:navigateToSObject");
        sObjectEvent.setParams({
            "recordId": component.get("v.contact.Id"),
            "slideDevName": 'related'
        })
        sObjectEvent.fire();
    },

    editRecord : function(component, event, helper) {
        // Fire the event to navigate to the edit contact page
        var editRecordEvent = $A.get("e.force:editRecord");
        editRecordEvent.setParams({
            "recordId": component.get("v.contact.Id")
        });
        editRecordEvent.fire();
    },

    relatedList : function (component, event, helper) {
        // Navigate to the related cases
        var relatedListEvent = $A.get("e.force:navigateToRelatedList");
        relatedListEvent.setParams({
            "relatedListId": "Cases",
            "parentRecordId": component.get("v.contact.Id")
        });
        relatedListEvent.fire();
    }
})
```

2. Refresh the Salesforce1 mobile browser app, and click these elements to test the events.
    - Contact: `force:navigateToSObject` is fired, which updates the view with the contact record page. The contact name corresponds to the following component.

      ```
      <div onclick="{!c.gotoRecord}">
          <force:recordView recordId="{!v.contact.Id}" type="MINI"/>
      </div>
      ```

    - Edit Contact button: `force:editRecord` is fired, which opens the edit record page. The Edit Contact icon corresponds to the following component.

      ```
      <ui:button label="Edit" press="{!c.editRecord}"/>
      ```

3. Open `contactsController.js`. After the `doInit` controller, enter this code and then save.

```
createRecord : function (component, event, helper) {
    // Open the create record page
    var createRecordEvent = $A.get("e.force:createRecord");
    createRecordEvent.setParams({
        "entityApiName": "Contact"
    });
    createRecordEvent.fire();
},

select : function(component, event, helper){
    // Get the selected value of the ui:inputSelect component
    var selectCmp = component.find("selection");
    var selectVal = selectCmp.get("v.value");

    // Display all primary contacts or all contacts
    if (selectVal==="All Primary"){
        var action = component.get("c.getPrimary");
        action.setCallback(this, function(response){
            var state = response.getState();
            if (component.isValid() && state === "SUCCESS") {
                component.set("v.contacts", response.getReturnValue());
            }
        });
        $A.enqueueAction(action);
    }
    else {
        // Return all contacts
        helper.getContacts(component);
    }
}
```

Notice that if you pull down the page and release it, the page refreshes all data in the view. Now you can test your components by clicking on the areas highlighted in Create a Component for Salesforce1 and Lightning Experience on page 30.

For an example on creating a standalone app that can be used independent of Salesforce1, see Create a Standalone Lightning App on page 7.

CHAPTER 3 Creating Components

In this chapter ...

Components are the functional units of the Lightning Component framework.

A component encapsulates a modular and potentially reusable section of UI, and can range in granularity from a single line of text to an entire application.

Create Lightning Components in the Developer Console

The Developer Console is a convenient, built-in tool you can use to create new and edit existing Lightning components and other bundles.

1. Open the Developer Console.

   Select **Developer Console** from the *Your Name* or the quick access menu ( ).

2. Open the New Lightning Bundle panel for a Lightning component.

   Select **File** > **New** > **Lightning Component**.

3. Name the component.

   For example, enter `helloWorld` in the Name field.

4. Optional: Describe the component.

   Use the Description field to add details about the component.

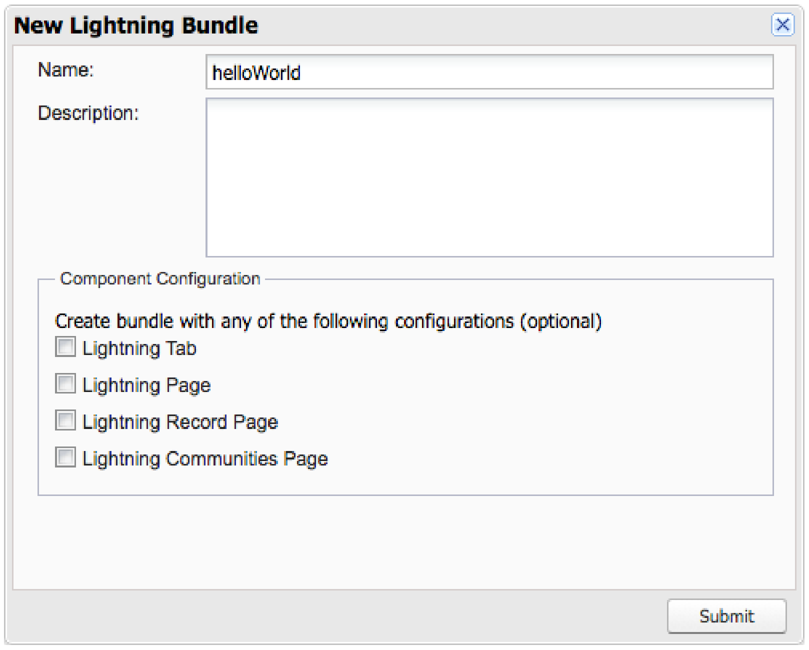
5. Optional: Add component configurations to the new component.

   You can select as many options in the Component Configuration section as you wish, or select no configuration at all.

6. Click **Submit** to create the component.

   Or, to cancel creating the component, click the panel's close box in the top right corner.

Example:



IN THIS SECTION:

Lightning Bundle Configurations Available in the Developer Console
Configurations make it easier to create a component or application for a specific purpose, like a Lightning Page or Lightning Communities Page, or a quick action or navigation item in Lightning Experience or Salesforce1. The New Lightning Bundle panel in the Developer Console offers a choice of component configurations when you create a Lightning component or application bundle.

SEE ALSO:

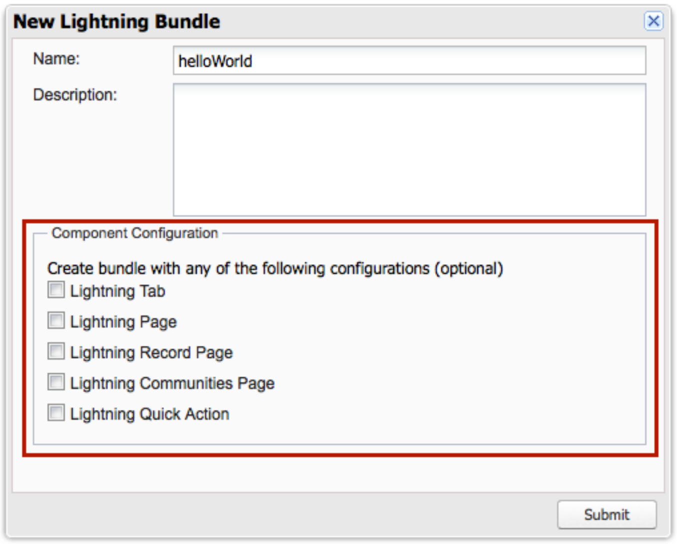
Using the Developer Console

Lightning Bundle Configurations Available in the Developer Console

Lightning Bundle Configurations Available in the Developer Console

Configurations make it easier to create a component or application for a specific purpose, like a Lightning Page or Lightning Communities Page, or a quick action or navigation item in Lightning Experience or Salesforce1. The New Lightning Bundle panel in the Developer Console offers a choice of component configurations when you create a Lightning component or application bundle.

Configurations add the interfaces required to support using the component in the desired context. For example, when you choose the **Lightning Tab** configuration, your new component includes `implements="force:appHostable"` in the `<aura:component>` tag.



New Lightning Bundle

Name: helloWorld

Description:

Component Configuration

Create bundle with any of the following configurations (optional)

- [ ] Lightning Tab
- [ ] Lightning Page
- [ ] Lightning Record Page
- [ ] Lightning Communities Page
- [ ] Lightning Quick Action

Using configurations is optional. You can use them in any combination, including all or none.

The following configurations are available in the New Lightning Bundle panel.

Configuration	Markup	Description
Lightning component bundle		
Lightning Tab	`implements="force:appHostable"`	Creates a component for use as a navigation element in Lightning Experience or Salesforce1.

Configuration	Markup	Description
Lightning Page	`implements="flexipage:availableForAllPageTypes"` and `access="global"`	Creates a component for use in Lightning Pages or the Lightning App Builder.
Lightning Record Page	`implements="flexipage:availableForRecordHome, force:hasRecordId"` and `access="global"`	Creates a component for use on a record home page in Lightning Experience.
Lightning Communities Page	`implements="forceCommunity:availableForAllPageTypes"` and `access="global"`	Creates a component that's available for drag and drop in the Community Builder.
Lightning Quick Action	`implements="force:lightningQuickAction"`	Creates a component that can be used with a Lightning quick action.
Lightning application bundle		
Lightning Out Dependency App	`extends="ltng:outApp"`	Creates an empty Lightning Out dependency app.

Note: For details of the markup added by each configuration, see the respective documentation for those features.

SEE ALSO:

Create Lightning Components in the Developer Console
Interface Reference
Configure Components for Custom Tabs
Configure Components for Custom Actions
Configure Components for Lightning Pages and the Lightning App Builder
Configure Components for Lightning Experience Record Pages
Configure Components for Communities

Component Markup

Component resources contain markup and have a `.cmp` suffix. The markup can contain text or references to other components, and also declares metadata about the component.

Let's start with a simple "Hello, world!" example in a `helloWorld.cmp` component.

```
<aura:component>
    Hello, world!
</aura:component>
```

This is about as simple as a component can get. The "Hello, world!" text is wrapped in the `<aura:component>` tags, which appear at the beginning and end of every component definition.

Components can contain most HTML tags so you can use markup, such as `<div>` and `<span>`. HTML5 tags are also supported.

```
<aura:component>
    <div class="container">
        <!--Other HTML tags or components here-->
    </div>
</aura:component>
```

Note: Case sensitivity should be respected as your markup interacts with JavaScript, CSS, and Apex.

Use the Developer Console to create components.

Component Naming Rules

A component name must follow these naming rules:

- Must begin with a letter
- Must contain only alphanumeric or underscore characters
- Must be unique in the namespace
- Can't include whitespace
- Can't end with an underscore
- Can't contain two consecutive underscores

SEE ALSO:

aura:component
Using the Developer Console
Component Access Control
Client-Side Rendering to the DOM
Dynamically Creating Components

Component Namespace

Every component is part of a namespace, which is used to group related components together. If your organization has a namespace prefix set, use that namespace to access your components. Otherwise, use the default namespace to access your components.

Another component or application can reference a component by adding `<myNamespace:myComponent>` in its markup. For example, the `helloWorld` component is in the `docsample` namespace. Another component can reference it by adding `<docsample:helloWorld />` in its markup.

Lightning components that Salesforce provides are grouped into several namespaces, such as `aura`, `ui`, and `force`. Components from third-party managed packages have namespaces from the providing organizations.

In your organization, you can choose to set a namespace prefix. If you do, that namespace is used for all of your Lightning components. A namespace prefix is required if you plan to offer managed packages on the AppExchange.

If you haven't set a namespace prefix for your organization, use the default namespace `c` when referencing components that you've created.

Namespaces in Code Samples

The code samples throughout this guide use the default `c` namespace. Replace `c` with your namespace if you've set a namespace prefix.

Using the Default Namespace in Organizations with No Namespace Set

If your organization hasn't set a namespace prefix, use the default namespace `c` when referencing Lightning components that you've created.

The following items must use the `c` namespace when your organization doesn't have a namespace prefix set.

- References to components that you've created
- References to events that you've defined

The following items use an implicit namespace for your organization and don't require you to specify a namespace.

- References to custom objects
- References to custom fields on standard and custom objects
- References to Apex controllers

See Namespace Usage Examples and Reference on page 43 for examples of all of the preceding items.

Using Your Organization's Namespace

If your organization has set a namespace prefix, use that namespace to reference Lightning components, events, custom objects and fields, and other items in your Lightning markup.

The following items use your organization's namespace when your organization has a namespace prefix set.

- References to components that you've created
- References to events that you've defined
- References to custom objects
- References to custom fields on standard and custom objects
- References to Apex controllers
- References to static resources

Note: Support for the `c` namespace in organizations that have set a namespace prefix is incomplete. The following items can use the `c` namespace if you prefer to use the shortcut, but it's not currently a recommended practice.

- References to components that you've created when used in Lightning markup, but not in expressions or JavaScript
- References to events that you've defined when used in Lightning markup, but not in expressions or JavaScript
- References to custom objects when used in component and event `type` and `default` system attributes, but not in expressions or JavaScript

See Namespace Usage Examples and Reference on page 43 for examples of the preceding items.

Using a Namespace in or from a Managed Package

Always use the complete namespace when referencing items from a managed package, or when creating code that you intend to distribute in your own managed packages.

Creating a Namespace in Your Organization

Create a namespace for your organization by registering a namespace prefix.

If you're not creating managed packages for distribution then registering a namespace prefix isn't required, but it's a best practice for all but the smallest organizations.

Your namespace prefix must:

- Begin with a letter
- Contain one to 15 alphanumeric characters
- Not contain two consecutive underscores

For example, `myNp123` and `my_np` are valid namespaces, but `123Company` and `my__np` aren't.

To register a namespace prefix:

1. From Setup, enter *`Packages`* in the Quick Find box. Under Create, select **Packages**.

   Note: This item is only available in Salesforce Classic.

2. In the Developer Settings panel, click **Edit**.

   Note: This button doesn't appear if you've already configured your developer settings.

3. Review the selections that are required for configuring developer settings, and then click **Continue**.
4. Enter the namespace prefix you want to register.
5. Click **Check Availability** to determine if the namespace prefix is already in use.
6. If the namespace prefix that you entered isn't available, repeat the previous two steps.
7. Click **Review My Selections**.
8. Click **Save**.

Namespace Usage Examples and Reference

This topic provides examples of referencing components, objects, fields, and so on in Lightning components code.

Examples are provided for the following.

- Components, events, and interfaces in your organization
- Custom objects in your organization
- Custom fields on standard and custom objects in your organization
- Server-side Apex controllers in your organization
- Dynamic creation of components in JavaScript
- Static resources in your organization

Organizations with No Namespace Prefix Set

The following illustrates references to elements in your organization when your organization doesn't have a namespace prefix set. References use the default namespace, `c`, where necessary.

Referenced Item	Example
Component used in markup	`<c:myComponent />`
Component used in a system attribute	`<aura:component extends="c:myComponent">` `<aura:component implements="c:myInterface">`
Apex controller	`<aura:component controller="ExpenseController">`
Custom object in attribute data type	`<aura:attribute name="expense" type="Expense__c" />`
Custom object or custom field in attribute defaults	`<aura:attribute name="newExpense" type="Expense__c" default="{ 'sobjectType': 'Expense__c', 'Name': '', 'Amount__c': 0, … }" />`
Custom field in an expression	`<ui:inputNumber value="{!v.newExpense.Amount__c}" label=… />`
Custom field in a JavaScript function	`updateTotal: function(component) { … for(var i = 0 ; i < expenses.length ; i++){ var exp = expenses[i]; total += exp.Amount__c; } … }`
Component created dynamically in a JavaScript function	`var myCmp = $A.createComponent("c:myComponent", {}, function(myCmp) { } );`
Interface comparison in a JavaScript function	`aCmp.isInstanceOf("c:myInterface")`
Event registration	`<aura:registerEvent type="c:updateExpenseItem" name=… />`
Event handler	`<aura:handler event="c:updateExpenseItem" action=… />`
Explicit dependency	`<aura:dependency resource="markup://c:myComponent" />`
Application event in a JavaScript function	`var updateEvent = $A.get("e.c:updateExpenseItem");`
Static resources	`<ltng:require scripts="{!$Resource.resourceName}" styles="{!$Resource.resourceName}" />`

Organizations with a Namespace Prefix

The following illustrates references to elements in your organization when your organization has set a namespace prefix. References use an example namespace `yournamespace`.

Referenced Item	Example
Component used in markup	`<yournamespace:myComponent />`
Component used in a system attribute	`<aura:component extends="yournamespace:myComponent">` `<aura:component implements="yournamespace:myInterface">`
Apex controller	`<aura:component controller="yournamespace.ExpenseController">`
Custom object in attribute data type	`<aura:attribute name="expenses" type="yournamespace__Expense__c[]" />`
Custom object or custom field in attribute defaults	`<aura:attribute name="newExpense" type="yournamespace__Expense__c" default="{ 'sobjectType': 'yournamespace__Expense__c', 'Name': '', 'yournamespace__Amount__c': 0, … }" />`
Custom field in an expression	`<ui:inputNumber value="{!v.newExpense.yournamespace__Amount__c}" label=… />`
Custom field in a JavaScript function	`updateTotal: function(component) { … for(var i = 0 ; i < expenses.length ; i++){ var exp = expenses[i]; total += exp.yournamespace__Amount__c; } … }`
Component created dynamically in a JavaScript function	`var myCmp = $A.createComponent("yournamespace:myComponent", {}, function(myCmp) { } );`
Interface comparison in a JavaScript function	`aCmp.isInstanceOf("yournamespace:myInterface")`
Event registration	`<aura:registerEvent type="yournamespace:updateExpenseItem" name=… />`
Event handler	`<aura:handler event="yournamespace:updateExpenseItem" action=… />`

Referenced Item	Example
Explicit dependency	`<aura:dependency resource="markup://`**`yournamespace:myComponent`**`" />`
Application event in a JavaScript function	`var updateEvent = $A.get("e.`**`yournamespace:updateExpenseItem`**`");`
Static resources	`<ltng:require scripts="{!$Resource.`**`yournamespace__resourceName`**`}" styles="{!$Resource.`**`yournamespace__resourceName`**`}" />`

Component Bundles

A component bundle contains a component or an app and all its related resources.

Resource	Resource Name	Usage	See Also
Component or Application	`sample.cmp` or `sample.app`	The only required resource in a bundle. Contains markup for the component or app. Each bundle contains only one component or app resource.	Creating Components on page 37 aura:application on page 331
CSS Styles	`sample.css`	Contains styles for the component.	CSS in Components on page 48
Controller	`sampleController.js`	Contains client-side controller methods to handle events in the component.	Handling Events with Client-Side Controllers on page 138
Design	`sample.design`	File required for components used in Lightning App Builder, Lightning Pages, or Community Builder.	Configure Components for Lightning Pages and the Lightning App Builder
Documentation	`sample.auradoc`	A description, sample code, and one or multiple references to example components	Providing Component Documentation on page 82
Renderer	`sampleRenderer.js`	Client-side renderer to override default rendering for a component.	Client-Side Rendering to the DOM on page 226
Helper	`sampleHelper.js`	JavaScript functions that can be called from any JavaScript code in a component's bundle	Sharing JavaScript Code in a Component Bundle on page 223
SVG File	sample.svg	Custom icon resource for components used in the Lightning App Builder or Community Builder.	Configure Components for Lightning Pages and the Lightning App Builder on page 109

All resources in the component bundle follow the naming convention and are auto-wired. For example, a controller `<componentName>Controller.js` is auto-wired to its component, which means that you can use the controller within the scope of that component.

Component IDs

A component has two types of IDs: a local ID and a global ID. You can retrieve a component using its local ID in your JavaScript code. A global ID can be useful to differentiate between multiple instances of a component or for debugging purposes.

Local IDs

A local ID is an ID that is only scoped to the component. A local ID is often unique but it's not required to be unique.

Create a local ID by using the `aura:id` attribute. For example:

```
<ui:button aura:id="button1" label="button1"/>
```

Note: `aura:id` doesn't support expressions. You can only assign literal string values to `aura:id`.

Find the button component by calling `cmp.find("button1")` in your client-side controller, where `cmp` is a reference to the component containing the button.

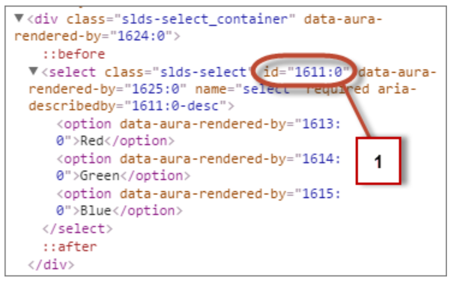
`find()` returns different types depending on the result.

- If the local ID is unique, `find()` returns the component.
- If there are multiple components with the same local ID, `find()` returns an array of the components.
- If there is no matching local ID, `find()` returns `undefined`.

To find the local ID for a component in JavaScript, use `cmp.getLocalId()`.

Global IDs

Every component has a unique `globalId`, which is the generated runtime-unique ID of the component instance. A global ID (1) is not guaranteed to be the same beyond the lifetime of a component, so it should never be relied on. A global ID can be useful to differentiate between multiple instances of a component or for debugging purposes.



```
▼<div class="slds-select_container" data-aura-
rendered-by="1624:0">
   ::before
 ▼<select class="slds-select" id="1611:0" data-aura-
  rendered-by="1625:0" name="select" required aria-
  describedby="1611:0-desc">
     <option data-aura-rendered-by="1613:
     0">Red</option>
     <option data-aura-rendered-by="1614:
     0">Green</option>
     <option data-aura-rendered-by="1615:
     0">Blue</option>
   </select>
   ::after
 </div>
```

To create a unique ID for an HTML element, you can use the `globalId` as a prefix or suffix for your element. For example:

```
<div id="{!globalId + '_footer'}"></div>
```

In your browser's developer console, retrieve the element using `document.getElementById("<globalId>_footer")`, where `<globalId>` is the generated runtime-unique ID.

To retrieve a component's global ID in JavaScript, use the `getGlobalId()` function.

```
var globalId = cmp.getGlobalId();
```

SEE ALSO:

Finding Components by ID

Which Button Was Pressed?

HTML in Components

An HTML tag is treated as a first-class component by the framework. Each HTML tag is translated into an `<aura:html>` component, allowing it to enjoy the same rights and privileges as any other component.

For example, the framework automatically converts a standard HTML `<div>` tag to this component:

```
<aura:html tag="div" />
```

You can add HTML markup in components. Note that you must use strict XHTML. For example, use `<br/>` instead of `<br>`. You can also use HTML attributes and DOM events, such as `onclick`.

Warning: Some tags, like `<applet>` and `<font>`, aren't supported. For a full list of unsupported tags, see Supported HTML Tags on page 486.

Unescaping HTML

To output pre-formatted HTML, use `aura:unescapedHTML`. For example, this is useful if you want to display HTML that is generated on the server and add it to the DOM. You must escape any HTML if necessary or your app might be exposed to security vulnerabilities.

You can pass in values from an expression, such as in `<aura:unescapedHtml value="{!v.note.body}"/>`.

`{!`***`expression`***`}` is the framework's expression syntax. For more information, see Using Expressions on page 57.

SEE ALSO:

Supported HTML Tags

CSS in Components

CSS in Components

Style your components with CSS.

Add CSS to a component bundle by clicking the **STYLE** button in the Developer Console sidebar.

For external CSS resources, see Styling Apps on page 190.

All top-level elements in a component have a special `THIS` CSS class added to them. This, effectively, adds namespacing to CSS and helps prevent one component's CSS from blowing away another component's styling. The framework throws an error if a CSS file doesn't follow this convention.

Let's look at a sample `helloHTML.cmp` component. The CSS is in `helloHTML.css`.

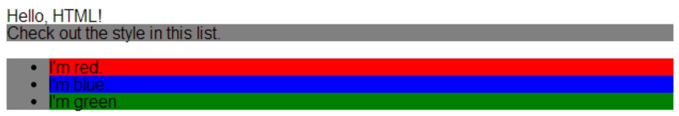
Component source

```
<aura:component>
  <div class="white">
    Hello, HTML!
  </div>

  <h2>Check out the style in this list.</h2>

  <ul>
    <li class="red">I'm red.</li>
    <li class="blue">I'm blue.</li>
    <li class="green">I'm green.</li>
  </ul>
</aura:component>
```

CSS source

```
.THIS {
    background-color: grey;
}

.THIS.white {
    background-color: white;
}

.THIS .red {
    background-color: red;
}

.THIS .blue {
    background-color: blue;
}

.THIS .green {
    background-color: green;
}
```

Output



```
Hello, HTML!
Check out the style in this list.

  • I'm red.
  • I'm blue.
  • I'm green.
```

The top-level elements, `h2` and `ul`, match the `THIS` class and render with a grey background. Top-level elements are tags wrapped by the HTML `body` tag and not by any other tags. In this example, the `li` tags are not top-level because they are nested in a `ul` tag.

The `<div class="white">` element matches the `.THIS.white` selector and renders with a white background. Note that there is no space in the selector as this rule is for top-level elements.

The `<li class="red">` element matches the `.THIS .red` selector and renders with a red background. Note that this is a descendant selector and it contains a space as the `<li>` element is not a top-level element.

SEE ALSO:

Adding and Removing Styles

HTML in Components

Component Attributes

Component attributes are like member variables on a class in Apex. They are typed fields that are set on a specific instance of a component, and can be referenced from within the component's markup using an expression syntax. Attributes enable you to make components more dynamic.

Use the `<aura:attribute>` tag to add an attribute to the component or app. Let's look at the following sample, `helloAttributes.app`:

```
<aura:application>
    <aura:attribute name="whom" type="String" default="world"/>
    Hello {!v.whom}!
</aura:application>
```

All attributes have a name and a type. Attributes may be marked as required by specifying `required="true"`, and may also specify a default value.

In this case we've got an attribute named `whom` of type String. If no value is specified, it defaults to "world".

Though not a strict requirement, `<aura:attribute>` tags are usually the first things listed in a component's markup, as it provides an easy way to read the component's shape at a glance.

Attribute Naming Rules

An attribute name must follow these naming rules:

- Must begin with a letter or an underscore
- Must contain only alphanumeric or underscore characters

Expressions

`helloAttributes.app` contains an expression, `{!v.whom}`, which is responsible for the component's dynamic output.

`{!`***`expression`***`}` is the framework's expression syntax. In this case, the expression we are evaluating is `v.whom`. The name of the attribute we defined is `whom`, while `v` is the value provider for a component's attribute set, which represents the view.

Note: Expressions are case sensitive. For example, if you have a custom field `myNamespace__Amount__c`, you must refer to it as `{!v.myObject.myNamespace__Amount__c}`.

SEE ALSO:

Supported aura:attribute Types

Using Expressions

Component Composition

Composing fine-grained components in a larger component enables you to build more interesting components and applications.

Let's see how we can fit components together. We will first create a few simple components: `c:helloHTML` and `c:helloAttributes`. Then, we'll create a wrapper component, `c:nestedComponents`, that contains the simple components.

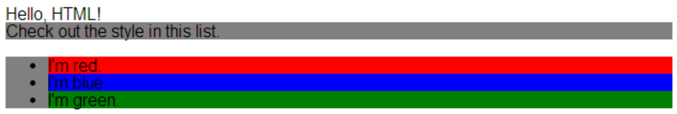
Here is the source for `helloHTML.cmp`.

```
<!--c:helloHTML-->
<aura:component>
  <div class="white">
    Hello, HTML!
  </div>

  <h2>Check out the style in this list.</h2>

  <ul>
    <li class="red">I'm red.</li>
    <li class="blue">I'm blue.</li>
    <li class="green">I'm green.</li>
  </ul>
</aura:component>
```

CSS source

```
.THIS {
    background-color: grey;
}

.THIS.white {
    background-color: white;
}

.THIS .red {
    background-color: red;
}

.THIS .blue {
    background-color: blue;
}

.THIS .green {
    background-color: green;
}
```

Output



```
Hello, HTML!
Check out the style in this list.

 • I'm red.
 • I'm blue.
 • I'm green.
```

Here is the source for `helloAttributes.cmp`.

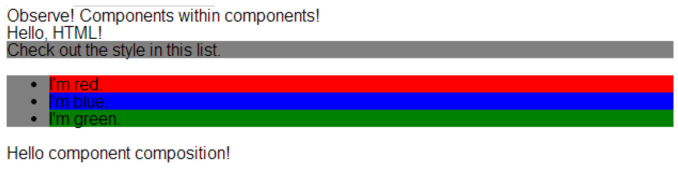
```
<!--c:helloAttributes-->
<aura:component>
```

```
    <aura:attribute name="whom" type="String" default="world"/>
    Hello {!v.whom}!
</aura:component>
```

`nestedComponents.cmp` uses composition to include other components in its markup.

```
<!--c:nestedComponents-->
<aura:component>
    Observe!  Components within components!

    <c:helloHTML/>

    <c:helloAttributes whom="component composition"/>
</aura:component>
```

Output


Observe! Components within components!
Hello, HTML!
Check out the style in this list.

- I'm red.
- I'm blue.
- I'm green.

Hello component composition!

Including an existing component is similar to including an HTML tag. Reference the component by its "descriptor", which is of the form *`namespace`*:*`component`*. `nestedComponents.cmp` references the `helloHTML.cmp` component, which lives in the `c` namespace. Hence, its descriptor is `c:helloHTML`.

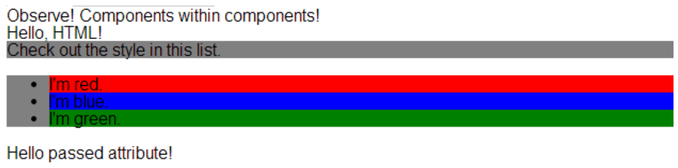
Note how `nestedComponents.cmp` also references `c:helloAttributes`. Just like adding attributes to an HTML tag, you can set attribute values in a component as part of the component tag. `nestedComponents.cmp` sets the `whom` attribute of `helloAttributes.cmp` to "component composition".

Attribute Passing

You can also pass attributes to nested components. `nestedComponents2.cmp` is similar to `nestedComponents.cmp`, except that it includes an extra `passthrough` attribute. This value is passed through as the attribute value for `c:helloAttributes`.

```
<!--c:nestedComponents2-->
<aura:component>
    <aura:attribute name="passthrough" type="String" default="passed attribute"/>
    Observe!  Components within components!

    <c:helloHTML/>

    <c:helloAttributes whom="{#v.passthrough}"/>
</aura:component>
```

Output


Observe! Components within components!
Hello, HTML!
Check out the style in this list.

- I'm red.
- I'm blue.
- I'm green.

Hello passed attribute!

`helloAttributes` is now using the passed through attribute value.

Note: `{#v.passthrough}` is an unbound expression. This means that any change to the value of the `whom` attribute in `c:helloAttributes` doesn't propagate back to affect the value of the `passthrough` attribute in `c:nestedComponents2`. For more information, see Data Binding Between Components on page 59.

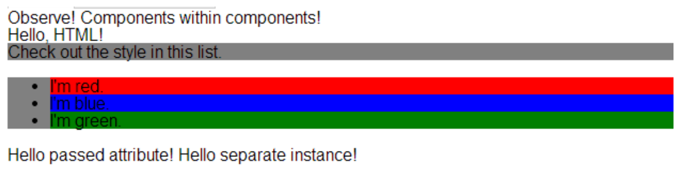
Definitions versus Instances

In object-oriented programming, there's a difference between a class and an instance of that class. Components have a similar concept. When you create a `.cmp` resource, you are providing the definition (class) of that component. When you put a component tag in a `.cmp`, you are creating a reference to (instance of) that component.

It shouldn't be surprising that we can add multiple instances of the same component with different attributes. `nestedComponents3.cmp` adds another instance of `c:helloAttributes` with a different attribute value. The two instances of the `c:helloAttributes` component have different values for their `whom` attribute.

```
<!--c:nestedComponents3-->
<aura:component>
    <aura:attribute name="passthrough" type="String" default="passed attribute"/>
    Observe!  Components within components!

    <c:helloHTML/>

    <c:helloAttributes whom="{#v.passthrough}"/>

    <c:helloAttributes whom="separate instance"/>
</aura:component>
```

Output



```
Observe! Components within components!
Hello, HTML!
Check out the style in this list.

  • I'm red.
  • I'm blue.
  • I'm green.

Hello passed attribute! Hello separate instance!
```

Component Body

The root-level tag of every component is `<aura:component>`. Every component inherits the `body` attribute from `<aura:component>`.

The `<aura:component>` tag can contain tags, such as `<aura:attribute>`, `<aura:registerEvent>`, `<aura:handler>`, `<aura:set>`, and so on. Any free markup that is not enclosed in one of the tags allowed in a component is assumed to be part of the body and is set in the `body` attribute.

The `body` attribute has type `Aura.Component[]`. It can be an array of one component, or an empty array, but it's always an array.

In a component, use "`v`" to access the collection of attributes. For example, `{!v.body}` outputs the body of the component.

Setting the Body Content

To set the `body` attribute in a component, add free markup within the `<aura:component>` tag. For example:

```
<aura:component>
    <!--START BODY-->
    <div>Body part</div>
    <ui:button label="Push Me"/>
    <!--END BODY-->
</aura:component>
```

To set the value of an inherited attribute, use the `<aura:set>` tag. Setting the body content is equivalent to wrapping that free markup inside `<aura:set attribute="body">`. Since the `body` attribute has this special behavior, you can omit `<aura:set attribute="body">`.

The previous sample is a shortcut for this markup. We recommend the less verbose syntax in the previous sample.

```
<aura:component>
    <aura:set attribute="body">
        <!--START BODY-->
        <div>Body part</div>
        <ui:button label="Push Me/>
        <!--END BODY-->
    </aura:set>
</aura:component>
```

The same logic applies when you use any component that has a `body` attribute, not just `<aura:component>`. For example:

```
<ui:panel>
    Hello world!
</ui:panel>
```

This is a shortcut for:

```
<ui:panel>
    <aura:set attribute="body">
        Hello World!
    </aura:set>
</ui:panel>
```

Accessing the Component Body

To access a component body in JavaScript, use `component.get("v.body")`.

SEE ALSO:

aura:set

Working with a Component Body in JavaScript

Component Facets

A facet is any attribute of type `Aura.Component[]`. The `body` attribute is an example of a facet.

To define your own facet, add an `aura:attribute` tag of type `Aura.Component[]` to your component. For example, let's create a new component called `facetHeader.cmp`.

```
<!--c:facetHeader-->
<aura:component>
    <aura:attribute name="header" type="Aura.Component[]"/>
    <div>
        <span class="header">{!v.header}</span><br/>
        <span class="body">{!v.body}</span>
    </div>
</aura:component>
```

This component has a header facet. Note how we position the output of the header using the `v.header` expression.

The component doesn't have any output when you access it directly as the `header` and `body` attributes aren't set. Let's create another component, `helloFacets.cmp`, that sets these attributes.

```
<!--c:helloFacets-->
<aura:component>
    See how we set the header facet.<br/>

    <c:facetHeader>

        Nice body!

        <aura:set attribute="header">
            Hello Header!
        </aura:set>
    </c:facetHeader>

</aura:component>
```

Note that `aura:set` sets the value of the `header` attribute of `facetHeader.cmp`, but you don't need to use `aura:set` if you're setting the `body` attribute.

SEE ALSO:

Component Body

Best Practices for Conditional Markup

Use the `<aura:if>` tag to conditionally display markup. Alternatively, you can conditionally set markup in JavaScript logic. Consider the performance cost as well as code maintainability when you design components. The best design choice depends on your use case.

Consider Alternatives to Conditional Markup

Here are some use cases where you should consider alternatives to `<aura:if>`.

You want to toggle visibility

Don't use `<aura:if>` to toggle markup visibility. Use CSS instead. See Dynamically Showing or Hiding Markup on page 244.

You need to nest conditional logic or use conditional logic in an iteration

Using `<aura:if>` can hurt performance by creating a large number of components. Excessive use of conditional logic in markup can also lead to cluttered markup that is harder to maintain.

Consider alternatives, such as using JavaScript logic in an `init` event handler instead. See Invoking Actions on Component Initialization on page 229.

SEE ALSO:

aura:if

Conditional Expressions

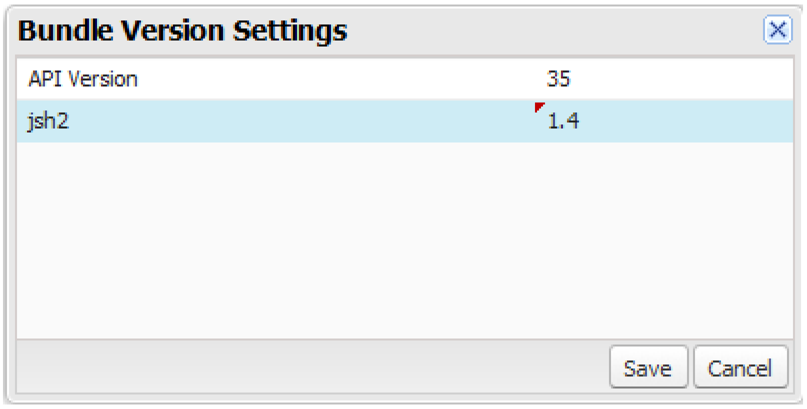
Component Versioning

Component versioning enables you to declare dependencies against specific revisions of an installed managed package.

By assigning a version to your component, you have granular control over how the component functions when new versions of a managed package are released. For example, imagine that a ***<packageNamespace>*:**`button` is pinned to version 2.0 of a package. Upon installing version 3.0, the button retains its version 2.0 functionality.

Note: The package developer is responsible for inserting versioning logic into the markup when updating a component. If the component wasn't changed in the update or if the markup doesn't account for version, the component behaves in the context of the most recent version.

Versions are assigned declaratively in the Developer Console. When you're working on a component, click **Bundle Version Settings** in the right panel to define the version. You can only version a component if you've installed a package, and the valid versions for the component are the available versions of that package. Versions are in the format *`<major>.<minor>`*. So if you assign a component version 1.4, its behavior depends on the first major release and fourth minor release of the associated package.



API Version	35
jsh2	1.4

When working with components, you can version:

- Apex controllers
- JavaScript controllers
- JavaScript helpers
- JavaScript renderers
- Bundle markup
  - Applications (`.app`)
  - Components (`.cmp`)
  - Interfaces (`.intf`)
  - Events (`.evt`)

You can't version any other types of resources in bundles. Unsupported types include:

- Styles (`.css`)
- Documentation (`.doc`)
- Design (`.design`)
- SVG (`.svg`)

Once you've assigned versions to components, or if you're developing components for a package, you can retrieve the version in several contexts.

Resource	Return Type	Expression
Apex	Version	`System.requestVersion()`
JavaScript	String	`cmp.getVersion()`
Lightning component markup	String	`{!Version}`

You can use the retrieved version to add logic to your code or markup to assign different functionality to different versions. Here's an example of using versioning in an `<aura:if>` statement.

```
<aura:component>
 <aura:if isTrue="{!Version > 1.0}">
  <c:newVersionFunctionality/>
 </aura:if>
 <c:oldVersionFunctionality/>
 ...
</aura:component>
```

Using Expressions

Expressions allow you to make calculations and access property values and other data within component markup. Use expressions for dynamic output or passing values into components by assigning them to attributes.

An expression is any set of literal values, variables, sub-expressions, or operators that can be resolved to a single value. Method calls are not allowed in expressions.

The expression syntax is: `{!`***`expression`***`}`

`expression` is a placeholder for the expression.

Anything inside the `{! }` delimiters is evaluated and dynamically replaced when the component is rendered or when the value is used by the component. Whitespace is ignored.

The resulting value can be a primitive, such as an integer, string, or boolean. It can also be a JavaScript object, a component or collection, a controller method such as an action method, and other useful results.

Note: If you're familiar with other languages, you may be tempted to read the `!` as the "bang" operator, which negates boolean values in many programming languages. In the Lightning Component framework, `{!` is simply the delimiter used to begin an expression.

If you're familiar with Visualforce, this syntax will look familiar.

There is a second expression syntax: `{#expression}`. For more details on the difference between the two forms of expression syntax, see Data Binding Between Components.

Identifiers in an expression, such as attribute names accessed through the view, controller values, or labels, must start with a letter or underscore. They can also contain numbers or hyphens after the first character. For example, `{!v.2count}` is not valid, but `{!v.count}` is.

Important: Only use the `{! }` syntax in markup in `.app` or `.cmp` files. In JavaScript, use string syntax to evaluate an expression. For example:

```
var theLabel = cmp.get("v.label");
```

If you want to escape `{!`, use this syntax:

```
<aura:text value="{!"/>
```

This renders `{!` in plain text because the `aura:text` component never interprets `{!` as the start of an expression.

IN THIS SECTION:

Dynamic Output in Expressions
The simplest way to use expressions is to output dynamic values.

Conditional Expressions
Here are examples of conditional expressions using the ternary operator and the `<aura:if>` tag.

Data Binding Between Components
When you add a component in markup, you can use an expression to initialize attribute values in the component based on attribute values of the container component. There are two forms of expression syntax, which exhibit different behaviors for data binding between the components.

Value Providers
Value providers are a way to access data. Value providers encapsulate related values together, similar to how an object encapsulates properties and methods.

Expression Evaluation
Expressions are evaluated much the same way that expressions in JavaScript or other programming languages are evaluated.

Expression Operators Reference
The expression language supports operators to enable you to create more complex expressions.

Expression Functions Reference
The expression language contains math, string, array, comparison, boolean, and conditional functions. All functions are case-sensitive.

Dynamic Output in Expressions

The simplest way to use expressions is to output dynamic values.

Values used in the expression can be from component attributes, literal values, booleans, and so on. For example:

```
{!v.desc}
```

In this expression, `v` represents the view, which is the set of component attributes, and `desc` is an attribute of the component. The expression is simply outputting the `desc` attribute value for the component that contains this markup.

If you're including literal values in expressions, enclose text values within single quotes, such as `{!'Some text'}`.

Include numbers without quotes, for example, `{!123}`.

For booleans, use `{!true}` for `true` and `{!false}` for `false`.

SEE ALSO:

Component Attributes

Value Providers

Conditional Expressions

Here are examples of conditional expressions using the ternary operator and the `<aura:if>` tag.

Ternary Operator

This expression uses the ternary operator to conditionally output one of two values dependent on a condition.

```
<a class="{!v.location == '/active' ? 'selected' : ''}" href="#/active">Active</a>
```

The `{!v.location == '/active' ? 'selected' : ''}` expression conditionally sets the `class` attribute of an HTML `<a>` tag, by checking whether the `location` attribute is set to `/active`. If true, the expression sets `class` to `selected`.

Using `<aura:if>` for Conditional Markup

This snippet of markup uses the `<aura:if>` tag to conditionally display an edit button.

```
<aura:attribute name="edit" type="Boolean" default="true"/>
<aura:if isTrue="{!v.edit}">
    <ui:button label="Edit"/>
    <aura:set attribute="else">
        You can’t edit this.
    </aura:set>
</aura:if>
```

If the `edit` attribute is set to `true`, a `ui:button` displays. Otherwise, the text in the `else` attribute displays.

SEE ALSO:

Best Practices for Conditional Markup

Data Binding Between Components

When you add a component in markup, you can use an expression to initialize attribute values in the component based on attribute values of the container component. There are two forms of expression syntax, which exhibit different behaviors for data binding between the components.

This concept is a little tricky, but it will make more sense when we look at an example. Consider a `c:parent` component that has a `parentAttr` attribute. `c:parent` contains a `c:child` component with a `childAttr` attribute that’s initialized to the value of the `parentAttr` attribute. We’re passing the `parentAttr` attribute value from `c:parent` into the `c:child` component, which results in a data binding, also known as a value binding, between the two components.

```
<!--c:parent-->
<aura:component>
```

```
    <aura:attribute name="parentAttr" type="String" default="parent attribute"/>

    <!-- Instantiate the child component -->
    <c:child childAttr="{!v.parentAttr}" />
</aura:component>
```

`{!v.parentAttr}` is a bound expression. Any change to the value of the `childAttr` attribute in `c:child` also affects the `parentAttr` attribute in `c:parent` and vice versa.

Now, let's change the markup from:

```
<c:child childAttr="{!v.parentAttr}" />
```

to:

```
<c:child childAttr="{#v.parentAttr}" />
```

`{#v.parentAttr}` is an unbound expression. Any change to the value of the `childAttr` attribute in `c:child` doesn't affect the `parentAttr` attribute in `c:parent` and vice versa.

Here's a summary of the differences between the forms of expression syntax.

`{#expression}` (Unbound Expressions)

Data updates behave as you would expect in JavaScript. Primitives, such as `String`, are passed by value, and data updates for the expression in the parent and child are decoupled.

Objects, such as `Array` or `Map`, are passed by reference, so changes to the data in the child propagate to the parent. However, change handlers in the parent aren't notified. The same behavior applies for changes in the parent propagating to the child.

`{!expression}` (Bound Expressions)

Data updates in either component are reflected through bidirectional data binding in both components. Similarly, change handlers are triggered in both the parent and child components.

Tip: Bi-directional data binding is expensive for performance and it can create hard-to-debug errors due to the propagation of data changes through nested components. We recommend using the `{#expression}` syntax instead when you pass an expression from a parent component to a child component unless you require bi-directional data binding.

Unbound Expressions

Let's look at another example of a `c:parentExpr` component that contains another component, `c:childExpr`.

Here is the markup for `c:childExpr`.

```
<!--c:childExpr-->
<aura:component>
    <aura:attribute name="childAttr" type="String" />

    <p>childExpr childAttr: {!v.childAttr}</p>
    <p><ui:button label="Update childAttr"
          press="{!c.updateChildAttr}"/></p>
</aura:component>
```

Here is the markup for `c:parentExpr`.

```
<!--c:parentExpr-->
<aura:component>
    <aura:attribute name="parentAttr" type="String" default="parent attribute"/>
    <!-- Instantiate the child component -->
    <c:childExpr childAttr="{#v.parentAttr}" />

    <p>parentExpr parentAttr: {!v.parentAttr}</p>
    <p><ui:button label="Update parentAttr"
          press="{!c.updateParentAttr}"/></p>
</aura:component>
```

The `c:parentExpr` component uses an unbound expression to set an attribute in the `c:childExpr` component.

```
<c:childExpr childAttr="{#v.parentAttr}" />
```

When we instantiate `childExpr`, we set the `childAttr` attribute to the value of the `parentAttr` attribute in `c:parentExpr`. Since the `{#v.parentAttr}` syntax is used, the `v.parentAttr` expression is not bound to the value of the `childAttr` attribute.

The `c:exprApp` application is a wrapper around `c:parentExpr`.

```
<!--c:exprApp-->
<aura:application >
    <c:parentExpr />
</aura:application>
```

In the Developer Console, click **Preview** in the sidebar for `c:exprApp` to view the app in your browser.

Both `parentAttr` and `childAttr` are set to “parent attribute”, which is the default value of `parentAttr`.

Now, let’s create a client-side controller for `c:childExpr` so that we can dynamically update the component. Here is the source for `childExprController.js`.

```
/* childExprController.js */
({
    updateChildAttr: function(cmp) {
        cmp.set("v.childAttr", "updated child attribute");
    }
})
```

In the Developer Console, click **Update Preview** for `c:exprApp`.

Press the **Update childAttr** button. This updates `childAttr` to “updated child attribute”. The value of `parentAttr` is unchanged since we used an unbound expression.

```
<c:childExpr childAttr="{#v.parentAttr}" />
```

Let’s add a client-side controller for `c:parentExpr`. Here is the source for `parentExprController.js`.

```
/* parentExprController.js */
({
    updateParentAttr: function(cmp) {
        cmp.set("v.parentAttr", "updated parent attribute");
    }
})
```

In the Developer Console, click **Update Preview** for `c:exprApp`.

Press the **Update parentAttr** button. This time, `parentAttr` is set to “updated parent attribute” while `childAttr` is unchanged due to the unbound expression.

Warning: Don't use a component's `init` event and client-side controller to initialize an attribute that is used in an unbound expression. The attribute will not be initialized. Use a bound expression instead. For more information on a component's `init` event, see Invoking Actions on Component Initialization on page 229.

Alternatively, you can wrap the component in another component. When you instantiate the wrapped component in the wrapper component, initialize the attribute value instead of initializing the attribute in the wrapped component's client-side controller.

Bound Expressions

Now, let's update the code to use a bound expression instead. Change this line in `c:parentExpr`:

```
<c:childExpr childAttr="{#v.parentAttr}" />
```

to:

```
<c:childExpr childAttr="{!v.parentAttr}" />
```

In the Developer Console, click **Update Preview** for `c:exprApp`.

Press the **Update childAttr** button. This updates both `childAttr` and `parentAttr` to "updated child attribute" even though we only set `v.childAttr` in the client-side controller of `childExpr`. Both attributes were updated since we used a bound expression to set the `childAttr` attribute.

Change Handlers and Data Binding

You can configure a component to automatically invoke a change handler, which is a client-side controller action, when a value in one of the component's attributes changes.

When you use a bound expression, a change in the attribute in the parent or child component triggers the change handler in both components. When you use an unbound expression, the change is not propagated between components so the change handler is only triggered in the component that contains the changed attribute.

Let's add change handlers to our earlier example to see how they are affected by bound versus unbound expressions.

Here is the updated markup for `c:childExpr`.

```
<!--c:childExpr-->
<aura:component>
    <aura:attribute name="childAttr" type="String" />

    <aura:handler name="change" value="{!v.childAttr}" action="{!c.onChildAttrChange}"/>

    <p>childExpr childAttr: {!v.childAttr}</p>
    <p><ui:button label="Update childAttr"
          press="{!c.updateChildAttr}"/></p>
</aura:component>
```

Notice the `<aura:handler>` tag with `name="change"`, which signifies a change handler. `value="{!v.childAttr}"` tells the change handler to track the `childAttr` attribute. When `childAttr` changes, the `onChildAttrChange` client-side controller action is invoked.

Here is the client-side controller for `c:childExpr`.

```
/* childExprController.js */
({
    updateChildAttr: function(cmp) {
        cmp.set("v.childAttr", "updated child attribute");
    },

    onChildAttrChange: function(cmp, evt) {
        console.log("childAttr has changed");
        console.log("old value: " + evt.getParam("oldValue"));
        console.log("current value: " + evt.getParam("value"));
    }
})
```

Here is the updated markup for `c:parentExpr` with a change handler.

```
<!--c:parentExpr-->
<aura:component>
    <aura:attribute name="parentAttr" type="String" default="parent attribute"/>

   <aura:handler name="change" value="{!v.parentAttr}" action="{!c.onParentAttrChange}"/>


    <!-- Instantiate the child component -->
    <c:childExpr childAttr="{!v.parentAttr}" />

    <p>parentExpr parentAttr: {!v.parentAttr}</p>
    <p><ui:button label="Update parentAttr"
          press="{!c.updateParentAttr}"/></p>
</aura:component>
```

Here is the client-side controller for `c:parentExpr`.

```
/* parentExprController.js */
({
    updateParentAttr: function(cmp) {
        cmp.set("v.parentAttr", "updated parent attribute");
    },

    onParentAttrChange: function(cmp, evt) {
        console.log("parentAttr has changed");
        console.log("old value: " + evt.getParam("oldValue"));
        console.log("current value: " + evt.getParam("value"));
    }
})
```

In the Developer Console, click **Update Preview** for `c:exprApp`.

Open your browser's console (**More tools** > **Developer tools** in Chrome).

Press the **Update parentAttr** button. The change handlers for `c:parentExpr` and `c:childExpr` are both triggered as we're using a bound expression.

```
<c:childExpr childAttr="{!v.parentAttr}" />
```

Change `c:parentExpr` to use an unbound expression instead.

```
<c:childExpr childAttr="{#v.parentAttr}" />
```

In the Developer Console, click **Update Preview** for `c:exprApp`.

Press the **Update childAttr** button. This time, only the change handler for `c:childExpr` is triggered as we're using an unbound expression.

SEE ALSO:

Detecting Data Changes with Change Handlers

Dynamic Output in Expressions

Component Composition

Value Providers

Value providers are a way to access data. Value providers encapsulate related values together, similar to how an object encapsulates properties and methods.

The value providers for a component are `v` (view) and `c` (controller).

Value Provider	Description	See Also
`v`	A component's attribute set. This value provider enables you to access the value of a component's attribute in the component's markup.	Component Attributes
`c`	A component's controller, which enables you to wire up event handlers and actions for the component	Handling Events with Client-Side Controllers

All components have a `v` value provider, but aren't required to have a controller. Both value providers are created automatically when defined for a component.

Note: Expressions are bound to the specific component that contains them. That component is also known as the attribute value provider, and is used to resolve any expressions that are passed to attributes of its contained components.

Global Value Providers

Global value providers are global values and methods that a component can use in expressions.

Global Value Provider	Description	See Also
`globalID`	The `globalId` global value provider returns the global ID for a component. Every component has a unique `globalId`, which is the generated runtime-unique ID of the component instance.	Component IDs
`$Browser`	The `$Browser` global value provider returns information about the hardware and operating system of the browser accessing the application.	$Browser
`$Label`	The `$Label` global value provider enables you to access labels stored outside your code.	Using Custom Labels

Global Value Provider	Description	See Also
`$Locale`	The `$Locale` global value provider returns information about the current user's preferred locale.	$Locale
`$Resource`	The `$Resource` global value provider lets you reference images, style sheets, and JavaScript code you've uploaded in static resources.	$Resource

Accessing Fields and Related Objects

Values in a value provider are accessed as named properties. To use a value, separate the value provider and the property name with a dot (period). For example, `v.body`. You can access value providers in markup or in JavaScript code.

When an attribute of a component is an object or other structured data (not a primitive value), access the values on that attribute using the same dot notation.

For example, `{!v.accounts.id}` accesses the id field in the accounts record.

For deeply nested objects and attributes, continue adding dots to traverse the structure and access the nested values.

SEE ALSO:

Dynamic Output in Expressions

`$Browser`

The `$Browser` global value provider returns information about the hardware and operating system of the browser accessing the application.

Attribute	Description
`formFactor`	Returns a `FormFactor` enum value based on the type of hardware the browser is running on. • DESKTOP for a desktop client • PHONE for a phone including a mobile phone with a browser and a smartphone • TABLET for a tablet client (for which `isTablet` returns `true`)
`isAndroid`	Indicates whether the browser is running on an Android device (`true`) or not (`false`).
`isIOS`	Not available in all implementations. Indicates whether the browser is running on an iOS device (`true`) or not (`false`).
`isIPad`	Not available in all implementations. Indicates whether the browser is running on an iPad (`true`) or not (`false`).
`isIPhone`	Not available in all implementations. Indicates whether the browser is running on an iPhone (`true`) or not (`false`).
`isPhone`	Indicates whether the browser is running on a phone including a mobile phone with a browser and a smartphone (`true`), or not (`false`).

Attribute	Description
`isTablet`	Indicates whether the browser is running on an iPad or a tablet with Android 2.2 or later (`true`) or not (`false`).
`isWindowsPhone`	Indicates whether the browser is running on a Windows phone (`true`) or not (`false`). Note that this only detects Windows phones and does not detect tablets or other touch-enabled Windows 8 devices.

Example: This example shows usage of the `$Browser` global value provider.

```
<aura:component>
    {!$Browser.isTablet}
    {!$Browser.isPhone}
    {!$Browser.isAndroid}
    {!$Browser.formFactor}
</aura:component>
```

Similarly, you can check browser information in a client-side controller using `$A.get()`.

```
({
    checkBrowser: function(component) {
        var device = $A.get("$Browser.formFactor");
        alert("You are using a " + device);
    }
})
```

`$Locale`

The `$Locale` global value provider returns information about the current user's preferred locale.

These attributes are based on Java's `Calendar`, `Locale` and `TimeZone` classes.

Attribute	Description	Sample Value
`country`	The ISO 3166 representation of the country code based on the language locale.	"US", "DE", "GB"
`currency`	The currency symbol.	"$"
`currencyCode`	The ISO 4217 representation of the currency code.	"USD"
`decimal`	The decimal separator.	"."
`firstDayOfWeek`	The first day of the week, where 1 is Sunday.	1
`grouping`	The grouping separator.	","
`isEasternNameStyle`	Specifies if a name is based on eastern style, for example, `last name first name [middle] [suffix]`.	false
`labelForToday`	The label for the Today link on the date picker.	"Today"
`language`	The language code based on the language locale.	"en", "de", "zh"

Attribute	Description	Sample Value
`langLocale`	The locale ID.	“en_US”, “en_GB”
`nameOfMonths`	The full and short names of the calendar months	{ fullName: “January”, shortName: “Jan” }
`nameOfWeekdays`	The full and short names of the calendar weeks	{ fullName: “Sunday”, shortName: “SUN” }
`timezone`	The time zone ID.	"America/Los_Angeles"
`userLocaleCountry`	The country based on the current user’s locale	“US”
`userLocaleLang`	The language based on the current user’s locale	“en”
`variant`	The vendor and browser-specific code.	"WIN", "MAC", "POSIX"

Number and Date Formatting

The framework’s number and date formatting are based on Java’s `DecimalFormat` and `DateFormat` classes.

Attribute	Description	Sample Value
`currencyformat`	The currency format.	"¤#,##0.00;(¤#,##0.00)" ¤ represents the currency sign, which is replaced by the currency symbol.
`dateFormat`	The date format.	"MMM d, yyyy"
`datetimeFormat`	The date time format.	"MMM d, yyyy h:mm:ss a"
`numberformat`	The number format.	"#,##0.###" # represents a digit, the comma is a placeholder for the grouping separator, and the period is a placeholder for the decimal separator. Zero (0) replaces # to represent trailing zeros.
`percentformat`	The percentage format.	"#,##0%"
`timeFormat`	The time format.	"h:mm:ss a"
`zero`	The character for the zero digit.	“0”

Example: This example shows how to retrieve different `$Locale` attributes.

Component source

```
<aura:component>
    {!$Locale.language}
    {!$Locale.timezone}
    {!$Locale.numberFormat}
    {!$Locale.currencyFormat}
</aura:component>
```

Similarly, you can check locale information in a client-side controller using `$A.get()`.

```
({
    checkDevice: function(component) {
        var locale = $A.get("$Locale.language");
        alert("You are using " + locale);
    }
})
```

SEE ALSO:

Localization

`$Resource`

The `$Resource` global value provider lets you reference images, style sheets, and JavaScript code you've uploaded in static resources.

Using `$Resource` lets you reference assets by name, without worrying about the gory details of URLs or file paths. You can use `$Resource` in Lightning components markup and within JavaScript controller and helper code.

Using `$Resource` in Component Markup

To reference a specific resource in component markup, use `$Resource.`***`resourceName`*** within an expression. *`resourceName`* is the `Name` of the static resource. In a managed packaged, the resource name must include the package namespace prefix, such as `$Resource.yourNamespace__resourceName`. For a stand-alone static resource, such as an individual graphic or script, that's all you need. To reference an item within an archive static resource, add the rest of the path to the item using string concatenation. Here are a few examples.

```
<aura:component>
    <!-- Stand-alone static resources -->
    <img src="{!$Resource.generic_profile_svg}"/>
    <img src="{!$Resource.yourNamespace__generic_profile_svg}"/>

    <!-- Asset from an archive static resource -->
    <img src="{!$Resource.SLDSv2 + '/assets/images/avatar1.jpg'}"/>
    <img src="{!$Resource.yourNamespace__SLDSv2 + '/assets/images/avatar1.jpg'}"/>
</aura:component>
```

Include CSS style sheets or JavaScript libraries into a component using the `<ltng:require>` tag. For example:

```
<aura:component>
  <ltng:require
    styles="{!$Resource.SLDSv2 + '/assets/styles/lightning-design-system-ltng.css'}"
    scripts="{!$Resource.jsLibraries + '/jsLibOne.js'}"
    afterScriptsLoaded="{!c.scriptsLoaded}" />
</aura:component>
```

Note: Due to a quirk in the way `$Resource` is parsed in expressions, use the `join` operator to include multiple `$Resource` references in a single attribute. For example, if you have more than one JavaScript library to include into a component the `scripts` attribute should be something like the following.

```
scripts="{!join(',',
    $Resource.jsLibraries + '/jsLibOne.js',
    $Resource.jsLibraries + '/jsLibTwo.js')}"
```

Using `$Resource` in JavaScript

To obtain a reference to a static resource in JavaScript code, use `$A.get('$Resource.resourceName')`.

`resourceName` is the `Name` of the static resource. In a managed packaged, the resource name must include the package namespace prefix, such as `$Resource.yourNamespace__resourceName`. For a stand-alone static resource, such as an individual graphic or script, that's all you need. To reference an item within an archive static resource, add the rest of the path to the item using string concatenation. For example:

```
({
    profileUrl: function(component) {
        var profUrl = $A.get('$Resource.SLDSv2') + '/assets/images/avatar1.jpg';
        alert("Profile URL: " + profUrl);
    }
})
```

Note: Static resources referenced in JavaScript aren't automatically added to packages. If your JavaScript depends on a resource that isn't referenced in component markup, add it manually to any packages the JavaScript code is included in.

`$Resource` Considerations

Global value providers in the Lightning Component framework are, behind the scenes, implemented quite differently from global variables in Salesforce. Although `$Resource` looks like the global variable with the same name available in Visualforce, formula fields, and elsewhere, there are important differences. Don't use other documentation as a guideline for its use or behavior.

Here are two specific things to keep in mind about `$Resource` in the Lightning Component framework.

First, `$Resource` isn't available until the Lightning Component framework is loaded on the client. Some very simple components that are composed of only markup can be rendered server-side, where `$Resource` isn't available. To avoid this, when you create a new app, stub out a client-side controller to force components to be rendered on the client.

Second, if you've worked with the `$Resource` global variable, in Visualforce or elsewhere, you've also used the `URLFOR()` formula function to construct complete URLs to specific resources. There's nothing similar to `URLFOR()` in the Lightning Component framework. Instead, use simple string concatenation, as illustrated in the preceding examples.

SEE ALSO:

Salesforce Help: Static Resources

Expression Evaluation

Expressions are evaluated much the same way that expressions in JavaScript or other programming languages are evaluated.

Operators are a subset of those available in JavaScript, and evaluation order and precedence are generally the same as JavaScript. Parentheses enable you to ensure a specific evaluation order. What you may find surprising about expressions is how often they are evaluated. The framework notices when things change, and trigger re-rendering of any components that are affected. Dependencies are handled automatically. This is one of the fundamental benefits of the framework. It knows when to re-render something on the page. When a component is re-rendered, any expressions it uses will be re-evaluated.

Action Methods

Expressions are also used to provide action methods for user interface events: `onclick`, `onhover`, and any other component attributes beginning with "`on`". Some components simplify assigning actions to user interface events using other attributes, such as the `press` attribute on `<ui:button>`.

Action methods must be assigned to attributes using an expression, for example `{!c.theAction}`. This assigns an `Aura.Action`, which is a reference to the controller function that handles the action.

Assigning action methods via expressions allows you to assign them conditionally, based on the state of the application or user interface. For more information, see Conditional Expressions on page 59.

```
<ui:button aura:id="likeBtn"
     label="{!(v.likeId == null) ? 'Like It' : 'Unlike It'}"
     press="{!(v.likeId == null) ? c.likeIt  : c.unlikeIt}"
/>
```

This button will show "Like It" for items that have not yet been liked, and clicking it will call the `likeIt` action method. Then the component will re-render, and the opposite user interface display and method assignment will be in place. Clicking a second time will unlike the item, and so on.

Expression Operators Reference

The expression language supports operators to enable you to create more complex expressions.

Arithmetic Operators

Expressions based on arithmetic operators result in numerical values.

Operator	Usage	Description
`+`	`1 + 1`	Add two numbers.
`-`	`2 - 1`	Subtract one number from the other.
`*`	`2 * 2`	Multiply two numbers.
`/`	`4 / 2`	Divide one number by the other.
`%`	`5 % 2`	Return the integer remainder of dividing the first number by the second.
`-`	`-v.exp`	Unary operator. Reverses the sign of the succeeding number. For example if the value of `expenses` is `100`, then `-expenses` is `-100`.

Numeric Literals

Literal	Usage	Description
Integer	`2`	Integers are numbers without a decimal point or exponent.
Float	`3.14` `-1.1e10`	Numbers with a decimal point, or numbers with an exponent.
Null	`null`	A literal null number. Matches the explicit null value **and** numbers with an undefined value.

String Operators

Expressions based on string operators result in string values.

Operator	Usage	Description
`+`	`'Title: ' + v.note.title`	Concatenates two strings together.

String Literals

String literals must be enclosed in single quotation marks `'like this'`.

Literal	Usage	Description
string	`'hello world'`	Literal strings must be enclosed in single quotation marks. Double quotation marks are reserved for enclosing attribute values, and must be escaped in strings.
\<escape>	`'\n'`	Whitespace characters: • `\t` (tab) • `\n` (newline) • `\r` (carriage return) Escaped characters: • `\"` (literal ") • `\'` (literal ') • `\\` (literal \)
Unicode	`'\u####'`	A Unicode code point. The # symbols are hexadecimal digits. A Unicode literal requires four digits.
null	`null`	A literal null string. Matches the explicit null value and strings with an undefined value.

Comparison Operators

Expressions based on comparison operators result in a `true` or `false` value. For comparison purposes, numbers are treated as the same type. In all other cases, comparisons check both value and type.

Operator	Alternative	Usage	Description

`==`	`eq`	`1 == 1`
		`1 == 1.0`
		`1 eq 1`
		Note: `undefined==null` evaluates to `true`.
			Returns `true` if the operands are equal. This comparison is valid for all data types.
			Warning: Don't use the `==` operator for objects, as opposed to basic types, such as Integer or String. For example, `object1==object2` evaluates inconsistently on the client versus the server and isn't reliable.

Operator	Alternative	Usage	Description

`!=`	`ne`	`1 != 2`
		`1 != true`
		`1 != '1'`
		`null != false`
		`1 ne 2`
			Returns `true` if the operands are not equal. This comparison is valid for all data types.

`<`	`lt`	`1 < 2`
		`1 lt 2`
			Returns `true` if the first operand is numerically less than the second. You must escape the `<` operator to `&lt;` to use it in component markup. Alternatively, you can use the `lt` operator.

`>`	`gt`	`42 > 2`
		`42 gt 2`
			Returns `true` if the first operand is numerically greater than the second.

`<=`	`le`	`2 <= 42`
		`2 le 42`
			Returns `true` if the first operand is numerically less than or equal to the second. You must escape the `<=` operator to `&lt;=` to use it in component markup. Alternatively, you can use the `le` operator.

`>=`	`ge`	`42 >= 42`
		`42 ge 42`
			Returns `true` if the first operand is numerically greater than or equal to the second.

Logical Operators

Expressions based on logical operators result in a `true` or `false` value.

Operator	Usage	Description
`&&`	`isEnabled && hasPermission`	Returns `true` if both operands are individually true. You must escape the `&&` operator to `&amp;&amp;` to use it in component markup. Alternatively, you can use the `and()` function and pass it two arguments. For example, `and(isEnabled, hasPermission)`.
`||`	`hasPermission || isRequired`	Returns `true` if either operand is individually true.
`!`	`!isRequired`	Unary operator. Returns `true` if the operand is false. This operator should not be confused with the `!` delimiter used to start an expression in `{!`. You can combine the expression delimiter with this negation operator to return the logical negation of a value, for example, `{!!true}` returns `false`.

Logical Literals

Logical values are never equivalent to non-logical values. That is, only `true == true`, and only `false == false`; `1 != true`, and `0 != false`, and `null != false`.

Literal	Usage	Description
true	`true`	A boolean `true` value.
false	`false`	A boolean `false` value.

Conditional Operator

There is only one conditional operator, the traditional ternary operator.

Operator	Usage	Description
`? :`	`(1 != 2) ? "Obviously" : "Black is White"`	The operand before the `?` operator is evaluated as a boolean. If true, the second operand is returned. If false, the third operand is returned.

SEE ALSO:

Expression Functions Reference

Expression Functions Reference

The expression language contains math, string, array, comparison, boolean, and conditional functions. All functions are case-sensitive.

Math Functions

The math functions perform math operations on numbers. They take numerical arguments. The Corresponding Operator column lists equivalent operators, if any.

Function	Alternative	Usage	Description	Corresponding Operator
`add`	`concat`	`add(1,2)`	Adds the first argument to the second.	`+`
`sub`	`subtract`	`sub(10,2)`	Subtracts the second argument from the first.	`-`
`mult`	`multiply`	`mult(2,10)`	Multiplies the first argument by the second.	`*`
`div`	`divide`	`div(4,2)`	Divides the first argument by the second.	`/`
`mod`	`modulus`	`mod(5,2)`	Returns the integer remainder resulting from dividing the first argument by the second.	`%`
`abs`		`abs(-5)`	Returns the absolute value of the argument:	None

Function	Alternative	Usage	Description	Corresponding Operator
			the same number if the argument is positive, and the number without its negative sign if the number is negative. For example, `abs(-5) is 5`.	
`neg`	`negate`	`neg(100)`	Reverses the sign of the argument. For example, `neg(100) is -100`.	− (unary)

String Functions

Function	Alternative	Usage	Description	Corresponding Operator

`concat`	`add`	`concat('Hello ', 'world')`
		
		`add('Walk ', 'the dog')`
			Concatenates the two arguments.	`+`

`format`		`format($Label.ns.labelName, v.myVal)` Note: This function works for arguments of type `String`, `Decimal`, `Double`, `Integer`, `Long`, `Array`, `String[]`, `List`, and `Set`.	Replaces any parameter placeholders with comma-separated attribute values.	

`join`		`join(separator, subStr1, subStr2, subStrN)`
		
		`join(' ','class1', 'class2', v.class)`
			Joins the substrings adding the separator String (first argument) between each subsequent argument.	

Label Functions

Function	Usage	Description

`format`	`format($Label.np.labelName, v.attribute1 , v.attribute2)`
	
	`format($Label.np.hello, v.name)`
		Outputs a label and updates it. Replaces any parameter placeholders with comma-separated attribute values.

Function	Usage	Description
		Supports ternary operators in labels and attributes.

Informational Functions

Function	Usage	Description
`length`	`myArray.length`	Returns the length of an array or a string.
`empty`	`empty(v.attributeName)` Note: This function works for arguments of type `String`, `Array`, `Object`, `List`, `Map`, or `Set`.	Returns `true` if the argument is empty. An empty argument is `undefined`, `null`, an empty array, or an empty string. An object with no properties is not considered empty. Tip: `{! !empty(v.myArray)}` evaluates faster than `{!v.myArray && v.myArray.length > 0}` so we recommend `empty()` to improve performance. The `$A.util.isEmpty()` method in JavaScript is equivalent to the `empty()` expression in markup.

Comparison Functions

Comparison functions take two number arguments and return `true` or `false` depending on the comparison result. The `eq` and `ne` functions can also take other data types for their arguments, such as strings.

Function	Usage	Description	Corresponding Operator
`equals`	`equals(1,1)`	Returns `true` if the specified arguments are equal. The arguments can be any data type.	`==` or `eq`
`notequals`	`notequals(1,2)`	Returns `true` if the specified arguments are not equal. The arguments can be any data type.	`!=` or `ne`
`lessthan`	`lessthan(1,5)`	Returns `true` if the first argument is numerically less than the second argument.	`<` or `lt`
`greaterthan`	`greaterthan(5,1)`	Returns `true` if the first argument is numerically greater than the second argument.	`>` or `gt`
`lessthanorequal`	`lessthanorequal(1,2)`	Returns `true` if the first argument is numerically less than or equal to the second argument.	`<=` or `le`

Function	Usage	Description	Corresponding Operator
`greaterthanorequal`	`greaterthanorequal(2,1)`	Returns `true` if the first argument is numerically greather than or equal to the second argument.	`>=` or `ge`

Boolean Functions

Boolean functions operate on Boolean arguments. They are equivalent to logical operators.

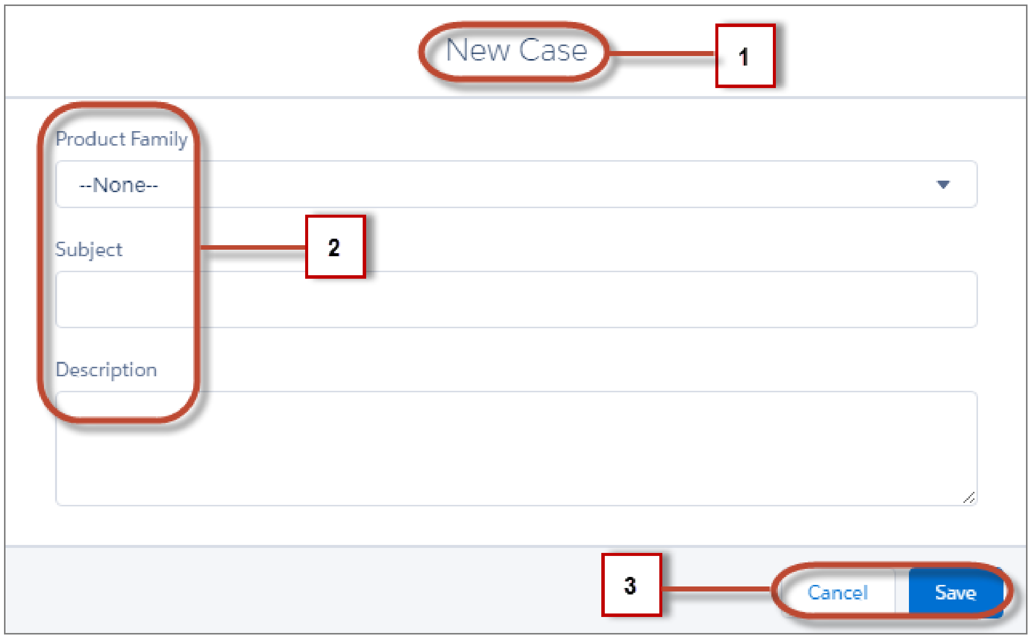
Function	Usage	Description	Corresponding Operator
`and`	`and(isEnabled, hasPermission)`	Returns `true` if both arguments are true.	`&&`
`or`	`or(hasPermission, hasVIPPass)`	Returns `true` if either one of the arguments is true.	`||`
`not`	`not(isNew)`	Returns `true` if the argument is false.	`!`

Conditional Function

Function	Usage	Description	Corresponding Operator
`if`	`if(isEnabled, 'Enabled', 'Not enabled')`	Evaluates the first argument as a boolean. If true, returns the second argument. Otherwise, returns the third argument.	`?:` (ternary)

Using Labels

Labels are text that presents information about the user interface, such as in the header (1), input fields (2), or buttons (3). While you can specify labels by providing text values in component markup, you can also access labels stored outside your code using the `$Label` global value provider in expression syntax.



This section discusses how to use the `$Label` global value provider in these contexts:

- The `label` attribute in input components
- The `format()` expression function for dynamically populating placeholder values in labels

IN THIS SECTION:

Using Custom Labels

Custom labels are custom text values that can be translated into any language that Salesforce supports. To access custom labels in Lightning components, use the `$Label` global value provider.

Custom labels enable developers to create multilingual applications by automatically presenting information (for example, help text or error messages) in a user's native language.

To create custom labels, from Setup, enter *`Custom Labels`* in the `Quick Find` box, then select **Custom Labels**.

Use this syntax to access custom labels in Lightning components:

- `$Label.c.`***`labelName`*** for the default namespace
- `$Label.`***`namespace`*****`.`*****`labelName`*** if your org has a namespace, or to access a label in a managed package

Here are some examples.

Label in a markup expression using the default namespace

`{!$Label.c.`***`labelName`***`}`

Label in JavaScript code if your org has a namespace

`$A.get("$Label.`***`namespace`*****`.`*****`labelName`***`")`

SEE ALSO:

Value Providers

Input Component Labels

A label describes the purpose of an input component. To set a label on an input component, use the `label` attribute.

This example shows how to use labels using the `label` attribute on an input component.

```
<ui:inputNumber label="Pick a Number:" value="54" />
```

The label is placed on the left of the input field and can be hidden by setting `labelClass="assistiveText"`. `assistiveText` is a global style class used to support accessibility.

Using `$Label`

Use the `$Label` global value provider to access labels stored in an external source. For example:

```
<ui:inputNumber label="{!$Label.Number.PickOne}" />
```

To output a label and dynamically update it, use the `format()` expression function. For example, if you have `np.labelName` set to `Hello {0}`, the following expression returns `Hello World` if `v.name` is set to `World`.

```
{!format($Label.np.labelName, v.name)}
```

SEE ALSO:

Supporting Accessibility

Dynamically Populating Label Parameters

Output and update labels using the `format()` expression function.

You can provide a string with placeholders, which are replaced by the substitution values at runtime.

Add as many parameters as you need. The parameters are numbered and are zero-based. For example, if you have three parameters, they will be named `{0}`, `{1}`, and `{2}`, and they will be substituted in the order they're specified.

Let's look at a custom label, `$Label.mySection.myLabel`, with a value of `Hello {0} and {1}`, where `$Label` is the global value provider that accesses your labels.

This expression dynamically populates the placeholder parameters with the values of the supplied attributes.

```
{!format($Label.mySection.myLabel, v.attribute1, v.attribute2)}
```

The label is automatically refreshed if one of the attribute values changes.

Note: Always use the `$Label` global value provider to reference a label with placeholder parameters. You can't set a string with placeholder parameters as the first argument for `format()`. For example, this syntax doesn't work:

```
{!format('Hello {0}', v.name)}
```

Use this expression instead.

```
{!format($Label.mySection.salutation, v.name)}
```

where `$Label.mySection.salutation` is set to `Hello {0}`.

Getting Labels in JavaScript

You can retrieve labels in JavaScript code. Your code performs optimally if the labels are statically defined and sent to the client when the component is loaded.

Static Labels

Static labels are defined in one string, such as `"$Label.c.task_mode_today"`. The framework parses static labels in markup or JavaScript code and sends the labels to the client when the component is loaded. A server trip isn't required to resolve the label. Use `$A.get()` to retrieve static labels in JavaScript code. For example:

```
var staticLabel = $A.get("$Label.c.task_mode_today");
```

Dynamic Labels

You can dynamically create labels in JavaScript code. This technique can be useful when you need to use a label that isn't known until runtime when it's dynamically generated.

```
// Assume the day variable is dynamically generated
// earlier in the code
// THIS CODE WON'T WORK
var dynamicLabel = $A.get("$Label.c." + day);
```

If the label is already known on the client, `$A.get()` displays the label. If the value is not known, an empty string is displayed in production mode, or a placeholder value showing the label key is displayed in debug mode.

Since the label, `"$Label.c." + day"`, is dynamically generated, the framework can't parse it and send it to the client when the component is requested. `dynamicLabel` is an empty string, which isn't what you want!

There are a few alternative approaches to using `$A.get()` so that you can work with dynamically generated labels.

If your component uses a known set of dynamically constructed labels, you can avoid a server roundtrip for the labels by adding a reference to the labels in a JavaScript resource. The framework sends these labels to the client when the component is requested. For example, if your component dynamically generates `$Label.c.task_mode_today` and `$Label.c.task_mode_tomorrow` label keys, you can add references to the labels in a comment in a JavaScript resource, such as a client-side controller or helper.

```
// hints to ensure labels are preloaded
// $Label.Related_Lists.task_mode_today
// $Label.Related_Lists.task_mode_tomorrow
```

If your code dynamically generates many labels, this approach doesn't scale well.

If you don't want to add comment hints for all the potential labels, the alternative is to use `$A.getReference()`. This approach comes with the added cost of a server trip to retrieve the label value.

This example dynamically constructs the label value by calling `$A.getReference()` and updates a `tempLabelAttr` component attribute with the retrieved label.

```
var labelSubStr = "task_mode_today";
var labelReference = $A.getReference("$Label.c." + labelSubStr);
cmp.set("v.tempLabelAttr", labelReference);
var dynamicLabel = cmp.get("v.tempLabelAttr");
```

`$A.getReference()` returns a reference to the label. This **isn't** a string, and you shouldn't treat it like one. You never get a string label directly back from `$A.getReference()`.

Instead, use the returned reference to set a component's attribute value. Our code does this in `cmp.set("v.tempLabelAttr", labelReference);`.

When the label value is asynchronously returned from the server, the attribute value is automatically updated as it's a reference. The component is rerendered and the label value displays.

Note: Our code sets `dynamicLabel = cmp.get("v.tempLabelAttr")` immediately after getting the reference. This code displays an empty string until the label value is returned from the server. If you don't want that behavior, use a comment hint to ensure that the label is sent to the client without requiring a later server trip.

SEE ALSO:

Using JavaScript

Input Component Labels

Dynamically Populating Label Parameters

Setting Label Values via a Parent Attribute

Setting label values via a parent attribute is useful if you want control over labels in child components.

Let's say that you have a container component, which contains another component, `inner.cmp`. You want to set a label value in `inner.cmp` via an attribute on the container component. This can be done by specifying the attribute type and default value. You must set a default value in the parent attribute if you are setting a label on an inner component, as shown in the following example.

This is the container component, which contains a default value `My Label` for the `_label` attribute .

```
<aura:component>
    <aura:attribute name="_label"
                    type="String"
                    default="My Label"/>
    <ui:button label="Set Label" aura:id="button1" press="{!c.setLabel}"/>
    <auradocs:inner aura:id="inner" label="{!v._label}"/>
</aura:component>
```

This `inner` component contains a text area component and a `label` attribute that's set by the container component.

```
<aura:component>
    <aura:attribute name="label" type="String"/>
    <ui:inputTextarea aura:id="textarea"
                      label="{!v.label}"/>
</aura:component>
```

This client-side controller action updates the label value.

```
({
    setLabel:function(cmp) {
        cmp.set("v._label", 'new label');
    }
})
```

When the component is initialized, you'll see a button and a text area with the label `My Label`. When the button in the container component is clicked, the `setLabel` action updates the label value in the `inner` component. This action finds the `label` attribute and sets its value to `new label`.

SEE ALSO:

- Input Component Labels
- Component Attributes

Localization

The framework provides client-side localization support on input and output components.

The following example shows how you can override the default `langLocale` and `timezone` attributes. The output displays the time in the format `hh:mm` by default.

Note: For more information on supported attributes, see the Reference Doc App.

Component source

```
<aura:component>
    <ui:outputDateTime value="2013-10-07T00:17:08.997Z"  timezone="Europe/Berlin"
langLocale="de"/>
</aura:component>
```

The component renders as `Okt. 7, 2015 2:17:08 AM`.

Additionally, you can use the global value provider, `$Locale`, to obtain the locale information. The locale settings in your organization overrides the browser's locale information.

Working with Locale Information

In a single currency organization, Salesforce administrators set the currency locale, default language, default locale, and default time zone for their organizations. Users can set their individual language, locale, and time zone on their personal settings pages.

Note: Single language organizations cannot change their language, although they can change their locale.

For example, setting the time zone on the Language & Time Zone page to `(GMT+02:00)` returns `28.09.2015 09:00:00` when you run the following code.

```
<ui:outputDateTime value="09/28/2015" />
```

Running `$A.get("$Locale.timezone")` returns the time zone name, for example, `Europe/Paris`. For more information, see "Supported Time Zones" in the Salesforce Help.

Setting the currency locale on the Company Information page to `Japanese (Japan) - JPY` returns `¥100,000` when you run the following code.

```
<ui:outputCurrency value="100000" />
```

Similarly, running `$A.get("$Locale.currency")` returns `"¥"` when your org's currency locale is set to `Japanese (Japan) - JPY`. For more information, see "Supported Currencies" in the Salesforce Help.

Using the Localization Service

The framework's localization service enables you to manage the localization of date, time, numbers, and currencies. These methods are available in the `AuraLocalizationService` JavaScript API.

This example sets the formatted date time using `$Locale` and the localization service.

```
var dateFormat = $A.get("$Locale.dateFormat");
var dateString = $A.localizationService.formatDateTime(new Date(), dateFormat);
```

If you're not retrieving the browser's date information, you can specify the date format on your own. This example specifies the date format and uses the browser's language locale information.

```
var dateFormat = "MMMM d, yyyy h:mm a";
var userLocaleLang = $A.get("$Locale.langLocale");
return $A.localizationService.formatDate(date, dateFormat, userLocaleLang);
```

The `AuraLocalizationService` JavaScript API provides methods for working with localization. For example, you can compare two dates to check that one is later than the other.

```
var startDateTime = new Date();
//return the date time at end of the day
var endDateTime = $A.localizationService.endOf(d, 'day');
if( $A.localizationService.isAfter(startDateTime,endDateTime)) {
    //throw an error if startDateTime is after endDateTime
}
```

Note: For more information on the localization service, see the JavaScript API in the Reference Doc App.

SEE ALSO:

Value Providers

Providing Component Documentation

Component documentation helps others understand and use your components.

You can provide two types of component reference documentation:

- Documentation definition (DocDef): Full documentation on a component, including a description, sample code, and a reference to an example. DocDef supports extensive HTML markup and is useful for describing what a component is and what it does.
- Inline descriptions: Text-only descriptions, typically one or two sentences, set via the `description` attribute in a tag.

To provide a DocDef, click **DOCUMENTATION** in the component sidebar of the Developer Console. The following example shows the DocDef for `np:myComponent`.

Note: DocDef is currently supported for components and applications. Events and interfaces support inline descriptions only.

```
<aura:documentation>
    <aura:description>
        <p>An <code>np:myComponent</code> component represents an element that executes
an action defined by a controller.</p>
        <!--More markup here, such as <pre> for code samples-->
    </aura:description>
    <aura:example name="myComponentExample" ref="np:myComponentExample" label="Using the
np:myComponent Component">
 <p>This example shows a simple setup of <code>myComponent</code>.</p>
    </aura:example>
    <aura:example name="mySecondExample" ref="np:mySecondExample" label="Customizing the
np:myComponent Component">
       <p>This example shows how you can customize <code>myComponent</code>.</p>
    </aura:example>
</aura:documentation>
```

A documentation definition contains these tags.

Tag	Description
`<aura:documentation>`	The top-level definition of the DocDef
`<aura:description>`	Describes the component using extensive HTML markup. To include code samples in the description, use the `<pre>` tag, which renders as a code block. Code entered in the `<pre>` tag must be escaped. For example, escape `<aura:component>` by entering `&lt;aura:component&gt;`.
`<aura:example>`	References an example that demonstrates how the component is used. Supports extensive HTML markup, which displays as text preceding the visual output and example component source. The example is displayed as interactive output. Multiple examples are supported and should be wrapped in individual `<aura:example>` tags. • `name`: The API name of the example • `ref`: The reference to the example component in the format `<namespace:exampleComponent>` • `label`: The label of the title

Providing an Example Component

Recall that the DocDef includes a reference to an example component. The example component is rendered as an interactive demo in the component reference documentation when it's wired up using `aura:example`.

```
 <aura:example name="myComponentExample" ref="np:myComponentExample" label="Using the
np:myComponent Component">
```

The following is an example component that demonstrates how `np:myComponent` can be used.

```

<!--The np:myComponentExample example component-->
<aura:component>
    <np:myComponent>
```

```
        <aura:set attribute="myAttribute">This sets the attribute on the np:myComponent
component.</aura:set>
        <!--More markup that demonstrates the usage of np:myComponent-->
    </np:myComponent>
</aura:component>
```

Providing Inline Descriptions

Inline descriptions provide a brief overview of what an element is about. HTML markup is not supported in inline descriptions. These tags support inline descriptions via the `description` attribute.

Tag	Example
`<aura:component>`	`<aura:component description="Represents a button element">`
`<aura:attribute>`	`<aura:attribute name="langLocale" type="String" description="The language locale used to format date value."/>`
`<aura:event>`	`<aura:event type="COMPONENT" description="Indicates that a keyboard key has been pressed and released"/>`
`<aura:interface>`	`<aura:interface description="A common interface for date components"/>`
`<aura:registerEvent>`	`<aura:registerEvent name="keydown" type="ui:keydown" description="Indicates that a key is pressed"/>`

Viewing the Documentation

The documentation you create will be available at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain.

SEE ALSO:

Reference

Working with Base Lightning Components

Base Lightning components are the building blocks that make up the modern Lightning Experience, Salesforce1, and Lightning Communities user interfaces.

Base Lightning components incorporate Lightning Design System markup and classes, providing improved performance and accessibility with a minimum footprint.

These base components handle the details of HTML and CSS for you. Each component provides simple attributes that enable variations in style. This means that you typically don't need to use CSS at all. The simplicity of the base Lightning component attributes and their clean and consistent definitions make them easy to use, enabling you to focus on your business logic.

You can find base Lightning components in the `lightning` namespace to complement the existing `ui` namespace components. In instances where there are matching `ui` and `lightning` namespace components, we recommend that you use the `lightning` namespace component. The `lightning` namespace components are optimized for common use cases. Beyond being equipped with the Lightning Design System styling, they handle accessibility, real-time interaction, and enhanced error messages.

In subsequent releases, we intend to provide additional base Lightning components. We expect that in time the `lightning` namespace will have parity with the `ui` namespace and go beyond it.

In addition, the base Lightning components will evolve with the Lightning Design System over time. This ensures that your customizations continue to match Lightning Experience and Salesforce1.

For all the components available, see the component reference at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain or see the Component Reference section.

Input Control Components

The following components are interactive, for example, like buttons and tabs.

Type	Key Components	Description	Lightning Design System
Button	`lightning:button`	Represents a button element.	Buttons
Button Icon	`lightning:buttonIcon`	An icon-only HTML button.	Button Icons
Button Group	`lightning:buttonGroup`	Represents a group of buttons.	Button Groups
Button Menu	`lightning:buttonMenu`	A dropdown menu with a list of actions or functions.	Menus
	`lightning:menuItem`	A list item in `lightning:buttonMenu`.	
Select	`lightning:select`	Creates an HTML `select` element.	Select
Tabs	`lightning:tab`	A single tab that is nested in a `lightning:tabset` component.	Tabs
	`lightning:tabset`	Represents a list of tabs.	

Visual Components

The following components provide informative cues, for example, like icons and loading spinners.

Type	Key Components	Description	Lightning Design System
Avatar	`lightning:avatar`	A visual representation of a person.	
Badge	`lightning:badge`	A label that holds a small amount of information.	Badges
Card	`lightning:card`	Applies a container around a related grouping of information.	Cards
Icon	`lightning:icon`	A visual element that provides context.	Icons
Layout	`lightning:layout`	Responsive grid system for arranging containers on a page.	Grid

Type	Key Components	Description	Lightning Design System
	`lightning:layoutItem`	A container within a `lightning:layout` component.	
Spinner	`lightning:spinner`	Displays an animated spinner.	Spinners

Field Components

The following components enable you to enter or display values.

Type	Key Components	Description	Lightning Design System
Input	`lighting:input`	Represents interactive controls that accept user input depending on the type attribute.	Forms
Internationalization	`lighting:formattedDateTime`	Displays formatted date and time.	N/A
	`lightning:formattedNumber`	Displays formatted numbers.	
Rich Text Area	`lightning:inputRichText`	A WYSIWYG editor with a customizable toolbar for entering rich text	Rich Text Editor
Text Area	`lightning:textArea`	A multiline text input.	Textarea

Base Lightning Components Considerations

Learn about the guidelines on using the base Lightning components.

We recommend that you don't depend on the markup of a Lightning component as its internals can change in the future. For example, using `cmp.get("v.body")` and examining the DOM elements can cause issues in your code if the component markup change down the road. With LockerService enforced, you can't traverse the DOM for components you don't own. Instead of accessing the DOM tree, take advantage of value binding with component attributes and use component methods that are available to you. For example, to get an attribute on a component, use `cmp.find("myInput").get("v.name")` instead of `cmp.find("myInput").getElement().name`. The latter doesn't work if you don't have access to the component, such as a component in another namespace.

Many of the base Lightning components are still evolving and the following considerations can help you while you're building your apps.

lightning:buttonMenu (Beta)

This component contains menu items that are created only if the button is triggered. You can't reference the menu items during initialization or if the button isn't triggered yet.

lightning:formattedDateTime (Beta)

This component provides fallback behavior in Apple Safari 10 and below. The following formatting options have exceptions when using the fallback behavior in older browsers.

- `era` is not supported.
- `timeZoneName` appends `GMT` for short format, `GMT-h:mm` or `GMT+h:mm` for long format.
- `timeZone` supports `UTC`. If another timezone value is used, `lightning:formattedDateTime` uses the browser timezone.

lightning:formattedNumber (Beta)

This component provides the following fallback behavior in Apple Safari 10 and below.

- If `style` is set to `currency`, providing a `currencyCode` value that's different from the locale displays the currency code instead of the symbol. The following example displays `EUR12.34` in fallback mode and `€12.34` otherwise.

  ```
  <lightning:formattedNumber value="12.34" style="currency"
   currencyCode="EUR"/>
  ```

- `currencyDisplayAs` supports `symbol` only. The following example displays `$12.34` in fallback mode only if the `currencyCode` matches the user's locale currency and `USD12.34` otherwise.

  ```
  <lightning:formattedNumber value="12.34" style="currency"
   currencyCode="USD" currencyDisplayAs="symbol"/>
  ```

lightning:input (Beta)

Date pickers are available in the following components but they don't inherit the Lightning Design System styling.

- `<lightning:input type="date" />`
- `<lightning:input type="datetime-local" />`

Fields for percentage and currency input must specify a step increment of 0.01 as required by the native implementation.

```
<lightning:input type="number" name="percentVal" label="Enter a percentage value"
formatter="percent" step="0.01" />
<lightning:input type="number" name="currencyVal" label="Enter a dollar amount"
formatter="currency" step="0.01" />
```

When working with checkboxes, radio buttons, and toggle switches, use `aura:id` to group and traverse the array of components. Grouping them enables you to use `get("v.checked")` to determine which elements are checked or unchecked without reaching into the DOM. You can also use the `name` and `value` attributes to identify each component during the iteration. The following example groups three checkboxes together using `aura:id`.

```
<aura:component>
    <form>
      <fieldset>
        <legend>Select your favorite color:</legend>
        <lightning:input type="checkbox" label="Red"
            name="color1" value="1" aura:id="colors"/>
        <lightning:input type="checkbox" label="Blue"
            name="color2" value="2" aura:id="colors"/>
        <lightning:input type="checkbox" label="Green"
            name="color3" value="3" aura:id="colors"/>
      </fieldset>
    <lightning:button label="Submit" onclick="{!c.submitForm}"/>
    </form>
</aura:component>
```

In your client-side controller, you can retrieve the array using `cmp.find("colors")` and inspect the `checked` values.

When working with `type="file"`, you must provide your own server-side logic for uploading files to Salesforce. Read the file using the FileReader HTML object, and then encode the file contents before sending them to your Apex controller. In your Apex controller, you can use the `EncodingUtil` methods to decode the file data. For example, you can use the Attachment object to upload files to a parent object. In this case, you pass in the base64 encoded file to the `Body` field to save the file as an attachment in your Apex controller.

Uploading files using this component is subject to regular Apex controller limits, which is 1 MB. To accommodate file size increase due to base64 encoding, we recommend that you set the maximum file size to 750 KB. You must implement chunking for file size larger than 1 MB. Files uploaded via chunking are subject to a size limit of 4 MB. For more information, see the *Apex Developer Guide*.

lightning:tab (Beta)

This component creates its body during runtime. You can't reference the component during initialization. Referencing the component using `aura:id` can return unexpected results, such as the component returning an undefined value when implementing `cmp.find("myComponent")`.

lightning:tabset (Beta)

When you load more tabs than can fit the width of the viewport, the tabset provides navigation buttons that scrolls horizontally to display the overflow tabs.

Event Handling in Base Lightning Components

Base components are lightweight and closely resemble HTML markup. They follow standard HTML practices by providing event handlers as attributes, such as `onfocus`, instead of registering and firing Lightning component events, like components in the `ui` namespace.

Because of their markup, you might expect to access DOM elements via `event.target` or `event.currentTarget`. However, this type of access breaks encapsulation because it provides access to another component's DOM elements, which are subject to change.

LockerService, which will be enabled for all orgs in Summer '17, enforces encapsulation. Use the methods described here to make your code compliant with LockerService.

To retrieve the component that fired the event, use `event.getSource()`.

```
<aura:component>
    <lightning:button name="myButton" onclick="{!c.doSomething}"/>
</aura:component>
```

```
({
    doSomething: function(cmp, event, helper) {
        var button = event.getSource();

        //The following patterns are not supported
        //when you're trying to access another component's
        //DOM elements.
        var el = event.target;
        var currentEl = event.currentTarget;
    }
})
```

Retrieve a component attribute that's passed to the event by using this syntax.

```
event.getSource().get("v.name")
```

Reusing Event Handlers

`event.getSource()` helps you determine which component fired an event. Let's say you have several buttons that reuse the same `onclick` handler. To retrieve the name of the button that fired the event, use `event.getSource().get("v.name")`.

```
<aura:component>
    <lightning:button label="New Record" name="new" onclick="{!c.handleClick}"/>
    <lightning:button label="Edit" name="edit" onclick="{!c.handleClick}"/>
    <lightning:button label="Delete" name="delete" onclick="{!c.handleClick}"/>
</aura:component>
```

```
({
    handleClick: function(cmp, event, helper) {
        //returns "new", "edit", or "delete"
        var buttonName = event.getSource().get("v.name");
    }
})
```

Retrieving the Active Component Using the **`onactive`** Handler

Components, such as `lightning:tab` and `lightning:menuItem`, support the `onactive` handler so that you can obtain a reference to the target component when it becomes active. Clicking the component multiple times invokes the handler once only.

For example, you can toggle a check mark on a menu item in a `lightning:buttonMenu` component when it's clicked.

```
<aura:component>
        <lightning:buttonMenu alternativeText="Show menu">
        <lightning:menuItem value="new" onactive="{! c.handleActive }" label="New"
checked="true" />
        <lightning:menuItem value="edit" onactive="{! c.handleActive }" label="Edit"
checked="false" />
        <lightning:menuItem value="delete" onactive="{! c.handleActive }" label="Delete"
checked="false" />
        </lightning:buttonMenu>
        </aura:component>
```

```
({
          handleActive: function (cmp, event) {
          var menuItem = event.getSource();
          menuItem.set("v.checked", !menuItem.get("v.checked"));
          }
          })
```

Note: If you only need the ID or value of the tab and you don't need a reference to the target component, use the `onselect` event handler.

Retrieving the ID and Value Using the **`onselect`** Handler

Some components provide event handlers to pass in events to child components, such as the `onselect` event handler on the following components.

- `lightning:buttonMenu`
- `lightning:tabset`

Although the `event.detail` syntax continues to be supported, we recommend that you update your JavaScript code to use the following patterns for the `onselect` handler as we plan to deprecate `event.detail` in a future release.

- `event.getParam("id")`
- `event.getParam("value")`

For example, you want to retrieve the value of a selected menu item in a `lightning:buttonMenu` component from a client-side controller.

```
//Before
var menuItem = event.detail.menuItem;
var itemValue = menuItem.get("v.value");
//After
var itemValue = event.getParam("value");
```

Similarly, to retrieve the ID of a selected tab in a `lightning:tabset` component:

```
//Before
var tab = event.detail.selectedTab;
var tabId = tab.get("v.id");
//After
var tabId = event.getParam("id");
```

Note: If you need a reference to the target component, use the `onactive` event handler instead.

Working with UI Components

The framework provides common user interface components in the `ui` namespace. All of these components extend either `aura:component` or a child component of `aura:component`. `aura:component` is an abstract component that provides a default rendering implementation. User interface components such as `ui:input` and `ui:output` provide easy handling of common user interface events like keyboard and mouse interactions. Each component can be styled and extended accordingly.

Note: If you are looking for components that apply the Lightning Design System styling, consider using the base lightning components instead.

For all the components available, see the component reference at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain.

Complex, Interactive Components

The following components contain one or more sub-components and are interactive.

Type	Key Components	Description
Message	`ui:message`	A message notification of varying severity levels
Menu	`ui:menu`	A drop-down list with a trigger that controls its visibility
	`ui:menuList`	A list of menu items
	`ui:actionMenuItem`	A menu item that triggers an action
	`ui:checkboxMenuItem`	A menu item that supports multiple selection and can be used to trigger an action
	`ui:radioMenuItem`	A menu item that supports single selection and can be used to trigger an action
	`ui:menuItemSeparator`	A visual separator for menu items

Type	Key Components	Description
	`ui:menuItem`	An abstract and extensible component for menu items in a `ui:menuList` component
	`ui:menuTrigger`	A trigger that expands and collapses a menu
	`ui:menuTriggerLink`	A link that triggers a dropdown menu. This component extends `ui:menuTrigger`

Input Control Components

The following components are interactive, for example, like buttons and checkboxes.

Type	Key Components	Description
Button	`ui:button`	An actionable button that can be pressed or clicked
Checkbox	`ui:inputCheckbox`	A selectable option that supports multiple selections
	`ui:outputCheckbox`	Displays a read-only value of the checkbox
Radio button	`ui:inputRadio`	A selectable option that supports only a single selection
Drop-down List	`ui:inputSelect`	A drop-down list with options
	`ui:inputSelectOption`	An option in a `ui:inputSelect` component

Visual Components

The following components provides informative cues, for example, like error messages and loading spinners.

Type	Key Components	Description
Field-level error	`ui:inputDefaultError`	An error message that is displayed when an error occurs
Spinner	`ui:spinner`	A loading spinner

Field Components

The following components enables you to enter or display values.

Type	Key Components	Description
Currency	`ui:inputCurrency`	An input field for entering currency
	`ui:outputCurrency`	Displays currency in a default or specified format
Email	`ui:inputEmail`	An input field for entering an email address
	`ui:outputEmail`	Displays a clickable email address
Date and time	`ui:inputDate`	An input field for entering a date

Type	Key Components	Description
	`ui:inputDateTime`	An input field for entering a date and time
	`ui:outputDate`	Displays a date in the default or specified format
	`ui:outputDateTime`	Displays a date and time in the default or specified format
Password	`ui:inputSecret`	An input field for entering secret text
Phone Number	`ui:inputPhone`	An input field for entering a telephone number
	`ui:outputPhone`	Displays a phone number
Number	`ui:inputNumber`	An input field for entering a numerical value
	`ui:outputNumber`	Displays a number
Range	`ui:inputRange`	An input field for entering a value within a range
Rich Text	`ui:inputRichText`	An input field for entering rich text
	`ui:outputRichText`	Displays rich text
Text	`ui:inputText`	An input field for entering a single line of text
	`ui:outputText`	Displays text
Text Area	`ui:inputTextArea`	An input field for entering multiple lines of text
	`ui:outputTextArea`	Displays a read-only text area
URL	`ui:inputURL`	An input field for entering a URL
	`ui:outputURL`	Displays a clickable URL

SEE ALSO:

Using the UI Components

Creating Components

Component Bundles

Event Handling in UI Components

UI components provide easy handling of user interface events such as keyboard and mouse interactions. By listening to these events, you can also bind values on UI input components using the `updateon` attribute, such that the values update when those events are fired.

Capture a UI event by defining its handler on the component. For example, you want to listen to the HTML DOM event, `onblur`, on a `ui:inputTextArea` component.

```
<ui:inputTextArea aura:id="textarea" value="My text area" label="Type something"
      blur="{!c.handleBlur}" />
```

The `blur="{!c.handleBlur}"` listens to the `onblur` event and wires it to your client-side controller. When you trigger the event, the following client-side controller handles the event.

```
handleBlur : function(cmp, event, helper){
    var elem = cmp.find("textarea").getElement();
    //do something else
}
```

For all available events on all components, see the Component Reference on page 339.

Value Binding for Browser Events

Any changes to the UI are reflected in the component attribute, and any change in that attribute is propagated to the UI. When you load the component, the value of the input elements are initialized to those of the component attributes. Any changes to the user input causes the value of the component variable to be updated. For example, a `ui:inputText` component can contain a value that's bound to a component attribute, and the `ui:outputText` component is bound to the same component attribute. The `ui:inputText` component listens to the `onkeyup` browser event and updates the corresponding component attribute values.

```
<aura:attribute name="first" type="String" default="John"/>
<aura:attribute name="last" type="String" default="Doe"/>

<ui:inputText label="First Name" value="{!v.first}" updateOn="keyup"/>
<ui:inputText label="Last Name" value="{!v.last}" updateOn="keyup"/>

<!-- Returns "John Doe" -->
<ui:outputText value="{!v.first +' '+ v.last}"/>
```

The next example takes in numerical inputs and returns the sum of those numbers. The `ui:inputNumber` component listens to the `onkeyup` browser event. When the value in this component changes on the keyup event, the value in the `ui:outputNumber` component is updated as well, and returns the sum of the two values.

```
<aura:attribute name="number1" type="integer" default="1"/>
<aura:attribute name="number2" type="integer" default="2"/>

<ui:inputNumber label="Number 1" value="{!v.number1}" updateOn="keyup" />
<ui:inputNumber label="Number 2" value="{!v.number2}"  updateOn="keyup" />

<!-- Adds the numbers and returns the sum -->
<ui:outputNumber  value="{!(v.number1 * 1) + (v.number2 * 1)}"/>
```

Note: The input fields return a string value and must be properly handled to accommodate numerical values. In this example, both values are multiplied by 1 to obtain their numerical equivalents.

Using the UI Components

Users interact with your app through input elements to select or enter values. Components such as `ui:inputText` and `ui:inputCheckbox` correspond to common input elements. These components simplify event handling for user interface events.

Note: For all available component attributes and events, see the component reference at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain .

To use input components in your own custom component, add them to your `.cmp` or `.app` resource. This example is a basic set up of a text field and button. The `aura:id` attribute defines a unique ID that enables you to reference the component from your JavaScript code using `cmp.find("myID");`.

```
<ui:inputText label="Name" aura:id="name" placeholder="First, Last"/>
<ui:outputText aura:id="nameOutput" value=""/>
<ui:button aura:id="outputButton" label="Submit" press="{!c.getInput}"/>
```

Note: All text fields must specify the `label` attribute to provide a textual label of the field. If you must hide the label from view, set `labelClass="assistiveText"` to make the label available to assistive technologies.

The `ui:outputText` component acts as a placeholder for the output value of its corresponding `ui:inputText` component. The value in the `ui:outputText` component can be set with the following client-side controller action.

```
getInput : function(cmp, event) {
      var fullName = cmp.find("name").get("v.value");
      var outName = cmp.find("nameOutput");
      outName.set("v.value", fullName);
    }
```

The following example is similar to the previous, but uses value binding without a client-side controller. The `ui:outputText` component reflects the latest value on the `ui:inputText` component when the `onkeyup` browser event is fired.

```
<aura:attribute name="first" type="String" default="John"/>
<aura:attribute name="last" type="String" default="Doe"/>

<ui:inputText label="First Name" value="{!v.first}" updateOn="keyup"/>
<ui:inputText label="Last Name" value="{!v.last}" updateOn="keyup"/>

<!-- Returns "John Doe" -->
<ui:outputText value="{!v.first +' '+ v.last}"/>
```

Tip: To create and edit records in Salesforce1, use the `force:createRecord` and `force:recordEdit` events to utilize the built-in record create and edit pages.

Supporting Accessibility

When customizing components, be careful in preserving code that ensures accessibility, such as the `aria` attributes.

Accessible software and assistive technology enable users with disabilities to use and interact with the products you build. Aura components are created according to W3C specifications so that they work with common assistive technologies. While we always recommend that you follow the WCAG Guidelines for accessibility when developing with the Lightning Component framework, this guide explains the accessibility features that you can leverage when using components in the `ui` namespace.

IN THIS SECTION:

Button Labels

Buttons may be designed to appear with just text, an image and text, or an image without text. To create an accessible button, use `ui:button` and set a textual label using the `label` attribute.

```
<ui:button label="Search"
iconImgSrc="/auraFW/resources/aura/images/search.png"/>
```

To create an accessible button with Lightning Design System styling, use `lightning:button` instead.

```
<lightning:button variant="brand" label="Submit"/>
```

When using `ui:button`, assign a non-empty string to label attribute. These examples show how a `ui:button` should render:

```
<!-- Good: using alt attribute to provide a invisible label -->
<button>
    <img src="search.png" alt="Search"/>
</button>
```

```
<!-- Good: using span/assistiveText to hide the label visually, but show it to screen
readers -->
<button>
 ::before
    <span class="assistiveText">Search</span>
</button>
```

Audio Messages

To convey audio notifications, use the `ui:message` component, which has `role="alert"` set on the component by default. The `"alert"` `aria` role will take any text inside the div and read it out loud to screen readers without any additional action by the user.

```
<ui:message title="Error" severity="error" closable="true">
      This is an error message.
</ui:message>
```

Forms, Fields, and Labels

Input components are designed to make it easy to assign labels to form fields. Labels build a programmatic relationship between a form field and its textual label. When using a placeholder in an input component, set the `label` attribute for accessibility.

Use the input components that extend `ui:input`, except when `type="file"`. For example, use `ui:inputTextarea` in preference to the `<textarea>` tag for multi-line text input or the `ui:inputSelect` component in preference to the `<select>` tag.

```
<ui:inputText label="Search" />
```

To create an accessible input field with Lightning Design System styling, use `lightning:input` instead.

```
<lightning:input type="search" label="Search" name="search" />
```

If your code failed, check the label element during component rendering. A label element should have the `for` attribute and match the value of input control id attribute, OR the label should be wrapped around an input. Input controls include `<input>`, `<textarea>`, and `<select>`.

```
<!-- Good: using label/for= -->
<label for="fullname">Enter your full name:</label>
<input type="text" id="fullname" />

<!-- Good: --using implicit label>
<label>Enter your full name:
    <input type="text" id="fullname"/>
</label>
```

SEE ALSO:

Using Labels

Events

Although you can attach an `onclick` event to any type of element, for accessibility, consider only applying this event to elements that are actionable in HTML by default, such as `<a>`, `<button>`, or `<input>` tags in component markup. You can use an `onclick` event on a `<div>` tag to prevent event bubbling of a click.

Menus

A menu is a drop-down list with a trigger that controls its visibility. You must provide the trigger and list of menu items. The drop-down menu and its menu items are hidden by default. You can change this by setting the `visible` attribute on the `ui:menuList` component to `true`. The menu items are shown only when you click the `ui:menuTriggerLink` component.

This example code creates a menu with several items:

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Opportunity Status"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu">
              <ui:actionMenuItem aura:id="item2" label="Open"
click="{!c.updateTriggerLabel}"/>
              <ui:actionMenuItem aura:id="item3" label="Closed"
click="{!c.updateTriggerLabel}"/>
              <ui:actionMenuItem aura:id="item4" label="Closed Won"
click="{!c.updateTriggerLabel}"/>
        </ui:menuList>
</ui:menu>
```

Different menus achieve different goals. Make sure you use the right menu for the desired behavior. The three types of menus are:

Actions
Use the `ui:actionMenuItem` for items that create an action, like print, new, or save.

Radio button
If you want users to pick only one from a list several items, use `ui:radioMenuItem`.

Checkbox style
If users can pick multiple items from a list of several items, use `ui:checkboxMenuItem`. Checkboxes can also be used to turn one item on or off.

CHAPTER 4 Using Components

In this chapter ...

You can use components in many different contexts. This section shows you how.

Use Lightning Components in Lightning Experience and Salesforce1

Customize and extend Lightning Experience and Salesforce1 with Lightning components. Launch components from tabs, apps, and actions.

IN THIS SECTION:

Configure Components for Custom Tabs

Add the `force:appHostable` interface to a Lightning component to allow it to be used as a custom tab in Lightning Experience or Salesforce1.

Components that implement this interface can be used to create tabs in both Lightning Experience and Salesforce1.

Example: **Example Component**

```
<!--simpleTab.cmp-->
<aura:component implements="force:appHostable">

    <!-- Simple tab content -->

    <h1>Lightning Component Tab</h1>

</aura:component>
```

The `appHostable` interface makes the component available for use as a custom tab. It doesn't require you to add anything else to the component.

Add Lightning Components as Custom Tabs in Lightning Experience

Make your Lightning components available for Lightning Experience users by displaying them in a custom tab.

In the components you wish to include in Lightning Experience, add `implements="force:appHostable"` in the `aura:component` tag and save your changes.

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Available for use in: **Contact Manager**, **Group**, **Professional**, **Enterprise**, **Performance**, **Unlimited**, and **Developer** Editions

Create Lightning components using the UI in **Enterprise**, **Performance**, **Unlimited**, **Developer** Editions or a sandbox.

USER PERMISSIONS

To create Lightning Component Tabs:
- "Customize Application"

```
<aura:component implements="force:appHostable">
```

Use the Developer Console to create Lightning components.

Follow these steps to include your components in Lightning Experience and make them available to users in your organization.

1. Create a custom tab for this component.
   a. From Setup, enter *`Tabs`* in the `Quick Find` box, then select **Tabs**.
   b. Click **New** in the Lightning Component Tabs related list.
   c. Select the Lightning component that you want to make available to users.
   d. Enter a label to display on the tab.
   e. Select the tab style and click **Next**.
   f. When prompted to add the tab to profiles, accept the default and click **Save**.
2. Add your Lightning components to the App Launcher.
   a. From Setup, enter *`Apps`* in the `Quick Find` box, then select **Apps**.
   b. Click **New**. Select *`Custom app`* and then click **Next**.
   c. Enter *`Lightning`* for `App Label`and click **Next**.
   d. In the `Available Tabs` dropdown menu, select the Lightning Component tab you created and click the right arrow button to add it to the custom app.
   e. Click **Next**. Select the `Visible` checkbox to assign the app to profiles and then **Save**.

3. Check your output by navigating to the App Launcher in Lightning Experience. Your custom app should appear in theApp Launcher. Click the custom app to see the components you added.

Add Lightning Components as Custom Tabs in Salesforce1

Make your Lightning components available for Salesforce1 users by displaying them in a custom tab.

In the component you wish to add, include `implements="force:appHostable"` in your `aura:component` tag and save your changes.

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Available for use in: **Contact Manager**, **Group**, **Professional**, **Enterprise**, **Performance**, **Unlimited**, and **Developer** Editions

Create Lightning components using the UI in **Enterprise**, **Performance**, **Unlimited**, **Developer** Editions or a sandbox.

USER PERMISSIONS

To create Lightning Component Tabs:
- "Customize Application"

```
<aura:component implements="force:appHostable">
```

The `appHostable` interface makes the component available as a custom tab.

Use the Developer Console to create Lightning components.

Include your components in the Salesforce1 navigation menu by following these steps.

1. Create a custom Lightning component tab for the component. From Setup, enter *`Tabs`* in the `Quick Find` box, then select **Tabs**.

   Note: You must create a custom Lightning component tab before you can add your component to the Salesforce1 navigation menu. Accessing your Lightning component from the full Salesforce site is not supported.

2. Add your Lightning component to the Salesforce1 navigation menu.
   a. From Setup, enter *`Navigation`* in the `Quick Find` box, then select **Salesforce1 Navigation**.
   b. Select the custom tab you just created and click **Add**.
   c. Sort items by selecting them and clicking **Up** or **Down**.

      In the navigation menu, items appear in the order you specify. The first item in the Selected list becomes your users' Salesforce1 landing page.

3. Check your output by going to the Salesforce1 mobile browser app. Your new menu item should appear in the navigation menu.

Note: By default, the mobile browser app is turned on for your org. For more information on using the Salesforce1 mobile browser app, see the *Salesforce1 App Developer Guide*.

Configure Components for Custom Actions

Add the `force:lightningQuickAction` or `force:lightningQuickActionWithoutHeader` interface to a Lightning component to enable it to be used as a custom action in Lightning Experience or Salesforce1. You can use components that implement one of these interfaces as *object-specific* actions in both Lightning Experience and Salesforce1. You can use them as *global* actions only in Salesforce1.

When used as actions, components that implement the `force:lightningQuickAction` interface display in a panel with standard action controls, such as a **Cancel** button. These components can also display and implement their own controls, but should be prepared for events from the standard controls.

Components that implement the `force:lightningQuickActionWithoutHeader` interface display in a panel without additional controls and are expected to provide a complete user interface for the action.

These interfaces are mutually exclusive. That is, components can implement either the `force:lightningQuickAction` interface or the `force:lightningQuickActionWithoutHeader` interface, but not both. This should make sense; a component can't both present standard user interface elements and *not* present standard user interface elements.

Example: **Example Component**

Here's an example of a component that can be used for a custom action, which you can name whatever you want—perhaps "Quick Add". (A component and an action that uses it don't need to have matching names.) This component allows you to quickly add two numbers together.

```
<!--quickAdd.cmp-->
<aura:component implements="force:lightningQuickAction">

    <!-- Very simple addition -->

    <ui:inputNumber aura:id="num1"/> +
    <ui:inputNumber aura:id="num2"/>

    <br/>
    <ui:button label="Add" press="{!c.clickAdd}"/>

</aura:component>
```

The component markup simply presents two input fields, and an **Add** button.

The component's controller does all of the real work.

```
/*quickAddController.js*/
({
    clickAdd: function(component, event, helper) {

        // Get the values from the form
        var n1 = component.find("num1").get("v.value");
        var n2 = component.find("num2").get("v.value");

        // Display the total in a "toast" status message
        var resultsToast = $A.get("e.force:showToast");
        resultsToast.setParams({
            "title": "Quick Add: " + n1 + " + " + n2,
            "message": "The total is: " + (n1 + n2) + "."
        });
        resultsToast.fire();

        // Close the action panel
        var dismissActionPanel = $A.get("e.force:closeQuickAction");
        dismissActionPanel.fire();
    }

})
```

Retrieving the two numbers entered by the user is straightforward, though a more robust component would check for valid inputs, and so on. The interesting part of this example is what happens to the numbers and how the custom action resolves.

The results of the add calculation are displayed in a "toast," which is a status message that appears at the top of the page. The toast is created by firing the `force:showToast` event. A toast isn't the only way you could display the results, nor are actions the only use for toasts. It's just a handy way to show a message at the top of the screen in Lightning Experience or Salesforce1.

What's interesting about using a toast here, though, is what happens afterward. The `clickAdd` controller action fires the `force:closeQuickAction` event, which dismisses the action panel. But, even though the action panel is closed, the toast still displays. The `force:closeQuickAction` event is handled by the action panel, which closes. The `force:showToast` event is handled by the `one.app` container, so it doesn't need the panel to work.

SEE ALSO:

Configure Components for Record-Specific Actions

Configure Components for Record-Specific Actions

Add the `force:hasRecordId` interface to a Lightning component to enable the component to be assigned the ID of the currently displaying record. The current record ID is useful if the component is used as an object-specific custom action in Lightning Experience or Salesforce1.

The `force:hasRecordId` interface does two things to a component that implements it.

- It adds an attribute named `recordId` to your component. This attribute is of type String, and its value is an 18-character Salesforce record ID, for example: 001xx000003DGSWAA4. If you added it yourself, the attribute definition would look like this:

  ```
  <aura:attribute name="recordId" type="String" />
  ```

  Note: You don't need to add a `recordId` attribute to a component yourself if it implements `force:hasRecordId`. If you do add it, don't change the access level or type of the attribute or the component will cause a runtime error.

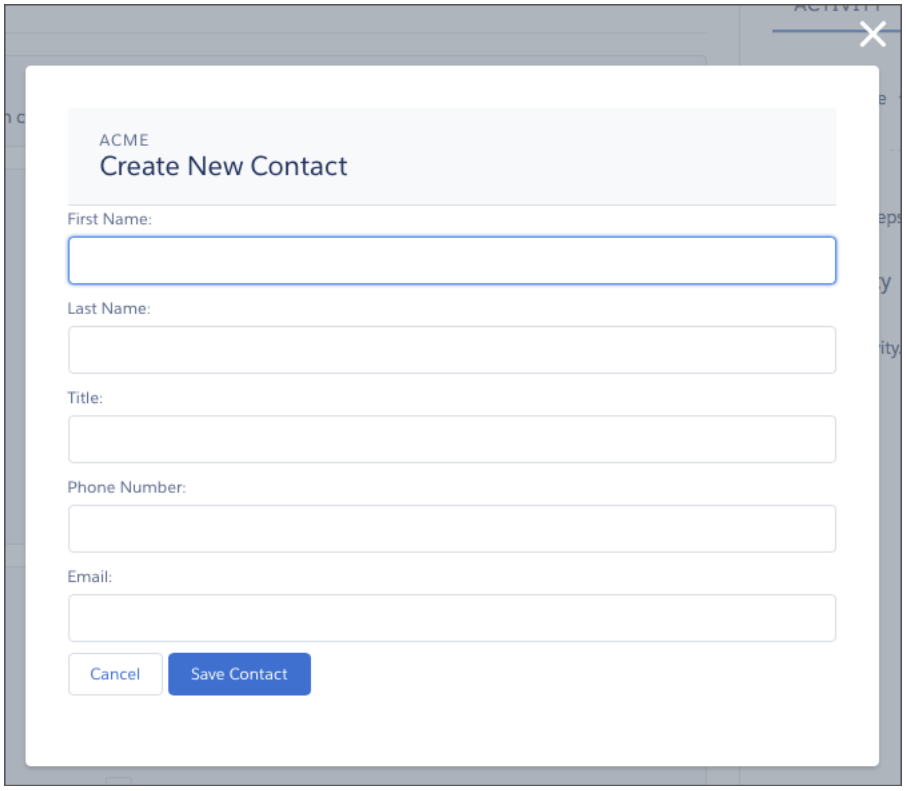
- When your component is invoked in a record context in Lightning Experience or Salesforce1, the `recordId` is set to the ID of the record being viewed.

This behavior is different than you might expect for an interface in a programming language. This difference is because `force:hasRecordId` is a *marker interface*. A marker interface is a signal to the component's container to add the interface's behavior to the component.

The record ID is set only when you place the component on a record page, or invoke it as an action from a record page. In all other cases, such as when you create this component programmatically inside another component, the record ID isn't set, and your component shouldn't depend on it.

Example: **Example of a Component for a Record-Specific Action**

This extended example shows a component designed to be invoked as a custom action from the detail page of an account record. After creating the component, you need to create the custom action on the account object, and then add the action to an account page layout. When opened using an action, the component appears in an action panel that looks like this:



The component definition begins by implementing both the `force:lightningQuickActionWithoutHeader` and the `force:hasRecordId` interfaces. The first makes it available for use as an action and prevents the standard controls from displaying. The second adds the interface's automatic record ID attribute and value assignment behavior, when the component is invoked in a record context.

`quickContact.cmp`

```
<aura:component controller="QuickContactController"
    implements="force:lightningQuickActionWithoutHeader,force:hasRecordId">

    <aura:attribute name="account" type="Account" />
    <aura:attribute name="newContact" type="Contact"
        default="{ 'sobjectType': 'Contact' }" /> <!-- default to empty record -->
    <aura:attribute name="hasErrors" type="Boolean"
        description="Indicate if there were failures when validating the contact." />


    <aura:handler name="init" value="{!this}" action="{!c.doInit}" />

    <!-- Display a header with details about the account -->
    <div class="slds-page-header" role="banner">
        <p class="slds-text-heading--label">{!v.account.Name}</p>
        <h1 class="slds-page-header__title slds-m-right--small
            slds-truncate slds-align-left">Create New Contact</h1>
    </div>

    <!-- Display form validation errors, if any -->
    <aura:if isTrue="{!v.hasErrors}">
        <div class="recordSaveError">
            <ui:message title="Error" severity="error" closable="true">
                The new contact can't be saved because it's not valid.
                Please review and correct the errors in the form.
            </ui:message>
        </div>
    </aura:if>

    <!-- Display the new contact form -->
    <div class="slds-form--stacked">

        <div class="slds-form-element">
            <label class="slds-form-element__label"
                for="contactFirstName">First Name: </label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactFirstName"
                value="{!v.newContact.FirstName}" required="true"/>
            </div>
        </div>
        <div class="slds-form-element">
            <label class="slds-form-element__label"
                for="contactLastName">Last Name: </label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactLastName"
                value="{!v.newContact.LastName}" required="true"/>
            </div>
        </div>

        <div class="slds-form-element">
           <label class="slds-form-element__label" for="contactTitle">Title: </label>

            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactTitle"
                value="{!v.newContact.Title}" />
            </div>
        </div>

        <div class="slds-form-element">
            <label class="slds-form-element__label"
                for="contactPhone">Phone Number: </label>
            <div class="slds-form-element__control">
              <ui:inputPhone class="slds-input" aura:id="contactPhone"
                value="{!v.newContact.Phone}" required="true"/>
            </div>
        </div>
        <div class="slds-form-element">
           <label class="slds-form-element__label" for="contactEmail">Email: </label>
```

```
            <div class="slds-form-element__control">
              <ui:inputEmail class="slds-input" aura:id="contactEmail"
                value="{!v.newContact.Email}" />
            </div>
        </div>

        <div class="slds-form-element">
            <ui:button label="Cancel" press="{!c.handleCancel}"
                class="slds-button slds-button--neutral" />
            <ui:button label="Save Contact" press="{!c.handleSaveContact}"
                class="slds-button slds-button--brand" />
        </div>

    </div>

</aura:component>
```

The component defines three attributes, which are used as member variables.

- *account*—holds the full account record, after it's loaded in the init handler
- *newContact*—an empty contact, used to capture the form field values
- *hasErrors*—a Boolean flag to indicate whether there are any form validation errors

The rest of the component definition is a standard form using the Lightning Design System for styling.

The component's controller has all of the interesting code, in three action handlers.

`quickContactController.js`

```
({
    doInit : function(component, event, helper) {

        // Prepare the action to load account record
        var action = component.get("c.getAccount");
        action.setParams({"accountId": component.get("v.recordId")});

        // Configure response handler
        action.setCallback(this, function(response) {
            var state = response.getState();
            if(component.isValid() && state === "SUCCESS") {
                component.set("v.account", response.getReturnValue());
            } else {
                console.log('Problem getting account, response state: ' + state);
            }
        });
        $A.enqueueAction(action);
    },

    handleSaveContact: function(component, event, helper) {
        if(helper.validateContactForm(component)) {
            component.set("v.hasErrors", false);

            // Prepare the action to create the new contact
            var saveContactAction = component.get("c.saveContactWithAccount");
            saveContactAction.setParams({
                "contact": component.get("v.newContact"),
                "accountId": component.get("v.recordId")
            });

            // Configure the response handler for the action
            saveContactAction.setCallback(this, function(response) {
                var state = response.getState();
                if(component.isValid() && state === "SUCCESS") {

                    // Prepare a toast UI message
                    var resultsToast = $A.get("e.force:showToast");
                    resultsToast.setParams({
                        "title": "Contact Saved",
                        "message": "The new contact was created."
                    });

                    // Update the UI: close panel, show toast, refresh account page
                    $A.get("e.force:closeQuickAction").fire();
                    resultsToast.fire();
                    $A.get("e.force:refreshView").fire();
                }
                else if (state === "ERROR") {
                    console.log('Problem saving contact, response state: ' + state);
                }
                else {
                    console.log('Unknown problem, response state: ' + state);
                }
            });

            // Send the request to create the new contact
            $A.enqueueAction(saveContactAction);
        }
        else {
            // New contact form failed validation, show a message to review errors
            component.set("v.hasErrors", true);
        }
    },

 handleCancel: function(component, event, helper) {
     $A.get("e.force:closeQuickAction").fire();
    }
})
```

The first action handler, `doInit`, is an init handler. Its job is to use the record ID that's provided via the `force:hasRecordId` interface and load the full account record. Note that there's nothing to stop this component from being used in an action on another object, like a lead, opportunity, or custom object. In that case, `doInit` will fail to load a record, but the form will still display.

The `handleSaveContact` action handler validates the form by calling a helper function. If the form isn't valid, the action handler sets the flag that displays the form error message. If the form is valid, then the action handler:

- Prepares the server action to save the new contact.
- Defines a callback function, called the *response handler*, for when the server completes the action. The response handler is discussed in a moment.
- Enqueues the server action.

The server action's response handler does very little itself. If the server action was successful, the response handler:

- Closes the action panel by firing the `force:closeQuickAction` event.
- Displays a "toast" message that the contact was created by firing the `force:showToast` event.
- Updates the record page by firing the `force:refreshView` event, which tells the record page to update itself.

This last item displays the new record in the list of contacts, once that list updates itself in response to the refresh event.

The `handleCancel` action handler closes the action panel by firing the `force:closeQuickAction` event.

The component helper provided here is minimal, sufficient to illustrate its use. You'll likely have more work to do in any production quality form validation code.

`quickContactHelper.js`

```
({
 validateContactForm: function(component) {
        var validContact = true;

        // First and Last Name are required
        var firstNameField = component.find("contactFirstName");
        if($A.util.isEmpty(firstNameField.get("v.value"))) {
            validContact = false;
            firstNameField.set("v.errors", [{message:"First name can't be blank"}]);
        }
        else {
            firstNameField.set("v.errors", null);
        }
        var lastNameField = component.find("contactLastName");
        if($A.util.isEmpty(lastNameField.get("v.value"))) {
            validContact = false;
            lastNameField.set("v.errors", [{message:"Last name can't be blank"}]);
        }
        else {
            lastNameField.set("v.errors", null);
        }

        // Verify we have an account to attach it to
        var account = component.get("v.account");
        if($A.util.isEmpty(account)) {
            validContact = false;
            console.log("Quick action context doesn't have a valid account.");
        }

        // TODO: (Maybe) Validate email and phone number

        return(validContact);
 }
})
```

Finally, the Apex class used as the server-side controller for this component is deliberately simple to the point of being obvious.

`QuickContactController.apxc`

```
public with sharing class QuickContactController {

    @AuraEnabled
    public static Account getAccount(Id accountId) {
        // Perform isAccessible() checks here
        return [SELECT Name, BillingCity, BillingState FROM Account WHERE Id =
:accountId];
    }

    @AuraEnabled
    public static Contact saveContactWithAccount(Contact contact, Id accountId) {
        // Perform isAccessible() and isUpdateable() checks here
        contact.AccountId = accountId;
        upsert contact;
        return contact;
    }

}
```

One method retrieves an account based on the record ID. The other associates a new contact record with an account, and then saves it to the database.

SEE ALSO:

Configure Components for Custom Actions

Lightning Component Actions

EDITIONS

Available in: both Salesforce1 and Lightning Experience

Available in: **Group**, **Professional**, **Enterprise**, **Performance**, **Unlimited**, **Contact Manager**, and **Developer** Editions

Lightning component actions are custom actions that invoke a Lightning component. They support Apex and JavaScript and provide a secure way to build client-side custom functionality. Lightning component actions are supported only in Salesforce1 and Lightning Experience.

Note: My Domain must be deployed in your org for Lightning component actions to work properly.

You can add Lightning component actions to an object's page layout using the page layout editor. If you have Lightning component actions in your org, you can find them in the Salesforce1 & Lightning Actions category in the page layout editor's palette.

On Lightning Experience record pages, Lightning component actions display in the page-level action menu in the highlights panel.

Lightning component actions can't call just any Lightning component in your org. For a component to work as a Lightning component action, it has to be configured specifically for that purpose and implement either the `force:LightningQuickAction` or `force:LightningQuickActionWithoutHeader` interfaces. You can find out more about configuring custom components in the Lightning Components Developer Guide.

If you plan on packaging a Lightning component action, the component the action invokes must be marked as `access=global`.

Get Your Lightning Components Ready to Use on Lightning Pages

Custom Lightning components don't work on Lightning Pages or in the Lightning App Builder right out of the box. To use a custom component in either of these places, you must configure the component and its component bundle so that they're compatible.

IN THIS SECTION:

Configure Components for Lightning Pages and the Lightning App Builder

There are three steps you must take before you can use your custom Lightning components in either Lightning Pages or the Lightning App Builder.

1. Deploy My Domain in Your Org

You must deploy My Domain in your org if you want to use Lightning components in Lightning tabs, Lightning Pages, or as standalone apps.

For more information about My Domain, see the Salesforce Help.

2. Add a New Interface to Your Component

To appear in the Lightning App Builder or a Lightning Page, a component must implement the `flexipage:availableForAllPageTypes` interface.

Here's the sample code for a simple "Hello World" component.

```
<aura:component implements="flexipage:availableForAllPageTypes" access="global">
    <aura:attribute name="greeting" type="String" default="Hello" access="global" />
    <aura:attribute name="subject" type="String" default="World" access="global" />

    <div style="box">
      <span class="greeting">{!v.greeting}</span>, {!v.subject}!
    </div>
</aura:component>
```

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

3. Add a Design Resource to Your Component Bundle

Include a design resource in the component bundle to make your Lightning component usable in Lightning Pages and the Lightning App Builder. Use a design resource to control which attributes are exposed to the Lightning App Builder. A design resource lives in the same folder as your .cmp resource, and describes the design-time behavior of the Lightning component—information that visual tools need to allow adding the component to a page or app.

Here's the design resource that goes in the bundle with the "Hello World" component.

```
<design:component label="Hello World">
    <design:attribute name="subject" label="Subject" description="Name of the person you
want to greet" />
    <design:attribute name="greeting" label="Greeting" />
</design:component>
```

Design resources must be named *`componentName`*`.design`.

Optional: Add an SVG Resource to Your Component Bundle

You can use an SVG resource to define a custom icon for your component when it appears in the Lightning App Builder's component pane. Include it in the component bundle.

Here's a simple red circle SVG resource to go with the "Hello World" component.

```
<?xml version="1.0"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">

<svg xmlns="http://www.w3.org/2000/svg"
     width="400" height="400">
  <circle cx="100" cy="100" r="50" stroke="black"
    stroke-width="5" fill="red" />
</svg>
```

SVG resources must be named *`componentName`*`.svg`.

SEE ALSO:

- Component Bundles
- Lightning Component Bundle Design Resources
- Tips and Considerations for Configuring Components for Lightning Pages and the Lightning App Builder

Lightning Component Bundle Design Resources

Use a design resource to control which attributes are exposed to the Lightning App Builder. A design resource lives in the same folder as your .cmp resource, and describes the design-time behavior of the Lightning component—information that visual tools need to allow adding the component to a page or app.

To make a Lightning component attribute available for administrators to edit in the Lightning App Builder, add a `design:attribute` node for the attribute into the design resource. An attribute marked as required in the component definition automatically appears for users in the Lightning App Builder, unless it has a default value assigned to it. Required attributes with default values and attributes not marked as required in the component definition must be specified in the design resource or they won't appear for users.

A design resource supports only attributes of type `int`, `string`, or `boolean`.

What Can You Do with Design Resources?

Render a field as a picklist

To render a field as a picklist with static values, add a `datasource` onto the attribute in the design resource.

```
<design:attribute name="Name" datasource="value1,value2,value3" />
```

Any string attribute with a `datasource` in a design resource is treated as a picklist.

Set a default value on an attribute

You can set a default value on an attribute in a design resource.

```
<design:attribute name="Name" datasource="value1,value2,value3" default="value1" />
```

Restrict a component to one or more objects

Use the `<sfdc:object>` tag set to specify which objects your component is valid for.

For example, here's a design resource that goes in a bundle with a "Hello World" component.

```
<design:component label="Hello World">
    <design:attribute name="subject" label="Subject" description="Name of the person
you want to greet" />
    <design:attribute name="greeting" label="Greeting" />
</design:component>
```

Here's the same design resource restricted to two objects.

```
<design:component label="Hello World">
    <design:attribute name="subject" label="Subject" description="Name of the person
you want to greet" />
    <design:attribute name="greeting" label="Greeting" />
    <sfdc:objects>
        <sfdc:object>Custom__c</sfdc:object>
        <sfdc:object>Opportunity</sfdc:object>
    </sfdc:objects>
</design:component>
```

If an object is installed from a package, add the ***`namespace`***`__` string to the beginning of the object name when including it in the `<sfdc:object>` tag set. For example: `objectNamespace__ObjectApiName__c`.

SEE ALSO:

Configure Components for Lightning Pages and the Lightning App Builder

Tips and Considerations for Configuring Components for Lightning Pages and the Lightning App Builder

Configure Components for Lightning Experience Record Pages

After your component is set up to work on Lightning Pages and in the Lightning App Builder, use these guidelines to configure the component so it works on record pages in Lightning Experience.

Record pages are different from app pages in a key way: they have the context of a record. To make your components display content that is based on the current record, use a combination of an interface and an attribute.

- If your component is available for both record pages and any other type of page, implement `flexipage:availableForAllPageTypes`.
- If your component is designed just for record pages, implement the `flexipage:availableForRecordHome` interface instead of `flexipage:availableForAllPageTypes`.
- If your component needs the record ID, also implement the `force:hasRecordId` interface.
- If your component needs the object's API name, also implement the `force:hasSObjectName` interface.

Note: If your managed component implements the `flexipage` or `forceCommunity` interfaces, its upload is blocked if the component and its attributes aren't set to `access="global"`. For more information on access checks, see Controlling Access.

`force:hasRecordId`

Useful for components invoked in a context associated with a specific record, such as record page components or custom object actions. Add this interface if you want your component to receive the ID of the currently displaying record.

The `force:hasRecordId` interface does two things to a component that implements it.

- It adds an attribute named `recordId` to your component. This attribute is of type String, and its value is an 18-character Salesforce record ID, for example: 001xx000003DGSWAA4. If you added it yourself, the attribute definition would look like this:

  ```
  <aura:attribute name="recordId" type="String" />
  ```

  Note: You don't need to add a `recordId` attribute to a component yourself if it implements `force:hasRecordId`. If you do add it, don't change the access level or type of the attribute or the component will cause a runtime error.

- When your component is invoked in a record context in Lightning Experience or Salesforce1, the `recordId` is set to the ID of the record being viewed.

This behavior is different than you might expect for an interface in a programming language. This difference is because `force:hasRecordId` is a *marker interface*. A marker interface is a signal to the component's container to add the interface's behavior to the component.

Don't expose the `recordId` attribute to the Lightning App Builder—don't put it in the component's design resource. You don't want admins supplying a record ID.

The record ID is set only when you place the component on a record page, or invoke it as an action from a record page. In all other cases, such as when you create this component programmatically inside another component, the record ID isn't set, and your component shouldn't depend on it.

`force:hasSObjectName`

Useful for record page components. Implement this interface if your component needs to know the API name of the object of the currently displaying record.

This interface adds an attribute named `sObjectName` to your component. This attribute is of type String, and its value is the API name of an object, such as `Account` or `myNamespace__myObject__c`. For example:

```
<aura:attribute name="sObjectName" type="String" />
```

The `sObjectName` attribute is populated only when you place the component on a record page. In all other cases, such as when you create this component programmatically inside another component, `sObjectName` isn't populated, and your component shouldn't depend on it.

SEE ALSO:

Configure Components for Lightning Pages and the Lightning App Builder

Tips and Considerations for Configuring Components for Lightning Pages and the Lightning App Builder

Working with Salesforce Records

Create Components for Lightning for Outlook and Lightning for Gmail (Beta)

Create custom Lightning components that are available for drag-and-drop in the Email Application Pane for Lightning for Outlook and Lightning for Gmail (Beta).

To add a component to email application panes in Lightning for Outlook or Lightning for Gmail (Beta), implement the `clients:availableForMailAppAppPage` interface.

To allow the component access to email or calendar events, implement the `clients:hasItemContext` interface.

The `clients:hasItemContext` interface adds attributes to your component that it can use to implement record- or context-specific logic. The attributes included are:

- The `source` attribute, which indicates the email or appointment source. Possible values include `email` and `event`.

  ```
  <aura:attribute name="source" type="String" />
  ```

- The `people` attribute indicates recipients' email addresses on the current email or appointment.

  ```
  <aura:attribute name="people" type="Object" />
  ```

  The shape of the `people` attribute changes according to the value of the `source` attribute.

  When the source attribute is set to email, the people object contains the following elements.

  ```
  {
      to: [ { name: nameString, email: emailString }, ... ],
      cc: [ ... ],
      from: [ { name: senderName, email: senderEmail } ],
  }
  ```

  When the source attribute is set to event, the people object contains the following elements.

  ```
  {
      requiredAttendees: [ { name: attendeenameString, email: emailString }, ... ],
      optionalAttendees: [ { name: optattendeenameString, email: emailString }, ... ],
      organizer: [ { name: organizerName, email: senderEmail } ],
  }
  ```

- The `subject` indicates the subject on the current email.

  ```
  <aura:attribute name="subject" type="String" />
  ```

- The `messageBody` indicates the email message on the current email.

  ```
  <aura:attribute name="messageBody" type="String" />
  ```

To provide the component with an event's date or location, implement the `clients:hasEventContext` interface.

```
    dates: {
            "start": value (String),
            "end": value (String),
    }
```

Lightning for Outlook and Lightning for Gmail don't support the following events:

- `force:navigateToList`
- `force:navigateToRelatedList`
- `force:navigateToObjectHome`
- `force:refreshView`

Note: To ensure that custom components appear correctly in Lightning for Outlook or Lightning for Gmail, enable them to adjust to variable widths.

IN THIS SECTION:

Sample Custom Components for Lightning for Outlook and Lightning for Gmail (Beta)
Review samples of custom Lightning components that you can implement in the Email Application Pane for Lightning for Outlook and Lightning for Gmail.

Sample Custom Components for Lightning for Outlook and Lightning for Gmail (Beta)

Review samples of custom Lightning components that you can implement in the Email Application Pane for Lightning for Outlook and Lightning for Gmail.

Here's an example of a custom Lightning Component you can include in your email application pane for Lightning for Outlook or Lightning for Gmail (Beta). This component leverages the context of the selected email or appointment.

```
<aura:component implements="clients:availableForMailAppAppPage,clients:hasItemContext">

<!--
    Add these handlers to customize what happens when the attributes change
    <aura:handler name="change" value="{!v.subject}" action="{!c.handleSubjectChange}" />

    <aura:handler name="change" value="{!v.people}" action="{!c.handlePeopleChange}" />
-->

    <div id="content">
        <h1><b>Email subject</b></h1>
        <span id="subject">{!v.subject}</span>

        <h1>To:</h1>
        <aura:iteration items="{!v.people.to}" var="to">
            {!to.name} - {!to.email} <br/>
        </aura:iteration>

        <h1>From:</h1>
        {!v.people.from.name} - {!v.people.from.email}

        <h1>CC:</h1>
        <aura:iteration items="{!v.people.cc}" var="cc">
            {!cc.name} - {!cc.email} <br/>
        </aura:iteration>

        <span class="greeting">New Email Arrived</span>, {!v.subject}!
    </div>
</aura:component>
```

In this example, the custom component displays account and opportunity information based on the email recipients' email addresses. The component calls a JavaScript controller function, `handlePeopleChange()`, on initialization. The JavaScript controller calls methods on an Apex server-side controller to query the information and compute the accounts ages and opportunities days until closing. The Apex controller, JavaScript controller, and helper are listed next.

```
<!--
This component handles the email context on initialization.
It retrieves accounts and opportunities based on the email addresses included
in the email recipients list.
It then calculates the account and opportunity ages based on when the accounts
were created and when the opportunities will close.
-->

<aura:component
    implements="clients:availableForMailAppAppPage,clients:hasItemContext"
    controller="ComponentController">

    <aura:handler name="init" value="{!this}" action="{!c.handlePeopleChange}" />
    <aura:attribute name="accounts" type="List" />
    <aura:attribute name="opportunities" type="List" />
    <aura:iteration items="{!v.accounts}" var="acc">
            {!acc.name} => {!acc.age}
    </aura:iteration>
    <aura:iteration items="{!v.opportunities}" var="opp">
            {!opp.name} => {!opp.closesIn} Days till closing
    </aura:iteration>

</aura:component>
```

```
/*
On the server side, the Apex controller includes
Aura-enabled methods that accept a list of emails as parameters.
*/

public class ComponentController {
    /*
    This method searches for Contacts with matching emails in the email list,
    and includes Account information in the fields. Then, it filters the
    information to return a list of objects to use on the client side.
    */
    @AuraEnabled
    public static List<Map<String, Object>> findAccountAges(List<String> emails) {
    List<Map<String, Object>> ret = new List<Map<String, Object>>();
    List<Contact> contacts = [SELECT Name, Account.Name, Account.CreatedDate
                              FROM Contact
                              WHERE Contact.Email IN :emails];
    for (Contact c: contacts) {
            Map<String, Object> item = new Map<String, Object>();
            item.put('name', c.Account.Name);
            item.put('age',
                     Date.valueOf(c.Account.CreatedDate).daysBetween(
                         System.Date.today()));
            ret.add(item);
    }
     return ret;
}

    /*
    This method searches for OpportunityContactRoles with matching emails
    in the email list.
    Then, it calculates the number of days until closing to return a list
    of objects to use on the client side.
    */
    @AuraEnabled
    public static List<Map<String, Object>> findOpportunityCloseDateTime(List<String>
emails) {
    List<Map<String, Object>> ret = new List<Map<String, Object>>();
    List<OpportunityContactRole> contacts =
           [SELECT Opportunity.Name, Opportunity.CloseDate
            FROM OpportunityContactRole
            WHERE isPrimary=true AND Contact.Email IN :emails];
    for (OpportunityContactRole c: contacts) {
            Map<String, Object> item = new Map<String, Object>();
            item.put('name', c.Opportunity.Name);
            item.put('closesIn',
                     System.Date.today().daysBetween(
                         Date.valueOf(c.Opportunity.CloseDate)));
            ret.add(item);
    }
     return ret;
  }
}
```

```
({
/*
This JavaScript controller is called on component initialization and relies
on the helper functionality to build a list of email addresses from the
available people. It then makes a caller to the server to run the actions to
display information.
Once the server returns the values, it sets the appropriate values to display
on the client side.
*/
    handlePeopleChange: function(component, event, helper){
            var people = component.get("v.people");
            var peopleEmails = helper.filterEmails(people);
            var action = component.get("c.findOpportunityCloseDateTime");
            action.setParam("emails", peopleEmails);
            action.setCallback(this, function(response){
            var state = response.getState();
            if(component.isValid() && state === "SUCCESS"){
               component.set("v.opportunities", response.getReturnValue());
            } else{
               component.set("v.opportunities",[]);
            }
});
            $A.enqueueAction(action);
            var action = component.get("c.findAccountAges");
            action.setParam("emails", peopleEmails);

            action.setCallback(this, function(response){
            var state = response.getState();
            if(component.isValid() && state === "SUCCESS"){
               component.set("v.accounts", response.getReturnValue());
            } else{
               component.set("v.accounts",[]);
            }
});
$A.enqueueAction(action);
}
})
```

```
({
    /*
    This helper function filters emails from objects.
    */
    filterEmails : function(people){
            return this.getEmailsFromList(people.to).concat(
                this.getEmailsFromList(people.cc));
    },

    getEmailsFromList : function(list){
            var ret = [];
            for (var i in list) {
            ret.push(list[i].email);
    }
     return ret;
  }
})
```

Create Dynamic Picklists for Your Custom Components

You can expose a component property as a picklist when the component is configured in the Lightning App Builder. The picklist's values are provided by an Apex class that you create.

For example, let's say you're creating a component for the Home page to display a custom Company Announcement record. You can use an Apex class to put the titles of all Company Announcement records in a picklist in the component's properties in the Lightning App Builder. Then, when admins add the component to a Home page, they can easily select the appropriate announcement to place on the page.

1. Create a custom Apex class to use as a datasource for the picklist. The Apex class must extend the `VisualEditor.DynamicPickList` abstract class.
2. Add an attribute to your design file that specifies your custom Apex class as the datasource.

Here's a simple example.

Create an Apex Class

```
global class MyCustomPickList extends VisualEditor.DynamicPickList{

    global override VisualEditor.DataRow getDefaultValue(){
        VisualEditor.DataRow defaultValue = new VisualEditor.DataRow('red', 'RED');
        return defaultValue;
    }
    global override VisualEditor.DynamicPickListRows getValues() {
        VisualEditor.DataRow value1 = new VisualEditor.DataRow('red', 'RED');
        VisualEditor.DataRow value2 = new VisualEditor.DataRow('yellow', 'YELLOW');
       VisualEditor.DynamicPickListRows  myValues = new VisualEditor.DynamicPickListRows();

        myValues.addRow(value1);
        myValues.addRow(value2);
        return myValues;
    }
}
```

Note: Although `VisualEditor.DataRow` allows you to specify any Object as its value, you can specify a datasource only for String attributes. The default implementation for `isValid()` and `getLabel()` assumes that the object passed in the parameter is a String for comparison.

For more information on the `VisualEditor.DynamicPickList` abstract class, see the Apex Developer Guide.

Add the Apex Class to Your Design File

To specify an Apex class as a datasource in an existing component, add the datasource property to the attribute with a value consisting of the Apex namespace and Apex class name.

```
<design:component>
        <design:attribute name="property1" datasource="apex://MyCustomPickList"/>
</design:component>
```

Dynamic Picklist Considerations

- Specifying the Apex datasource as public isn't respected in managed packages. If an Apex class is public and part of a managed package, it can be used as a datasource for custom components in the subscriber org.
- Profile access on the Apex class isn't respected when the Apex class is used as a datasource. If an admin's profile doesn't have access to the Apex class but does have access to the custom component, the admin sees values provided by the Apex class on the component in the Lightning App Builder.

Tips and Considerations for Configuring Components for Lightning Pages and the Lightning App Builder

Keep these guidelines in mind when creating components and component bundles for Lightning Pages and the Lightning App Builder.

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

Components

- Set a friendly name for the component using the `label` attribute in the element in the design file, such as `<design:component label="foo">`.
- Design your components to fill 100% of the width (including margins) of the region that they display in.
- Components should provide an appropriate placeholder behavior in declarative tools if they require interaction.
- A component should never display a blank box. Think of how other sites work. For example, Facebook displays an outline of the feed before the actual feed items come back from the server. This improves the user's perception of UI responsiveness.
- If the component depends on a fired event, then give it a default state that displays before the event fires.
- Style components in a manner consistent with the styling of Lightning Experience and consistent with the Salesforce Design System.

Attributes

- Use the design file to control which attributes are exposed to the Lightning App Builder.
- Make your attributes easy to use and understandable to an administrator. Don't expose SOQL queries, JSON objects, or Apex class names.
- Give your required attributes default values. When a component that has required attributes with no default values is added to the App Builder, it appears invalid, which is a poor user experience.
- Use basic supported types (string, integer, boolean) for any exposed attributes.
- Specify a min and max attribute for integer attributes in the `<design:attribute>` element to control the range of accepted values.
- String attributes can provide a datasource with a set of predefined values allowing the attribute to expose its configuration as a picklist.
- Give all attributes a label with a friendly display name.
- Provide descriptions to explain the expected data and any guidelines, such as data format or expected range of values. Description text appears as a tooltip in the Property Editor.
- To delete a design attribute for a component that implements the `flexipage:availableForAllPageTypes` or `forceCommunity:availableForAllPageTypes` interface, first remove the interface from the component before deleting the design attribute. Then reimplement the interface. If the component is referenced in a Lightning Page, you must remove the component from the page before you can change it.

Limitations

The Lightning App Builder doesn't support the Map, Object, or java:// complex types.

SEE ALSO:

Configure Components for Lightning Pages and the Lightning App Builder

Configure Components for Lightning Experience Record Pages

Use Lightning Components in Community Builder

To use a custom Lightning component in Community Builder, you must configure the component and its component bundle so that they're compatible.

IN THIS SECTION:

Configure Components for Communities
Make your custom Lightning components available for drag and drop in the Lightning Components pane in Community Builder.

Create Custom Theme Layout Components for Communities
Create a custom theme layout to transform the appearance and overall structure of the pages in the Customer Service (Napili) template.

Create Custom Search and Profile Menu Components for Communities
Create custom components to replace the Customer Service (Napili) template's standard Profile Header and Search & Post Publisher components in Community Builder.

Create Custom Content Layout Components for Communities
Community Builder includes several ready-to-use layouts that define the content regions of your page, such as a two-column layout with a 2:1 ratio. However, if you need a layout that's customized for your community, create a custom content layout component to use when building new pages in Community Builder. You can also update the content layout of the default pages that come with your community template.

Configure Components for Communities

Make your custom Lightning components available for drag and drop in the Lightning Components pane in Community Builder.

Add a New Interface to Your Component

To appear in Community Builder, a component must implement the `forceCommunity:availableForAllPageTypes` interface.

Here's the sample code for a simple "Hello World" component.

```
<aura:component implements="forceCommunity:availableForAllPageTypes" access="global">
    <aura:attribute name="greeting" type="String" default="Hello" access="global" />
    <aura:attribute name="subject" type="String" default="World" access="global" />

    <div style="box">
      <span class="greeting">{!v.greeting}</span>, {!v.subject}!
    </div>
</aura:component>
```

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

Next, add a design resource to your component bundle. A design resource describes the design-time behavior of a Lightning component—information that visual tools need to allow adding the component to a page or app. It contains attributes that are available for administrators to edit in Community Builder.

Adding this resource is similar to adding it for the Lightning App Builder. For more information, see Configure Components for Lightning Pages and the Lightning App Builder.

Important: When you add custom components to your community, they can bypass the object- and field-level security (FLS) you set for the guest user profile. Lightning components don't automatically enforce CRUD and FLS when referencing objects or retrieving the objects from an Apex controller. This means that the framework continues to display records and fields for which users don't have CRUD permissions and FLS visibility. You *must* manually enforce CRUD and FLS in your Apex controllers.

SEE ALSO:

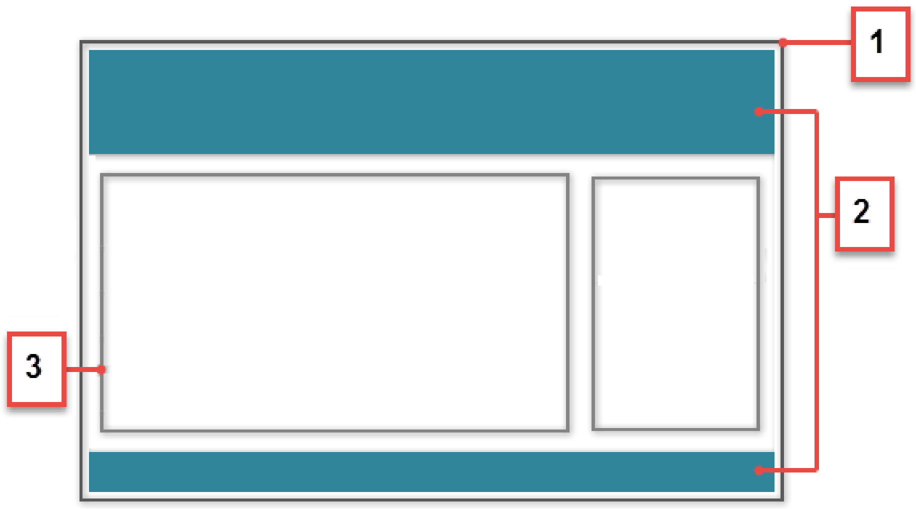
Component Bundles

Standard Design Tokens for Communities

Create Custom Theme Layout Components for Communities

Create a custom theme layout to transform the appearance and overall structure of the pages in the Customer Service (Napili) template.

A theme layout is the top-level layout for the template pages (1) in your community. It includes the common header and footer (2), and often includes navigation, search, and the user profile menu. In contrast, the content layout (3) defines the content regions of your pages, such as a two-column layout.



A theme layout type categorizes the pages in your community that share the same theme layout.

When you create a custom theme layout component in the Developer Console, it appears in Community Builder in the **Settings** > **Theme** area. Here you can assign it to new or existing theme layout types. Then you apply the theme layout type—and thereby the theme layout—in the page's properties.

1. Add an Interface to Your Theme Layout Component

A theme layout component must implement the `forceCommunity:themeLayout` interface to appear in Community Builder in the **Settings** > **Theme** area.

Explicitly declare `{!v.body}` in your code to ensure that your theme layout includes the content layout. Add `{!v.body}` wherever you want the page's contents to appear within the theme layout.

You can add components to the regions in your markup or leave regions open for users to drag-and-drop components into. Attributes declared as `Aura.Component[]` and included in your markup are rendered as open regions in the theme layout that users can add components to.

In Customer Service (Napili), the Template Header consists of these locked regions:

- `search`, which contains the Search Publisher component
- `profileMenu`, which contains the Profile Header component
- `navBar`, which contains the Navigation Menu component

To create a custom theme layout that reuses the existing components in the Template Header region, declare `search`, `profileMenu`, or `navBar` as the attribute name value, as appropriate. For example:

```
<aura:attribute name="navBar" type="Aura.Component[]" required="false" />
```

Tip: If you create a custom profile menu or a search component, declaring the attribute name value also lets users select the custom component when using your theme layout.

Here's the sample code for a simple theme layout.

```
<aura:component implements="forceCommunity:themeLayout" access="global" description="Sample
 Custom Theme Layout">
    <aura:attribute name="search" type="Aura.Component[]" required="false"/>
    <aura:attribute name="profileMenu" type="Aura.Component[]" required="false"/>
    <aura:attribute name="navBar" type="Aura.Component[]" required="false"/>
    <aura:attribute name="newHeader" type="Aura.Component[]" required="false"/>
    <div>
        <div class="searchRegion">
            {!v.search}
        </div>
        <div class="profileMenuRegion">
            {!v.profileMenu}
        </div>
        <div class="navigation">
            {!v.navBar}
        </div>
        <div class="newHeader">
            {!v.newHeader}
        </div>
        <div class="mainContentArea">
            {!v.body}
        </div>
    </div>
</aura:component>
```

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

2. Add a Design Resource to Include Theme Properties

You can expose theme layout properties in Community Builder by adding a design resource to your bundle.

This example adds two checkboxes to a theme layout called Small Header.

```
<design:component label="Small Header">
    <design:attribute name="blueBackground" label="Blue Background"/>
    <design:attribute name="smallLogo" label="Small Logo"/>
</design:component>
```

The design resource only exposes the properties. You must implement the properties in the component.

```
<aura:component implements="forceCommunity:themeLayout" access="global" description="Small
 Header">
    <aura:attribute name="blueBackground" type="Boolean" default="false"/>
    <aura:attribute name="smallLogo" type="Boolean" default="false" />
    ...
```

Design resources must be named `componentName.design`.

3. Add a CSS Resource to Avoid Overlapping Issues

Add a CSS resource to your bundle to style the theme layout as needed.

To avoid overlapping issues with positioned elements, such as dialog boxes or hovers:

- Apply CSS styles.

  ```
  .THIS {
      position: relative;
      z-index: 1;
  }
  ```

- Wrap the elements in your custom theme layout in a `div` tag.

  ```
  <div class="mainContentArea">
      {!v.body}
  </div>
  ```

Note: For custom theme layouts, SLDS is loaded by default.

CSS resources must be named `componentName.css`.

SEE ALSO:

Create Custom Search and Profile Menu Components for Communities

forceCommunity:navigationMenuBase

Salesforce Help: Custom Theme Layouts and Theme Layout Types

Create Custom Search and Profile Menu Components for Communities

Create custom components to replace the Customer Service (Napili) template's standard Profile Header and Search & Post Publisher components in Community Builder.

`forceCommunity:profileMenuInterface`

Add the `forceCommunity:profileMenuInterface` interface to a Lightning component to allow it to be used as a custom profile menu component for the Customer Service (Napili) community template. After you create a custom profile menu component, admins can select it in Community Builder in **Settings** > **Theme** to replace the template's standard Profile Header component.

Here's the sample code for a simple profile menu component.

```
<aura:component implements="forceCommunity:profileMenuInterface" access="global">
    <aura:attribute name="options" type="String[]" default="Option 1, Option 2"/>
    <ui:menu >
        <ui:menuTriggerLink aura:id="trigger" label="Profile Menu"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu">
            <aura:iteration items="{!v.options}" var="itemLabel">
                <ui:actionMenuItem label="{!itemLabel}" click="{!c.handleClick}"/>
            </aura:iteration>
        </ui:menuList>
    </ui:menu>
</aura:component>
```

`forceCommunity:searchInterface`

Add the `forceCommunity:searchInterface` interface to a Lightning component to allow it to be used as a custom search component for the Customer Service (Napili) community template. After you create a custom search component, admins can select it in Community Builder in **Settings** > **Theme** to replace the template's standard Search & Post Publisher component.

Here's the sample code for a simple search component.

```
<aura:component implements="forceCommunity:searchInterface" access="global">
    <div class="search">
        <div class="search-wrapper">
            <form class="search-form">
                <div class="search-input-wrapper">
                    <input class="search-input" type="text" placeholder="My Search"/>
                </div>
                <input type="hidden" name="language" value="en" />
            </form>
        </div>
    </div>
</aura:component>
```

SEE ALSO:

Create Custom Theme Layout Components for Communities

forceCommunity:navigationMenuBase

Salesforce Help: Custom Theme Layouts and Theme Layout Types

Create Custom Content Layout Components for Communities

Community Builder includes several ready-to-use layouts that define the content regions of your page, such as a two-column layout with a 2:1 ratio. However, if you need a layout that's customized for your community, create a custom content layout component to use when building new pages in Community Builder. You can also update the content layout of the default pages that come with your community template.

When you create a custom content layout component in the Developer Console, it appears in Community Builder in the New Page and the Change Layout dialog boxes.

1. Add a New Interface to Your Content Layout Component

To appear in the New Page and the Change Layout dialog boxes in Community Builder, a content layout component must implement the `forceCommunity:layout` interface.

Here's the sample code for a simple two-column content layout.

```
<aura:component implements="forceCommunity:layout" description="Custom Content Layout"
access="global">
   <aura:attribute name="column1" type="Aura.Component[]" required="false"></aura:attribute>

   <aura:attribute name="column2" type="Aura.Component[]" required="false"></aura:attribute>


    <div class="container">
        <div class="contentPanel">
            <div class="left">
                {!v.column1}
            </div>
            <div class="right">
                {!v.column2}
            </div>
        </div>
    </div>
</aura:component>
```

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

2. Add a CSS Resource to Your Component Bundle

Next, add a CSS resource to style the content layout as needed.

Here's the sample CSS for our simple two-column content layout.

```

.THIS .contentPanel:before,
.THIS .contentPanel:after {
    content: " ";
    display: table;
}
.THIS .contentPanel:after {
    clear: both;
}
.THIS .left {
    float: left;
    width: 50%;
}
.THIS .right {
    float: right;
    width: 50%;
}
```

CSS resources must be named *componentName*`.css`.

3. Optional: Add an SVG Resource to Your Component Bundle

You can include an SVG resource in your component bundle to define a custom icon for the content layout component when it appears in the Community Builder.

The recommended image size for a content layout component in Community Builder is 170px by 170px. However, if the image has different dimensions, Community Builder scales the image to fit.

SVG resources must be named *componentName*`.svg`.

SEE ALSO:

- Component Bundles
- Standard Design Tokens for Communities

Add Components to Apps

When you're ready to add components to your app, you should first look at the out-of-the-box components that come with the framework. You can also leverage these components by extending them or using composition to add them to custom components that you're building.

Note: For all the out-of-the-box components, see the `Components` folder at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain. The `ui` namespace includes many components that are common on Web pages.

Components are encapsulated and their internals stay private, while their public shape is visible to consumers of the component. This strong separation gives component authors freedom to change the internal implementation details and insulates component consumers from those changes.

The public shape of a component is defined by the attributes that can be set and the events that interact with the component. The shape is essentially the API for developers to interact with the component. To design a new component, think about the attributes that you want to expose and the events that the component should initiate or respond to.

Once you have defined the shape of any new components, developers can work on the components in parallel. This is a useful approach if you have a team working on an app.

To add a new custom component to your app, see Using the Developer Console on page 4.

SEE ALSO:

- Component Composition
- Using Object-Oriented Development
- Component Attributes
- Communicating with Events

Use Lightning Components in Visualforce Pages

Add Lightning components to your Visualforce pages to combine features you've built using both solutions. Implement new functionality using Lightning components and then use it with existing Visualforce pages.

Important: Lightning Components for Visualforce is based on Lightning Out, a powerful and flexible feature that lets you embed Lightning components into almost any web page. When used with Visualforce, some of the details become simpler. For example, you don't need to deal with authentication, and you don't need to configure a Connected App.

In other ways using Lightning Components for Visualforce is just like using Lightning Out. Refer to the Lightning Out section of this guide for additional details.

There are three steps to add Lightning components to a Visualforce page.

1. Add the Lightning Components for Visualforce JavaScript library to your Visualforce page using the `<apex:includeLightning/>` component.
2. Create and reference a Lightning app that declares your component dependencies.
3. Write a JavaScript function that creates the component on the page using `$Lightning.createComponent()`.

Add the Lightning Components for Visualforce JavaScript Library

Add `<apex:includeLightning/>` at the beginning of your page. This component loads the JavaScript file used by Lightning Components for Visualforce.

Create and Reference a Lightning Dependency App

To use Lightning Components for Visualforce, define component dependencies by referencing a Lightning dependency app. This app is globally accessible and extends `ltng:outApp`. The app declares dependencies on any Lightning definitions (like components) that it uses.

Here's an example of a simple app named `lcvfTest.app`. The app uses the `<aura:dependency>` tag to indicate that it uses the standard Lightning component, `ui:button`.

```
<aura:application access="GLOBAL" extends="ltng:outApp">
    <aura:dependency resource="ui:button"/>
</aura:application>
```

Note: Extending from `ltng:outApp` adds SLDS resources to the page to allow your Lightning components to be styled with the Salesforce Lightning Design System (SLDS). If you don't want SLDS resources added to the page, extend from `ltng:outAppUnstyled` instead.

To reference this app on your page, use the following JavaScript code, where *`theNamespace`* is the namespace prefix for the app. That is, either your org's namespace, or the namespace of the managed package that provides the app.

```
$Lightning.use("theNamespace:lcvfTest", function() {});
```

If the app is defined in your org (that is, not in a managed package), you can use the default "c" namespace instead, as shown in the next example. If your org doesn't have a namespace defined, you *must* use the default namespace.

For further details about creating a Lightning dependency app, see Lightning Out Dependencies.

Creating a Component on a Page

Finally, add your top-level component to a page using `$Lightning.createComponent(String type, Object attributes, String locator, function callback)`. This function is similar to `$A.createComponent()`, but includes an additional parameter, `domLocator`, which specifies the DOM element where you want the component inserted.

Let's look at a sample Visualforce page that creates a `ui:button` using the `lcvfTest.app` from the previous example.

```
<apex:page>
    <apex:includeLightning />

    <div id="lightning" />

    <script>
        $Lightning.use("c:lcvfTest", function() {
          $Lightning.createComponent("ui:button",
          { label : "Press Me!" },
          "lightning",
          function(cmp) {
            // do some stuff
          });
        });
    </script>
</apex:page>
```

This code creates a DOM element with the ID "lightning", which is then referenced in the `$Lightning.createComponent()` method. This method creates a `ui:button` that says "Press Me!", and then executes the callback function.

Important: You can call `$Lightning.use()` multiple times on a page, but all calls must reference the same Lightning dependency app.

For further details about using `$Lightning.use()` and `$Lightning.createComponent()`, see Lightning Out Markup.

SEE ALSO:

- Lightning Out Dependencies
- Add Lightning Components to Any App with Lightning Out (Beta)
- Lightning Out Markup
- Share Lightning Out Apps with Non-Authenticated Users
- Lightning Out Considerations and Limitations

Add Lightning Components to Any App with Lightning Out (Beta)

Use Lightning Out to run Lightning components apps outside of Salesforce servers. Whether it's a Node.js app running on Heroku, a department server inside the firewall, or even SharePoint, build your custom app with Force.com and run it wherever your users are.

Note: This release contains a beta version of Lightning Out, which means it's a high quality feature with known limitations. You can provide feedback and suggestions for Lightning Out on the IdeaExchange.

Developing Lightning components that you can deploy anywhere is for the most part the same as developing them to run within Salesforce. Everything you already know about Lightning components development still applies. The only real difference is in how you embed your Lightning components app in the remote web container, or *origin server*.

Lightning Out is added to external apps in the form of a JavaScript library you include in the page on the origin server, and markup you add to configure and activate your Lightning components app. Once initialized, Lightning Out pulls in your Lightning components app over a secure connection, spins it up, and inserts it into the DOM of the page it's running on. Once it reaches this point, your "normal" Lightning components code takes over and runs the show.

Note: This approach is quite different from embedding an app using an iframe. Lightning components running via Lightning Out are full citizens on the page. If you choose to, you can enable interaction between your Lightning components app and the page or app you've embedded it in. This interaction is handled using Lightning events.

In addition to some straightforward markup, there's a modest amount of setup and preparation within Salesforce to enable the secure connection between Salesforce and the origin server. And, because the origin server is hosting the app, you need to manage authentication with your own code.

This setup process is similar to what you'd do for an application that connects to Salesforce using the Force.com REST API, and you should expect it to require an equivalent amount of work.

IN THIS SECTION:

SEE ALSO:

Idea Exchange: Lightning Components Anywhere / Everywhere

Lightning Out Requirements

Deploying a Lightning components app using Lightning Out has a few modest requirements to ensure connectivity and security.

The remote web container, or *origin server*, must support the following.

- Ability to modify the markup served to the client browser, including both HTML and JavaScript. You need to be able to add the Lightning Out markup.
- Ability to acquire a valid Salesforce session ID. This will most likely require you to configure a Connected App for the origin server.

- Ability to access your Salesforce instance. For example, if the origin server is behind a firewall, it needs permission to access the Internet, at least to reach Salesforce.

Your Salesforce org must be configured to allow the following.

- The ability for the origin server to authenticate and connect. This will most likely require you to configure a Connected App for the origin server.
- The origin server must be added to the Cross-Origin Resource Sharing (CORS) whitelist.

Finally, you create a special Lightning components app that contains dependency information for the Lightning components to be hosted on the origin server. This app is only used by Lightning Out or Lightning Components for Visualforce.

Lightning Out Dependencies

Create a special Lightning dependency app to describe the component dependencies of a Lightning components app to be deployed using Lightning Out or Lightning Components for Visualforce.

When a Lightning components app is initialized using Lightning Out, Lightning Out loads the definitions for the components in the app. To do this efficiently, Lightning Out requires you to specify the component dependencies in advance, so that the definitions can be loaded once, at startup time.

The mechanism for specifying dependencies is a *Lightning dependency app*. A dependency app is simply an `<aura:application>` with a few attributes, and the dependent components described using the `<aura:dependency>` tag. A Lightning dependency app isn't one you'd ever actually deploy as an app for people to use directly. **A Lightning dependency app is used only to specify the dependencies for Lightning Out.** (Or for Lightning Components for Visualforce, which uses Lightning Out under the covers.)

A basic Lightning dependency app looks like the following.

```
<aura:application access="GLOBAL" extends="ltng:outApp">
    <aura:dependency resource="c:myAppComponent"/>
</aura:application>
```

A Lightning dependency app must do the following.

- Set access control to `GLOBAL`.
- Extend from either `ltng:outApp` or `ltng:outAppUnstyled`.
- List as a dependency every component that is referenced in a call to `$Lightning.createComponent()`.

In this example, `<c:myAppComponent>` is the top-level component for the Lightning components app you are planning to create on the origin server using `$Lightning.createComponent()`. Create a dependency for each different component you add to the page with `$Lightning.createComponent()`.

Note: Don't worry about components used within the top-level component. The Lightning Component framework handles dependency resolution for child components.

Defining a Styling Dependency

You have two options for styling your Lightning Out apps: Salesforce Lightning Design System and unstyled. Lightning Design System styling is the default, and Lightning Out automatically includes the current version of the Lightning Design System onto the page that's using Lightning Out. To omit Lightning Design System resources and take full control of your styles, perhaps to match the styling of the origin server, set your dependency app to extend from `ltng:outAppUnstyled` instead of `ltng:outApp`.

Usage Notes

A Lightning dependency app isn't a normal Lightning app, and you shouldn't treat it like one. Use it only to specify the dependencies for your Lightning Out app.

In particular, note the following.

- You can't add a template to a Lightning dependency app.
- Content you add to the body of the Lightning dependency app won't be rendered.

SEE ALSO:

Create a Connected App

Use CORS to Access Supported Salesforce APIs, Apex REST, and Lightning Out

aura:dependency

Using the Salesforce Lightning Design System in Apps

Lightning Out Markup

Lightning Out requires some simple markup on the page, and is activated using two straightforward JavaScript functions.

The markup and JavaScript functions in the Lightning Out library are the only things specific to Lightning Out. Everything else is the Lightning components code you already know and love.

Adding the Lightning Out Library to the Page

Enable an origin server for use with Lightning Out by including the Lightning Out JavaScript library in the app or page hosting your Lightning components app. Including the library requires a single line of markup.

```
<script src="https://myDomain.my.salesforce.com/lightning/lightning.out.js"></script>
```

Important: Use **your** custom domain for the host. Don't copy-and-paste someone else's instance from example source code. If you do this, your app will break whenever there's a version mismatch between your Salesforce instance and the instance from which you're loading the Lightning Out library. This happens at least three times a year, during regular upgrades of Salesforce. Don't do it!

Loading and Initializing Your Lightning Components App

Load and initialize the Lightning Component framework and your Lightning components app with the `$Lightning.use()` function.

The `$Lightning.use()` function takes four arguments.

Name	Type	Description
`appName`	string	Required. The name of your Lightning dependency app, including the namespace. For example, `"c:expenseAppDependencies"`.
`callback`	function	A function to call once the Lightning Component framework and your app have fully loaded. The callback receives no arguments. This callback is usually where you call `$Lightning.createComponent()` to add your app to the page

Name	Type	Description
		(see the next section). You might also update your display in other ways, or otherwise respond to your Lightning components app being ready.
`lightningEndPointURI`	string	The URL for the Lightning domain on your Salesforce instance. For example, "https://*myDomain*.lightning.force.com".
`authToken`	string	The session ID or OAuth access token for a valid, active Salesforce session. Note: You must obtain this token in your own code. Lightning Out doesn't handle authentication for you. See Authentication from Lightning Out.

`appName` is required. The other three parameters are optional. In normal use you provide all four parameters.

Note: You can't use more than one Lightning dependency app on a page. You can call `$Lightning.use()` more than once, but you must reference the same dependency app in every call.

Adding Your Lightning Components to the Page

Add to and activate your Lightning components on the page with the `$Lightning.createComponent()` function.

The `$Lightning.createComponent()` function takes four arguments.

Name	Type	Description
`componentName`	string	Required. The name of the Lightning component to add to the page, including the namespace. For example, `"c:newExpenseForm"`.
`attributes`	Object	Required. The attributes to set on the component when it's created. For example, `{ name: theName, amount: theAmount }`. If the component doesn't require any attributes, pass in an empty object, `{ }`.
`domLocator`	Element or string	Required. The DOM element or element ID that indicates where on the page to insert the created component.
`callback`	function	A function to call once the component is added to and active on the page. The callback receives the component created as its only argument.

Note: You can add more than one Lightning component to a page. That is, you can call `$Lightning.createComponent()` multiple times, with multiple DOM locators, to add components to different parts of the page. Each component created this way must be specified in the page's Lightning dependency app.

Behind the scenes `$Lightning.createComponent()` calls the standard `$A.createComponent()` function. Except for the DOM locator, the arguments are the same. And except for wrapping the call in some Lightning Out semantics, the behavior is the same, too.

SEE ALSO:

Dynamically Creating Components

Authentication from Lightning Out

Lightning Out doesn't handle authentication. Instead, you manually provide a Salesforce session ID or authentication token when you initialize a Lightning Out app.

There are two supported ways to obtain an authentication token for use with Lightning Out.

- On a Visualforce page, using Lightning Components for Visualforce, you can obtain the current Visualforce session ID using the expression `{! $Api.Session_ID }`. This session is intended for use only on Visualforce pages.
- Elsewhere, an authenticated session is obtained using OAuth, following the same process you'd use to obtain an authenticated session to use with the Force.com REST API. In this case, you obtain an OAuth token, and can use it anywhere.

The key thing to understand is that Lightning Out isn't in the business of authentication. The `$Lightning.use()` function simply passes along to the security subsystem whatever authentication token you provide it. For most organizations, this will be a session ID or an OAuth token.

Share Lightning Out Apps with Non-Authenticated Users

Add the `ltng:allowGuestAccess` interface to your Lightning Out dependency app to make it available to users without requiring them to authenticate with Salesforce. This interface lets you build your app with Lightning components, and deploy it anywhere and to anyone.

A Lightning Out dependency app with the `ltng:allowGuestAccess` interface can be used with Lightning Components for Visualforce and with Lightning Out.

- Using Lightning Components for Visualforce, you can add your Lightning app to a Visualforce page, and then use that page in Salesforce Tabs + Visualforce communities. Then you can allow public access to that page.
- Using Lightning Out, you can deploy your Lightning app anywhere Lightning Out is supported—which is almost anywhere!

The `ltng:allowGuestAccess` interface is only usable in orgs that have Communities enabled, and your Lightning Out app is associated with all community endpoints that you've defined in your org.

Important: When you make a Lightning app accessible to guest users by adding the `ltng:allowGuestAccess` interface, it's available through **every** community in your org, whether that community is enabled for public access or not. You can't prevent it from being accessible via community URLs, and you can't make it available for some communities but not others.

Warning: Be extremely careful about apps you open for guest access. Apps enabled for guest access bypass the object- and field-level security (FLS) you set for your community's guest user profile. Lightning components don't automatically enforce CRUD and FLS when you reference objects or retrieve the objects from an Apex controller. This means that the framework continues to display records and fields for which users don't have CRUD access and FLS visibility. You must manually enforce CRUD and FLS in your Apex controllers. A mistake in code used in an app enabled for guest access can open your org's data to the world.

Lightning Out Lightning Components for Visualforce

Usage

To begin with, add the `ltng:allowGuestAccess` interface to your Lightning Out dependency app. For example:

```
<aura:application access="GLOBAL" extends="ltng:outApp"
    implements="ltng:allowGuestAccess">

    <aura:dependency resource="c:storeLocatorMain"/>

</aura:application>
```

Note: You can only add the `ltng:allowGuestAccess` interface to Lightning apps, not to individual components.

Next, add the Lightning Out JavaScript library to your page.

- With Lightning Components for Visualforce, simply add the `<apex:includeLightning />` tag anywhere on your page.
- With Lightning Out, add a `<script>` tag that references the library directly, using a community endpoint URL. For example:

  ```
  <script
  src="https://yourCommunityDomain/communityURL/lightning/lightning.out.js"></script>
  ```

  For example, `https://universalcontainers.force.com/ourstores/lightning/lightning.out.js`

Finally, add the JavaScript code to load and activate your Lightning app. This code is standard Lightning Out, with the important addition that you must use one of your org's community URLs for the endpoint. The endpoint URL takes the form `https://`*`yourCommunityDomain`*`/`*`communityURL`*`/`. The relevant line is emphasized in the following sample.

```
<script>
    $Lightning.use("c:locatorApp",     // name of the Lightning app
        function() {                   // Callback once framework and app loaded
            $Lightning.createComponent(
                "c:storeLocatorMain", // top-level component of your app
                { },                   // attributes to set on the component when created
                "lightningLocator",    // the DOM location to insert the component
                function(cmp) {
                    // callback when component is created and active on the page
                }
            );
        },
        'https://universalcontainers.force.com/ourstores/'  // Community endpoint
    );
</script>
```

SEE ALSO:

Salesforce Help: Create Communities

Use Lightning Components in Visualforce Pages

Lightning Out Considerations and Limitations

Creating an app using Lightning Out is, for the most part, much like creating any app with Lightning components. However, because your components are running "outside" of Salesforce, there are a few issues you want to be aware of. And it's possible there are changes you might need to make to your components or your app.

The issues you should be aware of can be divided into two categories.

Considerations for Using Lightning Out

Because Lightning Out apps run outside of any Salesforce container, there are things you need to keep in mind, and possibly address.

The most obvious issue is authentication. There's no Salesforce container to handle authentication for you, so you have to handle it yourself. This essential topic is discussed in detail in "Authentication from Lightning Out."

Another important consideration is more subtle. Many important actions your apps support are accomplished by firing various Lightning events. But events are sort of like that tree that falls in the forest. If no one's listening, does it have an effect? In the case of many core

Lightning events, the "listener" is the `one.app` container. And if `one.app` isn't there to handle the events, they indeed have no effect. Firing those events silently fails.

Standard events are listed in "Event Reference." Events not supported for use in Lightning Out include the following note:

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Limitations During the Lightning Out Beta

While the core Lightning Out functionality is stable and complete, there are a few interactions with other Salesforce features that we're still working on.

Chief among these is the standard components built into the Lightning Component framework. At this time, a number of the standard components don't behave correctly when used in a stand-alone context, such as Lightning Out, and Lightning Components for Visualforce, which is based on Lightning Out. This is because the components implicitly depend on resources available in the `one.app` container, instead of explicitly defining their dependencies.

Avoid this issue with your components by making their dependencies explicit. Use `ltng:require` to reference all required JavaScript and CSS resources that aren't embedded in the component itself.

If you're using standard components in your apps, they might not be fully styled, or behave as documented, when they're used in Lightning Out or Lightning Components for Visualforce.

SEE ALSO:

Authentication from Lightning Out

System Event Reference

Use Lightning Components in Visualforce Pages

CHAPTER 5 Communicating with Events

In this chapter ...

The framework uses event-driven programming. You write handlers that respond to interface events as they occur. The events may or may not have been triggered by user interaction.

In the Lightning Component framework, events are fired from JavaScript controller actions. Events can contain attributes that can be set before the event is fired and read when the event is handled.

Events are declared by the `aura:event` tag in a `.evt` resource, and they can have one of two types: component or application.

Component Events

A component event is fired from an instance of a component. A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

Application Events

Application events follow a traditional publish-subscribe model. An application event is fired from an instance of a component. All components that provide a handler for the event are notified.

Note: Always try to use a component event instead of an application event, if possible. Component events can only be handled by components above them in the containment hierarchy so their usage is more localized to the components that need to know about them. Application events are best used for something that should be handled at the application level, such as navigating to a specific record. Application events allow communication between components that are in separate parts of the application and have no direct containment relationship.

Actions and Events

The framework uses events to communicate data between components. Events are usually triggered by a user action.

Actions

User interaction with an element on a component or app. User actions trigger events, but events aren't always explicitly triggered by user actions. This type of action is *not* the same as a client-side JavaScript controller, which is sometimes known as a *controller action*. The following button is wired up to a browser `onclick` event in response to a button click.

```
<ui:button label = "Click Me" press = "{!c.handleClick}" />
```

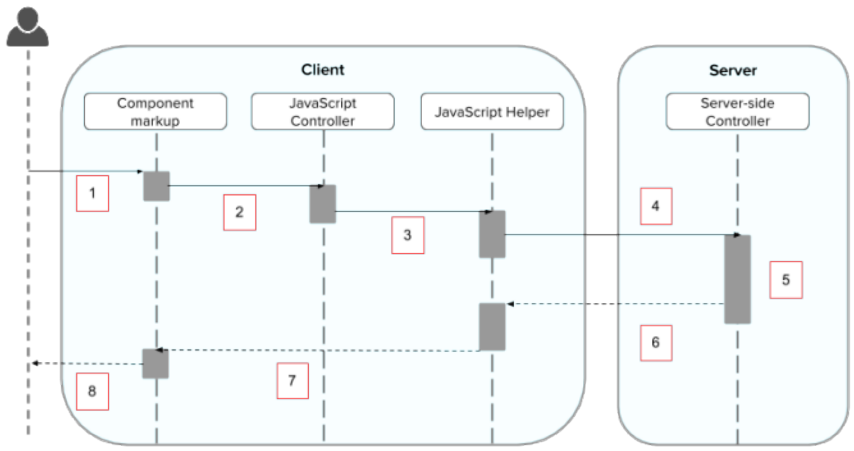
Clicking the button invokes the `handeClick` method in the component's client-side controller.

Events

A notification by the browser regarding an action. Browser events are handled by client-side JavaScript controllers, as shown in the previous example. A browser event is not the same as a framework *component event* or *application event*, which you can create and fire in a JavaScript controller to communicate data between components. For example, you can wire up the click event of a checkbox to a client-side controller, which fires a component event to communicate relevant data to a parent component.

Another type of event, known as a *system event*, is fired automatically by the framework during its lifecycle, such as during component initialization, change of an attribute value, and rendering. Components can handle a system event by registering the event in the component markup.

The following diagram describes what happens when a user clicks a button that requires the component to retrieve data from the server.



1. User clicks a button or interacts with a component, triggering a browser event. For example, you want to save data from the server when the button is clicked.
2. The button click invokes a client-side JavaScript controller, which provides some custom logic before invoking a helper function.
3. The JavaScript controller invokes a helper function. A helper function improves code reuse but it's optional for this example.
4. The helper function calls an Apex controller method and queues the action.
5. The Apex method is invoked and data is returned.
6. A JavaScript callback function is invoked when the Apex method completes.
7. The JavaScript callback function evaluates logic and updates the component's UI.

8. User sees the updated component.

SEE ALSO:

Handling Events with Client-Side Controllers

Detecting Data Changes with Change Handlers

Calling a Server-Side Action

Events Fired During the Rendering Lifecycle

Handling Events with Client-Side Controllers

A client-side controller handles events within a component. It's a JavaScript resource that defines the functions for all of the component's actions.

Client-side controllers are surrounded by brackets and curly braces to denote a JSON object containing a map of name-value pairs.

```
({
    myAction : function(cmp, event, helper) {
        // add code for the action
    }
})
```

Each action function takes in three parameters:

1. `cmp`—The component to which the controller belongs.
2. `event`—The event that the action is handling.
3. `helper`—The component's helper, which is optional. A helper contains functions that can be reused by any JavaScript code in the component bundle.

Creating a Client-Side Controller

A client-side controller is part of the component bundle. It is auto-wired via the naming convention, *`componentName`*`Controller.js`.

To create a client-side controller using the Developer Console, click **CONTROLLER** in the sidebar of the component.

Calling Client-Side Controller Actions

The following example component creates two buttons to contrast an HTML button with a `<ui:button>`, which is a standard Lightning component. Clicking on these buttons updates the `text` component attribute with the specified values. `target.get("v.label")` refers to the `label` attribute value on the button.

Component source

```
<aura:component>
    <aura:attribute name="text" type="String" default="Just a string. Waiting for change."/>

     <input type="button" value="Flawed HTML Button"
         onclick="alert('this will not work')"/>
     <br/>
     <ui:button label="Framework Button" press="{!c.handleClick}"/>
    <br/>
    {!v.text}
</aura:component>
```

If you know some JavaScript, you might be tempted to write something like the first "Flawed" button because you know that HTML tags are first-class citizens in the framework. However, the "Flawed" button won't work because arbitrary JavaScript, such as the `alert()` call, in the component is ignored.

The framework has its own event system. DOM events are mapped to Lightning events, since HTML tags are mapped to Lightning components.

Any browser DOM element event starting with `on`, such as `onclick` or `onkeypress`, can be wired to a controller action. You can only wire browser events to controller actions.

The "Framework" button wires the `press` attribute in the `<ui:button>` component to the `handleClick` action in the controller.

Client-side controller source

```
({
    handleClick : function(cmp, event) {
        var attributeValue = cmp.get("v.text");
        console.log("current text: " + attributeValue);

        var target = event.getSource();
        cmp.set("v.text", target.get("v.label"));
    }
})
```

The `handleClick` action uses `event.getSource()` to get the source component that fired this component event. In this case, the source component is the `<ui:button>` in the markup.

The code then sets the value of the `text` component attribute to the value of the button's `label` attribute. The `text` component attribute is defined in the `<aura:attribute>` tag in the markup.

Handling Framework Events

Handle framework events using actions in client-side component controllers. Framework events for common mouse and keyboard interactions are available with out-of-the-box components.

Tip: Use unique names for client-side and server-side actions in a component. A JavaScript function (client-side action) with the same name as a server-side action (Apex method) can lead to hard-to-debug issues.

Accessing Component Attributes

In the `handleClick` function, notice that the first argument to every action is the component to which the controller belongs. One of the most common things you'll want to do with this component is look at and change its attribute values.

`cmp.get("v.`***`attributeName`***`")` returns the value of the ***`attributeName`*** attribute.

`cmp.set("v.`***`attributeName`***`", "attribute value")` sets the value of the ***`attributeName`*** attribute.

Invoking Another Action in the Controller

To call an action method from another method, put the common code in a helper function and invoke it using `helper.someFunction(cmp)`.

SEE ALSO:

Sharing JavaScript Code in a Component Bundle

Event Handling Lifecycle

Creating Server-Side Logic with Controllers

Component Events

A component event is fired from an instance of a component. A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

IN THIS SECTION:

Component Event Propagation

The framework supports *capture* and *bubble* phases for the propagation of component events. These phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers.

Create Custom Component Events

Create a custom component event using the `<aura:event>` tag in a `.evt` resource. Events can contain attributes that can be set before the event is fired and read when the event is handled.

Fire Component Events

Fire a component event to communicate data to another component. A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

Handling Component Events

A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

SEE ALSO:

aura:method

Application Events

Handling Events with Client-Side Controllers

Advanced Events Example

What is Inherited?

Component Event Propagation

The framework supports *capture* and *bubble* phases for the propagation of component events. These phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers.

The component that fires an event is known as the source component. The framework allows you to handle the event in different phases. These phases give you flexibility for how to best process the event for your application.

The phases are:

Capture

The event is captured and trickles down from the application root to the source component. The event can be handled by a component in the containment hierarchy that receives the captured event.

Event handlers are invoked in order from the application root down to the source component that fired the event.

Any registered handler in this phase can stop the event from propagating, at which point no more handlers are called in this phase or the bubble phase.

Bubble

The component that fired the event can handle it. The event then bubbles up from the source component to the application root. The event can be handled by a component in the containment hierarchy that receives the bubbled event.

Event handlers are invoked in order from the source component that fired the event up to the application root.

Any registered handler in this phase can stop the event from propagating, at which point no more handlers are called in this phase.

Here's the sequence of component event propagation.

1. **Event fired**—A component event is fired.
2. **Capture phase**—The framework executes the capture phase from the application root to the source component until all components are traversed. Any handling event can stop propagation by calling `stopPropagation()` on the event.
3. **Bubble phase**—The framework executes the bubble phase from the source component to the application root until all components are traversed or `stopPropagation()` is called.

Note: Application events have a separate default phase. There's no separate default phase for component events. The default phase is the bubble phase.

Create Custom Component Events

Create a custom component event using the `<aura:event>` tag in a `.evt` resource. Events can contain attributes that can be set before the event is fired and read when the event is handled.

Use `type="COMPONENT"` in the `<aura:event>` tag for a component event. For example, this `c:compEvent` component event has one attribute with a name of `message`.

```
<!--c:compEvent-->
<aura:event type="COMPONENT">
    <!-- Add aura:attribute tags to define event shape.
         One sample attribute here. -->
    <aura:attribute name="message" type="String"/>
</aura:event>
```

The component that fires an event can set the event's data. To set the attribute values, call `event.setParam()` or `event.setParams()`. A parameter name set in the event must match the `name` attribute of an `<aura:attribute>` in the event. For example, if you fire `c:compEvent`, you could use:

```
event.setParam("message", "event message here");
```

The component that handles an event can retrieve the event data. To retrieve the attribute value in this event, call `event.getParam("message")` in the handler's client-side controller.

Fire Component Events

Fire a component event to communicate data to another component. A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

Register an Event

A component registers that it may fire an event by using `<aura:registerEvent>` in its markup. For example:

```
<aura:registerEvent name="sampleComponentEvent" type="c:compEvent"/>
```

We'll see how the value of the `name` attribute is used for firing and handling events.

Fire an Event

To get a reference to a component event in JavaScript, use `getEvent("evtName")` where `evtName` matches the `name` attribute in `<aura:registerEvent>`.

Use `fire()` to fire the event from an instance of a component. For example, in an action function in a client-side controller:

```
var compEvent = cmp.getEvent("sampleComponentEvent");
// Optional: set some data for the event (also known as event shape)
// A parameter’s name must match the name attribute
// of one of the event’s <aura:attribute> tags
// compEvent.setParams({"myParam" : myValue });
compEvent.fire();
```

Handling Component Events

A component event can be handled by the component that fired the event or by a component in the containment hierarchy that receives the event.

Use `<aura:handler>` in the markup of the handler component. For example:

```
<aura:handler name="sampleComponentEvent" event="c:compEvent"
    action="{!c.handleComponentEvent}"/>
```

The `name` attribute in `<aura:handler>` must match the `name` attribute in the `<aura:registerEvent>` tag in the component that fires the event.

The `action` attribute of `<aura:handler>` sets the client-side controller action to handle the event.

The `event` attribute specifies the event being handled. The format is ***`namespace:eventName`***.

In this example, when the event is fired, the `handleComponentEvent` client-side controller action is called.

Event Handling Phases

Component event handlers are associated with the bubble phase by default. To add a handler for the capture phase instead, use the `phase` attribute.

```
<aura:handler name="sampleComponentEvent" event="ns:eventName"
    action="{!c.handleComponentEvent}" phase="capture" />
```

Get the Source of an Event

In the client-side controller action for an `<aura:handler>` tag, use `evt.getSource()` to find out which component fired the event, where `evt` is a reference to the event. To retrieve the source element, use `evt.getSource().getElement()`.

IN THIS SECTION:

Component Handling Its Own Event

A component can handle its own event by using the `<aura:handler>` tag in its markup.

Handling Bubbled or Captured Component Events

Event propagation rules determine which components in the containment hierarchy can handle events by default in the bubble or capture phases. Learn about the rules and how to handle events in the bubble or capture phases.

Handling Component Events Dynamically

A component can have its handler bound dynamically via JavaScript. This is useful if a component is created in JavaScript on the client-side.

SEE ALSO:

Component Event Propagation

Component Handling Its Own Event

A component can handle its own event by using the `<aura:handler>` tag in its markup.

The `action` attribute of `<aura:handler>` sets the client-side controller action to handle the event. For example:

```
<aura:registerEvent name="sampleComponentEvent" type="c:compEvent"/>
<aura:handler name="sampleComponentEvent" event="c:compEvent"
    action="{!c.handleSampleEvent}"/>
```

Note: The `name` attributes in `<aura:registerEvent>` and `<aura:handler>` must match, since each event is defined by its name.

Handling Bubbled or Captured Component Events

Event propagation rules determine which components in the containment hierarchy can handle events by default in the bubble or capture phases. Learn about the rules and how to handle events in the bubble or capture phases.

The framework supports *capture* and *bubble* phases for the propagation of component events. These phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers. The capture phase executes before the bubble phase.

Default Event Propagation Rules

By default, every parent in the containment hierarchy can't handle an event during the capture and bubble phases. Instead, the event propagates to every owner in the containment hierarchy.

A component's owner is the component that is responsible for its creation. For declaratively created components, the owner is the outermost component containing the markup that references the component firing the event. For programmatically created components, the owner component is the component that invoked `$A.createComponent` to create it.

The same rules apply for the capture phase, although the direction of event propagation (down) is the opposite of the bubble phase (up).

Confused? It makes more sense when you look at an example in the bubbling phase.

`c:owner` contains `c:container`, which in turn contains `c:eventSource`.

```
<!--c:owner-->
<aura:component>
    <c:container>
        <c:eventSource />
    </c:container>
</aura:component>
```

If `c:eventSource` fires an event, it can handle the event itself. The event then bubbles up the containment hierarchy.

`c:container` contains `c:eventSource` but it's not the owner because it's not the outermost component in the markup, so it can't handle the bubbled event.

`c:owner` is the owner because `c:container` is in its markup. `c:owner` can handle the event.

Propagation to All Container Components

The default behavior doesn't allow an event to be handled by every parent in the containment hierarchy. Some components contain other components but aren't the owner of those components. These components are known as container components. In the example, `c:container` is a container component because it's not the owner for `c:eventSource`. By default, `c:container` can't handle events fired by `c:eventSource`.

A container component has a facet attribute whose type is `Aura.Component[]`, such as the default `body` attribute. The container component includes those components in its definition using an expression, such as `{!v.body}`. The container component isn't the owner of the components rendered with that expression.

To allow a container component to handle the event, add `includeFacets="true"` to the `<aura:handler>` tag of the container component. For example, adding `includeFacets="true"` to the handler in the container component, `c:container`, enables it to handle the component event bubbled from `c:eventSource`.

```
<aura:handler name="bubblingEvent" event="c:compEvent" action="{!c.handleBubbling}"
    includeFacets="true" />
```

Handle Bubbled Event

A component that fires a component event registers that it fires the event by using the `<aura:registerEvent>` tag.

```
<aura:component>
    <aura:registerEvent name="compEvent" type="c:compEvent" />
</aura:component>
```

A component handling the event in the bubble phase uses the `<aura:handler>` tag to assign a handling action in its client-side controller.

```
<aura:component>
    <aura:handler name="compEvent" event="c:compEvent" action="{!c.handleBubbling}"/>
</aura:component>
```

Note: The `name` attribute in `<aura:handler>` must match the `name` attribute in the `<aura:registerEvent>` tag in the component that fires the event.

Handle Captured Event

A component handling the event in the capture phase uses the `<aura:handler>` tag to assign a handling action in its client-side controller.

```
<aura:component>
    <aura:handler name="compEvent" event="c:compEvent" action="{!c.handleCapture}"
        phase="capture" />
</aura:component>
```

The default handling phase for component events is bubble if no `phase` attribute is set.

Stop Event Propagation

Use the `stopPropagation()` method in the `Event` object to stop the event propagating to other components.

Pausing Event Propagation for Asynchronous Code Execution

Use `event.pause()` to pause event handling and propagation until `event.resume()` is called. This flow-control mechanism is useful for any decision that depends on the response from the execution of asynchronous code. For example, you might make a decision about event propagation based on the response from an asynchronous call to native mobile code.

You can call `pause()` or `resume()` in the capture or bubble phases.

Event Bubbling Example

Let's look at an example so you can play around with it yourself.

```
<!--c:eventBubblingParent-->
<aura:component>
    <c:eventBubblingChild>
        <c:eventBubblingGrandchild />
    </c:eventBubblingChild>
</aura:component>
```

Note: This sample code uses the default `c` namespace. If your org has a namespace, use that namespace instead.

First, we define a simple component event.

```
<!--c:compEvent-->
<aura:event type="COMPONENT">
    <!--simple event with no attributes-->
</aura:event>
```

`c:eventBubblingEmitter` is the component that fires `c:compEvent`.

```
<!--c:eventBubblingEmitter-->
<aura:component>
    <aura:registerEvent name="bubblingEvent" type="c:compEvent" />
    <ui:button press="{!c.fireEvent}" label="Start Bubbling"/>
</aura:component>
```

Here's the controller for `c:eventBubblingEmitter`. When you press the button, it fires the `bubblingEvent` event registered in the markup.

```
/*eventBubblingEmitterController.js*/
{
    fireEvent : function(cmp) {
        var cmpEvent = cmp.getEvent("bubblingEvent");
        cmpEvent.fire();
    }
}
```

`c:eventBubblingGrandchild` contains `c:eventBubblingEmitter` and uses `<aura:handler>` to assign a handler for the event.

```
<!--c:eventBubblingGrandchild-->
<aura:component>
    <aura:handler name="bubblingEvent" event="c:compEvent" action="{!c.handleBubbling}"/>


    <div class="grandchild">
        <c:eventBubblingEmitter />
    </div>
</aura:component>
```

Here's the controller for `c:eventBubblingGrandchild`.

```
/*eventBubblingGrandchildController.js*/
{
    handleBubbling : function(component, event) {
        console.log("Grandchild handler for " + event.getName());
    }
}
```

The controller logs the event name when the handler is called.

Here's the markup for `c:eventBubblingChild`. We will pass `c:eventBubblingGrandchild` in as the body of `c:eventBubblingChild` when we create `c:eventBubblingParent` later in this example.

```
<!--c:eventBubblingChild-->
<aura:component>
    <aura:handler name="bubblingEvent" event="c:compEvent" action="{!c.handleBubbling}"/>


    <div class="child">
        {!v.body}
    </div>
</aura:component>
```

Here's the controller for `c:eventBubblingChild`.

```
/*eventBubblingChildController.js*/
{
    handleBubbling : function(component, event) {
        console.log("Child handler for " + event.getName());
    }
}
```

`c:eventBubblingParent` contains `c:eventBubblingChild`, which in turn contains `c:eventBubblingGrandchild`.

```
<!--c:eventBubblingParent-->
<aura:component>
    <aura:handler name="bubblingEvent" event="c:compEvent" action="{!c.handleBubbling}"/>


    <div class="parent">
        <c:eventBubblingChild>
            <c:eventBubblingGrandchild />
        </c:eventBubblingChild>
    </div>
</aura:component>
```

Here's the controller for `c:eventBubblingParent`.

```
/*eventBubblingParentController.js*/
{
    handleBubbling : function(component, event) {
        console.log("Parent handler for " + event.getName());
    }
}
```

Now, let's see what happens when you run the code.

1. In your browser, navigate to `c:eventBubblingParent`. Create a `.app` resource that contains `<c:eventBubblingParent />`.
2. Click the **Start Bubbling** button that is part of the markup in `c:eventBubblingEmitter`.
3. Note the output in your browser's console:

   ```
   Grandchild handler for bubblingEvent
   Parent handler for bubblingEvent
   ```

The `c:compEvent` event is bubbled to `c:eventBubblingGrandchild` and `c:eventBubblingParent` as they are owners in the containment hierarchy. The event is not handled by `c:eventBubblingChild` as `c:eventBubblingChild` is in the markup for `c:eventBubblingParent` but it's not an owner as it's not the outermost component in that markup.

Now, let's see how to stop event propagation. Edit the controller for `c:eventBubblingGrandchild` to stop propagation.

```
/*eventBubblingGrandchildController.js*/
{
    handleBubbling : function(component, event) {
        console.log("Grandchild handler for " + event.getName());
        event.stopPropagation();
    }
}
```

Now, navigate to `c:eventBubblingParent` and click the **Start Bubbling** button.

Note the output in your browser's console:

```
Grandchild handler for bubblingEvent
```

The event no longer bubbles up to the `c:eventBubblingParent` component.

SEE ALSO:

Component Event Propagation

Handling Component Events Dynamically

A component can have its handler bound dynamically via JavaScript. This is useful if a component is created in JavaScript on the client-side.

For more information, see Dynamically Adding Event Handlers on page 243.

Component Event Example

Here's a simple use case of using a component event to update an attribute in another component.

1. A user clicks a button in the notifier component, `ceNotifier.cmp`.
2. The client-side controller for `ceNotifier.cmp` sets a message in a component event and fires the event.
3. The handler component, `ceHandler.cmp`, contains the notifier component, and handles the fired event.
4. The client-side controller for `ceHandler.cmp` sets an attribute in `ceHandler.cmp` based on the data sent in the event.

Note: The event and components in this example use the default `c` namespace. If your org has a namespace, use that namespace instead.

Component Event

The `ceEvent.evt` component event has one attribute. We'll use this attribute to pass some data in the event when it's fired.

```
<!--c:ceEvent-->
<aura:event type="COMPONENT">
    <aura:attribute name="message" type="String"/>
</aura:event>
```

Notifier Component

The `c:ceNotifier` component uses `aura:registerEvent` to declare that it may fire the component event.

The button in the component contains a `press` browser event that is wired to the `fireComponentEvent` action in the client-side controller. The action is invoked when you click the button.

```
<!--c:ceNotifier-->
<aura:component>
    <aura:registerEvent name="cmpEvent" type="c:ceEvent"/>

    <h1>Simple Component Event Sample</h1>
    <p><ui:button
        label="Click here to fire a component event"
        press="{!c.fireComponentEvent}" />
    </p>
</aura:component>
```

The client-side controller gets an instance of the event by calling `cmp.getEvent("cmpEvent")`, where `cmpEvent` matches the value of the name attribute in the `<aura:registerEvent>` tag in the component markup. The controller sets the `message` attribute of the event and fires the event.

```
/* ceNotifierController.js */
{
    fireComponentEvent : function(cmp, event) {
        // Get the component event by using the
        // name value from aura:registerEvent
        var cmpEvent = cmp.getEvent("cmpEvent");
        cmpEvent.setParams({
            "message" : "A component event fired me. " +
            "It all happened so fast. Now, I'm here!" });
        cmpEvent.fire();
    }
}
```

Handler Component

The `c:ceHandler` handler component contains the `c:ceNotifier` component. The `<aura:handler>` tag uses the same value of the `name` attribute, `cmpEvent`, from the `<aura:registerEvent>` tag in `c:ceNotifier`. This wires up `c:ceHandler` to handle the event bubbled up from `c:ceNotifier`.

When the event is fired, the `handleComponentEvent` action in the client-side controller of the handler component is invoked.

```
<!--c:ceHandler-->
<aura:component>
    <aura:attribute name="messageFromEvent" type="String"/>
    <aura:attribute name="numEvents" type="Integer" default="0"/>

    <!-- Note that name="cmpEvent" in aura:registerEvent
     in ceNotifier.cmp -->
    <aura:handler name="cmpEvent" event="c:ceEvent" action="{!c.handleComponentEvent}"/>

    <!-- handler contains the notifier component -->
    <c:ceNotifier />

    <p>{!v.messageFromEvent}</p>
    <p>Number of events: {!v.numEvents}</p>

</aura:component>
```

The controller retrieves the data sent in the event and uses it to update the `messageFromEvent` attribute in the handler component.

```
/* ceHandlerController.js */
{
    handleComponentEvent : function(cmp, event) {
        var message = event.getParam("message");

        // set the handler attributes based on event data
        cmp.set("v.messageFromEvent", message);
        var numEventsHandled = parseInt(cmp.get("v.numEvents")) + 1;
        cmp.set("v.numEvents", numEventsHandled);
    }
}
```

Put It All Together

Add the `c:ceHandler` component to a `c:ceHandlerApp` application. Navigate to the application and click the button to fire the component event.

`https://<myDomain>.lightning.force.com/c/ceHandlerApp.app`, where `<myDomain>` is the name of your custom Salesforce domain.

If you want to access data on the server, you could extend this example to call a server-side controller from the handler's client-side controller.

SEE ALSO:

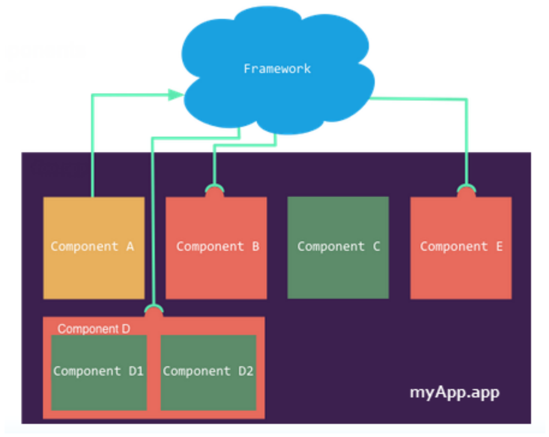
Component Events

Creating Server-Side Logic with Controllers

Application Event Example

Application Events

Application events follow a traditional publish-subscribe model. An application event is fired from an instance of a component. All components that provide a handler for the event are notified.



IN THIS SECTION:

Application Event Propagation

The framework supports *capture*, *bubble*, and *default* phases for the propagation of application events. The capture and bubble phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers. The default phase preserves the framework's original handling behavior.

Create Custom Application Events

Create a custom application event using the `<aura:event>` tag in a `.evt` resource. Events can contain attributes that can be set before the event is fired and read when the event is handled.

Fire Application Events

Application events follow a traditional publish-subscribe model. An application event is fired from an instance of a component. All components that provide a handler for the event are notified.

Handling Application Events
Use `<aura:handler>` in the markup of the handler component.

SEE ALSO:

Component Events

Handling Events with Client-Side Controllers

Application Event Propagation

Advanced Events Example

Application Event Propagation

The framework supports *capture*, *bubble*, and *default* phases for the propagation of application events. The capture and bubble phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers. The default phase preserves the framework's original handling behavior.

The component that fires an event is known as the source component. The framework allows you to handle the event in different phases. These phases give you flexibility for how to best process the event for your application.

The phases are:

Capture

The event is captured and trickles down from the application root to the source component. The event can be handled by a component in the containment hierarchy that receives the captured event.

Event handlers are invoked in order from the application root down to the source component that fired the event.

Any registered handler in this phase can stop the event from propagating, at which point no more handlers are called in this phase or the bubble phase. If a component stops the event propagation using `event.stopPropagation()`, the component becomes the root node used in the default phase.

Any registered handler in this phase can cancel the default behavior of the event by calling `event.preventDefault()`. This call prevents execution of any of the handlers in the default phase.

Bubble

The component that fired the event can handle it. The event then bubbles up from the source component to the application root. The event can be handled by a component in the containment hierarchy that receives the bubbled event.

Event handlers are invoked in order from the source component that fired the event up to the application root.

Any registered handler in this phase can stop the event from propagating, at which point no more handlers will be called in this phase. If a component stops the event propagation using `event.stopPropagation()`, the component becomes the root node used in the default phase.

Any registered handler in this phase can cancel the default behavior of the event by calling `event.preventDefault()`. This call prevents execution of any of the handlers in the default phase.

Default

Event handlers are invoked in a non-deterministic order from the root node through its subtree. The default phase doesn't have the same propagation rules related to component hierarchy as the capture and bubble phases. The default phase can be useful for handling application events that affect components in different sub-trees of your app.

If the event's propagation wasn't stopped in a previous phase, the root node defaults to the application root. If the event's propagation was stopped in a previous phase, the root node is set to the component whose handler invoked `event.stopPropagation()`.

Here is the sequence of application event propagation.

1. **Event fired**—An application event is fired. The component that fires the event is known as the source component.

2. **Capture phase**—The framework executes the capture phase from the application root to the source component until all components are traversed. Any handling event can stop propagation by calling `stopPropagation()` on the event.
3. **Bubble phase**—The framework executes the bubble phase from the source component to the application root until all components are traversed or `stopPropagation()` is called.
4. **Default phase**—The framework executes the default phase from the root node unless `preventDefault()` was called in the capture or bubble phases. If the event's propagation wasn't stopped in a previous phase, the root node defaults to the application root. If the event's propagation was stopped in a previous phase, the root node is set to the component whose handler invoked `event.stopPropagation()`.

Create Custom Application Events

Create a custom application event using the `<aura:event>` tag in a `.evt` resource. Events can contain attributes that can be set before the event is fired and read when the event is handled.

Use `type="APPLICATION"` in the `<aura:event>` tag for an application event. For example, this `c:appEvent` application event has one attribute with a name of `message`.

```
<!--c:appEvent-->
<aura:event type="APPLICATION">
    <!-- Add aura:attribute tags to define event shape.
         One sample attribute here. -->
    <aura:attribute name="message" type="String"/>
</aura:event>
```

The component that fires an event can set the event's data. To set the attribute values, call `event.setParam()` or `event.setParams()`. A parameter name set in the event must match the `name` attribute of an `<aura:attribute>` in the event. For example, if you fire `c:appEvent`, you could use:

```
event.setParam("message", "event message here");
```

The component that handles an event can retrieve the event data. To retrieve the attribute in this event, call `event.getParam("message")` in the handler's client-side controller.

Fire Application Events

Application events follow a traditional publish-subscribe model. An application event is fired from an instance of a component. All components that provide a handler for the event are notified.

Register an Event

A component registers that it may fire an application event by using `<aura:registerEvent>` in its markup. The `name` attribute is required but not used for application events. The `name` attribute is only relevant for component events. This example uses `name="appEvent"` but the value isn't used anywhere.

```
<aura:registerEvent name="appEvent" type="c:appEvent"/>
```

Fire an Event

Use `$A.get("e.myNamespace:myAppEvent")` in JavaScript to get an instance of the `myAppEvent` event in the `myNamespace` namespace. Use `fire()` to fire the event.

```
var appEvent = $A.get("e.c:appEvent");
// Optional: set some data for the event (also known as event shape)
// A parameter's name must match the name attribute
// of one of the event's <aura:attribute> tags
//appEvent.setParams({ "myParam" : myValue });
appEvent.fire();
```

Events Fired on App Rendering

Several events are fired when an app is rendering. All `init` events are fired to indicate the component or app has been initialized. If a component is contained in another component or app, the inner component is initialized first.

If a server call is made during rendering, `aura:waiting` is fired. When the framework receives a server response, `aura:doneWaiting` is fired.

Finally, `aura:doneRendering` is fired when all rendering has been completed.

Note: We don't recommend using the legacy `aura:waiting`, `aura:doneWaiting`, and `aura:doneRendering` application events except as a last resort. The `aura:waiting` and `aura:doneWaiting` application events are fired for every batched server request, even for requests from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle these application events. The container app may fire server-side actions and trigger your event handlers multiple times.

For more information, see Events Fired During the Rendering Lifecycle on page 165.

Handling Application Events

Use `<aura:handler>` in the markup of the handler component.

For example:

```
<aura:handler event="c:appEvent" action="{!c.handleApplicationEvent}"/>
```

The `event` attribute specifies the event being handled. The format is ***`namespace:eventName`***.

The `action` attribute of `<aura:handler>` sets the client-side controller action to handle the event.

In this example, when the event is fired, the `handleApplicationEvent` client-side controller action is called.

Event Handling Phases

The framework allows you to handle the event in different phases. These phases give you flexibility for how to best process the event for your application.

Application event handlers are associated with the default phase. To add a handler for the capture or bubble phases instead, use the `phase` attribute.

Get the Source of an Event

In the client-side controller action for an `<aura:handler>` tag, use `evt.getSource()` to find out which component fired the event, where `evt` is a reference to the event. To retrieve the source element, use `evt.getSource().getElement()`.

IN THIS SECTION:

Handling Bubbled or Captured Application Events

Event propagation rules determine which components in the containment hierarchy can handle events by default in the bubble or capture phases. Learn about the rules and how to handle events in the bubble or capture phases.

Handling Bubbled or Captured Application Events

Event propagation rules determine which components in the containment hierarchy can handle events by default in the bubble or capture phases. Learn about the rules and how to handle events in the bubble or capture phases.

The framework supports *capture*, *bubble*, and *default* phases for the propagation of application events. The capture and bubble phases are similar to DOM handling patterns and provide an opportunity for interested components to interact with an event and potentially control the behavior for subsequent handlers. The default phase preserves the framework's original handling behavior.

Default Event Propagation Rules

By default, every parent in the containment hierarchy can't handle an event during the capture and bubble phases. Instead, the event propagates to every owner in the containment hierarchy.

A component's owner is the component that is responsible for its creation. For declaratively created components, the owner is the outermost component containing the markup that references the component firing the event. For programmatically created components, the owner component is the component that invoked `$A.createComponent` to create it.

The same rules apply for the capture phase, although the direction of event propagation (down) is the opposite of the bubble phase (up).

Confused? It makes more sense when you look at an example in the bubbling phase.

`c:owner` contains `c:container`, which in turn contains `c:eventSource`.

```
<!--c:owner-->
<aura:component>
    <c:container>
        <c:eventSource />
    </c:container>
</aura:component>
```

If `c:eventSource` fires an event, it can handle the event itself. The event then bubbles up the containment hierarchy.

`c:container` contains `c:eventSource` but it's not the owner because it's not the outermost component in the markup, so it can't handle the bubbled event.

`c:owner` is the owner because `c:container` is in its markup. `c:owner` can handle the event.

Propagation to All Container Components

The default behavior doesn't allow an event to be handled by every parent in the containment hierarchy. Some components contain other components but aren't the owner of those components. These components are known as container components. In the example, `c:container` is a container component because it's not the owner for `c:eventSource`. By default, `c:container` can't handle events fired by `c:eventSource`.

A container component has a facet attribute whose type is `Aura.Component[]`, such as the default `body` attribute. The container component includes those components in its definition using an expression, such as `{!v.body}`. The container component isn't the owner of the components rendered with that expression.

To allow a container component to handle the event, add `includeFacets="true"` to the `<aura:handler>` tag of the container component. For example, adding `includeFacets="true"` to the handler in the container component, `c:container`, enables it to handle the component event bubbled from `c:eventSource`.

```
<aura:handler name="bubblingEvent" event="c:compEvent" action="{!c.handleBubbling}"
    includeFacets="true" />
```

Handle Bubbled Event

To add a handler for the bubble phase, set `phase="bubble"`.

```
<aura:handler event="c:appEvent" action="{!c.handleBubbledEvent}"
    phase="bubble" />
```

The `event` attribute specifies the event being handled. The format is ***`namespace:eventName`***.

The `action` attribute of `<aura:handler>` sets the client-side controller action to handle the event.

Handle Captured Event

To add a handler for the capture phase, set `phase="capture"`.

```
<aura:handler event="c:appEvent" action="{!c.handleCapturedEvent}"
    phase="capture" />
```

Stop Event Propagation

Use the `stopPropagation()` method in the `Event` object to stop the event propagating to other components.

Pausing Event Propagation for Asynchronous Code Execution

Use `event.pause()` to pause event handling and propagation until `event.resume()` is called. This flow-control mechanism is useful for any decision that depends on the response from the execution of asynchronous code. For example, you might make a decision about event propagation based on the response from an asynchronous call to native mobile code.

You can call `pause()` or `resume()` in the capture or bubble phases.

Application Event Example

Here's a simple use case of using an application event to update an attribute in another component.

1. A user clicks a button in the notifier component, `aeNotifier.cmp`.
2. The client-side controller for `aeNotifier.cmp` sets a message in a component event and fires the event.
3. The handler component, `aeHandler.cmp`, handles the fired event.
4. The client-side controller for `aeHandler.cmp` sets an attribute in `aeHandler.cmp` based on the data sent in the event.

Note: The event and components in this example use the default `c` namespace. If your org has a namespace, use that namespace instead.

Application Event

The `aeEvent.evt` application event has one attribute. We'll use this attribute to pass some data in the event when it's fired.

```
<!--c:aeEvent-->
<aura:event type="APPLICATION">
    <aura:attribute name="message" type="String"/>
</aura:event>
```

Notifier Component

The `aeNotifier.cmp` notifier component uses `aura:registerEvent` to declare that it may fire the application event. The `name` attribute is required but not used for application events. The `name` attribute is only relevant for component events.

The button in the component contains a `press` browser event that is wired to the `fireApplicationEvent` action in the client-side controller. Clicking this button invokes the action.

```
<!--c:aeNotifier-->
<aura:component>
    <aura:registerEvent name="appEvent" type="c:aeEvent"/>

    <h1>Simple Application Event Sample</h1>
    <p><ui:button
        label="Click here to fire an application event"
        press="{!c.fireApplicationEvent}" />
    </p>
</aura:component>
```

The client-side controller gets an instance of the event by calling `$A.get("e.c:aeEvent")`. The controller sets the `message` attribute of the event and fires the event.

```
/* aeNotifierController.js */
{
    fireApplicationEvent : function(cmp, event) {
        // Get the application event by using the
        // e.<namespace>.<event> syntax
        var appEvent = $A.get("e.c:aeEvent");
        appEvent.setParams({
            "message" : "An application event fired me. " +
            "It all happened so fast. Now, I'm everywhere!" });
        appEvent.fire();
    }
}
```

Handler Component

The `aeHandler.cmp` handler component uses the `<aura:handler>` tag to register that it handles the application event.

When the event is fired, the `handleApplicationEvent` action in the client-side controller of the handler component is invoked.

```
<!--c:aeHandler-->
<aura:component>
    <aura:attribute name="messageFromEvent" type="String"/>
    <aura:attribute name="numEvents" type="Integer" default="0"/>
    <aura:handler event="c:aeEvent" action="{!c.handleApplicationEvent}"/>

    <p>{!v.messageFromEvent}</p>
    <p>Number of events: {!v.numEvents}</p>
</aura:component>
```

The controller retrieves the data sent in the event and uses it to update the `messageFromEvent` attribute in the handler component.

```
/* aeHandlerController.js */
{
    handleApplicationEvent : function(cmp, event) {
        var message = event.getParam("message");

        // set the handler attributes based on event data
        cmp.set("v.messageFromEvent", message);
        var numEventsHandled = parseInt(cmp.get("v.numEvents")) + 1;
        cmp.set("v.numEvents", numEventsHandled);
    }
}
```

Container Component

The `aeContainer.cmp` container component contains the notifier and handler components. This is different from the component event example where the handler contains the notifier component.

```
<!--c:aeContainer-->
<aura:component>
    <c:aeNotifier/>
    <c:aeHandler/>
</aura:component>
```

Put It All Together

You can test this code by adding `<c:aeContainer>` to a sample `aeWrapper.app` application and navigating to the application.

`https://<myDomain>.lightning.force.com/c/aeWrapper.app`, where `<myDomain>` is the name of your custom Salesforce domain.

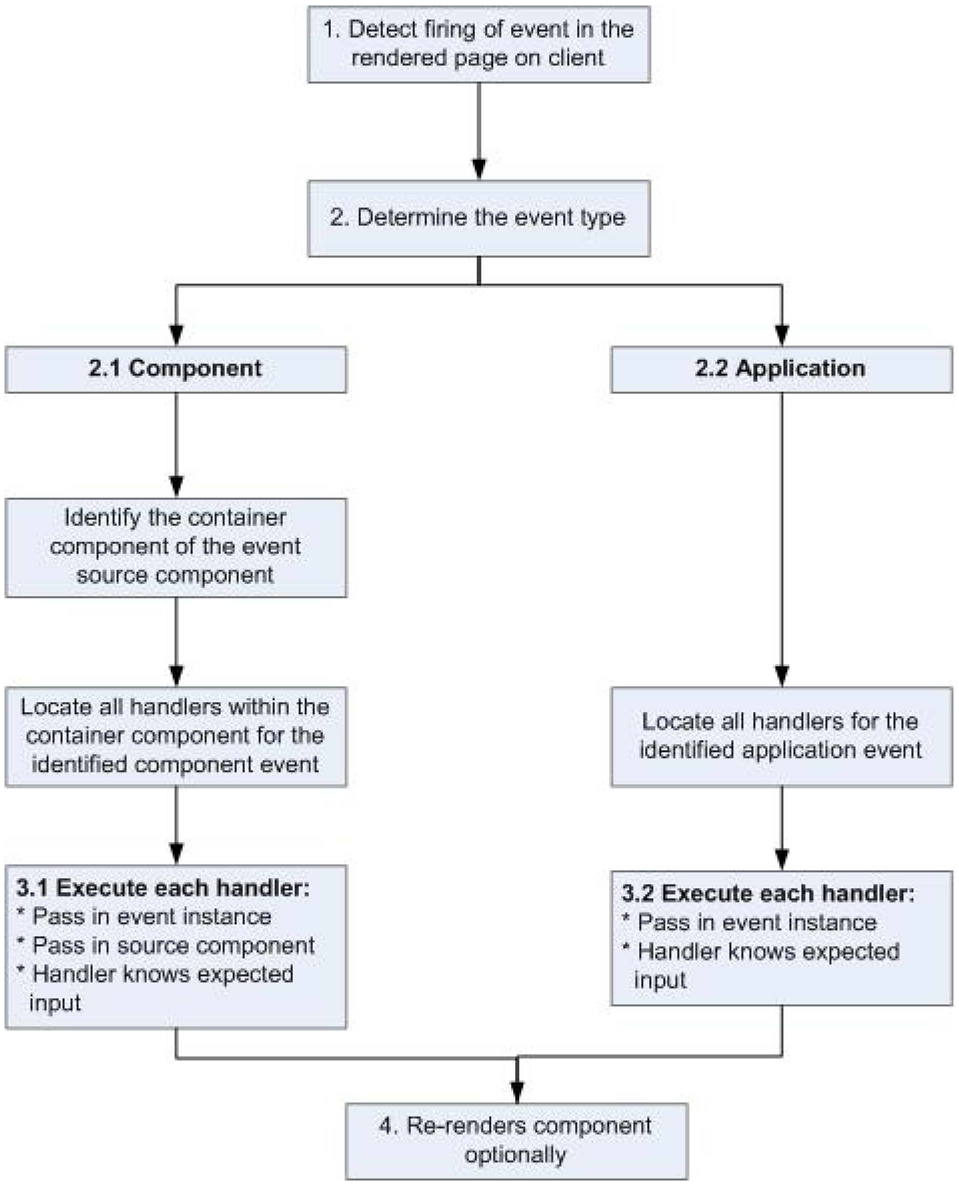
If you want to access data on the server, you could extend this example to call a server-side controller from the handler's client-side controller.

SEE ALSO:

- Application Events
- Creating Server-Side Logic with Controllers
- Component Event Example

Event Handling Lifecycle

The following chart summarizes how the framework handles events.


1. Detect firing of event in the rendered page on client
2. Determine the event type
2.1 Component
2.2 Application
Identify the container component of the event source component
Locate all handlers within the container component for the identified component event
Locate all handlers for the identified application event
3.1 Execute each handler:
* Pass in event instance
* Pass in source component
* Handler knows expected input
3.2 Execute each handler:
* Pass in event instance
* Handler knows expected input
4. Re-renders component optionally

1 Detect Firing of Event

The framework detects the firing of an event. For example, the event could be triggered by a button click in a notifier component.

2 Determine the Event Type

2.1 Component Event

The parent or container component instance that fired the event is identified. This container component locates all relevant event handlers for further processing.

2.2 Application Event

Any component can have an event handler for this event. All relevant event handlers are located.

3 Execute each Handler

3.1 Executing a Component Event Handler

Each of the event handlers defined in the container component for the event are executed by the handler controller, which can also:

- Set attributes or modify data on the component (causing a re-rendering of the component).
- Fire another event or invoke a client-side or server-side action.

3.2 Executing an Application Event Handler

All event handlers are executed. When the event handler is executed, the event instance is passed into the event handler.

4 Re-render Component (optional)

After the event handlers and any callback actions are executed, a component might be automatically re-rendered if it was modified during the event handling process.

SEE ALSO:

Client-Side Rendering to the DOM

Advanced Events Example

This example builds on the simpler component and application event examples. It uses one notifier component and one handler component that work with both component and application events. Before we see a component wired up to events, let's look at the individual resources involved.

This table summarizes the roles of the various resources used in the example. The source code for these resources is included after the table.

Resource	Resource Name	Usage
Event files	Component event (`compEvent.evt`) and application event (`appEvent.evt`)	Defines the component and application events in separate resources. `eventsContainer.cmp` shows how to use both component and application events.
Notifier	Component (`eventsNotifier.cmp`) and its controller (`eventsNotifierController.js`)	The notifier contains an `onclick` browser event to initiate the event. The controller fires the event.
Handler	Component (`eventsHandler.cmp`) and its controller (`eventsHandlerController.js`)	The handler component contains the notifier component (or a `<aura:handler>` tag for application events), and calls the controller action that is executed after the event is fired.
Container Component	`eventsContainer.cmp`	Displays the event handlers on the UI for the complete demo.

The definitions of component and application events are stored in separate `.evt` resources, but individual notifier and handler component bundles can contain code to work with both types of events.

The component and application events both contain a `context` attribute that defines the shape of the event. This is the data that is passed to handlers of the event.

Component Event

Here is the markup for `compEvent.evt`.

```
<!--c:compEvent-->
<aura:event type="COMPONENT">
    <!-- pass context of where the event was fired to the handler. -->
    <aura:attribute name="context" type="String"/>
</aura:event>
```

Application Event

Here is the markup for `appEvent.evt`.

```
<!--c:appEvent-->
<aura:event type="APPLICATION">
    <!-- pass context of where the event was fired to the handler. -->
    <aura:attribute name="context" type="String"/>
</aura:event>
```

Notifier Component

The `eventsNotifier.cmp` notifier component contains buttons to initiate a component or application event.

The notifier uses `aura:registerEvent` tags to declare that it may fire the component and application events. Note that the `name` attribute is required but the value is only relevant for the component event; the value is not used anywhere else for the application event.

The `parentName` attribute is not set yet. We will see how this attribute is set and surfaced in `eventsContainer.cmp`.

```
<!--c:eventsNotifier-->
<aura:component>
  <aura:attribute name="parentName" type="String"/>
  <aura:registerEvent name="componentEventFired" type="c:compEvent"/>
  <aura:registerEvent name="appEvent" type="c:appEvent"/>

  <div>
    <h3>This is {!v.parentName}'s eventsNotifier.cmp instance</h3>
    <p><ui:button
        label="Click here to fire a component event"
        press="{!c.fireComponentEvent}" />
    </p>
    <p><ui:button
        label="Click here to fire an application event"
        press="{!c.fireApplicationEvent}" />
    </p>
  </div>
</aura:component>
```

CSS source

The CSS is in `eventsNotifier.css`.

```
/* eventsNotifier.css */
.cEventsNotifier {
    display: block;
    margin: 10px;
    padding: 10px;
    border: 1px solid black;
}
```

Client-side controller source

The `eventsNotifierController.js` controller fires the event.

```
/* eventsNotifierController.js */
{
    fireComponentEvent : function(cmp, event) {
        var parentName = cmp.get("v.parentName");

        // Look up event by name, not by type
        var compEvents = cmp.getEvent("componentEventFired");

        compEvents.setParams({ "context" : parentName });
        compEvents.fire();
    },

    fireApplicationEvent : function(cmp, event) {
        var parentName = cmp.get("v.parentName");

        // note different syntax for getting application event
        var appEvent = $A.get("e.c:appEvent");

        appEvent.setParams({ "context" : parentName });
        appEvent.fire();
    }
}
```

You can click the buttons to fire component and application events but there is no change to the output because we haven't wired up the handler component to react to the events yet.

The controller sets the `context` attribute of the component or application event to the `parentName` of the notifier component before firing the event. We will see how this affects the output when we look at the handler component.

Handler Component

The `eventsHandler.cmp` handler component contains the `c:eventsNotifier` notifier component and `<aura:handler>` tags for the application and component events.

```
<!--c:eventsHandler-->
<aura:component>
  <aura:attribute name="name" type="String"/>
  <aura:attribute name="mostRecentEvent" type="String" default="Most recent event handled:"/>

  <aura:attribute name="numComponentEventsHandled" type="Integer" default="0"/>
  <aura:attribute name="numApplicationEventsHandled" type="Integer" default="0"/>

  <aura:handler event="c:appEvent" action="{!c.handleApplicationEventFired}"/>
  <aura:handler name="componentEventFired" event="c:compEvent"
action="{!c.handleComponentEventFired}"/>
```

```
  <div>
    <h3>This is {!v.name}</h3>
    <p>{!v.mostRecentEvent}</p>
    <p># component events handled: {!v.numComponentEventsHandled}</p>
    <p># application events handled: {!v.numApplicationEventsHandled}</p>
    <c:eventsNotifier parentName="{#v.name}" />
  </div>
</aura:component>
```

Note: `{#v.name}` is an unbound expression. This means that any change to the value of the `parentName` attribute in `c:eventsNotifier` doesn't propagate back to affect the value of the `name` attribute in `c:eventsHandler`. For more information, see Data Binding Between Components on page 59.

CSS source

The CSS is in `eventsHandler.css`.

```
/* eventsHandler.css */
.cEventsHandler {
  display: block;
  margin: 10px;
  padding: 10px;
  border: 1px solid black;
}
```

Client-side controller source

The client-side controller is in `eventsHandlerController.js`.

```
/* eventsHandlerController.js */
{
    handleComponentEventFired : function(cmp, event) {
        var context = event.getParam("context");
        cmp.set("v.mostRecentEvent",
            "Most recent event handled: COMPONENT event, from " + context);

        var numComponentEventsHandled =
            parseInt(cmp.get("v.numComponentEventsHandled")) + 1;
        cmp.set("v.numComponentEventsHandled", numComponentEventsHandled);
    },

    handleApplicationEventFired : function(cmp, event) {
        var context = event.getParam("context");
        cmp.set("v.mostRecentEvent",
            "Most recent event handled: APPLICATION event, from " + context);

        var numApplicationEventsHandled =
            parseInt(cmp.get("v.numApplicationEventsHandled")) + 1;
        cmp.set("v.numApplicationEventsHandled", numApplicationEventsHandled);
    }
}
```

The `name` attribute is not set yet. We will see how this attribute is set and surfaced in `eventsContainer.cmp`.

You can click buttons and the UI now changes to indicate the type of event. The click count increments to indicate whether it's a component or application event. We aren't finished yet though. Notice that the source of the event is undefined as the event `context` attribute hasn't been set .

Container Component

Here is the markup for `eventsContainer.cmp`.

```
<!--c:eventsContainer-->
<aura:component>
    <c:eventsHandler name="eventsHandler1"/>
    <c:eventsHandler name="eventsHandler2"/>
</aura:component>
```

The container component contains two handler components. It sets the `name` attribute of both handler components, which is passed through to set the `parentName` attribute of the notifier components. This fills in the gaps in the UI text that we saw when we looked at the notifier or handler components directly.

Add the `c:eventsContainer` component to a `c:eventsContainerApp` application. Navigate to the application.

`https://<myDomain>.lightning.force.com/c/eventsContainerApp.app`, where `<myDomain>` is the name of your custom Salesforce domain.

Click the **Click here to fire a component event** button for either of the event handlers. Notice that the **# component events handled** counter only increments for that component because only the firing component's handler is notified.

Click the **Click here to fire an application event** button for either of the event handlers. Notice that the **# application events handled** counter increments for both the components this time because all the handling components are notified.

SEE ALSO:

Component Event Example

Application Event Example

Event Handling Lifecycle

Firing Lightning Events from Non-Lightning Code

You can fire Lightning events from JavaScript code outside a Lightning app. For example, your Lightning app might need to call out to some non-Lightning code, and then have that code communicate back to your Lightning app once it's done.

For example, you could call external code that needs to log into another system and return some data to your Lightning app. Let's call this event `mynamespace:externalEvent`. You'll fire this event when your non-Lightning code is done by including this JavaScript in your non-Lightning code.

```
var myExternalEvent;
    if(window.opener.$A &&
      (myExternalEvent = window.opener.$A.get("e.mynamespace:externalEvent"))) {
         myExternalEvent.setParams({isOauthed:true});
         myExternalEvent.fire();
       }
```

`window.opener.$A.get()` references the master window where your Lightning app is loaded.

SEE ALSO:

Application Events

Modifying Components Outside the Framework Lifecycle

Events Best Practices

Here are some best practices for working with events.

Use Component Events Whenever Possible

Always try to use a component event instead of an application event, if possible. Component events can only be handled by components above them in the containment hierarchy so their usage is more localized to the components that need to know about them. Application events are best used for something that should be handled at the application level, such as navigating to a specific record. Application events allow communication between components that are in separate parts of the application and have no direct containment relationship.

Separate Low-Level Events from Business Logic Events

It's a good practice to handle low-level events, such as a click, in your event handler and refire them as higher-level events, such as an `approvalChange` event or whatever is appropriate for your business logic.

Dynamic Actions based on Component State

If you need to invoke a different action on a click event depending on the state of the component, try this approach:

1. Store the component state as a discrete value, such as New or Pending, in a component attribute.
2. Put logic in your client-side controller to determine the next action to take.
3. If you need to reuse the logic in your component bundle, put the logic in the helper.

For example:

1. Your component markup contains `<ui:button label="do something" press="{!c.click}" />`.
2. In your controller, define the `click` function, which delegates to the appropriate helper function or potentially fires the correct event.

Using a Dispatcher Component to Listen and Relay Events

If you have a large number of handler component instances listening for an event, it may be better to identify a dispatcher component to listen for the event. The dispatcher component can perform some logic to decide which component instances should receive further information and fire another component or application event targeted at those component instances.

SEE ALSO:

Handling Events with Client-Side Controllers

Events Anti-Patterns

Events Anti-Patterns

These are some anti-patterns that you should avoid when using events.

Don't Fire an Event in a Renderer

Firing an event in a renderer can cause an infinite rendering loop.

Don't do this!

```
afterRender: function(cmp, helper) {
    this.superAfterRender();
    $A.get("e.myns:mycmp").fire();
}
```

Instead, use the `init` hook to run a controller action after component construction but before rendering. Add this code to your component:

```
<aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
```

For more details, see .Invoking Actions on Component Initialization on page 229.

Don't Use `onclick` and `ontouchend` Events

You can't use different actions for `onclick` and `ontouchend` events in a component. The framework translates touch-tap events into clicks and activates any `onclick` handlers that are present.

SEE ALSO:

Client-Side Rendering to the DOM

Events Best Practices

Events Fired During the Rendering Lifecycle

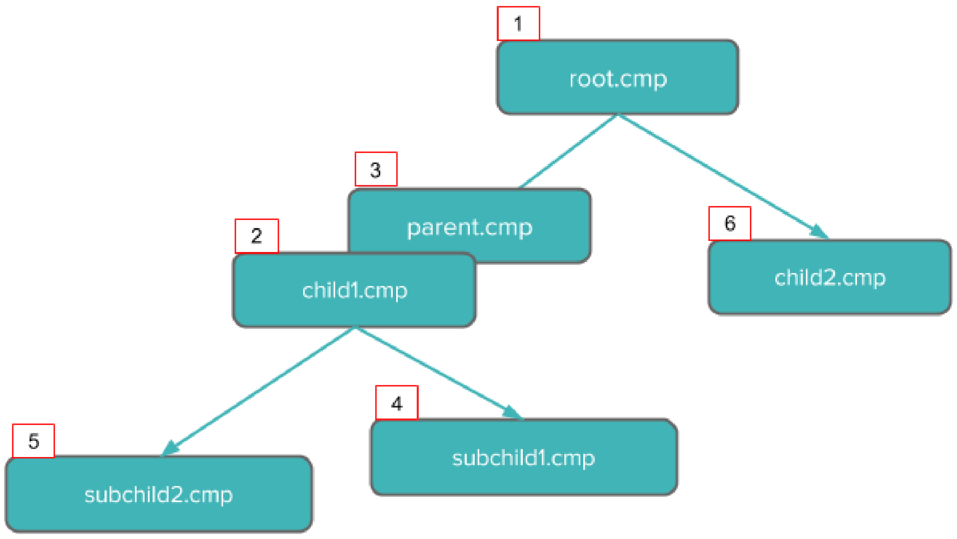
A component is instantiated, rendered, and rerendered during its lifecycle. A component is rerendered only when there's a programmatic or value change that would require a rerender, such as when a browser event triggers an action that updates its data.

Component Creation

The component lifecycle starts when the client sends an HTTP request to the server and the component configuration data is returned to the client. No server trip is made if the component definition is already on the client from a previous request and the component has no server dependencies.

Let's look at an app with several nested components. The framework instantiates the app and goes through the children of the `v.body` facet to create each component, First, it creates the component definition, its entire parent hierarchy, and then creates the facets within those components. The framework also creates any component dependencies on the server, including definitions for attributes, interfaces, controllers, and actions.

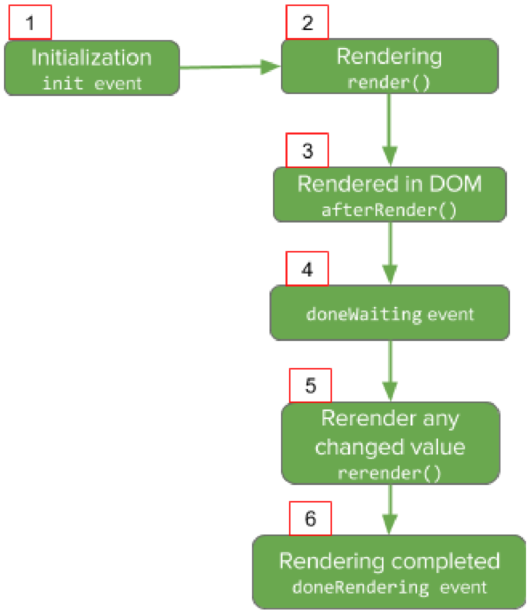
The following image lists the order of component creation.



After creating a component instance, the serialized component definitions and instances are sent down to the client. Definitions are cached but not the instance data. The client deserializes the response to create the JavaScript objects or maps, resulting in an instance tree that's used to render the component instance. When the component tree is ready, the `init` event is fired for all the components, starting from the children component and finishing in the parent component.

Component Rendering

The following image depicts a typical rendering lifecycle of a component on the client, after the component definitions and instances are deserialized.



1. The `init` event is fired by the component service that constructs the components to signal that initialization has completed.

   ```
   <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
   ```

   You can customize the `init` handler and add your own controller logic before the component starts rendering. For more information, see Invoking Actions on Component Initialization on page 229.

2. For each component in the tree, the base implementation of `render()` or your custom renderer is called to start component rendering. For more information, see Client-Side Rendering to the DOM on page 226. Similar to the component creation process, rendering starts at the root component, its children components and their super components, if any, and finally the subchildren components.

3. Once your components are rendered to the DOM, `afterRender()` is called to signal that rendering is completed for each of these component definitions. It enables you to interact with the DOM tree after the framework rendering service has created the DOM elements.

4. To indicate that the client is done waiting for a response to the server request XHR, the `aura:doneWaiting` event is fired. You can handle this event by adding a handler wired to a client-side controller action.

   Note: We don't recommend using the legacy `aura:doneWaiting` event except as a last resort. The `aura:doneWaiting` application event is fired for every server response, even for responses from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may fire server-side actions and trigger your event handler multiple times.

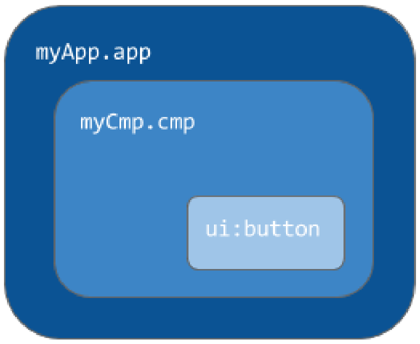
5. The framework checks whether any components need to be rerendered and rerenders any "dirtied" components to reflect any updates to attribute values. This rerender check is done even if there's no dirtied components or values.

6. Finally, the `aura:doneRendering` event is fired at the end of the rendering lifecycle.

   Note: We don't recommend using the legacy `aura:doneRendering` event except as a last resort. Unless your component is running in complete isolation in a standalone app and not included in complex apps, such as Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may trigger your event handler multiple times.

Rendering Nested Components

Let's say that you have an app `myApp.app` that contains a component `myCmp.cmp` with a `ui:button` component.



During initialization, the `init()` event is fired in this order: `ui:button`, `ui:myCmp`, and `myApp.app`.

SEE ALSO:

Client-Side Rendering to the DOM

System Event Reference

Events Handled In Salesforce1 and Lightning Experience

Salesforce1 and Lightning Experience handle some events, which you can fire in your Lightning component.

If you fire one of these events in your Lightning apps or components outside of Salesforce1 or Lightning Experience:

- You must handle the event by using the `<aura:handler>` tag in the handling component.
- Use the `<aura:registerEvent>` or `<aura:dependency>` tags to ensure that the event is sent to the client, when needed.

Event Name	Description
`force:createRecord`	Opens a page to create a record for the specified `entityApiName`, for example, "Account" or "myNamespace__MyObject__c".
`force:editRecord`	Opens the page to edit the record specified by `recordId`.
`force:navigateToList`	Navigates to the list view specified by `listViewId`.
`force:navigateToObjectHome`	Navigates to the object home specified by the `scope` attribute.
`force:navigateToRelatedList`	Navigates to the related list specified by `parentRecordId`.
`force:navigateToSObject`	Navigates to an sObject record specified by `recordId`.
`force:navigateToURL`	Navigates to the specified URL.
`force:recordSave`	Saves a record.
`force:recordSaveSuccess`	Indicates that the record has been successfully saved.
`force:refreshView`	Reloads the view.
`force:showToast`	Displays a toast notification with a message.

Customizing Client-Side Logic for Salesforce1, Lightning Experience, and Standalone Apps

Since Salesforce1 and Lightning Experience automatically handle many events, you have to do extra work if your component runs in a standalone app. Instantiating the event using `$A.get()` can help you determine if your component is running within Salesforce1 and Lightning Experience or a standalone app. For example, you want to display a toast when a component loads in Salesforce1 and Lightning Experience. You can fire the `force:showToast` event and set its parameters for Salesforce1 and Lightning Experience, but you have to create your own implementation for a standalone app.

```
displayToast : function (component, event, helper) {
    var toast = $A.get("e.force:showToast");
    if (toast){
        //fire the toast event in Salesforce1 and Lightning Experience
        toast.setParams({
            "title": "Success!",
            "message": "The component loaded successfully."
        });
        toast.fire();
    } else {
        //your toast implementation for a standalone app here
    }
}
```

SEE ALSO:

- Event Reference
- aura:dependency
- Fire Component Events
- Fire Application Events

System Events

The framework fires several system events during its lifecycle.

You can handle these events in your Lightning apps or components, and within Salesforce1.

Event Name	Description
`aura:doneRendering`	Indicates that the initial rendering of the root application has completed. We don't recommend using the legacy `aura:doneRendering` event except as a last resort. Unless your component is running in complete isolation in a standalone app and not included in complex apps, such as Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may trigger your event handler multiple times.
`aura:doneWaiting`	Indicates that the app is done waiting for a response to a server request. This event is preceded by an `aura:waiting` event. We don't recommend using the legacy `aura:doneWaiting` event except as a last resort. The `aura:doneWaiting` application event is fired for every server response, even for responses from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may fire server-side actions and trigger your event handler multiple times.
`aura:locationChange`	Indicates that the hash part of the URL has changed.
`aura:noAccess`	Indicates that a requested resource is not accessible due to security constraints on that resource.
`aura:systemError`	Indicates that an error has occurred.
`aura:valueChange`	Indicates that an attribute value has changed.

Event Name	Description
`aura:valueDestroy`	Indicates that a component has been destroyed.
`aura:valueInit`	Indicates that an app or component has been initialized.
`aura:waiting`	Indicates that the app is waiting for a response to a server request. We don't recommend using the legacy `aura:waiting` event except as a last resort. The `aura:waiting` application event is fired for every server request, even for requests from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may fire server-side actions and trigger your event handler multiple times.

SEE ALSO:

System Event Reference

CHAPTER 6 Creating Apps

In this chapter ...

Components are the building blocks of an app. This section shows you a typical workflow to put the pieces together to create a new app.

First, you should decide whether you're creating a component for a standalone app or for Salesforce apps, such as Lightning Experience or Salesforce1. Both components can access your Salesforce data, but only a component created for Lightning Experience or Salesforce1 can automatically handle Salesforce events that take advantage of record create and edit pages, among other benefits.

The Quick Start on page 6 walks you through creating components for a standalone app and components for Salesforce1 to help you determine which one you need.

App Overview

An app is a special top-level component whose markup is in a `.app` resource.

On a production server, the `.app` resource is the only addressable unit in a browser URL. Access an app using the URL:

`https://<myDomain>.lightning.force.com/<namespace>/<appName>.app`, where `<myDomain>` is the name of your custom Salesforce domain

SEE ALSO:

aura:application

Supported HTML Tags

Designing App UI

Design your app's UI by including markup in the `.app` resource. Each part of your UI corresponds to a component, which can in turn contain nested components. Compose components to create a sophisticated app.

An app's markup starts with the `<aura:application>` tag.

To learn more about the `<aura:application>` tag, see aura:application.

Let's look at a `sample.app` file, which starts with the `<aura:application>` tag.

```
<aura:application>
    <div>
      <header>
          <h1>Sample App</h1>
      </header>
      <ui:block class="wrapper" aura:id="block">
        <aura:set attribute="left">
             <docsample:sidebar aura:id="sidebar" />
        </aura:set>
             <docsample:details aura:id="details" />
      </ui:block>
    </div>
</aura:application>
```

The `sample.app` file contains HTML tags, such as `<h1>` and `<div>`, as well as components, such as `<ui:block>`. We won't go into the details for all the components here but note how simple the markup is. The `<docsample:sidebar>` and `<docsample:details>` components encapsulate the layout for the page.

For another sample app, see the `expenseTracker.app` resource created in Create a Standalone Lightning App.

SEE ALSO:

aura:application

Creating App Templates

An app template bootstraps the loading of the framework and the app. Customize an app's template by creating a component that extends the default `aura:template` template.

A template must have the `isTemplate` system attribute in the `<aura:component>` tag set to `true`. This informs the framework to allow restricted items, such as `<script>` tags, which aren't allowed in regular components.

For example, a sample app has a `np:template` template that extends `aura:template`. `np:template` looks like:

```
<aura:component isTemplate="true" extends="aura:template">
    <aura:set attribute="title" value="My App"/>
    ...
</aura:component>
```

Note how the component extends `aura:template` and sets the `title` attribute using `aura:set`.

The app points at the custom template by setting the `template` system attribute in `<aura:application>`.

```
<aura:application template="np:template">
    ...
</aura:application>
```

A template can only extend a component or another template. A component or an application can't extend a template.

Developing Secure Code

The framework uses Content Security Policy (CSP) to control the source of content that can be loaded on a page.

The LockerService architectural layer enhances security by isolating individual Lightning components in their own containers and enforcing coding best practices.

IN THIS SECTION:

Content Security Policy Overview

The Lightning Component framework uses Content Security Policy (CSP) to control the source of content that can be loaded on a page.

CSP is a Candidate Recommendation of the W3C working group on Web Application Security. The framework uses the `Content-Security-Policy` HTTP header recommended by the W3C.

The framework's CSP covers these resources:

JavaScript Libraries

All JavaScript libraries must be uploaded to Salesforce static resources. For more information, see Using External JavaScript Libraries on page 217.

HTTPS Connections for Resources

All external fonts, images, frames, and CSS must use an HTTPS URL.

You can change the CSP policy and expand access to third-party resources by adding CSP Trusted Sites.

Content Security Policy and LockerService

LockerService tightens CSP to eliminate the possibility of cross-site scripting attacks. These CSP changes are only enforced in sandboxes and Developer Edition orgs.

The stricter CSP disallows the `unsafe-inline` and `unsafe-eval` keywords for inline scripts (`script-src`). Ensure that your code and third-party libraries you use adhere to these rules by removing all calls using `eval()` or inline JavaScript code execution. You might have to update your third-party libraries to modern versions that don't depend on `unsafe-inline` or `unsafe-eval`.

LockerService is a critical update for this release. LockerService will be automatically activated for all orgs in the Summer '17 release. Before the Summer '17 release, you can manually activate and deactivate the update as often as you need to evaluate the impact on your org.

Browser Support

CSP isn't enforced by all browsers. For a list of browsers that enforce CSP, see `caniuse.com`.

Note: IE11 doesn't support CSP, so we recommend using other supported browsers for enhanced security.

Finding CSP Violations

Any policy violations are logged in the browser's developer console. The violations look like the following message.

```
Refused to load the script 'https://externaljs.docsample.com/externalLib.js'
because it violates the following Content Security Policy directive: ...
```

If your app's functionality isn't affected, you can ignore the CSP violation.

SEE ALSO:

- Making API Calls from Components
- Create CSP Trusted Sites to Access Third-Party APIs
- *Salesforce Help*: Supported Browsers for Lightning Experience

What is LockerService?

LockerService is a powerful security architecture for Lightning components. LockerService enhances security by isolating individual Lightning components in their own namespace. LockerService also promotes best practices that improve the supportability of your code by only allowing access to supported APIs and eliminating access to non-published framework internals.

What Does LockerService Affect?

LockerService enforces security in:

- Lightning Experience
- Salesforce1
- Template-based Communities
- Standalone apps that you create (for example, `myApp.app`)

LockerService enforces security in **Lightning Out**. However, the CSP restrictions of LockerService aren't enforced in Lightning Out. Lightning Out allows you to run Lightning components in a container outside of Lightning apps, such as Lightning components in Visualforce and Visualforce-based communities. The container defines the CSP rules.

LockerService doesn't affect **Salesforce Classic**, Visualforce-based communities, Sales Console, or Service Console, except for usage of Lightning components in Visualforce in these contexts.

Graceful Degradation for Unsupported Browsers

LockerService relies on some basic JavaScript features in the browser: support for strict mode and the `Map` object. These requirements align with the supported browsers for Lightning Experience. If a browser doesn't meet the requirements, LockerService can't enforce all its security features.

LockerService provides a graceful degradation for unsupported browsers by disabling LockerService features that aren't supported by a browser. However, if you use an unsupported browser, you're likely to encounter issues that won't be fixed. Make your life easier and your browsing experience more secure by using a supported browser.

Note: IE11 doesn't support CSP, so we recommend using other supported browsers for enhanced security.

LockerService Requirements

LockerService enforces several security features in your code.

JavaScript ES5 Strict Mode Enforcement

JavaScript ES5 strict mode is implicitly enabled. You don't need to specify `"use strict"` in your code.

JavaScript strict mode makes code more robust and supportable. For example, it throws some errors that would otherwise be suppressed.

A few common stumbling points when using strict mode are:

- You must declare variables with the `var` keyword.
- You must explicitly attach a variable to the `window` object to make the variable available outside a library. For more information, see Sharing JavaScript Code Across Components.
- The libraries that your components use must also work in strict mode.

For more information about JavaScript strict mode, see the Mozilla Developer Network.

DOM Access Containment

A component can only traverse the DOM and access elements created by a component in the same namespace. This behavior prevents the anti-pattern of reaching into DOM elements owned by components in another namespace.

Note: It's an anti-pattern for any component to "reach into" another component, regardless of namespace. LockerService only prevents cross-namespace access. Your good judgment should prevent cross-component access within your own namespace as it makes components tightly coupled and more likely to break.

For more information, see DOM Access Containment.

Restrictions to Global References

LockerService applies restrictions to global references. You can access intrinsic objects, such as `Array`. LockerService provides secure versions of non-intrinsic objects, such as `window`. The secure object versions automatically and seamlessly control access to the object and its properties.

Use the Salesforce Lightning CLI tool to scan your code for Lightning-specific issues.

Access to Supported JavaScript API Framework Methods Only

You can access published, supported JavaScript API framework methods only. These methods are published in the reference doc app at `https://yourDomain.lightning.force.com/auradocs/reference.app`. Previously, unsupported methods were accessible, which exposed your code to the risk of breaking when unsupported methods were changed or removed.

The preceding security features are enforced when LockerService is active in your org. LockerService is a critical update for this release. LockerService will be automatically activated for all orgs in the Summer '17 release. Before the Summer '17 release, you can manually activate and deactivate the update as often as you need to evaluate the impact on your org.

The LockerService critical update also enforces a stricter CSP in sandboxes and Developer Edition orgs.

Stricter Content Security Policy (CSP)

LockerService tightens CSP to eliminate the possibility of cross-site scripting attacks. These CSP changes are only enforced in sandboxes and Developer Edition orgs.

The stricter CSP disallows the `unsafe-inline` and `unsafe-eval` keywords for inline scripts (`script-src`). Ensure that your code and third-party libraries you use adhere to these rules by removing all calls using `eval()` or inline JavaScript code execution. You might have to update your third-party libraries to modern versions that don't depend on `unsafe-inline` or `unsafe-eval`.

Note: IE11 doesn't support CSP, so we recommend using other supported browsers for enhanced security.

Activate the Critical Update

LockerService is a critical update for this release. LockerService will be automatically activated for all orgs in the Summer '17 release. Before the Summer '17 release, you can manually activate and deactivate the update as often as you need to evaluate the impact on your org.

To activate this critical update:

1. From Setup, enter *`Critical Updates`* in the `Quick Find` box, and then select **Critical Updates**.
2. For "Enable Lightning LockerService Security", click **Activate**.
3. Refresh your browser page to proceed with LockerService enabled.

We recommend that you test LockerService in a sandbox or a Developer Edition org to verify correct behavior of your components before enabling it in your production org.

Components Installed from Managed Packages

To control whether LockerService is enforced for components installed from a managed package:

1. From Setup, enter *`Lightning Components`* in the `Quick Find` box, and then select **Lightning Components**.
2. Select the `Enable LockerService for Managed Packages` checkbox to enforce LockerService for components installed from a managed package.

   Note: The checkbox is only visible when the critical update is activated.

If you deselect the `Enable LockerService for Managed Packages` checkbox, LockerService is not enforced for components installed from a managed package. Components that you create in your org still run with enforcement of LockerService restrictions.

Default Settings for New Orgs

Here's a table summarizing when LockerService is enforced for new orgs.

Components created in your org are in the default namespace, `c`, or in your org's namespace, if you created a namespace.

Component Source	Developer Edition	All Other Supported Editions
Created in your org	Yes	Yes
Managed package	Yes	No

You can change LockerService enforcement by toggling the critical update (for components created in your org) or the `Enable LockerService for Managed Packages` checkbox (for components from managed packages).

SEE ALSO:

- Content Security Policy Overview
- Modifying the DOM
- Reference Doc App
- Salesforce Lightning CLI
- *Salesforce Help*: Supported Browsers for Lightning Experience

Writing Secure Code

We've talked at a high level about CSP and LockerService. This section gives you specific details about how to write secure code.

IN THIS SECTION:

Sharing JavaScript Code Across Components
You can build simple Lightning components that are entirely self-contained. However, if you build more complex applications, you probably want to share code, or even client-side data, between components.

DOM Access Containment
A component can only traverse the DOM and access elements created by a component in the same namespace. This behavior prevents the anti-pattern of reaching into DOM elements owned by components in another namespace.

Sharing JavaScript Code Across Components

You can build simple Lightning components that are entirely self-contained. However, if you build more complex applications, you probably want to share code, or even client-side data, between components.

The `<ltng:require>` tag enables you to load external JavaScript libraries after you upload them as static resources. You can also use `<ltng:require>` to import your own JavaScript libraries of utility methods.

Let's look at a simple counter library that provides a `getValue()` method, which returns the current value of the counter, and an `increment()` method, which increments the value of that counter.

Create the JavaScript Library

1. In the Developer Console, click **File** > **New** > **Static Resource**.
2. Enter *`counter`* in the `Name` field.
3. Select *`text/javascript`* in the `MIME Type` field.
4. Click **Submit**.
5. Enter this code and click **File** > **Save**.

```
window.counter = (function() {
    var value = 0; // private

    return { //public API
        increment: function() {
            value = value + 1;
            return value;
        },

        getValue: function() {
            return value;
        }
    };
}());
```

This code uses the JavaScript module pattern. Using this closure-based pattern, the `value` variable remains private to your library. Components using the library can't access `value` directly.

The most important line of the code to note is:

```
window.counter = (function() {
```

You must attach `counter` to the `window` object as a requirement of JavaScript strict mode, which is implicitly enabled in LockerService. Even though `window.counter` looks like a global declaration, `counter` is attached to the LockerService secure window object and therefore is a namespace variable, not a global variable.

If you use `counter` instead of `window.counter`, `counter` isn't available. When you try to access it, you get an error similar to:

```
Action failed: ... [counter is not defined]
```

Use the JavaScript Library

Let's use the library in a `MyCounter` component that has a simple UI to exercise the `counter` methods.

```
<!--c:MyCounter-->
<aura:component access="global">
    <ltng:require scripts="{!$Resource.counter}"
                  afterScriptsLoaded="{!c.getValue}"/>
    <aura:attribute name="value" type="Integer"/>

    <h1>MyCounter</h1>
    <p>{!v.value}</p>
    <lightning:button label="Get Value" onclick="{!c.getValue}"/>
    <lightning:button label="Increment" onclick="{!c.increment}"/>
</aura:component>
```

The `<ltng:require>` tag loads the counter library and calls the `getValue` action in the component's client-side controller after the library is loaded.

Here's the client-side controller.

```
/* MyCounterController.js */
({
    getValue : function(component, event, helper) {
        component.set("v.value", counter.getValue());
    },

    increment : function(component, event, helper) {
        component.set("v.value", counter.increment());
    }
})
```

You can access properties of the `window` object without having to type the `window.` prefix. Therefore, you can use `counter.getValue()` as shorthand for `window.counter.getValue()`.

Click the buttons to get the value or increment it.

Our counter library shares the counter value between any components that use the library. If you need each component to have a separate counter, you could modify the counter implementation. To see the per-component code and for more details, see this blog post about *Modularizing Code in Lightning Components*.

SEE ALSO:

Using External JavaScript Libraries

ltng:require

DOM Access Containment

A component can only traverse the DOM and access elements created by a component in the same namespace. This behavior prevents the anti-pattern of reaching into DOM elements owned by components in another namespace.

Note: It's an anti-pattern for any component to "reach into" another component, regardless of namespace. LockerService only prevents cross-namespace access. Your good judgment should prevent cross-component access within your own namespace as it makes components tightly coupled and more likely to break.

Let's look at a sample component that demonstrates DOM containment.

```
<!--c:domLocker-->
<aura:component>
    <div id="myDiv" aura:id="div1">
        <p>See how LockerService restricts DOM access</p>
    </div>
    <lightning:button name="myButton" label="Peek in DOM"
            aura:id="button1" onclick="{!c.peekInDom}"/>
</aura:component>
```

The `c:domLocker` component creates a `<div>` element and a `<lightning:button>` component.

Here's the client-side controller that peeks around in the DOM.

```
({ /* domLockerController.js */
    peekInDom : function(cmp, event, helper) {
        console.log("cmp.getElements(): ", cmp.getElements());
        // access the DOM in c:domLocker
        console.log("div1: ", cmp.find("div1").getElement());
        console.log("button1: ", cmp.find("button1"));
        console.log("button name: ", event.getSource().get("v.name"));

        // returns an error
        //console.log("button1 element: ", cmp.find("button1").getElement());
    }
})
```

Valid DOM Access

The following methods are valid DOM access because the elements are created by `c:domLocker`.

`cmp.getElements()`
Returns the elements in the DOM rendered by the component.

`cmp.find()`
Returns the div and button components, identified by their `aura:id` attributes.

`cmp.find("div1").getElement()`
Returns the DOM element for the div as `c:domLocker` created the div.

`event.getSource().get("v.name")`
Returns the name of the button that dispatched the event; in this case, `myButton`.

Invalid DOM Access

You can't use `cmp.find("button1").getElement()` to access the DOM element created by `<lightning:button>`. LockerService doesn't allow `c:domLocker` to access the DOM for `<lightning:button>` because the button is in the lightning namespace and `c:domLocker` is in the `c` namespace.

If you uncomment the code for `cmp.find("button1").getElement()`, you'll see an error:

```
c:domLocker$controller$peekInDom [cmp.find(...).getElement is not a function]
```

SEE ALSO:

What is LockerService?

Using JavaScript

Salesforce Lightning CLI

Lightning CLI is a Heroku Toolbelt plugin that lets you scan your code for general JavaScript coding issues and Lightning-specific issues. This tool is useful for preparing your Lightning components code for LockerService enablement.

Lightning CLI is a linting tool based on the open source ESLint project. Like ESLint, the CLI tool flags general JavaScript issues it finds in your code.

Lightning CLI alerts you to specific issues related to LockerService. Issues that are flagged include incorrect Lightning components code, and usage of unsupported or private JavaScript API methods. Lightning CLI installs into the Heroku Toolbelt, and is used on the command line.

IN THIS SECTION:

Install Salesforce Lightning CLI

Install Lightning CLI as a Heroku Toolbelt plugin. Then, update the Heroku Toolbelt to get the latest Lightning CLI rules.

Lightning CLI relies on Heroku Toolbelt. Make sure that you have the `heroku` command installed correctly before attempting to use Lightning CLI. More information about Heroku Toolbelt is available here:

`https://devcenter.heroku.com/articles/getting-started-with-nodejs#set-up`

After getting Heroku Toolbelt up and running, install the Lightning CLI plugin using the following command:

```
heroku plugins:install salesforce-lightning-cli
```

Once installed, the plugin is updated whenever you update the Heroku Toolbelt using the `heroku update` command. Run the update command every week or so to make sure you've got the latest Lightning CLI rules.

Use Salesforce Lightning CLI

Run Lightning CLI just like any other lint command-line tool. The only trick is invoking it through the `heroku` command. Your shell window shows the results.

Normal Use

You can run the Lightning CLI linter on any folder that contains Lightning components:

```
heroku lightning:lint ./path/to/lightning/components/
```

Note: Lightning CLI runs only on local files. Download your component code to your machine using the Metadata API, or a tool such as the Force.com IDE, the Force.com Migration Tool, or various third-party options.

The default output only shows errors. To see warnings too, use the verbose mode option.

See "Review and Resolve Problems" for what to do with the output of running Lightning CLI.

Common Options

Filtering Files

Sometimes, you just want to scan a particular kind of file. The `--files` argument allows you to set a pattern to match files against.

For example, the following command allows you to scan controllers only:

```
heroku lightning:lint ./path/to/lightning/components/ --files **/*Controller.js
```

Verbose Mode

The default output only shows errors so you can focus on bigger issues. The `--verbose` argument allows you to see warning messages and errors during the linting process.

SEE ALSO:

Salesforce Lightning CLI Options

Review and Resolve Problems

When you run Lightning CLI on your Lightning components code, the tool outputs results for each issue found in the files scanned. Review the results and resolve problems in your code.

For example, here is some example output.

```
error     secure-document    Invalid SecureDocument API
  Line:109:29
  scrapping = document.innerHTML;
  ^

  warning   no-plusplus   Unary operator '++' used
  Line:120:50
  for (var i = (index+1); i < sibs.length; i++) {
  ^

  error    secure-window  Invalid SecureWindow API
  Line:33:21
  var req = new XMLHttpRequest();
  ^

  error  default-case  Expected a default case
  Line:108:13
  switch (e.keyCode) {
  ^
```

Issues are displayed, one for each warning or error. Each issue includes the line number, severity, and a brief description of the issue. It also includes the rule name, which you can use to look up a more detailed description of the issue. See "Salesforce Lightning CLI Rules" for the rules applied by Lightning CLI, as well as possible resolutions and options for further reading.

Your mission is to review each issue, examine the code in question, and to revise it to eliminate all of the genuine problems.

While no automated tool is perfect, we expect that most errors and warnings generated by Lightning CLI will point to genuine issues in your code, which you should plan to fix before using the code with LockerService enabled.

SEE ALSO:

Salesforce Lightning CLI Rules

Salesforce Lightning CLI Rules

Rules built into Lightning CLI cover restrictions under LockerService, correct use of Lightning APIs, and a number of best practices for writing Lightning components code. Each rule, when triggered by your code, points to an area where your code might have an issue.

In addition to the Lightning-specific rules we've created, other rules are active in Lightning CLI, included from ESLint. Documentation for these rules is available on the ESLint project site. When you encounter an error or warning from a rule not described here, search for it on the ESLint Rules page.

IN THIS SECTION:

Validate JavaScript Intrinsic APIs (`ecma-intrinsics`)

This rule deals with the intrinsic APIs in JavaScript, more formally known as ECMAScript.

When LockerService is enabled, the framework prevents the use of unsupported API objects or calls. That means your Lightning components code is allowed to use:

- Features built into JavaScript ("intrinsic" features)
- Published, supported features built into the Lightning Component framework
- Published, supported features built into LockerService *SecureObject* objects

What exactly are these "intrinsic APIs"? They're the APIs defined in the ECMAScript Language Specification. That is, things built into JavaScript. This includes Annex B of the specification, which deals with legacy browser features that aren't part of the "core" of JavaScript, but are nevertheless still supported for JavaScript running inside a web browser.

Note that some features of JavaScript that you might consider intrinsic—for example, the `window` and `document` global variables—are superceded by *SecureObject* objects, which offer a more constrained API.

Rule Details

This rule verifies that use of the intrinsic JavaScript APIs is according to the published specification. The use of non-standard, deprecated, and removed language features is disallowed.

Further Reading

- ECMAScript specification
- Annex B: Additional ECMAScript Features for Web Browsers
- Intrinsic Objects (JavaScript)

SEE ALSO:

Validate Aura API (aura-api)

Validate Lightning Component Public API (secure-component)

Validate Secure Document Public API (secure-document)

Validate Secure Window Public API (secure-window)

Disallow `instanceof` (`no-instanceof`)

This rule aims to eliminate the use of `instanceof`, and direct comparison with `Array` or `Object` primitives.

The framework sometimes, for security reasons, evaluates a component's code in a different iframe or worker. As a result your code might fail under certain conditions. For these reasons, it's a best practice to avoid using `instanceof`.

Why is this? Different scopes have different execution environments. This means that they have different built-ins—different global objects, different constructors, etc. This can produce results you might, at first, find unintuitive. For example, `[] instanceof window.parent.Array` returns `false`, because `Array.prototype !== window.parent.Array`, and arrays inherit from the former.

You'll encounter this issue when you're dealing with multiple frames or windows in your script and pass objects from one context to another via functions. Because the security infrastructure of the framework does this automatically, you want to write code that behaves consistently no matter what context it executes in.

Rule Details

The following patterns are considered problematic:

```
if (foo instanceof bar) {
    // do something!
}
if (foo.prototype === Array) {
    // do something
}
if (foo.prototype === Object) {
    // do something else
}
```

The following patterns make use of built in JavaScript or Lightning components utility functions, and are a suggested alternative:

```
if (Array.isArray(foo)) {
    // do something
}
if ($A.util.isPlainObject(foo)) {
    // do something else
}
```

Further Reading

- instanceof
- Array.isArray
- typeof

Validate Aura API (`aura-api`)

This rule verifies that use of the framework APIs is according to the published documentation. The use of undocumented or private features is disallowed.

When LockerService is enabled, the framework prevents the use of unsupported API objects or calls. That means your Lightning components code is allowed to use:

- Features built into JavaScript ("intrinsic" features)
- Published, supported features built into the Lightning Component framework
- Published, supported features built into LockerService *SecureObject* objects

This rule deals with the supported, public framework APIs, for example, those available through the framework global `$A`.

Why is this rule called "Aura API"? Because the core of the the Lightning Component framework is the open source Aura Framework. And this rule verifies permitted uses of that framework, rather than anything specific to Lightning Components.

Rule Details

The following patterns are considered problematic:

```
Aura.something(); // Use $A instead
$A.util.fake(); // fake is not available in $A.util
```

Further Reading

For details of all of the methods available in the framework, including `$A`, see the JavaScript API at `https://myDomain.lightning.force.com/auradocs/reference.app`, where *`myDomain`* is the name of your custom Salesforce domain.

SEE ALSO:

Validate Lightning Component Public API (secure-component)
Validate Secure Document Public API (secure-document)
Validate Secure Window Public API (secure-window)

Validate Lightning Component Public API (`secure-component`)

This rule validates that only public, supported framework API functions and properties are used.

When LockerService is enabled, the framework prevents the use of unsupported API objects or calls. That means your Lightning components code is allowed to use:

- Features built into JavaScript ("intrinsic" features)
- Published, supported features built into the Lightning Component framework
- Published, supported features built into LockerService *SecureObject* objects

Prior to LockerService, when you created or obtained a reference to a component, you could call any function and access any property available on that component, even if it wasn't public. When LockerService is enabled, components are "wrapped" by a new SecureComponent object, which controls access to the component and its functions and properties. SecureComponent restricts you to using only published, supported component API.

Rule Details

The reference doc app lists the API for `SecureComponent`. Access the reference doc app at:

`https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain.

The API for `SecureComponent` is listed at **JavaScript API** > **Component**.

Further Reading

- SecureComponent.js Implementation

SEE ALSO:

Validate Aura API (aura-api)

Validate Secure Document Public API (secure-document)

Validate Secure Window Public API (secure-window)

Validate Secure Document Public API (`secure-document`)

This rule validates that only supported functions and properties of the `document` global are accessed.

When LockerService is enabled, the framework prevents the use of unsupported API objects or calls. That means your Lightning components code is allowed to use:

- Features built into JavaScript ("intrinsic" features)
- Published, supported features built into the Lightning Component framework
- Published, supported features built into LockerService *SecureObject* objects

Prior to LockerService, when you accessed the `document` global, you could call any function and access any property available. When LockerService is enabled, the `document` global is "wrapped" by a new SecureDocument object, which controls access to `document` and its functions and properties. SecureDocument restricts you to using only "safe" features of the `document` global.

Further Reading

- SecureDocument.js Implementation

SEE ALSO:

Validate Aura API (aura-api)

Validate Lightning Component Public API (secure-component)

Validate Secure Window Public API (secure-window)

Validate Secure Window Public API (`secure-window`)

This rule validates that only supported functions and properties of the `window` global are accessed.

When LockerService is enabled, the framework prevents the use of unsupported API objects or calls. That means your Lightning components code is allowed to use:

- Features built into JavaScript ("intrinsic" features)
- Published, supported features built into the Lightning Component framework
- Published, supported features built into LockerService *SecureObject* objects

Prior to LockerService, when you accessed the `window` global, you could call any function and access any property available. When LockerService is enabled, the `window` global is "wrapped" by a new SecureWindow object, which controls access to `window` and its functions and properties. SecureWindow restricts you to using only "safe" features of the `window` global.

Further Reading

- SecureWindow.js Implementation

SEE ALSO:

Validate Aura API (aura-api)

Validate Lightning Component Public API (secure-component)

Validate Secure Document Public API (secure-document)

Custom "House Style" Rules

Customize the JavaScript style rules that Salesforce Lightning CLI applies to your code.

It's common that different organizations or projects will adopt different JavaScript rules. The Lightning CLI tool is here to help you get ready for LockerService, not enforce Salesforce coding conventions. To that end, the Lightning CLI rules are divided into two sets, *security* rules and *style* rules. The security rules can't be modified, but you can modify or add to the style rules.

Use the `--config` argument to provide a custom rules configuration file. A custom rules configuration file allows you to define your own code style rules, which affect the **style** rules used by the Lightning CLI tool.

Note: If failure of a custom rule generates a warning, the warning doesn't appear in the default output. To see warnings, use the `--verbose` flag.

The Lightning CLI default style rules are provided below. Copy the rules to a new file, and modify them to match your preferred style rules. Alternatively, you can use your existing ESLint rule configuration file directly. For example:

```
heroku lightning:lint ./path/to/lightning/components/ --config ~/.eslintrc
```

Note: Not all ESLint rules can be added or modified using `--config`. Only rules that we consider benign or neutral in the context of Lightning Platform are activated by Lightning CLI. And again, you can't override the security rules.

Default Style Rules

Here are the default style rules used by Lightning CLI.

```
/*
 * Copyright (C) 2016 salesforce.com, inc.
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 *         http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

 module.exports = {
    rules: {
        // code style rules, these are the default value, but the user can
        // customize them via --config in the linter by providing custom values
        // for each of these rules.
        "no-trailing-spaces": 1,
        "no-spaced-func": 1,
        "no-mixed-spaces-and-tabs": 0,
        "no-multi-spaces": 0,
        "no-multiple-empty-lines": 0,
        "no-lone-blocks": 1,
        "no-lonely-if": 1,
        "no-inline-comments": 0,
        "no-extra-parens": 0,
        "no-extra-semi": 1,
       "no-warning-comments": [0, { "terms": ["todo", "fixme", "xxx"], "location": "start"
 }],
        "block-scoped-var": 1,
        "brace-style": [1, "1tbs"],
        "camelcase": 1,
        "comma-dangle": [1, "never"],
        "comma-spacing": 1,
        "comma-style": 1,
        "complexity": [0, 11],
        "consistent-this": [0, "that"],
        "curly": [1, "all"],
        "eol-last": 0,
        "func-names": 0,
        "func-style": [0, "declaration"],
        "generator-star-spacing": 0,
        "indent": 0,
        "key-spacing": 0,
        "keyword-spacing": [0, "always"],
        "max-depth": [0, 4],
        "max-len": [0, 80, 4],
        "max-nested-callbacks": [0, 2],
        "max-params": [0, 3],
        "max-statements": [0, 10],
        "new-cap": 0,
        "newline-after-var": 0,
        "one-var": [0, "never"],
        "operator-assignment": [0, "always"],
        "padded-blocks": 0,
        "quote-props": 0,
        "quotes": 0,
        "semi": 1,
        "semi-spacing": [0, {"before": false, "after": true}],
        "sort-vars": 0,
        "space-after-function-name": [0, "never"],
        "space-before-blocks": [0, "always"],
        "space-before-function-paren": [0, "always"],
        "space-before-function-parentheses": [0, "always"],
        "space-in-brackets": [0, "never"],
        "space-in-parens": [0, "never"],
        "space-infix-ops": 0,
        "space-unary-ops": [1, { "words": true, "nonwords": false }],
        "spaced-comment": [0, "always"],
        "vars-on-top": 0,
        "valid-jsdoc": 0,
        "wrap-regex": 0,
        "yoda": [1, "never"]
    }
};
```

Salesforce Lightning CLI Options

There are several options that modify the behavior of Lightning CLI.

The following options are available.

Option	Description
`-i`, `--ignore` *`IGNORE`*	Pattern to ignore some folders. For example, to ignore any folder named `foo`: `--ignore **/foo/**`
`--files` *`FILES`*	Pattern to include only specific files. Defaults to all `.js` files. For example, to include only client-side controllers: `--files **/*Controller.js`
`-j`, `--json`	Output JSON to facilitate integration with other tools. Without this option, defaults to standard text output format.

Option	Description
`--config CONFIG`	Path to a custom ESLint configuration. Only code styles rules are picked up, the rest are ignored. For example: `--config path/to/.eslintrc`
`--verbose`	Report errors and warnings. By default, Lightning CLI reports only errors.

Lightning CLI also provides some built-in help, which you can access at any time with the following commands:

```
heroku lightning --help
heroku lightning:lint --help
```

SEE ALSO:

Use Salesforce Lightning CLI

Styling Apps

An app is a special top-level component whose markup is in a `.app` resource. Just like any other component, you can put CSS in its bundle in a resource called `<appName>.css`.

For example, if the app markup is in `notes.app`, its CSS is in `notes.css`.

When viewed in Salesforce1 and Lightning Experience, the UI components include styling that matches those visual themes. For example, the `ui:button` includes the `button--neutral` class to display a neutral style. The input components that extend `ui:input` include the `uiInput--input` class to display the input fields using a custom font in addition to other styling.

Note: Styles added to UI components in Salesforce1 and Lightning Experience don't apply to components in standalone apps.

IN THIS SECTION:

Using the Salesforce Lightning Design System in Apps

The Salesforce Lightning Design System provides a look and feel that's consistent with Lightning Experience. Use Lightning Design System styles to give your custom applications a UI that is consistent with Salesforce, without having to reverse-engineer our styles.

Using External CSS

To reference an external CSS resource that you've uploaded as a static resource, use a `<ltng:require>` tag in your `.cmp` or `.app` markup.

More Readable Styling Markup with the join Expression

Markup can get messy when you specify the class names to apply based on the component attribute values. Try using a `join` expression for easier-to-read markup.

Tips for CSS in Components

Here are some tips for configuring the CSS for components that you plan to use in Lightning Pages, the Lightning App Builder, or the Community Builder.

Styling with Design Tokens

Capture the essential values of your visual design into named tokens. Define the token values once and reuse them throughout your Lightning components CSS resources. Tokens make it easy to ensure that your design is consistent, and even easier to update it as your design evolves.

SEE ALSO:

CSS in Components

Add Lightning Components as Custom Tabs in Salesforce1

Using the Salesforce Lightning Design System in Apps

The Salesforce Lightning Design System provides a look and feel that's consistent with Lightning Experience. Use Lightning Design System styles to give your custom applications a UI that is consistent with Salesforce, without having to reverse-engineer our styles.

Your application automatically gets Lightning Design System styles and design tokens if it extends `force:slds`. This method is the easiest way to stay up to date and consistent with Lightning Design System enhancements.

To extend `force:slds`:

```
<aura:application extends="force:slds">
    <!-- customize your application here -->
</aura:application>
```

Using a Static Resource

When you extend `force:slds`, the version of Lightning Design System styles are automatically updated whenever the CSS changes. If you want to use a specific Lightning Design System version, download the version and add it to your org as a static resource.

Note: We recommend extending `force:slds` instead so that you automatically get the latest Lightning Design System styles. If you stick to a specific Lightning Design System version, your app's styles will gradually start to drift from later versions in Lightning Experience or incur the cost of duplicate CSS downloads.

To download the latest version of Lightning Design System, generate and download it.

We recommend that you name the Lightning Design System archive static resource using the name format SLDS`###`, where `###` is the Lightning Design System version number (for example, *`SLDS203`*). This lets you have multiple versions of the Lightning Design System installed, and manage version usage in your components.

To use the static version of the Lightning Design System in a component, include it using `<ltng:require/>`. For example:

```
<aura:component>
    <ltng:require
       styles="{!$Resource.SLDS203 + '/assets/styles/lightning-design-system-ltng.css'}"/>
</aura:component>
```

SEE ALSO:

Styling with Design Tokens

Using External CSS

To reference an external CSS resource that you've uploaded as a static resource, use a `<ltng:require>` tag in your `.cmp` or `.app` markup.

Here's an example of using `<ltng:require>`:

```
<ltng:require styles="{!$Resource.resourceName}" />
```

`resourceName` is the `Name` of the static resource. In a managed packaged, the resource name must include the package namespace prefix, such as `$Resource.yourNamespace__resourceName`. For a stand-alone static resource, such as an individual graphic or script, that's all you need. To reference an item within an archive static resource, add the rest of the path to the item using string concatenation.

Here are some considerations for loading styles:

Loading Sets of CSS

Specify a comma-separated list of resources in the `styles` attribute to load a set of CSS.

> Note: Due to a quirk in the way `$Resource` is parsed in expressions, use the `join` operator to include multiple `$Resource` references in a single attribute. For example, if you have more than one style sheet to include into a component the `styles` attribute should be something like the following.

```
styles="{!join(',',
    $Resource.myStyles + '/stylesheetOne.css',
    $Resource.myStyles + '/moreStyles.css')}"
```

Loading Order

The styles are loaded in the order that they are listed.

One-Time Loading

The styles load only once, even if they're specified in multiple `<ltng:require>` tags in the same component or across different components.

Encapsulation

To ensure encapsulation and reusability, add the `<ltng:require>` tag to every `.cmp` or `.app` resource that uses the CSS resource.

`<ltng:require>` also has a `scripts` attribute to load a list of JavaScript libraries. The `afterScriptsLoaded` event enables you to call a controller action after the `scripts` are loaded. It's only triggered by loading of the `scripts` and is never triggered when the CSS in `styles` is loaded.

For more information on static resources, see "Static Resources" in the Salesforce online help.

Styling Components for Lightning Experience or Salesforce1

To prevent styling conflicts in Lightning Experience or Salesforce1, prefix your external CSS with a unique namespace. For example, if you prefix your external CSS declarations with `.myBootstrap`, wrap your component markup with a `<div>` tag that specifies the `myBootstrap` class.

```
<ltng:require styles="{!$Resource.bootstrap}"/>
<div class="myBootstrap">
    <c:myComponent />
    <!-- Other component markup -->
</div>
```

Note: Prefixing your CSS with a unique namespace only applies to external CSS. If you're using CSS within a component bundle, the `.THIS` keyword becomes `.namespaceComponentName` during runtime.

SEE ALSO:

Using External JavaScript Libraries

CSS in Components

$Resource

More Readable Styling Markup with the `join` Expression

Markup can get messy when you specify the class names to apply based on the component attribute values. Try using a `join` expression for easier-to-read markup.

This example sets the class names based on the component attribute values. It's readable, but the spaces between class names are easy to forget.

```
<li class="{! 'calendarEvent ' +
    v.zoomDirection + ' ' +
    (v.past ? 'pastEvent ' : '') +
    (v.zoomed ? 'zoom ' : '') +
    (v.multiDayFragment ? 'multiDayFragment ' : '')}">
    <!-- content here -->
</li>
```

Sometimes, if the markup is not broken into multiple lines, it can hurt your eyes or make you mutter profanities under your breath.

```
<li class="{! 'calendarEvent ' + v.zoomDirection + ' ' + (v.past ? 'pastEvent ' : '') +
(v.zoomed ? 'zoom ' : '') + (v.multiDayFragment ? 'multiDayFragment ' : '')}">
    <!-- content here -->
</li>
```

Try using a `join` expression instead for easier-to-read markup. This example `join` expression sets `' '` as the first argument so that you don't have to specify it for each subsequent argument in the expression.

```
<li
    class="{! join(' ',
        'calendarEvent',
        v.zoomDirection,
        v.past ? 'pastEvent' : '',
        v.zoomed ? 'zoom' : '',
        v.multiDayFragment ? 'multiDayFragment' : ''
    )}">
    <!-- content here -->
</li>
```

You can also use a `join` expression for dynamic styling.

```
<div style="{! join(';',
    'top:' + v.timeOffsetTop + '%',
    'left:' + v.timeOffsetLeft + '%',
    'width:' + v.timeOffsetWidth + '%'
)}">
```

```
    <!-- content here -->
</div>
```

SEE ALSO:

Expression Functions Reference

Tips for CSS in Components

Here are some tips for configuring the CSS for components that you plan to use in Lightning Pages, the Lightning App Builder, or the Community Builder.

Components must be set to 100% width

Because they can be moved to different locations on a Lightning Page, components must not have a specific width nor a left or right margin. Components should take up 100% of whatever container they display in. Adding a left or right margin changes the width of a component and can break the layout of the page.

Don't remove HTML elements from the flow of the document

Some CSS rules remove the HTML element from the flow of the document. For example:

```
float: left;
float: right;
position: absolute;
position: fixed;
```

Because they can be moved to different locations on the page as well as used on different pages entirely, components must rely on the normal document flow. Using floats and absolute or fixed positions breaks the layout of the page the component is on. Even if they don't break the layout of the page *you're* looking at, they will break the layout of *some* page the component can be put on.

Child elements shouldn't be styled to be larger than the root element

The Lightning Page maintains consistent spacing between components, and can't do that if child elements are larger than the root element.

For example, avoid these patterns:

```
<div style="height: 100px">
  <div style="height: 200px">
    <!--Other markup here-->
  </div>
</div>
```

```
<!--Margin increases the element's effective size-->
<div style="height: 100px">
  <div style="height: 100px margin: 10px">
    <!--Other markup here-->
  </div>
</div>
```

Vendor Prefixes

Vendor prefixes, such as `—moz-` and `—webkit-` among many others, are automatically added in Lightning.

You only need to write the unprefixed version, and the framework automatically adds any prefixes that are necessary when generating the CSS output. If you choose to add them, they are used as-is. This enables you to specify alternative values for certain prefixes.

Example: For example, this is an unprefixed version of `border-radius`.

```
.class {
  border-radius: 2px;
}
```

The previous declaration results in the following declarations.

```
.class {
  -webkit-border-radius: 2px;
  -moz-border-radius: 2px;
  border-radius: 2px;
}
```

Styling with Design Tokens

Capture the essential values of your visual design into named tokens. Define the token values once and reuse them throughout your Lightning components CSS resources. Tokens make it easy to ensure that your design is consistent, and even easier to update it as your design evolves.

Design tokens are visual design "atoms" for building a design for your components or apps. Specifically, they're named entities that store visual design attributes, such as pixel values for margins and spacing, font sizes and families, or hex values for colors. Tokens are a terrific way to centralize the low-level values, which you then use to compose the styles that make up the design of your component or app.

IN THIS SECTION:

Tokens Bundles

Tokens are a type of bundle, just like components, events, and interfaces.

A tokens bundle contains only one resource, a tokens collection definition.

Resource	Resource Name	Usage
Tokens Collection	`defaultTokens.tokens`	The only required resource in a tokens bundle. Contains markup for one or more tokens. Each tokens bundle contains only one tokens resource.

Note: You can't edit the tokens bundle name or description in the Developer Console after you create it. The bundle's `AuraBundleDefinition` can be modified using the Metadata API.

A tokens collection starts with the `<aura:tokens>` tag. It can only contain `<aura:token>` tags to define tokens.

Tokens collections have restricted support for expressions; see Using Expressions in Tokens. You can't use other markup, renderers, controllers, or anything else in a tokens collection.

SEE ALSO:

Using Expressions in Tokens

Create a Tokens Bundle

Create a tokens bundle in your org using the Developer Console.

To create a tokens bundle:

1. In the Developer Console, select **File** > **New** > **Lightning Tokens**.
2. Enter a name for the tokens bundle.

   Your first tokens bundle should be named *`defaultTokens`*. The tokens defined within `defaultTokens` are automatically accessible in your Lightning components. Tokens defined in any other bundle won't be accessible in your components unless you import them into the `defaultTokens` bundle.

You have an empty tokens bundle, ready to edit.

```
<aura:tokens>

</aura:tokens>
```

Note: You can't edit the tokens bundle name or description in the Developer Console after you create it. The bundle's `AuraBundleDefinition` can be modified using the Metadata API. Although you can set a version on a tokens bundle, doing so has no effect.

Defining and Using Tokens

A token is a name-value pair that you specify using the `<aura:token>` component. Define tokens in a tokens bundle, and then use tokens in your components' CSS styles resources.

Defining Tokens

Add new tokens as child components of the bundle's `<aura:tokens>` component. For example:

```
<aura:tokens>
    <aura:token name="myBodyTextFontFace"
              value="'Salesforce Sans', Helvetica, Arial, sans-serif"/>
    <aura:token name="myBodyTextFontWeight" value="normal"/>
    <aura:token name="myBackgroundColor" value="#f4f6f9"/>
    <aura:token name="myDefaultMargin" value="6px"/>
</aura:tokens>
```

The only allowed attributes for the `<aura:token>` tag are `name` and `value`.

Using Tokens

Tokens created in the `defaultTokens` bundle are automatically available in components in your namespace. To use a design token, reference it using the `token()` function and the token name in the CSS resource of a component bundle. For example:

```
.THIS p {
    font-family: token(myBodyTextFontFace);
    font-weight: token(myBodyTextFontWeight);
}
```

If you prefer a more concise function name for referencing tokens, you can use the `t()` function instead of `token()`. The two are equivalent. If your token names follow a naming convention or are sufficiently descriptive, the use of the more terse function name won't affect the clarity of your CSS styles.

Using Expressions in Tokens

Tokens support a restricted set of expressions. Use expressions to reuse one token value in another token, or to combine tokens to form a more complex style property.

Cross-Referencing Tokens

To reference one token's value in another token's definition, wrap the token to be referenced in standard expression syntax.

In the following example, we'll reference tokens provided by Salesforce in our custom tokens. Although you can't see the standard tokens directly, we'll imagine they look something like the following.

```
<!-- force:base tokens (SLDS standard tokens) -->
<aura:tokens>
  ...
  <aura:token name="colorBackground" value="rgb(244, 246, 249)" />
  <aura:token name="fontFamily" value="'Salesforce Sans', Arial, sans-serif" />
  ...
</aura:tokens>
```

With the preceding in mind, you can reference the standard tokens in your custom tokens, as in the following.

```
<!-- defaultTokens.tokens (your tokens) -->
<aura:tokens extends="force:base">
  <aura:token name="mainColor" value="{! colorBackground }" />
  <aura:token name="btnColor" value="{! mainColor }" />
  <aura:token name="myFont" value="{! fontFamily }" />
</aura:tokens>
```

You can only cross-reference tokens defined in the same file or a parent.

Expression syntax in tokens resources is restricted to references to other tokens.

Combining Tokens

To support combining individual token values into more complex CSS style properties, the `token()` function supports string concatenation. For example, if you have the following tokens defined:

```
<!-- defaultTokens.tokens (your tokens) -->
<aura:tokens>
  <aura:token name="defaultHorizonalSpacing" value="12px" />
  <aura:token name="defaultVerticalSpacing" value="6px" />
</aura:tokens>
```

You can combine these two tokens in a CSS style definition. For example:

```
/* myComponent.css */
.THIS div.notification {
  margin: token(defaultVerticalSpacing + ' ' + defaultHorizonalSpacing);
  /* more styles here */
}
```

You can mix tokens with strings as much as necessary to create the right style definition. For example, use `margin: token(defaultVerticalSpacing + ' ' + defaultHorizonalSpacing + ' 3px');` to hard code the bottom spacing in the preceding definition.

The only operator supported within the `token()` function is "+" for string concatenation.

SEE ALSO:

Defining and Using Tokens

Extending Tokens Bundles

Use the `extends` attribute to extend one tokens bundle from another.

To add tokens from one bundle to another, extend the "child" tokens bundle from the "parent" tokens, like this.

```
<aura:tokens extends="yourNamespace:parentTokens">
    <!-- additional tokens here -->
</aura:tokens>
```

Overriding tokens values works mostly as you'd expect: tokens in a child tokens bundle override tokens with the same name from a parent bundle. The exception is if you're using standard tokens. You can't override standard tokens in Lightning Experience or Salesforce1.

Important: Overriding standard token values is undefined behavior and unsupported. If you create a token with the same name as a standard token, it overrides the standard token's value in some contexts, and has no effect in others. This behavior will change in a future release. Don't use it.

SEE ALSO:

Using Standard Design Tokens

Using Standard Design Tokens

Salesforce exposes a set of "base" tokens that you can access in your component style resources. Use these standard tokens to mimic the look-and-feel of the Salesforce Lightning Design System (SLDS) in your own custom components. As the SLDS evolves, components that are styled using the standard design tokens will evolve along with it.

To add the standard tokens to your org, extend a tokens bundle from the base tokens, like so.

```
<aura:tokens extends="force:base">
    <!-- your own tokens here -->
</aura:tokens>
```

Once added to `defaultTokens` (or another tokens bundle that `defaultTokens` extends) you can reference tokens from `force:base` just like your own tokens, using the `token()` function and token name. For example:

```
.THIS p {
    font-family: token(fontFamily);
    font-weight: token(fontWeightRegular);
}
```

You can mix-and-match your tokens with the standard tokens. It's a best practice to develop a naming system for your own tokens to make them easily distinguishable from standard tokens. Consider prefixing your token names with "my", or something else easily identifiable.

IN THIS SECTION:

Overriding Standard Tokens (Developer Preview)

Standard tokens provide the look-and-feel of the Lightning Design System in your custom components. You can override standard tokens to customize and apply branding to your Lightning apps.

Standard Design Tokens—force:base

The standard tokens available are a subset of the design tokens offered in the Salesforce Lightning Design System (SLDS). The following tokens are available when extending from `force:base`.

Standard Design Tokens for Communities

Use a subset of the standard design tokens to make your components compatible with the Branding panel in Community Builder. The Branding panel enables administrators to quickly style an entire community using branding properties. Each property in the Branding panel maps to one or more standard design tokens. When an administrator updates a property in the Branding panel, the system automatically updates any Lightning components that use the tokens associated with that branding property.

SEE ALSO:

Extending Tokens Bundles

Overriding Standard Tokens (Developer Preview)

Standard tokens provide the look-and-feel of the Lightning Design System in your custom components. You can override standard tokens to customize and apply branding to your Lightning apps.

Note: Overriding standard tokens is available as a developer preview. This feature isn't generally available unless or until Salesforce announces its general availability in documentation or in press releases or public statements. You can provide feedback and suggestions for this feature on the IdeaExchange.

To override a standard token for your Lightning app, create a tokens bundle with a unique name, for example `myOverrides`. In the tokens resource, redefine the value for a standard token:

```
<aura:tokens>
    <aura:token name="colorTextBrand" value="#8d7d74"/>
</aura:tokens>
```

In your Lightning app, specify the tokens bundle in the `tokens` attribute:

```
<aura:application tokens="c:myOverrides">
    <!-- Your app markup here -->
</aura:application>
```

Token overrides apply across your app, including resources and components provided by Salesforce and components of your own that use tokens.

Packaging apps that use the tokens attribute is unsupported.

Important: Overriding standard token values within `defaultTokens.tokens`, a required resource in a tokens bundle, is unsupported. If you create a token with the same name as a standard token, it overrides the standard token's value in some contexts, and has no effect in others. Overrides should only be done in a separate resource as described above.

SEE ALSO:

Standard Design Tokens—force:base

Standard Design Tokens—`force:base`

The standard tokens available are a subset of the design tokens offered in the Salesforce Lightning Design System (SLDS). The following tokens are available when extending from `force:base`.

Available Tokens

Important: The standard token values evolve along with SLDS. Available tokens and their values can change without notice. Token values presented here are for example only.

Token Name	Example Value
`borderWidthThin`	1px
`borderWidthThick`	2px
`borderStrokeWidthThin`	1px
`borderStrokeWidthThick`	2px
`spacingNone`	0
`spacingXxxSmall`	0.125rem
`spacingXxSmall`	0.25rem
`spacingXSmall`	0.5rem
`spacingSmall`	0.75rem
`spacingMedium`	1rem
`spacingLarge`	1.5rem
`spacingXLarge`	2rem
`spacingXxLarge`	3rem
`sizeXxSmall`	6rem

Token Name	Example Value
`sizeXSmall`	12rem
`sizeSmall`	15rem
`sizeMedium`	20rem
`sizeLarge`	25rem
`sizeXLarge`	40rem
`sizeXxLarge`	60rem
`squareIconUtilitySmall`	1rem
`squareIconUtilityMedium`	1.25rem
`squareIconUtilityLarge`	1.5rem
`squareIconLargeBoundary`	3rem
`squareIconLargeBoundaryAlt`	5rem
`squareIconLargeContent`	2rem
`squareIconMedium`	2.375rem
`squareIconMediumBoundary`	2rem
`squareIconMediumBoundaryAlt`	2.25rem
`squareIconMediumContent`	1rem
`squareIconMediumContentAlt`	0.875rem
`squareIconSmall`	1rem
`squareIconSmallBoundary`	1.5rem
`squareIconSmallContent`	.75rem
`squareIconXSmallBoundary`	1.25rem
`squareIconXSmallContent`	.5rem
`squareIconXxSmallBoundary`	1rem
`squareIconXxSmallContent`	.875rem
`squareIconLarge`	3.125rem
`heightPill`	1.625rem
`fillBrand`	rgb(0, 112, 210)
`fillBrandHover`	rgb(0, 95, 178)
`fillBrandActive`	rgb(22, 50, 92)
`fillHeaderButton`	rgb(159, 170, 181)

Token Name	Example Value
`fillHeaderButtonHover`	rgb(0, 95, 178)
`fontWeightLight`	300
`fontWeightRegular`	400
`fontWeightBold`	700
`fontSizeXSmall`	0.625rem
`fontSizeSmall`	0.875rem
`fontSizeMedium`	1rem
`fontSizeMediumA`	1.125rem
`fontSizeLarge`	1.25rem
`fontSizeXLarge`	1.5rem
`fontSizeXLargeA`	1.57rem
`fontSizeXxLarge`	2rem
`fontSizeTextXxSmall`	.625rem
`fontSizeTextXSmall`	.75rem
`fontSizeTextSmall`	.8125rem
`fontSizeTextMedium`	1rem
`fontSizeTextLarge`	1.125rem
`fontSizeTextXLarge`	1.25rem
`fontSizeHeadingXxSmall`	.625rem
`fontSizeHeadingXSmall`	.75rem
`fontSizeHeadingSmall`	.875rem
`fontSizeHeadingMedium`	1.125rem
`fontSizeHeadingLarge`	1.5rem
`fontSizeHeadingXLarge`	2rem
`lineHeightHeading`	1.25
`lineHeightText`	1.375
`lineHeightReset`	1
`lineHeightTab`	2.5rem
`fontFamily`	'Salesforce Sans', Arial, sans-serif
`fontFamilyText`	'Salesforce Sans', Arial, sans-serif

Token Name	Example Value
`fontFamilyHeading`	'Salesforce Sans', Arial, sans-serif
`borderRadiusSmall`	.125rem
`borderRadiusMedium`	.25rem
`borderRadiusLarge`	.5rem
`borderRadiusPill`	15rem
`borderRadiusCircle`	50%
`colorBorder`	rgb(216, 221, 230)
`colorBorderBrand`	rgb(21, 137, 238)
`colorBorderBrandDark`	rgb(0, 112, 210)
`colorBorderCustomer`	rgb(255, 154, 60)
`colorBorderDestructive`	rgb(194, 57, 52)
`colorBorderDestructiveHover`	rgb(166, 26, 20)
`colorBorderDestructiveActive`	rgb(135, 5, 0)
`colorBorderInfo`	rgb(84, 105, 141)
`colorBorderError`	rgb(194, 57, 52)
`colorBorderErrorAlt`	rgb(234, 130, 136)
`colorBorderErrorDark`	rgb(234, 130, 136)
`colorBorderOffline`	rgb(68, 68, 68)
`colorBorderSuccess`	rgb(75, 202, 129)
`colorBorderSuccessDark`	rgb(4, 132, 75)
`colorBorderWarning`	rgb(255, 183, 93)
`colorBorderInverse`	rgb(6, 28, 63)
`colorBorderTabSelected`	rgb(0, 112, 210)
`colorBorderTabActive`	rgb(255, 255, 255)
`colorBorderSeparator`	rgb(244, 246, 249)
`colorBorderSeparatorAlt`	rgb(216, 221, 230)
`colorBorderSeparatorAlt2`	rgb(168, 183, 199)
`colorBorderSeparatorInverse`	rgb(42, 66, 108)
`colorBorderRowSelected`	rgb(0, 112, 210)
`colorBorderRowSelectedHover`	rgb(21, 137, 238)

Token Name	Example Value
`colorBorderHint`	rgb(42, 66, 108)
`colorBorderSelection`	rgb(0, 112, 210)
`colorBorderSelectionHover`	rgb(21, 137, 238)
`colorBorderSelectionActive`	rgb(244, 246, 249)
`colorBorderCanvasElementSelection`	rgb(94, 180, 255)
`colorBorderCanvasElementSelectionHover`	rgb(0, 95, 178)
`colorBorderIconInverseHint`	rgba(255, 255, 255, 0.5)
`colorBorderIconInverseHintHover`	rgba(255, 255, 255, 0.75)
`colorBorderButtonBrand`	rgb(0, 112, 210)
`colorBorderButtonBrandDisabled`	rgba(0, 0, 0, 0)
`colorBorderButtonDefault`	rgb(216, 221, 230)
`colorBorderButtonInverseDisabled`	rgba(255, 255, 255, 0.15)
`colorBorderInput`	rgb(216, 221, 230)
`colorBorderInputActive`	rgb(21, 137, 238)
`colorBorderInputDisabled`	rgb(168, 183, 199)
`colorBorderInputCheckboxSelectedCheckmark`	rgb(255, 255, 255)
`colorBorderToggleChecked`	rgb(255, 255, 255)
`colorStrokeBrand`	rgb(0, 112, 210)
`colorStrokeBrandHover`	rgb(0, 112, 210)
`colorStrokeBrandActive`	rgb(22, 50, 92)
`colorStrokeDisabled`	rgb(224, 229, 238)
`colorStrokeHeaderButton`	rgb(159, 170, 181)
`colorBackground`	rgb(244, 246, 249)
`colorBackgroundAlt`	rgb(255, 255, 255)
`colorBackgroundAlt2`	rgb(238, 241, 246)
`colorBackgroundAltInverse`	rgb(22, 50, 92)
`colorBackgroundRowHover`	rgb(244, 246, 249)
`colorBackgroundRowActive`	rgb(238, 241, 246)
`colorBackgroundRowSelected`	rgb(240, 248, 252)
`colorBackgroundRowNew`	rgb(217, 255, 223)

Token Name	Example Value
colorBackgroundInverse	rgb(6, 28, 63)
colorBackgroundBrowser	rgb(84, 105, 141)
colorBackgroundChromeMobile	rgb(0, 112, 210)
colorBackgroundChromeDesktop	rgb(255, 255, 255)
colorBackgroundCustomer	rgb(255, 154, 60)
colorBackgroundHighlight	rgb(250, 255, 189)
colorBackgroundHighlightSearch	rgb(255, 240, 63)
colorBackgroundSelection	rgb(216, 237, 255)
colorBackgroundActionbarIconUtility	rgb(84, 105, 141)
colorBackgroundIndicatorDot	rgb(22, 50, 92)
colorBackgroundSpinnerDot	rgb(159, 170, 181)
colorBackgroundModal	rgb(255, 255, 255)
colorBackgroundModalBrand	rgb(0, 112, 210)
colorBackgroundNotificationBadge	rgb(194, 57, 52)
colorBackgroundNotificationBadgeHover	rgb(0, 95, 178)
colorBackgroundNotificationBadgeFocus	rgb(0, 95, 178)
colorBackgroundNotificationBadgeActive	rgb(0, 57, 107)
colorBackgroundNotification	rgb(255, 255, 255)
colorBackgroundNotificationNew	rgb(240, 248, 252)
colorBackgroundOrgSwitcherArrow	rgb(6, 28, 63)
colorBackgroundPayload	rgb(244, 246, 249)
colorBackgroundPost	rgb(247, 249, 251)
colorBackgroundUtilityBarHover	rgb(224, 229, 238)
colorBackgroundUtilityBarActive	rgb(21, 137, 238)
colorBackgroundShade	rgb(224, 229, 238)
colorBackgroundShadeDark	rgb(216, 221, 230)
colorBackgroundStencil	rgb(238, 241, 246)
colorBackgroundStencilAlt	rgb(224, 229, 238)
colorBackgroundTempModal	rgba(126, 140, 153, 0.8)
colorBackgroundTempModalTint	rgba(126, 140, 153, 0.8)

Token Name	Example Value
`colorBackgroundTempModalTintAlt`	rgba(255, 255, 255, 0.75)
`colorBackgroundBackdrop`	rgba(255, 255, 255, 0.75)
`colorBackgroundBackdropTint`	rgba(240, 248, 252, 0.75)
`colorBackgroundScrollbar`	rgb(224, 229, 238)
`colorBackgroundScrollbarTrack`	rgb(168, 183, 199)
`colorBrand`	rgb(21, 137, 238)
`colorBrandDark`	rgb(0, 112, 210)
`colorBrandDarker`	rgb(0, 95, 178)
`colorBackgroundToggle`	rgb(159, 170, 181)
`colorBackgroundToggleDisabled`	rgb(159, 170, 181)
`colorBackgroundToggleHover`	rgb(126, 140, 153)
`colorBackgroundToggleActive`	rgb(0, 112, 210)
`colorBackgroundToggleActiveHover`	rgb(0, 95, 178)
`colorBackgroundModalButton`	rgba(0, 0, 0, 0.07)
`colorBackgroundModalButtonActive`	rgba(0, 0, 0, 0.16)
`colorBackgroundInput`	rgb(255, 255, 255)
`colorBackgroundInputActive`	rgb(255, 255, 255)
`colorBackgroundInputCheckbox`	rgb(255, 255, 255)
`colorBackgroundInputCheckboxDisabled`	rgb(216, 221, 230)
`colorBackgroundInputCheckboxSelected`	rgb(21, 137, 238)
`colorBackgroundInputDisabled`	rgb(224, 229, 238)
`colorBackgroundInputError`	rgb(255, 221, 225)
`colorBackgroundInputSearch`	rgba(0, 0, 0, 0.16)
`colorBackgroundPill`	rgb(255, 255, 255)
`colorBackgroundImageOverlay`	rgba(0, 0, 0, 0.4)
`colorBackgroundDestructive`	rgb(194, 57, 52)
`colorBackgroundDestructiveHover`	rgb(166, 26, 20)
`colorBackgroundDestructiveActive`	rgb(135, 5, 0)
`colorBackgroundInfo`	rgb(84, 105, 141)
`colorBackgroundError`	rgb(212, 80, 76)

Token Name	Example Value
colorBackgroundErrorDark	rgb(194, 57, 52)
colorBackgroundErrorAlt	rgb(234, 130, 136)
colorBackgroundOffline	rgb(68, 68, 68)
colorBackgroundSuccess	rgb(75, 202, 129)
colorBackgroundSuccessDark	rgb(4, 132, 75)
colorBackgroundToast	rgba(84, 105, 141, 0.95)
colorBackgroundToastSuccess	rgba(4, 132, 75, 0.95)
colorBackgroundToastError	rgba(194, 57, 52, 0.95)
colorBackgroundWarning	rgb(255, 183, 93)
colorBackgroundButtonSuccess	rgb(75, 202, 129)
colorBackgroundButtonSuccessHover	rgb(4, 132, 75)
colorBackgroundButtonSuccessActive	rgb(4, 132, 75)
shadowActionOverflowFooter	0 -2px 4px #F4F6F9
shadowOverlay	0 -2px 4px rgba(0, 0, 0, 0.07)
shadowDrag	0 2px 4px 0 rgba(0, 0, 0, 0.40)
shadowDropDown	0 2px 3px 0 rgba(0, 0, 0, 0.16)
shadowHeader	0 2px 4px rgba(0, 0, 0, 0.07)
shadowButton	0 1px 1px 0 rgba(0, 0, 0, 0.05)
shadowButtonFocus	0 0 3px #0070D2
shadowButtonFocusInverse	0 0 3px #E0E5EE
shadowInlineEdit	0 2px 4px 4px rgba(0, 0, 0, 0.16)
shadowFocusInset	0 0 2px 2px #1589EE inset
shadowDocked	0 -2px 2px 0 rgba(0, 0, 0, 0.16)
shadowImage	0 1px 1px rgba(0, 0, 0, 0.16)
elevation3Inset	-3
elevation0	0
elevation2	2
elevation4	4
elevation8	8
elevation16	16

Token Name	Example Value
`elevation32`	32
`elevationShadow3Below`	0 3px 3px 0 rgba(0, 0, 0, 0.16) inset
`elevationShadow0`	none
`elevationShadow2`	0 2px 2px 0 rgba(0, 0, 0, 0.16)
`elevationShadow4`	0 4px 4px 0 rgba(0, 0, 0, 0.16)
`elevationShadow8`	0 8px 8px 0 rgba(0, 0, 0, 0.16)
`elevationShadow16`	0 16px 16px 0 rgba(0, 0, 0, 0.16)
`elevationShadow32`	0 32px 32px 0 rgba(0, 0, 0, 0.16)
`elevationInverseShadow3Below`	0 -3px 3px 0 rgba(0, 0, 0, 0.16) inset
`elevationInverseShadow0`	none
`elevationInverseShadow2`	0 -2px 2px 0 rgba(0, 0, 0, 0.16)
`elevationInverseShadow4`	0 -4px 4px 0 rgba(0, 0, 0, 0.16)
`elevationInverseShadow8`	0 -8px 8px 0 rgba(0, 0, 0, 0.16)
`elevationInverseShadow16`	0 -16px 16px 0 rgba(0, 0, 0, 0.16)
`elevationInverseShadow32`	0 -32px 32px 0 rgba(0, 0, 0, 0.16)
`colorTextActionLabel`	rgb(84, 105, 141)
`colorTextActionLabelActive`	rgb(22, 50, 92)
`colorTextBrand`	rgb(21, 137, 238)
`colorTextBrowser`	rgb(255, 255, 255)
`colorTextBrowserActive`	rgba(0, 0, 0, 0.4)
`colorTextCustomer`	rgb(255, 154, 60)
`colorTextDefault`	rgb(22, 50, 92)
`colorTextError`	rgb(194, 57, 52)
`colorTextInputDisabled`	rgb(84, 105, 141)
`colorTextInputFocusInverse`	rgb(22, 50, 92)
`colorTextInputIcon`	rgb(159, 170, 181)
`colorTextInverse`	rgb(255, 255, 255)
`colorTextInverseWeak`	rgb(159, 170, 181)
`colorTextInverseActive`	rgb(94, 180, 255)
`colorTextInverseHover`	rgb(159, 170, 181)

Token Name	Example Value
`colorTextLink`	rgb(0, 112, 210)
`colorTextLinkActive`	rgb(0, 57, 107)
`colorTextLinkDisabled`	rgb(22, 50, 92)
`colorTextLinkFocus`	rgb(0, 95, 178)
`colorTextLinkHover`	rgb(0, 95, 178)
`colorTextLinkInverse`	rgb(255, 255, 255)
`colorTextLinkInverseHover`	rgba(255, 255, 255, 0.75)
`colorTextLinkInverseActive`	rgba(255, 255, 255, 0.5)
`colorTextLinkInverseDisabled`	rgba(255, 255, 255, 0.15)
`colorTextModal`	rgb(255, 255, 255)
`colorTextModalButton`	rgb(84, 105, 141)
`colorTextStageLeft`	rgb(224, 229, 238)
`colorTextTabLabel`	rgb(22, 50, 92)
`colorTextTabLabelSelected`	rgb(0, 112, 210)
`colorTextTabLabelHover`	rgb(0, 95, 178)
`colorTextTabLabelFocus`	rgb(0, 95, 178)
`colorTextTabLabelActive`	rgb(0, 57, 107)
`colorTextTabLabelDisabled`	rgb(224, 229, 238)
`colorTextToast`	rgb(224, 229, 238)
`colorTextWarning`	rgb(255, 183, 93)
`colorTextWarningAlt`	rgb(132, 72, 0)
`colorTextWeak`	rgb(84, 105, 141)
`colorTextIconBrand`	rgb(0, 112, 210)
`colorTextIconUtility`	rgb(159, 170, 181)
`colorTextToggleDisabled`	rgb(216, 221, 230)
`colorTextButtonBrand`	rgb(255, 255, 255)
`colorTextButtonBrandHover`	rgb(255, 255, 255)
`colorTextButtonBrandActive`	rgb(255, 255, 255)
`colorTextButtonBrandDisabled`	rgb(255, 255, 255)
`colorTextButtonDefault`	rgb(0, 112, 210)

Token Name	Example Value
`colorTextButtonDefaultHover`	rgb(0, 112, 210)
`colorTextButtonDefaultActive`	rgb(0, 112, 210)
`colorTextButtonDefaultDisabled`	rgb(216, 221, 230)
`colorTextButtonDefaultHint`	rgb(159, 170, 181)
`colorTextButtonInverse`	rgb(224, 229, 238)
`colorTextButtonInverseDisabled`	rgba(255, 255, 255, 0.15)
`colorTextIconDefault`	rgb(84, 105, 141)
`colorTextIconDefaultHint`	rgb(159, 170, 181)
`colorTextIconInverseHint`	rgba(255, 255, 255, 0.5)
`colorTextIconDefaultHintBorderless`	rgb(224, 229, 238)
`colorTextIconDefaultHover`	rgb(0, 112, 210)
`colorTextIconDefaultActive`	rgb(0, 57, 107)
`colorTextIconDefaultDisabled`	rgb(216, 221, 230)
`colorTextIconInverse`	rgb(255, 255, 255)
`colorTextIconInverseHover`	rgb(255, 255, 255)
`colorTextIconInverseActive`	rgb(255, 255, 255)
`colorTextIconInverseDisabled`	rgba(255, 255, 255, 0.15)
`colorTextIconInverseHintHover`	rgba(255, 255, 255, 0.75)
`colorTextLabel`	rgb(84, 105, 141)
`colorTextPlaceholder`	rgb(84, 105, 141)
`colorTextPlaceholderInverse`	rgb(224, 229, 238)
`colorTextRequired`	rgb(194, 57, 52)
`colorTextPill`	rgb(0, 112, 210)
`colorTextSuccess`	rgb(2, 128, 72)
`colorTextSuccessInverse`	rgb(75, 202, 129)
`textTransform`	none
`opacity5`	0.5
`opacity8`	0.8
`durationInstantly`	0s
`durationImmediately`	0.05s

Token Name	Example Value
`durationQuickly`	0.1s
`durationPromptly`	0.2s
`durationSlowly`	0.4s
`durationPaused`	3.2s
`durationToastShort`	4.8s
`durationToastMedium`	9.6s
`zIndexToast`	10000
`zIndexModal`	9000
`zIndexOverlay`	8000
`zIndexDropdown`	7000
`zIndexDialog`	6000
`zIndexPopup`	5000
`zIndexSticky`	100
`zIndexDefault`	1
`zIndexDeepdive`	-99999
`colorBackgroundButtonBrand`	rgb(0, 112, 210)
`colorBackgroundButtonBrandActive`	rgb(0, 57, 107)
`colorBackgroundButtonBrandHover`	rgb(0, 95, 178)
`colorBackgroundButtonBrandDisabled`	rgb(224, 229, 238)
`colorBackgroundButtonDefault`	rgb(255, 255, 255)
`colorBackgroundButtonDefaultHover`	rgb(244, 246, 249)
`colorBackgroundButtonDefaultFocus`	rgb(244, 246, 249)
`colorBackgroundButtonDefaultActive`	rgb(238, 241, 246)
`colorBackgroundButtonDefaultDisabled`	rgb(255, 255, 255)
`colorBackgroundButtonIcon`	rgba(0, 0, 0, 0)
`colorBackgroundButtonIconHover`	rgb(244, 246, 249)
`colorBackgroundButtonIconFocus`	rgb(244, 246, 249)
`colorBackgroundButtonIconActive`	rgb(238, 241, 246)
`colorBackgroundButtonIconDisabled`	rgb(255, 255, 255)
`colorBackgroundButtonInverse`	rgba(0, 0, 0, 0)

Token Name	Example Value
`colorBackgroundButtonInverseActive`	rgba(0, 0, 0, 0.24)
`colorBackgroundButtonInverseDisabled`	rgba(0, 0, 0, 0)
`lineHeightButton`	1.875rem
`lineHeightButtonSmall`	1.75rem
`cardColorBackground`	rgb(255, 255, 255)
`cardSpacingSmall`	0.75rem
`cardSpacingMedium`	1rem
`cardSpacingLarge`	1.5rem
`tableSpacingXSmall`	0.5rem
`colorBackgroundDockedPanelHeader`	rgb(247, 249, 251)
`heightDockedBar`	2.5rem
`lineHeightToggle`	1.3rem
`squareToggleSlider`	1.25rem
`widthToggle`	3rem
`heightToggle`	1.5rem
`squareIconGlobalIdentityIcon`	1.25rem
`colorBackgroundContextBar`	rgb(255, 255, 255)
`colorBackgroundContextBarBrandAccent`	rgb(0, 161, 223)
`colorBackgroundContextBarItemHover`	rgb(247, 249, 251)
`colorBackgroundContextBarItemActive`	rgb(247, 249, 251)
`colorBackgroundContextTabBarItem`	rgb(255, 255, 255)
`colorBackgroundContextBarInverseItemHover`	rgba(255, 255, 255, 0.2)
`colorBackgroundContextBarInverseItemActive`	rgba(255, 255, 255, 0.4)
`colorBackgroundContextBarShadow`	linear-gradient(to bottom, rgba(0, 0, 0, 0.25) 0, rgba(0, 0, 0, 0) 100%)
`colorBackgroundContextBarActionHighlight`	rgba(255, 255, 255, 0.2)
`colorBackgroundIconWaffle`	rgb(84, 105, 141)
`colorBorderContextBarDivider`	rgba(255, 255, 255, 0.2)
`colorBorderContextBarItem`	rgba(0, 0, 0, 0.2)
`colorBorderContextBarInverseItem`	rgba(255, 255, 255, 0.2)
`colorBorderContextBarThemeDefault`	rgb(0, 161, 223)

Token Name	Example Value
`colorBorderContextBarThemeDefaultAlt`	rgb(223, 228, 238)
`colorBorderContextBarThemeDefaultHover`	rgb(11, 35, 153)
`colorBorderContextBarThemeDefaultActive`	rgb(223, 228, 238)
`heightContextBar`	2.5rem
`colorTextContextBar`	rgb(84, 105, 141)
`colorTextContextBarInverse`	rgb(255, 255, 255)
`colorTextContextBarActionTrigger`	rgba(255, 255, 255, 0.4)
`colorBackgroundAnchor`	rgb(244, 246, 249)
`colorBackgroundPageHeader`	rgb(247, 249, 251)
`colorBackgroundPathComplete`	rgb(75, 202, 129)
`colorBackgroundPathCompleteHover`	rgba(4, 132, 75, 0.95)
`colorBackgroundPathCurrent`	rgb(0, 112, 210)
`colorBackgroundPathCurrentHover`	rgb(0, 95, 178)
`colorBackgroundPathIncomplete`	rgb(224, 229, 238)
`colorBackgroundPathIncompleteHover`	rgb(216, 221, 230)
`colorBackgroundPathLost`	rgb(194, 57, 52)
`colorBackgroundGuidance`	rgb(250, 250, 251)
`colorBorderPathDivider`	rgb(255, 255, 255)
`lineHeightSalespath`	1.5rem
`heightSalesPath`	2rem
`progressColorBackground`	rgb(255, 255, 255)
`progressColorBackgroundShade`	rgb(244, 246, 249)
`progressBarColorBackground`	rgb(216, 221, 230)
`progressBarColorBackgroundFill`	rgb(94, 180, 255)
`progressColorBorder`	rgb(255, 255, 255)
`progressColorBorderShade`	rgb(244, 246, 249)
`progressColorBorderHover`	rgb(0, 112, 210)
`progressColorBorderActive`	rgb(21, 137, 238)
`progressBarHeight`	0.125rem
`splitViewColorBackground`	rgb(51, 62, 79)

Token Name	Example Value
`splitViewColorBackgroundRowHover`	rgb(65, 76, 94)
`splitViewColorBorder`	rgb(44, 54, 70)

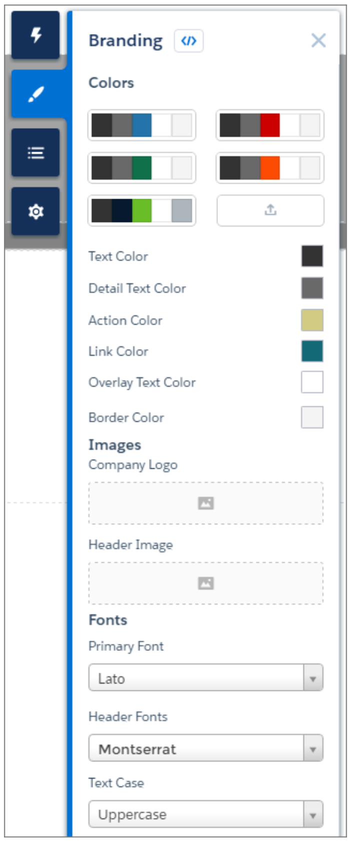
For a complete list of the design tokens available in the SLDS, see Design Tokens on the Lightning Design System site.

SEE ALSO:

Extending Tokens Bundles

Standard Design Tokens for Communities

Use a subset of the standard design tokens to make your components compatible with the Branding panel in Community Builder. The Branding panel enables administrators to quickly style an entire community using branding properties. Each property in the Branding panel maps to one or more standard design tokens. When an administrator updates a property in the Branding panel, the system automatically updates any Lightning components that use the tokens associated with that branding property.



Available Tokens for Communities

For Communities using the Customer Service (Napili) template, the following standard tokens are available when extending from `force:base`.

Important: The standard token values evolve along with SLDS. Available tokens and their values can change without notice.

These Branding panel properties...	...map to these standard design tokens
Text Color	`colorTextDefault`
Detail Text Color	• `colorTextLabel` • `colorTextPlaceholder` • `colorTextWeak`
Action Color	• `colorBackgroundButtonBrand` • `colorBackgroundHighlight` • `colorBorderBrand` • `colorBorderButtonBrand` • `colorBrand` • `colorTextBrand`
Link Color	`colorTextLink`
Overlay Text Color	• `colorTextButtonBrand` • `colorTextButtonBrandHover` • `colorTextInverse`
Border Color	• `colorBorder` • `colorBorderButtonDefault` • `colorBorderInput` • `colorBorderSeparatorAlt`
Primary Font	`fontFamily`
Text Case	`textTransform`

In addition, the following standard tokens are available for derived branding properties in the Customer Service (Napili) template. You can indirectly access derived branding properties when you update the properties in the Branding panel. For example, if you change the Action Color property in the Branding panel, the system automatically recalculates the Action Color Darker value based on the new value.

These derived branding properties...	...map to these standard design tokens
Action Color Darker (Derived from Action Color)	• `colorBackgroundButtonBrandActive` • `colorBackgroundButtonBrandHover`
Hover Color (Derived from Action Color)	• `colorBackgroundButtonDefaultHover` • `colorBackgroundRowHover`

These derived branding properties...	...map to these standard design tokens
	• `colorBackgroundRowSelected` • `colorBackgroundShade`
Link Color Darker (Derived from Link Color)	• `colorTextLinkActive` • `colorTextLinkHover`

For a complete list of the design tokens available in the SLDS, see Design Tokens on the Lightning Design System site.

SEE ALSO:

Configure Components for Communities

Using JavaScript

Use JavaScript for client-side code. The `$A` namespace is the entry point for using the framework in JavaScript code.

For all the methods available in `$A`, see the JavaScript API at `https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain.

A component bundle can contain JavaScript code in a client-side controller, helper, or renderer. Client-side controllers are the most commonly used of these JavaScript resources.

Expressions in JavaScript Code

In JavaScript, use string syntax to evaluate an expression. For example, this expression retrieves the `label` attribute in a component.

```
var theLabel = cmp.get("v.label");
```

Note: Only use the `{! }` expression syntax in markup in `.app` or `.cmp` resources.

IN THIS SECTION:

Sharing JavaScript Code in a Component Bundle

Put functions that you want to reuse in the component's helper. Helper functions also enable specialization of tasks, such as processing data and firing server-side actions.

Modifying the DOM

The Document Object Model (DOM) is the language-independent model for representing and interacting with objects in HTML and XML documents. It's important to know how to modify the DOM safely so that the framework's rendering service doesn't stomp on your changes and give you unexpected results.

Client-Side Rendering to the DOM

The framework's rendering service takes in-memory component state and creates and manages the DOM elements owned by the component. If you want to modify DOM elements created by the framework for a component, modify the DOM elements in the component's renderer. Otherwise, the framework will override your changes when the component is rerendered.

Invoking Actions on Component Initialization

Use the `init` event to initialize a component or fire an event after component construction but before rendering.

Modifying Components Outside the Framework Lifecycle

Use `$A.getCallback()` to wrap any code that modifies a component outside the normal rerendering lifecycle, such as in a `setTimeout()` call. The `$A.getCallback()` call ensures that the framework rerenders the modified component and processes any enqueued actions.

Validating Fields

Validate user input, handle errors, and display error messages on input fields.

Throwing and Handling Errors

The framework gives you flexibility in handling unrecoverable and recoverable app errors in JavaScript code. For example, you can throw these errors in a callback when handling an error in a server-side response.

Calling Component Methods

Use `<aura:method>` to define a method as part of a component's API. This enables you to directly call a method in a component's client-side controller instead of firing and handling a component event. Using `<aura:method>` simplifies the code needed for a parent component to call a method on a child component that it contains.

Using JavaScript Promises

You can use ES6 Promises in JavaScript code. Promises can simplify code that handles the success or failure of asynchronous calls, or code that chains together multiple asynchronous calls.

Making API Calls from Components

By default, you can't make calls to third-party APIs from client-side code. Add a remote site as a CSP Trusted Site to allow client-side component code to load assets from and make API requests to that site's domain.

Create CSP Trusted Sites to Access Third-Party APIs

The Lightning Component framework uses Content Security Policy (CSP) to control the source of content that can be loaded on a page. To use third-party APIs that make requests to an external (non-Salesforce) server, add the server as a CSP Trusted Site.

SEE ALSO:

Handling Events with Client-Side Controllers

Using External JavaScript Libraries

To reference a JavaScript library that you've uploaded as a static resource, use a `<ltng:require>` tag in your `.cmp` or `.app` markup.

The framework's content security policy mandates that external JavaScript libraries must be uploaded to Salesforce static resources. For more information on static resources, see "Static Resources" in the Salesforce online help.

Here's an example of using `<ltng:require>`.

```
<ltng:require scripts="{!$Resource.resourceName}"
    afterScriptsLoaded="{!c.afterScriptsLoaded}" />
```

`resourceName` is the `Name` of the static resource. In a managed packaged, the resource name must include the package namespace prefix, such as `$Resource.yourNamespace__resourceName`. For a stand-alone static resource, such as an individual graphic or script, that's all you need. To reference an item within an archive static resource, add the rest of the path to the item using string concatenation.

The `afterScriptsLoaded` action in the client-side controller is called after the scripts are loaded. Don't use the `init` event to access scripts loaded by `<ltng:require>`. These scripts load asynchronously and are most likely not available when the `init` event handler is called.

Here are some considerations for loading scripts:

Loading Sets of Scripts

Specify a comma-separated list of resources in the `scripts` attribute to load a set of resources.

Note: Due to a quirk in the way `$Resource` is parsed in expressions, use the `join` operator to include multiple `$Resource` references in a single attribute. For example, if you have more than one JavaScript library to include into a component the `scripts` attribute should be something like the following.

```
scripts="{!join(',',
    $Resource.jsLibraries + '/jsLibOne.js',
    $Resource.jsLibraries + '/jsLibTwo.js')}"
```

Loading Order

The scripts are loaded in the order that they are listed.

One-Time Loading

Scripts load only once, even if they're specified in multiple `<ltng:require>` tags in the same component or across different components.

Parallel Loading

Use separate `<ltng:require>` tags for parallel loading if you have multiple sets of scripts that are not dependent on each other.

Encapsulation

To ensure encapsulation and reusability, add the `<ltng:require>` tag to every `.cmp` or `.app` resource that uses the JavaScript library.

`<ltng:require>` also has a `styles` attribute to load a list of CSS resources. You can set the `scripts` and `styles` attributes in one `<ltng:require>` tag.

If you're using an external library to work with your HTML elements after rendering, use `afterScriptsLoaded` to wire up a client-side controller. The following example sets up a chart using the `Chart.js` library, which is uploaded as a static resource.

```
<ltng:require scripts="{!$Resource.chart}"
              afterScriptsLoaded="{!c.setup}"/>
<canvas aura:id="chart" id="myChart" width="400" height="400"/>
```

The component's client-side controller sets up the chart after component initialization and rendering.

```
setup : function(component, event, helper) {
    var data = {
        labels: ["January", "February", "March"],
        datasets: [{
            data: [65, 59, 80, 81, 56, 55, 40]
        }]
    };
    var el = component.find("chart").getElement();
    var ctx = el.getContext("2d");
    var myNewChart = new Chart(ctx).Line(data);
}
```

SEE ALSO:

- Reference Doc App
- Content Security Policy Overview
- Using External CSS
- $Resource

Working with Attribute Values in JavaScript

These are useful and common patterns for working with attribute values in JavaScript.

`component.get(String key)` and `component.set(String key, Object value)` retrieves and assigns values associated with the specified key on the component. Keys are passed in as an expression, which represents attribute values. To retrieve an attribute value of a component reference, use `component.find("cmpId").get("v.value")`. Similarly, use `component.find("cmpId").set("v.value", myValue)` to set the attribute value of a component reference. This example shows how you can retrieve and set attribute values on a component reference, represented by the button with an ID of `button1`.

```
<aura:component>
    <aura:attribute name="buttonLabel" type="String"/>
    <ui:button aura:id="button1" label="Button 1"/>
    {!v.buttonLabel}
    <ui:button label="Get Label" press="{!c.getLabel}"/>
</aura:component>
```

This controller action retrieves the `label` attribute value of a button in a component and sets its value on the `buttonLabel` attribute.

```
({
    getLabel : function(component, event, helper) {
        var myLabel = component.find("button1").get("v.label");
        component.set("v.buttonLabel", myLabel);
    }
})
```

In the following examples, `cmp` is a reference to a component in your JavaScript code.

Get an Attribute Value

To get the value of a component's `label` attribute:

```
var label = cmp.get("v.label");
```

Set an Attribute Value

To set the value of a component's `label` attribute:

```
cmp.set("v.label","This is a label");
```

Validate that an Attribute Value is Defined

To determine if a component's `label` attribute is defined:

```
var isDefined = !$A.util.isUndefined(cmp.get("v.label"));
```

Validate that an Attribute Value is Empty

To determine if a component's `label` attribute is empty:

```
var isEmpty = $A.util.isEmpty(cmp.get("v.label"));
```

SEE ALSO:

Working with a Component Body in JavaScript

Working with a Component Body in JavaScript

These are useful and common patterns for working with a component's body in JavaScript.

In these examples, `cmp` is a reference to a component in your JavaScript code. It's usually easy to get a reference to a component in JavaScript code. Remember that the `body` attribute is an array of components, so you can use the JavaScript `Array` methods on it.

Note: When you use `cmp.set("v.body", ...)` to set the component body, you must explicitly include `{!v.body}` in your component markup.

Replace a Component's Body

To replace the current value of a component's body with another component:

```
// newCmp is a reference to another component
cmp.set("v.body", newCmp);
```

Clear a Component's Body

To clear or empty the current value of a component's body:

```
cmp.set("v.body", []);
```

Append a Component to a Component's Body

To append a `newCmp` component to a component's body:

```
var body = cmp.get("v.body");
// newCmp is a reference to another component
body.push(newCmp);
cmp.set("v.body", body);
```

Prepend a Component to a Component's Body

To prepend a `newCmp` component to a component's body:

```
var body = cmp.get("v.body");
body.unshift(newCmp);
cmp.set("v.body", body);
```

Remove a Component from a Component's Body

To remove an indexed entry from a component's body:

```
var body = cmp.get("v.body");
// Index (3) is zero-based so remove the fourth component in the body
body.splice(3, 1);
cmp.set("v.body", body);
```

SEE ALSO:

Component Body

Working with Attribute Values in JavaScript

Working with Events in JavaScript

These are useful and common patterns for working with events in JavaScript.

Events communicate data across components. Events can contain attributes with values set before the event is fired and read when the event is handled.

Fire an Event

Fire a component event or an application event that's registered on a component.

```
//Fire a component event
var compEvent = cmp.getEvent("sampleComponentEvent");
compEvent.fire();

//Fire an application event
var appEvent = $A.get("e.c:appEvent");
appEvent.fire();
```

For more information, see:

- Fire Component Events

- Fire Application Events

Get an Event Name

To get the name of the event that's fired:

```
event.getSource().getName();
```

Get an Event Parameter

To get an attribute that's passed into an event:

```
event.getParam("value");
```

Get Parameters on an Event

To get all attributes that are passed into an event:

```
event.getParams();
```

`event.getParams()` returns an object containing all event parameters.

Get the Current Phase of an Event

To get the current phase of an event:

```
event.getPhase();
```

If the event hasn't been fired, `event.getPhase()` returns `undefined`. Possible return values for component and application events are `capture`, `bubble`, and `default`. Value events return `default`. For more information, see:

- Component Event Propagation
- Application Event Propagation

Get the Source Component

To get the component that fired the event:

```
event.getSource();
```

To retrieve an attribute on the component that fired the event:

```
event.getSource().get("v.myName");
```

Pause the Event

To pause the fired event:

```
event.pause();
```

If paused, the event is not handled until `event.resume()` is called. You can pause an event in the `capture` or `bubble` phase only. For more information, see:

- Handling Bubbled or Captured Component Events

- Handling Bubbled or Captured Application Events

Prevent the Default Event Execution

To cancel the default action on the event:

```
event.preventDefault();
```

For example, you can prevent a `lightning:button` component from submitting a form when it's clicked.

Resume a Paused Event

To resume event handling for a paused event:

```
event.resume();
```

You can resume a paused event in the `capture` or `bubble` phase only. For more information, see:

- Handling Bubbled or Captured Component Events
- Handling Bubbled or Captured Application Events

Set a Value for an Event Parameter

To set a value for an event parameter:

```
event.setParam("name", cmp.get("v.myName");
```

If the event has already been fired, setting a parameter value has no effect on the event.

Set Values for Event Parameters

To set values for parameters on an event:

```
event.setParams({
    key : value
});
```

If the event has already been fired, setting the parameter values has no effect on the event.

Stop Event Propagation

To prevent further propagation of an event:

```
event.stopPropagation();
```

You can stop event propagation in the `capture` or `bubble` phase only.

Sharing JavaScript Code in a Component Bundle

Put functions that you want to reuse in the component's helper. Helper functions also enable specialization of tasks, such as processing data and firing server-side actions.

They can be called from any JavaScript code in a component's bundle, such as from a client-side controller or renderer. Helper functions are similar to client-side controller functions in shape, surrounded by brackets and curly braces to denote a JSON object containing a map of name-value pairs. A helper function can pass in any arguments required by the function, such as the component it belongs to, a callback, or any other objects.

Creating a Helper

A helper resource is part of the component bundle and is auto-wired via the naming convention, `<componentName>Helper.js`.

To create a helper using the Developer Console, click **HELPER** in the sidebar of the component. This helper file is valid for the scope of the component to which it's auto-wired.

Using a Helper in a Renderer

Add a helper argument to a renderer function to enable the function to use the helper. In the renderer, specify `(component, helper)` as parameters in a function signature to enable the function to access the component's helper. These are standard parameters and you don't have to access them in the function. The following code shows an example on how you can override the `afterRender()` function in the renderer and call `open` in the helper method.

detailsRenderer.js

```
({
    afterRender : function(component, helper){
        helper.open(component, null, "new");
    }
})
```

detailsHelper.js

```
({
    open : function(component, note, mode, sort){
        if(mode === "new") {
            //do something
        }
        // do something else, such as firing an event
    }
})
```

For an example on using helper methods to customize renderers, see Client-Side Rendering to the DOM.

Using a Helper in a Controller

Add a `helper` argument to a controller function to enable the function to use the helper. Specify `(component, event, helper)` in the controller. These are standard parameters and you don't have to access them in the function. You can also pass in an instance variable as a parameter, for example, `createExpense: function(component, expense){...}`, where `expense` is a variable defined in the component.

The following code shows you how to call the `updateItem` helper function in a controller, which can be used with a custom event handler.

```
({
    newItemEvent: function(component, event, helper) {
        helper.updateItem(component, event.getParam("item"));
    }
})
```

Helper functions are local to a component, improve code reuse, and move the heavy lifting of JavaScript logic away from the client-side controller where possible. The following code shows the helper function, which takes in the `value` parameter set in the controller via the `item` argument. The code walks through calling a server-side action and returning a callback but you can do something else in the helper function.

```
({
    updateItem : function(component, item, callback) {
        //Update the items via a server-side action
        var action = component.get("c.saveItem");
        action.setParams({"item" : item});
        //Set any optional callback and enqueue the action
        if (callback) {
            action.setCallback(this, callback);
        }
        $A.enqueueAction(action);
    }
})
```

SEE ALSO:

Client-Side Rendering to the DOM

Component Bundles

Handling Events with Client-Side Controllers

Modifying the DOM

The Document Object Model (DOM) is the language-independent model for representing and interacting with objects in HTML and XML documents. It's important to know how to modify the DOM safely so that the framework's rendering service doesn't stomp on your changes and give you unexpected results.

The framework's rendering service takes in-memory component state and creates and manages the DOM elements owned by the component. The framework automatically renders your components so you don't have to know anything more about rendering unless you need to customize the default rendering behavior for a component.

There are a few supported ways to modify the DOM.

DOM Elements Managed by the Lightning Component Framework

The framework creates and manages the DOM elements owned by a component. If you want to modify these DOM elements created by the framework, modify the DOM elements in the component's renderer. Otherwise, the framework will override your changes when the component is rerendered.

For example, if you modify DOM elements directly from a client-side controller, the changes may be overwritten when the components are rendered. Instead, update the component's attributes and let the framework's rendering service take care of the DOM updates.

You don't normally have to write a custom renderer, but it's useful if you need to interact with the DOM tree after the framework's rendering service has inserted DOM elements. If you want to customize rendering behavior and you can't do it in markup or by using the `init` event, create a client-side renderer.

In a renderer, modify the DOM that belongs to the current component only. Never break component encapsulation by reaching into another component and changing its DOM elements, even if you are reaching in from the parent component.

There are often better alternatives to creating a custom renderer. Consider using an expression in the markup instead of setting a DOM element directly.

You can modify CSS classes for a component outside a renderer by using the `$A.util.addClass()`, `$A.util.removeClass()`, and `$A.util.toggleClass()` methods.

You can read from the DOM outside a renderer.

DOM Elements Managed by External Libraries

You can use different libraries, such as a charting library, to create and manage DOM elements. You don't have to modify these DOM elements within a renderer. A renderer is only used to customize DOM elements created and managed by the Lightning Component framework.

To use external libraries, use `<ltng:require>`. This tag orchestrates the loading of your library of choice with the rendering cycle of the Lightning Component framework to ensure that everything works in concert.

SEE ALSO:

- Client-Side Rendering to the DOM
- Using Expressions
- Invoking Actions on Component Initialization
- Dynamically Showing or Hiding Markup
- Using External JavaScript Libraries

Client-Side Rendering to the DOM

The framework's rendering service takes in-memory component state and creates and manages the DOM elements owned by the component. If you want to modify DOM elements created by the framework for a component, modify the DOM elements in the component's renderer. Otherwise, the framework will override your changes when the component is rerendered.

The DOM is the language-independent model for representing and interacting with objects in HTML and XML documents. The framework automatically renders your components so you don't have to know anything more about rendering unless you need to customize the default rendering behavior for a component.

For more details on whether creating a custom renderer is the right choice, see Modifying the DOM.

Base Component Rendering

The base component in the framework is `aura:component`. Every component extends this base component.

The renderer for `aura:component` is in `componentRenderer.js`. This renderer has base implementations for the four phases of the rendering and rerendering cycles:

- `render()`
- `rerender()`
- `afterRender()`
- `unrender()`

The framework calls these functions as part of the rendering and rerendering lifecycles and we will learn more about them soon. You can override the base rendering functions in a custom renderer.

Rendering Lifecycle

The rendering lifecycle happens once in the lifetime of a component unless the component gets explicitly unrendered. When you create a component:

1. The framework fires an `init` event, enabling you to update a component or fire an event after component construction but before rendering.
2. The `render()` method is called to render the component's body.
3. The `afterRender()` method is called to enable you to interact with the DOM tree after the framework's rendering service has inserted DOM elements.

Rerendering Lifecycle

The rerendering lifecycle automatically handles rerendering of components whenever the underlying data changes. Here is a typical sequence.

1. A browser event triggers one or more Lightning events.
2. Each Lightning event triggers one or more actions that can update data. The updated data can fire more events.
3. The rendering service tracks the stack of events that are fired.
4. When all the data updates from the events are processed, the framework rerenders all the components that own modified data by calling each component's `rerender()` method.

The component rerendering lifecycle repeats whenever the underlying data changes as long as the component is valid and not explicitly unrendered.

For more information, see Events Fired During the Rendering Lifecycle .

Create a Renderer

You don't normally have to write a custom renderer, but it's useful when you want to interact with the DOM tree after the framework's rendering service has inserted DOM elements. If you want to customize rendering behavior and you can't do it in markup or by using the `init` event, you can create a client-side renderer.

A renderer file is part of the component bundle and is auto-wired if you follow the naming convention, `<componentName>Renderer.js`. For example, the renderer for `sample.cmp` would be in `sampleRenderer.js`.

Note: These guidelines are important when you customize rendering.

- Only modify DOM elements that are part of the component. Never break component encapsulation by reaching in to another component and changing its DOM elements, even if you are reaching in from the parent component.
- Never fire an event as it can trigger new rendering cycles. An alternative is to use an `init` event instead.
- Don't set attribute values on other components as these changes can trigger new rendering cycles.
- Move as much of the UI concerns, including positioning, to CSS.

Customize Component Rendering

Customize rendering by creating a `render()` function in your component's renderer to override the base `render()` function, which updates the DOM.

The `render()` function returns a DOM node, an array of DOM nodes, or nothing. The base HTML component expects DOM nodes when it renders a component.

You generally want to extend default rendering by calling `superRender()` from your `render()` function before you add your custom rendering code. Calling `superRender()` creates the DOM nodes specified in the markup.

This code outlines a custom `render()` function.

```
render : function(cmp, helper) {
    var ret = this.superRender();
    // do custom rendering here
    return ret;
},
```

Rerender Components

When an event is fired, it may trigger actions to change data and call `rerender()` on affected components. The `rerender()` function enables components to update themselves based on updates to other components since they were last rendered. This function doesn't return a value.

If you update data in a component, the framework automatically calls `rerender()`.

You generally want to extend default rerendering by calling `superRerender()` from your `renderer()` function before you add your custom rerendering code. Calling `superRerender()` chains the rerendering to the components in the `body` attribute.

This code outlines a custom `rerender()` function.

```
rerender : function(cmp, helper){
    this.superRerender();
    // do custom rerendering here
}
```

Access the DOM After Rendering

The `afterRender()` function enables you to interact with the DOM tree after the framework's rendering service has inserted DOM elements. It's not necessarily the final call in the rendering lifecycle; it's simply called after `render()` and it doesn't return a value.

You generally want to extend default after rendering by calling `superAfterRender()` function before you add your custom code.

This code outlines a custom `afterRender()` function.

```
afterRender: function (component, helper) {
    this.superAfterRender();
    // interact with the DOM here
},
```

Unrender Components

The base `unrender()` function deletes all the DOM nodes rendered by a component's `render()` function. It is called by the framework when a component is being destroyed. Customize this behavior by overriding `unrender()` in your component's renderer. This method can be useful when you are working with third-party libraries that are not native to the framework.

You generally want to extend default unrendering by calling `superUnrender()` from your `unrender()` function before you add your custom code.

This code outlines a custom `unrender()` function.

```
unrender: function () {
    this.superUnrender();
    // do custom unrendering here
}
```

SEE ALSO:

- Modifying the DOM
- Invoking Actions on Component Initialization
- Component Bundles
- Modifying Components Outside the Framework Lifecycle
- Sharing JavaScript Code in a Component Bundle

Invoking Actions on Component Initialization

Use the `init` event to initialize a component or fire an event after component construction but before rendering.

Component source

```
<aura:component>
    <aura:attribute name="setMeOnInit" type="String" default="default value" />
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>

    <p>This value is set in the controller after the component initializes and before
rendering.</p>
    <p><b>{!v.setMeOnInit}</b></p>

</aura:component>
```

Client-side controller source

```
({
    doInit: function(cmp) {
        // Set the attribute value.
        // You could also fire an event here instead.
        cmp.set("v.setMeOnInit", "controller init magic!");
    }
})
```

Let's look at the **Component source** to see how this works. The magic happens in this line.

```
<aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
```

This registers an `init` event handler for the component. `init` is a predefined event sent to every component. After the component is initialized, the `doInit` action is called in the component's controller. In this sample, the controller action sets an attribute value, but it could do something more interesting, such as firing an event.

Setting `value="{!this}"` marks this as a value event. You should always use this setting for an `init` event.

SEE ALSO:

- Handling Events with Client-Side Controllers
- Client-Side Rendering to the DOM
- Component Attributes
- Detecting Data Changes with Change Handlers

Modifying Components Outside the Framework Lifecycle

Use `$A.getCallback()` to wrap any code that modifies a component outside the normal rerendering lifecycle, such as in a `setTimeout()` call. The `$A.getCallback()` call ensures that the framework rerenders the modified component and processes any enqueued actions.

Note: `$A.run()` is deprecated. Use `$A.getCallback()` instead.

You don't need to use `$A.getCallback()` if your code is executed as part of the framework's call stack; for example, your code is handling an event or in the callback for a server-side controller action.

An example of where you need to use `$A.getCallback()` is calling `window.setTimeout()` in an event handler to execute some logic after a time delay. This puts your code outside the framework's call stack.

This sample sets the `visible` attribute on a component to `true` after a five-second delay.

```
window.setTimeout(
    $A.getCallback(function() {
        if (cmp.isValid()) {
            cmp.set("v.visible", true);
        }
    }), 5000
);
```

Note how the code updating a component attribute is wrapped in `$A.getCallback()`, which ensures that the framework rerenders the modified component.

Note: Always add an `isValid()` check if you reference a component in asynchronous code, such as a callback or a timeout. If you navigate elsewhere in the UI while asynchronous code is executing, the framework unrenders and destroys the component that made the asynchronous request. You can still have a reference to that component, but it is no longer valid. Add an `isValid()` call to check that the component is still valid before processing the results of the asynchronous request.

Warning: Don't save a reference to a function wrapped in `$A.getCallback()`. If you use the reference later to send actions, the saved transaction state will cause the actions to be aborted.

SEE ALSO:

- Handling Events with Client-Side Controllers
- Firing Lightning Events from Non-Lightning Code
- Communicating with Events

Validating Fields

Validate user input, handle errors, and display error messages on input fields.

Client-side input validation is available for the following components:

- `lightning:input`
- `lightning:select`
- `lightning:textarea`
- `ui:input*`

Components in the `lightning` namespace simplify input validation by providing attributes to define error conditions, enabling you to handle errors by checking the component's validity state. For example, you can set a minimum length for a field , display an error message when the condition is not met, and handle the error based on the given validity state. Alternatively, input components in the `ui` namespace let you define and handle errors in a client-side controller. See the `lightning` namespace components in the Reference section for more information.

The following sections discuss error handling for `ui:input`* components.

Default Error Handling

The framework can handle and display errors using the default error component, `ui:inputDefaultError`. This component is dynamically created when you set the errors using the `inputCmp.set("v.errors",[{message:"my error message"}])` syntax. The following example shows how you can handle a validation error and display an error message. Here is the markup.

```
<!--c:errorHandling-->
<aura:component>
    Enter a number: <ui:inputNumber aura:id="inputCmp"/> <br/>
    <ui:button label="Submit" press="{!c.doAction}"/>
</aura:component>
```

Here is the client-side controller.

```
/*errorHandlingController.js*/
{
    doAction : function(component) {
        var inputCmp = component.find("inputCmp");
        var value = inputCmp.get("v.value");

        // Is input numeric?
        if (isNaN(value)) {
            // Set error
            inputCmp.set("v.errors", [{message:"Input not a number: " + value}]);
        } else {
            // Clear error
            inputCmp.set("v.errors", null);
        }
    }
}
```

When you enter a value and click **Submit**, `doAction` in the controller validates the input and displays an error message if the input is not a number. Entering a valid input clears the error. Add error messages to the input component using the `errors` attribute.

Custom Error Handling

`ui:input` and its child components can handle errors using the `onError` and `onClearErrors` events, which are wired to your custom error handlers defined in a controller. `onError` maps to a `ui:validationError` event, and `onClearErrors` maps to `ui:clearErrors`.

The following example shows how you can handle a validation error using custom error handlers and display the error message using the default error component. Here is the markup.

```
<!--c:errorHandlingCustom-->
<aura:component>
    Enter a number: <ui:inputNumber aura:id="inputCmp" onError="{!c.handleError}"
onClearErrors="{!c.handleClearError}"/> <br/>
```

```
    <ui:button label="Submit" press="{!c.doAction}"/>
</aura:component>
```

Here is the client-side controller.

```
/*errorHandlingCustomController.js*/
{
    doAction : function(component, event) {
        var inputCmp = component.find("inputCmp");
        var value = inputCmp.get("v.value");

        // is input numeric?
        if (isNaN(value)) {
            inputCmp.set("v.errors", [{message:"Input not a number: " + value}]);
        } else {
            inputCmp.set("v.errors", null);
        }
    },

    handleError: function(component, event){
        /* do any custom error handling
         * logic desired here */
        // get v.errors, which is an Object[]
        var errorsArr  = event.getParam("errors");
        for (var i = 0; i < errorsArr.length; i++) {
            console.log("error " + i + ": " + JSON.stringify(errorsArr[i]));
        }
    },

    handleClearError: function(component, event) {
        /* do any custom error handling
         * logic desired here */
    }
}
```

When you enter a value and click **Submit**, `doAction` in the controller executes. However, instead of letting the framework handle the errors, we define a custom error handler using the `onError` event in `<ui:inputNumber>`. If the validation fails, `doAction` adds an error message using the `errors attribute`. This automatically fires the `handleError` custom error handler.

Similarly, you can customize clearing the errors by using the `onClearErrors` event. See the `handleClearError` handler in the controller for an example.

SEE ALSO:

Handling Events with Client-Side Controllers

Component Events

Throwing and Handling Errors

The framework gives you flexibility in handling unrecoverable and recoverable app errors in JavaScript code. For example, you can throw these errors in a callback when handling an error in a server-side response.

Unrecoverable Errors

Use `throw new Error("error message here")` for unrecoverable errors, such as an error that prevents your app from starting successfully. The error message is displayed.

Note: `$A.error()` is deprecated. Throw the native JavaScript `Error` object instead by using `throw new Error()`.

This example shows you the basics of throwing an unrecoverable error in a JavaScript controller.

```
<!--c:unrecoverableError-->
<aura:component>
    <ui:button label="throw error" press="{!c.throwError}"/>
</aura:component>
```

Here is the client-side controller source.

```
/*unrecoverableErrorController.js*/
({
    throwError : function(component, event){
        throw new Error("I can’t go on. This is the end.");
    }
})
```

Recoverable Errors

To handle recoverable errors, use a component, such as `ui:message`, to tell users about the problem.

This sample shows you the basics of throwing and catching a recoverable error in a JavaScript controller.

```
<!--c:recoverableError-->
<aura:component>
    <p>Click the button to trigger the controller to throw an error.</p>
    <div aura:id="div1"></div>

    <ui:button label="Throw an Error" press="{!c.throwErrorForKicks}"/>
</aura:component>
```

Here is the client-side controller source.

```
/*recoverableErrorController.js*/
({
    throwErrorForKicks: function(cmp) {
        // this sample always throws an error to demo try/catch
        var hasPerm = false;
        try {
            if (!hasPerm) {
                throw new Error("You don't have permission to edit this record.");
            }
        }
        catch (e) {
            $A.createComponents([
                ["ui:message",{
                    "title" : "Sample Thrown Error",
                    "severity" : "error",
                }],
                ["ui:outputText",{
                    "value" : e.message
                }]
                ],
                function(components, status, errorMessage){
                    if (status === "SUCCESS") {
                        var message = components[0];
                        var outputText = components[1];
                        // set the body of the ui:message to be the ui:outputText
                        message.set("v.body", outputText);
                        var div1 = cmp.find("div1");
                        // Replace div body with the dynamic component
                        div1.set("v.body", message);
                    }
                    else if (status === "INCOMPLETE") {
                        console.log("No response from server or client is offline.")
                        // Show offline error
                    }
                    else if (status === "ERROR") {
                        console.log("Error: " + errorMessage);
                        // Show error message
                    }
                }
            );
        }
    }
})
```

The controller code always throws an error and catches it in this example. The message in the error is displayed to the user in a dynamically created `ui:message` component. The body of the `ui:message` is a `ui:outputText` component containing the error text.

SEE ALSO:

Validating Fields

Dynamically Creating Components

Calling Component Methods

Use `<aura:method>` to define a method as part of a component's API. This enables you to directly call a method in a component's client-side controller instead of firing and handling a component event. Using `<aura:method>` simplifies the code needed for a parent component to call a method on a child component that it contains.

Use this syntax to call a method in JavaScript code.

```
cmp.sampleMethod(arg1, … argN);
```

`cmp` is a reference to the component. `arg1, … argN` is an optional comma-separated list of arguments passed to the method.

Let's look at an example of a component containing a button. The handler for the button calls a component method instead of firing and handling its own component event.

Here is the component source.

```
<!--c:auraMethod-->
<aura:component>
    <aura:method name="sampleMethod" action="{!c.doAction}"
```

```
      description="Sample method with parameters">
        <aura:attribute name="param1" type="String" default="parameter 1" />
    </aura:method>

    <ui:button label="Press Me" press="{!c.handleClick}"/>
</aura:component>
```

Here is the client-side controller.

```
/*auraMethodController.js*/
({
    handleClick : function(cmp, event) {
        console.log("in handleClick");
        // call the method declared by <aura:method> in the markup
        cmp.sampleMethod("1");
    },

    doAction : function(cmp, event) {
        var params = event.getParam('arguments');
        if (params) {
            var param1 = params.param1;
            console.log("param1: " + param1);
            // add your code here
        }
    },
})
```

This simple example just logs the parameter passed to the method.

The `<aura:method>` tag set `name="sampleMethod"` and `action="{!c.doAction}"` so the method is called by `cmp.sampleMethod()` and handled by `doAction()` in the controller.

Note: If you don't specify an `action` value, the controller action defaults to the value of the method `name`. If we omitted `action="{!c.doAction}"` from the earlier example, the method would be called by `cmp.sampleMethod()` and handled by `sampleMethod()` instead of `doAction()` in the controller.

Using Inherited Methods

A sub component that extends a super component has access to any methods defined in the super component.

An interface can also include an `<aura:method>` tag. A component that implements the interface can access the method.

SEE ALSO:

aura:method

Component Events

Using JavaScript Promises

You can use ES6 Promises in JavaScript code. Promises can simplify code that handles the success or failure of asynchronous calls, or code that chains together multiple asynchronous calls.

If the browser doesn't provide a native version, the framework uses a polyfill so that promises work in all browsers supported for Lightning Experience.

We assume that you are familiar with the fundamentals of promises. For a great introduction to promises, see https://developers.google.com/web/fundamentals/getting-started/primers/promises.

Promises are an optional feature. Some people love them, some don't. Use them if they make sense for your use case.

When you need to coordinate or chain together multiple callbacks, promises can be useful . The generic pattern is:

```
somePromise()
    .then(
        // resolve handler
        $A.getCallback(function(result) {
            return anotherPromise();
        }),

        // reject handler
        $A.getCallback(function(error) {
            console.log("Promise was rejected: ", error);
            return errorRecoveryPromise();
        })
    )
    .then(
        // resolve handler
        $A.getCallback(function() {
            return yetAnotherPromise();
        })
    );
```

`somePromise()` returns a `Promise`. The constructor in that promise determines the conditions for calling `resolve()` or `reject()` on the promise.

The `then()` method chains multiple promises. In this example, each resolve handler returns another promise.

`then()` is part of the Promises API. It takes two arguments:

1. A callback for a fulfilled promise (resolve handler)
2. A callback for a rejected promise (reject handler)

The first callback, `function(result)`, is called when `resolve()` is called in the promise constructor. The `result` object in the callback is the object passed as the argument to `resolve()`.

The second callback, `function(error)`, is called when `reject()` is called in the promise constructor. The `error` object in the callback is the object passed as the argument to `reject()`.

Note: The two callbacks are wrapped by `$A.getCallback()` in our example. What's that all about? Promises execute their resolve and reject functions asynchronously so the code is outside the Lightning event loop and normal rendering lifecycle. If the resolve or reject code makes any calls to the Lightning Component framework, such as setting a component attribute, use `$A.getCallback()` to wrap the code. For more information, see Modifying Components Outside the Framework Lifecycle on page 230.

Always Use `catch()` or a Reject Handler

The reject handler in the first `then()` method returns a promise with `errorRecoveryPromise()`. Reject handlers are often used "midstream" in a promise chain to trigger an error recovery mechanism.

The Promises API includes a `catch()` method to optionally catch unhandled errors. Always include a reject handler or a `catch()` method in your promise chain.

Throwing an error in a promise doesn't trigger `window.onerror`, which is where the framework configures its global error handler. If you don't have a `catch()` method, keep an eye on your browser's console during development for reports about uncaught errors in a promise. To show an error message in a `catch()` method, use `$A.reportError()`. The syntax for `catch()` is:

```
promise.then(...)
    .catch(function(error) {
        $A.reportError("error message here", error);
    });
```

For more information on `catch()`, see the Mozilla Developer Network.

Don't Use Storable Actions in Promises

The framework stores the response for storable actions in client-side cache. This stored response can dramatically improve the performance of your app and allow offline usage for devices that temporarily don't have a network connection. Storable actions are only suitable for read-only actions.

Storable actions might have their callbacks invoked more than once: first with cached data, then with updated data from the server. This doesn't align well with promises, which are expected to resolve or reject only once.

SEE ALSO:

Storable Actions

Making API Calls from Components

By default, you can't make calls to third-party APIs from client-side code. Add a remote site as a CSP Trusted Site to allow client-side component code to load assets from and make API requests to that site's domain.

The Lightning Component framework uses Content Security Policy (CSP) to control the source of content that can be loaded on a page. Lightning apps are served from a different domain than Salesforce APIs, and the default CSP policy doesn't allow API calls from JavaScript code. You change the policy, and the content of the CSP header, by adding CSP Trusted Sites.

Important: You can't load JavaScript resources from a third-party site, even a CSP Trusted Site. To use a JavaScript library from a third-party site, add it to a static resource, and then add the static resource to your component. After the library is loaded from the static resource, you can use it as normal.

Sometimes, you have to make API calls from server-side controllers rather than client-side code. In particular, you can't make calls to Salesforce APIs from client-side Lightning component code. For information about making API calls from server-side controllers, see Making API Calls from Apex on page 265.

SEE ALSO:

Content Security Policy Overview

Create CSP Trusted Sites to Access Third-Party APIs

Create CSP Trusted Sites to Access Third-Party APIs

The Lightning Component framework uses Content Security Policy (CSP) to control the source of content that can be loaded on a page. To use third-party APIs that make requests to an external (non-Salesforce) server, add the server as a CSP Trusted Site.

CSP is a Candidate Recommendation of the W3C working group on Web Application Security. The framework uses the `Content-Security-Policy` HTTP header recommended by the W3C. By default, the framework's headers allow content to be loaded only from secure (HTTPS) URLs and forbid XHR requests from JavaScript.

When you define a CSP Trusted Site, the site's URL is added to the list of allowed sites for the following directives in the CSP header.

- `connect-src`
- `frame-src`
- `img-src`
- `style-src`
- `font-src`
- `media-src`

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Available in: **Developer**, **Enterprise**, **Performance**, and **Unlimited**

USER PERMISSIONS

To create, read, update, and delete:

- "Customize Application" or "Modify All Data"

This change to the CSP header directives allows Lightning components to load resources, such as images, styles, and fonts, from the site. It also allows client-side code to make requests to the site.

Important: You can't load JavaScript resources from a third-party site, even a CSP Trusted Site. To use a JavaScript library from a third-party site, add it to a static resource, and then add the static resource to your component. After the library is loaded from the static resource, you can use it as normal.

1. From Setup, enter *`CSP`* in the `Quick Find` box, then select **CSP Trusted Sites**.
   This page displays a list of any CSP Trusted Sites already registered, and provides additional information about each site, including site name and URL.
2. Select **New Trusted Site**.
3. Name the Trusted Site.

   For example, enter *`Google Maps`*.
4. Enter the URL for the Trusted Site.

   The URL must begin with `http://` or `https://`. It must include a domain name, and can include a port.

   Warning: The default CSP requires secure (HTTPS) connections for external resources. Configuring a CSP Trusted Site with an insecure (HTTP) URL is an anti-pattern, and compromises the security of your org.
5. Optional: Enter a description for the Trusted Site.
6. Optional: To temporarily disable a Trusted Site without actually deleting it, deselect the **Active** checkbox.
7. Select **Save**.

Note: CSP Trusted Sites affect the CSP header only for Lightning Component framework requests. To enable corresponding access for Visualforce or Apex, create a Remote Site.

CSP isn't enforced by all browsers. For a list of browsers that enforce CSP, see `caniuse.com`.

IE11 doesn't support CSP, so we recommend using other supported browsers for enhanced security.

SEE ALSO:

Content Security Policy Overview

Making API Calls from Components

JavaScript Cookbook

This section includes code snippets and samples that can be used in various JavaScript files.

IN THIS SECTION:

Dynamically Creating Components

Create a component dynamically in your client-side JavaScript code by using the `$A.createComponent()` method. To create multiple components, use `$A.createComponents()`.

Note: Use `$A.createComponent()` instead of the deprecated `$A.newCmp()` and `$A.newCmpAsync()` methods.

The syntax is:

```
$A.createComponent(String type, Object attributes, function callback)
```

1. `type`—The type of component to create; for example, `"ui:button"`.
2. `attributes`—A map of attributes for the component, including the local Id (`aura:id`).

3. `callback(cmp, status, errorMessage)`—The callback to invoke after the component is created. The callback has three parameters.
   a. `cmp`—The new component created. This enables you to do something with the new component, such as add it to the body of the component that creates it. If there's an error, `cmp` is `null`.
   b. `status`—The status of the call. The possible values are `SUCCESS`, `INCOMPLETE`, or `ERROR`. Always check the status is `SUCCESS` before you try to use the component.
   c. `errorMessage`—The error message if the status is `ERROR`.

Let's add a dynamically created button to this sample component.

```
<!--c:createComponent-->
<aura:component>
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>

    <p>Dynamically created button</p>
    {!v.body}
</aura:component>
```

The client-side controller calls `$A.createComponent()` to create a `ui:button` with a local ID and a handler for the `press` event. The `function(newButton, ...)` callback appends the button to the `body` of `c:createComponent`. The `newButton` that's dynamically created by `$A.createComponent()` is passed as the first argument to the callback.

```
/*createComponentController.js*/
({
    doInit : function(cmp) {
        $A.createComponent(
            "ui:button",
            {
                "aura:id": "findableAuraId",
                "label": "Press Me",
                "press": cmp.getReference("c.handlePress")
            },
            function(newButton, status, errorMessage){
                //Add the new button to the body array
                if (status === "SUCCESS") {
                    var body = cmp.get("v.body");
                    body.push(newButton);
                    cmp.set("v.body", body);
                }
                else if (status === "INCOMPLETE") {
                    console.log("No response from server or client is offline.")
                    // Show offline error
                }
                else if (status === "ERROR") {
                    console.log("Error: " + errorMessage);
                    // Show error message
                }
            }
        );
    },

    handlePress : function(cmp) {
        console.log("button pressed");
    }
})
```

Note: `c:createComponent` contains a `{!v.body}` expression. When you use `cmp.set("v.body", ...)` to set the component body, you must explicitly include `{!v.body}` in your component markup.

Creating Nested Components

To dynamically create a component in the body of another component, use `$A.createComponents()` to create the components. In the function callback, nest the components by setting the inner component in the `body` of the outer component. This example creates a `ui:outputText` component in the `body` of a `ui:message` component.

```
$A.createComponents([
    ["ui:message",{
        "title" : "Sample Thrown Error",
        "severity" : "error",
    }],
    ["ui:outputText",{
        "value" : e.message
    }]
    ],
    function(components, status, errorMessage){
        if (status === "SUCCESS") {
            var message = components[0];
            var outputText = components[1];
            // set the body of the ui:message to be the ui:outputText
            message.set("v.body", outputText);
        }
        else if (status === "INCOMPLETE") {
            console.log("No response from server or client is offline.")
            // Show offline error
        }
        else if (status === "ERROR") {
            console.log("Error: " + errorMessage);
            // Show error message
        }
    }
);
```

Destroying Dynamically Created Components

After a component that is declared in markup is no longer in use, the framework automatically destroys it and frees up its memory.

If you create a component dynamically in JavaScript and that component isn't added to a facet (`v.body` or another attribute of type `Aura.Component[]`), you have to destroy it manually using `Component.destroy()` to avoid memory leaks.

Avoiding a Server Trip

The `createComponent()` and `createComponents()` methods supports both client-side and server-side component creation. If no server-side dependencies are found, the methods are executed client-side.

A server-side controller is not a server-side dependency for component creation as controller actions are only called after the component has been created.

A component with server-side dependencies is created on the server. If there are no server dependencies and the definition already exists on the client via preloading or declared dependencies, no server call is made.

Tip: There's no limit in component creation on the client side. You can create up to 10,000 components in one server request. If you hit this limit, ensure that you're creating components on the client side in markup or in JavaScript using `$A.createComponent()` or `$A.createComponents()`. To avoid a trip to the server for component creation in JavaScript code, add an `<aura:dependency>` tag for the component in the markup to explicitly tell the framework about the dependency.

The framework automatically tracks dependencies between definitions, such as components, defined in markup. However, some dependencies aren't easily discoverable by the framework; for example, if you dynamically create a component that isn't directly referenced in the component's markup. To tell the framework about such a dynamic dependency, use the `<aura:dependency>` tag. This ensures that the component and its dependencies are sent to the client, when needed.

The top-level component determines whether a server request is necessary for component creation.

Note: Creating components where the top-level components don't have server dependencies but nested inner components do is not currently supported.

SEE ALSO:

- Reference Doc App
- aura:dependency
- Invoking Actions on Component Initialization
- Dynamically Adding Event Handlers

Detecting Data Changes with Change Handlers

Configure a component to automatically invoke a change handler, which is a client-side controller action, when a value in one of the component's attributes changes.

When the value changes, the `valueChange.evt` event is automatically fired. The event has `type="VALUE"`.

In the component, define a handler with `name="change"`.

```
<aura:handler name="change" value="{!v.numItems}" action="{!c.itemsChange}"/>
```

The `value` attribute sets the component attribute that the change handler tracks.

The `action` attribute sets the client-side controller action to invoke when the attribute value changes.

A component can have multiple `<aura:handler name="change">` tags to detect changes to different attributes.

In the controller, define the action for the handler.

```
({
    itemsChange: function(cmp, evt) {
        console.log("numItems has changed");
        console.log("old value: " + evt.getParam("oldValue"));
        console.log("current value: " + evt.getParam("value"));
    }
})
```

The `valueChange` event gives you access to the previous value (`oldValue`) and the current value (`value`) in the handler action.

When a change occurs to a value that is represented by the `change` handler, the framework handles the firing of the event and rerendering of the component.

SEE ALSO:

Invoking Actions on Component Initialization

aura:valueChange

Finding Components by ID

Retrieve a component by its ID in JavaScript code.

Use `aura:id` to add a local ID of `button1` to the `ui:button` component.

```
<ui:button aura:id="button1" label="button1"/>
```

You can find the component by calling `cmp.find("button1")`, where `cmp` is a reference to the component containing the button. The `find()` function has one parameter, which is the local ID of a component within the markup.

`find()` returns different types depending on the result.

- If the local ID is unique, `find()` returns the component.
- If there are multiple components with the same local ID, `find()` returns an array of the components.
- If there is no matching local ID, `find()` returns `undefined`.

SEE ALSO:

Component IDs

Value Providers

Dynamically Adding Event Handlers

You can dynamically add a handler for an event that a component fires. The component can be created dynamically on the client-side or fetched from the server at runtime.

This sample code adds an event handler to instances of `c:sampleComponent`.

```
addNewHandler : function(cmp, event) {
    var cmpArr = cmp.find({ instancesOf : "c:sampleComponent" });
    for (var i = 0; i < cmpArr.length; i++) {
        var outputCmpArr = cmpArr[i];
        outputCmpArr.addHandler("cmpEvent", cmp, "c.someAction");
    }
}
```

Let's look at the `addHandler()` method that adds an event handler to a component.

```
outputCmpArr.addHandler("cmpEvent", cmp, "c.someAction");
```

- `cmpEvent`—The first argument is the name of the event that triggers the handler. Note that you can't force a component to start firing events that it doesn't fire so make sure that this argument corresponds to an event that the component fires. The `<aura:registerEvent>` tag in a component's markup advertises an event that the component fires. Set this argument to match the `name` attribute of one of the `<aura:registerEvent>` tags.

- `cmp`—The second argument is the value provider for resolving the action expression, which is the next argument. In this example, the value provider is the component associated with the controller.
- `c.someAction`—The third argument is the controller action that handles the event. This is equivalent to the value you would put in the `action` attribute in the `<aura:handler>` tag if the handler was statically defined in the markup.

For a full list of methods and arguments, refer to the JavaScript API in the doc reference app.

You can also add an event handler to a component that is created dynamically in the callback function of `$A.createComponent()`. For more information, see Dynamically Creating Components.

SEE ALSO:

Handling Events with Client-Side Controllers

Handling Component Events

Reference Doc App

Dynamically Showing or Hiding Markup

Use CSS to toggle markup visibility. You could use the `<aura:if>` tag to do the same thing but we recommend using CSS as it's the more standard approach.

This example uses `$A.util.toggleClass(cmp, 'class')` to toggle visibility of markup.

```
<!--c:toggleCss-->
<aura:component>
    <ui:button label="Toggle" press="{!c.toggle}"/>
    <p aura:id="text">Now you see me</p>
</aura:component>
```

```
/*toggleCssController.js*/
({
    toggle : function(component, event, helper) {
        var toggleText = component.find("text");
        $A.util.toggleClass(toggleText, "toggle");
    }
})
```

```
/*toggleCss.css*/
.THIS.toggle {
    display: none;
}
```

Click the **Toggle** button to hide or show the text by toggling the CSS class.

SEE ALSO:

Handling Events with Client-Side Controllers

Component Attributes

Adding and Removing Styles

Adding and Removing Styles

You can add or remove a CSS style on a component or element during runtime.

To retrieve the class name on a component, use `component.find('myCmp').get('v.class')`, where `myCmp` is the `aura:id` attribute value.

To append and remove CSS classes from a component or element, use the `$A.util.addClass(cmpTarget, 'class')` and `$A.util.removeClass(cmpTarget, 'class')` methods.

Component source

```
<aura:component>
    <div aura:id="changeIt">Change Me!</div><br />
    <ui:button press="{!c.applyCSS}" label="Add Style" />
    <ui:button press="{!c.removeCSS}" label="Remove Style" />
</aura:component>
```

CSS source

```
.THIS.changeMe {
    background-color:yellow;
    width:200px;
}
```

Client-side controller source

```
{
    applyCSS: function(cmp, event) {
        var cmpTarget = cmp.find('changeIt');
        $A.util.addClass(cmpTarget, 'changeMe');
    },

    removeCSS: function(cmp, event) {
        var cmpTarget = cmp.find('changeIt');
        $A.util.removeClass(cmpTarget, 'changeMe');
    }
}
```

The buttons in this demo are wired to controller actions that append or remove the CSS styles. To append a CSS style to a component, use `$A.util.addClass(cmpTarget, 'class')`. Similarly, remove the class by using `$A.util.removeClass(cmpTarget, 'class')` in your controller. `cmp.find()` locates the component using the local ID, denoted by `aura:id="changeIt"` in this demo.

Toggling a Class

To toggle a class, use `$A.util.toggleClass(cmp, 'class')`, which adds or removes the class.

The `cmp` parameter can be component or a DOM element.

Note: We recommend using a component instead of a DOM element. If the utility function is not used inside `afterRender()` or `rerender()`, passing in `cmp.getElement()` might result in your class not being applied when the components are rerendered. For more information, see Events Fired During the Rendering Lifecycle on page 165.

To hide or show markup dynamically, see Dynamically Showing or Hiding Markup on page 244.

To conditionally set a class for an array of components, pass in the array to `$A.util.toggleClass()`.

```
mapClasses: function(arr, cssClass) {
    for(var cmp in arr) {
        $A.util.toggleClass(arr[cmp], cssClass);
    }
}
```

SEE ALSO:

- Handling Events with Client-Side Controllers
- CSS in Components
- Component Bundles

Which Button Was Pressed?

To find out which button was pressed in a component containing multiple buttons, use `Component.getLocalId()`.

Let's look at a component that contains multiple buttons. Each button has a unique local ID, set by an `aura:id` attribute.

```
<!--c:buttonPressed-->
<aura:component >
    <aura:attribute name="whichButton" type="String" />

    <p>You clicked: {!v.whichButton}</p>

    <ui:button aura:id="button1" label="Click me" press="{!c.nameThatButton}"/>
    <ui:button aura:id="button2" label="Click me too" press="{!c.nameThatButton}"/>
</aura:component>
```

Use `event.getSource()` in the client-side controller to get the button component that was clicked. Call `getLocalId()` to get the `aura:id` of the clicked button.

```
/* buttonPressedController.js */
({
    nameThatButton : function(cmp, event, helper) {
        var whichOne = event.getSource().getLocalId();
        console.log(whichOne);
        cmp.set("v.whichButton", whichOne);
    }
})
```

SEE ALSO:

- Component IDs
- Finding Components by ID

Using Apex

Use Apex to write server-side code, such as controllers and test classes.

Server-side controllers handle requests from client-side controllers. For example, a client-side controller might handle an event and call a server-side controller action to persist a record. A server-side controller can also load your record data.

IN THIS SECTION:

Creating Server-Side Logic with Controllers

The framework supports client-side and server-side controllers. An event is always wired to a client-side controller action, which can in turn call a server-side controller action. For example, a client-side controller might handle an event and call a server-side controller action to persist a record.

Server-side actions need to make a round trip, from the client to the server and back again, so they are usually completed more slowly than client-side actions.

For more details on the process of calling a server-side action, see Calling a Server-Side Action on page 250.

IN THIS SECTION:

Abortable Actions

Mark an action as abortable to make it potentially abortable while it's queued to be sent to the server. An abortable action in the queue is not sent to the server if the component that created the action is no longer valid, that is `cmp.isValid() == false`. A component is automatically destroyed and marked invalid by the framework when it is unrendered.

Apex Server-Side Controller Overview

Create a server-side controller in Apex and use the `@AuraEnabled` annotation to enable client- and server-side access to the controller method.

Only methods that you have explicitly annotated with `@AuraEnabled` are exposed. Calling server-side actions aren't counted against your org's API limits. However, your server-side controller actions are written in Apex, and as such are subject to all the usual Apex limits.

This Apex controller contains a `serverEcho` action that prepends a string to the value passed in.

```
public with sharing class SimpleServerSideController {

    //Use @AuraEnabled to enable client- and server-side access to the method
    @AuraEnabled
    public static String serverEcho(String firstName) {
        return ('Hello from the server, ' + firstName);
    }
}
```

In addition to using the `@AuraEnabled` annotation, your Apex controller must follow these requirements.

- Methods must be `static` and marked `public` or `global`. Non-static methods aren't supported.
- If a method returns an object, instance methods that retrieve the value of the object's instance field must be `public`.

Tip: Don't store component state in your controller (client-side or server-side). Store it in a component's attribute instead.

For more information, see Understanding Classes in the *Apex Developer Guide*.

SEE ALSO:

Calling a Server-Side Action

Creating an Apex Server-Side Controller

Creating an Apex Server-Side Controller

Use the Developer Console to create an Apex server-side controller.

1. Open the Developer Console.
2. Click **File** > **New** > **Apex Class**.
3. Enter a name for your server-side controller.
4. Click **OK**.
5. Enter a method for each server-side action in the body of the class.

   Note: Add the `@AuraEnabled` annotation to any methods, including getters and setters, that you wish to expose on the client- or server-side. This means that you only expose methods that you have explicitly annotated.

6. Click **File** > **Save**.
7. Open the component that you want to wire to the new controller class.

8. Add a `controller` system attribute to the `<aura:component>` tag to wire the component to the controller. For example:

```
<aura:component controller="SimpleServerSideController" >
```

SEE ALSO:

Salesforce Help: Open the Developer Console

Returning Errors from an Apex Server-Side Controller

Create and throw a `System.AuraHandledException` from your server-side controller to return a custom error message.

Errors happen. Sometimes they're expected, such as invalid input from a user, or a duplicate record in a database. Sometimes they're unexpected, such as... Well, if you've been programming for any length of time, you know that the range of unexpected errors is nearly infinite.

When your server-side controller code experiences an error, two things can happen. You can catch it there and handle it in Apex. Otherwise, the error is passed back in the controller's response.

If you handle the error Apex, you again have two ways you can go. You can process the error, perhaps recovering from it, and return a normal response to the client. Or, you can create and throw an `AuraHandledException`.

The benefit of throwing `AuraHandledException`, instead of letting a system exception be returned, is that you have a chance to handle the exception more gracefully in your client code. System exceptions have important details stripped out for security purposes, and result in the dreaded "An internal server error has occurred…" message. Nobody likes that. When you use an `AuraHandledException` you have an opportunity to add some detail back into the response returned to your client-side code. More importantly, you can choose a better message to show your users.

Here's an example of creating and throwing an `AuraHandledException` in response to bad input. However, the real benefit of using `AuraHandledException` comes when you use it in response to a system exception. For example, throw an `AuraHandledException` in response to catching a DML exception, instead of allowing that to propagate down to your client component code.

```
public with sharing class SimpleErrorController {

    static final List<String> BAD_WORDS = new List<String> {
        'bad',
        'words',
        'here'
    };

    @AuraEnabled
    public static String helloOrThrowAnError(String name) {

        // Make sure we're not seeing something naughty
        for(String badWordStem : BAD_WORDS) {
            if(name.containsIgnoreCase(badWordStem)) {
                // How rude! Gracefully return an error...
                throw new AuraHandledException('NSFW name detected.');
            }
        }

        // No bad word found, so...
        return ('Hello ' + name + '!');
    }
}
```

Calling a Server-Side Action

Call a server-side controller action from a client-side controller. In the client-side controller, you set a callback, which is called after the server-side action is completed. A server-side action can return any object containing serializable JSON data.

A client-side controller is a JavaScript object in object-literal notation containing name-value pairs. Each name corresponds to a client-side action. Its value is the function code associated with the action.

Let's say that you want to trigger a server-call from a component. The following component contains a button that's wired to a client-side controller `echo` action. `SimpleServerSideController` contains a method that returns a string passed in from the client-side controller.

```
<aura:component controller="SimpleServerSideController">
    <aura:attribute name="firstName" type="String" default="world"/>
    <ui:button label="Call server" press="{!c.echo}"/>
</aura:component>
```

This client-side controller includes an `echo` action that executes a `serverEcho` method on a server-side controller.

Tip: Use unique names for client-side and server-side actions in a component. A JavaScript function (client-side action) with the same name as a server-side action (Apex method) can lead to hard-to-debug issues.

```
({
    "echo" : function(cmp) {
        // create a one-time use instance of the serverEcho action
        // in the server-side controller
        var action = cmp.get("c.serverEcho");
        action.setParams({ firstName : cmp.get("v.firstName") });

        // Create a callback that is executed after
        // the server-side action returns
        action.setCallback(this, function(response) {
            var state = response.getState();
            // This callback doesn't reference cmp. If it did,
            // you should run an isValid() check
            //if (cmp.isValid() && state === "SUCCESS") {
            if (state === "SUCCESS") {
                // Alert the user with the value returned
                // from the server
                alert("From server: " + response.getReturnValue());

                // You would typically fire a event here to trigger
                // client-side notification that the server-side
                // action is complete
            }
            //else if (cmp.isValid() && state === "INCOMPLETE") {
            else if (state === "INCOMPLETE") {
                // do something
            }
            //else if (cmp.isValid() && state === "ERROR") {
            else if (state === "ERROR") {
                var errors = response.getError();
                if (errors) {
                    if (errors[0] && errors[0].message) {
                        console.log("Error message: " +
                                 errors[0].message);
                    }
                } else {
                    console.log("Unknown error");
                }
            }
        });

        // optionally set storable, abortable, background flag here

        // A client-side action could cause multiple events,
        // which could trigger other events and
        // other server-side action calls.
        // $A.enqueueAction adds the server-side action to the queue.
        $A.enqueueAction(action);
    }
})
```

In the client-side controller, we use the value provider of `c` to invoke a server-side controller action. We also use the `c` syntax in markup to invoke a client-side controller action.

The `cmp.get("c.serverEcho")` call indicates that we're calling the `serverEcho` method in the server-side controller. The method name in the server-side controller must match everything after the `c.` in the client-side call. In this case, that's `serverEcho`.

Use `action.setParams()` to set arguments to be passed to the server-side controller. The following call sets the value of the `firstName` argument on the server-side controller's `serverEcho` method based on the `firstName` attribute value.

```
action.setParams({ firstName : cmp.get("v.firstName") });
```

`action.setCallback()` sets a callback action that is invoked after the server-side action returns.

```
action.setCallback(this, function(response) { ... });
```

The server-side action results are available in the `response` variable, which is the argument of the callback.

`response.getState()` gets the state of the action returned from the server.

Note: Always add an `isValid()` check if you reference a component in asynchronous code, such as a callback or a timeout. If you navigate elsewhere in the UI while asynchronous code is executing, the framework unrenders and destroys the component that made the asynchronous request. You can still have a reference to that component, but it is no longer valid. Add an `isValid()` call to check that the component is still valid before processing the results of the asynchronous request.

`response.getReturnValue()` gets the value returned from the server. In this example, the callback function alerts the user with the value returned from the server.

`$A.enqueueAction(action)` adds the server-side controller action to the queue of actions to be executed. All actions that are enqueued will run at the end of the event loop. Rather than sending a separate request for each individual action, the framework processes the event chain and batches the actions in the queue into one request. The actions are asynchronous and have callbacks.

Tip: If your action is not executing, make sure that you're not executing code outside the framework's normal rerendering lifecycle. For example, if you use `window.setTimeout()` in an event handler to execute some logic after a time delay, wrap your code in `$A.getCallback()`. You don't need to use `$A.getCallback()` if your code is executed as part of the framework's call stack; for example, your code is handling an event or in the callback for a server-side controller action.

Action States

The possible action states are:

NEW
: The action was created but is not in progress yet

RUNNING
: The action is in progress

SUCCESS
: The action executed successfully

ERROR
: The server returned an error

INCOMPLETE
: The server didn't return a response. The server might be down or the client might be offline. The framework guarantees that an action's callback is always invoked as long as the component is valid. If the socket to the server is never successfully opened, or closes abruptly, or any other network error occurs, the XHR resolves and the callback is invoked with state equal to `INCOMPLETE`.

ABORTED
: The action was aborted. This action state is deprecated. A callback for an aborted action is never executed so you can't do anything to handle this state.

SEE ALSO:

- Handling Events with Client-Side Controllers
- Queueing of Server-Side Actions

Queueing of Server-Side Actions

The framework queues up actions before sending them to the server. This mechanism is largely transparent to you when you're writing code but it enables the framework to minimize network traffic by batching multiple actions into one request.

Event processing can generate a tree of events if an event handler fires more events. The framework processes the event tree and adds every action that needs to be executed on the server to a queue.

When the tree of events and all the client-side actions are processed, the framework batches actions from the queue into a message before sending it to the server. A message is essentially a wrapper around a list of actions.

Tip: If your action is not executing, make sure that you're not executing code outside the framework's normal rerendering lifecycle. For example, if you use `window.setTimeout()` in an event handler to execute some logic after a time delay, wrap your code in `$A.getCallback()`.

SEE ALSO:

- Modifying Components Outside the Framework Lifecycle

Storable Actions

Enhance your component's performance by marking actions as storable to quickly show cached data from client-side storage without waiting for a server trip. If the cached data is stale, the framework retrieves the latest data from the server. Caching is especially beneficial for users on high latency, slow, or unreliable connections such as 3G networks.

Warning:

- A storable action might result in no call to the server. Never mark as storable an action that updates or deletes data.
- For storable actions in the cache, the framework returns the cached response immediately and also refreshes the data if it's stale. Therefore, storable actions might have their callbacks invoked more than once: first with cached data, then with updated data from the server.

Most server requests are read-only and idempotent, which means that a request can be repeated or retried as often as necessary without causing data changes. The responses to idempotent actions can be cached and quickly reused for subsequent identical actions. For storable actions, the key for determining an identical action is a combination of:

- Apex controller name
- Method name
- Method parameter values

Marking an Action as Storable

To mark a server-side action as storable, call `setStorable()` on the action in JavaScript code, as follows.

```
action.setStorable();
```

Note: Storable actions are always implicitly marked as abortable too.

The `setStorable` function takes an optional argument, which is a configuration map of key-value pairs representing the storage options and values to set. You can only set the following property:

`ignoreExisting`

Set to `true` to bypass the cache. The default value is `false`.

This property is useful when you know that any cached data is invalid, such as after a record modification. This property should be used rarely because it explicitly defeats caching.

To set the storage options for the action response, pass this configuration map into `setStorable(`***`configObj`***`)`.

IN THIS SECTION:

Lifecycle of Storable Actions

This image describes the sequence of callback execution for storable actions.

Enable Storable Actions in an Application

Storable actions are automatically configured in Lightning Experience and Salesforce1. To use storable actions in a standalone app (`.app` resource), you must configure client-side storage for cached action responses.

Storage Service Adapters

The Storage Service supports multiple implementations of storage and selects an adapter at runtime based on browser support and specified characteristics of persistence and security. Storage can be persistent and secure. With persistent storage, cached data is preserved between user sessions in the browser. With secure storage, cached data is encrypted.

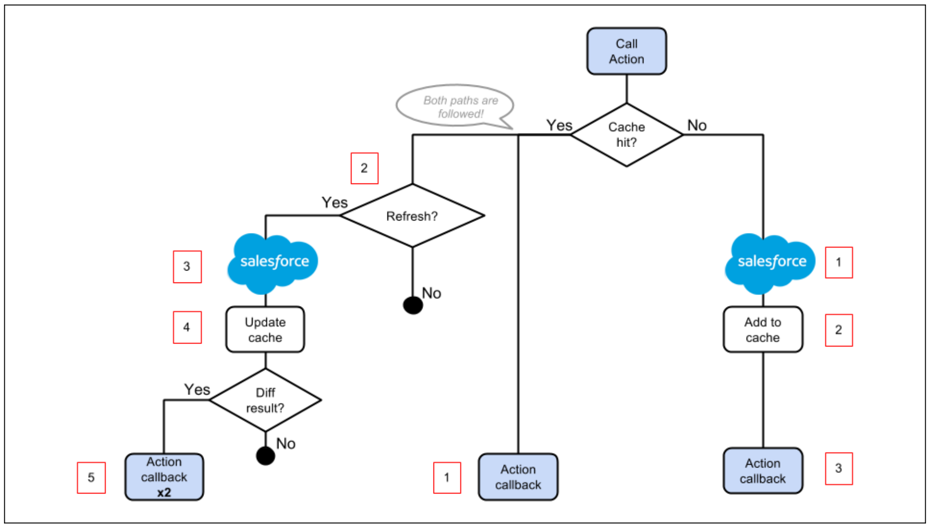
Lifecycle of Storable Actions

This image describes the sequence of callback execution for storable actions.

Note: An action might have its callback invoked more than once:

- First with the cached response, if it's in storage.

- Second with updated data from the server, if the stored response has exceeded the time to refresh entries.



Cache Miss

If the action is not a cache hit as it doesn't match a storage entry:

1. The action is sent to the server-side controller.
2. If the response is `SUCCESS`, the response is added to storage.
3. The callback in the client-side controller is executed.

Cache Hit

If the action is a cache hit as it matches a storage entry:

1. The callback in the client-side controller is executed with the cached action response.
2. If the response has been cached for longer than the refresh time, the storage entry is refreshed.

   When an application enables storable actions, a refresh time is configured. The refresh time is the duration in seconds before an entry is refreshed in storage. The refresh time is automatically configured in Lightning Experience and Salesforce1.

3. The action is sent to the server-side controller.
4. If the response is `SUCCESS`, the response is added to storage.
5. If the refreshed response is different from the cached response, the callback in the client-side controller is executed for a second time.

SEE ALSO:

Storable Actions

Enable Storable Actions in an Application

Enable Storable Actions in an Application

Storable actions are automatically configured in Lightning Experience and Salesforce1. To use storable actions in a standalone app (`.app` resource), you must configure client-side storage for cached action responses.

To configure client-side storage for your standalone app, use `<auraStorage:init>` in the `auraPreInitBlock` attribute of your application's template. For example:

```
<aura:component isTemplate="true" extends="aura:template">
    <aura:set attribute="auraPreInitBlock">
        <auraStorage:init
          name="actions"
          persistent="false"
          secure="true"
          maxSize="1024"
          defaultExpiration="900"
          defaultAutoRefreshInterval="30" />
    </aura:set>
</aura:component>
```

`name`
: The storage name must be `actions`. Storable actions are the only currently supported type of storage.

`persistent`
: Set to `true` to preserve cached data between user sessions in the browser.

`secure`
: Set to `true` to encrypt cached data.

`maxsize`
: The maximum size in KB of the storage.

`defaultExpiration`
: The duration in seconds that an entry is retained in storage.

`defaultAutoRefreshInterval`
: The duration in seconds before an entry is refreshed in storage.

For more information, see the Reference Doc App.

Storable actions use the Storage Service. The Storage Service supports multiple implementations of storage and selects an adapter at runtime based on browser support and specified characteristics of persistence and security.

SEE ALSO:

Storage Service Adapters

Storage Service Adapters

The Storage Service supports multiple implementations of storage and selects an adapter at runtime based on browser support and specified characteristics of persistence and security. Storage can be persistent and secure. With persistent storage, cached data is preserved between user sessions in the browser. With secure storage, cached data is encrypted.

Storage Adapter Name	Persistent	Secure
IndexedDB	`true`	`false`
Memory	`false`	`true`

IndexedDB

(Persistent but not secure) Provides access to an API for client-side storage and search of structured data. For more information, see the Indexed Database API.

Memory

(Not persistent but secure) Provides access to JavaScript memory for caching data. The stored cache persists only per browser page. Browsing to a new page resets the cache.

The Storage Service selects a storage adapter on your behalf that matches the persistent and secure options you specify when initializing the service. For example, if you request a persistent and insecure storage service, the Storage Service returns the IndexedDB storage if the browser supports it.

Abortable Actions

Mark an action as abortable to make it potentially abortable while it's queued to be sent to the server. An abortable action in the queue is not sent to the server if the component that created the action is no longer valid, that is `cmp.isValid() == false`. A component is automatically destroyed and marked invalid by the framework when it is unrendered.

Note: We recommend that you only use abortable actions for read-only operations as they are not guaranteed to be sent to the server.

An abortable action is sent to the server and executed normally unless the component that created the action is invalid before the action is sent to the server.

A non-abortable action is always sent to the server and can't be aborted in the queue.

If an action response returns from the server and the associated component is now invalid, the logic has been executed on the server but the action callback isn't executed. This is true whether or not the action is marked as abortable.

Marking an Action as Abortable

Mark a server-side action as abortable by using the `setAbortable()` method on the `Action` object in JavaScript. For example:

```
var action = cmp.get("c.serverEcho");
action.setAbortable();
```

SEE ALSO:

Creating Server-Side Logic with Controllers

Queueing of Server-Side Actions

Calling a Server-Side Action

Creating Components

The `Cmp.<myNamespace>.<myComponent>` syntax to reference a component in Apex is deprecated. Use `$A.createComponent()` in client-side JavaScript code instead.

SEE ALSO:

Dynamically Creating Components

Working with Salesforce Records

It's easy to work with your Salesforce records in Apex.

The term `sObject` refers to any object that can be stored in Force.com. This could be a standard object, such as Account, or a custom object that you create, such as a Merchandise object.

An `sObject` variable represents a row of data, also known as a record. To work with an object in Apex, declare it using the SOAP API name of the object. For example:

```
Account a = new Account();
MyCustomObject__c co = new MyCustomObject__c();
```

For more information on working on records with Apex, see Working with Data in Apex.

This example controller persists an updated Account record. Note that the `update` method has the `@AuraEnabled` annotation, which enables it to be called as a server-side controller action.

```
public with sharing class AccountController {

    @AuraEnabled
    public static void updateAnnualRevenue(String accountId, Decimal annualRevenue) {
        Account acct = [SELECT Id, Name, BillingCity FROM Account WHERE Id = :accountId];

        acct.AnnualRevenue = annualRevenue;

        // Perform isAccessible() and isUpdateable() checks here
        update acct;
    }
}
```

For an example of calling Apex code from JavaScript code, see the Quick Start on page 6.

Loading Record Data from a Standard Object

Load records from a standard object in a server-side controller. The following server-side controller has methods that return a list of opportunity records and an individual opportunity record.

```
public with sharing class OpportunityController {

    @AuraEnabled
    public static List<Opportunity> getOpportunities() {
        List<Opportunity> opportunities =
                [SELECT Id, Name, CloseDate FROM Opportunity];
        return opportunities;
    }

    @AuraEnabled
    public static Opportunity getOpportunity(Id id) {
        Opportunity opportunity = [
                SELECT Id, Account.Name, Name, CloseDate,
                       Owner.Name, Amount, Description, StageName
            FROM Opportunity
            WHERE Id = :id
         ];
        // Perform isAccessible() check here
        return opportunity;
    }
}
```

This example component uses the previous server-side controller to display a list of opportunity records when you press a button.

```
<aura:component controller="OpportunityController">
    <aura:attribute name="opportunities" type="Opportunity[]"/>

    <ui:button label="Get Opportunities" press="{!c.getOpps}"/>
    <aura:iteration var="opportunity" items="{!v.opportunities}">
     <p>{!opportunity.Name} : {!opportunity.CloseDate}</p>
    </aura:iteration>
</aura:component>
```

When you press the button, the following client-side controller calls the `getOpportunities()` server-side controller and sets the `opportunities` attribute on the component. For more information about calling server-side controller methods, see Calling a Server-Side Action on page 250.

```
({
    getOpps: function(cmp){
        var action = cmp.get("c.getOpportunities");
        action.setCallback(this, function(response){
            var state = response.getState();
            if (state === "SUCCESS") {
                cmp.set("v.opportunities", response.getReturnValue());
            }
        });
  $A.enqueueAction(action);
    }
})
```

Note: To load record data during component initialization, use the `init` handler.

Loading Record Data from a Custom Object

Load record data using an Apex controller and setting the data on a component attribute. This server-side controller returns records on a custom object `myObj__c`.

```
public with sharing class MyObjController {

    @AuraEnabled
    public static List<MyObj__c> getMyObjects() {

        // Perform isAccessible() checks here
        return [SELECT Id, Name, myField__c FROM MyObj__c];
    }
}
```

This example component uses the previous controller to display a list of records from the `myObj__c` custom object.

```
<aura:component controller="MyObjController"/>
<aura:attribute name="myObjects" type="namespace.MyObj__c[]"/>
<aura:iteration items="{!v.myObjects}" var="obj">
```

```
    {!obj.Name}, {!obj.namespace__myField__c}
</aura:iteration>
```

This client-side controller sets the `myObjects` component attribute with the record data by calling the `getMyObjects()` method in the server-side controller. This step can also be done during component initialization using the `init` handler.

```
getMyObjects: function(cmp){
    var action = cmp.get("c.getMyObjects");
    action.setCallback(this, function(response){
        var state = response.getState();
        if (state === "SUCCESS") {
            cmp.set("v.myObjects", response.getReturnValue());
        }
    });
    $A.enqueueAction(action);
}
```

For an example on loading and updating records using controllers, see the Quick Start on page 6.

IN THIS SECTION:

CRUD and Field-Level Security (FLS)

Lightning components don't automatically enforce CRUD and FLS when you reference objects or retrieve the objects from an Apex controller. This means that the framework continues to display records and fields for which users don't have CRUD access and FLS visibility. You must manually enforce CRUD and FLS in your Apex controllers.

Saving Records

You can take advantage of the built-in create and edit record pages in Salesforce1 to create or edit records via a Lightning component.

Deleting Records

You can delete records via a Lightning component to remove them from both the view and database.

SEE ALSO:

CRUD and Field-Level Security (FLS)

CRUD and Field-Level Security (FLS)

Lightning components don't automatically enforce CRUD and FLS when you reference objects or retrieve the objects from an Apex controller. This means that the framework continues to display records and fields for which users don't have CRUD access and FLS visibility. You must manually enforce CRUD and FLS in your Apex controllers.

For example, including the `with sharing` keyword in an Apex controller ensures that users see only the records they have access to in a Lightning component. Additionally, you must explicitly check for `isAccessible()`, `isCreateable()`, `isDeletable()`, and `isUpdateable()` prior to performing operations on records or objects.

This example shows the recommended way to perform an operation on a custom expense object.

```
public with sharing class ExpenseController {

    // ns refers to namespace; leave out ns__ if not needed
    // This method is vulnerable.
    @AuraEnabled
    public static List<ns__Expense__c> get_UNSAFE_Expenses() {
        return [SELECT Id, Name, ns__Amount__c, ns__Client__c, ns__Date__c,
            ns__Reimbursed__c, CreatedDate FROM ns__Expense__c];
     }

    // This method is recommended.
    @AuraEnabled
    public static List<ns__Expense__c> getExpenses() {
        String [] expenseAccessFields = new String [] {'Id',
                                                       'Name',
                                                       'ns__Amount__c',
                                                       'ns__Client__c',
                                                       'ns__Date__c',
                                                       'ns__Reimbursed__c',
                                                       'CreatedDate'
                                                       };


    // Obtain the field name/token map for the Expense object
   Map<String,Schema.SObjectField> m = Schema.SObjectType.ns__Expense__c.fields.getMap();


    for (String fieldToCheck : expenseAccessFields) {

        // Check if the user has access to view field
        if (!m.get(fieldToCheck).getDescribe().isAccessible()) {

            // Pass error to client
            throw new System.NoAccessException();

           // Suppress editor logs
           return null;
        }
    }

    // Query the object safely
    return [SELECT Id, Name, ns__Amount__c, ns__Client__c, ns__Date__c,
            ns__Reimbursed__c, CreatedDate FROM ns__Expense__c];
    }
}
```

Note: For more information, see the articles on Enforcing CRUD and FLS and Lightning Security.

Saving Records

You can take advantage of the built-in create and edit record pages in Salesforce1 to create or edit records via a Lightning component.

The following component contains a button that calls a client-side controller to display the edit record page.

```
<aura:component>
    <ui:button label="Edit Record" press="{!c.edit}"/>
</aura:component>
```

The client-side controller fires the `force:recordEdit` event, which displays the edit record page for a given contact ID. For this event to be handled correctly, the component must be included in Salesforce1.

```
edit : function(component, event, helper) {
    var editRecordEvent = $A.get("e.force:editRecord");
    editRecordEvent.setParams({
        "recordId": component.get("v.contact.Id")
    });
    editRecordEvent.fire();
}
```

Records updated using the `force:recordEdit` event are persisted by default.

Saving Records using a Lightning Component

Alternatively, you might have a Lightning component that provides a custom form for users to add a record. To save the new record, wire up a client-side controller to an Apex controller. The following list shows how you can persist a record via a component and Apex controller.

Note: If you create a custom form to handle record updates, you must provide your own field validation.

Create an Apex controller to save your updates with the `upsert` operation. The following example is an Apex controller for upserting record data.

```
@AuraEnabled
public static Expense__c saveExpense(Expense__c expense) {
    // Perform isUpdateable() check here
    upsert expense;
    return expense;
}
```

Call a client-side controller from your component. For example, `<ui:button label="Submit" press="{!c.createExpense}"/>`.

In your client-side controller, provide any field validation and pass the record data to a helper function.

```
createExpense : function(component, event, helper) {
    // Validate form fields
    // Pass form data to a helper function
    var newExpense = component.get("v.newExpense");
    helper.createExpense(component, newExpense);
}
```

In your component helper, get an instance of the server-side controller and set a callback. The following example upserts a record on a custom object. Recall that `setParams()` sets the value of the `expense` argument on the server-side controller's `saveExpense()` method.

```
createExpense: function(component, expense) {
    //Save the expense and update the view
    this.upsertExpense(component, expense, function(a) {
        var expenses = component.get("v.expenses");
        expenses.push(a.getReturnValue());
        component.set("v.expenses", expenses);
    });
},
upsertExpense : function(component, expense, callback) {
    var action = component.get("c.saveExpense");
    action.setParams({
        "expense": expense
    });
    if (callback) {
        action.setCallback(this, callback);
    }
    $A.enqueueAction(action);
}
```

SEE ALSO:

CRUD and Field-Level Security (FLS)

Deleting Records

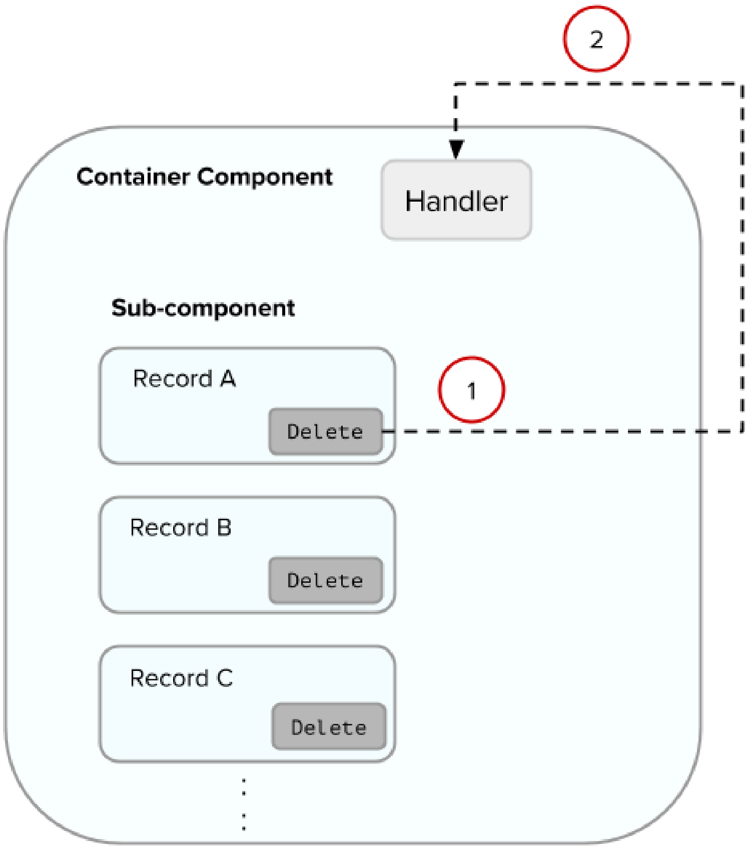
You can delete records via a Lightning component to remove them from both the view and database.

Create an Apex controller to delete a specified record with the `delete` operation. The following Apex controller deletes an expense object record.

```
@AuraEnabled
public static Expense__c deleteExpense(Expense__c expense) {
    // Perform isDeletable() check here
    delete expense;
    return expense;
}
```

Depending on how your components are set up, you might need to create an event to tell another component that a record has been deleted. For example, you have a component that contains a sub-component that is iterated over to display the records. Your sub-component contains a button (1), which when pressed fires an event that's handled by the container component (2), which deletes the record that's clicked on.

```
<aura:registerEvent name="deleteExpenseItem" type="c:deleteExpenseItem"/>
<ui:button label="Delete" press="{!c.delete}"/>
```



Create a component event to capture and pass the record that's to be deleted. Name the event `deleteExpenseItem`.

```
<aura:event type="COMPONENT">
    <aura:attribute name="expense" type="Expense__c"/>
</aura:event>
```

Then, pass in the record to be deleted and fire the event in your client-side controller.

```
delete : function(component, evt, helper) {
    var expense = component.get("v.expense");
    var deleteEvent = component.getEvent("deleteExpenseItem");
    deleteEvent.setParams({ "expense": expense }).fire();
}
```

In the container component, include a handler for the event. In this example, `c:expenseList` is the sub-component that displays records.

```
<aura:handler name="deleteExpenseItem" event="c:deleteExpenseItem" action="c:deleteEvent"/>
<aura:iteration items="{!v.expenses}" var="expense">
    <c:expenseList expense="{!expense}"/>
</aura:iteration>
```

And handle the event in the client-side controller of the container component.

```
deleteEvent : function(component, event, helper) {
    // Call the helper function to delete record and update view
    helper.deleteExpense(component, event.getParam("expense"));
}
```

Finally, in the helper function of the container component, call your Apex controller to delete the record and update the view.

```
deleteExpense : function(component, expense, callback) {
    // Call the Apex controller and update the view in the callback
    var action = component.get("c.deleteExpense");
    action.setParams({
        "expense": expense
    });
    action.setCallback(this, function(response) {
        var state = response.getState();
        if (state === "SUCCESS") {
            // Remove only the deleted expense from view
            var expenses = component.get("v.expenses");
            var items = [];
            for (i = 0; i < expenses.length; i++) {
                if(expenses[i]!==expense) {
                    items.push(expenses[i]);
                }
            }
            component.set("v.expenses", items);
            // Other client-side logic
        }
    });
    $A.enqueueAction(action);
}
```

The helper function calls the Apex controller to delete the record in the database. In the callback function, `component.set("v.expenses", items)` updates the view with the updated array of records.

SEE ALSO:

- CRUD and Field-Level Security (FLS)
- Create a Standalone Lightning App
- Component Events
- Calling a Server-Side Action

Testing Your Apex Code

Before you can upload a managed package, you must write and execute tests for your Apex code to meet minimum code coverage requirements. Also, all tests must run without errors when you upload your package to AppExchange.

To package your application and components that depend on Apex code, the following must be true.

- At least 75% of your Apex code must be covered by unit tests, and all of those tests must complete successfully.

  Note the following.

  - When deploying Apex to a production organization, each unit test in your organization namespace is executed by default.
  - Calls to `System.debug` are not counted as part of Apex code coverage.
  - Test methods and test classes are not counted as part of Apex code coverage.

  - While only 75% of your Apex code must be covered by tests, your focus shouldn't be on the percentage of code that is covered. Instead, you should make sure that every use case of your application is covered, including positive and negative cases, as well as bulk and single records. This should lead to 75% or more of your code being covered by unit tests.

- Every trigger must have some test coverage.
- All classes and triggers must compile successfully.

This sample shows an Apex test class that is used with the controller class in the expense tracker app available at Create a Standalone Lightning App on page 7.

```
@isTest
class TestExpenseController {
    static testMethod void test() {
        //Create new expense and insert it into the database
        Expense__c exp = new Expense__c(name='My New Expense',
                             amount__c=20, client__c='ABC',
                             reimbursed__c=false, date__c=null);
         ExpenseController.saveExpense(exp);

        //Assert the name field and saved expense
        System.assertEquals('My New Expense',
                           ExpenseController.getExpenses()[0].Name,
                          'Name does not match');
        System.assertEquals(exp, ExpenseController.saveExpense(exp));
    }
}
```

Note: Apex classes must be manually added to your package.

For more information on distributing Apex code, see the *Apex Code Developer's Guide*.

SEE ALSO:

Distributing Applications and Components

Making API Calls from Apex

Make API calls from an Apex controller. You can't make Salesforce API calls from JavaScript code.

For security reasons, the Lightning Component framework places restrictions on making API calls from JavaScript code. To call third-party APIs from your component's JavaScript code, add the API endpoint as a CSP Trusted Site.

To call Salesforce APIs, make the API calls from your component's Apex controller. Use a named credential to authenticate to Salesforce.

Note: By security policy, sessions created by Lightning components aren't enabled for API access. This prevents even your Apex code from making API calls to Salesforce. Using a named credential for specific API calls allows you to carefully and selectively bypass this security restriction.

The restrictions on API-enabled sessions aren't accidental. Carefully review any code that uses a named credential to ensure you're not creating a vulnerability.

For information about making API calls from Apex, see the *Apex Developer Guide*.

SEE ALSO:

Apex Developer Guide: Named Credentials as Callout Endpoints

Making API Calls from Components

Create CSP Trusted Sites to Access Third-Party APIs

Content Security Policy Overview

Lightning Data Service (Developer Preview)

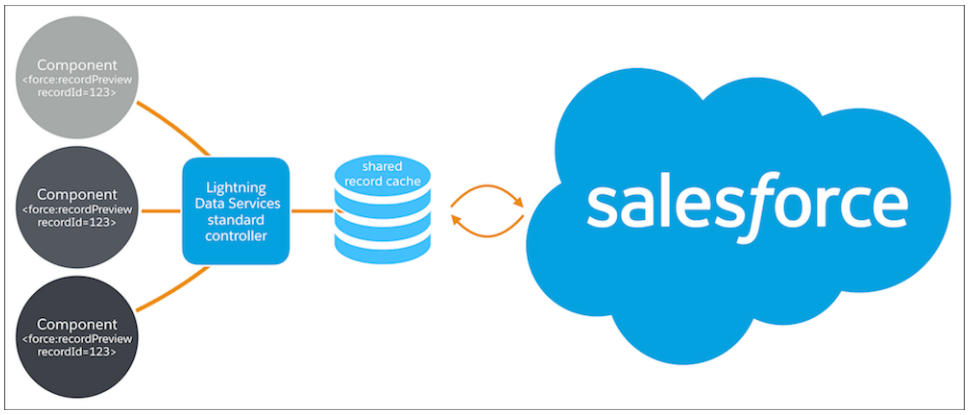
Use Lightning Data Service to load, create, edit, or delete a record in your component, without requiring Apex code. Lightning Data Service handles sharing rules and field level security for you. In addition to not needing Apex, Lightning Data Service improves performance and user interface consistency.

Note: Lightning Data Service is available as a developer preview. Lightning Data Service isn't generally available unless or until Salesforce announces its general availability in documentation or in press releases or public statements. You can provide feedback and suggestions for Lightning Data Service on the IdeaExchange.

At the simplest level, you can think of Lightning Data Service as the Lightning Components version of the Visualforce standard controller. While this statement is an over-simplification, it serves to illustrate a point. Whenever possible, your components should use Lightning Data Service to read and modify Salesforce data.

Data access with Lightning Data Service is usually simpler than the equivalent using a server-side Apex controller. Read-only access can be entirely declarative in your component's markup. For code that modifies data, your component's JavaScript controller is roughly the same amount of code, and you eliminate the Apex entirely. Additionally, all of your data access code is consolidated into your component, which significantly reduces complexity.

Lightning Data Service provides other benefits aside from the code. It's built on highly efficient local storage that's shared across all components that use it. Records loaded in Lightning Data Service are cached and shared across components.


Component <force:recordPreview recordId=123>
Component <force:recordPreview recordId=123>
Component <force:recordPreview recordId=123>
Lightning Data Services standard controller
shared record cache
salesforce

Components accessing the same record see significant performance improvements, because a record is only loaded once, no matter how many components are using it. Shared records also improve user interface consistency. When one component updates a record, any other components using it are notified, and in most cases refresh automatically.

IN THIS SECTION:

Loading a Record

To load a record using Lightning Data Service, add the `force:recordPreview` tag to your component. In the `force:recordPreview` tag, specify the ID of the record to be loaded, a list of fields, and the attribute to which to assign the loaded record.

Loading a record is the simplest operation in Lightning Data Service. You can accomplish it entirely in markup. The `force:recordPreview` must specify the following three things.

- The ID of the record to be loaded
- The component attribute to which the loaded record should be assigned
- A list of fields to load

The list of fields to load can be specified explicitly, using the `fields` attribute. Simply provide a list of fields to query for. For example, `fields="Name,BillingCity,BillingState"`.

Alternatively, and more powerfully, you can specify a layout, using the `layoutType` attribute. All fields on that layout are loaded for the record. Layouts are typically modified by administrators. Loading record data using `layoutType` allows your component to adapt to those layout definitions. There are several layouts available but in practice the FULL and COMPACT layouts are the simplest and most common to use.

Example: Loading a Record

The following example illustrates the essentials of loading a record using Lightning Data Service. This component can be added to a record home page in Lightning App Builder, or as a custom action. The record ID is supplied by the implicit `recordId` attribute added by the `force:hasRecordId` interface.

`ldsLoad.cmp`

```
<aura:component

implements="flexipage:availableForRecordHome,force:lightningQuickActionWithoutHeader,force:hasRecordId">


    <aura:attribute name="record" type="Object"/>
    <aura:attribute name="recordError" type="String"/>

    <force:recordPreview aura:id="recordLoader"
      recordId="{!v.recordId}"
      layoutType="FULL"
      targetRecord="{!v.record}"
      targetError="{!v.recordError}"
      />

    <!-- Display a header with details about the record -->
    <div class="slds-page-header" role="banner">
        <p class="slds-text-heading--label">{!v.record.Name}</p>
        <h1 class="slds-page-header__title slds-m-right--small
            slds-truncate slds-align-left">{!v.record.BillingCity},
{!v.record.BillingState}</h1>
    </div>

    <!-- Display Lightning Data Service errors, if any -->
    <aura:if isTrue="{!not(empty(v.recordError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.recordError}
            </ui:message>
        </div>
    </aura:if>

</aura:component>
```

SEE ALSO:

Configure Components for Lightning Experience Record Pages

Configure Components for Record-Specific Actions

force:recordPreview (Developer Preview)

Saving a Record

To save a record using Lightning Data Service, call `saveRecord` on the `force:recordPreview` component, and pass in a callback function to be invoked after the save operation completes.

The Lightning Data Service save operation is used in two cases.

- To save changes to an existing record.
- To create and save a new record.

To save changes to an existing record, first load the record in EDIT mode. Then call `saveRecord` on the `force:recordPreview` component. These techniques are described in the following sections.

To save a new record, and thus create it, first create the record from a record template, as described in Creating a Record. Then call `saveRecord` on the `force:recordPreview` component, described in a following section.

Load a Record in EDIT Mode

To load a record that might be updated, set the `force:recordPreview` tag's `mode` attribute to "EDIT". Other than explicitly setting the `mode`, loading a record for editing is the same as loading it for any other purpose.

Note: Lightning Data Service records are shared across all components. When you load a record in EDIT mode, the record assigned to the to the `targetRecord` attribute is a *copy* of the record object in the Lightning Data Service cache, instead of a direct reference. This protects other components that might also be using the record from unsaved changes in the component that's editing it. When the edited copy is saved, the "real" version of the record is updated on the server, then the Lightning Data Service cache is updated. At that point, other components using that record are notified of the change.

Call `saveRecord` to Save Record Changes

To perform the actual save operation, call `saveRecord` on the `force:recordPreview` component from the appropriate controller action handler. `saveRecord` takes one argument, a callback function to be invoked when the operation completes. This callback function receives a `SaveRecordResult` as its only parameter. `SaveRecordResult` includes a `state` attribute that indicates success or error, and other details you can use to handle the result of the operation.

Example: **Saving a Record**

The following example illustrates the essentials of saving a record using Lightning Data Service. It's intended for use on a record page. The record ID is supplied by the implicit `recordId` attribute added by the `force:hasRecordId` interface.

`ldsSave.cmp`

```
<aura:component
    implements="flexipage:availableForRecordHome,force:hasRecordId">

    <aura:attribute name="record" type="Object" access="private"/>
    <aura:attribute name="recordError" type="String" access="private"/>

    <force:recordPreview aura:id="recordHandler"
      recordId="{!v.recordId}"
      layoutType="FULL"
      targetRecord="{!v.record}"
      targetError="{!v.recordError}"
      mode="EDIT"
      />
    <!-- Display a header with details about the record -->
    <div class="slds-page-header" role="banner">
        <p class="slds-text-heading--label">Edit Record</p>
        <h1 class="slds-page-header__title slds-m-right--small
            slds-truncate slds-align-left">{!v.record.Name}</h1>
    </div>

    <!-- Display Lightning Data Service errors, if any -->
    <aura:if isTrue="{!not(empty(v.recordError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.recordError}
            </ui:message>
        </div>
    </aura:if>

    <!-- Display an editing form -->
    <div class="slds-form--stacked">

        <div class="slds-form-element">
            <label class="slds-form-element__label" for="recordName">Name: </label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="recordName"
                value="{!v.record.Name}" required="true"/>
            </div>
        </div>

        <div class="slds-form-element">
            <ui:button label="Save Record" press="{!c.handleSaveRecord}"
                class="slds-button slds-button--brand" />
        </div>

    </div>

</aura:component>
```

This component loads a record using `force:recordPreview` set to EDIT mode, and provides a form for editing record values. (In this simple example, just the record name field.)

`ldsSaveController.js`

```
({
    handleSaveRecord: function(component, event, helper) {
       component.find("recordHandler").saveRecord($A.getCallback(function(saveResult)
 {
            if (saveResult.state === "SUCCESS" || saveResult.state === "DRAFT") {

                // Saved! Show a toast UI message
                var resultsToast = $A.get("e.force:showToast");
                resultsToast.setParams({
                    "title": "Saved",
                    "message": "The record was updated."
                });
                resultsToast.fire();
                // Reload the view so components not using force:recordPreview
                // are updated
                $A.get("e.force:refreshView").fire();
            }
            else if (saveResult.state === "INCOMPLETE") {
                console.log("User is offline, device doesn't support drafts.");
            }
            else if (saveResult.state === "ERROR") {
                console.log('Problem saving record, error: ' +
                            JSON.stringify(saveResult.error));
            }
            else {
                console.log('Unknown problem, state: ' + saveResult.state +
                            ', error: ' + JSON.stringify(saveResult.error));
            }
        }));
    },

})
```

The `handleSaveRecord` action here is a minimal version. There's no form validation or real error handling. Whatever is entered in the form is attempted to be saved to the record.

SEE ALSO:

SaveRecordResult

Configure Components for Lightning Experience Record Pages

Configure Components for Record-Specific Actions

force:recordPreview (Developer Preview)

Creating a Record

To create a record using Lightning Data Service, first declare `force:recordPreview` without assigning a `recordId`. Then load a record template by calling the `getNewRecord` function on `force:recordPreview`. Finally, apply values to the new record, and save the record by calling the `saveRecord` function on `force:recordPreview`.

Creating a record with Lightning Data Service is a two-step process.

1. Call `getNewRecord` to create an empty record from a record template. This record can be used as the backing store for a form, or otherwise have its values set to data intended to be saved. This is described in a later section.
2. Call `saveRecord` to commit the record. This is described in Saving a Record.

Create an Empty Record from a Record Template

To create an empty record from a record template, you must first not set a `recordId` on the `force:recordPreview` tag. Without a `recordId`, Lightning Data Service doesn't load an existing record.

Then, in your component's `init` or another handler, call the `getNewRecord` on `force:recordPreview`. `getNewRecord` takes the following arguments.

Attribute Name	Type	Description
`entityApiName`	String	The entity API name for the sObject of the record to be created.
`recordTypeId`	String	The 18 character ID of the record type for the new record. If not specified, the default record type for the object is used, as defined in the user's profile.
`defaultFieldValues`	Map	A map of field values to set on the empty record before use. Use this attribute to set default or context-specific values.
`skipCache`	Boolean	Whether to load the record template from the server, instead of the client-side Lightning Data Service cache. Defaults to `false`.
`callback`	Function	A function invoked after the empty record is created. This function receives no arguments.

`getNewRecord` doesn't return a result. It simply prepares an empty record and assigns it to the `targetRecord` attribute.

Example: **Creating a Record**

The following example illustrates the essentials of creating a record using Lightning Data Service. This example is intended to be added to an account record Lightning page.

`ldsCreate.cmp`

```
<aura:component implements="flexipage:availableForRecordHome,force:hasRecordId">

    <aura:attribute name="newContact" type="Object"/>
    <aura:attribute name="newContactError" type="String"/>
    <force:recordPreview aura:id="contactRecordCreator"
        layoutType="FULL"
        targetRecord="{!v.newContact}"
        targetError="{!v.newContactError}"
        />

    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>

    <!-- Header -->
    <div class="slds-page-header" role="banner">
        <p class="slds-text-heading--label">Create Contact</p>
    </div>

    <!-- Display Lightning Data Service errors, if any -->
    <aura:if isTrue="{!not(empty(v.newContactError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.newContactError}
            </ui:message>
        </div>
    </aura:if>

    <!-- Display the new contact form -->
    <div class="slds-form--stacked">
```

```
        <div class="slds-form-element">
           <label class="slds-form-element__label" for="contactFirstName">First Name:
 </label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactFirstName"
                value="{!v.newContact.FirstName}" required="true"/>
            </div>
        </div>
        <div class="slds-form-element">
            <label class="slds-form-element__label" for="contactLastName">Last Name:
</label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactLastName"
                value="{!v.newContact.LastName}" required="true"/>
            </div>
        </div>

        <div class="slds-form-element">
           <label class="slds-form-element__label" for="contactTitle">Title: </label>

            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactTitle"
                value="{!v.newContact.Title}" />
            </div>
        </div>

        <div class="slds-form-element">
            <ui:button label="Save Contact" press="{!c.handleSaveContact}"
                class="slds-button slds-button--brand" />
        </div>

    </div>

</aura:component>
```

This component doesn't set the `recordId` attribute of `force:recordPreview`. This tells Lightning Data Service to expect a new record. Here, that's created in the component's `init` handler.

`ldsCreateController.js`

```
({
    doInit: function(component, event, helper) {
        // Prepare a new record from template
        component.find("contactRecordCreator").getNewRecord(
            "Contact", // sObject type (entity API name)
            null,      // record type
            null,      // default record values
            false,     // skip cache?
            $A.getCallback(function() {
                var rec = component.get("v.newContact");
                var error = component.get("v.newContactError");
                if(error || (rec === null)) {
                    console.log("Error initializing record template: " + error);
                }
                else {
                    console.log("Record template initialized: " + rec.sobjectType);
                }
            })
        );
    },

    handleSaveContact: function(component, event, helper) {
        if(helper.validateContactForm(component)) {
            component.set("v.newContact.AccountId", component.get("v.recordId"));
            component.find("contactRecordCreator").saveRecord(function(saveResult) {
                if (saveResult.state === "SUCCESS" || saveResult.state === "DRAFT") {


                    // Success! Prepare a toast UI message
                    var resultsToast = $A.get("e.force:showToast");
                    resultsToast.setParams({
                        "title": "Contact Saved",
                        "message": "The new contact was created."
                    });
                    resultsToast.fire();

                    // TODO: Reset the form to empty values

                    // Reload the view so components not using force:recordPreview
                    // are updated
                    $A.get("e.force:refreshView").fire();
                }
                else if (saveResult.state === "INCOMPLETE") {
                    console.log("User is offline, device doesn't support drafts.");
                }
                else if (saveResult.state === "ERROR") {
                    console.log('Problem saving contact, error: ' +
                                 JSON.stringify(saveResult.error));
                }
                else {
                    console.log('Unknown problem, state: ' + saveResult.state +
                                ', error: ' + JSON.stringify(saveResult.error));
                }
            });
        }
    },
})
```

The `doInit` init handler calls `getNewRecord()` on the `force:recordPreview` component, passing in a very simple callback handler. This call creates a new, empty contact record, which is used by the contact form in the component's markup.

Note: The callback passed to `getNewRecord()` must be wrapped in `$A.getCallback()` to ensure correct access context when the callback is invoked. If the callback is passed in without being wrapped in `$A.getCallback()`, any attempt to access private attributes of your component results in access check failures.

Even if you're not accessing private attributes, it's a best practice to always wrap the callback function for `getNewRecord()` in `$A.getCallback()`. Never mix (contexts), never worry.

The `handleSaveContact` handler is called when the **Save Contact** button is clicked. It's a straightforward application of saving the contact, as described in Saving a Record, and then updating the user interface.

Note: The helper function, `validateContactForm`, isn't shown. It simply validates the form values. For an example of this validation, see Lightning Data Service Example.

SEE ALSO:

Saving a Record

Configure Components for Lightning Experience Record Pages

Configure Components for Record-Specific Actions

Controlling Access

force:recordPreview (Developer Preview)

Deleting a Record

To delete a record using Lightning Data Service, call `deleteRecord` on the `force:recordPreview` component, and pass in a callback function to be invoked after the delete operation completes.

Delete operations with Lightning Data Service are straightforward. The `force:recordPreview` tag can include minimal details. If you don't need any record data, set the `fields` attribute to just `Id`. If you know that the only operation is a delete, any `mode` can be used.

To perform the delete operation, call `deleteRecord` on the `force:recordPreview` component from the appropriate controller action handler. `deleteRecord` takes one argument, a callback function to be invoked when the operation completes. This callback function receives a `SaveRecordResult` as its only parameter. `SaveRecordResult` includes a `state` attribute that indicates success or error, and other details you can use to handle the result of the operation.

Example: **Deleting a Record**

The following example illustrates the essentials of deleting a record using Lightning Data Service. This component adds a **Delete Record** button to a record page, which deletes the record being displayed. The record ID is supplied by the implicit `recordId` attribute added by the `force:hasRecordId` interface.

`ldsDelete.cmp`

```
<aura:component
    implements="flexipage:availableForRecordHome,force:hasRecordId">

    <aura:attribute name="recordError" type="String" access="private"/>
    <force:recordPreview aura:id="recordHandler"
      recordId="{!v.recordId}"
      fields="Id"
      targetError="{!v.recordError}"
      />

    <!-- Display Lightning Data Service errors, if any -->
    <aura:if isTrue="{!not(empty(v.recordError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.recordError}
            </ui:message>
        </div>
    </aura:if>

    <div class="slds-form-element">
        <ui:button
            label="Delete Record"
            press="{!c.handleDeleteRecord}"
            class="slds-button slds-button--brand" />
    </div>

</aura:component>
```

Notice that the `force:recordPreview` tag includes only the `recordId` and a nearly empty `fields` list—the absolute minimum required. If you want to display record values in the user interface, for example, as part of a confirmation message, define the `force:recordPreview` tag as you would for a load operation, instead of this minimal delete example.

`ldsDeleteController.js`

```
({
    handleDeleteRecord: function(component, event, helper) {
       component.find("recordHandler").deleteRecord($A.getCallback(function(saveResult)
 {
            if (saveResult.state === "SUCCESS" || saveResult.state === "DRAFT") {

                // Deleted! Show a toast UI message
                var resultsToast = $A.get("e.force:showToast");
                resultsToast.setParams({
                    "title": "Deleted",
                    "message": "The record was deleted."
                });
                resultsToast.fire();

                // Navigate to deleted record's object home
                var goToObjectHome = $A.get("e.force:navigateToObjectHome");
                goToObjectHome.setParams({
                    "scope": saveResult.entityApiName
                });
                goToObjectHome.fire();
            }
            else if (saveResult.state === "INCOMPLETE") {
                console.log("User is offline, device doesn't support drafts.");
            }
            else if (saveResult.state === "ERROR") {
                console.log('Problem deleting record, error: ' +
                            JSON.stringify(saveResult.error));
            }
            else {
                console.log('Unknown problem, state: ' + saveResult.state +
                            ', error: ' + JSON.stringify(saveResult.error));
            }
        }));
    }
})
```

When the record is deleted, you need to navigate away from the record page, or you'll see a "record not found" error when the component refreshes. Here the controller uses the `entityApiName` property in the `SaveRecordResult` provided to the callback function, and navigates to the object home page.

SEE ALSO:

- SaveRecordResult
- Configure Components for Lightning Experience Record Pages
- Configure Components for Record-Specific Actions
- force:recordPreview (Developer Preview)

Record Changes

To perform tasks beyond rerendering the record when the record changes, handle the `recordUpdated` event. You can handle record loaded, updated, and deleted changes, applying different actions to each change type.

If a component performs logic that is record data specific, it must run that logic again when the record changes. A common example is a business process in which the actions that apply to a record change depending on the record's values. For example, different actions apply to opportunities at different stages of the sales cycle.

Note: Lightning Data Service notifies listeners about data changes only if the changed fields are the same as in the listener's fields or layout.

Example:

Declare that your component handles the recordUpdated event.

```
<force:recordPreview aura:id="forceRecord"
  recordId="{!v.recordId}"
  layoutType="FULL"
  targetRecord="{!v._record}"
  targetError="{!v._error}"
  recordUpdated="{!c.recordUpdated}" />
```

Then implement an action handler that handles the change.

```
({
  recordUpdated: function(component, event, helper) {

    var changeType = event.getParams().changeType;

    if (changeType === "ERROR") { /* handle error; do this first! */ }
    else if (changeType === "LOADED") { /* handle record load */ }
    else if (changeType === "REMOVED") { /* handle record removal */ }
    else if (changeType === "CHANGED") { /* handle record change */ }
})
```

When loading a record in edit mode, the record is not automatically updated to prevent edits currently in progress from being overwritten. To update the record, use the `reloadRecord` method in the action handler.

```
<force:recordPreview aura:id="forceRecord"
  recordId="{!v.recordId}"
  layoutType="FULL"
  targetRecord="{!v._record}"
  targetError="{!v._error}"
  mode="EDIT"
  recordUpdated="{!c.recordUpdated}" />
```

```
({
  recordUpdated : function(component, event, helper) {

    var changeType = event.getParams().changeType;

    if (changeType === "ERROR") { /* handle error; do this first! */ }
    else if (changeType === "LOADED") { /* handle record load */ }
    else if (changeType === "REMOVED") { /* handle record removal */ }
    else if (changeType === "CHANGED") {
      /* handle record change; reloadRecord will cause you to lose your current record,
 including any changes you've made */
      component.find("forceRecord").reloadRecord();}
    }
})
```

Errors

To act when there's an error, handle the `recordUpdated` event and handle the case where the `changeType` is "ERROR".

Example: Declare that your component handles the `recordUpdated` event.

```
<force:recordPreview aura:id="forceRecord"
  recordId="{!v.recordId}"
  layoutType="FULL"
  targetRecord="{!v._record}"
  targetError="{!v._error}"
  recordUpdated="{!c.recordUpdated}" />
```

Then implement an action handler that handles the error.

```
({
  recordUpdated: function(component, event, helper) {

    var changeType = event.getParams().changeType;

    if (changeType === "ERROR") { /* handle error; do this first! */ }
    else if (changeType === "LOADED") { /* handle record load */ }
    else if (changeType === "REMOVED") { /* handle record removal */ }
    else if (changeType === "CHANGED") { /* handle record change */ }
})
```

If an error occurs when the record begins to load, `targetError` is set to a localized error message. An error occurs if:

- Input is invalid because of an invalid attribute value, or combination of attribute values. For example, an invalid `recordId`, or omitting both the `layoutType` and the `fields` attributes.
- The record isn't in the cache and the server is unreachable (offline).

If the record becomes inaccessible on the server, the `recordUpdated` event is fired with `changeType` set to "REMOVED." No error is set on `targetError`, since records becoming inaccessible is sometimes the expected outcome of an operation. For example, after lead convert the lead record becomes inaccessible.

Records can become inaccessible for the following reasons.

- Record or entity sharing or visibility settings
- Record or entity being deleted

When the record becomes inaccessible on the server, the record's JavaScript object assigned to `targetRecord` is unchanged.

Considerations and Limitations

Lightning Data Service is simple to use and quite powerful. However, it's not a complete replacement for writing your own data access code. Here are some considerations to keep in mind when using it.

Note: Lightning Data Service is available as a developer preview. Lightning Data Service isn't generally available unless or until Salesforce announces its general availability in documentation or in press releases or public statements. You can provide feedback and suggestions for Lightning Data Service on the IdeaExchange.

During the developer preview, you can only use Lightning Data Service in a Developer Edition org. You can't package or deploy code that uses Lightning Data Service.

During the developer preview Lightning Data Service is accessed using the force:recordPreview tag. This tag name is temporary, and will change in the future. And, although it's not planned, we reserve the right to make other backwards-incompatible changes with Lightning Data Service.

Lightning Data Service is only available in Lightning Experience and Salesforce1. Using Lightning Data Service in other containers, such as Lightning Components for Visualforce, Lightning Out, or Communities isn't supported. This is true even if these containers are accessed inside Lightning Experience or Salesforce1, for example, a Visualforce page added to Lightning Experience.

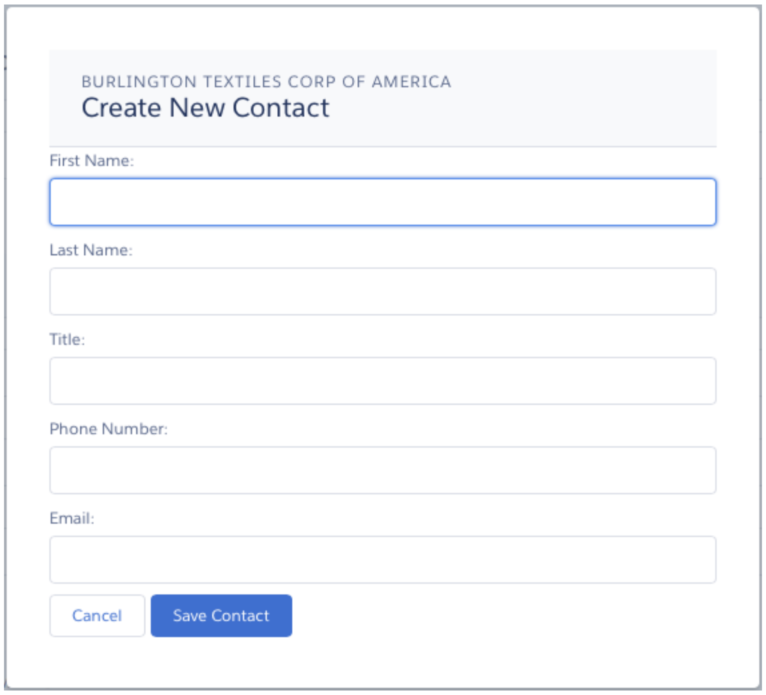
Lightning Data Service supports primitive DML operations—create, read, update, and delete (or CRUD). It operates on one record at a time, which you retrieve or modify using the record ID. Lightning Data Service supports spanned fields with a maximum depth of five levels. Support for working with collections of records or for querying for a record by anything other than the record ID isn't available. If you need to support higher-level operations or multiple operations in one transaction, use standard `@AuraEnabled` Apex methods.

Lightning Data Service shared data storage provides notifications to all components that use a record whenever a component changes that record. It doesn't notify components if that record is changed on the server, for example, if someone else modifies it. Records changed on the server aren't updated locally until they're reloaded. Lightning Data Service notifies listeners about data changes only if the changed fields are the same as in the listener's fields or layout.

Lightning Data Service Example

Here's a longer, more complete example of using Lightning Data Service to create a "Quick Contact" action panel.

Example: This example is intended to be added as a Lightning action on the account object. Clicking the action's button on the account layout opens a panel to create a new contact.



This example is very similar to the example provided in Configure Components for Record-Specific Actions. Compare the two examples to better understand the differences between using `@AuraEnabled` Apex controllers and using Lightning Data Service.

`ldsQuickContact.cmp`

```
<aura:component implements="force:lightningQuickActionWithoutHeader,force:hasRecordId">


    <aura:attribute name="account" type="Object"/>
    <aura:attribute name="accountError" type="String"/>
    <force:recordPreview aura:id="accountRecordLoader"
      recordId="{!v.recordId}"
      fields="Name,BillingCity,BillingState"
      targetRecord="{!v.account}"
      targetError="{!v.accountError}"
      />

    <aura:attribute name="newContact" type="Object" access="private"/>
    <aura:attribute name="newContactError" type="String" access="private"/>
    <aura:attribute name="hasErrors" type="Boolean"
       description="Indicate whether there were failures when validating the contact."
 />
    <force:recordPreview aura:id="contactRecordCreator"
        layoutType="FULL"
        targetRecord="{!v.newContact}"
        targetError="{!v.newContactError}"
        />

    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
    <!-- Display a header with details about the account -->
    <div class="slds-page-header" role="banner">
        <p class="slds-text-heading--label">{!v.account.Name}</p>
        <h1 class="slds-page-header__title slds-m-right--small
            slds-truncate slds-align-left">Create New Contact</h1>
    </div>

    <!-- Display Lightning Data Service errors, if any -->
    <aura:if isTrue="{!not(empty(v.accountError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.accountError}
            </ui:message>
        </div>
    </aura:if>
    <aura:if isTrue="{!not(empty(v.newContactError))}">
        <div class="recordError">
            <ui:message title="Error" severity="error" closable="true">
                {!v.newContactError}
            </ui:message>
        </div>
    </aura:if>

    <!-- Display form validation errors, if any -->
    <aura:if isTrue="{!v.hasErrors}">
        <div class="formValidationError">
            <ui:message title="Error" severity="error" closable="true">
                The new contact can't be saved because it's not valid.
                Please review and correct the errors in the form.
            </ui:message>
        </div>
    </aura:if>

    <!-- Display the new contact form -->
    <div class="slds-form--stacked">

        <div class="slds-form-element">
           <label class="slds-form-element__label" for="contactFirstName">First Name:
 </label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactFirstName"
                value="{!v.newContact.FirstName}" required="true"/>
            </div>
        </div>
        <div class="slds-form-element">
            <label class="slds-form-element__label" for="contactLastName">Last Name:
</label>
            <div class="slds-form-element__control">
              <ui:inputText class="slds-input" aura:id="contactLastName"
                value="{!v.newContact.LastName}" required="true"/>
            </div>
        </div>

        <div class="slds-form-element">
```

```
            <label class="slds-form-element__label" for="contactTitle">Title: </label>

             <div class="slds-form-element__control">
               <ui:inputText class="slds-input" aura:id="contactTitle"
                 value="{!v.newContact.Title}" />
             </div>
         </div>

         <div class="slds-form-element">
             <label class="slds-form-element__label" for="contactPhone">Phone Number:
</label>
             <div class="slds-form-element__control">
               <ui:inputPhone class="slds-input" aura:id="contactPhone"
                 value="{!v.newContact.Phone}" required="true"/>
             </div>
         </div>
         <div class="slds-form-element">
            <label class="slds-form-element__label" for="contactEmail">Email: </label>

             <div class="slds-form-element__control">
               <ui:inputEmail class="slds-input" aura:id="contactEmail"
                 value="{!v.newContact.Email}" />
             </div>
         </div>

         <div class="slds-form-element">
             <ui:button label="Cancel" press="{!c.handleCancel}"
                 class="slds-button slds-button--neutral" />
             <ui:button label="Save Contact" press="{!c.handleSaveContact}"
                 class="slds-button slds-button--brand" />
         </div>

     </div>

</aura:component>
```

ldsQuickContactController.js

```
({
    doInit: function(component, event, helper) {
        component.find("contactRecordCreator").getNewRecord(
            "Contact",
            null,
            null,
            false,
            $A.getCallback(function() {
                var rec = component.get("v.newContact");
                var error = component.get("v.newContactError");
                if(error || (rec === null)) {
                    console.log("Error initializing record template: " + error);
                }
                else {
                    console.log("Record template initialized: " + rec.sobjectType);
                }
            })
        );
    },

    handleSaveContact: function(component, event, helper) {
        if(helper.validateContactForm(component)) {
            component.set("v.hasErrors", false);
            component.set("v.newContact.AccountId", component.get("v.recordId"));
            component.find("contactRecordCreator").saveRecord(function(saveResult) {
                if (saveResult.state === "SUCCESS" || saveResult.state === "DRAFT") {


                    // Success! Prepare a toast UI message
                    var resultsToast = $A.get("e.force:showToast");
                    resultsToast.setParams({
                        "title": "Contact Saved",
                        "message": "The new contact was created."
                    });

                    // Update the UI: close panel, show toast, refresh account page
                    $A.get("e.force:closeQuickAction").fire();
                    resultsToast.fire();

                    // Reload the view so components not using force:recordPreview
                    // are updated
                    $A.get("e.force:refreshView").fire();
                }
                else if (saveResult.state === "INCOMPLETE") {
                    console.log("User is offline, device doesn't support drafts.");
                }
                else if (saveResult.state === "ERROR") {
                    console.log('Problem saving contact, error: ' +
                                 JSON.stringify(saveResult.error));
                }
                else {
                    console.log('Unknown problem, state: ' + saveResult.state +
                                ', error: ' + JSON.stringify(saveResult.error));
                }
            });
        }
        else {
            // New contact form failed validation, show a message to review errors
            component.set("v.hasErrors", true);
        }
    },

    handleCancel: function(component, event, helper) {
        $A.get("e.force:closeQuickAction").fire();
    },
})
```

Note: The callback passed to `getNewRecord()` must be wrapped in `$A.getCallback()` to ensure correct access context when the callback is invoked. If the callback is passed in without being wrapped in `$A.getCallback()`, any attempt to access private attributes of your component results in access check failures.

Even if you're not accessing private attributes, it's a best practice to always wrap the callback function for `getNewRecord()` in `$A.getCallback()`. Never mix (contexts), never worry.

`ldsQuickContactHelper.js`

```
({
    validateContactForm: function(component) {
        var validContact = true;

        // First and Last Name are required
        var firstNameField = component.find("contactFirstName");
        if($A.util.isEmpty(firstNameField.get("v.value"))) {
            validContact = false;
            firstNameField.set("v.errors", [{message:"First name can't be blank"}]);
        }
        else {
            firstNameField.set("v.errors", null);
        }
        var lastNameField = component.find("contactLastName");
        if($A.util.isEmpty(lastNameField.get("v.value"))) {
            validContact = false;
            lastNameField.set("v.errors", [{message:"Last name can't be blank"}]);
        }
        else {
            lastNameField.set("v.errors", null);
        }

        // Verify we have an account to attach it to
        var account = component.get("v.account");
        if($A.util.isEmpty(account)) {
            validContact = false;
            console.log("Quick action context doesn't have a valid account.");
        }

        // TODO: (Maybe) Validate email and phone number

        return validContact;
    }
})
```

SEE ALSO:

- Configure Components for Record-Specific Actions
- Controlling Access
- force:recordPreview (Developer Preview)

SaveRecordResult

Represents the result of a Lightning Data Service operation that makes a persistent change to record data.

`SaveRecordResult` Object

Callback functions for the `saveRecord` and `deleteRecord` functions receive a `SaveRecordResult` object as their only argument.

Attribute Name	Type	Description
`entityApiName`	String	The entity API name for the sObject of the record.
`entityLabel`	String	The label for the name of the sObject of the record.
`error`	String	Error is one of the following. • A localized message indicating what went wrong. • An array of errors, including a localized message indicating what went wrong. It might also include further data to help handle the error, such as field- or page-level errors. `error` is undefined if the save `state` is SUCCESS or DRAFT.
`recordId`	String	The 18 character ID of the record affected.
`state`	String	The result state of the operation. The following are possible values. • SUCCESS—The operation completed on the server successfully. • DRAFT—The server wasn't reachable, so the operation was saved locally as a draft. The change will be applied to the server when it's reachable. • INCOMPLETE—The server wasn't reachable, and the device doesn't support drafts. (Drafts are only supported in the Salesforce1 app.) Try this operation again later. • ERROR—The operation couldn't be completed. Check the `error` attribute for more the specifics of the error.

Lightning Container (Developer Preview)

Upload an app developed with a third-party framework as a static resource, and host the content in a Lightning component using `lightning:container`. Use `lightning:container` to use third-party frameworks like AngularJS or React within your Lightning pages.

Note: The `lightning:container` component is available as a developer preview. This feature is available in Developer Edition orgs only. `lightning:container` isn't generally available unless or until Salesforce announces its general availability in documentation or in press releases or public statements. All commands, parameters, and other features are subject to change or deprecation at any time, with or without notice. Don't implement functionality developed with these commands or tools.

The `lightning:container` component hosts content in an iframe. You can use `lightning:container` only for single-page applications (SPA).

You can implement communication to and from the framed application, allowing it to interact with the Lightning component. `lightning:container` provides the `message()` method, which you can use in the JavaScript controller to send messages to the application. In the component, specify a method for handling messages with the `onmessage` attribute.

Content in `lightning:container` is served from the Visualforce domain, which limits where `lightning:container` can be used. `lightning:container` can't be used, for example, in Visualforce pages (using Lightning Components for Visualforce) or Community Builder.

IN THIS SECTION:

Using a Third-Party Framework

`lightning:container` allows you to use an app developed with a third-party framework, such as AngularJS or React, in a Lightning component. Upload the app as a static resource.

Sending Messages to and from the App

Use the `onmessage` attribute of `lightning:container` to specify a method for handling messages to and from the contents of the component. The contents of `lightning:container` are contained within an iframe, and this method allows you to communicate across the frame boundary.

Handling Errors in Your Container

Handle errors in Lightning container with a method in your component's controller.

Lightning Container Limits

Understand the limits of `lightning:container`.

Implement an Example

See further examples of `lightning:container` in the Developerforce Git repository.

Using a Third-Party Framework

`lightning:container` allows you to use an app developed with a third-party framework, such as AngularJS or React, in a Lightning component. Upload the app as a static resource.

Only single-page applications work in `lightning:container`. Your application should have a launch page, which is specified with the `src` attribute. By convention, the launch page is `index.html`. The following example shows a simple Lightning component that references `myApp`, an app uploaded as a static resource, with a launch page of `index.html`.

```
<aura:component>
    <lightning:container src="{!$Resource.myApp + '/index.html'}" />
</aura:component>
```

The contents of the static resource are up to you. It should include the JavaScript that makes up your app, any associated assets, and a launch page.

As in other Lightning components, you can specify custom attributes. This example references the same static resource, `myApp`, and has three attributes, `messageToSend`, `messageReceived`, and `error`. Because this component includes `implements="flexipage:availableForAllPageTypes"`, it can be used in the Lightning App Builder and added to Lightning pages.

```
<aura:component access="global" implements="flexipage:availableForAllPageTypes" >

    <aura:attribute access="private" name="messageToSend" type="String" default=""/>
    <aura:attribute access="private" name="messageReceived" type="String" default=""/>
    <aura:attribute access="private" name="error" type="String" default=""/>

    <div>
        <lightning:input name="messageToSend" value="{!v.messageToSend}"
                         label="Message to send to React app: "/>
        <lightning:button label="Send" onclick="{!c.sendMessage}"/>
        <br/>

        <lightning:textarea name="messageReceived" value="{!v.messageReceived}"
                            label="Message received from React app: "/>

        <br/>

        <aura:if isTrue="{! !empty(v.error)}">
            <lightning:textarea name="errorMessage" value="{!v.error}" label="Error: "/>
        </aura:if>

        <lightning:container aura:id="ReactApp"
                             src="{!$Resource.SendReceiveMessages + '/index.html'}"
                             onmessage="{!c.handleMessage}"
                             onerror="{!c.handleError}"/>
    </div>

</aura:component>
```

The component includes a `lightning:input` element, allowing users to enter a value for `messageToSend`. When a user hits **Send**, the component calls the controller method `sendMessage`. This component also provides methods for handling messages and errors.

There's a lot going on in this Lightning component, but don't worry. We'll break it down and explain how to implement message and error handling as we go in Sending Messages to and from the App and Handling Errors in Your Container.

SEE ALSO:

- Lightning Container (Developer Preview)
- Sending Messages to and from the App
- Handling Errors in Your Container

Sending Messages to and from the App

Use the `onmessage` attribute of `lightning:container` to specify a method for handling messages to and from the contents of the component. The contents of `lightning:container` are contained within an iframe, and this method allows you to communicate across the frame boundary.

This example shows a Lightning component that includes `lightning:container` and has three attributes, `messageToSend`, `messageReceived`. and `error`.

This example uses the same code as the one in Using a Third-Party Framework.

```
<aura:component access="global" implements="flexipage:availableForAllPageTypes" >

    <aura:attribute access="private" name="messageToSend" type="String" default=""/>
    <aura:attribute access="private" name="messageReceived" type="String" default=""/>
    <aura:attribute access="private" name="error" type="String" default=""/>

    <div>
        <lightning:input name="messageToSend" value="{!v.messageToSend}"
                         label="Message to send to React app: "/>
        <lightning:button label="Send" onclick="{!c.sendMessage}"/>
        <br/>

        <lightning:textarea name="messageReceived" value="{!v.messageReceived}"
                            label="Message received from React app: "/>

        <br/>

        <lightning:container aura:id="ReactApp"
                             src="{!$Resource.SendReceiveMessages + '/index.html'}"
                             onmessage="{!c.handleMessage}"/>
    </div>

</aura:component>
```

`messageToSend` represents a message sent from Salesforce to the Lightning container app, while `messageReceived` represents a message sent by `lightning:container` to the Lightning component. `lightning:container` includes the required `src` attribute, an `aura:id`, and the `onmessage` attribute. The `onmessage` attribute specifies the message-handling method in your JavaScript controller, and the `aura:id` allows that method to reference the component.

This example shows the component's JavaScript controller.

```
({
    sendMessage : function(component, event, helper) {

        var msg = {
            name: "General",
            value: component.get("v.messageToSend")
        };
        component.find("ReactApp").message(msg);
    },

    handleMessage: function(component, message, helper) {
        var payload = message.payload;
        var name = payload.name;
        if (name === "General") {
            var value = payload.value;
            component.set("v.messageReceived", value);
        }
        else if (name === "Foo") {
            // A different response
        }
    },
})
```

This code does a couple of different things. The `sendMessage` action creates a variable, `msg`, that has a JSON definition including a `name` and a `value`. This definition of the message is user-defined—the message's payload can be a value, a structured JSON response, or something else. The `messageToSend` attribute of the Lightning component populates the `value` of the message. The method then uses the component's `aura:id` and the `message()` function to send the message back to the Lightning component.

The `handleMessage` method takes a component, a message, and a helper as arguments. The method uses conditional logic to parse the message. If this is the message with the `name` and `value` we're expecting, the method sets the Lightning component's `messageReceived` attribute to the `value` of the message. Although this code only defines one message, the conditional allows you to handle different types of message, which are defined in the `sendMessage` method.

The handler code for sending and receiving messages can be complicated. It helps to understand the flow of a message between the Lightning component, its controller, and the app. The process begins when user enters a message as the `messageToSend` attribute. When the user clicks **Send**, the component calls `sendMessage`. `sendMessage` defines the message payload and uses the `message()` method to send it to `lightning:container`.

When `lightning:container` sends a message to the Lightning component, it calls the controller's `handleMessage` method, which is specified by the `onmessage` attribute of `lightning:container`. The `handleMessage` method takes the message, and sets its value as the `messageReceived` attribute. Finally, the component displays `messageReceived` in a `lightning:textarea`.

This is a simple example of message handling across the container. Because you implement the controller-side code and the functionality of the app, you can use this functionality for any kind of communication between Salesforce and the contents of `lightning:container`.

SEE ALSO:

Lightning Container (Developer Preview)

Using a Third-Party Framework

Handling Errors in Your Container

Handling Errors in Your Container

Handle errors in Lightning container with a method in your component's controller.

This example uses the same code as the examples in Using a Third-Party Framework and Sending Messages to and from the App, with the addition of the `handleError` method.

```
({
    sendMessage : function(component, event, helper) {

        var msg = {
            name: "General",
            value: component.get("v.messageToSend")
        };
        component.find("ReactApp").message(msg);
    },

    handleMessage: function(component, message, helper) {
        var payload = message.payload;
        var name = payload.name;
        if (name === "General") {
            var value = payload.value;
            component.set("v.messageReceived", value);
        }
        else if (name === "Foo") {
            // A different response
        }
    },

    handleError: function(component, error, helper) {
        var e = error;
    }
})
```

In the component, the `onerror` attribute of `lightning:container` specifies `handleError` as the error handling method. To display the error, the component markup uses a conditional statement with `aura:if`, and another attribute, `error`, for holding an error message.

```
<aura:component access="global" implements="flexipage:availableForAllPageTypes" >

    <aura:attribute access="private" name="messageToSend" type="String" default=""/>
    <aura:attribute access="private" name="messageReceived" type="String" default=""/>
    <aura:attribute access="private" name="error" type="String" default=""/>

    <div>
        <lightning:input name="messageToSend" value="{!v.messageToSend}" label="Message
to send to React app: "/><lightning:button label="Send" onclick="{!c.sendMessage}"/>

        <br/>

        <lightning:textarea name="messageReceived" value="{!v.messageReceived}"
label="Message received from React app: "/>

        <br/>

        <aura:if isTrue="{! !empty(v.error)}">
            <lightning:textarea name="errorMessage" value="{!v.error}" label="Error: "/>
        </aura:if>

        <lightning:container aura:id="ReactApp"
                             src="{!$Resource.SendReceiveMessages + '/index.html'}"
                             onmessage="{!c.handleMessage}"
                             onerror="{!c.handleError}"/>
    </div>

</aura:component>
```

If the Lightning container application throws an error, the error handling function sets the `error` attribute. The `aura:if` conditional checks if the error attribute is empty. If it is, the component populates a `lightning:textarea` element with the error message stored in `error`.

SEE ALSO:

- Lightning Container (Developer Preview)
- Using a Third-Party Framework
- Sending Messages to and from the App

Lightning Container Limits

Understand the limits of `lightning:container`.

`lightning:container` has known limitations. You might observe performance and scrolling issues associated with the use of iframes. This component isn't designed for the multi-page model, and it doesn't integrate with browser navigation history.

If you navigate away from the page a `lightning:container` component is on, the component doesn't automatically remember its state. The content within the iframe doesn't use the same offline and caching schemes as the rest of Lightning Experience.

Content in `lightning:container` is served from the Visualforce domain. `lightning:container` can't be used in Lightning pages that aren't served from the Lightning domain, such as Visualforce pages (using Lightning Components for Visualforce) or Community Builder. These restrictions allow `lightning:container` to comply with LockerService security, and might change in future releases.

SEE ALSO:

Lightning Container (Developer Preview)

Implement an Example

See further examples of `lightning:container` in the Developerforce Git repository.

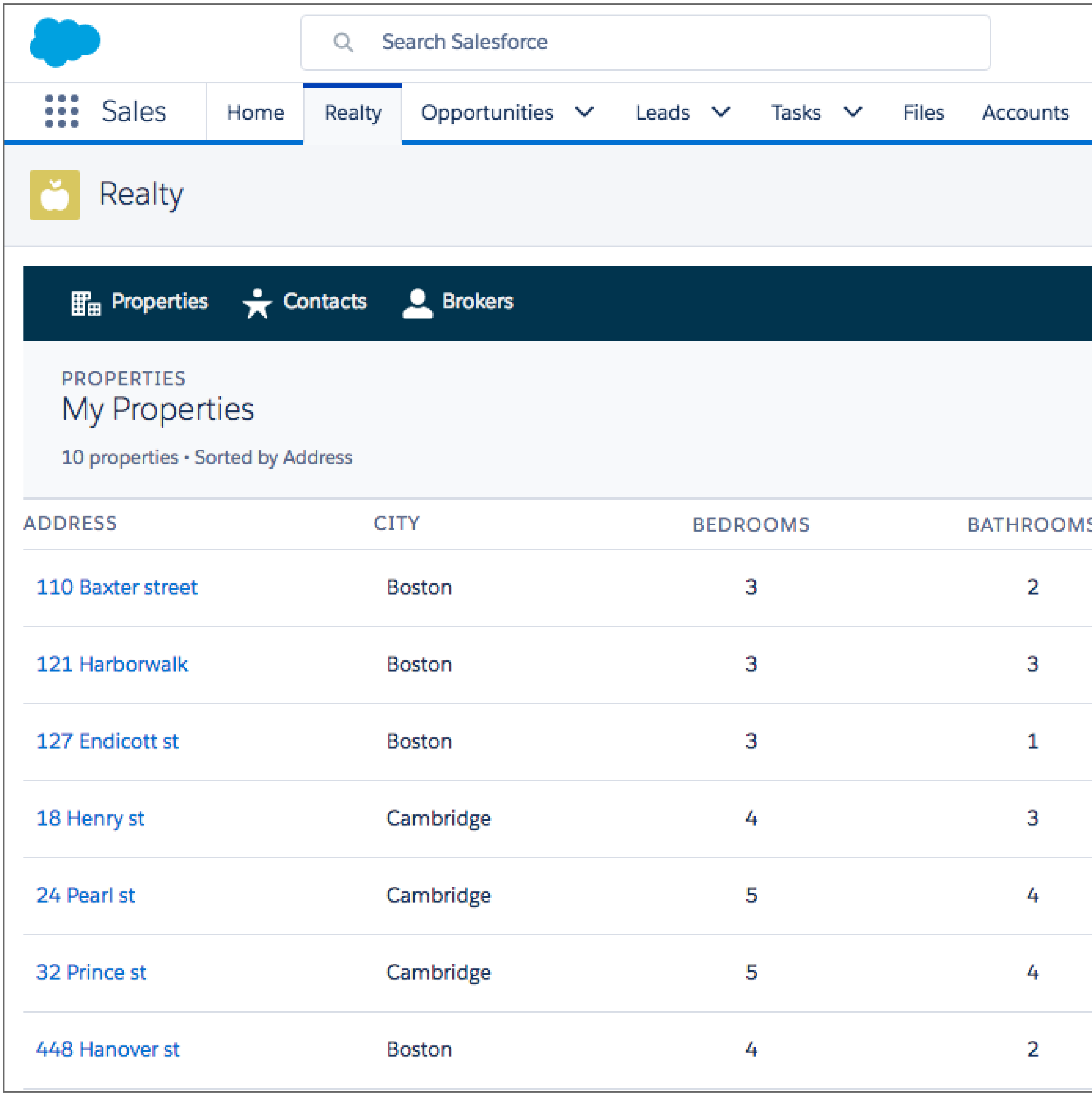
Implement a more in-depth example of `lightning:container` with the code included in https://github.com/developerforce/LightningContainerExamples. This example uses React and `lightning:container` to show a real estate listing app in a Lightning page.

To implement this example, use npm. The easiest way to install npm is by installing node.js. Once you've installed npm, install the latest version by running `npm install --save latest-version` from the command line.

To create custom Lightning components, you also need to have enabled My Domain in your org. For more information on My Domain, see My Domain in the Salesforce Help.

1. Clone the Git repository. From the command line, enter *`git clone https://github.com/developerforce/LightningContainerExamples`*
2. From the command line, navigate to `LightningContainerExamples/ReactJS/Javascript/Realty` and build the project's dependencies by entering `npm install`.
3. From the command line, build the app by entering *`npm run build`*.
4. Edit `package.json` and add your Salesforce login credentials where indicated.
5. From the command line, enter `npm run deploy`.
6. Log in to Salesforce and activate the new Realty Lightning page in the Lightning App Builder by adding it to a Lightning app.
7. To upload sample data to your org, enter `npm run load` from the command line.

See the Lightning realty app in action in your org. The app uses `lightning:container` to embed a React app in a Lightning page, displaying sample real estate listing data.



PROPERTIES
My Properties
10 properties • Sorted by Address

ADDRESS	CITY	BEDROOMS	BATHROOMS
110 Baxter street	Boston	3	2
121 Harborwalk	Boston	3	3
127 Endicott st	Boston	3	1
18 Henry st	Cambridge	4	3
24 Pearl st	Cambridge	5	4
32 Prince st	Cambridge	5	4
448 Hanover st	Boston	4	2

The component and handler code are similar to the examples in Sending Messages to and from the App and Handling Errors in Your Container.

Controlling Access

The framework enables you to control access to your applications, attributes, components, events, interfaces, and methods via the `access` system attribute. The `access` system attribute indicates whether the resource can be used outside of its own namespace.

Use the `access` system attribute on these tags:

- `<aura:application>`
- `<aura:attribute>`
- `<aura:component>`
- `<aura:event>`
- `<aura:interface>`
- `<aura:method>`

Access Values

You can specify these values for the `access` system attribute.

`private`

Available within the component, app, interface, event, or method and can't be referenced outside the resource. This value can only be used for `<aura:attribute>` or `<aura:method>`.

Marking an attribute as private makes it easier to refactor the attribute in the future as the attribute can only be used within the resource.

Accessing a private attribute returns `undefined` unless you reference it from the component in which it's declared. You can't access a private attribute from a sub-component that extends the component containing the private attribute.

`public`

Available within your org only. This is the default access value.

`global`

Available in all orgs.

Note: Mark your resources, such as a component, with `access="global"` to make the resource usable outside of your own org. For example, if you want a component to be usable in an installed package or by a Lightning App Builder user or a Community Builder user in another org.

Example

This sample component has global access.

```
<aura:component access="global">
    ...
</aura:component>
```

Access Violations

If your code accesses a resource, such as a component, that doesn't have an `access` system attribute allowing you to access the resource:

- Client-side code doesn't execute or returns `undefined`. If you enabled debug mode, you see an error message in your browser console.
- Server-side code results in the component failing to load. If you enabled debug mode, you see a popup error message.

Anatomy of an Access Check Error Message

Here is a sample access check error message for an access violation.

```
Access  Check  Failed ! ComponentService.getDef():'markup://c:targetComponent' is not
visible to 'markup://c:sourceComponent'.
```

An error message has four parts:

1. The context (who is trying to access the resource). In our example, this is `markup://c:sourceComponent`.
2. The target (the resource being accessed). In our example, this is `markup://c:targetComponent`.
3. The type of failure. In our example, this is `not visible`.
4. The code that triggered the failure. This is usually a class method. In our example, this is `ComponentService.getDef()`, which means that the target definition (component) was not accessible. A definition describes metadata for a resource, such as a component.

Fixing Access Check Errors

Tip: If your code isn't working as you expect, enable debug mode to get better error reporting.

You can fix access check errors using one or more of these techniques.

- Add appropriate `access` system attributes to the resources that you own.
- Remove references in your code to resources that aren't available. In the earlier example, `markup://c:targetComponent` doesn't have an access value allowing `markup://c:sourceComponent` to access it.
- Ensure that an attribute that you're accessing exists by looking at its `<aura:attribute>` definition. Confirm that you're using the correct case-sensitive spelling for the `name`.

  Accessing an undefined attribute or an attribute that is out of scope, for example a private attribute, triggers the same access violation message. The access context doesn't know whether the attribute is undefined or inaccessible.

Example: `is not visible to 'undefined'`

```
ComponentService.getDef():'markup://c:targetComponent' is not visible to 'undefined'
```

The key word in this error message is `undefined`, which indicates that the framework has lost context. This happens when your code accesses a component outside the normal framework lifecycle, such as in a `setTimeout()` or `setInterval()` call or in an ES6 Promise.

Fix this error by wrapping the code in a `$A.getCallback()` call. For more information, see Modifying Components Outside the Framework Lifecycle.

Example: `is not visible to 'InvalidComponent ...'`

```
ComponentService.getDef():'markup://c:targetComponent' is not visible to 'InvalidComponent
 markup://c:sourceComponent'
```

The key word in this error message is `InvalidComponent`, which indicates that `c:sourceComponent` is invalid and has been destroyed.

Always add an `isValid()` check if you reference a component in asynchronous code, such as a callback or a timeout. If you navigate elsewhere in the UI while asynchronous code is executing, the framework unrenders and destroys the component that made the asynchronous request. You can still have a reference to that component, but it is no longer valid. Add an `isValid()` call to check that the component is still valid before processing the results of the asynchronous request.

Example: `Cannot read property 'Yb' of undefined`

```
Action failed: c$sourceComponent$controller$doInit [Cannot read property 'Yb' of undefined]
```

This error message happens when you reference a property on a variable with a value of `undefined`. The error can happen in many contexts, one of which is the side-effect of an access check failure. For example, let's see what happens when you try to access an undefined attribute, `imaginaryAttribute`, in JavaScript.

```
var whatDoYouExpect = cmp.get("v.imaginaryAttribute");
```

This is an access check error and `whatDoYouExpect` is set to `undefined`. Now, if you try to access a property on `whatDoYouExpect`, you get an error.

```
Action failed: c$sourceComponent$controller$doInit [Cannot read property 'Yb' of undefined]
```

The `c$sourceComponent$controller$doInit` portion of the error message tells you that the error is in the `doInit` method of the controller of the `sourceComponent` component in the `c` namespace.

IN THIS SECTION:

Application Access Control

The `access` attribute on the `aura:application` tag controls whether the app can be used outside of the app's namespace.

Interface Access Control

The `access` attribute on the `aura:interface` tag controls whether the interface can be used outside of the interface's namespace.

Component Access Control

The `access` attribute on the `aura:component` tag controls whether the component can be used outside of the component's namespace.

Attribute Access Control

The `access` attribute on the `aura:attribute` tag controls whether the attribute can be used outside of the attribute's namespace.

Event Access Control

The `access` attribute on the `aura:event` tag controls whether the event can be used outside of the event's namespace.

SEE ALSO:

Enable Debug Mode for Lightning Components

Application Access Control

The `access` attribute on the `aura:application` tag controls whether the app can be used outside of the app's namespace.

Possible values are listed below.

Modifier	Description
`public`	Available within your org only. This is the default access value.
`global`	Available in all orgs.

Interface Access Control

The `access` attribute on the `aura:interface` tag controls whether the interface can be used outside of the interface's namespace.

Possible values are listed below.

Modifier	Description
`public`	Available within your org only. This is the default access value.
`global`	Available in all orgs.

A component can implement an interface using the `implements` attribute on the `aura:component` tag.

Component Access Control

The `access` attribute on the `aura:component` tag controls whether the component can be used outside of the component's namespace.

Possible values are listed below.

Modifier	Description
`public`	Available within your org only. This is the default access value.
`global`	Available in all orgs.

Note: Components aren't directly addressable via a URL. To check your component output, embed your component in a `.app` resource.

Attribute Access Control

The `access` attribute on the `aura:attribute` tag controls whether the attribute can be used outside of the attribute's namespace.

Possible values are listed below.

Access	Description
`private`	Available within the component, app, interface, event, or method and can't be referenced outside the resource. Note: Accessing a private attribute returns `undefined` unless you reference it from the component in which it's declared. You can't access a private attribute from a sub-component that extends the component containing the private attribute.
`public`	Available within your org only. This is the default access value.
`global`	Available in all orgs.

Event Access Control

The `access` attribute on the `aura:event` tag controls whether the event can be used outside of the event's namespace.

Possible values are listed below.

Modifier	Description
`public`	Available within your org only. This is the default access value.
`global`	Available in all orgs.

Using Object-Oriented Development

The framework provides the basic constructs of inheritance and encapsulation from object-oriented programming and applies them to presentation layer development.

For example, components are encapsulated and their internals stay private. Consumers of the component can access the public shape (attributes and registered events) of the component, but can't access other implementation details in the component bundle. This strong separation gives component authors freedom to change the internal implementation details and insulates component consumers from those changes.

You can extend a component, app, or interface, or you can implement a component interface.

What is Inherited?

This topic lists what is inherited when you extend a definition, such as a component.

When a component contains another component, we refer in the documentation to parent and child components in the containment hierarchy. When a component extends another component, we refer to sub and super components in the inheritance hierarchy.

Component Attributes

A sub component that extends a super component inherits the attributes of the super component. Use `<aura:set>` in the markup of a sub component to set the value of an attribute inherited from a super component.

Events

A sub component that extends a super component can handle events fired by the super component. The sub component automatically inherits the event handlers from the super component.

The super and sub component can handle the same event in different ways by adding an `<aura:handler>` tag to the sub component. The framework doesn't guarantee the order of event handling.

Helpers

A sub component's helper inherits the methods from the helper of its super component. A sub component can override a super component's helper method by defining a method with the same name as an inherited method.

Controllers

A sub component that extends a super component can call actions in the super component's client-side controller. For example, if the super component has an action called `doSomething`, the sub component can directly call the action using the `{!c.doSomething}` syntax.

Note: We don't recommend using inheritance of client-side controllers as this feature may be deprecated in the future to preserve better component encapsulation. We recommend that you put common code in a helper instead.

SEE ALSO:

- Component Attributes
- Communicating with Events
- Sharing JavaScript Code in a Component Bundle
- Handling Events with Client-Side Controllers
- aura:set

Inherited Component Attributes

A sub component that extends a super component inherits the attributes of the super component.

Attribute values are identical at any level of extension. There is an exception to this rule for the `body` attribute, which we'll look at more closely soon.

Let's start with a simple example. `c:super` has a `description` attribute with a value of "Default description",

```
<!--c:super-->
<aura:component extensible="true">
    <aura:attribute name="description" type="String" default="Default description" />

    <p>super.cmp description: {!v.description}</p>

    {!v.body}
</aura:component>
```

Don't worry about the `{!v.body}` expression for now. We'll explain that when we talk about the `body` attribute.

`c:sub` extends `c:super` by setting `extends="c:super"` in its `<aura:component>` tag.

```
<!--c:sub-->
<aura:component extends="c:super">
    <p>sub.cmp description: {!v.description}</p>
</aura:component
```

Note that `sub.cmp` has access to the inherited `description` attribute and it has the same value in `sub.cmp` and `super.cmp`.

Use `<aura:set>` in the markup of a sub component to set the value of an inherited attribute.

Inherited **`body`** Attribute

Every component inherits the `body` attribute from `<aura:component>`. The inheritance behavior of `body` is different than other attributes. It can have different values at each level of component extension to enable different output from each component in the inheritance chain. This will be clearer when we look at an example.

Any free markup that is not enclosed in another tag is assumed to be part of the `body`. It's equivalent to wrapping that free markup inside `<aura:set attribute="body">`.

The default renderer for a component iterates through its `body` attribute, renders everything, and passes the rendered data to its super component. The super component can output the data passed to it by including `{!v.body}` in its markup. If there is no super component, you've hit the root component and the data is inserted into `document.body`.

Let's look at a simple example to understand how the `body` attribute behaves at different levels of component extension. We have three components.

`c:superBody` is the super component. It inherently extends `<aura:component>`.

```
<!--c:superBody-->
<aura:component extensible="true">
    Parent body: {!v.body}
</aura:component>
```

At this point, `c:superBody` doesn't output anything for `{!v.body}` as it's just a placeholder for data that will be passed in by a component that extends `c:superBody`.

`c:subBody` extends `c:superBody` by setting `extends="c:superBody"` in its `<aura:component>` tag.

```
<!--c:subBody-->
<aura:component extends="c:superBody">
    Child body: {!v.body}
</aura:component>
```

`c:subBody` outputs:

```
Parent body: Child body:
```

In other words, `c:subBody` sets the value for `{!v.body}` in its super component, `c:superBody`.

`c:containerBody` contains a reference to `c:subBody`.

```
<!--c:containerBody-->
<aura:component>
    <c:subBody>
        Body value
    </c:subBody>
</aura:component>
```

In `c:containerBody`, we set the `body` attribute of `c:subBody` to `Body value`. `c:containerBody` outputs:

```
Parent body: Child body: Body value
```

SEE ALSO:

aura:set

Component Body

Component Markup

Abstract Components

Object-oriented languages, such as Java, support the concept of an abstract class that provides a partial implementation for an object but leaves the remaining implementation to concrete sub-classes. An abstract class in Java can't be instantiated directly, but a non-abstract subclass can.

Similarly, the Lightning Component framework supports the concept of abstract components that have a partial implementation but leave the remaining implementation to concrete sub-components.

To use an abstract component, you must extend it and fill out the remaining implementation. An abstract component can't be used directly in markup.

The `<aura:component>` tag has a boolean `abstract` attribute. Set `abstract="true"` to make the component abstract.

SEE ALSO:

Interfaces

Interfaces

Object-oriented languages, such as Java, support the concept of an interface that defines a set of method signatures. A class that implements the interface must provide the method implementations. An interface in Java can't be instantiated directly, but a class that implements the interface can.

Similarly, the Lightning Component framework supports the concept of interfaces that define a component's shape by defining its attributes.

An interface starts with the `<aura:interface>` tag. It can only contain these tags:

- `<aura:attribute>` tags to define the interface's attributes.
- `<aura:registerEvent>` tags to define the events that it may fire.

You can't use markup, renderers, controllers, or anything else in an interface.

To use an interface, you must implement it. An interface can't be used directly in markup otherwise. Set the `implements` system attribute in the `<aura:component>` tag to the name of the interface that you are implementing. For example:

```
<aura:component implements="mynamespace:myinterface" >
```

A component can implement an interface and extend another component.

```
<aura:component extends="ns1:cmp1" implements="ns2:intf1" >
```

An interface can extend multiple interfaces using a comma-separated list.

```
<aura:interface extends="ns:intf1,ns:int2" >
```

Note: Use `<aura:set>` in a sub component to set the value of any attribute that is inherited from the super component. This usage works for components and abstract components, but it doesn't work for interfaces. To set the value of an attribute inherited from an interface, redefine the attribute in the sub component using `<aura:attribute>` and set the value in its default attribute.

Since there are fewer restrictions on the content of abstract components, they are more common than interfaces. A component can implement multiple interfaces but can only extend one abstract component, so interfaces can be more useful for some design patterns.

SEE ALSO:

- Setting Attributes Inherited from an Interface
- Abstract Components

Marker Interfaces

You can use an interface as a marker interface that is implemented by a set of components that you want to easily identify for specific usage in your app.

In JavaScript, you can determine if a component implements an interface by using `myCmp.isInstanceOf("mynamespace:myinterface")`.

Inheritance Rules

This table describes the inheritance rules for various elements.

Element	extends	implements	Default Base Element
component	one extensible component	multiple interfaces	`<aura:component>`
app	one extensible app	N/A	`<aura:application>`
interface	multiple interfaces using a comma-separated list (`extends="ns:intf1,ns:int2"`)	N/A	N/A

SEE ALSO:

- Interfaces

Using the AppCache

AppCache support is deprecated. Browser vendors have deprecated AppCache so we've followed their lead. Remove the `useAppcache` attribute in the `<aura:application>` tag of your standalone apps (`.app` resources) to avoid cross-browser support issues due to deprecation by browser vendors.

If you don't currently set `useAppcache` in an `<aura:application>` tag, you don't have to do anything as the default value of `useAppcache` is `false`.

Note: See an introduction to AppCache for more information.

SEE ALSO:

aura:application

Distributing Applications and Components

As an ISV or Salesforce partner, you can package and distribute applications and components to other Salesforce users and organizations, including those outside your company.

Publish applications and components to and install them from AppExchange. When adding an application or component to a package, all definition bundles referenced by the application or component are automatically included, such as other components, events, and interfaces. Custom fields, custom objects, list views, page layouts, and Apex classes referenced by the application or component are also included. However, when you add a custom object to a package, the application and other definition bundles that reference that custom object must be explicitly added to the package. Other dependencies that must be explicitly added to a package include the following.

- CSP Trusted Sites
- Remote Site Settings

A managed package ensures that your application and other resources are fully upgradeable. To create and work with managed packages, you must use a Developer Edition organization and register a namespace prefix. A managed package includes your namespace prefix in the component names and prevents naming conflicts in an installer's organization. An organization can create a single managed package that can be downloaded and installed by other organizations. After installation from a managed package, the application or component names are locked, but the following attributes are editable.

- API Version
- Description
- Label
- Language
- Markup

Any Apex that is included as part of your definition bundle must have at least 75% cumulative test coverage. When you upload your package to AppExchange, all tests are run to ensure that they run without errors. The tests are also run when the package is installed.

For more information on packaging and distributing, see the *ISVforce Guide*.

SEE ALSO:

Testing Your Apex Code

CHAPTER 7 Debugging

In this chapter ...

There are a few basic tools and techniques that can help you to debug applications.

Use Chrome DevTools to debug your client-side code.

- To open DevTools on Windows and Linux, press Control-Shift-I in your Google Chrome browser. On Mac, press Option-Command-I.
- To quickly find which line of code is failing, enable the **Pause on all exceptions** option before running your code.

To learn more about debugging JavaScript on Google Chrome, refer to the Google Chrome's DevTools website.

Enable Debug Mode for Lightning Components

EDITIONS

Available in: Salesforce Classic and Lightning Experience

Available for use in: **Contact Manager**, **Group**, **Professional**, **Enterprise**, **Performance**, **Unlimited**, and **Developer** Editions

Create Lightning components using the UI in **Enterprise**, **Performance**, **Unlimited**, **Developer** Editions or a sandbox.

Enable debug mode to make it easier to debug JavaScript code in your Lightning components.

There are two modes: production and debug. By default, the Lightning Component framework runs in production mode. This mode is optimized for performance. It uses the Google Closure Compiler to optimize and minimize the size of the JavaScript code. The method names and code are heavily obfuscated.

When you enable debug mode, the framework doesn't use Google Closure Compiler so the JavaScript code isn't minimized and is easier to read and debug. Debug mode also adds more detailed output for some warnings and errors.

Important: Debug mode has a significant performance impact. The setting affects all users in your org. For this reason, we recommend using it only in sandbox and Developer Edition orgs. Don't leave debug mode on permanently in your production org.

To enable debug mode for your org:

1. From Setup, enter `Lightning Components` in the `Quick Find` box, then select **Lightning Components**.
2. Select the `Enable Debug Mode` checkbox.
3. Click **Save**.

Note: The `Enable LockerService for Managed Packages` setting lets you control whether LockerService is enforced for components installed from a managed package. The checkbox is only visible when the LockerService critical update is activated.

Salesforce Lightning Inspector Chrome Extension

The Salesforce Lightning Inspector is a Google Chrome DevTools extension that enables you to navigate the component tree, inspect component attributes, and profile component performance. The extension also helps you to understand the sequence of event firing and handling.

The extension helps you to:

- Navigate the component tree in your app, inspect components and their associated DOM elements.
- Identify performance bottlenecks by looking at a graph of component creation time.
- Debug server interactions faster by monitoring and modifying responses.
- Test the fault tolerance of your app by simulating error conditions or dropped action responses.
- Track the sequence of event firing and handling for one or more actions.

This documentation assumes that you are familiar with Google Chrome DevTools.

IN THIS SECTION:

Install Salesforce Lightning Inspector

Install the Google Chrome DevTools extension to help you debug and profile component performance.

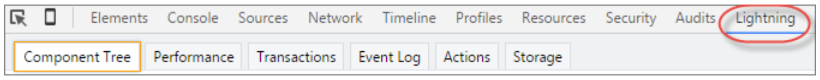
1. In Google Chrome, navigate to the Salesforce Lightning Inspector extension page on the Chrome Web Store.
2. Click the **Add to Chrome** button.

Salesforce Lightning Inspector

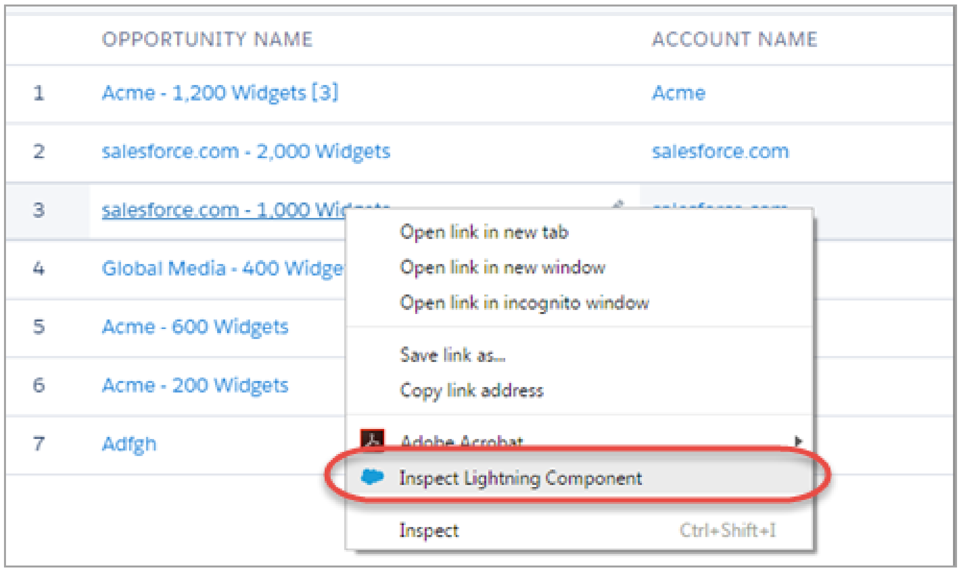
The Chrome extension adds a Lightning tab to the DevTools menu. Use it to inspect different aspects of your app.

1. Navigate to a page containing a Lightning component, such as Lightning Experience (`one.app`).
2. Open the Chrome DevTools (**More tools** > **Developer tools** in the Chrome control menu).

   You should see a Lightning tab in the DevTools menu.

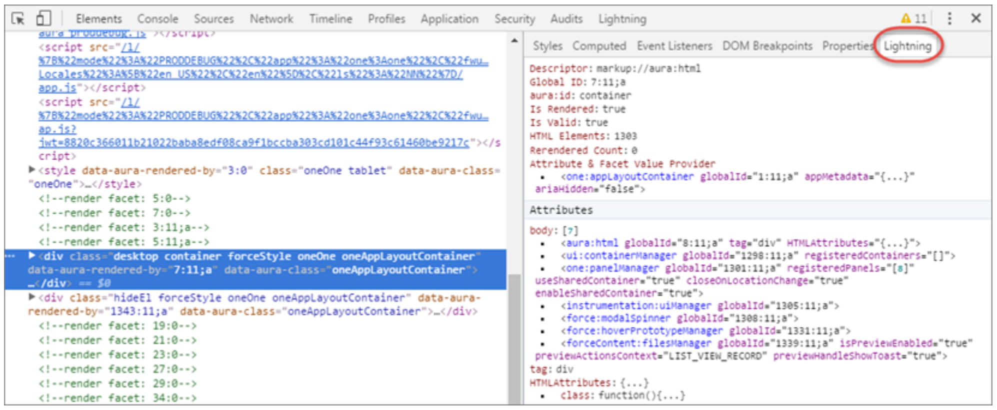
   

   To get information quickly about an element on a Lightning page, right-click the element and select **Inspect Lightning Component**.



	OPPORTUNITY NAME	ACCOUNT NAME
1	Acme - 1,200 Widgets [3]	Acme
2	salesforce.com - 2,000 Widgets	salesforce.com
3	salesforce.com - 1,000 Wi	
4	Global Media - 400 Widge	
5	Acme - 600 Widgets	
6	Acme - 200 Widgets	
7	Adfgh	

You can also click a Lightning component in the DevTools Elements tab or an element with a `data-aura-rendered-by` attribute to see a description and attributes.



Elements Console Sources Network Timeline Profiles Application Security Audits Lightning

```
  <script src="/l/%7B%22mode%22%3A%22PRODDEBUG%22%2C%22app%22%3A%22one%3Aone%22%2C%22fwu…Locales%22%3A%5B%22en_US%22%2C%22en%22%5D%2C%22ls%22%3A%22NN%22%7D/app.js"></script>
  <script src="/l/%7B%22mode%22%3A%22PRODDEBUG%22%2C%22app%22%3A%22one%3Aone%22%2C%22fwu…ap.js?jwt=8820c366011b21022baba8edf08ca9f1bccba303cd101c44f93c61460be9217c"></script>
▶<style data-aura-rendered-by="3:0" class="oneOne tablet" data-aura-class="oneOne">…</style>
  <!--render facet: 5:0-->
  <!--render facet: 7:0-->
  <!--render facet: 3:11;a-->
  <!--render facet: 5:11;a-->
▶<div class="desktop container forceStyle oneOne oneAppLayoutContainer" data-aura-rendered-by="7:11;a" data-aura-class="oneAppLayoutContainer">…</div> == $0
▶<div class="hideEl forceStyle oneOne oneAppLayoutContainer" data-aura-rendered-by="1343:11;a" data-aura-class="oneAppLayoutContainer">…</div>
  <!--render facet: 19:0-->
  <!--render facet: 21:0-->
  <!--render facet: 23:0-->
  <!--render facet: 27:0-->
  <!--render facet: 29:0-->
  <!--render facet: 34:0-->
```

Styles Computed Event Listeners DOM Breakpoints Properties Lightning

```
Descriptor: markup://aura:html
Global ID: 7:11;a
aura:id: container
Is Rendered: true
Is Valid: true
HTML Elements: 1303
Rerendered Count: 0
Attribute & Facet Value Provider
  • <one:appLayoutContainer globalId="1:11;a" appMetadata="{...}" ariaHidden="false">
Attributes
body: [7]
  • <aura:html globalId="8:11;a" tag="div" HTMLAttributes="{...}">
  • <ui:containerManager globalId="1298:11;a" registeredContainers="[]">
  • <one:panelManager globalId="1301:11;a" registeredPanels="[8]" useSharedContainer="true" closeOnLocationChange="true" enableSharedContainer="true">
  • <instrumentation:uiManager globalId="1305:11;a">
  • <force:modalSpinner globalId="1308:11;a">
  • <force:hoverPrototypeManager globalId="1331:11;a">
  • <forceContent:filesManager globalId="1339:11;a" isPreviewEnabled="true" previewActionsContext="LIST_VIEW_RECORD" previewHandleShowToast="true">
tag: div
HTMLAttributes: {...}
  • class: function(){...}
```

Use the following subtabs to inspect different aspects of your app.

IN THIS SECTION:

Component Tree Tab

This tab shows the component markup including the tree of nested components.

Performance Tab

The Performance tab shows a flame graph of the creation time for your components. Look at longer and deeper portions of the graph for potential performance bottlenecks.

Transactions Tab

Some apps delivered by Salesforce include transaction markers that enable you to see fine-grained metrics for actions within those transactions. You can't create your own transactions.

Event Log Tab

This tab shows all the events fired. The event graph helps you to understand the sequence of events and handlers for one or more actions.

Actions Tab

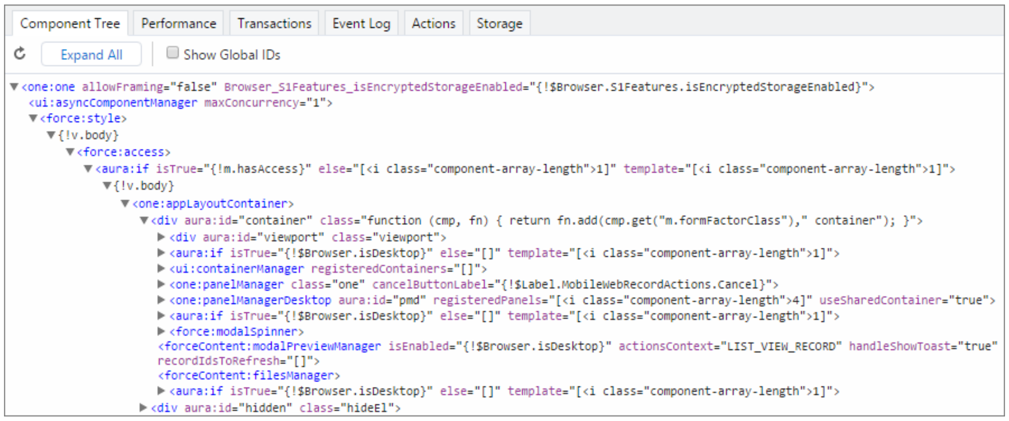
This tab shows the server-side actions executed. The list automatically refreshes when the page updates.

Storage Tab

This tab shows the client-side storage for Lightning applications. Actions marked as storable are stored in the `actions` store. Use this tab to analyze storage in Salesforce1 and Lightning Experience.

Component Tree Tab

This tab shows the component markup including the tree of nested components.



```
▼<one:one allowFraming="false" Browser_S1Features_isEncryptedStorageEnabled="{!$Browser.S1Features.isEncryptedStorageEnabled}">
  <ui:asyncComponentManager maxConcurrency="1">
  ▼<force:style>
    ▼{!v.body}
      ▼<force:access>
        ▼<aura:if isTrue="{!m.hasAccess}" else="[<i class="component-array-length">1]" template="[<i class="component-array-length">1]">
          ▼{!v.body}
            ▼<one:appLayoutContainer>
              ▼<div aura:id="container" class="function (cmp, fn) { return fn.add(cmp.get("m.formFactorClass")," container"); }">
                ▶<div aura:id="viewport" class="viewport">
                ▶<aura:if isTrue="{!$Browser.isDesktop}" else="[]" template="[<i class="component-array-length">1]">
                ▶<ui:containerManager registeredContainers="[]">
                ▶<one:panelManager class="one" cancelButtonLabel="{!$Label.MobileWebRecordActions.Cancel}">
                ▶<one:panelManagerDesktop aura:id="pmd" registeredPanels="[<i class="component-array-length">4]" useSharedContainer="true">
                ▶<aura:if isTrue="{!$Browser.isDesktop}" else="[]" template="[<i class="component-array-length">1]">
                ▶<force:modalSpinner>
                <forceContent:modalPreviewManager isEnabled="{!$Browser.isDesktop}" actionsContext="LIST_VIEW_RECORD" handleShowToast="true"
                recordIdsToRefresh="[]">
                <forceContent:filesManager>
                ▶<aura:if isTrue="{!$Browser.isDesktop}" else="[]" template="[<i class="component-array-length">1]">
              ▶<div aura:id="hidden" class="hideEl">
```

Collapse or Expand Markup

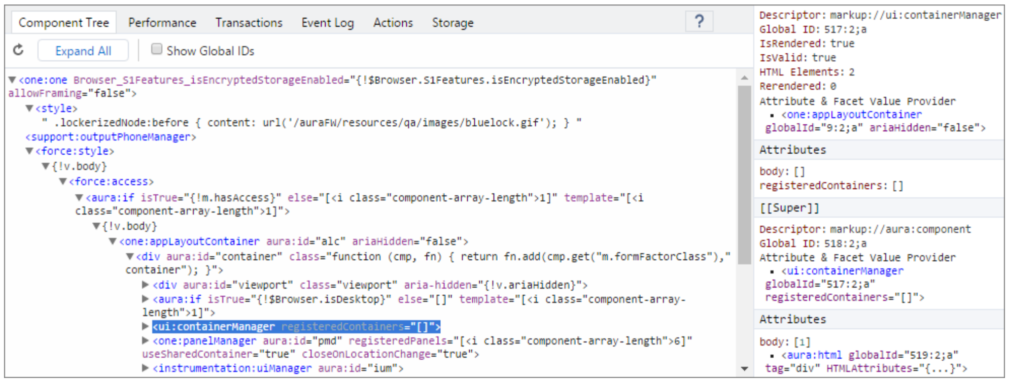
Expand or collapse the component hierarchy by clicking a triangle at the start of a line.

Refresh the Data

The component tree is expensive to serialize, and doesn't respond to component updates. You must manually update the tree when necessary by scrolling to the top of the panel and clicking the Refresh icon.

See More Details for a Component

Click a node to see a sidebar with more details for that selected component. While you must manually refresh the component tree, the component details in the sidebar are automatically refreshed.



```
▼<one:one Browser_S1Features_isEncryptedStorageEnabled="{!$Browser.S1Features.isEncryptedStorageEnabled}"
allowFraming="false">
  ▼<style>
    " .lockerizedNode:before { content: url('/auraFW/resources/qa/images/bluelock.gif'); } "
  <support:outputPhoneManager>
  ▼<force:style>
    ▼{!v.body}
      ▼<force:access>
        ▼<aura:if isTrue="{!m.hasAccess}" else="[<i class="component-array-length">1]" template="[<i
        class="component-array-length">1]">
          ▼{!v.body}
            ▼<one:appLayoutContainer aura:id="alc" ariaHidden="false">
              ▼<div aura:id="container" class="function (cmp, fn) { return fn.add(cmp.get("m.formFactorClass"),"
              container"); }">
                ▶<div aura:id="viewport" class="viewport" aria-hidden="{!v.ariaHidden}">
                ▶<aura:if isTrue="{!$Browser.isDesktop}" else="[]" template="[<i class="component-array-
                length">1]">
                ▶<ui:containerManager registeredContainers="[]">
                ▶<one:panelManager aura:id="pmd" registeredPanels="[<i class="component-array-length">6]"
                useSharedContainer="true" closeOnLocationChange="true">
                ▶<instrumentation:uiManager aura:id="ium">
```

```
Descriptor: markup://ui:containerManager
Global ID: 517:2;a
IsRendered: true
IsValid: true
HTML Elements: 2
Rerendered: 0
Attribute & Facet Value Provider
  ▪ <one:appLayoutContainer
  globalId="9:2;a" ariaHidden="false">
Attributes
body: []
registeredContainers: []
[[Super]]
Descriptor: markup://aura:component
Global ID: 518:2;a
Attribute & Facet Value Provider
  ▪ <ui:containerManager
  globalId="517:2;a"
  registeredContainers="[]">
Attributes
body: [1]
  ▪ <aura:html globalId="519:2;a"
  tag="div" HTMLAttributes="{...}">
```

The sidebar contains these sections:

Top Panel

- **Descriptor**—Description of a component in a format of `prefix://namespace:name`
- **Global ID**—The unique identifier for the component for the lifetime of the application
- **aura:id**—The local ID for the component, if it's defined
- **IsRendered**—A component can be present in the component tree but not rendered in the app. The component is rendered when it's included in `v.body` or in an expression, such as `{!v.myCmp}`.
- **IsValid**—When a component is destroyed, it becomes invalid. While you can still hold a reference to an invalid component, it should not be used.
- **HTML Elements**—The count of HTML elements for the component (including children components)

- **Rerendered**—The number of times the component has been rerendered since you opened the Inspector. Changing properties on a component makes it dirty, which triggers a rerender. Rerendering can be an expensive operation, and you generally want to avoid it, if possible.
- **Attribute & Facet Value Provider**—The attribute value provider and facet value provider are usually the same component. If so, they are consolidated into one entry.

  The attribute value provider is the component that provides attribute values for expressions. In the following example, the name attribute of `<c:myComponent>` gets its value from the `avpName` attribute of its attribute value provider.

  ```
  <c:myComponent name="{!v.avpName}" />
  ```

  The facet value provider is the value provider for facet attributes (attributes of type `Aura.Component[]`). The facet value provider can be different than the attribute value provider for the component. We won't get into that here as it's complicated! However, it's important to know that if you have expressions in facets, the expressions use the facet value provider instead of the attribute value provider.

Attributes

Shows the attribute values for a component. Use `v.attributeName` when you reference an attribute in an expression or code.

[[Super]]

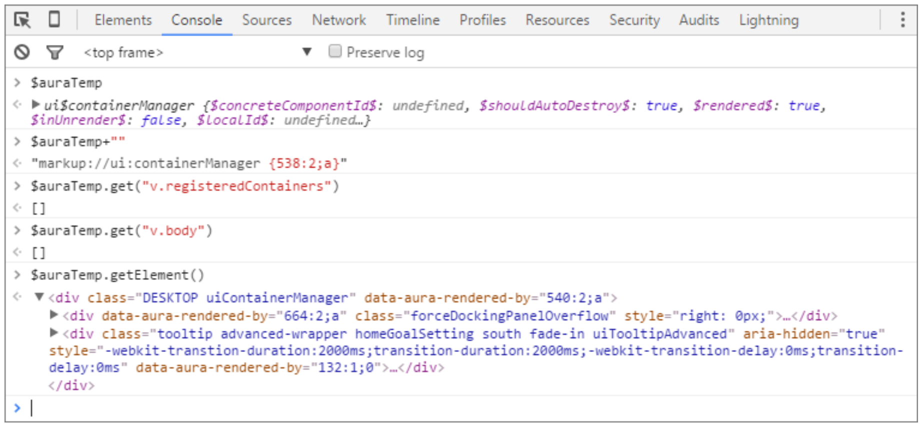
When a component extends another component, the sub component creates an instance of the super component during its creation. Each of these super components has their own set of properties. While a super component has its own attributes section, the super component only has a `body` attribute. All other attribute values are shared in the extension hierarchy.

Model

Some components you see might have a Model section. Models are a deprecated feature and they are included simply for debugging purposes. Don't reference models or your code will break.

Get a Reference to a Component in the Console

Click a component reference anywhere in the Inspector to generate a `$auraTemp` variable that points at that component. You can explore the component further by referring to `$auraTemp` in the Console tab.



```
> $auraTemp
< ▶ui$containerManager {$concreteComponentId$: undefined, $shouldAutoDestroy$: true, $rendered$: true,
  $inUnrender$: false, $localId$: undefined…}
> $auraTemp+""
< "markup://ui:containerManager {538:2;a}"
> $auraTemp.get("v.registeredContainers")
< []
> $auraTemp.get("v.body")
< []
> $auraTemp.getElement()
< ▼<div class="DESKTOP uiContainerManager" data-aura-rendered-by="540:2;a">
    ▶<div data-aura-rendered-by="664:2;a" class="forceDockingPanelOverflow" style="right: 0px;">…</div>
    ▶<div class="tooltip advanced-wrapper homeGoalSetting south fade-in uiTooltipAdvanced" aria-hidden="true"
    style="-webkit-transtion-duration:2000ms;transition-duration:2000ms;-webkit-transition-delay:0ms;transition-
    delay:0ms" data-aura-rendered-by="132:1;0">…</div>
    </div>
> |
```

These commands are useful to explore the component contents using the `$auraTemp` variable.

`$auraTemp+""`

Returns the component descriptor.

`$auraTemp.get("v.attributeName")`

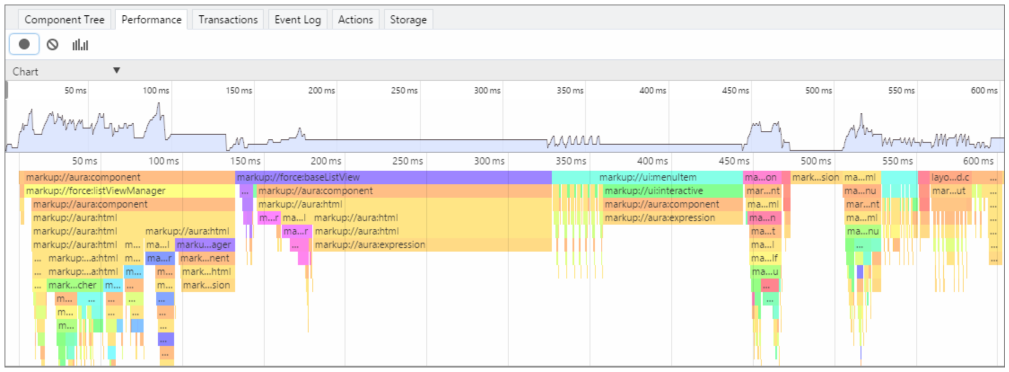
Returns the value for the *`attributeName`* attribute.

`$auraTemp.getElement()`
Returns the corresponding DOM element.

`inspect($auraTemp.getElement())`
Opens the Elements tab and inspects the DOM element for the component.

Performance Tab

The Performance tab shows a flame graph of the creation time for your components. Look at longer and deeper portions of the graph for potential performance bottlenecks.



Record Performance Data

Use the Record ●, Clear ⊘, and Show current collected 📊 buttons to gather performance data about specific user actions or collections of user actions.

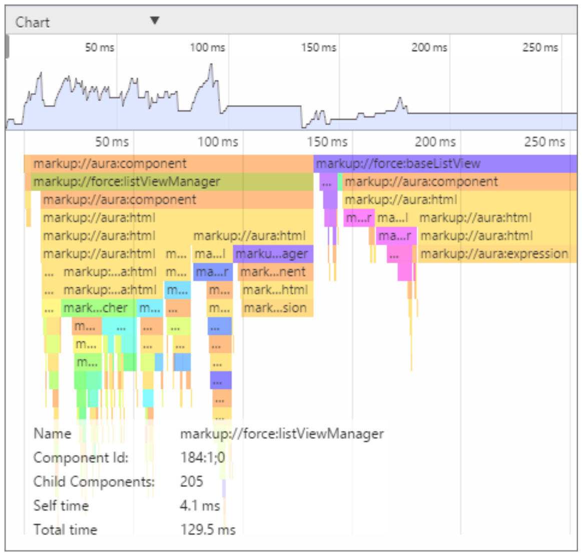
1. To start gathering performance data, press ●.
2. Take one or more actions in the app.
3. To stop gathering performance data, press 🔴.

The flame graph for your actions displays. To see the graph before you stop recording, press the 📊 button.

See More Performance Details for a Component

Hover over a component in the flame graph to see more detailed information about that component in the bottom-left corner. The component complexity and timing information can help diagnose performance issues.

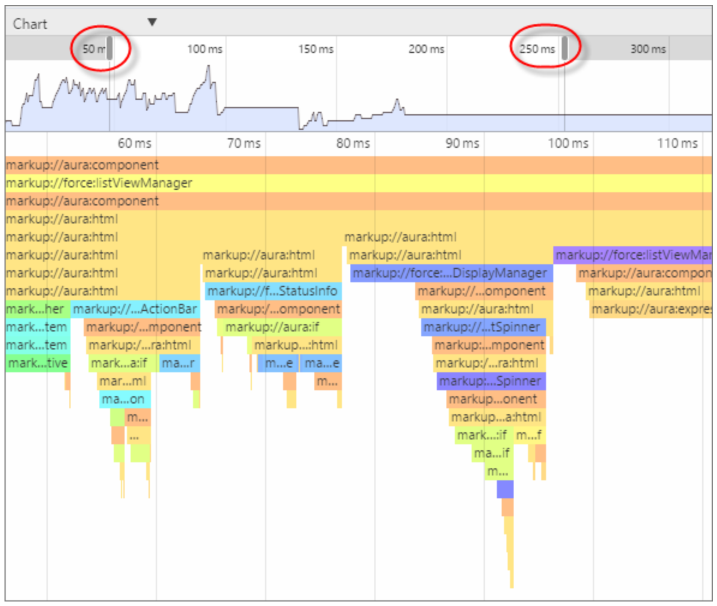
This measure...	Is the time it took to complete...
Self time	The current function. It excludes the completion time for functions it invoked.
Aggregated self time	All invocations of the function across the recorded timeline. It excludes the completion time for functions it invoked.
Total time	The current function and all functions that it invoked.
Aggregated total time	All invocations of the function across the recorded timeline, including completion time for functions it invoked.



Name markup://force:listViewManager
Component Id: 184:1;0
Child Components: 205
Self time 4.1 ms
Total time 129.5 ms

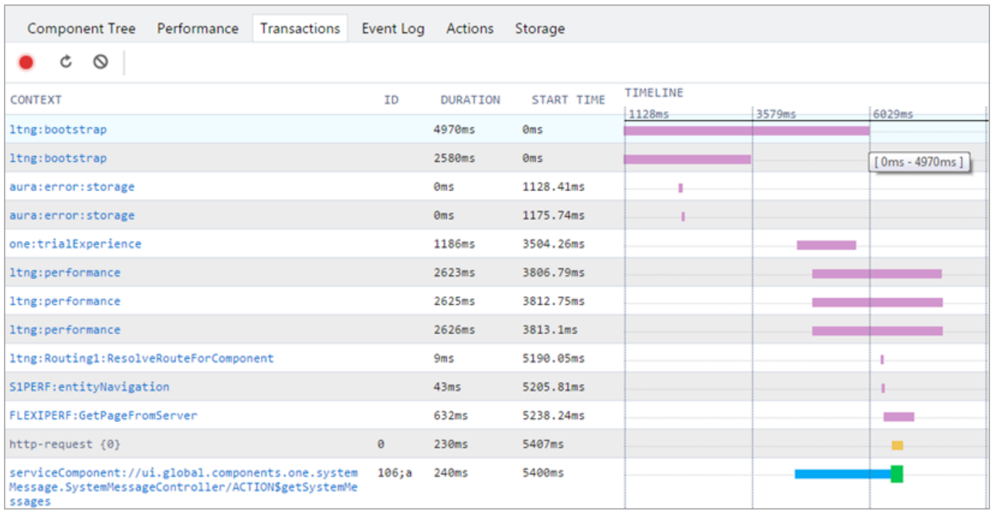
Narrow the Timeline

Drag the vertical handles on the timeline to select a time window to focus on. Zoom in on a smaller time window to inspect component creation time for potential performance hot spots.



Transactions Tab

Some apps delivered by Salesforce include transaction markers that enable you to see fine-grained metrics for actions within those transactions. You can't create your own transactions.

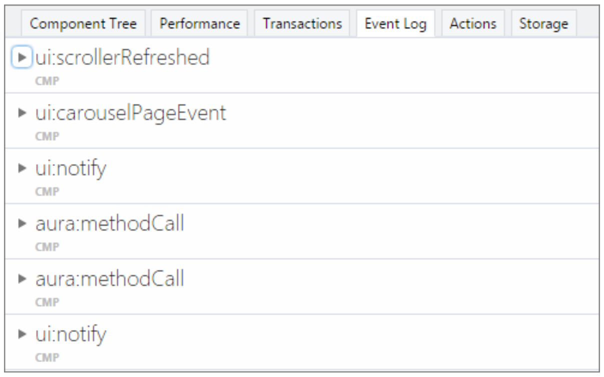


CONTEXT	ID	DURATION	START TIME
ltng:bootstrap		4970ms	0ms
ltng:bootstrap		2580ms	0ms
aura:error:storage		0ms	1128.41ms
aura:error:storage		0ms	1175.74ms
one:trialExperience		1186ms	3504.26ms
ltng:performance		2623ms	3806.79ms
ltng:performance		2625ms	3812.75ms
ltng:performance		2626ms	3813.1ms
ltng:Routing1:ResolveRouteForComponent		9ms	5190.05ms
S1PERF:entityNavigation		43ms	5205.81ms
FLEXIPERF:GetPageFromServer		632ms	5238.24ms
http-request {0}	0	230ms	5407ms
serviceComponent://ui.global.components.one.systemMessage.SystemMessageController/ACTION$getSystemMessages	106;a	240ms	5400ms

Measure	Description
Duration	The page duration since the page start time, in milliseconds
Start Time	The start time when the page was last loaded or refreshed, in milliseconds
Timeline	The start and end times of a transaction, represented by a colored bar: • Green — How long the action took on the server • Yellow — XMLHttpRequest transaction • Blue — Queued time until the XMLHttpRequest transaction was sent • Purple — Custom transaction

Event Log Tab

This tab shows all the events fired. The event graph helps you to understand the sequence of events and handlers for one or more actions.



ui:scrollerRefreshed
CMP
ui:carouselPageEvent
CMP
ui:notify
CMP
aura:methodCall
CMP
aura:methodCall
CMP
ui:notify
CMP

Record Events

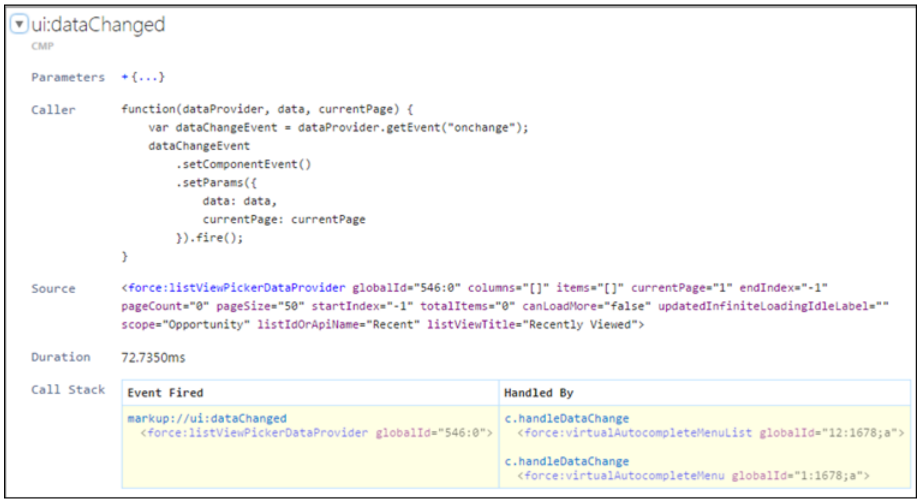
Use the Toggle recording ● and Clear ⃠ buttons to capture specific user actions or collections of user actions.

1. To start gathering event data, press ●.

2. Take one or more actions in the app.
3. To stop gathering event data, press ●.

View Event Details

Expand an event to see more details. In the call stack, click an event handler (for example, `c.handleDataChange`) to see where it's defined in code. The handler in the yellow row is the most current.



ui:dataChanged

CMP

Parameters ▸{...}

Caller

```
function(dataProvider, data, currentPage) {
    var dataChangeEvent = dataProvider.getEvent("onchange");
    dataChangeEvent
        .setComponentEvent()
        .setParams({
            data: data,
            currentPage: currentPage
        }).fire();
}
```

Source

```
<force:listViewPickerDataProvider globalId="546:0" columns="[]" items="[]" currentPage="1" endIndex="-1"
pageCount="0" pageSize="50" startIndex="-1" totalItems="0" canLoadMore="false" updatedInfiniteLoadingIdleLabel=""
scope="Opportunity" listIdOrApiName="Recent" listViewTitle="Recently Viewed">
```

Duration 72.7350ms

Call Stack

Event Fired	Handled By
markup://ui:dataChanged `<force:listViewPickerDataProvider globalId="546:0">`	c.handleDataChange `<force:virtualAutocompleteMenuList globalId="12:1678;a">` c.handleDataChange `<force:virtualAutocompleteMenu globalId="1:1678;a">`

Filter the List of Events

By default, both application and component events are shown. You can hide or show both types of events by toggling the **App Events** and **Cmp Events** buttons.

Enter a search string in the `Filter` field to match any substring.

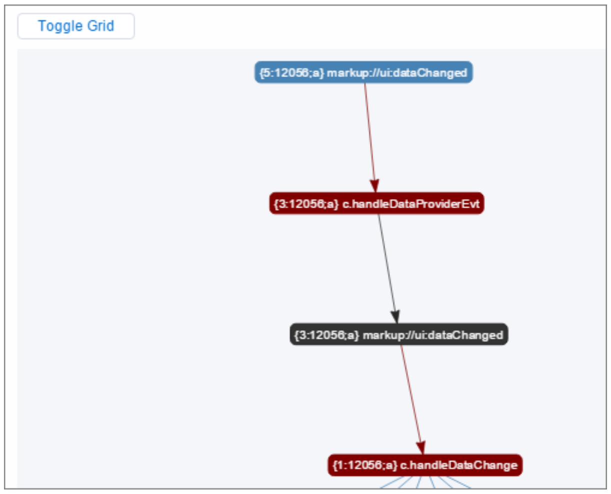
Invert the filter by starting the search string with `!`. For example, `!aura` returns all events that don't contain the string `aura`.

Show Unhandled Events

Show events that are fired but are not handled. Unhandled events aren't listed by default but can be useful to see during development.

View Graph of Events

Expand an event to see more details. Click the **Toggle Grid** button to generate a network graph showing the events fired before and after this event, and the components handling those events. Event-driven programming can be confusing when a cacophony of events explode. The event graph helps you to join the dots and understand the sequence of events and handlers.


Toggle Grid
{5:12056;a} markup://ui:dataChanged
{3:12056;a} c.handleDataProviderEvt
{3:12056;a} markup://ui:dataChanged
{1:12056;a} c.handleDataChange

The graph is color coded.

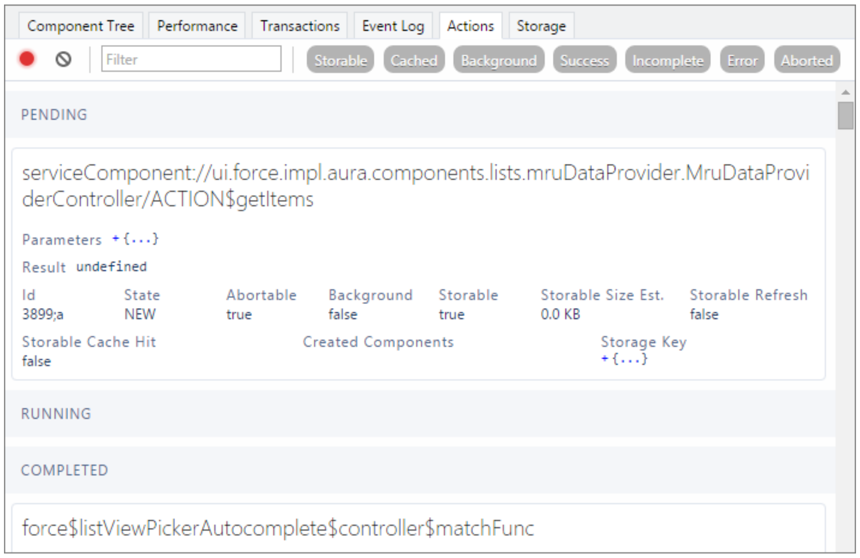
- **Black**—The current event
- **Maroon**—A controller action
- **Blue**—Another event fired before or after the current event

SEE ALSO:

Communicating with Events

Actions Tab

This tab shows the server-side actions executed. The list automatically refreshes when the page updates.



PENDING

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}
Result undefined

Id	State	Abortable	Background	Storable	Storable Size Est.	Storable Refresh
3899;a	NEW	true	false	true	0.0 KB	false

Storable Cache Hit	Created Components	Storage Key
false		+{...}

RUNNING

COMPLETED

force$listViewPickerAutocomplete$controller$matchFunc

Filter the List of Actions

To filter the list of actions, toggle the buttons related to the different action types or states.

- **Storable**—Storable actions whose responses can be cached.

- **Cached**—Storable actions whose responses are cached. Toggle this button off to show cache misses and non-storable actions. This information can be valuable if you're investigating performance bottlenecks.
- **Background**—Not supported for Lightning components. Available in the open-source Aura framework.
- **Success**—Actions that were executed successfully.
- **Incomplete**—Actions with no server response. The server might be down or the client might be offline.
- **Error**—Actions that returned a server error.
- **Aborted**—Actions that were aborted.

Enter a search string in the `Filter` field to match any substring.

Invert the filter by starting the search string with *`!`*. For example, *`!aura`* returns all actions that don't contain the string *`aura`* and filters out many framework-level actions.

IN THIS SECTION:

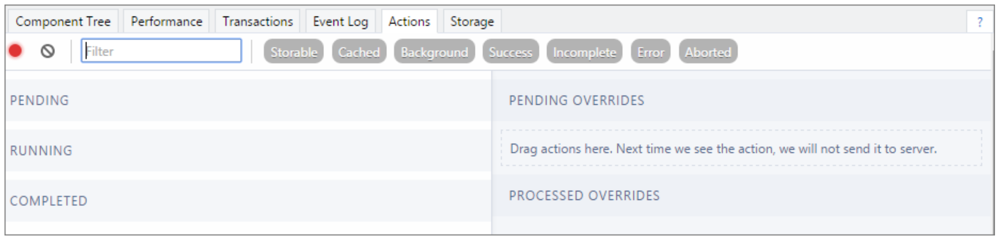
Manually Override Server Responses
The Overrides panel on the right side of the Actions tab lets you manually tweak the server responses and investigate the fault tolerance of your app.

SEE ALSO:

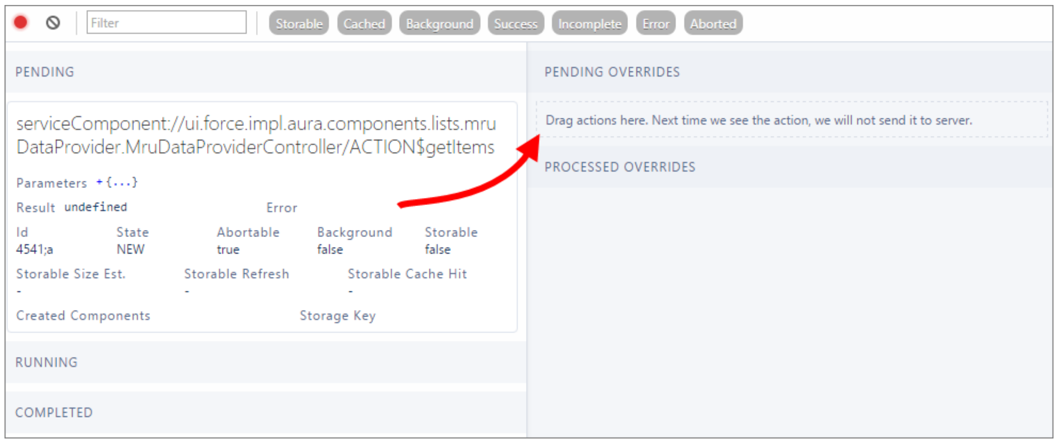
Calling a Server-Side Action

Manually Override Server Responses

The Overrides panel on the right side of the Actions tab lets you manually tweak the server responses and investigate the fault tolerance of your app.



Drag an action from the list on the left side to the PENDING OVERRIDES section.



serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}				
Result undefined		Error		
Id	State	Abortable	Background	Storable
4541;a	NEW	true	false	false
Storable Size Est.		Storable Refresh	Storable Cache Hit	
-		-	-	
Created Components			Storage Key	

The next time the same action is enqueued to be sent to the server, the framework won't send it. Instead, the framework mocks the response based on the override option that you choose. Here are the override options.

- Override the Result
- Error Response Next Time
- Drop the Action

Note: The same action means an action with the same name. The action parameters don't have to be identical.

IN THIS SECTION:

Modify an Action Response

Modify an action response in the Salesforce Lightning Inspector by changing one of the JSON object values and see how the UI is affected. The server returns a JSON object when you call a server-side action.

Set an Error Response

Your app should degrade gracefully when an error occurs so that users understand what happened or know how to proceed. Use the Salesforce Lightning Inspector to simulate an error condition and see how the user experience is affected.

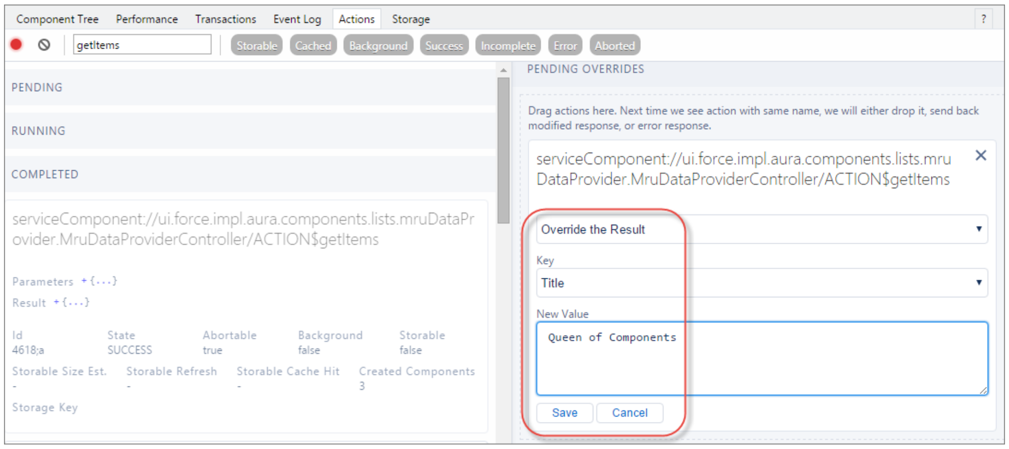
Drop an Action Response

Your app should degrade gracefully when a server-side action times out or the response is dropped. Use the Salesforce Lightning Inspector to simulate a dropped action response and see how the user experience is affected.

Modify an Action Response

Modify an action response in the Salesforce Lightning Inspector by changing one of the JSON object values and see how the UI is affected. The server returns a JSON object when you call a server-side action.

1. Drag the action whose response you want to modify to the PENDING OVERRIDES section.
2. Select Override the Result in the drop-down list.
3. Select a response key to modify in the `Key` field.
4. Enter a modified value for the key in the `New Value` field.



getItems

Drag actions here. Next time we see action with same name, we will either drop it, send back modified response, or error response.

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Override the Result

Key: Title

New Value: Queen of Components

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}
Result +{...}

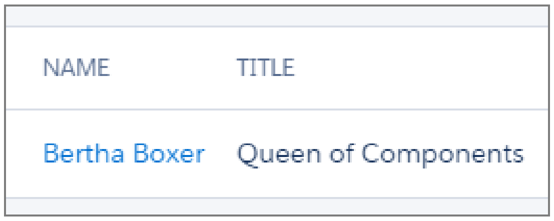
Id	State	Abortable	Background	Storable
4618;a	SUCCESS	true	false	false

Storable Size Est.	Storable Refresh	Storable Cache Hit	Created Components
-	-	-	3

Storage Key

5. Click **Save**.
6. To trigger execution of the action, refresh the page.
   The modified action response moves from the PENDING OVERRIDES section to the PROCESSED OVERRIDES section.

7. Note the UI change, if any, related to your change.

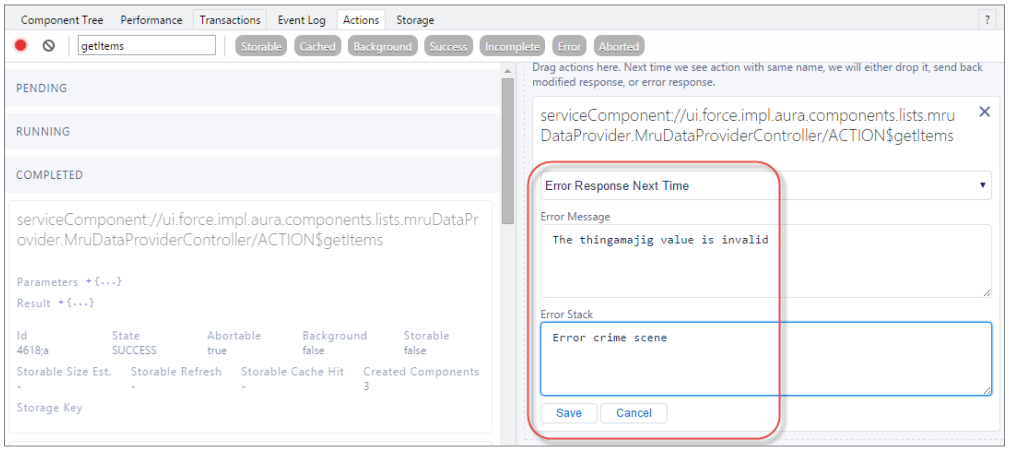


NAME	TITLE
Bertha Boxer	Queen of Components

Set an Error Response

Your app should degrade gracefully when an error occurs so that users understand what happened or know how to proceed. Use the Salesforce Lightning Inspector to simulate an error condition and see how the user experience is affected.

1. Drag the action whose response you want to modify to the PENDING OVERRIDES section.
2. Select Error Response Next Time in the drop-down list.
3. Add an `Error Message`.
4. Add some text in the `Error Stack` field.



getItems

PENDING

RUNNING

COMPLETED

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}
Result +{...}

Id	State	Abortable	Background	Storable
4618;a	SUCCESS	true	false	false

Storable Size Est.	Storable Refresh	Storable Cache Hit	Created Components
-	-	-	3

Storage Key

Drag actions here. Next time we see action with same name, we will either drop it, send back modified response, or error response.

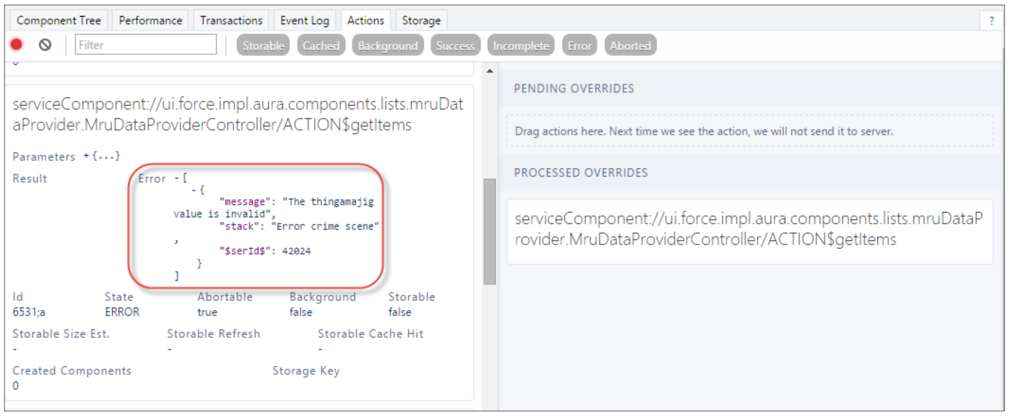
serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Error Response Next Time

Error Message
```
The thingamajig value is invalid
```

Error Stack
```
Error crime scene
```

5. Click **Save**.
6. To trigger execution of the action, refresh the page.
   - The modified action response moves from the PENDING OVERRIDES section to the PROCESSED OVERRIDES section.
   - The action response displays in the COMPLETED section in the left panel with a `State` equals `ERROR`.



serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}

Result

```
Error -[
    -{
        "message": "The thingamajig
 value is invalid",
        "stack": "Error crime scene"
 ,
        "$serId$": 42024
    }
 ]
```

```
Id           State     Abortable    Background    Storable
6531;a       ERROR     true         false         false
Storable Size Est.     Storable Refresh     Storable Cache Hit
-                      -                    -
Created Components                 Storage Key
0
```

PENDING OVERRIDES

Drag actions here. Next time we see the action, we will not send it to server.

PROCESSED OVERRIDES

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

7. Note the UI change, if any, related to your change. The UI should handle errors by alerting the user or allowing them to continue using the app.

   To degrade gracefully, make sure that your action response callback handles an error response (`response.getState() === "ERROR"`).

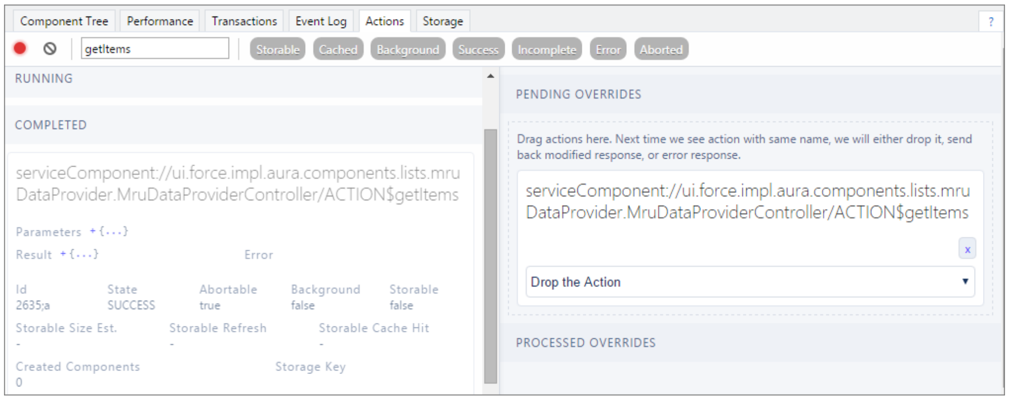
SEE ALSO:

Calling a Server-Side Action

Drop an Action Response

Your app should degrade gracefully when a server-side action times out or the response is dropped. Use the Salesforce Lightning Inspector to simulate a dropped action response and see how the user experience is affected.

1. Drag the action whose response you want to modify to the PENDING OVERRIDES section.
2. Select Drop the Action in the drop-down list.



RUNNING

COMPLETED

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}

Result +{...} Error

```
Id           State     Abortable    Background    Storable
2635;a       SUCCESS   true         false         false
Storable Size Est.     Storable Refresh     Storable Cache Hit
-                      -                    -
Created Components                 Storage Key
0
```

PENDING OVERRIDES

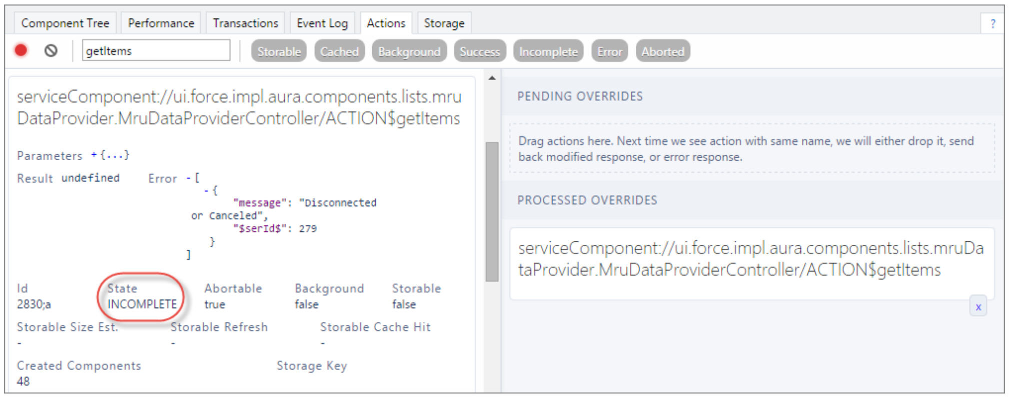
Drag actions here. Next time we see action with same name, we will either drop it, send back modified response, or error response.

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Drop the Action ▾

PROCESSED OVERRIDES

3. To trigger execution of the action, refresh the page.
   - The modified action response moves from the PENDING OVERRIDES section to the PROCESSED OVERRIDES section.
   - The action response displays in the COMPLETED section in the left panel with a `State` equals `INCOMPLETE`.



serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

Parameters +{...}

Result undefined

```
Error -[
       -{
          "message": "Disconnected
        or Canceled",
          "$serId$": 279
        }
      ]
```

Id	State	Abortable	Background	Storable
2830;a	INCOMPLETE	true	false	false

Storable Size Est.	Storable Refresh	Storable Cache Hit
-	-	-

Created Components 48

Storage Key

PENDING OVERRIDES

Drag actions here. Next time we see action with same name, we will either drop it, send back modified response, or error response.

PROCESSED OVERRIDES

serviceComponent://ui.force.impl.aura.components.lists.mruDataProvider.MruDataProviderController/ACTION$getItems

4. Note the UI change, if any, related to your change. The UI should handle the dropped action by alerting the user or allowing them to continue using the app.

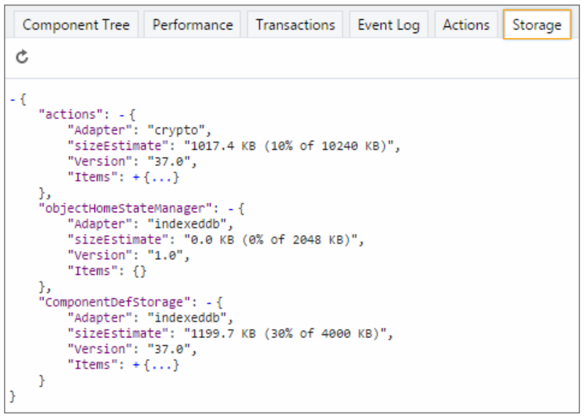
To degrade gracefully, make sure that your action response callback handles an incomplete response (`response.getState() === "INCOMPLETE"`).

SEE ALSO:

Calling a Server-Side Action

Storage Tab

This tab shows the client-side storage for Lightning applications. Actions marked as storable are stored in the `actions` store. Use this tab to analyze storage in Salesforce1 and Lightning Experience.



```
-{
    "actions": -{
        "Adapter": "crypto",
        "sizeEstimate": "1017.4 KB (10% of 10240 KB)",
        "Version": "37.0",
        "Items": +{...}
    },
    "objectHomeStateManager": -{
        "Adapter": "indexeddb",
        "sizeEstimate": "0.0 KB (0% of 2048 KB)",
        "Version": "1.0",
        "Items": {}
    },
    "ComponentDefStorage": -{
        "Adapter": "indexeddb",
        "sizeEstimate": "1199.7 KB (30% of 4000 KB)",
        "Version": "37.0",
        "Items": +{...}
    }
}
```

Log Messages

To help debug your client-side code, you can write output to the JavaScript console of a web browser using `console.log()` if your browser supports it..

For instructions on using the JavaScript console, refer to the instructions for your web browser.

CHAPTER 8 Fixing Performance Warnings

In this chapter ...

A few common performance anti-patterns in code prompt the framework to log warning messages to the browser console. Fix the warning messages to speed up your components!

The warnings display in the browser console only if you enabled debug mode.

SEE ALSO:

Enable Debug Mode for Lightning Components

`<aura:if>`—Clean Unrendered Body

This warning occurs when you change the `isTrue` attribute of an `<aura:if>` tag from `true` to `false` in the same rendering cycle. The unrendered body of the `<aura:if>` must be destroyed, which is avoidable work for the framework that slows down rendering time.

Example

This component shows the anti-pattern.

```
<!--c:ifCleanUnrendered-->
<aura:component>
    <aura:attribute name="isVisible" type="boolean" default="true"/>
    <aura:handler name="init" value="{!this}" action="{!c.init}"/>

    <aura:if isTrue="{!v.isVisible}">
        <p>I am visible</p>
    </aura:if>
</aura:component>
```

Here's the component's client-side controller.

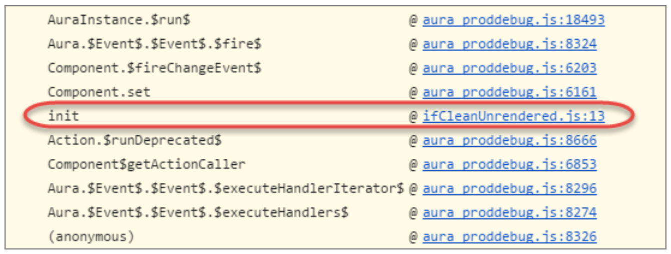
```
/* c:ifCleanUnrenderedController.js */
({
    init: function(cmp) {
        /* Some logic */
        cmp.set("v.isVisible", false); // Performance warning trigger
    }
})
```

When the component is created, the `isTrue` attribute of the `<aura:if>` tag is evaluated. The value of the `isVisible` attribute is `true` by default so the framework creates the body of the `<aura:if>` tag. After the component is created but before rendering, the `init` event is triggered.

The `init()` function in the client-side controller toggles the `isVisible` value from `true` to `false`. The `isTrue` attribute of the `<aura:if>` tag is now `false` so the framework must destroy the body of the `<aura:if>` tag. This warning displays in the browser console only if you enabled debug mode.

```
WARNING: [Performance degradation] markup://aura:if ["5:0"] in c:ifCleanUnrendered ["3:0"]
needed to clear unrendered body.
```

Click the expand button beside the warning to see a stack trace for the warning.



```
AuraInstance.$run$                              @ aura_proddebug.js:18493
Aura.$Event$.$Event$.$fire$                     @ aura_proddebug.js:8324
Component.$fireChangeEvent$                     @ aura_proddebug.js:6203
Component.set                                   @ aura_proddebug.js:6161
init                                            @ ifCleanUnrendered.js:13
Action.$runDeprecated$                          @ aura_proddebug.js:8666
Component$getActionCaller                       @ aura_proddebug.js:6853
Aura.$Event$.$Event$.$executeHandlerIterator$   @ aura_proddebug.js:8296
Aura.$Event$.$Event$.$executeHandlers$          @ aura_proddebug.js:8274
(anonymous)                                     @ aura_proddebug.js:8326
```

Click the link for the `ifCleanUnrendered` entry in the stack trace to see the offending line of code in the Sources pane of the browser console.

How to Fix the Warning

Reverse the logic for the `isTrue` expression. Instead of setting the `isTrue` attribute to `true` by default, set it to `false`. Set the `isTrue` expression to true in the `init()` method, if needed.

Here's the fixed component:

```
<!--c:ifCleanUnrenderedFixed-->
<aura:component>
    <!-- FIX: Change default to false.
         Update isTrue expression in controller instead. -->
    <aura:attribute name="isVisible" type="boolean" default="false"/>
    <aura:handler name="init" value="{!this}" action="{!c.init}"/>

    <aura:if isTrue="{!v.isVisible}">
        <p>I am visible</p>
    </aura:if>
</aura:component>
```

Here's the fixed controller:

```
/* c:ifCleanUnrenderedFixedController.js */
({
    init: function(cmp) {
        // Some logic
        // FIX: set isVisible to true if logic criteria met
        cmp.set("v.isVisible", true);
    }
})
```

SEE ALSO:

aura:if

Enable Debug Mode for Lightning Components

`<aura:iteration>`—Multiple Items Set

This warning occurs when you set the `items` attribute of an `<aura:iteration>` tag multiple times in the same rendering cycle.

There's no easy and performant way to check if two collections are the same in JavaScript. Even if the old value of `items` is the same as the new value, the framework deletes and replaces the previously created body of the `<aura:iteration>` tag.

Example

This component shows the anti-pattern.

```
<!--c:iterationMultipleItemsSet-->
<aura:component>
    <aura:attribute name="groceries" type="List"
                    default="[ 'Eggs', 'Bacon', 'Bread' ]"/>

    <aura:handler name="init" value="{!this}" action="{!c.init}"/>
    <aura:iteration items="{!v.groceries}" var="item">
        <p>{!item}</p>
    </aura:iteration>
</aura:component>
```

Here's the component's client-side controller.

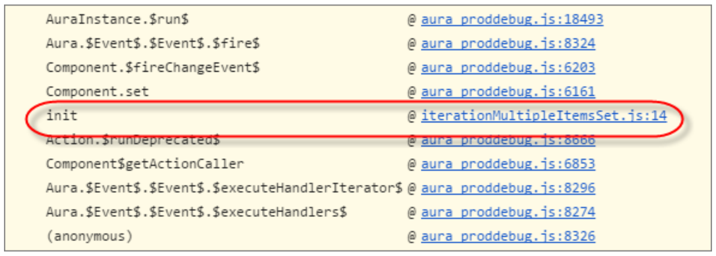
```
/* c:iterationMultipleItemsSetController.js */
({
    init: function(cmp) {
        var list = cmp.get('v.groceries');
        // Some logic
        cmp.set('v.groceries', list); // Performance warning trigger
    }
})
```

When the component is created, the `items` attribute of the `<aura:iteration>` tag is set to the default value of the `groceries` attribute. After the component is created but before rendering, the `init` event is triggered.

The `init()` function in the client-side controller sets the `groceries` attribute, which resets the `items` attribute of the `<aura:iteration>` tag. This warning displays in the browser console only if you enabled debug mode.

```
WARNING: [Performance degradation] markup://aura:iteration [id:5:0] in
c:iterationMultipleItemsSet ["3:0"]
had multiple items set in the same Aura cycle.
```

Click the expand button beside the warning to see a stack trace for the warning.



```
AuraInstance.$run$                                    @ aura_proddebug.js:18493
Aura.$Event$.$Event$.$fire$                           @ aura_proddebug.js:8324
Component.$fireChangeEvent$                           @ aura_proddebug.js:6203
Component.set                                         @ aura_proddebug.js:6161
init                                                  @ iterationMultipleItemsSet.js:14
Action.$runDeprecated$                                @ aura_proddebug.js:8666
Component$getActionCaller                             @ aura_proddebug.js:6853
Aura.$Event$.$Event$.$executeHandlerIterator$ @ aura_proddebug.js:8296
Aura.$Event$.$Event$.$executeHandlers$                @ aura_proddebug.js:8274
(anonymous)                                           @ aura_proddebug.js:8326
```

Click the link for the `iterationMultipleItemsSet` entry in the stack trace to see the offending line of code in the Sources pane of the browser console.

How to Fix the Warning

Make sure that you don't modify the `items` attribute of an `<aura:iteration>` tag multiple times. The easiest solution is to remove the default value for the `groceries` attribute in the markup. Set the value for the `groceries` attribute in the controller instead.

The alternate solution is to create a second attribute whose only purpose is to store the default value. When you've completed your logic in the controller, set the `groceries` attribute.

Here's the fixed component:

```
<!--c:iterationMultipleItemsSetFixed-->
<aura:component>
    <!-- FIX: Remove the default from the attribute -->
    <aura:attribute name="groceries" type="List" />
    <!-- FIX (ALTERNATE): Create a separate attribute containing the default -->
    <aura:attribute name="groceriesDefault" type="List"
```

```
                  default="[ 'Eggs', 'Bacon', 'Bread' ]"/>

    <aura:handler name="init" value="{!this}" action="{!c.init}"/>

    <aura:iteration items="{!v.groceries}" var="item">
        <p>{!item}</p>
    </aura:iteration>
</aura:component>
```

Here's the fixed controller:

```
/* c:iterationMultipleItemsSetFixedController.js */
({
    init: function(cmp) {
        // FIX (ALTERNATE) if need to set default in markup
        // use a different attribute
        // var list = cmp.get('v.groceriesDefault');
        // FIX: Set the value in code
        var list = ['Eggs', 'Bacon', 'Bread'];
        // Some logic
        cmp.set('v.groceries', list);
    }
})
```

SEE ALSO:

- aura:iteration
- Enable Debug Mode for Lightning Components

CHAPTER 9 Reference

In this chapter ...

This section contains reference documentation including details of the various tags available in the framework.

Note that the the Lightning Component framework provides a subset of what's available in the open-source Aura framework, in addition to components and events that are specific to Salesforce.

Reference Doc App

The reference doc app includes more reference information, including descriptions and source for the out-of-the-box components that come with the framework, as well as the JavaScript API. Explore this section for reference information or access the app at:

`https://<myDomain>.lightning.force.com/auradocs/reference.app`, where `<myDomain>` is the name of your custom Salesforce domain.

Supported aura:attribute Types

`aura:attribute` describes an attribute available on an app, interface, component, or event.

Attribute Name	Type	Description
`access`	String	Indicates whether the attribute can be used outside of its own namespace. Possible values are `public` (default), and `global`, and `private`.
`name`	String	Required. The name of the attribute. For example, if you set `<aura:attribute name="isTrue" type="Boolean" />` on a component called `aura:newCmp`, you can set this attribute when you instantiate the component; for example,`<aura:newCmp isTrue="false" />`.
`type`	String	Required. The type of the attribute. For a list of basic types supported, see Basic Types.
`default`	String	The default value for the attribute, which can be overwritten as needed. When setting a default value, expressions using the `$Label`, `$Locale`, and `$Browser` global value providers are supported. Alternatively, to set a dynamic default, use an `init` event. See Invoking Actions on Component Initialization on page 229.
`required`	Boolean	Determines if the attribute is required. The default is `false`.
`description`	String	A summary of the attribute and its usage.

All `<aura:attribute>` tags have name and type values. For example:

```
<aura:attribute name="whom" type="String" />
```

Note: Although type values are case insensitive, case sensitivity should be respected as your markup interacts with JavaScript, CSS, and Apex.

SEE ALSO:

Component Attributes

Basic Types

Here are the supported basic type values. Some of these types correspond to the wrapper objects for primitives in Java. Since the framework is written in Java, defaults, such as maximum size for a number, for these basic types are defined by the Java objects that they map to.

type	Example	Description
`Boolean`	`<aura:attribute name="showDetail" type="Boolean" />`	Valid values are `true` or `false`. To set a default value of `true`, add `default="true"`.
`Date`	`<aura:attribute name="startDate" type="Date" />`	A date corresponding to a calendar day in the format yyyy-mm-dd. The hh:mm:ss portion of the date is not stored. To include time fields, use `DateTime` instead.
`DateTime`	`<aura:attribute name="lastModifiedDate" type="DateTime" />`	A date corresponding to a timestamp. It includes date and time details with millisecond precision.
`Decimal`	`<aura:attribute name="totalPrice" type="Decimal" />`	`Decimal` values can contain fractional portions (digits to the right of the decimal). Maps to java.math.BigDecimal. `Decimal` is better than `Double` for maintaining precision for floating-point calculations. It's preferable for currency fields.
`Double`	`<aura:attribute name="widthInchesFractional" type="Double" />`	`Double` values can contain fractional portions. Maps to java.lang.Double. Use `Decimal` for currency fields instead.
`Integer`	`<aura:attribute name="numRecords" type="Integer" />`	`Integer` values can contain numbers with no fractional portion. Maps to java.lang.Integer, which defines its limits, such as maximum size.
`Long`	`<aura:attribute name="numSwissBankAccount" type="Long" />`	`Long` values can contain numbers with no fractional portion. Maps to java.lang.Long, which defines its limits, such as maximum size. Use this data type when you need a range of values wider than those provided by `Integer`.
`String`	`<aura:attribute name="message" type="String" />`	A sequence of characters.

You can use arrays for each of these basic types. For example:

```
<aura:attribute name="favoriteColors" type="String[]" default="['red','green','blue']" />
```

Retrieving Data from an Apex Controller

To retrieve the string array from an Apex controller, bind the component to the controller. This component retrieves the string array when a button is clicked.

```
<aura:component controller="namespace.AttributeTypes">
    <aura:attribute name="favoriteColors" type="String[]" default="cyan, yellow, magenta"/>

    <aura:iteration items="{!v.favoriteColors}" var="s">
        {!s}
    </aura:iteration>
    <ui:button press="{!c.getString}" label="Update"/>
</aura:component>
```

Set the Apex controller to return a `List<String>` object.

```
public class AttributeTypes {
    private final String[] arrayItems;

 @AuraEnabled
    public static List<String> getStringArray() {
        String[] arrayItems = new String[]{ 'red', 'green', 'blue' };
        return arrayItems;
    }

}
```

This client-side controller retrieves the string array from the Apex controller and displays it using the `{!v.favoriteColors}` expression.

```
({
    getString : function(component, event) {
    var action = component.get("c.getStringArray");
     action.setCallback(this, function(response) {
            var state = response.getState();
            if (state === "SUCCESS") {
                var stringItems = response.getReturnValue();
                component.set("v.favoriteColors", stringItems);
            }
        });
        $A.enqueueAction(action);
    }
})
```

Object Types

An attribute can have a type corresponding to an Object.

```
<aura:attribute name="data" type="Object" />
```

For example, you may want to create an attribute of type `Object` to pass a JavaScript array as an event parameter. In the component event, declare the event parameter using `aura:attribute`.

```
<aura:event type="COMPONENT">
    <aura:attribute name="arrayAsObject" type="Object" />
<aura:event>
```

In JavaScript code, you can set the attribute of type `Object`.

```
// Set the event parameters
var event = component.getEvent(eventType);
event.setParams({
    arrayAsObject:["file1", "file2", "file3"]
});
event.fire();
```

Checking for Types

To determine a variable type, use `typeof` or a standard JavaScript method instead. The `instanceof` operator is unreliable due to the potential presence of multiple windows or frames.

SEE ALSO:

Working with Salesforce Records

Standard and Custom Object Types

An attribute can have a type corresponding to a standard or custom object. For example, this is an attribute for a standard `Account` object:

```
<aura:attribute name="acct" type="Account" />
```

This is an attribute for an `Expense__c` custom object:

```
<aura:attribute name="expense" type="Expense__c" />
```

Note: Make your Apex class methods, getter and setter methods, available to your components by annotating them with `@AuraEnabled`.

SEE ALSO:

Working with Salesforce Records

Collection Types

Here are the supported collection type values.

type	Example	Description
type[] (Array)	`<aura:attribute name="colorPalette" type="String[]" default="['red', 'green', 'blue']" />`	An array of items of a defined type.

type	Example	Description
`List`	`<aura:attribute name="colorPalette" type="List" default="['red', 'green', 'blue']" />`	An ordered collection of items.
`Map`	`<aura:attribute name="sectionLabels" type="Map" default="{ a: 'label1', b: 'label2' }" />`	A collection that maps keys to values. A map can't contain duplicate keys. Each key can map to at most one value. Defaults to an empty object, `{}`. Retrieve values by using `cmp.get("v.sectionLabels")['a']`.
`Set`	`<aura:attribute name="collection" type="Set" default="['red', 'green', 'blue']" />`	A collection that contains no duplicate elements. The order for set items is not guaranteed. For example, `"red,green,blue"` might be returned as `"blue,green,red"`.

Checking for Types

To determine a variable type, use `typeof` or a standard JavaScript method, such as `Array.isArray()`, instead. The `instanceof` operator is unreliable due to the potential presence of multiple windows or frames.

Setting List Items

There are several ways to set items in a list. To use a client-side controller, create an attribute of type List and set the items using `component.set()`.

This example retrieves a list of numbers from a client-side controller when a button is clicked.

```
<aura:attribute name="numbers" type="List"/>
<ui:button press="{!c.getNumbers}" label="Display Numbers" />
<aura:iteration var="num" items="{!v.numbers}">
  {!num.value}
</aura:iteration>
```

```
/** Client-side Controller **/
({
  getNumbers: function(component, event, helper) {
    var numbers = [];
    for (var i = 0; i < 20; i++) {
      numbers.push({
        value: i
      });
    }
    component.set("v.numbers", numbers);
    }
})
```

To retrieve list data from a controller, use `aura:iteration`.

Setting Map Items

To add a key and value pair to a map, use the syntax `myMap['myNewKey'] = myNewValue`.

```
var myMap = cmp.get("v.sectionLabels");
myMap['c'] = 'label3';
```

The following example retrieves data from a map.

```
for (key in myMap){
     //do something
}
```

Custom Apex Class Types

An attribute can have a type corresponding to an Apex class. For example, this is an attribute for a `Color` Apex class:

```
<aura:attribute name="color" type="docSampleNamespace.Color" />
```

Using Arrays

If an attribute can contain more than one element, use an array.

This `aura:attribute` tag shows the syntax for an array of Apex objects:

```
<aura:attribute name="colorPalette" type="docSampleNamespace.Color[]" />
```

Note: Make your Apex class methods, getter and setter methods, available to your components by annotating them with `@AuraEnabled`.

SEE ALSO:

Working with Salesforce Records

Framework-Specific Types

Here are the supported type values that are specific to the framework.

type	Example	Description
`Aura.Component`	N/A	A single component. We recommend using `Aura.Component[]` instead.

type	Example	Description
`Aura.Component[]`	`<aura:attribute name="detail" type="Aura.Component[]"/>` To set a default value for `type="Aura.Component[]"`, put the default markup in the body of `aura:attribute`. For example: `<aura:component> <aura:attribute name="detail" type="Aura.Component[]"> <p>default paragraph1</p> </aura:attribute> Default value is: {!v.detail} </aura:component>`	Use this type to set blocks of markup. An attribute of type `Aura.Component[]` is called a facet.

SEE ALSO:

- Component Body
- Component Facets

aura:application

An app is a special top-level component whose markup is in a `.app` resource.

The markup looks similar to HTML and can contain components as well as a set of supported HTML tags. The `.app` resource is a standalone entry point for the app and enables you to define the overall application layout, style sheets, and global JavaScript includes. It starts with the top-level `<aura:application>` tag, which contains optional system attributes. These system attributes tell the framework how to configure the app.

System Attribute	Type	Description
`access`	String	Indicates whether the app can be extended by another app outside of a namespace. Possible values are `public` (default), and `global`.
`controller`	String	The server-side controller class for the app. The format is `namespace.myController`.
`description`	String	A brief description of the app.
`extends`	Component	The app to be extended, if applicable. For example, `extends="namespace:yourApp"`.
`extensible`	Boolean	Indicates whether the app is extensible by another app. Defaults to `false`.
`implements`	String	A comma-separated list of interfaces that the app implements.

System Attribute	Type	Description
`template`	Component	The name of the template used to bootstrap the loading of the framework and the app. The default value is `aura:template`. You can customize the template by creating your own component that extends the default template. For example: `<aura:component extends="aura:template" ... >`
`tokens`	String	A comma-separated list of tokens bundles for the application. For example, `tokens="ns:myAppTokens"`. Tokens make it easy to ensure that your design is consistent, and even easier to update it as your design evolves. Define the token values once and reuse them throughout your application.
`useAppcache`	Boolean	Deprecated. Browser vendors have deprecated AppCache so we've followed their lead. Remove the `useAppcache` attribute in the `<aura:application>` tag of your standalone apps (`.app` resources) to avoid cross-browser support issues due to deprecation by browser vendors. If you don't currently set `useAppcache` in an `<aura:application>` tag, you don't have to do anything as the default value of `useAppcache` is `false`.

`aura:application` also includes a `body` attribute defined in a `<aura:attribute>` tag. Attributes usually control the output or behavior of a component, but not the configuration information in system attributes.

Attribute	Type	Description
`body`	`Component[]`	The body of the app. In markup, this is everything in the body of the tag.

SEE ALSO:

- Creating Apps
- Using the AppCache
- Application Access Control

aura:component

The root of the component hierarchy. Provides a default rendering implementation.

Components are the functional units of Aura, which encapsulate modular and reusable sections of UI. They can contain other components or HTML markup. The public parts of a component are its attributes and events. Aura provides out-of-the-box components in the `aura` and `ui` namespaces.

Every component is part of a namespace. For example, the `button` component is saved as `button.cmp` in the `ui` namespace can be referenced in another component with the syntax `<ui:button label="Submit"/>`, where `label="Submit"` is an attribute setting.

To create a component, follow this syntax.

```
<aura:component>
    <!-- Optional coponent attributes here -->
    <!-- Optional HTML markup -->
    <div class="container">
        Hello world!
        <!-- Other components -->
    </div>
</aura:component>
```

A component has the following optional attributes.

Attribute	Type	Description
`access`	String	Indicates whether the component can be used outside of its own namespace. Possible values are `public` (default), and `global`.
`controller`	String	The server-side controller class for the component. The format is `namespace.myController`.
`description`	String	A description of the component.
`extends`	Component	The component to be extended.
`extensible`	Boolean	Set to `true` if the component can be extended. The default is `false`.
`implements`	String	A comma-separated list of interfaces that the component implements.
`isTemplate`	Boolean	Set to `true` if the component is a template. The default is `false`. A template must have `isTemplate="true"` set in its `<aura:component>` tag. `<aura:component isTemplate="true" extends="aura:template">`
`template`	Component	The template for this component. A template bootstraps loading of the framework and app. The default template is `aura:template`. You can customize the template by creating your own component that extends the default template. For example: `<aura:component extends="aura:template" ... >`

`aura:component` includes a `body` attribute defined in a `<aura:attribute>` tag. Attributes usually control the output or behavior of a component, but not the configuration information in system attributes.

Attribute	Type	Description
`body`	`Component[]`	The body of the component. In markup, this is everything in the body of the tag.

aura:dependency

The `<aura:dependency>` tag enables you to declare dependencies that can't easily be discovered by the framework.

The framework automatically tracks dependencies between definitions, such as components, defined in markup. This enables the framework to automatically send the definitions to the browser. However, if a component's JavaScript code dynamically instantiates another component or fires an event that isn't directly referenced in the component's markup, use `<aura:dependency>` in the component's markup to explicitly tell the framework about the dependency. Adding the `<aura:dependency>` tag ensures that a definition, such as a component, and its dependencies are sent to the client, when needed.

For example, adding this tag to a component marks the `sampleNamespace:sampleComponent` component as a dependency.

```
<aura:dependency resource="markup://sampleNamespace:sampleComponent" />
```

Add this tag to component markup to mark the event as a dependency.

```
<aura:dependency resource="markup://force:navigateToComponent" type="EVENT"/>
```

Use the `<aura:dependency>` tag if you fire an event in JavaScript code and you're not registering the event in component markup using `<aura:registerEvent>`. Using an `<aura:registerEvent>` tag is the preferred approach.

The `<aura:dependency>` tag includes these system attributes.

System Attribute	Description
`resource`	The resource that the component depends on. For example, `resource="markup://sampleNamespace:sampleComponent"` refers to the `sampleComponent` in the `sampleNamespace` namespace. Use an asterisk (`*`) in the resource name for wildcard matching. For example, `resource="markup://sampleNamespace:*"` matches everything in the namespace; `resource="markup://sampleNamespace:input*"` matches everything in the namespace that starts with `input`. Note: We don't recommend using an asterisk (`*`) for wildcard matching as it tells the framework to send all matching definitions to the client. Wildcard matching usually sends more definitions than you need and leads to slower page load time. To speed up page load time, add an `<aura:dependency>` tag for each definition that's not directly referenced in the component's markup. Don't use an asterisk (`*`) in the namespace portion of the resource name. For example, `resource="markup://sample*:sampleComponent"` is not supported.
`type`	The type of resource that the component depends on. The default value is `COMPONENT`. Use `type="*"` to match all types of resources. Note: We don't recommend using an asterisk (`*`) for wildcard matching as it tells the framework to send all matching definitions to the client. Be as selective as possible in the types of definitions that you send to the client. The most commonly used values are: • `COMPONENT` • `APPLICATION` • `EVENT`

System Attribute	Description
	Use a comma-separated list for multiple types; for example: `COMPONENT,APPLICATION`.

SEE ALSO:

- Dynamically Creating Components
- Fire Component Events
- Fire Application Events

aura:event

An event is represented by the `aura:event` tag, which has the following attributes.

Attribute	Type	Description
`access`	String	Indicates whether the event can be extended or used outside of its own namespace. Possible values are `public` (default), and `global`.
`description`	String	A description of the event.
`extends`	Component	The event to be extended. For example, `extends="namespace:myEvent"`.
`type`	String	Required. Possible values are `COMPONENT` or `APPLICATION`.

SEE ALSO:

- Communicating with Events
- Event Access Control

aura:interface

The `aura:interface` tag has the following optional attributes.

Attribute	Type	Description
`access`	String	Indicates whether the interface can be extended or used outside of its own namespace. Possible values are `public` (default), and `global`.
`description`	String	A description of the interface.

Attribute	Type	Description
`extends`	Component	The comma-seperated list of interfaces to be extended. For example, `extends="namespace:intfB"`.

SEE ALSO:

- Interfaces
- Interface Access Control

aura:method

Use `<aura:method>` to define a method as part of a component's API. This enables you to directly call a method in a component's client-side controller instead of firing and handling a component event. Using `<aura:method>` simplifies the code needed for a parent component to call a method on a child component that it contains.

The `<aura:method>` tag has these system attributes.

Attribute	Type	Description
`name`	`String`	The method name. Use the method name to call the method in JavaScript code. For example: `cmp.sampleMethod(param1);`
`action`	`Expression`	The client-side controller action to execute. For example: `action="{!c.sampleAction}"` `sampleAction` is an action in the client-side controller. If you don't specify an `action` value, the controller action defaults to the value of the method `name`.
`access`	`String`	The access control for the method. Valid values are: • **public**—Any component in the same namespace can call the method. This is the default access level. • **global**—Any component in any namespace can call the method.
`description`	`String`	The method description.

Declaring Parameters

An `<aura:method>` can optionally include parameters. Use an `<aura:attribute>` tag within an `<aura:method>` to declare a parameter for the method. For example:

```
<aura:method name="sampleMethod" action="{!c.doAction}"
  description="Sample method with parameters">
    <aura:attribute name="param1" type="String" default="parameter 1"/>
    <aura:attribute name="param2" type="Object" />
</aura:method>
```

Note: You don't need an `access` system attribute in the `<aura:attribute>` tag for a parameter.

Creating a Handler Action

This handler action shows how to access the arguments passed to the method.

```
({
    doAction : function(cmp, event) {
        var params = event.getParam('arguments');
        if (params) {
            var param1 = params.param1;
            // add your code here
        }
    }
})
```

Retrieve the arguments using `event.getParam('arguments')`. It returns an object if there are arguments or an empty array if there are no arguments.

SEE ALSO:

Calling Component Methods

Component Events

aura:set

Use `<aura:set>` in markup to set the value of an attribute inherited from a super component, event, or interface.

To learn more, see:

- Setting Attributes Inherited from a Super Component
- Setting Attributes on a Component Reference
- Setting Attributes Inherited from an Interface

Setting Attributes Inherited from a Super Component

Use `<aura:set>` in the markup of a sub component to set the value of an inherited attribute.

Let's look at an example. Here is the `c:setTagSuper` component.

```
<!--c:setTagSuper-->
<aura:component extensible="true">
    <aura:attribute name="address1" type="String" />
    setTagSuper address1: {!v.address1}<br/>
</aura:component>
```

`c:setTagSuper` outputs:

```
setTagSuper address1:
```

The `address1` attribute doesn't output any value yet as it hasn't been set.

Here is the `c:setTagSub` component that extends `c:setTagSuper`.

```
<!--c:setTagSub-->
<aura:component extends="c:setTagSuper">
    <aura:set attribute="address1" value="808 State St" />
</aura:component>
```

`c:setTagSub` outputs:

```
setTagSuper address1: 808 State St
```

`sampleSetTagExc:setTagSub` sets a value for the `address1` attribute inherited from the super component, `c:setTagSuper`.

Warning: This usage of `<aura:set>` works for components and abstract components, but it doesn't work for interfaces. For more information, see Setting Attributes Inherited from an Interface on page 339.

If you're using a component by making a reference to it in your component, you can set the attribute value directly in the markup. For example, `c:setTagSuperRef` makes a reference to `c:setTagSuper` and sets the `address1` attribute directly without using `aura:set`.

```
<!--c:setTagSuperRef-->
<aura:component>
    <c:setTagSuper address1="1 Sesame St" />
</aura:component>
```

`c:setTagSuperRef` outputs:

```
setTagSuper address1: 1 Sesame St
```

SEE ALSO:

Component Body

Inherited Component Attributes

Setting Attributes on a Component Reference

Setting Attributes on a Component Reference

When you include another component, such as `<ui:button>`, in a component, we call that a component reference to `<ui:button>`. You can use `<aura:set>` to set an attribute on the component reference. For example, if your component includes a reference to `<ui:button>`:

```
<ui:button label="Save">
    <aura:set attribute="buttonTitle" value="Click to save the record"/>
</ui:button>
```

This is equivalent to:

```
<ui:button label="Save" buttonTitle="Click to save the record" />
```

The latter syntax without `aura:set` makes more sense in this simple example. You can also use this simpler syntax in component references to set values for attributes that are inherited from parent components.

`aura:set` is more useful when you want to set markup as the attribute value. For example, this sample specifies the markup for the `else` attribute in the `aura:if` tag.

```
<aura:component>
    <aura:attribute name="display" type="Boolean" default="true"/>
    <aura:if isTrue="{!v.display}">
        Show this if condition is true
        <aura:set attribute="else">
           <ui:button label="Save" press="{!c.saveRecord}" />
        </aura:set>
    </aura:if>
</aura:component>
```

SEE ALSO:

Setting Attributes Inherited from a Super Component

Setting Attributes Inherited from an Interface

To set the value of an attribute inherited from an interface, redefine the attribute in the component and set its default value. Let's look at an example with the `c:myIntf` interface.

```
<!--c:myIntf-->
<aura:interface>
    <aura:attribute name="myBoolean" type="Boolean" default="true" />
</aura:interface>
```

This component implements the interface and sets `myBoolean` to `false`.

```
<!--c:myIntfImpl-->
<aura:component implements="c:myIntf">
    <aura:attribute name="myBoolean" type="Boolean" default="false" />

    <p>myBoolean: {!v.myBoolean}</p>
</aura:component>
```

Component Reference

Use out-of-the-box components for Lightning Experience, Salesforce1, or for your Lightning apps. These components belong to different namespaces, including:

aura
Provides components that are part of the framework's building blocks.

force
Provides components for field- and record-specific implementations.

forceChatter
Provides components for the Chatter feed.

forceCommunity
Provides components for Communities.

lightning

Provides components with Lightning Design System styling. For components in this namespace that are used in standalone Lightning apps, extend `force:slds` to implement Lightning Design System styling. In instances where there are matching `ui` and `lightning` namespace components, we recommend that you use the `lightning` namespace component. The `lightning` namespace components are optimized for common use cases. Event handling for `lightning` namespace components follows standard HTML practices and are simpler than that for the `ui` namespace components. For more information, see Event Handling in Base Lightning Components.

ui

Provides an older implementation of user interface components that don't match the look and feel of Lightning Experience and Salesforce1. Components in this namespace support multiple styling mechanism, and are usually more complex.

aura:expression

Renders the value to which an expression evaluates. Creates an instance of this component which renders the referenced "property reference value" set to the value attribute when expressions are found in free text or markup.

An expression is any set of literal values, variables, sub-expressions, or operators that can be resolved to a single value. It is used for dynamic output or passing a value into components by assigning them to attributes.

The syntax for an expression is `{!expression}`. `expression` is evaluated and dynamically replaced when the component is rendered or when the value is used by the component. The resulting value can be a primitive (integer, string, and so on), a boolean, a JavaScript or Aura object, an Aura component or collection, a controller method such as an action method, and other useful results.

An expression uses a value provider to access data and can also use operators and functions for more complex expressions. Value providers include `m` (data from model), `v`(attribute data from component), and `c` (controller action). This example show an expression `{!v.num}` whose value is resolved by the attribute `num`.

```
<aura:attribute name="num" type="integer" default="10"/>
<ui:inputNumber label="Enter age" aura:id="num" value="{!v.num}"/>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`value`	String	The expression to evaluate and render.	

aura:html

A meta component that represents all html elements. Any html found in your markup causes the creation of one of these.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`HTMLAttributes`	Map	A map of attributes to set on the html element.	

Attribute Name	Attribute Type	Description	Required?
`tag`	String	The name of the html element that should be rendered.	

`aura:if`

Conditionally instantiates and renders either the body or the components in the else attribute.

`aura:if` evaluates the `isTrue` expression on the server and instantiates components in either its `body` or `else` attribute. Only one branch is created and rendered. Switching condition unrenders and destroys the current branch and generates the other

```
<aura:component>
    <aura:if isTrue="{!v.truthy}">
    True
    <aura:set attribute="else">
      False
    </aura:set>
  </aura:if>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	ComponentDefRef[]	The components to render when isTrue evaluates to true.	Yes
`else`	ComponentDefRef[]	The alternative to render when isTrue evaluates to false, and the body is not rendered. Should always be set using the aura:set tag.	
`isTrue`	Boolean	An expression that must be fulfilled in order to display the body.	Yes

`aura:iteration`

Renders a view of a collection of items. Supports iterations containing components that can be created exclusively on the client-side.

`aura:iteration` iterates over a collection of items and renders the body of the tag for each item. Data changes in the collection are rerendered automatically on the page. It also supports iterations containing components that are created exclusively on the client-side or components that have server-side dependencies.

This example shows a basic way to use `aura:iteration` exclusively on the client-side.

```
<aura:component>

  <aura:iteration items="1,2,3,4,5" var="item">
        <meter value="{!item / 5}"/><br/>
    </aura:iteration>

</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	ComponentDefRef[]	Template to use when creating components for each iteration.	Yes
`end`	Integer	The index of the collection to stop at (exclusive)	
`indexVar`	String	The name of variable to use for the index of each item inside the iteration	
`items`	List	The collection of data to iterate over	Yes
`loaded`	Boolean	True if the iteration has finished loading the set of templates.	
`start`	Integer	The index of the collection to start at (inclusive)	
`template`	ComponentDefRef[]	The template that is used to generate components. By default, this is set from the body markup on first load.	
`var`	String	The name of the variable to use for each item inside the iteration	Yes

`aura:renderIf`

Deprecated. Use aura:if instead. This component allows you to conditionally render its contents. It renders its body only if isTrue evaluates to true. The else attribute allows you to render an alternative when isTrue evaluates to false.

The expression in `isTrue` is re-evaluated every time any value used in the expression changes. When the results of the expression change, it triggers a re-rendering of the component. Use `aura:renderIf` if you expect to show the components for both the true and false states, and it would require a server round trip to instantiate the components that aren't initially rendered. Switching condition unrenders current branch and renders the other. Otherwise, use `aura:if` instead if you want to instantiate the components in either its body or the else attribute, but not both.

```
<aura:component>
    <aura:renderIf isTrue="{!v.truthy}">
    True
    <aura:set attribute="else">
      False
    </aura:set>
  </aura:renderIf>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`else`	Component[]	The alternative content to render when isTrue evaluates to false, and the body is not rendered. Set using the <aura:set> tag.	
`isTrue`	Boolean	An expression that must evaluate to true to display the body of the component.	Yes

aura:template

Default template used to bootstrap Aura framework. To use another template, extend aura:template and set attributes using aura:set.

Attributes

Attribute Name	Attribute Type	Description	Required?
auraPreInitBlock	Component[]	The block of content that is rendered before Aura initialization.	
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
bodyClass	String	Extra body CSS styles	
defaultBodyClass	String	Default body CSS styles.	
doctype	String	The DOCTYPE declaration for the template.	
errorMessage	String	Error loading text	
errorTitle	String	Error title when an error has occured.	
loadingText	String	Loading text	
title	String	The title of the template.	

aura:text

Renders plain text. When any free text (not a tag or attribute value) is found in markup, an instance of this component is created with the value attribute set to the text found in the markup.

Attributes

Attribute Name	Attribute Type	Description	Required?
value	String	The String to be rendered.	

aura:unescapedHtml

The value assigned to this component will be rendered as-is, without altering its contents. It's intended for outputting pre-formatted HTML, for example, where the formatting is arbitrary, or expensive to calculate. The body of this component is ignored, and won't be rendered. Warning: this component outputs value as unescaped HTML, which introduces the possibility of security vulnerabilities in your code. You must sanitize user input before rendering it unescaped, or you will create a cross-site scripting (XSS) vulnerability. Only use <aura:unescapedHtml> with trusted or sanitized sources of data.

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of <aura:unescapedHtml> is ignored and won't be rendered.	
value	String	The string that should be rendered as unescaped HTML.	

auraStorage:init

Initializes a storage instance using an adapter that satisfies the provided criteria.

Use auraStorage:init to initialize storage in your app's template for caching server-side action response values.

This example uses a template to initialize storage for server-side action response values. The template contains an auraStorage:init tag that specifies storage initialization properties.

```
<aura:component isTemplate="true" extends="aura:template">
    <aura:set attribute="auraPreInitBlock">
        <!-- Note that the maxSize attribute in auraStorage:init is in KB -->
        <auraStorage:init name="actions" persistent="false" secure="false"
             maxSize="1024" />
    </aura:set>
</aura:component>
```

When you initialize storage, you can set certain options, such as the name, maximum cache size, and the default expiration time.

Storage for server-side actions caches action response values. The storage name must be actions.

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
clearStorageOnInit	Boolean	Set to true to delete all previous data on initialization (relevant for persistent storage only). This value defaults to true.	
debugLoggingEnabled	Boolean	Set to true to enable debug logging with $A.log(). This value defaults to false.	
defaultAutoRefreshInterval	Integer	The default duration (seconds) before an auto refresh request will be initiated. Actions may override this on a per-entry basis with Action.setStorable(). This value defaults to 30.	
defaultExpiration	Integer	The default duration (seconds) that an object will be retained in storage. Actions may override this on a per-entry basis with Action.setStorable(). This value defaults to 10.	

Attribute Name	Attribute Type	Description	Required?
maxSize	Integer	Maximum size (KB) of the storage instance. Existing items will be evicted to make room for new items; algorithm is adapter-specific. This value defaults to 1000.	
name	String	The programmatic name for the storage instance.	Yes
persistent	Boolean	Set to true if this storage desires persistence. This value defaults to false.	
secure	Boolean	Set to true if this storage requires secure storage support. This value defaults to false.	
version	String	Version to associate with all stored items.	

force:canvasApp

Enables you to include a Force.com Canvas app in a Lightning component.

A `force:canvasApp` component represents a canvas app that's embedded in your Lightning component. You can create a web app in the language of your choice and expose it in Salesforce as a canvas app. Use the Canvas App Previewer to test and debug the canvas app before embedding it in a Lightning component.

If you have a namespace prefix, specify it using the `namespacePrefix` attribute. Either the `developerName` or `applicationName` attribute is required. This example embeds a canvas app in a Lightning component.

```
<aura:component>
    <force:canvasApp developerName="MyCanvasApp" namespacePrefix="myNamespace" />
</aura:component />
```

For more information on building canvas apps, see the Force.com Canvas Developer's Guide.

Attributes

Attribute Name	Attribute Type	Description	Required?
applicationName	String	Name of the canvas app. Either applicationName or developerName is required.	
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
border	String	Width of the canvas app border, in pixels. If not specified, defaults to 0 px.	
canvasId	String	An unique label within a page for the Canvas app window. This should be used when targeting events to this canvas app.	
containerId	String	An html element id in which canvas app is rendered. The container needs to be defined before canvasApp cmp usage.	
developerName	String	Developer name of the canvas app. This name is defined when the canvas app is created and can be viewed in the Canvas App Previewer. Either developerName or applicationName is required.	

Attribute Name	Attribute Type	Description	Required?
`displayLocation`	String	The location in the application where the canvas app is currently being called from.	
`height`	String	Canvas app window height, in pixels. If not specified, defaults to 900 px.	
`maxHeight`	String	The maximum height of the Canvas app window in pixels. Defaults to 2000 px; 'infinite' is also a valid value.	
`maxWidth`	String	The maximum width of the Canvas app window in pixels. Defaults to 1000 px; 'infinite' is also a valid value.	
`namespacePrefix`	String	Namespace value of the Developer Edition organization in which the canvas app was created. Optional if the canvas app wasn't created in a Developer Edition organization. If not specified, defaults to null.	
`onCanvasAppError`	String	Name of the JavaScript function to be called if the canvas app fails to render.	
`onCanvasAppLoad`	String	Name of the JavaScript function to be called after the canvas app loads.	
`onCanvasSubscribed`	String	Name of the JavaScript function to be called after the canvas app registers with the parent.	
`parameters`	String	Object representation of parameters passed to the canvas app. This should be supplied in JSON format or as a JavaScript object literal. Here's an example of parameters in a JavaScript object literal: {param1:'value1',param2:'value2'}. If not specified, defaults to null.	
`referenceId`	String	The reference id of the canvas app, if set this is used instead of developerName, applicationName and namespacePrefix	
`scrolling`	String	Canvas window scrolling	
`sublocation`	String	The sublocation is the location in the application where the canvas app is currently being called from, for ex, displayLocation can be PageLayout and sublocation can be S1MobileCardPreview or S1MobileCardFullview, etc	
`title`	String	Title for the link	
`watermark`	Boolean	Renders a link if set to true	
`width`	String	Canvas app window width, in pixels. If not specified, defaults to 800 px.	

`force:inputField`

A component that provides a concrete type-specific input component implementation based on the data to which it is bound.

Represents an input field that corresponds to a field on a Salesforce object. This component respects the attributes of the associated field. For example, if the component is a number field with 2 decimal places, then the default input value contains the same number of decimal places. Bind the field using the `value` attribute and provide a default value to initialize the object.

```
<aura:attribute name="contact" type="Contact"
               default="{ 'sobjectType': 'Contact' }"/>
<force:inputField aura:id="contactName"
                 value="{!v.contact.Name}"/>
```

To load record data, wire up the container component to an Apex controller that returns the data. See Working with Salesforce Records in the Lightning Components Developer Guide for more information.

This component doesn't inherit the Lightning Design System styling. Use `lightning:input` if you want an input field that inherits the Lightning Design System styling.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	The CSS style used to display the field.	
`errorComponent`	Component[]	A component which is responsible for displaying the error message.	
`required`	Boolean	Specifies whether this field is required or not.	
`value`	Object	Data value of Salesforce field to which to bind.	

Events

Event Name	Event Type	Description
`change`	COMPONENT	The event fired when the user changes the content of the input.

`force:outputField`

A component that provides a concrete type-specific output component implementation based on the data to which it is bound.

Represents a read-only display of a value for a field on a Salesforce object. This component respects the attributes of the associated field and how it should be displayed. For example, if the component contains a date and time value, then the default output value contains the date and time in the user's locale. Bind the field using the `value` attribute and provide a default value to initialize the object.

```
<aura:attribute name="contact" type="Contact"
               default="{ 'sobjectType': 'Contact'}"/>
<force:outputField aura:id="contactName"
                 value="{!v.contact.Name}"/>
```

To load record data, wire up the container component to an Apex controller that returns the data. See Working with Salesforce Records in the Lightning Components Developer Guide for more information.

This component doesn't inherit the Lightning Design System styling. Use `lightning:input` if you want an input field that inherits the Lightning Design System styling.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`value`	Object	Data value of Salesforce field to which to bind.	

`force:recordEdit`

Generates an editable view of the specified Salesforce record.

A `force:recordEdit` component represents the record edit UI for the specified `recordId`.

This example displays the record edit UI and a button, which when pressed saves the record.

```
<force:recordEdit aura:id="edit" recordId="a02D0000006V8Ni"/>
<ui:button label="Save" press="{!c.save}"/>
```

This client-side controller fires the `recordSave` event, which saves the record.

```
save : function(component, event, helper) {
component.find("edit").get("e.recordSave").fire();
}
```

You can provide a dynamic ID for the `recordId` attribute using the format `{!v.myObject.recordId}`. To load record data, wire up the container component to an Apex controller that returns the data. See Working with Salesforce Records in the Lightning Components Developer Guide for more information.

To indicate that the record has been successfully saved, handle the `force:recordSaveSuccess` event.

This component displays fields in the order they appear on the corresponding page layout and record details page. We recommend that you use this component in Lightning Experience or Salesforce1. If used outside of the one.app container, such as in Lightning Out, this component doesn't inherit the Lightning Design System styling and won't be styled correctly.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`recordId`	String	The Id of the record to load, optional if record attribute is specified.	

Events

Event Name	Event Type	Description
`recordSave`	COMPONENT	User fired event to indicate request to save the record.
`onSaveSuccess`	COMPONENT	Fired when record saving was successful.

`force:recordPreview` (Developer Preview)

Use the `force:recordPreview` component to define the parameters for accessing, modifying, or creating a record using Lightning Data Service.

Methods

This component supports the following methods.

`getNewRecord`: Loads a record template and sets it to `force:recordPreview`'s `targetRecord` attribute, including redefined values for the entity and record type.

`reloadRecord`: Performs the same load function as on init using the current configuration values (`recordId`, `layoutType`, `mode`, and others). Doesn't force a server trip unless required.

`saveRecord`: Saves the record.

`deleteRecord`: Deletes the record.

Attributes

Attribute Name	Attribute Type	Description	Required?
`fields`	String[]	List of fields to query. This attribute or `layoutType` must be specified. If you specify both, the list of fields queried is the union of fields from `fields` and `layoutType`.	
`ignoreExistingAction`	Boolean	Whether to skip the cache and force a server request. Defaults to `false`. Setting this attribute to `true` is useful for handling user-triggered actions such as pull-to-refresh.	
`layoutType`	String	Name of the layout to query, which determines the fields included. Valid values are the following. • FULL • COMPACT This attribute or `fields` must be specified. If you specify both, the list of fields queried is the union of fields from `fields` and `layoutType`.	
`mode`	String	The mode in which to access the record. Valid values are the following. • VIEW • EDIT	

Attribute Name	Attribute Type	Description	Required?
		Defaults to VIEW.	
`recordId`	String	The 15-character or 18-character ID of the record to load, modify, or delete. Defaults to null, to create a record.	
`targetError`	String	A reference to a component attribute to which a localized error message is assigned if necessary.	
`targetRecord`	Record	A reference to a component attribute, to which the loaded record is assigned. Changes to the record are also assigned to this value, which triggers change handlers, re-renders, and so on.	

Events

Event Name	Event Type	Description
`recordUpdated`	COMPONENT	The event fired when the record is loaded, changed, updated, or removed.

`force:recordView`

Generates a view of the specified Salesforce record.

A `force:recordView` component represents a read-only view of a record. You can display the record view using different layout types. By default, the record view uses the full layout to display all fields of the record. The mini layout displays fields corresponding to the compact layout. You can change the fields and the order they appear in the component by going to Compact Layouts in Setup for the particular object.

This example shows a record view with a mini layout.

```
<force:recordView recordId="a02D0000006V8Ov" type="MINI"/>
```

You can provide a dynamic ID for the `recordId` attribute using the format `{!v.myObject.recordId}`. To load record data, wire up the container component to an Apex controller that returns the data. See Working with Salesforce Records in the Lightning Components Developer Guide for more information.

We recommend that you use this component in Lightning Experience or Salesforce1. If used outside of the one.app container, such as in Lightning Out, this component doesn't inherit the Lightning Design System styling and won't be styled correctly.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`record`	SObjectRow	The record (SObject) to load, optional if recordId attribute is specified.	
`recordId`	String	The Id of the record to load, optional if record attribute is specified.	

Attribute Name	Attribute Type	Description	Required?
`type`	String	The type of layout to use to display the record. Possible values: FULL, MINI. The default is FULL.	

`forceChatter:feed`

Represents a Chatter feed.

A `forceChatter:feed` component represents a feed that's specified by its type. Use the `type` attribute to display a specific feed type. For example, set `type="groups"` to display the feed from all groups the context user either owns or is a member of.

```
<aura:component implements="force:appHostable">
    <forceChatter:feed type="groups"/>
</aura:component>
```

You can also display a feed depending on the type selected. This example provides a drop-down menu that controls the type of feed to display.

```
<aura:component implements="force:appHostable">
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
   <aura:attribute name="type" type="String" default="News" description="The type of feed"
 access="GLOBAL"/>
    <aura:attribute name="types" type="String[]"
                    default="Bookmarks,Company,Files,Groups,Home,News,People"
                    description="A list of feed types"/>
   <h1>My Feeds</h1>
   <ui:inputSelect aura:id="typeSelect" change="{!c.onChangeType}" label="Type"/>
    <div aura:id="feedContainer" class="feed-container">
        <forceChatter:feed />
    </div>
</aura:component>
```

The `types` attribute specifies the feed types, which are set on the `ui:inputSelect` component during component initialization. When a user selects a feed type, the feed is dynamically created and displayed.

```
({
    // Handle component initialization
    doInit : function(component, event, helper) {
        var type = component.get("v.type");
        var types = component.get("v.types");
        var typeOpts = new Array();

        // Set the feed types on the ui:inputSelect component
        for (var i = 0; i < types.length; i++) {
           typeOpts.push({label: types[i], value: types[i], selected: types[i] === type});

        }
        component.find("typeSelect").set("v.options", typeOpts);
    },

 onChangeType : function(component, event, helper) {
        var typeSelect = component.find("typeSelect");
        var type = typeSelect.get("v.value");
        component.set("v.type", type);

        // Dynamically create the feed with the specified type
        $A.createComponent("forceChatter:feed", {"type": type}, function(feed) {
            var feedContainer = component.find("feedContainer");
            feedContainer.set("v.body", feed);
        });
    }
})
```

The feed component is supported for Lightning Experience and communities based on the Customer Service template.

For a list of feed types, see the Chatter REST API Developer's Guide.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`feedDesign`	String	Valid values include DEFAULT (shows inline comments on desktop, a bit more detail) or BROWSE (primarily an overview of the feed items)	
`subjectId`	String	For most feeds tied to an entity, this is used specified the desired entity. Defaults to the current user if not specified	
`type`	String	The strategy used to find items associated with the subject. Valid values include: Bookmarks, Company, DirectMessages, Feeds, Files, Filter, Groups, Home, Moderation, Mute, News, PendingReview, Record, Streams, To, Topics, UserProfile.	

`forceChatter:fullFeed`

A Chatter feed that is full length

The fullFeed component is still considered BETA and isn't ready for production.

The fullFeed component is intended for use with Lightning Out or other apps outside of Salesforce1 and Lightning Desktop. Including the fullFeed component in Lightning Desktop results in unexpected behavior such as posts being temporarily duplicated in the UI.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component, including everything in the body of the tag.	
`handleNavigationEvents`	Boolean	Determines whether the component can handle navigation events for entities and URLs. If set to true then navigation events occur in the entity or URL being opened in a new window.	
`subjectId`	String	For most feeds tied to an entity, this attribute is used to specify the desired entity. Defaults to the current user if not specified	

Attribute Name	Attribute Type	Description	Required?
`type`	String	This attribute is used to find items associated with the subject. Valid values include: News, Home, Record, To.	

`forceChatter:publisher`

Lets users create posts on records or groups, and upload attachments from any device.

The `forceChatter:publisher` component is a standalone publisher component you can place on a record page. It works together with the Chatter Feed component available in the Lightning App Builder to provide a complete Chatter experience. The advantage of having separate components for publisher and feed is the flexibility it gives you in arranging page components. The connection between publisher and feed is automatic and requires no additional coding.

The `forceChatter:publisher` component includes the `context` attribute, which determines what type of feed is shown. Use `RECORD` for a record feed, and `GLOBAL` for all other feed types.

```
<aura:component implements="flexipage:availableForAllPageTypes" description="Sample
Component">
    <forceChatter:publisher context="GLOBAL" />
</aura:component>
```

This component is supported for Lightning Experience and communities based on the Customer Service template.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`context`	String	The context in which the component is being displayed (RECORD or GLOBAL). RECORD is for a record feed, and GLOBAL is for all other feed types. This attribute is case-sensitive.	Yes
`recordId`	String	The record Id	

`forceCommunity:navigationMenuBase`

An abstract component for customizing the navigation menu in a community, which loads menu data and handles navigation. The menu's look and feel is controlled by the component that's extending it.

Extend the `forceCommunity:navigationMenuBase` component to create a customized navigation component for the Customer Service (Napili) or custom community templates. Provide navigation menu data using the menu editor in Community Builder or via the `NavigationMenuItem` entity.

The `menuItems` attribute is automatically populated with an array of top-level menu items, each with the following properties:

- `id`: Used by the `navigate` method.
- `label`: The menu item's display label.
- `subMenu`: An optional property, which is an array of menu items.

Here's an example of a custom Navigation Menu component:

```
<aura:component extends="forceCommunity:navigationMenuBase"
implements="forceCommunity:availableForAllPageTypes">
    <ul onclick="{!c.onClick}">
        <aura:iteration items="{!v.menuItems}" var="item" >
            <aura:if isTrue="{!item.subMenu}">
                <li>{!item.label}</li>
                <ul>
                    <aura:iteration items="{!item.subMenu}" var="subItem">
                        <li><a data-menu-item-id="{!subItem.id}"
href="">{!subItem.label}</a></li>
                    </aura:iteration>
                </ul>
            <aura:set attribute="else">
                <li><a data-menu-item-id="{!item.id}" href="">{!item.label}</a></li>
            </aura:set>
            </aura:if>
        </aura:iteration>
    </ul>
</aura:component>
```

Here's an example of a controller:

```
({
    onClick : function(component, event, helper) {
        var id = event.target.dataset.menuItemId;
        if (id) {
            component.getSuper().navigate(id);
         }
   }
})
```

Methods

`navigate(menuItemId)`: Navigates to the page the menu item points to. Takes the `id` of the menu item as a parameter.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`menuItems`	Object	Automatically populated with menu item's data. This attribute is read-only.	

forceCommunity:routeLink

Sets an HTML anchor tag with an href attribute that's automatically generated from the provided record ID. Use it to improve SEO link equity in template-based communities.

Because the `href` attribute is automatically generated from the provided record ID, `forceCommunity:routeLink` is only suitable for creating internal links to recordId-based pages in your community, such as the Article Detail or the Case Detail pages.

Internal links help establish an SEO-friendly site hierarchy and spread link equity (or link juice) to your community's pages.

Here's an example of a `forceCommunity:routeLink` component:

```
<aura:component implements="forceCommunity:availableForAllPageTypes">
    <aura:attribute name="recordId" type="String" default="500xx000000YkvU" />
    <aura:attribute name="routeInput" type="Map"/>
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
    <forceCommunity:routeLink id="myCaseId" class="caseClass" title="My Case Tooltip"
label="My Case Link Text" routeInput="{!v.routeInput}" onClick="{!c.onClick}"/>
</aura:component>
```

To create the link, the client-side controller sets the record ID on the `routeInput` attribute during initialization. Clicking the link enables you to navigate to the record page.

```
({
    doInit : function(component, event, helper) {
    component.set('v.routeInput', {recordId: component.get('v.recordId')});
    },

    onClick : function(component, event, helper) {
           var navEvt = $A.get("e.force:navigateToSObject");
           navEvt.setParams({
             "recordId": component.get('v.recordId')
           });
           navEvt.fire();
   }
})
```

The previous example renders the following anchor tag:

```
<a class="caseClass" href="/myCommunity/s/case/500xx000000YkvU/mycase"
   id="myCaseId" title="My Case Tooltip">My Case Link Text</a>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS class for the anchor tag.	
id	String	The ID of the anchor tag.	

Attribute Name	Attribute Type	Description	Required?
`label`	String	The text displayed in the link.	
`onClick`	Action	Action to trigger when the anchor is clicked.	
`routeInput`	HashMap	The map of dynamic parameters that create the link. Only recordId-based routes are supported.	Yes
`title`	String	The text to display for the link tooltip.	

`lightning:avatar`

A visual representation of a person.

A `lightning:avatar` component is an image that represents a person. By default, the image renders in medium sizing with a rounded rectangle, which is also known as the `square` variant.

This component inherits styling from avatars in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:avatar src="/images/codey.jpg" alternativeText="Codey Bear"/>
</aura:component>
```

Accessibility

Use the `alternativeText` attribute to describe the avatar, such as a user's initials or name. This description provides the value for the `alt` attribute in the `img` HTML tag.

Attributes

Attribute Name	Attribute Type	Description	Required?
`alternativeText`	String	The alternative text used to describe the avatar, which is displayed as hover text on the image.	Yes
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`size`	String	The size of the avatar. Valid values are x-small, small, medium, and large. This value defaults to medium.	
`src`	String	The URL for the image.	Yes
`variant`	String	The variant changes the shape of the avatar. Valid values are empty, circle, and square. This value defaults to square.	

`lightning:badge`

Represents a label which holds a small amount of information, such as the number of unread notifications.

A `lightning:badge` is a label that holds small amounts of information. A badge can be used to display unread notifications, or to label a block of text. Badges don't work for navigation because they can't include a hyperlink.

This component inherits styling from badges in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:badge label="Label" />
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`label`	String	The text to be displayed inside the badge.	Yes

`lightning:button`

Represents a button element.

A `lightning:button` component represents a button element that executes an action in a controller. Clicking the button triggers the client-side controller method set for `onclick`. Buttons can be either a label only, label and icon, body only, or body and icon. Use `lightning:buttonIcon` if you need an icon-only button.

Use the `variant` and `class` attributes to apply additional styling.

The Lightning Design System utility icon category provides nearly 200 utility icons that can be used in `lightning:button` along with label text. Although SLDS provides several categories of icons, only the utility category can be used in this component.

Visit https://lightningdesignsystem.com/icons/#utility to view the utility icons.

This component inherits styling from buttons in the Lightning Design System.

Here are two examples.

```
<aura:component>
    <lightning:button variant="brand" label="Submit" onclick="{! c.handleClick }" />
</aura:component>
```

```
<aura:component>
    <lightning:button variant="brand" label="Download" iconName="utility:download"
iconPosition="left" onclick="{! c.handleClick }" />
</aura:component>
```

Accessibility

To inform screen readers that a button is disabled, set the `disabled` attribute to true.

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`disabled`	Boolean	Specifies whether this button should be displayed in a disabled state. Disabled buttons can't be clicked. This value defaults to false.	
`iconName`	String	The Lightning Design System name of the icon. Names are written in the format '\utility:down\' where 'utility' is the category, and 'down' is the specific icon to be displayed.	
`iconPosition`	String	Describes the position of the icon with respect to body. Options include left and right. This value defaults to left.	
`label`	String	The text to be displayed inside the button.	
`name`	String	The name for the button element. This value is optional and can be used to identify the button in a callback.	
`onblur`	Action	The action triggered when the element releases focus.	
`onclick`	Action	The action triggered when the button is clicked.	
`onfocus`	Action	The action triggered when the element receives focus.	
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`title`	String	Displays tooltip text when the mouse moves over the element.	
`type`	String	Specifies the type of button. Valid values are button, reset, and submit. This value defaults to button.	
`value`	String	The value for the button element. This value is optional and can be used when submitting a form.	
`variant`	String	The variant changes the appearance of the button. Accepted variants include base, neutral, brand, destructive, and inverse. This value defaults to neutral.	

lightning:buttonGroup

Represents a group of buttons.

A lightning:buttonGroup component represents a set of buttons that can be displayed together to create a navigational bar. The body of the component can contain lightning:button or lightning:buttonMenu. If navigational tabs are needed, use lightning:tabset instead of lightning:buttonGroup.

This component inherits styling from button groups in the Lightning Design System.

This is the basic setup of lightning:buttonGroup with standard buttons.

```
<aura:component>
    <lightning:buttonGroup>
        <lightning:button label="Refresh" />
        <lightning:button label="Edit" />
        <lightning:button label="Save" />
    </lightning:buttonGroup>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS class for the outer element, in addition to the component's base classes.	

lightning:buttonIcon

An icon-only HTML button.

A lightning:buttonIcon component represents an icon-only button element that executes an action in a controller. Clicking the button triggers the client-side controller method set for onclick.

You can use a combination of the variant, size, class, and iconClass attributes to customize the button and icon styles. To customize styling on the button container, use the class attribute. For the bare variant, the size class applies to the icon itself. For non-bare variants, the size class applies to the button. To customize styling on the icon element, use the iconClass attribute. This example creates an icon-only button with bare variant and custom icon styling.

```
<!-- Bare variant with custom "dark" CSS class added to icon svg element -->
<lightning:buttonIcon iconName="utility:settings" variant="bare" alternativeText="Settings"
 iconClass="dark"/>
```

The Lightning Design System utility icon category offers nearly 200 utility icons that can be used in lightning:buttonIcon. Although the Lightning Design System provides several categories of icons, only the utility category can be used in lightning:buttonIcon.

Visit https://lightningdesignsystem.com/icons/#utility to view the utility icons.

This component inherits styling from button icons in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:buttonIcon iconName="utility:close" variant="bare" onclick="{! c.handleClick
 }" alternativeText="Close window." />
</aura:component>
```

Accessibility

Use the `alternativeText` attribute to describe the icon. The description should indicate what happens when you click the button, for example 'Upload File', not what the icon looks like, 'Paperclip'.

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`alternativeText`	String	The alternative text used to describe the icon. This text should describe what happens when you click the button, for example 'Upload File', not what the icon looks like, 'Paperclip'.	Yes
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`disabled`	Boolean	Specifies whether this button should be displayed in a disabled state. Disabled buttons can't be clicked. This value defaults to false.	
`iconClass`	String	The class to be applied to the contained icon element.	
`iconName`	String	The Lightning Design System name of the icon. Names are written in the format '\utility:down\' where 'utility' is the category, and 'down' is the specific icon to be displayed. Note: Only utility icons can be used in this component.	Yes
`name`	String	The name for the button element. This value is optional and can be used to identify the button in a callback.	
`onblur`	Action	The action triggered when the element releases focus.	
`onclick`	Action	The action that will be run when the button is clicked.	
`onfocus`	Action	The action triggered when the element receives focus.	
`size`	String	The size of the buttonIcon. For the bare variant, options include x-small, small, medium, and large. For non-bare variants, options include xx-small, x-small, small, and medium. This value defaults to medium.	

Attribute Name	Attribute Type	Description	Required?
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`title`	String	Displays tooltip text when the mouse moves over the element.	
`type`	String	Specifies the type of button. Valid values are button, reset, and submit. This value defaults to button.	
`value`	String	The value for the button element. This value is optional and can be used when submitting a form.	
`variant`	String	The variant changes the appearance of buttonIcon. Accepted variants include bare, container, border, border-filled, bare-inverse, and border-inverse. This value defaults to border.	

`lightning:buttonMenu` (Beta)

Represents a dropdown menu with a list of actions or functions.

A `lightning:buttonMenu` represents a button that when clicked displays a dropdown menu of actions or functions that a user can access.

Use the `variant`, `size`, or `class` attributes to customize the styling.

This component inherits styling from menus in the Lightning Design System.

This example shows a dropdown menu with three items.

```
<lightning:buttonMenu iconName="utility:settings" alternativeText="Settings" onselect="{!
 c.handleMenuSelect }">
    <lightning:menuItem label="Font" value="font" />
    <lightning:menuItem label="Size" value="size"/>
    <lightning:menuItem label="Format" value="format" />
</lightning:buttonMenu>
```

When `onselect` is triggered, its event will have a `value` parameter, which is the value of the selected menu item. Here's an example of how to read that value.

```
handleMenuSelect: function(cmp, event, helper) {
    var selectedMenuItemValue = event.getParam("value");
}
```

You can create menu items that can be checked or unchecked using the `checked` attribute in the `lightning:menuItem` component, toggling it as needed. To enable toggling of a menu item, you must set an initial value on the checked attribute, specifying either `true` or `false`.

The menu closes when you click away from it, and it will also close and will put the focus back on the button when a menu item is selected.

Generating Menu Items with `aura:iteration`

This example creates a button menu with several items during initialization.

```
<aura:component>
    <aura:handler name="init" value="{!this}" action="{!c.createItems}" />
   <lightning:buttonMenu alternativeText="Action" onselect="{! c.handleMenuSelect }">
```

```
        <aura:iteration var="action" items="{! v.actions }">
            <lightning:menuItem aura:id="actionMenuItems" label="{! action.label }"
value="{! action.value }"/>
        </aura:iteration>
    </lightning:buttonMenu>
</aura:component>
```

The client-side controller creates the array of menu items and set its value on the `actions` attribute.

```
({
    createItems: function (cmp, event) {
        var items = [
            { label: "New", value: "new" },
            { label: "Edit", value: "edit" },
            { label: "Delete", value: "delete" }
        ];
        cmp.set("v.actions", items);
    }
})
```

Usage Considerations

This component contains menu items that are created only if the button is triggered. You won't be able to reference the menu items during initialization or if the button isn't triggered yet.

Accessibility

To inform screen readers that a button is disabled, set the `disabled` attribute to true.

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`alternativeText`	String	The assistive text for the button.	
`body`	ComponentDefRef[]	The body of the component.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`disabled`	Boolean	If true, the menu is disabled. Disabling the menu prevents users from opening it. This value defaults to false.	
`iconName`	String	The name of the icon to be used in the format \'utility:down\'. This value defaults to utility:down. If an icon other than utility:down or utility:chevrondown is used, a utility:down icon is appended to the right of that icon.	

Attribute Name	Attribute Type	Description	Required?
`iconSize`	String	The size of the icon. Options include xx-small, x-small, medium, or large. This value defaults to medium.	
`menuAlignment`	String	Determines the alignment of the menu relative to the button. Available options are: left, center, right. This value defaults to left.	
`name`	String	The name for the button element. This value is optional and can be used to identify the button in a callback.	
`onblur`	Action	The action triggered when the element releases focus.	
`onfocus`	Action	The action triggered when the element receives focus.	
`onselect`	Action	Action fired when a menu item is selected. The 'detail.menuItem' property of the passed event is the selected menu item.	
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`title`	String	Tooltip text on the button.	
`value`	String	The value for the button element. This value is optional and can be used when submitting a form.	
`variant`	String	The variant changes the look of the button. Accepted variants include bare, container, border, border-filled, bare-inverse, and border-inverse. This value defaults to border.	
`visible`	Boolean	If true, the menu items are displayed. This value defaults to false.	

`lightning:card`

Cards are used to apply a container around a related grouping of information.

A `lightning:card` is used to apply a stylized container around a grouping of information. The information could be a single item or a group of items such as a related list.

Use the `variant` or `class` attributes to customize the styling.

A `lightning:card` contains a title, body, and footer. To style the card body, use the Lightning Design System helper classes.

This component inherits styling from cards in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:card>
        <aura:set attribute="title">
            Hello!
        </aura:set>
        <aura:set attribute="footer">
            <lightning:badge label="footer"/>
        </aura:set>
        <aura:set attribute="actions">
            <lightning:button label="New"/>
        </aura:set>
        <p class="slds-p-horizontal--small">
            Card Body (custom component)
        </p>
    </lightning:card>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`actions`	Component[]	Actions are components such as button or buttonIcon. Actions are displayed in the header.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`footer`	Component[]	The footer can include text or another component	
`iconName`	String	The Lightning Design System name of the icon. Names are written in the format '\utility:down\' where 'utility' is the category, and 'down' is the specific icon to be displayed. The icon is displayed in the header to the left of the title.	
`title`	Component[]	The title can include text or another component, and is displayed in the header.	Yes
`variant`	String	The variant changes the appearance of the card. Accepted variants include base or narrow. This value defaults to base.	

`lightning:container`

Used to contain content that uses a third-party javascript framework such as Angular or React.

The `lightning:container` component allows you to host content developed with a third-party framework within a Lightning component. The content is uploaded as a static resource, and hosted in an iFrame. The `lightning:container` component can be used for single-page applications only.

This is a simple example of `lightning:container`.

```
<aura:component access="global" implements="flexipage:availableForAllPageTypes">
    <lightning:container src="{!$Resource.myReactApp + '/index.html'}"/>
</aura:component>
```

You can also implement communication to and from the framed application, allowing it to interact with Salesforce. Use the `message()` function in the Javascript controller to send messages to the application, and specify a method for handling messages with the component’s `onmessage` attribute.

This example of a Javascript controller uses the `message()` function to send a simple JSON payload to the third-party content, in this case an AngularJS app.

```
({
    sendMessage : function(component, event, helper) {
        var msg = {
            name: "General",
            value: component.get("v.messageToSend")
        };
        component.find("AngularApp").message(msg);
    },
    handleMessage: function(component, message, helper) {
        var payload = message.payload;
        var name = payload.name;
        if (name === "General") {
            var value = payload.value;
            component.set("v.messageReceived", value);
        }
        else if (name === "Foo") {
            // A different response
        }
    },
})
```

The accompanying component definition defines attributes for a message to send from the container to the Lightning component and for a message received. The `onmessage` attribute of `lightning:container` references the Javascript method `handleMessage`.

```
<aura:component access="global" implements="flexipage:availableForAllPageTypes" >
    <aura:attribute name="messageToSend" type="String" default=""/>
    <aura:attribute name="messageReceived" type="String" default=""/>
    <div>
        <lightning:input name="messageToSend" value="{!v.messageToSend}" label="Message 
to send to Angular app: "/>
        <lightning:button label="Send" onclick="{!c.sendMessage}"/>
        <lightning:textarea name="messageReceived" value="{!v.messageReceived}" 
label="Message received from Angular app: "/>
        <lightning:container aura:id="AngularApp"
                             src="{!$Resource.SendReceiveMessages + '/index.html'}"
                             onmessage="{!c.handleMessage}"/>
    </div>
</aura:component>
```

Because you define the controller-side message handling yourself, you can use it to handle any kind of message payload. You can, for example, send just a text string or return a structured JSON response.

Usage Considerations

When specifying the `src` of the container, don't specify a hostname. Instead, use `$Resource` with dot notation to reference your application, uploaded as a static resource.

Accessibility

Use the `alternativeText` attribute to provide assistive text for the lightning:container.

Methods

The component supports the following method.

`message()`: Sends a user-defined message from the component to the iFrame content.

Attributes

Attribute Name	Attribute Type	Description	Required?
`alternativeText`	String	Used for alternative text in accessibility scenarios.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	The CSS class for the iframe element.	
`onerror`	Action	The client-side controller action to run when an error occurs when sending a message to the contained app.	
`onmessage`	Action	The client-side controller action to run when a message is received from the contained content.	
`src`	String	The resource name, landing page and query params in url format. Navigation is supported only for the single page identified.	Yes

`lightning:formattedDateTime` (Beta)

Displays formatted date and time.

A `lightning:formattedDateTime` component displays formatted date and time. This component uses the Intl.DateTimeFormat JavaScript object to format date values. The locale set in the app's user preferences determines the formatting.

Here are some examples based on a locale of en-US.

Displays: 8/2/2016

```
<aura:component>
    <lightning:formattedDateTime value="1470174029742" />
</aura:component>
```

Displays: Tuesday, Aug 02, 16

```
<aura:component>
    <lightning:formattedDateTime value="1470174029742" year="2-digit" month="short"
day="2-digit" weekday="long"/>
</aura:component>
```

Displays: 8/2/2016, 3:15 PM PDT

```
<aura:component>
    <lightning:formattedDateTime value="1470174029742" year="numeric" month="numeric"
day="numeric"  hour="2-digit" minute="2-digit" timeZoneName="short" />
</aura:component>
```

Usage Considerations

This component provides fallback behavior in Apple Safari 10 and below. The following formatting options have exceptions when using the fallback behavior in older browsers.

- `era` is not supported.
- `timeZoneName` appends `GMT` for short format, `GMT-h:mm` or `GMT+h:mm` for long format.
- `timeZone` supports `UTC`. If another timezone value is used, `lightning:formattedDateTime` uses the browser timezone.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`day`	String	Allowed values are numeric or 2-digit.	
`era`	String	Allowed values are narrow, short, or long.	
`hour`	String	Allowed values are numeric or 2-digit.	
`hour12`	Boolean	Determines whether time is displayed as 12-hour. If false, time displays as 24-hour. The default setting is determined by the user's locale.	
`minute`	String	Allowed values are numeric or 2-digit.	
`month`	String	Allowed values are 2-digit, narrow, short, or long.	
`second`	String	Allowed values are numeric or 2-digit.	
`timeZone`	String	The time zone to use. Implementations can include any time zone listed in the IANA time zone database. The default is the runtime's default time zone. Use this attribute only if you want to override the default time zone.	
`timeZoneName`	String	Allowed values are short or long. For example, the Pacific Time zone would display as 'PST' if you select 'short', or 'Pacific Standard Time' if you select 'long.'	
`value`	Object	The value to be formatted, which can be a Date object or timestamp.	Yes
`weekday`	String	Allowed values are narrow, short, or long.	
`year`	String	Allowed values are numeric or 2-digit.	

`lightning:formattedNumber` (Beta)

Displays formatted numbers for decimals, currency, and percentages.

A `lightning:formattedNumber` component displays formatted numbers for decimals, currency, and percentages. This component uses the Intl.NumberFormat JavaScript object to format numerical values. The locale set in the app's user preferences determines how numbers are formatted.

The component has several attributes that specify how number formatting is handled in your app. Among these attributes are `minimumSignificantDigits` and `maximumSignificantDigits`. Significant digits refer the accuracy of a number. For example, 1000 has one significant digit, but 1000.0 has five significant digits.

In this example the formatted number displays as $5,000.00.

```
<aura:component>
    <lightning:formattedNumber value="5000" style="currency" currency="USD" />
</aura:component>
```

In this example the formatted number displays as 50%.

```
<aura:component>
    <lightning:formattedNumber value="0.5" style="percent" />
</aura:component>
```

Usage Considerations

This component provides the following fallback behavior in Apple Safari 10 and below.

- If `style` is set to `currency`, providing a `currencyCode` value that's different from the locale displays the currency code instead of the symbol. The following example displays `EUR12.34` in fallback mode and `€12.34` otherwise.

  ```
  <lightning:formattedNumber value="12.34" style="currency"
   currencyCode="EUR"/>
  ```

- `currencyDisplayAs` supports symbol only. The following example displays `$12.34` in fallback mode only if `currencyCode` matches the user's locale currency and `USD12.34` otherwise.

  ```
  <lightning:formattedNumber value="12.34" style="currency"
   currencyCode="USD" currencyDisplayAs="symbol"/>
  ```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`currencyCode`	String	Only used if style='currency', this attribute determines which currency is displayed. Possible values are the ISO 4217 currency codes, such as 'USD' for the US dollar.	
`currencyDisplayAs`	String	Determines how currency is displayed. Possible values are symbol, code, and name. This value defaults to symbol.	
`maximumFractionDigits`	Integer	The maximum number of fraction digits that are allowed.	
`maximumSignificantDigits`	Integer	The maximum number of significant digits that are allowed. Possible values are from 1 to 21.	
`minimumFractionDigits`	Integer	The minimum number of fraction digits that are required.	
`minimumIntegerDigits`	Integer	The minimum number of integer digits that are required. Possible values are from 1 to 21.	
`minimumSignificantDigits`	Integer	The minimum number of significant digits that are required. Possible values are from 1 to 21.	

Attribute Name	Attribute Type	Description	Required?
`style`	String	The number formatting style to use. Possible values are decimal, currency, and percent. This value defaults to decimal.	
`value`	Decimal	The value to be formatted.	Yes

`lightning:icon`

Represents a visual element that provides context and enhances usability.

A `lightning:icon` is a visual element that provides context and enhances usability. Icons can be used inside the body of another component or on their own.

Visit https://lightningdesignsystem.com/icons to view the available icons.

Here is an example.

```
<aura:component>
    <lightning:icon iconName="action:approval" size="large" alternativeText="Indicates
approval"/>
</aura:component>
```

Use the `variant`, `size`, or `class` attributes to customize the styling. The `variant` attribute changes the appearance of a utility icon. For example, the `error` variant adds a red fill to the error utility icon.

```
<lightning:icon iconName="utility:error" variant="error"/>
```

If you want to make additional changes to the color or styling of an icon, use the `class` attribute.

Accessibility

Use the `alternativeText` attribute to describe the icon. The description should indicate what happens when you click the button, for example 'Upload File', not what the icon looks like, 'Paperclip'.

Sometimes an icon is decorative and does not need a description. But icons can switch between being decorative or informational based on the screen size. If you choose not to include an `alternativeText` description, check smaller screens and windows to ensure that the icon is decorative on all formats.

Attributes

Attribute Name	Attribute Type	Description	Required?
`alternativeText`	String	The alternative text used to describe the icon. This text should describe what happens when you click the button, for example 'Upload File', not what the icon looks like, 'Paperclip'.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`iconName`	String	The Lightning Design System name of the icon. Names are written in the format '\utility:down\' where 'utility' is the category, and 'down' is the specific icon to be displayed.	Yes

Attribute Name	Attribute Type	Description	Required?
size	String	The size of the icon. Options include xx-small, x-small, small, medium, or large. This value defaults to medium.	
title	String	Displays tooltip text when the mouse moves over the element.	
variant	String	The variant changes the appearance of a utility icon. Accepted variants include bare, warning and error.	

`lightning:input` (Beta)

Represents interactive controls that accept user input depending on the type attribute.

A `lightning:input` component creates an HTML `input` element. This component supports HTML5 input types, including `checkbox`, `date` and `datetime-local`, `email`, `file`, `password`, `search`, `tel`, `url`, `number`, `radio`, `toggle`. The default is `text`.

You can define a client-side controller action for input events like `onblur`, `onfocus`, and `onchange`. For example, to handle a change event on the component when the value of the component is changed, use the `onchange` attribute.

This component inherits styling from forms in the Lightning Design System.

Checkbox

Checkboxes let you select one or more options.

```
<lightning:input type="checkbox" label="Red" name="red" checked="true"/>
<lightning:input type="checkbox" label="Blue" name="blue" />
```

Date

An input field for entering a date. Date pickers don't currently inherit the Lightning Design System styling. The date format is automatically validated during the `onblur` event.

```
<lightning:input type="date" label="Birthday" name="date" />
```

Datetime-local

An input field for entering a date and time. Date pickers don't currently inherit the Lightning Design System styling. The date and time format is automatically validated during the `onblur` event.

```
<lightning:input type="datetime-local" label="Birthday" name="datetime" />
```

Email

An input field for entering an email address. The email pattern is automatically validated during the `onblur` event.

```
<lightning:input type="email" label="Email" name="email" value="abc@domain.com" />
```

File

An input field for uploading files using a `Upload Files` button or a drag-and-drop zone. To retrieve the list of selected files, use `event.getSource().get("v.files");`.

```
<lightning:input type="file" label="Attachment" name="file" multiple="true"
accept="image/png, .zip" onchange="{! c.handleFilesChange }"/>
```

Month

An input field for entering a month and year. Date pickers don't currently inherit the Lightning Design System styling. The month and year format is automatically validated during the `onblur` event.

```
<lightning:input type="month" label="Birthday" name="month" />
```

Number

An input field for entering a number. When working with numerical input, you can use attributes like `max`, `min`, and `step`.

```
<lightning:input type="number" name="number" label="Number" value="12345"/>
```

To format numerical input as a percentage or currency, set `formatter` to `percent` or `currency` respectively.

```
<lightning:input type="number" name="ItemPrice"
    label="Price" value="12345" formatter="currency"/>
```

Fields for percentage and currency input must specify a step increment of 0.01 as required by the native implementation.

```
<lightning:input type="number" name="percentVal" label="Enter a percentage value"
formatter="percent" step="0.01" />
<lightning:input type="number" name="currencyVal" label="Enter a dollar amount"
formatter="currency" step="0.01" />
```

Password

An input field for entering a password. Characters you enter are masked.

```
<lightning:input type="password" label="Password" name="password" />
```

Radio

Radio buttons let you select only one of a given number of options.

```
<lightning:input type="radio" label="Red" name="red" value="red" checked="true" />
<lightning:input type="radio" label="Blue" name="blue" value="blue" />
```

Range

A slider control for entering a number. When working with numerical input, you can use attributes like `max`, `min`, and `step`.

```
<lightning:input type="range" label="Number" name="number" min="0" max="10" />
```

Search

An input field for entering a search string. This field displays the Lightning Design System search utility icon.

```
<lightning:input type="search" label="Search" name="search" />
```

Tel

An input field for entering a telephone number. Use the `pattern` attribute to define a pattern for field validation.

```
<lightning:input type="tel" label="Telephone" name="tel" value="343-343-3434"
pattern="[0-9]{3}-[0-9]{3}-[0-9]{4}"/>
```

Text

An input field for entering text. This is the default input type.

```
<lightning:input label="Name" name="myname" />
```

Time

An input field for entering time. The time format is automatically validated during the `onblur` event.

```
<lightning:input type="time" label="Time" name="time" />
```

Toggle

A checkbox toggle for selecting one of two given values.

```
<lightning:input type="toggle" label="Toggle value" name="togglevalue" checked="true" />
```

URL

An input field for entering a URL. This URL pattern is automatically validated during the `onblur` event.

```
<lightning:input type="url" label="Website" name="website" />
```

Week

An input field for entering a week and year. Date pickers don't currently inherit the Lightning Design System styling. The week and year format is automatically validated during the `onblur` event.

```
<lightning:input type="week" label="Week" name="week" />
```

Input Validation

Client-side input validation is available for this component. For example, an error message is displayed when a URL or email address is expected for an input type of `url` or `email`.

You can define additional field requirements. For example, to set a maximum length, use the `maxlength` attribute.

```
<lightning:input name="quantity" value="1234567890" label="Quantity" maxlength="10" />
```

To check the validity states of an input, use the `validity` attribute, which is based on the `ValidityState` Web API. To determine if a field is valid, you can access the validity states in your client-side controller. Let's say you have the following input field.

```
<lightning:input name="input" aura:id="myinput" label="Enter some text" onblur="{!
c.handleBlur }" />
```

The `valid` property returns true because all constraint validations are met, and in this case there are none.

```
handleBlur: function (cmp, event) {
    var validity = cmp.find("myinput").get("v.validity");
    console.log(validity.valid); //returns true
    }
```

For example, you have the following form with several fields and a button. To display error messages on invalid fields, use the `showHelpMessageIfInvalid()` method.

```
<aura:component>
        <lightning:input aura:id="field" label="First name" placeholder="First name"
required="true" />
        <lightning:input aura:id="field" label="Last name" placeholder="Last name"
required="true" />
       <lightning:button aura:id="submit" type="submit" label="Submit" onclick="{! c.onClick
 }" />
</aura:component>
```

Validate the fields in the client-side controller.

```
({
    onClick: function (cmp, evt, helper) {
        var allValid = cmp.find('field').reduce(function (validSoFar, inputCmp) {
            inputCmp.showHelpMessageIfInvalid();
            return validSoFar && inputCmp.get('v.validity').valid;
         }, true);
         if (allValid) {
             alert('All form entries look valid. Ready to submit!');
         } else {
             alert('Please update the invalid form entries and try again.');
         }
     }
})
```

This `validity` attribute returns an object with the following `boolean` properties.

- `badInput`: Indicates that the value is invalid
- `patternMismatch`: Indicates that the value doesn't match the specified pattern
- `rangeOverflow`: Indicates that the value is greater than the specified `max` attribute
- `rangeUnderflow`: Indicates that the value is less than the specified `min` attribute
- `stepMismatch`: Indicates that the value doesn't match the specified `step` attribute
- `tooLong`: Indicates that the value exceeds the specified `maxlength` attribute
- `typeMismatch`: Indicates that the value doesn't match the required syntax for an email or url input type
- `valid`: Indicates that the value is valid
- `valueMissing`: Indicates that an empty value is provided when `required` attribute is set to `true`

Error Messages

When an input validation fails, the following messages are displayed by default.

- `badInput`: Enter a valid value.
- `patternMismatch`: Your entry does not match the allowed pattern.
- `rangeOverflow`: The number is too high.
- `rangeUnderflow`: The number is too low.
- `stepMismatch`: Your entry isn't a valid increment.
- `tooLong`: Your entry is too long.
- `typeMismatch`: You have entered an invalid format.
- `valueMissing`: Complete this field.

You can override the default messages by providing your own values for these attributes: `messageWhenBadInput`, `messageWhenPatternMismatch`, `messageWhenTypeMismatch`, `messageWhenValueMissing`, `messageWhenRangeOverflow`, `messageWhenRangeUnderflow`, `messageWhenStepMismatch`, `messageWhenTooLong`.

For example, you want to display a custom error message when the input is less than five characters.

```
<lightning:input name="firstname" label="First Name" minlength="5"
    messageWhenBadInput="Your entry must be at least 5 characters." />
```

Usage Considerations

The following input types are not supported.

- `button`
- `hidden`

- `image`
- `reset`
- `submit`

When working with checkboxes, radio buttons, and toggle switches, use `aura:id` to group and traverse the array of components. You can use `get("v.checked")` to determine which elements are checked or unchecked without reaching into the DOM. You can also use the `name` and `value` attributes to identify each component during the iteration. The following example groups three checkboxes together using `aura:id`.

```
<aura:component>
    <fieldset>
        <legend>Select your favorite color:</legend>
        <lightning:input type="checkbox" label="Red"
            name="color1" value="1" aura:id="colors"/>
        <lightning:input type="checkbox" label="Blue"
            name="color2" value="2" aura:id="colors"/>
        <lightning:input type="checkbox" label="Green"
            name="color3" value="3" aura:id="colors"/>
    </fieldset>
<lightning:button label="Submit" onclick="{!c.submitForm}"/>
</aura:component>
```

Accessibility

You must provide a text label for accessibility to make the information available to assistive technology. The `label` attribute creates an HTML `label` element for your input component.

Methods

This component supports the following methods.

`focus()`: Sets the focus on the element.

`showHelpMessageIfInvalid()`: Shows the help message if the form control is in an invalid state.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accept`	String	Specifies the types of files that the server accepts. This attribute can be used only when type='file'.	
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`checked`	Boolean	Specifies whether the checkbox is checked. This value defaults to false.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`disabled`	Boolean	Specifies that an input element should be disabled. This value defaults to false.	
`files`	Object	A FileList that contains selected files. This attribute can be used only when type='file'.	

Attribute Name	Attribute Type	Description	Required?
formatter	String	String value with the formatter to be used.	
label	String	Text label for the input.	Yes
max	Decimal	Expected higher bound for the value in Floating-Point number	
maxlength	Integer	The maximum number of characters allowed in the field.	
messageWhenBadInput	String	Error message to be displayed when a bad input is detected.	
messageWhenPatternMismatch	String	Error message to be displayed when a pattern mismatch is detected.	
messageWhenRangeOverflow	String	Error message to be displayed when a range overflow is detected.	
messageWhenRangeUnderflow	String	Error message to be displayed when a range underflow is detected.	
messageWhenStepMismatch	String	Error message to be displayed when a step mismatch is detected.	
messageWhenTooLong	String	Error message to be displayed when the value is too long.	
messageWhenTypeMismatch	String	Error message to be displayed when a type mismatch is detected.	
messageWhenValueMissing	String	Error message to be displayed when the value is missing.	
min	Decimal	Expected lower bound for the value in Floating-Point number	
minlength	Integer	The minimum number of characters allowed in the field.	
multiple	Boolean	Specifies that a user can enter more than one value. This attribute can be used only when type='file' or type='email'.	
name	String	Specifies the name of an input element.	Yes
onblur	Action	The action triggered when the element releases focus.	
onchange	Action	The action triggered when a value attribute changes.	
onfocus	Action	The action triggered when the element receives focus.	
pattern	String	Specifies the regular expression that the input's value is checked against. This attributed is supported for text, date, search, url, tel, email, and password types.	
placeholder	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
readonly	Boolean	Specifies that an input field is read-only. This value defaults to false.	
required	Boolean	Specifies that an input field must be filled out before submitting the form. This value defaults to false.	
step	Object	Granularity of the value in Positive Floating Point. Use 'any' when granularity is not a concern.	
tabindex	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
type	String	The type of the input. This value defaults to text.	

Attribute Name	Attribute Type	Description	Required?
`validity`	Object	Represents the validity states that an element can be in, with respect to constraint validation.	
`value`	Object	Specifies the value of an input element.	

`lightning:inputRichText` (Beta)

A WYSIWYG editor with a customizable toolbar for entering rich text.

A `lightning:inputRichText` component creates a rich text editor based on the Quill JS library, enabling you to add, edit, format, and delete rich text. You can create multiple rich text editors with different toolbar configurations. Pasting rich content into the editor is supported if the feature is available in the toolbar. For example, you can paste bold text if the bold button is available in the toolbar. An overflow menu is provided if more toolbar buttons are available than can fit the width of the toolbar.

This component inherits styling from rich text editor in the Lightning Design System.

Here is an example.

```
<aura:component>
    <aura:attribute name="myVal" type="String" />
    <lightning:inputRichText value="{!v.myVal}" />
    </lightning:inputRichText>
</aura:component>
```

Customizing the Toolbar

By default, the toolbar displays the font family and size menu, the format text block with **Bold**, **Italic**, **Underline**, and **Strikethrough** buttons. It also displays the format body block with **Bulleted List**, **Numbered List**, **Indent**, and **Outdent** buttons, followed by the align text block with **Left Align Text**, **Center Align Text**, and **Right Align Text** buttons. The **Remove Formatting** button is also available, and it always stands alone at the end of the toolbar.

You can disable buttons by category using the `disabledCategories` attribute. The categories are:

1. `FORMAT_FONT`: Format font family and size menus
2. `FORMAT_TEXT`: Format text buttons
3. `FORMAT_BODY`: Format body buttons
4. `ALIGN_TEXT`: Align text buttons
5. `REMOVE_FORMATTING`: Remove formatting buttons

The font menu provides the following font selection: Arial, Courier, Garamond, Salesforce Sans, Tahoma, Times New Roman, and Verdana. The font selection defaults to Salesforce Sans with a size of 12px. Supported font sizes are: 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 36, 48, and 72. When you copy and paste text in the editor, the font is preserved only if the font is available in the font menu.

Supported HTML Tags

The component sanitizes HTML tags passed to the `value` attribute to prevent XSS vulnerabilities. Only a subset of HTML tags are allowed. The tags are: `a`, `b`, `br`, `big`, `blockquote`, `caption`, `cite`, `code`, `del`, `div`, `em`, `h1`, `h2`, `h3`, `hr`, `i`, `img`, `ins`, `kbd`, `li`, `ol`, `p`, `param`, `pre`, `q`, `s`, `samp`, `small`, `span`, `strong`, `sub`, `sup`, `table`, `tbody`, `td`, `tfoot`, `th`, `thead`, `tr`, `tt`, `u`, `ul`, `var`, `strike`.

Supported HTML attributes include: `accept`, `action`, `align`, `alt`, `autocomplete`, `background`, `bgcolor`, `border`, `cellpadding`, `cellspacing`, `checked`, `cite`, `class`, `clear`, `color`, `cols`, `colspan`, `coords`, `datetime`, `default`, `dir`, `disabled`, `download`, `enctype`, `face`, `for`, `headers`, `height`, `hidden`, `high`, `href`, `hreflang`, `id`, `ismap`, `label`, `lang`, `list`, `loop`, `low`, `max`, `maxlength`, `media`, `method`, `min`, `multiple`, `name`, `noshade`, `novalidate`, `nowrap`, `open`, `optimum`, `pattern`, `placeholder`, `poster`, `preload`, `pubdate`, `radiogroup`, `readonly`, `rel`, `required`, `rev`, `reversed`, `rows`, `rowspan`, `spellcheck`, `scope`, `selected`, `shape`, `size`, `span`, `srclang`, `start`, `src`, `step`, `style`, `summary`, `tabindex`, `target`, `title`, `type`, `usemap`, `valign`, `value`, `width`, `xmlns`.

Usage Considerations

`lightning:inputRichText` doesn't provide built-in validation but you can wire up your own validation logic. Set the `valid` attribute to `false` to change the border color of the rich text editor to red.

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`disabled`	Boolean	Specifies whether the editor is disabled. This value defaults to false.	
`disabledCategories`	List	A comma-separated list of button categories to remove from the toolbar.	
`onblur`	Action	The action triggered when the element releases focus.	
`onfocus`	Action	The action triggered when the element receives focus.	
`placeholder`	String	Text that is displayed when the field is empty.	
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`valid`	Boolean	Specifies whether the editor content is valid. If invalid, the slds-has-error class is added. This value defaults to true.	
`value`	String	The HTML content in the rich text editor.	

`lightning:layout`

Represents a responsive grid system for arranging containers on a page.

A `lightning:layout` is a flexible grid system for arranging containers within a page or inside another container. The default layout is mobile-first and can be easily configured to work on different devices.

The layout can be customized by setting the following attributes.

- `horizontalAlign`="center": This attribute orders the layout items into a horizontal line without any spacing, and places the group into the center of the container.
- `horizontalAlign`="space": The layout items are spaced horizontally across the container, starting and ending with a space.

- `horizontalAlign`="spread": The layout items are spaced horizontally across the container, starting and ending with a layout item.
- `horizontalAlign`="end": The layout items are grouped together and aligned horizontally on the right side of the container.
- `verticalAlign`="start": The layout items are aligned at the top of the container.
- `verticalAlign`="center": The layout items are aligned in the center of the container.
- `verticalAlign`="end": The layout items are aligned at the bottom of the container.
- `verticalAlign`="stretch": The layout items extend vertically to fill the container.
- `pullToBoundary`: If padding is used on layout items, this attribute will pull the elements on either side of the container to the boundary. Choose the size that corresponds to the padding on your layoutItems. For instance, if `lightning:layoutItem`="horizontalSmall", choose `pullToBoundary`="small".

Use the `class` or `multipleRows` attributes to customize the styling in other ways.

A simple layout can be achieved by enclosing layout items within `lightning:layout`. Here is an example.

```
<aura:component>
    <div class="c-container">
        <lightning:layout horizontalAlign="space">
            <lightning:layoutItem flexibility="auto" padding="around-small">
                1
            </lightning:layoutItem>
            <lightning:layoutItem flexibility="auto" padding="around-small">
                2
            </lightning:layoutItem>
            <lightning:layoutItem flexibility="auto" padding="around-small">
                3
            </lightning:layoutItem>
            <lightning:layoutItem flexibility="auto" padding="around-small">
                4
            </lightning:layoutItem>
        </lightning:layout>
    </div>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	Body of the layout component.	
`class`	String	A CSS class that is applied to the outer element. This style is in addition to base classes output by the component.	
`horizontalAlign`	String	Determines how to spread the layout items horizontally. The alignment options are center, space, spread, and end.	
`multipleRows`	Boolean	Determines whether to wrap the child items when they exceed the layout width. If true, the items wrap to the following line. This value defaults to false.	

Attribute Name	Attribute Type	Description	Required?
`pullToBoundary`	String	Pulls layout items to the layout boundaries and corresponds to the padding size on the layout item. Possible values are small, medium, or large.	
`verticalAlign`	String	Determines how to spread the layout items vertically. The alignment options are start, center, end, and stretch.	

`lightning:layoutItem`

The basic element of lightning:layout.

A `lightning:layoutItem` is the basic element within `lightning:layout`. You can arrange one or more layout items inside `lightning:layout`. The attributes of `lightning:layoutItem` enable you to configure the size of the layout item, and change how the layout is configured on different device sizes.

The layout system is mobile-first. If the `size` and `smallDeviceSize` attributes are both specified, the `size` attribute is applied to small mobile phones, and the `smallDeviceSize` is applied to smart phones. The sizing attributes are additive and apply to devices that size and larger. For example, if `mediumDeviceSize=10` and `largeDeviceSize` isn't set, then `mediumDeviceSize` will apply to tablets, as well as desktop and larger devices.

If the `smallDeviceSize`, `mediumDeviceSize`, or `largeDeviceSize` attributes are specified, the `size` attribute is required.

Here is an example.

```
<aura:component>
    <div>
        <lightning:layout>
            <lightning:layoutItem padding="around-small">
                <div>1</div>
            </lightning:layoutItem>
            <lightning:layoutItem padding="around-small">
                <div>2</div>
            </lightning:layoutItem>
            <lightning:layoutItem padding="around-small">
                <div>3</div>
            </lightning:layoutItem>
            <lightning:layoutItem padding="around-small">
                <div>4</div>
            </lightning:layoutItem>
        </lightning:layout>
    </div>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	

Attribute Name	Attribute Type	Description	Required?
`class`	String	A CSS class that will be applied to the outer element. This style is in addition to base classes output by the component.	
`flexibility`	Object	Make the item fluid so that it absorbs any extra space in its container or shrinks when there is less space. Allowed values are auto, shrink, no-shrink, grow, no-grow, no-flex.	
`largeDeviceSize`	Integer	If the viewport is divided into 12 parts, this attribute indicates the relative space the container occupies on device-types larger than desktop. It is expressed as an integer from 1 through 12.	
`mediumDeviceSize`	Integer	If the viewport is divided into 12 parts, this attribute indicates the relative space the container occupies on device-types larger than tablet. It is expressed as an integer from 1 through 12.	
`padding`	String	Sets padding to either the right and left sides of a container, or all sides of a container. Allowed values are horizontal-small, horizontal-medium, horizontal-large, around-small, around-medium, around-large.	
`size`	Integer	If the viewport is divided into 12 parts, size indicates the relative space the container occupies. Size is expressed as an integer from 1 through 12. This applies for all device-types.	
`smallDeviceSize`	Integer	If the viewport is divided into 12 parts, this attribute indicates the relative space the container occupies on device-types larger than mobile. It is expressed as an integer from 1 through 12.	

`lightning:menuItem` (Beta)

Represents a list item in a menu.

A `lightning:menuItem` is a menu item within the `lightning:buttonMenu` dropdown component. It can hold state such as checked or unchecked, and can contain icons.

Use the `class` attribute to customize the styling.

This component inherits styling from menus in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:buttonMenu alternativeText="Toggle menu">
        <lightning:menuItem label="Menu Item 1" value="menuitem1" iconName="utility:table"
 />
    </lightning:buttonMenu>
</aura:component>
```

To implement a multi-select menu, use the `checked` attribute. The following client-side controller example handles selection via the `onselect` event on the `lightning:buttonMenu` component. Selecting a menu item applies the selected state to that item.

```
({
    handleSelect : function (cmp, event) {
        var menuItem = event.getSource();
        // Toggle check mark on the menu item
        menuItem.set("v.checked", !menuItem.get("v.checked"));
    }
})
```

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`checked`	Boolean	If not specified, the menu item is not checkable. If true, the a check mark is shown to the left of the menu item. If false, a check mark is not shown but there is space to accommodate one.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`disabled`	Boolean	If true the menu item is not actionable and is shown as disabled.	
`iconName`	String	If provided an icon with the provided name is shown to the right of the menu item.	
`label`	String	Text of the menu item.	
`onblur`	Action	The action triggered when the element releases focus.	
`onfocus`	Action	The action triggered when the element receives focus.	
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`title`	String	Tooltip text.	
`value`	String	A value associated with the menu item.	
`onactive`	Action	The action triggered when this menu item becomes active.	

`lightning:select`

Represents a select input.

A `lightning:select` component creates an HTML `select` element. This component uses HTML `option` elements to create options in the dropdown list, enabling you to select a single option from the list. Multiple selection is currently not supported.

This component inherits styling from input select in the Lightning Design System.

You can define a client-side controller action to handle various input events on the dropdown list. For example, to handle a change event on the component, use the `onchange` attribute. Retrieve the selected value using `cmp.find("selectItem").get("v.value")`.

```
<aura:component>
    <lightning:select name="selectItem" label="Select an item" onchange="{!c.doSomething}">

        <option value="">choose one...</option>
        <option value="1">one</option>
        <option value="2">two</option>
    </lightning:select>
</aura:component>
```

Generating Options with `aura:iteration`

You can use `aura:iteration` to iterate over a list of items to generate options. This example iterates over a list of items.

```
<aura:component>
    <aura:attribute name="colors" type="String[]" default="Red,Green,Blue"/>
    <lightning:select name="select" label="Select a Color" required="true">
        <aura:iteration items="{!v.colors}" var="color">
            <option value="{!color}" text="{!color}"></option>
        </aura:iteration>
    </lightning:select>
</aura:component>
```

Generating Options on Initialization

Use an attribute to store and set the array of option value on the component. The following component calls the client-side controller to create options during component initialization.

```
<aura:component>
    <aura:attribute name="options" type="List" />
    <aura:attribute name="selectedValue" type="String" default="Red"/>
    <aura:handler name="init" value="{!this}" action="{!c.loadOptions}" />
    <lightning:select name="mySelect" label="Select a color:" aura:id="mySelect"
value="{!v.selectedValue}">
        <aura:iteration items="{!v.options}" var="item">
          <option text="{!item.label}" value="{!item.value}" selected="{!item.selected}"/>

         </aura:iteration>
    </lightning:select>
    </aura:component>
```

In your client-side controller, define an array of options and assign this array to the `items` attribute.

```
({
    loadOptions: function (component, event, helper) {
        var opts = [
            { value: "Red", label: "Red" },
            { value: "Green", label: "Green" },
            { value: "Blue", label: "Blue" }
         ];
         component.set("v.options", opts);
    }
})
```

In cases where you're providing a new array of options on the component, you might encounter a race condition in which the value on the component does not reflect the new selected value. For example, the component returns a previously selected value when you run `component.find("mySelect").get("v.value")` even after you select a new option because you are getting the value before the options finish rendering. You can avoid this race condition by binding the `value` and `selected` attributes in the `lightning:select` component as illustrated in the previous example. Also, bind the `selected` attribute in the new option value and explicitly set the selected value on the component as shown in the next example, which ensures that the value on the component corresponds to the new selected option.

```
updateSelect: function(component, event, helper){
    var opts = [
        { value: "Cyan", label: "Cyan" },
        { value: "Yellow", label: "Yellow" },
        { value: "Magenta", label: "Magenta", selected: true }];
    component.set('v.options', opts);
    //set the new selected value on the component
    component.set('v.selectedValue', 'Magenta');
    //return the selected value
    component.find("mySelect").get("v.value");
}
```

Input Validation

Client-side input validation is available for this component. You can make the text area a required field by setting `required="true"`. An error message is automatically displayed when an item is not selected and `required="true"`.

To check the validity states of an input, use the `validity` attribute, which is based on the `ValidityState` object. You can access the validity states in your client-side controller. This `validity` attribute returns an object with `boolean` properties. See `lightning:input` for more information.

You can override the default message by providing your own value for `messageWhenValueMissing`.

Usage Considerations

The `onchange` event is triggered only when a user selects a value on the dropdown list with a mouse click, which is expected behavior of the HTML `select` element. Programmatic changes to the `value` attribute don't trigger this event, even though that change propagates to the select element. To handle this event programmatically, provide a change handler for `value`.

```
<aura:handler name="change" value="{!v.value}" action="{!c.itemsChange}"/>
```

Accessibility

You must provide a text label for accessibility to make the information available to assistive technology. The label attribute creates an HTML label element for your input component.

Methods

This component supports the following methods.

`focus()`: Sets the focus on the element.

`showHelpMessageIfInvalid()`: Shows the help message if the form control is in an invalid state.

Attributes

Attribute Name	Attribute Type	Description	Required?
accesskey	String	Specifies a shortcut key to activate or focus an element.	

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS class that will be applied to the outer element. This style is in addition to base classes associated with the component.	
disabled	Boolean	Specifies that an input element should be disabled. This value defaults to false.	
label	String	Text that describes the desired select input.	Yes
messageWhenValueMissing	String	Error message to be displayed when the value is missing.	
name	String	Specifies the name of an input element.	Yes
onblur	Action	The action triggered when the element releases focus.	
onchange	Action	The action triggered when a value attribute changes.	
onfocus	Action	The action triggered when the element receives focus.	
readonly	Boolean	Specifies that an input field is read-only. This value defaults to false.	
required	Boolean	Specifies that an input field must be filled out before submitting the form. This value defaults to false.	
tabindex	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
validity	Object	Represents the validity states that an element can be in, with respect to constraint validation.	
value	String	The value of the select, also used as the default value to select the right option during init. If no value is provided, the first option will be selected.	

lightning:spinner

Displays an animated spinner.

A `lightning:spinner` displays an animated spinner image to indicate that a feature is loading. This component can be used when retrieving data or anytime an operation doesn't immediately complete.

The `variant` attribute changes the appearance of the spinner. If you set `variant="brand"`, the spinner matches the Lightning Design System brand color. Setting `variant="inverse"` displays a white spinner. The default spinner color is dark blue.

This component inherits styling from spinners in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:spinner variant="brand" size="large"/>
</aura:component>
```

`lightning:spinner` is intended to be used conditionally. You can use `aura:if` or the Lightning Design System utility classes to show or hide the spinner.

```
<aura:component>
    <lightning:button label="Toggle" variant="brand" onclick="{!c.toggle}"/>
    <div class="exampleHolder">
        <lightning:spinner aura:id="mySpinner" />
    </div>
</aura:component>
```

This client-side controller toggles the `slds-hide` class on the spinner.

```
({
    toggle: function (cmp, event) {
        var spinner = cmp.find("mySpinner");
        $A.util.toggleClass(spinner, "slds-hide");
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
alternativeText	String	The alternative text used to describe the reason for the wait and need for a spinner.	
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS class for the outer element, in addition to the component's base classes.	
size	String	The size of the spinner. Accepted sizes are small, medium, and large. This value defaults to medium.	
variant	String	The variant changes the appearance of the spinner. Accepted variants are brand and inverse.	

`lightning:tab` (Beta)

A single tab that is nested in a lightning:tabset component.

A `lightning:tab` keeps related content in a single container. The tab content displays when a user clicks the tab. `lightning:tab` is intended to be used with `lightning:tabset`.

This component inherits styling from tabs in the Lightning Design System.

The `label` attribute can contain text or more complex markup. In the following example, `aura:set` is used to specify a label that includes a `lightning:icon`.

```
 <aura:component>
    <lightning:tabset>
        <lightning:tab>
            <aura:set attribute="label">
```

```
                Item One
                <lightning:icon iconName="utility:connected_apps" />
            </aura:set>
        </lightning:tab>
    </lightning:tabset>
</aura:component>
```

Usage Considerations

This component creates its body during runtime. You won't be able to reference the component during initialization. You can set your content using value binding with component attributes instead. See `lightning:tabset` for more information.

Methods

This component supports the following method.

`focus()`: Sets the focus on the element.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	ComponentDefRef[]	The body of the tab.	
`id`	String	The optional ID is used during tabset's onSelect event to determine which tab was clicked.	
`label`	Component[]	The text that appears in the tab.	
`onblur`	Action	The action triggered when the element releases focus.	
`onfocus`	Action	The action triggered when the element receives focus.	
`tabindex`	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
`title`	String	The title displays when you hover over the tab. The title should describe the content of the tab for screen readers.	
`onactive`	Action	The action triggered when this tab becomes active.	

`lightning:tabset` (Beta)

Represents a list of tabs.

A `lightning:tabset` displays a tabbed container with multiple content areas, only one of which is visible at a time. Tabs are displayed horizontally inline with content shown below it. A tabset can hold multiple lightning:tab components as part of its body. The first tab is activated by default, but you can change the default tab by setting the `selectedTabId` attribute on the target tab.

Use the `variant` attribute to change the appearance of a tabset. The `variant` attribute can be set to default or scoped. The default variant underlines the active tab. The scoped tabset styling displays a closed container with a defined border around the active tab.

This component inherits styling from tabs in the Lightning Design System.

Here is an example.

```
<aura:component>
    <lightning:tabset>
        <lightning:tab label="Item One">
            Sample Content One
        </lightning:tab>
        <lightning:tab label="Item Two">
            Sample Content Two
        </lightning:tab>
    </lightning:tabset>
</aura:component>
```

You can lazy load content in a tab by using the `onactive` attribute to inject the tab body programmatically. Here's an example with two tabs, which loads content when they're active.

```
<lightning:tabset variant="scoped">
    <lightning:tab onactive="{! c.handleActive }" label="Accounts" id="accounts" />
    <lightning:tab onactive="{! c.handleActive }" label="Cases" id="cases" />
</lightning:tabset>
```

In your client-side helper, pass the tab that's selected before adding your content using `$A.createComponent()`.

```
({
    handleActive: function (cmp, event) {
        var tab = event.getSource();
        switch (tab.get('v.id')) {
            case 'accounts' :
                this.injectComponent('c:myAccountComponent', tab);
                break;
            case 'cases' :
                this.injectComponent('c:myCaseComponent', tab);
                break;
        }
    },
    injectComponent: function (name, target) {
        $A.createComponent(name, {
        }, function (contentComponent, status, error) {
            if (status === "SUCCESS") {
                target.set('v.body', contentComponent);
            } else {
                throw new Error(error);
            }
        });
    }
})
```

Usage Considerations

When you load more tabs than can fit the width of the view port, the tabset provides navigation buttons for the overflow tabs.

This component creates its body during runtime. You won't be able to reference the component during initialization. You can set your content using value binding with component attributes instead.

For example, you can't create a `lightning:select` component in a tabset by loading the list of options dynamically during initialization using the `init` handler. However, you can create the list of options by binding the component attribute to the values. By default, the option's `value` attribute is given the same value as the option passed to it unless you explicitly assign a value to it.

```
<aura:component>
    <aura:attribute name="opts" type="List" default="['red', 'blue', 'green']" />
    <lightning:tabset>
        <lightning:tab label="View Options">
           <lightning:select name="colors" label="Select a color:">
                    <aura:iteration items="{!v.opts}" var="option">
                        <option>{! option }</option>
                    </aura:iteration>
            </lightning:select>
        </lightning:tab>
    </lightning:tabset>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	ComponentDefRef[]	The body of the component. This could be one or more lightning:tab components.	
`class`	String	A CSS class for the outer element, in addition to the component's base classes.	
`onselect`	Action	The action that will run when the tab is clicked.	
`selectedTabId`	String	Allows you to set a specific tab to open by default. If this attribute is not used, the first tab opens by default.	
`variant`	String	The variant changes the appearance of the tabset. Accepted variants are default and scoped.	

`lightning:textarea`

Represents a multiline text input.

A `lightning:textarea` component creates an HTML `textarea` element for entering multi-line text input. A text area holds an unlimited number of characters.

This component inherits styling from forms in the Lightning Design System.

The `rows` and `cols` HTML attributes are not supported. To apply a custom height and width for the text area, use the `class` attribute. To set the input for the text area, set its value using the `value` attribute. Setting this value overwrites any initial value that's provided.

The following example creates a text area with a maximum length of 300 characters.

```
<lightning:textarea name="myTextArea" value="initial value"
    label="What are you thinking about?" maxlength="300" />
```

You can define a client-side controller action to handle input events like `onblur`, `onfocus`, and `onchange`. For example, to handle a change event on the component, use the `onchange` attribute.

```
<lightning:textarea name="myTextArea" value="initial value"
    label="What are you thinking about?" onchange="{!c.countLength}" />
```

Input Validation

Client-side input validation is available for this component. Set a maximum length using the `maxlength` attribute or a minimum length using the `minlength` attribute. You can make the text area a required field by setting `required="true"`. An error message is automatically displayed in the following cases:

- A required field is empty when `required` is set to `true`.
- The input value contains fewer characters than that specified by the `minlength` attribute.
- The input value contains more characters than that specified by the `maxlength` attribute.

To check the validity states of an input, use the `validity` attribute, which is based on the `ValidityState` object. You can access the validity states in your client-side controller. This `validity` attribute returns an object with `boolean` properties. See `lightning:input` for more information.

You can override the default message by providing your own values for `messageWhenValueMissing`, `messageWhenBadInput`, or `messageWhenTooLong`.

For example,

```
<lightning:textarea name="myText" required="true" label="Your Name"
        messageWhenValueMissing="This field is required."/>
```

Accessibility

You must provide a text label for accessibility to make the information available to assistive technology. The label attribute creates an HTML label element for your input component.

Methods

This component supports the following methods.

`focus()`: Sets the focus on the element.

`showHelpMessageIfInvalid()`: Shows the help message if the form control is in an invalid state.

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	Specifies a shortcut key to activate or focus an element.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class that will be applied to the outer element. This style is in addition to base classes associated with the component.	
`disabled`	Boolean	Specifies that an input element should be disabled. This value defaults to false.	
`label`	String	Text that describes the desired textarea input.	Yes
`maxlength`	Integer	The maximum number of characters allowed in the textarea.	

Attribute Name	Attribute Type	Description	Required?
messageWhenBadInput	String	Error message to be displayed when a bad input is detected.	
messageWhenTooLong	String	Error message to be displayed when the value is too long.	
messageWhenValueMissing	String	Error message to be displayed when the value is missing.	
minlength	Integer	The minimum number of characters allowed in the textarea.	
name	String	Specifies the name of an input element.	Yes
onblur	Action	The action triggered when the element releases focus.	
onchange	Action	The action triggered when a value attribute changes.	
onfocus	Action	The action triggered when the element receives focus.	
placeholder	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
readonly	Boolean	Specifies that an input field is read-only. This value defaults to false.	
required	Boolean	Specifies that an input field must be filled out before submitting the form. This value defaults to false.	
tabindex	Integer	Specifies the tab order of an element (when the tab button is used for navigating).	
validity	Object	Represents the validity states that an element can be in, with respect to constraint validation.	
value	String	The value of the textarea, also used as the default value during init.	

`ltng:require`

Loads scripts and stylesheets while maintaining dependency order. The styles are loaded in the order that they are listed. The styles only load once if they are specified in multiple <ltng:require> tags in the same component or across different components.

`ltng:require` enables you to load external CSS and JavaScript libraries after you upload them as static resources.

```
<aura:component>

    <ltng:require

        styles="{!$Resource.SLDSv1 + '/assets/styles/lightning-design-system-ltng.css'}"

        scripts="{!$Resource.jsLibraries + '/jsLibOne.js'}"

        afterScriptsLoaded="{!c.scriptsLoaded}" />

</aura:component>
```

Due to a quirk in the way $Resource is parsed in expressions, use the join operator to include multiple $Resource references in a single attribute. For example, if you have more than one JavaScript library to include into a component the scripts attribute should be something like the following.

```
scripts="{!join(',',

    $Resource.jsLibraries + '/jsLibOne.js',

    $Resource.jsLibraries + '/jsLibTwo.js')}"
```

The comma-separated lists of resources are loaded in the order that they are entered in the `scripts` and `styles` attributes. The `afterScriptsLoaded` action in the client-side controller is called after the scripts are loaded. To ensure encapsulation and reusability, add the `<ltng:require>` tag to every `.cmp` or `.app` resource that uses the CSS or JavaScript library.

The resources only load once if they are specified in multiple `<ltng:require>` tags in the same component or across different components.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`scripts`	String[]	The set of scripts in dependency order that will be loaded.	
`styles`	String[]	The set of style sheets in dependency order that will be loaded.	

Events

Event Name	Event Type	Description
`afterScriptsLoaded`	COMPONENT	Fired when ltng:require has loaded all scripts listed in ltng:require.scripts
`beforeLoadingResources`	COMPONENT	Fired before ltng:require starts loading resources

`ui:actionMenuItem`

A menu item that triggers an action. This component is nested in a ui:menu component.

A `ui:actionMenuItem` component represents a menu list item that triggers an action when clicked. Use `aura:iteration` to iterate over a list of values and display the menu items. A `ui:menuTriggerLink` component displays and hides your menu items.

```
<aura:attribute name="status" type="String[]" default="Open, Closed, Closed Won, Any"/>
    <ui:menu>
        <ui:menuTriggerLink aura:id="trigger" label="Opportunity Status"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu">
            <aura:iteration items="{!v.status}" var="s">
                <ui:actionMenuItem label="{!s}" click="{!c.doSomething}"/>
            </aura:iteration>
        </ui:menuList>
    </ui:menu>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
hideMenuAfterSelected	Boolean	Set to true to hide menu after the menu item is selected.	
label	String	The text displayed on the component.	
selected	Boolean	The status of the menu item. True means this menu item is selected; False is not selected.	
type	String	The concrete type of the menu item. Accepted values are 'action', 'checkbox', 'radio', 'separator' or any namespaced component descriptor, e.g. ns:xxxxmenuItem.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.

Event Name	Event Type	Description
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.

`ui:button`

Represents a button element.

A `ui:button` component represents a button element that executes an action defined by a controller. Clicking the button triggers the client-side controller method set for the `press` event. The button can be created in several ways.

A text-only button has only the `label` attribute set on it.

```
<ui:button label="Find"/>
```

An image-only button uses both the `label` and `labelClass` attributes with CSS.

```
<!-- Component markup -->
<ui:button label="Find" labelClass="assistiveText" class="img" />

/** CSS **/
THIS.uiButton.img {
background: url(/path/to/img) no-repeat;
width:50px;
height:25px;
}
```

The `assistiveText` class hides the label from view but makes it available to assistive technologies. To create a button with both image and text, use the `label` attribute and add styles for the button.

```
<!-- Component markup -->
<ui:button label="Find" />

/** CSS **/
THIS.uiButton {
background: url(/path/to/img) no-repeat;
}
```

The previous markup for a button with text and image results in the following HTML.

```
<button class="button uiButton--default uiButton" accesskey type="button">
<span class="label bBody truncate" dir="ltr">Find</span>
</button>
```

This example shows a button that displays the input value you enter.

```

<aura:component access="global">
 <ui:inputText aura:id="name" label="Enter Name:" placeholder="Your Name" />
 <ui:button aura:id="button" buttonTitle="Click to see what you put into the field"
class="button" label="Click me" press="{!c.getInput}"/>
```

```
 <ui:outputText aura:id="outName" value="" class="text"/>
</aura:component>
```

```
({
    getInput : function(cmp, evt) {
        var myName = cmp.find("name").get("v.value");
        var myText = cmp.find("outName");
        var greet = "Hi, " + myName;
        myText.set("v.value", greet);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`accesskey`	String	The keyboard access key that puts the button in focus. When the button is in focus, pressing Enter clicks the button.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`buttonTitle`	String	The text displayed in a tooltip when the mouse pointer hovers over the button.	
`buttonType`	String	Specifies the type of button. Possible values: reset, submit, or button. This value defaults to button.	
`class`	String	A CSS style to be attached to the button. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether this button should be displayed in a disabled state. Disabled buttons can't be clicked. Default value is "false".	
`label`	String	The text displayed on the button. Corresponds to the value attribute of the rendered HTML input element.	
`labelClass`	String	A CSS style to be attached to the label. This style is added in addition to base styles output by the component.	

Events

Event Name	Event Type	Description
`press`	COMPONENT	The event fired when the button is clicked.

`ui:checkboxMenuItem`

A menu item with a checkbox that supports multiple selection and can be used to invoke an action. This component is nested in a ui:menu component.

A `ui:checkboxMenuItem` component represents a menu list item that enables multiple selection. Use `aura:iteration` to iterate over a list of values and display the menu items. A `ui:menuTriggerLink` component displays and hides your menu items.

```
<aura:attribute name="status" type="String[]" default="Open, Closed, Closed Won, Any"/>
    <ui:menu>
    <ui:menuTriggerLink aura:id="checkboxMenuLabel" label="Multiple selection"/>
       <ui:menuList aura:id="checkboxMenu" class="checkboxMenu">
        <aura:iteration items="{!v.status}" var="s">
            <ui:checkboxMenuItem label="{!s}"/>
            </aura:iteration>
        </ui:menuList>
    </ui:menu>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`hideMenuAfterSelected`	Boolean	Set to true to hide menu after the menu item is selected.	
`label`	String	The text displayed on the component.	
`selected`	Boolean	The status of the menu item. True means this menu item is selected; False is not selected.	
`type`	String	The concrete type of the menu item. Accepted values are 'action', 'checkbox', 'radio', 'separator' or any namespaced component descriptor, e.g. ns:xxxxmenuItem.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.

Event Name	Event Type	Description
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.

`ui:inputCheckbox`

Represents a checkbox. Its behavior can be configured using events such as click and change.

A `ui:inputCheckbox` component represents a checkbox whose state is controlled by the `value` and `disabled` attributes. It's rendered as an HTML `input` tag of type `checkbox`. To render the output from a `ui:inputCheckbox` component, use the `ui:outputCheckbox` component.

This is a basic set up of a checkbox.

```
<ui:inputCheckbox label="Reimbursed?"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputCheckbox uiInput--default uiInput--checkbox">
  <label class="uiLabel-left form-element__label uiLabel">
    <span>Reimbursed?</span>
  </label>
  <input type="checkbox">
</div>
```

The `value` attribute controls the state of a checkbox, and events such as `click` and `change` determine its behavior. This example updates the checkbox CSS class on a click event.

```
<!-- Component Markup -->
<ui:inputCheckbox label="Color me" click="{!c.update}"/>

/** Client-Side Controller **/
update : function (cmp, event) {
  $A.util.toggleClass(event.getSource(), "red");
}
```

This example retrieves the value of a `ui:inputCheckbox` component.

```
<aura:component>
 <aura:attribute name="myBool" type="Boolean" default="true"/>
 <ui:inputCheckbox aura:id="checkbox" label="Select?" change="{!c.onCheck}"/>
 <p>Selected:</p>
 <p><ui:outputText class="result" aura:id="checkResult" value="false" /></p>
 <p>The following checkbox uses a component attribute to bind its value.</p>
 <ui:outputCheckbox aura:id="output" value="{!v.myBool}"/>
</aura:component>
```

```
({
  onCheck: function(cmp, evt) {
   var checkCmp = cmp.find("checkbox");
   resultCmp = cmp.find("checkResult");
   resultCmp.set("v.value", ""+checkCmp.get("v.value"));

  }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`label`	String	The text displayed on the component.	
`labelClass`	String	The CSS class of the label component	
`name`	String	The name of the component.	
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`text`	String	The input value attribute.	
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change,click".	
`value`	Boolean	Indicates whether the status of the option is selected. Default value is “false”.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputCurrency`

An input field for entering a currency.

A `ui:inputCurrency` component represents an input field for a number as a currency, which is rendered as an HTML `input` element of type `text`. The browser's locale is used by default. To render the output from a `ui:inputCurrency` component, use the `ui:outputCurrency` component.

This is a basic set up of a `ui:inputCurrency` component, which renders an input field with the value `$50.00` when the browser's currency locale is `$`.

```
<ui:inputCurrency aura:id="amount" label="Amount" class="field" value="50"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInput--default uiInput--input">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Amount</span>
    </label>
    <input class="field input" max="99999999999999" step="1" type="text"
min="-99999999999999">
</div>
```

To override the browser's locale, set the new format on the `v.format` attribute of the `ui:inputCurrency` component. This example renders an input field with the value `£50.00`.

```
var curr = component.find("amount");
curr.set("v.format", '£#,###.00');
```

This example binds the value of a `ui:inputCurrency` component to `ui:outputCurrency`.

```

<aura:component>
    <aura:attribute name="myCurrency" type="integer" default="50"/>
   <ui:inputCurrency aura:id="amount" label="Amount" class="field" value="{!v.myCurrency}"
 updateOn="keyup"/>
 You entered: <ui:outputCurrency value="{!v.myCurrency}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`format`	String	The format of the number. For example, format=".00" displays the number followed by two decimal places. If not specified, the Locale default format will be used.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	
`maxlength`	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
`placeholder`	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	

Attribute Name	Attribute Type	Description	Required?
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`size`	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
`value`	Decimal	The input value of the number.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:inputDate

An input field for entering a date.

A `ui:inputDate` component represents a date input field, which is rendered as an HTML `input` tag of type `text` on desktop. Web apps running on mobiles and tablets use an input field of type `date` for all browsers except Internet Explorer. The value is displayed based on the locale of the browser, for example, `MMM d, yyyy`, which is returned by `$Locale.dateFormat`.

This is a basic set up of a date field with a date picker, which displays the field value `Jan 30, 2014` based on the locale format. On desktop, the `input` tag is wrapped in a `form` tag.

```
<ui:inputDate aura:id="dateField" label="Birthday" value="2014-01-30"
displayDatePicker="true"/>
```

This example sets today's date on a `ui:inputDate` component, retrieves its value, and displays it using `ui:outputDate`. The `init` handler initializes and sets the date on the component.

```

<aura:component>
 <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
 <aura:attribute name="today" type="Date" default=""/>

    <ui:inputDate aura:id="expdate" label="Today's Date" class="field" value="{!v.today}"
 displayDatePicker="true" />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
  You entered: <ui:outputDate aura:id="oDate" value="" />
 </div>
</aura:component>
```

```

({
    doInit : function(component, event, helper) {
        var today = new Date();
        component.set('v.today', today.getFullYear() + "-" + (today.getMonth() + 1) + "-"
 + today.getDate());
    },

    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');
        var expdate = component.find("expdate").get("v.value");

        var oDate = component.find("oDate");
        oDate.set("v.value", expdate);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
displayDatePicker	Boolean	Indicate if ui:datePicker is displayed.	
errors	List	The list of errors to be displayed.	
format	String	The java.text.SimpleDateFormat style format string.	
label	String	The text of the label component	
labelClass	String	The CSS class of the label component	
langLocale	String	The language locale used to format date time.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The input value of the date/time.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.

Event Name	Event Type	Description
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.
cut	COMPONENT	The event fired when the user cuts content to the clipboard.
onError	COMPONENT	The event fired when there are any validation errors on the component.
onClearErrors	COMPONENT	The event fired when any validation errors should be cleared.
change	COMPONENT	The event fired when the user changes the content of the input.
copy	COMPONENT	The event fired when the user copies content to the clipboard.
paste	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:inputDateTime

An input field for entering a date and time.

A `ui:inputDateTime` component represents a date and time input field, which is rendered as an HTML `input` tag of type `text` on desktop. Web apps running on mobiles and tablets use an input field of type `datetime-local` for all browsers except Internet Explorer. The value is displayed based on the locale of the browser, for example, `MMM d, yyyy` and `h:mm:ss a`, which is returned by `$Locale.dateFormat` and `$Locale.timeFormat`.

This is a basic set up of a date and time field with a date picker, which displays the current date and time. On desktop, the `input` tag is wrapped in a `form` tag; the date and time fields display as two separate fields. The time picker displays a list of time in 30-minute increments.

```
<!-- Component markup -->
<aura:attribute name="today" type="DateTime" />
<ui:inputDateTime aura:id="expdate" label="Expense Date" class="form-control"
   value="{!v.today}" displayDatePicker="true" />

/** Client-Side Controller **/
 var today = new Date();
component.set("v.today", today);
```

This example retrieves the value of a `ui:inputDateTime` component and displays it using `ui:outputDateTime`.

```

<aura:component>
 <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
 <aura:attribute name="today" type="Date" default=""/>

    <ui:inputDateTime aura:id="today" label="Time" class="field" value=""
displayDatePicker="true" />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>
    <div aura:id="msg" class="hide">
  You entered: <ui:outputDateTime aura:id="oDateTime" value=""  />
 </div>
</aura:component>
```

```
({
    doInit : function(component, event, helper) {
        var today = new Date();
        component.set('v.today', today.getFullYear() + "-" + (today.getMonth() + 1) + "-"
 + today.getDate());
    },

    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var todayVal = component.find("today").get("v.value");
        var oDateTime = component.find("oDateTime");
        oDateTime.set("v.value", todayVal);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`displayDatePicker`	Boolean	Indicate if ui:datePicker is displayed.	
`errors`	List	The list of errors to be displayed.	
`format`	String	The java.text.SimpleDateFormat style format string.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	
`langLocale`	String	The language locale used to format date time.	
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	

Attribute Name	Attribute Type	Description	Required?
`value`	String	The input value of the date/time.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputDefaultError`

The default implementation of field-level errors, which iterates over the value and displays the message.

`ui:inputDefaultError` is the default error handling for your input components. This component displays as a list of errors below the field. Field-level error messages can be added using `set("v.errors")`. You can use the error atribute to show the error message. For example, this component validates if the input is a number.

```
<aura:component>
    Enter a number: <ui:inputNumber aura:id="inputCmp" label="number"/>
    <ui:button label="Submit" press="{!c.doAction}"/>
</aura:component>
```

This client-side controller displays an error if the input is not a number.

```
doAction : function(component, event) {
    var inputCmp = cmp.find("inputCmp");
    var value = inputCmp.get("v.value");
    if (isNaN(value)) {
        inputCmp.set("v.errors", [{message:"Input not a number: " + value}]);
    } else {
        //clear error
        inputCmp.set("v.errors", null);
    }
}
```

Alternatively, you can provide your own `ui:inputDefaultError` component. This example returns an error message if the `warnings` attribute contains any messages.

```
<aura:component>
      <aura:attribute name="warnings" type="String[]" description="Warnings for input
text"/>
    Enter a number: <ui:inputNumber aura:id="inputCmp" label="number"/>
    <ui:button label="Submit" press="{!c.doAction}"/>
    <ui:inputDefaultError aura:id="number" value="{!v.warnings}" />
</aura:component>
```

This client-side controller diplays an error by adding a string to the `warnings` attribute.

```
doAction : function(component, event) {
    var inputCmp = component.find("inputCmp");
    var value = inputCmp.get("v.value");

    // is input numeric?
    if (isNaN(value)) {
       component.set("v.warnings", "Input is not a number");
    } else {
       // clear error
       component.set("v.warnings", null);
    }
}
```

This example shows a `ui:inputText` component with the default error handling, and a corresponding `ui:outputText` component for text rendering.

```

<aura:component>
 <ui:inputText aura:id="color" label="Enter some text: " placeholder="Blue" />
 <ui:button label="Validate" press="{!c.checkInput}" />
 <ui:outputText aura:id="outColor" value="" class="text"/>
</aura:component>
```

```
({
    checkInput : function(cmp) {
     var colorCmp = cmp.find("color");
        var myColor = colorCmp.get("v.value");

        var myOutput = cmp.find("outColor");
        var greet = "You entered: " + myColor;
        myOutput.set("v.value", greet);

        if (!myColor) {
            colorCmp.set("v.errors", [{message:"Enter some text"}]);
        }
        else {
            colorCmp.set("v.errors", null);
        }
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`value`	String[]	The list of errors strings to be displayed.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

ui:inputEmail

Represents an input field for entering an email address.

A `ui:inputEmail` component represents an email input field, which is rendered as an HTML `input` tag of type `email`. To render the output from a `ui:inputEmail` component, use the `ui:outputEmail` component.

This is a basic set up of an email field.

```
<ui:inputEmail aura:id="email" label="Email" placeholder="abc@email.com"/>
```

This example results in the following HTML.

```
<ui:inputEmail aura:id="email" label="Email" placeholder="abc@email.com"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputEmail uiInput--default uiInput--input">
  <label class="uiLabel-left form-element__label uiLabel">
    <span>Email</span>
  </label>
  <input placeholder="abc@email.com" type="email" class="field input">
</div>
```

This example retrieves the value of a `ui:inputEmail` component and displays it using `ui:outputEmail`.

```

<aura:component>
    <ui:inputEmail aura:id="email" label="Email" class="field" value="manager@email.com"/>

     <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
      You entered: <ui:outputEmail aura:id="oEmail" value="Email" />
 </div>

</aura:component>
```

```

({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var email = component.find("email").get("v.value");
        var oEmail = component.find("oEmail");
        oEmail.set("v.value", email);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
errors	List	The list of errors to be displayed.	
label	String	The text of the label component	
labelClass	String	The CSS class of the label component	
maxlength	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
placeholder	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
size	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

Event Name	Event Type	Description
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputNumber`

An input field for entering a number, taking advantage of client input assistance and validation when available.

A `ui:inputNumber` component represents a number input field, which is rendered as an HTML `input` element of type `text`. This example shows a number field, which displays a value of `10`.

```
<aura:attribute name="num" type="integer" default="10"/>
<ui:inputNumber aura:id="num" label="Age" value="{!v.num}"/>
```

The previous example results in the following HTML.

```
<div class="uiInput uiInputNumber uiInput--default uiInput--input">
<label class="uiLabel-left form-element__label uiLabel">
    <span>Age</span>
</label>
<input max="99999999999999" step="1" type="text"
        min="-99999999999999" class="input">
</div>
```

To render the output from a `ui:inputNumber` component, use the `ui:outputNumber` component. When providing a number value with commas, use `type="integer"`. This example returns `100,000`.

```
<aura:attribute name="number" type="integer" default="100,000"/>
<ui:inputNumber label="Number" value="{!v.number}"/>
```

For `type="string"`, provide the number without commas for the output to be formatted accordingly. This example also returns `100,000`.

```
<aura:attribute name="number" type="string" default="100000"/>
<ui:inputNumber label="Number" value="{!v.number}"/>
```

Specifying `format="#,##0,000.00#"` returns a formatted number value like `10,000.00`.

```
<ui:inputNumber label="Cost" aura:id="costField" format="#,##0,000.00#" value="10000"/>
```

This example binds the value of a `ui:inputNumber` component to `ui:outputNumber`.

```

<aura:component>
    <aura:attribute name="myNumber" type="integer" default="10"/>
 <ui:inputNumber label="Enter a number: " value="{!v.myNumber}" updateOn="keyup"/> <br/>
    <ui:outputNumber value="{!v.myNumber}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`format`	String	The format of the number. For example, format=".00" displays the number followed by two decimal places. If not specified, the Locale default format will be used.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	
`maxlength`	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
`placeholder`	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`size`	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	

Attribute Name	Attribute Type	Description	Required?
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
`value`	Decimal	The input value of the number.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputPhone`

Represents an input field for entering a telephone number.

A `ui:inputPhone` component represents an input field for entering a phone number, which is rendered as an HTML `input` tag of type `tel`. To render the output from a `ui:inputPhone` component, use the `ui:outputPhone` component.

This example shows a phone field, which displays the specified phone number.

```
<ui:inputPhone label="Phone" value="415-123-4567" />
```

The previous example results in the following HTML.

```
<ui:inputPhone label="Phone" value="415-123-4567" />
```

The previous example results in the following HTML.

```
<div class="uiInput uiInputPhone uiInput--default uiInput--input">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Phone</span>
    </label>
    <input class="input" type="tel">
</div>
```

This example retrieves the value of a `ui:inputPhone` component and displays it using `ui:outputPhone`.

```

<aura:component>
   <ui:inputPhone aura:id="phone" label="Phone Number" class="field" value="415-123-4567"
 />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
  You entered: <ui:outputPhone aura:id="oPhone" value="" />
 </div>
</aura:component>
```

```

({

    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var phone = component.find("phone").get("v.value");
        var oPhone = component.find("oPhone");
        oPhone.set("v.value", phone);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	

Attribute Name	Attribute Type	Description	Required?
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	
`maxlength`	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
`placeholder`	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`size`	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
`value`	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.

Event Name	Event Type	Description
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.
cut	COMPONENT	The event fired when the user cuts content to the clipboard.
onError	COMPONENT	The event fired when there are any validation errors on the component.
onClearErrors	COMPONENT	The event fired when any validation errors should be cleared.
change	COMPONENT	The event fired when the user changes the content of the input.
copy	COMPONENT	The event fired when the user copies content to the clipboard.
paste	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputRadio`

The radio button used in the input.

A `ui:inputRadio` component represents a radio button whose state is controlled by the `value` and `disabled` attributes. It's rendered as an HTML `input` tag of type `radio`. To group your radio buttons together, specify the `name` attribute with a unique name.

This is a basic set up of a radio button.

```
<ui:inputRadio label="Yes"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputRadio uiInput--default uiInput--radio">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Yes</span>
    </label>
    <input type="radio">
</div>
```

This example retrieves the value of a selected `ui:inputRadio` component.

```

<aura:component>
    <aura:attribute name="stages" type="String[]" default="Any,Open,Closed,Closed Won"/>
    <aura:iteration items="{!v.stages}" var="stage">
     <ui:inputRadio label="{!stage}" change="{!c.onRadio}" />
    </aura:iteration>

   <b>Selected Item:</b>
   <p><ui:outputText class="result" aura:id="radioResult" value="" /></p>

   <b>Radio Buttons - Group</b>
   <ui:inputRadio aura:id="r0" name="others" label="Prospecting" change="{!c.onGroup}"/>
   <ui:inputRadio aura:id="r1" name="others" label="Qualification" change="{!c.onGroup}"
value="true"/>
  <ui:inputRadio aura:id="r2" name="others" label="Needs Analysis" change="{!c.onGroup}"/>
```

```
    <ui:inputRadio aura:id="r3" name="others" label="Closed Lost" change="{!c.onGroup}"/>
    <b>Selected Items:</b>
    <p><ui:outputText class="result" aura:id="radioGroupResult" value="" /></p>

</aura:component>
```

```
({
 onRadio: function(cmp, evt) {
   var selected = evt.getSource().get("v.label");
   resultCmp = cmp.find("radioResult");
   resultCmp.set("v.value", selected);
  },

  onGroup: function(cmp, evt) {
   var selected = evt.getSource().get("v.label");
   resultCmp = cmp.find("radioGroupResult");
   resultCmp.set("v.value", selected);
  }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
disabled	Boolean	Specifies whether this radio button should be displayed in a disabled state. Disabled radio buttons can't be clicked. Default value is "false".	
errors	List	The list of errors to be displayed.	
label	String	The text displayed on the component.	
labelClass	String	The CSS class of the label component	
name	String	The name of the component.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
text	String	The input value attribute.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	Boolean	Indicates whether the status of the option is selected. Default value is "false".	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:inputRichText

An input field for entering rich text. This component is not supported by LockerService.

Note: We recommend that you use `lightning:inputRichText` instead of `ui:inputRichText`. `ui:inputRichText` is no longer supported when LockerService is activated.

`ui:inputRichText` renders a WYSIWYG editor for entering rich text, using the CKEditor library to provide formatting and accessibility features.

This example displays a rich text editor.

```
<ui:inputRichText label="Enter Your Comments" />
```

Tags such as `<script>` are removed from the component. For a list of supported HTML tags, see `ui:outputRichText`.

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
cols	Integer	The width of the text area, which is defined by the number of characters to display in a single row at a time. Default value is “20”.	
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
errors	List	The list of errors to be displayed.	
height	String	The height of the editing area (that includes the editor content). This can be an integer, for pixel sizes, or any CSS-defined length unit.	
label	String	The text of the label component	
labelClass	String	The CSS class of the label component	
maxlength	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML textarea element.	
placeholder	String	The text that is displayed by default.	
readonly	Boolean	Specifies whether the text area should be rendered as read-only. Default value is “false”.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
resizable	Boolean	Specifies whether or not the textarea should be resizable. Defaults to true.	
rows	Integer	The height of the text area, which is defined by the number of rows to display at a time. Default value is “2”.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	
width	String	The editor UI outer width. This can be an integer, for pixel sizes, or any CSS-defined unit. If isRichText is set to false, use the cols attribute instead.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.
cut	COMPONENT	The event fired when the user cuts content to the clipboard.
onError	COMPONENT	The event fired when there are any validation errors on the component.
onClearErrors	COMPONENT	The event fired when any validation errors should be cleared.
change	COMPONENT	The event fired when the user changes the content of the input.
copy	COMPONENT	The event fired when the user copies content to the clipboard.
paste	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:inputSecret

An input field for entering secret text with type password.

A `ui:inputSecret` component represents a password field, which is rendered as an HTML `input` tag of type `password`.

This is a basic set up of a password field.

```
<ui:inputSecret aura:id="secret" label="Pin" class="field" value="123456"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputSecret uiInput--default uiInput--input">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Pin</span>
    </label>
    <input class="field input" type="password">
</div>
```

This example displays a `ui:inputSecret` component with a default value.

```
<aura:component>
    <ui:inputSecret aura:id="secret" label="Pin" class="field" value="123456"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	
`maxlength`	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
`placeholder`	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
`required`	Boolean	Specifies whether the input is required. Default value is "false".	
`requiredIndicatorClass`	String	The CSS class of the required indicator component	
`size`	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
`updateOn`	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
`value`	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.

Event Name	Event Type	Description
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputSelect`

Represents a drop-down list with options.

A `ui:inputSelect` component is rendered as an HTML `select` element. It contains options, represented by the `ui:inputSelectOption` components. To enable multiple selections, set `multiple="true"`. To wire up any client-side logic when an input value is selected, use the `change` event.

```
<ui:inputSelect multiple="true">
    <ui:inputSelectOption text="All Primary" label="All Contacts" value="true"/>
    <ui:inputSelectOption text="All Primary" label="All Primary"/>
    <ui:inputSelectOption text="All Secondary" label="All Secondary"/>
</ui:inputSelect>
```

`v.value` represents the option's HTML `selected` attribute, and `v.text` represents the option's HTML `value` attribute.

Generating Options with `aura:iteration`

You can use `aura:iteration` to iterate over a list of items to generate options. This example iterates over a list of items and handles the change event.

```
<aura:attribute name="contactLevel" type="String[]" default="Primary Contact, Secondary
Contact, Other"/>
    <ui:inputSelect aura:id="levels" label="Contact Levels" change="{!c.onSelectChange}">

        <aura:iteration items="{!v.contactLevel}" var="level">
             <ui:inputSelectOption text="{!level}" label="{!level}"/>
        </aura:iteration>
    </ui:inputSelect>
```

When the selected option changes, this client-side controller retrieves the new text value.

```
onSelectChange : function(component, event, helper) {
    var selected = component.find("levels").get("v.value");
    //do something else
}
```

Generating Options Dynamically

Generate the options dynamically on component initialization using a controller-side action.

```
<aura:component>
    <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
    <ui:inputSelect label="Select me:" class="dynamic" aura:id="InputSelectDynamic"/>
</aura:component>
```

The following client-side controller generates options using the options attribute on the `ui:inputSelect` component. `v.options` takes in the list of objects and converts them into list options. The `opts` object constructs `InputOption` objects to create the `ui:inputSelectOptions` components within `ui:inputSelect`. Although the sample code generates the options during initialization, the list of options can be modified anytime when you manipulate the list in `v.options`. The component automatically updates itself and rerenders with the new options.

```
({
    doInit : function(cmp) {
        var opts = [
            { class: "optionClass", label: "Option1", value: "opt1", selected: "true" },
            { class: "optionClass", label: "Option2", value: "opt2" },
            { class: "optionClass", label: "Option3", value: "opt3" }

        ];
        cmp.find("InputSelectDynamic").set("v.options", opts);
    }
})
```

`class` is a reserved keyword that might not work with older versions of Internet Explorer. We recommend using `"class"` with double quotes. If you're reusing the same set of options on multiple drop-down lists, use different attributes for each set of options. Otherwise, selecting a different option in one list also updates other list options bound to the same attribute.

```
<aura:attribute name="options1" type="String" />
<aura:attribute name="options2" type="String" />
<ui:inputSelect aura:id="Select1" label="Select1" options="{!v.options1}" />
<ui:inputSelect aura:id="Select2" label="Select2" options="{!v.options2}" />
```

This example displays a drop-down list with single and multiple selection enabled, and another with dynamically generated list options. It retrieves the selected value of a `ui:inputSelect` component.

```
<aura:component>
<aura:handler name="init" value="{!this}" action="{!c.doInit}"/>

<div class="row">
<p class="title">Single Selection</p>
<ui:inputSelect class="single" aura:id="InputSelectSingle"
change="{!c.onSingleSelectChange}">

            <ui:inputSelectOption text="Any"/>
            <ui:inputSelectOption text="Open" value="true"/>
            <ui:inputSelectOption text="Closed"/>
            <ui:inputSelectOption text="Closed Won"/>
         <ui:inputSelectOption text="Prospecting"/>
            <ui:inputSelectOption text="Qualification"/>
            <ui:inputSelectOption text="Needs Analysis"/>
            <ui:inputSelectOption text="Closed Lost"/>
    </ui:inputSelect>
    <p>Selected Item:</p>
      <p><ui:outputText class="result" aura:id="singleResult" value="" /></p>
</div>

<div class="row">
    <p class="title">Multiple Selection</p>
    <ui:inputSelect multiple="true" class="multiple" aura:id="InputSelectMultiple"
change="{!c.onMultiSelectChange}">

            <ui:inputSelectOption text="Any"/>
            <ui:inputSelectOption text="Open"/>
            <ui:inputSelectOption text="Closed"/>
            <ui:inputSelectOption text="Closed Won"/>
            <ui:inputSelectOption text="Prospecting"/>
            <ui:inputSelectOption text="Qualification"/>
            <ui:inputSelectOption text="Needs Analysis"/>
            <ui:inputSelectOption text="Closed Lost"/>

    </ui:inputSelect>
    <p>Selected Items:</p>
     <p><ui:outputText class="result" aura:id="multiResult" value="" /></p>
</div>

<div class="row">
   <p class="title">Dynamic Option Generation</p>
   <ui:inputSelect label="Select me: " class="dynamic" aura:id="InputSelectDynamic"
change="{!c.onChange}" />
   <p>Selected Items:</p>
   <p><ui:outputText class="result" aura:id="dynamicResult" value="" /></p>
</div>
```

```
</aura:component>
```

```
({
    doInit : function(cmp) {
     // Initialize input select options
        var opts = [
            { "class": "optionClass", label: "Option1", value: "opt1", selected: "true"
},
            { "class": "optionClass", label: "Option2", value: "opt2" },
            { "class": "optionClass", label: "Option3", value: "opt3" }

        ];
        cmp.find("InputSelectDynamic").set("v.options", opts);

    },

 onSingleSelectChange: function(cmp) {
         var selectCmp = cmp.find("InputSelectSingle");
         var resultCmp = cmp.find("singleResult");
         resultCmp.set("v.value", selectCmp.get("v.value"));
  },

  onMultiSelectChange: function(cmp) {
         var selectCmp = cmp.find("InputSelectMultiple");
         var resultCmp = cmp.find("multiResult");
         resultCmp.set("v.value", selectCmp.get("v.value"));
  },

  onChange: function(cmp) {
   var dynamicCmp = cmp.find("InputSelectDynamic");
   var resultCmp = cmp.find("dynamicResult");
   resultCmp.set("v.value", dynamicCmp.get("v.value"));
  }

})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`label`	String	The text of the label component	

Attribute Name	Attribute Type	Description	Required?
labelClass	String	The CSS class of the label component	
multiple	Boolean	Specifies whether the input is a multiple select. Default value is “false”.	
options	List	A list of options to use for the select. Note: setting this attribute will make the component ignore v.body	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.
cut	COMPONENT	The event fired when the user cuts content to the clipboard.
onError	COMPONENT	The event fired when there are any validation errors on the component.
onClearErrors	COMPONENT	The event fired when any validation errors should be cleared.
change	COMPONENT	The event fired when the user changes the content of the input.

Event Name	Event Type	Description
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:inputSelectOption

An HTML option element that is nested in a ui:inputSelect component. Denotes the available options in the list.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`label`	String	The text displayed on the component.	
`name`	String	The name of the component.	
`text`	String	The input value attribute.	
`value`	Boolean	Indicates whether the status of the option is selected. Default value is "false".	

Events

Event Name	Event Type	Description
`select`	COMPONENT	The event fired when the user selects some text.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.

Event Name	Event Type	Description
`click`	COMPONENT	The event fired when the user clicks on the component.
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:inputText`

Represents an input field suitable for entering a single line of free-form text.

A `ui:inputText` component represents a text input field, which is rendered as an HTML `input` tag of type `text`. To render the output from a `ui:inputText` component, use the `ui:outputText` component.

This is a basic set up of a text field.

```
<ui:inputText label="Expense Name" value="My Expense" required="true"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputTextuiInput--default uiInput--input">
  <label class="uiLabel-left form-element__label uiLabel">
    <span>Expense Name</span>
    <span class="required">*</span>
  </label>
  <input required="required" class="input" type="text">
</div>
```

This example binds the value of a `ui:inputText` component to `ui:outputText`.

```

<aura:component>
    <aura:attribute name="myText" type="string" default="Hello there!"/>
 <ui:inputText label="Enter some text" class="field" value="{!v.myText}" updateOn="click"/>

 You entered: <ui:outputText value="{!v.myText}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	

Attribute Name	Attribute Type	Description	Required?
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
errors	List	The list of errors to be displayed.	
label	String	The text of the label component	
labelClass	String	The CSS class of the label component	
maxlength	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
placeholder	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
size	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.

Event Name	Event Type	Description
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputTextArea`

An HTML textarea element that can be editable or read-only. Scroll bars may not appear on Chrome browsers in Android devices, but you can select focus in the textarea to activate scrolling.

A `ui:inputTextArea` component represents a multi-line text input control, which is rendered as an HTML `textarea` tag. To render the output from a `ui:inputTextArea` component, use the `ui:outputTextArea` component.

This is a basic set up of a `ui:inputTextArea` component.

```
<ui:inputTextArea aura:id="comments" label="Comments" value="My comments" rows="5"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputTextArea uiInput--default uiInput--textarea">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Comments</span>
    </label>
    <textarea class="textarea" cols="20" rows="5">
    </textarea>
</div>
```

This example retrieves the value of a `ui:inputTextArea` component and displays it using `ui:outputTextArea`.

```

<aura:component>
     <ui:inputTextArea aura:id="comments" label="Comments"  value="My comments" rows="5"/>

     <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

     <div aura:id="msg" class="hide">
  You entered: <ui:outputTextArea aura:id="oTextarea" value=""/>
 </div>
</aura:component>
```

```

({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var comments = component.find("comments").get("v.value");
        var oTextarea = component.find("oTextarea");
        oTextarea.set("v.value", comments);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
cols	Integer	The width of the text area, which is defined by the number of characters to display in a single row at a time. Default value is “20”.	
disabled	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
errors	List	The list of errors to be displayed.	
label	String	The text of the label component	
labelClass	String	The CSS class of the label component	
maxlength	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML textarea element.	
placeholder	String	The text that is displayed by default.	
readonly	Boolean	Specifies whether the text area should be rendered as read-only. Default value is “false”.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
resizable	Boolean	Specifies whether or not the textarea should be resizable. Defaults to true.	
rows	Integer	The height of the text area, which is defined by the number of rows to display at a time. Default value is “2”.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`cut`	COMPONENT	The event fired when the user cuts content to the clipboard.
`onError`	COMPONENT	The event fired when there are any validation errors on the component.
`onClearErrors`	COMPONENT	The event fired when any validation errors should be cleared.
`change`	COMPONENT	The event fired when the user changes the content of the input.
`copy`	COMPONENT	The event fired when the user copies content to the clipboard.
`paste`	COMPONENT	The event fired when the user pastes content from the clipboard.

`ui:inputURL`

An input field for entering a URL.

A `ui:inputURL` component represents an input field for a URL, which is rendered as an HTML `input` tag of type `url`. To render the output from a `ui:inputURL` component, use the `ui:outputURL` component.

This is a basic set up of a `ui:inputURL` component.

```
<ui:inputURL aura:id="url" label="Venue URL" class="field" value="http://www.myURL.com"/>
```

This example results in the following HTML.

```
<div class="uiInput uiInputText uiInputURL uiInput--default uiInput--input">
    <label class="uiLabel-left form-element__label uiLabel">
        <span>Venue URL</span>
    </label>
    <input class="field input" type="url">
</div>
```

This example retrieves the value of a `ui:inputURL` component and displays it using `ui:outputURL`.

```

<aura:component>
   <ui:inputURL aura:id="url" label="Venue URL" class="field" value="http://www.myURL.com"/>

    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>
 <div aura:id="msg" class="hide">
  You entered: <ui:outputURL aura:id="oURL" value=""/>
 </div>
</aura:component>
```

```

({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var url = component.find("url").get("v.value");
        var oURL = component.find("oURL");
        oURL.set("v.value", url);
        oURL.set("v.label", url);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`errors`	List	The list of errors to be displayed.	
`label`	String	The text of the label component	
`labelClass`	String	The CSS class of the label component	

Attribute Name	Attribute Type	Description	Required?
maxlength	Integer	The maximum number of characters that can be typed into the input field. Corresponds to the maxlength attribute of the rendered HTML input element.	
placeholder	String	Text that is displayed when the field is empty, to prompt the user for a valid entry.	
required	Boolean	Specifies whether the input is required. Default value is "false".	
requiredIndicatorClass	String	The CSS class of the required indicator component	
size	Integer	The width of the input field, in characters. Corresponds to the size attribute of the rendered HTML input element.	
updateOn	String	Updates the component's value binding if the updateOn attribute is set to the handled event. Default value is "change".	
value	String	The value currently in the input field.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.
cut	COMPONENT	The event fired when the user cuts content to the clipboard.
onError	COMPONENT	The event fired when there are any validation errors on the component.

Event Name	Event Type	Description
onClearErrors	COMPONENT	The event fired when any validation errors should be cleared.
change	COMPONENT	The event fired when the user changes the content of the input.
copy	COMPONENT	The event fired when the user copies content to the clipboard.
paste	COMPONENT	The event fired when the user pastes content from the clipboard.

ui:menu

A dropdown menu list with a trigger that controls its visibility. To create a clickable link and a list of menu items, use ui:menuTriggerLink and ui:menuList.

A `ui:menu` component contains a trigger and list items. You can wire up list items to actions in a client-side controller so that selection of the item triggers an action. This example shows a menu with list items, which when pressed updates the label on the trigger.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Opportunity Status"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu">
              <ui:actionMenuItem aura:id="item1" label="Any"
click="{!c.updateTriggerLabel}"/>
            <ui:actionMenuItem aura:id="item2" label="Open" click="{!c.updateTriggerLabel}"
 disabled="true"/>
              <ui:actionMenuItem aura:id="item3" label="Closed"
click="{!c.updateTriggerLabel}"/>
              <ui:actionMenuItem aura:id="item4" label="Closed Won"
click="{!c.updateTriggerLabel}"/>
          </ui:menuList>
</ui:menu>
```

This client-side controller updates the trigger label when a menu item is clicked.

```
({
    updateTriggerLabel: function(cmp, event) {
        var triggerCmp = cmp.find("trigger");
        if (triggerCmp) {
            var source = event.getSource();
            var label = source.get("v.label");
            triggerCmp.set("v.label", label);
        }
    }
})
```

The dropdown menu and its menu items are hidden by default. You can change this by setting the `visible` attribute on the `ui:menuList` component to `true`. The menu items are shown only when you click the `ui:menuTriggerLink` component.

To use a trigger, which opens the menu, nest the `ui:menuTriggerLink` component in `ui:menu`. For list items, use the `ui:menuList` component, and include any of these list item components that can trigger a client-side controller action:

- `ui:actionMenuItem` - A menu item
- `ui:checkboxMenuItem` - A checkbox that supports multiple selections
- `ui:radioMenuItem` - A radio item that supports single selection

To include a separator for these menu items, use `ui:menuItemSeparator`.

This example shows several ways to create a menu.

```
<aura:component access="global">
    <aura:attribute name="status" type="String[]" default="Open, Closed, Closed Won, Any"/>

        <ui:menu>
            <ui:menuTriggerLink aura:id="trigger" label="Single selection with actionable
 menu item"/>
            <ui:menuList class="actionMenu" aura:id="actionMenu">
                <aura:iteration items="{!v.status}" var="s">
                    <ui:actionMenuItem label="{!s}" click="{!c.updateTriggerLabel}"/>
                </aura:iteration>
            </ui:menuList>
        </ui:menu>
        <hr/>
        <ui:menu>
        <ui:menuTriggerLink class="checkboxMenuLabel" aura:id="checkboxMenuLabel"
label="Multiple selection"/>
           <ui:menuList aura:id="checkboxMenu" class="checkboxMenu">
            <aura:iteration items="{!v.status}" var="s">
                <ui:checkboxMenuItem aura:id="checkbox" label="{!s}"/>
                </aura:iteration>
            </ui:menuList>
        </ui:menu>
         <p><ui:button class="checkboxButton" aura:id="checkboxButton"
press="{!c.getMenuSelected}" label="Check the selected menu items"/></p>
          <p><ui:outputText class="result" aura:id="result" value="Which items get
selected"/></p>
 <hr/>
         <ui:menu>
             <ui:menuTriggerLink class="radioMenuLabel" aura:id="radioMenuLabel"
label="Select a status"/>
             <ui:menuList class="radioMenu" aura:id="radioMenu">
                    <aura:iteration items="{!v.status}" var="s">
                     <ui:radioMenuItem aura:id="radio" label="{!s}"/>
                    </aura:iteration>
             </ui:menuList>
         </ui:menu>
        <p><ui:button class="radioButton" aura:id="radioButton"
press="{!c.getRadioMenuSelected}" label="Check the selected menu items"/></p>
         <p><ui:outputText class="radioResult" aura:id="radioResult" value="Which items
get selected"/> </p>
 <hr/>
 <div style="margin:20px;">
     <div style="display:inline-block;width:50%;vertical-align:top;">
         Combination menu items
         <ui:menu>
             <ui:menuTriggerLink aura:id="mytrigger" label="Select Menu Items"/>
             <ui:menuList>
                <ui:actionMenuItem label="Red" click="{!c.updateLabel}" disabled="true"/>

                 <ui:actionMenuItem label="Green" click="{!c.updateLabel}"/>
                 <ui:actionMenuItem label="Blue" click="{!c.updateLabel}"/>
                 <ui:actionMenuItem label="Yellow United" click="{!c.updateLabel}"/>
                 <ui:menuItemSeparator/>
                 <ui:checkboxMenuItem label="A"/>
                 <ui:checkboxMenuItem label="B"/>
                 <ui:checkboxMenuItem label="C"/>
                 <ui:checkboxMenuItem label="All"/>
                 <ui:menuItemSeparator/>
                 <ui:radioMenuItem label="A only"/>
                 <ui:radioMenuItem label="B only"/>
                 <ui:radioMenuItem label="C only"/>
                 <ui:radioMenuItem label="None"/>
             </ui:menuList>
         </ui:menu>
       </div>
 </div>
</aura:component>
```

```
({
    updateTriggerLabel: function(cmp, event) {
        var triggerCmp = cmp.find("trigger");
        if (triggerCmp) {
            var source = event.getSource();
            var label = source.get("v.label");
            triggerCmp.set("v.label", label);
        }
    },
    updateLabel: function(cmp, event) {
        var triggerCmp = cmp.find("mytrigger");
        if (triggerCmp) {
            var source = event.getSource();
            var label = source.get("v.label");
            triggerCmp.set("v.label", label);
        }
    },
    getMenuSelected: function(cmp) {
        var menuItems = cmp.find("checkbox");
        var values = [];
        for (var i = 0; i < menuItems.length; i++) {
            var c = menuItems[i];
            if (c.get("v.selected") === true) {
                values.push(c.get("v.label"));
            }
        }
        var resultCmp = cmp.find("result");
        resultCmp.set("v.value", values.join(","));
    },
    getRadioMenuSelected: function(cmp) {
        var menuItems = cmp.find("radio");
        var values = [];
        for (var i = 0; i < menuItems.length; i++) {
            var c = menuItems[i];
            if (c.get("v.selected") === true) {
                values.push(c.get("v.label"));
            }
        }
        var resultCmp = cmp.find("radioResult");
        resultCmp.set("v.value", values.join(","));
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:menuItem`

A UI menu item in a ui:menuList component.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	

Attribute Name	Attribute Type	Description	Required?
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`hideMenuAfterSelected`	Boolean	Set to true to hide menu after the menu item is selected.	
`label`	String	The text displayed on the component.	
`selected`	Boolean	The status of the menu item. True means this menu item is selected; False is not selected.	
`type`	String	The concrete type of the menu item. Accepted values are 'action', 'checkbox', 'radio', 'separator' or any namespaced component descriptor, e.g. ns:xxxxmenuItem.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.

ui:menuItemSeparator

A menu separator to divide menu items, such as ui:radioMenuItem, and used in a ui:menuList component.

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

ui:menuList

A menu component that contains menu items.

This component is nested in a `ui:menu` component and can be used together with a `ui:menuTriggerLink` component. Clicking the menu trigger displays the container with menu items.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Click me to display menu items"/>
    <ui:menuList class="actionMenu" aura:id="actionMenu">
        <ui:actionMenuItem aura:id="item1" label="Item 1" click="{!c.doSomething}"/>
        <ui:actionMenuItem aura:id="item2" label="Item 2" click="{!c.doSomething}"/>
        <ui:actionMenuItem aura:id="item3" label="Item 3" click="{!c.doSomething}"/>
        <ui:actionMenuItem aura:id="item4" label="Item 4" click="{!c.doSomething}"/>
   </ui:menuList>
</ui:menu>
```

`ui:menuList` can contain these components, which runs a client-side controller when clicked:

- `ui:actionMenuItem`
- `ui:checkboxMenuItem`
- `ui:radioMenuItem`
- `ui:menuItemSeparator`

See `ui:menu` for more information.

Attributes

Attribute Name	Attribute Type	Description	Required?
`autoPosition`	Boolean	Move the popup target up when there is not enough space at the bottom to display. Note: even if autoPosition is set to false, popup will still position the menu relative to the trigger. To override default positioning, use manualPosition attribute.	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`closeOnClickOutside`	Boolean	Close target when user clicks or taps outside of the target	
`closeOnTabKey`	Boolean	Indicates whether to close the target list on tab key or not.	
`curtain`	Boolean	Whether or not to apply an overlay under the target.	
`menuItems`	List	A list of menu items set explicitly using instances of the Java class: aura.components.ui.MenuItem.	
`visible`	Boolean	Controls the visibility of the menu. The default is false, which hides the menu.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`menuExpand`	COMPONENT	The event fired when the menu list displays.
`menuSelect`	COMPONENT	The event fired when the user select a menu item.
`menuCollapse`	COMPONENT	The event fired when the menu list collapses.

Event Name	Event Type	Description
`menuFocusChange`	COMPONENT	The event fired when the menu list focus changed from one menuItem to another menuItem.

`ui:menuTrigger`

A clickable link that expands and collapses a menu. To create a link for ui:menu, use ui:menuTriggerLink instead.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`label`	String	The text displayed on the component.	
`title`	String	The text to display as a tooltip when the mouse pointer hovers over this component.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.
`blur`	COMPONENT	The event fired when the user moves off from the component.
`focus`	COMPONENT	The event fired when the user focuses on the component.

Event Name	Event Type	Description
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`menuTriggerPress`	COMPONENT	The event that is fired when the trigger is clicked.

`ui:menuTriggerLink`

A link that triggers a dropdown menu used in ui:menu

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`label`	String	The text displayed on the component.	
`title`	String	The text to display as a tooltip when the mouse pointer hovers over this component.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.
`select`	COMPONENT	The event fired when the user selects some text.

Event Name	Event Type	Description
`blur`	COMPONENT	The event fired when the user moves off from the trigger.
`focus`	COMPONENT	The event fired when the user focuses on the trigger.
`keypress`	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
`keyup`	COMPONENT	The event fired when the user releases a keyboard key on the component.
`keydown`	COMPONENT	The event fired when the user presses a keyboard key on the component.
`menuTriggerPress`	COMPONENT	The event that is fired when the trigger is clicked.

`ui:message`

Represents a message of varying severity levels

The `severity` attribute indicates a message's severity level and determines the style to use when displaying the message. If the `closable` attribute is set to true, the message can be dismissed by pressing the × symbol.

This example shows a confirmation message that can be dismissed.

```
<ui:message title="Confirmation" severity="confirm" closable="true">
      This is a confirmation message.
  </ui:message>
```

This example shows messages in varying severity levels.

```

<aura:component access="global">
 <ui:message title="Confirmation" severity="confirm" closable="true">
   This is a confirmation message.
 </ui:message>
 <ui:message title="Information" severity="info" closable="true">
   This is a message.
 </ui:message>
 <ui:message title="Warning" severity="warning" closable="true">
   This is a warning.
 </ui:message>
 <ui:message title="Error" severity="error" closable="true">
   This is an error message.
 </ui:message>

</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	

Attribute Name	Attribute Type	Description	Required?
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`closable`	Boolean	Specifies whether to display an 'x' that will close the alert when clicked. Default value is 'false'.	
`severity`	String	The severity of the message. Possible values: message (default), confirm, info, warning, error	
`title`	String	The title text for the message.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputCheckbox`

Displays a checkbox in a checked or unchecked state.

A `ui:outputCheckbox` component represents a checkbox that is rendered as an HTML `img` tag. This component can be used with `ui:inputCheckbox`, which enables users to select or deselect the checkbox. To select or deselect the checkbox, set the `value` attribute to `true` or `false`. To display a checkbox, you can use an attribute value and bind it to the `ui:outputCheckbox` component.

```
<aura:attribute name="myBool" type="Boolean" default="true"/>
<ui:outputCheckbox value="{!v.myBool}"/>
```

The previous example renders the following HTML.

```
<img class="checked uiImage uiOutputCheckbox" alt="checkbox checked" src="path/to/checkbox">
```

This example shows how you can use the `ui:inputCheckbox` component.

```

<aura:component>
 <aura:attribute name="myBool" type="Boolean" default="true"/>
 <ui:inputCheckbox aura:id="checkbox" label="Select?" change="{!c.onCheck}"/>
 <p>Selected:</p>
 <p><ui:outputText class="result" aura:id="checkResult" value="false" /></p>
 <p>The following checkbox uses a component attribute to bind its value.</p>
 <ui:outputCheckbox aura:id="output" value="{!v.myBool}"/>
</aura:component>
```

```
({
  onCheck: function(cmp, evt) {
   var checkCmp = cmp.find("checkbox");
   resultCmp = cmp.find("checkResult");
   resultCmp.set("v.value", ""+checkCmp.get("v.value"));

  }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
altChecked	String	The alternate text description when the checkbox is checked. Default value is “True”.	
altUnchecked	String	The alternate text description when the checkbox is unchecked. Default value is “False”.	
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
value	Boolean	Specifies whether the checkbox is checked.	Yes

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputCurrency`

Displays the currency in the default or specified format, such as with specific currency code or decimal places.

A `ui:outputCurrency` component represents a number as a currency that is wrapped in an HTML `span` tag. This component can be used with `ui:inputCurrency`, which takes in a number as a currency. To display a currency, you can use an attribute value and bind it to the `ui:outputCurrency` component.

```
<aura:attribute name="myCurr" type="Decimal" default="50000"/>
<ui:outputCurrency aura:id="curr" value="{!v.myCurr}"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputCurrency">$50,000.00</span>
```

To override the browser's locale, use the `currencySymbol` attribute.

```
<aura:attribute name="myCurr" type="Decimal" default="50" currencySymbol="£"/>
```

You can also override it by specifying the format.

```
var curr = cmp.find("curr");
curr.set("v.format", '£#,###.00');
```

This example shows how you can bind data from a `ui:inputCurrency` component.

```

<aura:component>
    <aura:attribute name="myCurrency" type="integer" default="50"/>
   <ui:inputCurrency aura:id="amount" label="Amount" class="field" value="{!v.myCurrency}"
 updateOn="keyup"/>
 You entered: <ui:outputCurrency value="{!v.myCurrency}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`currencyCode`	String	The ISO 4217 currency code specified as a String, e.g. “USD”.	
`currencySymbol`	String	The currency symbol specified as a String.	
`format`	String	The format of the number. For example, format=”.00” displays the number followed by two decimal places. If not specified, the default format based on the browser's locale will be used.	
`value`	Decimal	The output value of the currency, which is defined as type Decimal.	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputDate`

Displays a date in the default or specified format based on the user's locale.

A `ui:outputDate` component represents a date output in the YYYY-MM-DD format and is wrapped in an HTML `span` tag. This component can be used with `ui:inputDate`, which takes in a date input. `ui:outputDate` retrieves the browser's locale information and displays the date accordingly. To display a date, you can use an attribute value and bind it to the `ui:outputDate` component.

```
<aura:attribute name="myDate" type="Date" default="2014-09-29"/>
<ui:outputDate value="{!v.myDate}"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputDate">Sep 29, 2014</span>
```

This example shows how you can bind data from the `ui:inputDate` component.

```

<aura:component>
 <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
 <aura:attribute name="today" type="Date" default=""/>

    <ui:inputDate aura:id="expdate" label="Today's Date" class="field" value="{!v.today}"
 displayDatePicker="true" />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
  You entered: <ui:outputDate aura:id="oDate" value="" />
 </div>
</aura:component>
```

```

({
    doInit : function(component, event, helper) {
        var today = new Date();
        component.set('v.today', today.getFullYear() + "-" + (today.getMonth() + 1) + "-"
 + today.getDate());
    },

    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');
        var expdate = component.find("expdate").get("v.value");

        var oDate = component.find("oDate");
        oDate.set("v.value", expdate);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`format`	String	A string (pattern letters are defined in java.text.SimpleDateFormat) used to format the date and time of the value attribute.	
`langLocale`	String	The language locale used to format date value.	
`value`	String	The output value of the date. It should be a date string in ISO-8601 format (YYYY-MM-DD).	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputDateTime`

Displays a date, time in a specified or default format based on the user's locale.

A `ui:outputDateTime` component represents a date and time output that is wrapped in an HTML `span` tag. This component can be used with `ui:inputDateTime`, which takes in a date input. `ui:outputDateTime` retrieves the browser's locale information and displays the date accordingly. To display a date and time, you can use an attribute value and bind it to the `ui:outputDateTime` component.

```
<aura:attribute name="myDateTime" type="Date" default="2014-09-29T00:17:08z"/>
<ui:outputDateTime value="{!v.myDateTime}"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputDateTime">Sep 29, 2014 12:17:08 AM</span>
```

This example shows how you can bind data from a `ui:inputDateTime` component.

```

<aura:component>
 <aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
 <aura:attribute name="today" type="Date" default=""/>

    <ui:inputDateTime aura:id="today" label="Time" class="field" value=""
displayDatePicker="true" />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

    <div aura:id="msg" class="hide">
  You entered: <ui:outputDateTime aura:id="oDateTime" value=""  />
 </div>
</aura:component>
```

```

({
    doInit : function(component, event, helper) {
        var today = new Date();
        component.set('v.today', today.getFullYear() + "-" + (today.getMonth() + 1) + "-"
 + today.getDate());
    },

    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var todayVal = component.find("today").get("v.value");
        var oDateTime = component.find("oDateTime");
        oDateTime.set("v.value", todayVal);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`format`	String	A string (pattern letters are defined in java.text.SimpleDateFormat) used to format the date and time of the value attribute.	
`langLocale`	String	The language locale used to format date value.	
`timezone`	String	The timezone ID, for example, America/Los_Angeles.	
`value`	String	An ISO8601-formatted string representing a date time.	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputEmail`

Displays an email address in an HTML anchor (<a>) element. The leading and trailing space are trimmed.

A `ui:outputEmail` component represents an email output that is wrapped in an HTML `span` tag. This component can be used with `ui:inputEmail`, which takes in an email input. The email output is wrapped in an HTML anchor element and `mailto` is automatically appended to it. This is a simple set up of a `ui:outputEmail` component.

```
<ui:outputEmail value="abc@email.com"/>
```

The previous example renders the following HTML.

```
<span><a href="mailto:abc@email.com" class="uiOutputEmail">abc@email.com</a></span>
```

This example shows how you can bind data from a `ui:inputEmail` component.

```
<aura:component>
   <ui:inputEmail aura:id="email" label="Email" class="field" value="manager@email.com"/>

    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
     You entered: <ui:outputEmail aura:id="oEmail" value="Email" />
 </div>

</aura:component>
```

```
({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var email = component.find("email").get("v.value");
        var oEmail = component.find("oEmail");
        oEmail.set("v.value", email);

    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`value`	String	The output value of the email	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.

Event Name	Event Type	Description
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

ui:outputNumber

Displays the number in the default or specified format. Supports up to 18 digits before the decimal place.

A `ui:outputNumber` component represents a number output that is rendered as an HTML `span` tag. This component can be used with `ui:inputNumber`, which takes in a number input. `ui:outputNumber` retrieves the locale information and displays the number in the given decimal format. To display a number, you can use an attribute value and bind it to the `ui:outputNumber` component.

```
<aura:attribute name="myNum" type="Decimal" default="10.10"/>
<ui:outputNumber value="{!v.myNum}" format=".00"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputNumber">10.10</span>
```

This example retrieves the value of a `ui:intputNumber` component, validates the input, and displays it using `ui:outputNumber`.

```

<aura:component>
    <aura:attribute name="myNumber" type="integer" default="10"/>
 <ui:inputNumber label="Enter a number: " value="{!v.myNumber}" updateOn="keyup"/> <br/>
    <ui:outputNumber value="{!v.myNumber}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
format	String	The format of the number. For example, format=".00" displays the number followed by two decimal places. If not specified, the Locale default format will be used.	
value	Decimal	The number displayed when this component is rendered.	Yes

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.

Event Name	Event Type	Description
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputPhone`

Displays the phone number in a URL link format.

A `ui:outputPhone` component represents a phone number output that is wrapped in an HTML `span` tag. This component can be used with `ui:inputPhone`, which takes in a phone number input. The following example is a simple set up of a `ui:outputPhone` component.

```
<ui:outputPhone value="415-123-4567"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputPhone">415-123-4567</span>
```

When viewed on a mobile device, the example renders as an actionable link.

```
<span class="uiOutputPhone">
    <a href="tel:415-123-4567">415-123-4567</a>
</span>
```

This example shows how you can bind data from a `ui:inputPhone` component.

```

<aura:component>
   <ui:inputPhone aura:id="phone" label="Phone Number" class="field" value="415-123-4567"
 />
    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

 <div aura:id="msg" class="hide">
  You entered: <ui:outputPhone aura:id="oPhone" value="" />
 </div>
</aura:component>
```

```

({


    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var phone = component.find("phone").get("v.value");
        var oPhone = component.find("oPhone");
        oPhone.set("v.value", phone);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
body	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
class	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
value	String	The phone number displayed when this component is rendered.	Yes

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

ui:outputRichText

Displays richly-formatted text including tags such as paragraph, image, and hyperlink, as specified in the value attribute.

A `ui:outputRichText` component represents rich text and can be used to display input from a `ui:inputRichText` component. This component displays URLs and email addresses within rich text fields as hyperlinks.

For example, you can enter bold or colored text via a `ui:inputRichText` component and bind its value to a `ui:outputRichText` component, which results in the following HTML.

```
<div class="uiOutputRichText">
    <b>Aura</b>, <span style="color:red">input rich text demo</span>
</div>
```

This component supports the following HTML tags: `a`, `b`, `br`, `big`, `blockquote`, `caption`, `cite`, `code`, `col`, `colgroup`, `del`, `div`, `em`, `h1`, `h2`, `h3`, `hr`, `i`, `img`, `ins`, `kbd`, `li`, `ol`, `p`, `param`, `pre`, `q`, `s`, `samp`, `small`, `span`, `strong`, `sub`, `sup`, `table`, `tbody`, `td`, `tfoot`, `th`, `thead`, `tr`, `tt`, `u`, `ul`, `var`, `strike`.

Supported HTML attributes include: `accept`, `action`, `align`, `alt`, `autocomplete`, `background`, `bgcolor`, `border`, `cellpadding`, `cellspacing`, `checked`, `cite`, `class`, `clear`, `color`, `cols`, `colspan`, `coords`, `datetime`, `default`, `dir`, `disabled`, `download`, `enctype`, `face`, `for`, `headers`, `height`, `hidden`, `high`, `href`, `hreflang`, `id`, `ismap`, `label`, `lang`, `list`, `loop`, `low`, `max`, `maxlength`, `media`, `method`, `min`, `multiple`, `name`, `noshade`, `novalidate`, `nowrap`, `open`, `optimum`, `pattern`, `placeholder`, `poster`, `preload`, `pubdate`, `radiogroup`, `readonly`, `rel`, `required`, `rev`, `reversed`, `rows`, `rowspan`, `spellcheck`, `scope`, `selected`, `shape`, `size`, `span`, `srclang`, `start`, `src`, `step`, `style`, `summary`, `tabindex`, `target`, `title`, `type`, `usemap`, `valign`, `value`, `width`, `xmlns`.

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`linkify`	Boolean	Indicates if the URLs in the text are set to render as hyperlinks.	
`value`	String	The richly-formatted text used for output.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputText`

Displays text as specified by the value attribute.

A `ui:outputText` component represents text output that is wrapped in an HTML `span` tag. This component can be used with `ui:inputText`, which takes in a text input. To display text, you can use an attribute value and bind it to the `ui:outputText` component.

```
<aura:attribute name="myText" type="String" default="some string"/>
<ui:outputText value="{!v.myText}" />
```

The previous example renders the following HTML.

```
<span dir="ltr" class="uiOutputText">
    some string
</span>
```

This example shows how you can bind data from an `ui:inputText` component.

```

<aura:component>
    <aura:attribute name="myText" type="string" default="Hello there!"/>
 <ui:inputText label="Enter some text" class="field" value="{!v.myText}" updateOn="click"/>

 You entered: <ui:outputText value="{!v.myText}"/>
</aura:component>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`title`	String	Displays extra information as hover text.	
`value`	String	The text displayed when this component is rendered.	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputTextArea`

Displays the text area as specified by the value attribute.

A `ui:outputTextArea` component represents text output that is wrapped in an HTML `span` tag. This component can be used with `ui:inputTextArea`, which takes in a multiline text input. To display text, you can use an attribute value and bind it to the `ui:outputTextArea` component. A `ui:outputTextArea` component displays URLs and email addresses as hyperlinks.

```
<aura:attribute name="myTextArea" type="String" default="some string"/>
<ui:outputTextArea value="{!v.myTextArea}"/>
```

The previous example renders the following HTML.

```
<span class="uiOutputTextArea">some string</span>
```

This example shows how you can bind data from the `ui:inputTextArea` component.

```

<aura:component>
    <ui:inputTextArea aura:id="comments" label="Comments"  value="My comments" rows="5"/>

     <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>

     <div aura:id="msg" class="hide">
  You entered: <ui:outputTextArea aura:id="oTextarea" value=""/>
 </div>
</aura:component>
```

```

({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var comments = component.find("comments").get("v.value");
        var oTextarea = component.find("oTextarea");
        oTextarea.set("v.value", comments);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`linkify`	Boolean	Indicates if the URLs in the text are set to render as hyperlinks.	
`value`	String	The text to display.	Yes

Events

Event Name	Event Type	Description
dblclick	COMPONENT	The event fired when the user double-clicks the component.
mouseover	COMPONENT	The event fired when the user moves the mouse pointer over the component.
mouseout	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
mouseup	COMPONENT	The event fired when the user releases the mouse button over the component.
mousemove	COMPONENT	The event fired when the user moves the mouse pointer over the component.
click	COMPONENT	The event fired when the user clicks on the component.
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.

`ui:outputURL`

Displays a link to a URL as specified by the value attribute, rendered on a given text (label attribute) and image, if any.

A `ui:outputURL` component represents a URL that is wrapped in an HTML `a` tag. This component can be used with `ui:inputURL`, which takes in a URL input. To display a URL, you can use an attribute value and bind it to the `ui:outputURL` component.

```
<aura:attribute name="myURL" type="String" default="http://www.google.com"/>
<ui:outputURL value="{!v.myURL}" label="{!v.myURL}"/>
```

The previous example renders the following HTML.

```
<a href="http://www.google.com" dir="ltr" class="uiOutputURL">http://www.google.com</a>
```

This example shows how you can bind data from a `ui:inputURL` component.

```

<aura:component>
   <ui:inputURL aura:id="url" label="Venue URL" class="field" value="http://www.myURL.com"/>

    <ui:button class="btn" label="Submit" press="{!c.setOutput}"/>
 <div aura:id="msg" class="hide">
  You entered: <ui:outputURL aura:id="oURL" value=""/>
 </div>
</aura:component>
```

```

({
    setOutput : function(component, event, helper) {
     var cmpMsg = component.find("msg");
     $A.util.removeClass(cmpMsg, 'hide');

        var url = component.find("url").get("v.value");
        var oURL = component.find("oURL");
        oURL.set("v.value", url);
        oURL.set("v.label", url);
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`alt`	String	The alternate text description for image (used when there is no label)	
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`iconClass`	String	The CSS style used to display the icon or image.	
`label`	String	The text displayed on the component.	
`target`	String	The target destination where this rendered component is displayed. Possible values: _blank, _parent, _self, _top	
`title`	String	The text to display as a tooltip when the mouse pointer hovers over this component.	
`value`	String	The text displayed when this component is rendered.	Yes

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.
`mousedown`	COMPONENT	The event fired when the user clicks a mouse button over the component.

ui:radioMenuItem

A menu item with a radio button that indicates a mutually exclusive selection and can be used to invoke an action. This component is nested in a ui:menu component.

A `ui:radioMenuItem` component represents a menu list item for single selection. Use `aura:iteration` to iterate over a list of values and display the menu items. A `ui:menuTriggerLink` component displays and hides your menu items.

```
<aura:attribute name="status" type="String[]" default="Open, Closed, Closed Won, Any"/>
    <ui:menu>
        <ui:menuTriggerLink class="radioMenuLabel" aura:id="radioMenuLabel" label="Select
 a status"/>
        <ui:menuList class="radioMenu" aura:id="radioMenu">
            <aura:iteration items="{!v.status}" var="s">
                <ui:radioMenuItem label="{!s}"/>
            </aura:iteration>
        </ui:menuList>
    </ui:menu>
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`disabled`	Boolean	Specifies whether the component should be displayed in a disabled state. Default value is "false".	
`hideMenuAfterSelected`	Boolean	Set to true to hide menu after the menu item is selected.	
`label`	String	The text displayed on the component.	
`selected`	Boolean	The status of the menu item. True means this menu item is selected; False is not selected.	
`type`	String	The concrete type of the menu item. Accepted values are 'action', 'checkbox', 'radio', 'separator' or any namespaced component descriptor, e.g. ns:xxxxmenuItem.	

Events

Event Name	Event Type	Description
`dblclick`	COMPONENT	The event fired when the user double-clicks the component.
`mouseover`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`mouseout`	COMPONENT	The event fired when the user moves the mouse pointer away from the component.
`mouseup`	COMPONENT	The event fired when the user releases the mouse button over the component.
`mousemove`	COMPONENT	The event fired when the user moves the mouse pointer over the component.
`click`	COMPONENT	The event fired when the user clicks on the component.

Event Name	Event Type	Description
mousedown	COMPONENT	The event fired when the user clicks a mouse button over the component.
select	COMPONENT	The event fired when the user selects some text.
blur	COMPONENT	The event fired when the user moves off from the component.
focus	COMPONENT	The event fired when the user focuses on the component.
keypress	COMPONENT	The event fired when the user presses or holds down a keyboard key on the component.
keyup	COMPONENT	The event fired when the user releases a keyboard key on the component.
keydown	COMPONENT	The event fired when the user presses a keyboard key on the component.

ui:scrollerWrapper

Creates a container that enables native scrolling in Salesforce1.

A `ui:scrollerWrapper` creates a container that enables native scrolling in Salesforce1. This component enables you to nest more than one scroller inside the container. Use the `class` attribute to define the height and width of the container. To enable scrolling, specify a height that's smaller than its content.

This example creates a scrollable area with a height of 300px.

```
<aura:component>
    <ui:scrollerWrapper class="scrollerSize">
        <!--Scrollable content here -->
    </ui:scrollerWrapper>
</aura:component>

/** CSS **/
.THIS.scrollerSize {
    height: 300px;
}
```

The Lightning Design System `scrollable` class isn't compatible with native scrolling on mobile devices. Use `ui:scrollerWrapper` if you want to enable scrolling in Salesforce1.

Usage Considerations

In Google Chrome on mobile devices, nested `ui:scrollerWrapper` components are not scrollable when the `border-radius` CSS property is set to a non-zero value. To enable scrolling in this case, set `border-radius` to a non-zero value on the outer `ui:scrollerWrapper` component.

Here is an example.

```
<aura:component>
    <ui:scrollerWrapper class="outerScroller">
        <!-- Scrollable content here -->
        <ui:scrollerWrapper class="innerScroller">
            <!-- Scrollable content here -->
        </ui:scrollerWrapper>
        <!-- Scrollable content here -->
    </ui:scrollerWrapper>
```

```
</aura:component>

/** CSS **/
.THIS.outerScroller {
    /* fix scrolling in innerScroller */
    border-radius: 1px;
}
.THIS.innerScroller {
    /* make innerScroller rounded */
    border-radius: 10px;
}
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS class applied to the outer element. This style is in addition to base classes output by the component.	

`ui:spinner`

A loading spinner to be used while the real component body is being loaded

To toggle the spinner, use `get("e.toggle")`, set the `isVisible` parameter to `true` or `false`, and then fire the event.

This example shows a spinner that can be toggled.

```
<aura:component access="global">
 <ui:spinner aura:id="spinner"/>
 <ui:button press="{!c.toggleSpinner}" label="Toggle Spinner" />
</aura:component>
```

```
({
    toggleSpinner: function(cmp) {
        var spinner = cmp.find('spinner');
        var evt = spinner.get("e.toggle");

    if(!$A.util.hasClass(spinner, 'hideEl')){
        evt.setParams({ isVisible : false });
     }
    else {
        evt.setParams({ isVisible : true });
 }
    evt.fire();
    }
})
```

Attributes

Attribute Name	Attribute Type	Description	Required?
`body`	Component[]	The body of the component. In markup, this is everything in the body of the tag.	
`class`	String	A CSS style to be attached to the component. This style is added in addition to base styles output by the component.	
`isVisible`	Boolean	Specifies whether or not this spinner should be visible. Defaults to true.	

Events

Event Name	Event Type	Description
`toggle`	COMPONENT	The event fired when the spinner is toggled.

Interface Reference

Implement these platform interfaces to allow a component to be used in different contexts, or to enable your component to receive extra context data. A component can implement multiple interfaces. Some interfaces are intended to be implemented together, while others are mutually exclusive. Some interfaces have an effect only in Lightning Experience and Salesforce1.

`clients:hasEventContext`
: Enables a component to be assigned to an event's date or location attributes in Lightning for Outlook and Lightning for Gmail. For more information, see Create Components for Lightning for Outlook and Lightning for Gmail (Beta).

`clients:hasItemContext`
: Enables a component to be assigned to an email's or a calendar event's item attributes in Lightning for Outlook and Lightning for Gmail. For more information, see Create Components for Lightning for Outlook and Lightning for Gmail (Beta).

`flexipage:availableForAllPageTypes`
: To appear in the Lightning App Builder or a Lightning Page, a component must implement the `flexipage:availableForAllPageTypes` interface. For more information, see Configure Components for Lightning Pages and the Lightning App Builder.

`flexipage:availableForRecordHome`
: If your component is designed just for record pages, implement the `flexipage:availableForRecordHome` interface instead of `flexipage:availableForAllPageTypes`. For more information, see Configure Components for Lightning Experience Record Pages.

`forceCommunity:availableForAllPageTypes`
: To appear in Community Builder, a component must implement the `forceCommunity:availableForAllPageTypes` interface. For more information, see Configure Components for Communities.

`force:appHostable`
: Allows a component to be used as a custom tab in Lightning Experience or Salesforce1. For more information, see Add Lightning Components as Custom Tabs in Lightning Experience.

`force:hasRecordId`

Enables a component to be assigned the ID of the currently displaying record. Useful for components invoked in a context associated with a specific record, such as record page components or custom object actions. This interface has no effect except when used within Lightning Experience, Salesforce1, and template-based communities. For more information, see Configure Components for Lightning Experience Record Pages.

`force:hasSObjectName`

Enables a component to access the API name of the object of the currently displaying record. Useful for record page components. This interface has no effect except when used within Lightning Experience, Salesforce1, and template-based communities. For more information, see Configure Components for Lightning Experience Record Pages.

`force:lightningQuickAction`

Allows a component to display in a panel with standard action controls, such as a **Cancel** button. These components can also display and implement their own controls, but should handle events from the standard controls. If you implement `force:lightningQuickAction`, you can't implement `force:lightningQuickActionWithoutHeader` within the same component. For more information, see Configure Components for Custom Actions.

`force:lightningQuickActionWithoutHeader`

Allows a component to display in a panel without additional controls. The component should provide a complete user interface for the action. If you implement `force:lightningQuickActionWithoutHeader`, you can't implement `force:lightningQuickAction` within the same component. For more information, see Configure Components for Custom Actions.

`ltng:allowGuestAccess`

Add the `ltng:allowGuestAccess` interface to your Lightning Out dependency app to make it available to users without requiring them to authenticate with Salesforce. This interface lets you build your app with Lightning components, and deploy it anywhere and to anyone. For more information, see Share Lightning Out Apps with Non-Authenticated Users.

Event Reference

Use out-of-the-box events to enable component interaction within Lightning Experience or Salesforce1, or within your Lightning components. For example, these events enable your components to open a record create or edit page, or navigate to a record.

If you fire one of these events in your Lightning apps or components outside of Salesforce1 or Lightning Experience:

- You must handle the event by using the `<aura:handler>` tag in the handling component.
- Use the `<aura:registerEvent>` or `<aura:dependency>` tags to ensure that the event is sent to the client, when needed.

SEE ALSO:

aura:dependency

Fire Component Events

Fire Application Events

force:closeQuickAction

Closes a quick action panel. Only one quick action panel can be open in the app at a time.

To close a quick action panel, usually in response to completing or canceling the action, run `$A.get("e.force:closeQuickAction").fire();`.

This example closes the quick action panel after processing the input from the panel's user interface and displaying a "toast" message with the processing results. While the processing and the toast are unrelated to closing the quick action, the sequence is important. Firing `force:closeQuickAction` should be the last thing your quick action handler does.

```
/*quickAddController.js*/
({
    clickAdd: function(component, event, helper) {

        // Get the values from the form
        var n1 = component.find("num1").get("v.value");
        var n2 = component.find("num2").get("v.value");

        // Display the total in a "toast" status message
        var resultsToast = $A.get("e.force:showToast");
        resultsToast.setParams({
            "title": "Quick Add: " + n1 + " + " + n2,
            "message": "The total is: " + (n1 + n2) + "."
        });
        resultsToast.fire();

        // Close the action panel
        var dismissActionPanel = $A.get("e.force:closeQuickAction");
        dismissActionPanel.fire();
    }

})
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

force:createRecord

Opens a page to create a record for the specified `entityApiName`, for example, "Account" or "myNamespace__MyObject__c".

To display the record create page for an object, set the object name on the `entityApiName` parameter and fire the event. `recordTypeId` is optional and, if provided, specifies the record type for the created object. This example displays the record create panel for contacts.

```
createRecord : function (component, event, helper) {
    var createRecordEvent = $A.get("e.force:createRecord");
    createRecordEvent.setParams({
        "entityApiName": "Contact"
    });
    createRecordEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only. This event presents a standard page to create a record. That is, it doesn't respect overrides on the object's create action.

Attribute Name	Type	Description
`entityApiName`	String	Required. The API name of the custom or standard object, such as "Account", "Case", "Contact", "Lead", "Opportunity", or "namespace__objectName__c".
`recordTypeId`	String	The ID of the record type, if record types are available for the object.

force:editRecord

Opens the page to edit the record specified by `recordId`.

To display the record edit page for an object, set the object name on the `recordId` attribute and fire the event. This example displays the record edit page for a contact that's specified by `recordId`.

```
editRecord : function(component, event, helper) {
    var editRecordEvent = $A.get("e.force:editRecord");
    editRecordEvent.setParams({
         "recordId": component.get("v.contact.Id")
   });
    editRecordEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`recordId`	String	Required. The record ID associated with the record to be edited.

force:navigateToComponent (Beta)

Navigates from a Lightning component to another.

Note: This release contains a beta version of `force:navigateToComponent` with known limitations.

To navigate from a Lightning component to another, specify the component name using `componentDef`. This example navigates to a component `c:myComponent` and sets a value on the `contactName` attribute.

```
navigateToMyComponent : function(component, event, helper) {
        var evt = $A.get("e.force:navigateToComponent");
        evt.setParams({
            componentDef : "c:myComponent",
            componentAttributes: {
                contactName : component.get("v.contact.Name")
            }
        });
        evt.fire();
    }
```

You can navigate only to a component that's marked `access="global"` or a component within the current namespace.

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`componentDef`	String	The component to navigate to, for example, `c:myComponent`
`componentAttributes`	Object	The attributes for the component
`isredirect`	Boolean	Specifies whether the navigation is a redirect. If true, the browser replaces the current URL with the new one in the navigation history. This value defaults to `false`.

force:navigateToList

Navigates to the list view specified by `listViewId`.

To navigate to a list view, set the list view ID on the `listViewId` attribute and fire the event. This example displays the list views for contacts.

```
gotoList : function (component, event, helper) {
    var action = component.get("c.getListViews");
    action.setCallback(this, function(response){
        var state = response.getState();
        if (state === "SUCCESS") {
            var listviews = response.getReturnValue();
            var navEvent = $A.get("e.force:navigateToList");
            navEvent.setParams({
                "listViewId": listviews.Id,
                "listViewName": null,
                "scope": "Contact"
            });
            navEvent.fire();
        }
    });
    $A.enqueueAction(action);
}
```

This Apex controller returns all list views for the contact object.

```
@AuraEnabled
public static List<ListView> getListViews() {
    List<ListView> listviews =
        [SELECT Id, Name FROM ListView WHERE SobjectType = 'Contact'];

    // Perform isAccessible() check here
    return listviews;
}
```

You can also provide a single list view ID by providing the list view name you want to navigate to in the SOQL query.

```
SELECT Id, Name FROM ListView WHERE SobjectType = 'Contact' and Name='All Contacts'
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`listViewId`	String	Required. The ID of the list view to be displayed.
`listViewName`	String	Specifies the name for the list view and doesn't need to match the actual name. To use the actual name that's saved for the list view, set `listViewName` to null.
`scope`	String	The name of the sObject in the view, for example, "Account" or "namespace__MyObject__c".

SEE ALSO:

CRUD and Field-Level Security (FLS)

force:navigateToObjectHome

Navigates to the object home specified by the `scope` attribute.

To navigate to an object home, set the object name on the `scope` attribute and fire the event. This example displays the home page for a custom object.

```
navHome : function (component, event, helper) {
    var homeEvent = $A.get("e.force:navigateToObjectHome");
    homeEvent.setParams({
        "scope": "myNamespace__myObject__c"
    });
    homeEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`scope`	String	Required. The API name of the custom or standard object, such as "Contact", or "namespace__objectName__c".
`resetHistory`	Boolean	Resets history if set to true. Defaults to false, which provides a Back button in Salesforce1.

force:navigateToRelatedList

Navigates to the related list specified by `parentRecordId`.

To navigate to a related list, set the parent record ID on the `parentRecordId` attribute and fire the event. For example, to display a related list for a Contact object, the `parentRecordId` is `Contact.Id`. This example displays the related cases for a contact record.

```
gotoRelatedList : function (component, event, helper) {
    var relatedListEvent = $A.get("e.force:navigateToRelatedList");
    relatedListEvent.setParams({
        "relatedListId": "Cases",
        "parentRecordId": component.get("v.contact.Id")
    });
    relatedListEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`parentRecordId`	String	Required. The ID of the parent record.
`relatedListId`	String	Required. The API name of the related list to display, such as "Contacts" or "Opportunities".

force:navigateToSObject

Navigates to an sObject record specified by `recordId`.

To display the record view, set the record ID on the `recordId` attribute and fire the event.

The record view contains slides that displays the Chatter feed, the record details, and related information. This example displays the related information slide of a record view for the specified record ID.

Note: You can set a specific slide in Salesforce1, but not in Lightning Experience.

```
createRecord : function (component, event, helper) {
    var navEvt = $A.get("e.force:navigateToSObject");
    navEvt.setParams({
      "recordId": "00QB0000000ybNX",
      "slideDevName": "related"
    });
    navEvt.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`recordId`	String	Required. The record ID.
`slideDevName`	String	Specifies the slide within the record view to display initially. Valid options are: • `detail`: The record detail slide. This is the default value. • `chatter`: The Chatter slide • `related`: The related information slide This attribute has no effect in Lightning Experience.

force:navigateToURL

Navigates to the specified URL.

Relative and absolute URLs are supported. Relative URLs are relative to the Salesforce1 mobile browser app domain, and retain navigation history. External URLs open in a separate browser window.

Use relative URLs to navigate to different screens within your app. Use external URLs to allow the user to access a different site or app, where they can take actions that don't need to be preserved in your app. To return to your app, the separate window that's opened by an external URL must be closed when the user is finished with the other app. The new window has a separate history from your app, and this history is discarded when the window is closed. This also means that the user can't click a Back button to go back to your app; the user must close the new window.

`mailto:`, `tel:`, `geo:`, and other URL schemes are supported for launching external apps and attempt to "do the right thing." However, support varies by mobile platform and device. `mailto:` and `tel:` are reliable, but we recommend that you test any other URLs on a range of expected devices.

Note: Only standard URL schemes are supported by `navigateToURL`. To access custom schemes, use `window.location` instead.

When using `mailto:` and `tel:` URL schemes, you can also consider using `ui:outputEmail` and `ui:outputURL` components.

This example navigates a user to the opportunity page, `/006/o`, using a relative URL.

```
gotoURL : function (component, event, helper) {
    var urlEvent = $A.get("e.force:navigateToURL");
    urlEvent.setParams({
      "url": "/006/o"
    });
    urlEvent.fire();
}
```

This example opens an external website when the link is clicked.

```
navigate : function(component, event, helper) {

    //Find the text value of the component with aura:id set to "address"
    var address = component.find("address").get("v.value");

    var urlEvent = $A.get("e.force:navigateToURL");
    urlEvent.setParams({
      "url": 'https://www.google.com/maps/place/' + address
    });
    urlEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

Attribute Name	Type	Description
`isredirect`	Boolean	Indicates that the new URL should replace the current one in the navigation history. Defaults to `false`.
`url`	String	Required. The URL of the target.

force:recordSave

Saves a record.

`force:recordSave` is handled by the `force:recordEdit` component. This examples shows a `force:recordEdit` component, which takes in user input to update a record specified by the `recordId` attribute. The button fires the `force:recordSave` event.

```
<force:recordEdit aura:id="edit" recordId="a02D0000006V8Ni"/>
<ui:button label="Save" press="{!c.save}"/>
```

This client-side controller fires the event to save the record.

```
save : function(component, event, helper) {
    component.find("edit").get("e.recordSave").fire();
    // Update the component
    helper.getRecords(component);
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

force:recordSaveSuccess

Indicates that the record has been successfully saved.

`force:recordSaveSuccess` is used with the `force:recordEdit` component. This examples shows a `force:recordEdit` component, which takes in user input to update a record specified by the `recordId` attribute. The button fires the `force:recordSave` event.

```
<aura:attribute name="recordId" type="String" default="a02D0000006V8Ni"/>
<aura:attribute name="saveState" type="String" default="UNSAVED" />
<aura:handler name="onSaveSuccess" event="force:recordSaveSuccess"
action="{!c.handleSaveSuccess}"/>

<force:recordEdit aura:id="edit" recordId="{!v.recordId}" />
<ui:button label="Save" press="{!c.save}"/>
Record save status: {!v.saveState}
```

This client-side controller fires the event to save the record and handle it accordingly.

```
({
    save : function(cmp, event) {
        // Save the record
        cmp.find("edit").get("e.recordSave").fire();
    },

    handleSaveSuccess : function(cmp, event) {
        // Display the save status
        cmp.set("v.saveState", "SAVED");
    }
})
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

force:refreshView

Reloads the view.

To refresh a view, run `$A.get("e.force:refreshView").fire();`, which reloads all data for the view.

This example refreshes the view after an action is successfully completed.

```
refresh : function(component, event, helper) {
    var action = cmp.get('c.myController');
    action.setCallback(cmp,
        function(response) {
            var state = response.getState();
            if (state === 'SUCCESS'){
                $A.get('e.force:refreshView').fire();
            } else {
                 //do something
            }
        }
    );
    $A.enqueueAction(action);
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

force:showToast

Displays a toast notification with a message.

A toast displays a message below the header at the top of a view. The message is specified by the `message` attribute.

This example displays a toast message "**`Success!`** `The record has been updated successfully.`".

```
showToast : function(component, event, helper) {
    var toastEvent = $A.get("e.force:showToast");
    toastEvent.setParams({
        "title": "Success!",
        "message": "The record has been updated successfully."
    });
    toastEvent.fire();
}
```

Note: This event is handled by the `one.app` container. It's supported in Lightning Experience and Salesforce1 only.

The background color and icon used by a toast is controlled by the `type` attribute. For example, setting it to `success` displays the toast notification with a green background and checkmark icon. This toast displays for 5000ms, with a close button in the top right corner when the `mode` attribute is `dismissible`.

Attribute Name	Type	Description
`title`	String	Specifies the toast title in bold.
`message`	String	Required. Specifies the message to display.
`key`	String	Specifies an icon when the toast type is `other`. Icon keys are available at the Lightning Design System Resources page.
`duration`	Integer	Toast duration in milliseconds. The default is 5000ms.
`type`	String	The toast type, which can be `error`, `warning`, `success`, or `info`. The default is `other`, which is styled like an `info` toast and doesn't display an icon, unless specified by the `key` attribute. Available in API version 37.0 and later.
`mode`	String	The toast mode, which controls how users can dismiss the toast. The default is `dismissible`, which displays the close button. Available in API version 37.0 and later. Valid values: • `dismissible`: Remains visible until you press the close button or `duration` has elapsed, whichever comes first. • `pester`: Remains visible until `duration` has elapsed. No close button is displayed. • `sticky`: Remains visible until you press the close buttons.

forceCommunity:analyticsInteraction

Tracks events triggered by custom components in Communities and sends the data to Google Analytics.

For example, you could create a custom button and include the `forceCommunity:analyticsInteraction` event in the button's client-side controller. Clicking the button sends event data to Google Analytics.

```
onClick : function(cmp, event, helper) {
    var analyticsInteraction = $A.get("e.forceCommunity:analyticsInteraction");
    analyticsInteraction.setParams({
        hitType : 'event',
        eventCategory : 'Button',
        eventAction : 'click',
        eventLabel : 'Winter Campaign Button',
        eventValue: 200
    });
    analyticsInteraction.fire();
}
```

Note:

- This event is supported in template-based communities only. To enable event tracking, add your Google Analytics tracking ID in **Settings** > **Advanced** in Community Builder and publish the community.
- Google Analytics isn't supported in sandbox environments.

Attribute Name	Type	Description
`hitType`	String	Required. The type of hit. `'event'` is the only permitted value.
`eventCategory`	String	Required. The type or category of item that was interacted with, such as a button or video.
`eventAction`	String	Required. The type of action. For example, for a video player, actions could include play, pause, or share.
`eventLabel`	String	Can be used to provide additional information about the event.
`eventValue`	Integer	A positive numeric value associated with the event.

forceCommunity:routeChange

The system fires the `forceCommunity:routeChange` event when a page's URL changes. Custom Lightning components can listen to this system event and handle it as required—for example, for analytics or SEO purposes.

Note: This event is supported in template-based communities only.

This sample component listens to the system event.

```
<aura:component implements="forceCommunity:availableForAllPageTypes">
   <aura:attribute name="routeChangeCounter" default="0" type="Integer" required="false"/>

    <aura:handler event="forceCommunity:routeChange" action="{!c.handleRouteChange}"/>
    <h1>Route was changed: {!v.routeChangeCounter} times</h1>
</aura:component>
```

This client-side controller example handles the system event.

```
({handleRouteChange : function(component, event, helper) {
    component.set('v.routeChangeCounter', component.get('v.routeChangeCounter') + 1);
    }
})
```

lightning:openFiles

Opens one or more file records from the ContentDocument and ContentHubItem objects.

On desktops, the event opens the SVG file preview player, which lets you preview images, documents, and other files in the browser. The file preview player supports full-screen presentation mode and provides quick access to file actions, such as upload, delete, download, and share.

On mobile devices, the file is downloaded. If the device supports file preview, the device's preview app is opened.

This example opens a single file.

```
openSingleFile: function(cmp, event, helper) {
    $A.get('e.lightning:openFiles').fire({
        recordIds: [component.get("v.currentContentDocumentId")]
    });
}
```

This example opens multiple files.

```
openMultipleFiles: function(cmp, event, helper) {
    $A.get('e.lightning:openFiles').fire({
        recordIds: component.get("v.allContentDocumentIds"),
        selectedRecordId: component.get("v.currentContentDocumentId")
    });
}
```

Note: This event is supported in Lightning Experience, Salesforce1, and communities based on the Customer Service (Napili) template only.

Attribute Name	Type	Description
`recordIds`	String[]	Required. IDs of the records to open.
`selectedRecordId`	String	ID of the first record to open from the list specified in `recordIds`. If a value isn't provided or is incorrect, the first item in the list is used.

ltng:selectSObject

Sends the `recordId` of an object when it's selected in the UI.

To select an object, set the record ID on the `recordId` attribute. Optionally, specify a channel for this event so that your components can select if they want to listen to particular event messages.

```
selectedObj: function(component, event) {
 var selectedObjEvent = $A.get("e.ltng:selectSObject");
 selectedObjEvent.setParams({
          "recordId": "0061a000004x8e1",
          "channel": "AccountsChannel"
 });
 selectedObj.fire();
}
```

Attribute Name	Type	Description
`recordId`	String	Required. The record ID associated with the record to select.
`channel`	String	Specify this field if you want particular components to process some event messages while ignoring others.

ltng:sendMessage

Passes a message between two components.

To send a message, specify a string of text that you want to pass between components. Optionally, specify a channel for this event so that your components can select if they want to listen to particular event messages

```
sendMsg: function(component, event) {
 var sendMsgEvent = $A.get("e.ltng:sendMessage");
 sendMsgEvent.setParams({
          "message": "Hello World",
          "channel": "AccountsChannel"
 });
 sendMsgEvent.fire();
}
```

Attribute Name	Type	Description
`message`	String	Required. The text that you want to pass between components.
`channel`	String	Specify this field if you want particular components to process some event messages while ignoring others.

ui:clearErrors

Indicates that any validation errors should be cleared.

To set a handler for the `ui:clearErrors` event, use the `onClearErrors` system attribute on a component that extends `ui:input`, such as `ui:inputNumber`.

The following `ui:inputNumber` component handles an error when the `ui:button` component is pressed. You can fire and handle these events in a client-side controller.

```
<aura:component>
    Enter a number:
    <!-- onError calls your client-side controller to handle a validation error -->
    <!-- onClearErrors calls your client-side controller to handle clearing of errors -->

    <ui:inputNumber aura:id="inputCmp" onError="{!c.handleError}"
onClearErrors="{!c.handleClearError}"/>

    <!-- press calls your client-side controller to trigger validation errors -->
    <ui:button label="Submit" press="{!c.doAction}"/>
</aura:component>
```

For more information, see Validating Fields on page 230.

ui:collapse

Indicates that a menu component collapses.

For example, the `ui:menuList` component registers this event and handles it when it's fired.

```
<aura:registerEvent name="menuCollapse"  type="ui:collapse"
                    description="The event fired when the menu list collapses." />
```

You can handle this event in a `ui:menuList` component instance. This example shows a menu component with two list items. It handles the `ui:collapse` and `ui:expand` events.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Contacts"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu"
                     menuCollapse="{!c.addMyClass}" menuExpand="{!c.removeMyClass}">
            <ui:actionMenuItem aura:id="item1" label="All Contacts"
                               click="{!c.doSomething}"/>
          <ui:actionMenuItem aura:id="item2" label="All Primary" click="{!c.doSomething}"/>

        </ui:menuList>
</ui:menu>
```

This client-side controller adds a CSS class to the trigger when the menu is collapsed and removes it when the menu is expanded.

```
({
    addMyClass : function(component, event, helper) {
        var trigger = component.find("trigger");
        $A.util.addClass(trigger, "myClass");
    },
    removeMyClass : function(component, event, helper) {
        var trigger = component.find("trigger");
        $A.util.removeClass(trigger, "myClass");
    }
})
```

ui:expand

Indicates that a menu component expands.

For example, the `ui:menuList` component registers this event and handles it when it's fired.

```
<aura:registerEvent name="menuExpand"  type="ui:expand"
                    description="The event fired when the menu list displays." />
```

You can handle this event in a `ui:menuList` component instance. This example shows a menu component with two list items. It handles the `ui:collapse` and `ui:expand` events.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Contacts"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu"
```

```
                     menuCollapse="{!c.addMyClass}" menuExpand="{!c.removeMyClass}">
            <ui:actionMenuItem aura:id="item1" label="All Contacts"
                               click="{!c.doSomething}"/>
          <ui:actionMenuItem aura:id="item2" label="All Primary" click="{!c.doSomething}"/>

        </ui:menuList>
</ui:menu>
```

This client-side controller adds a CSS class to the trigger when the menu is collapsed and removes it when the menu is expanded.

```
({
    addMyClass : function(component, event, helper) {
        var trigger = component.find("trigger");
        $A.util.addClass(trigger, "myClass");
    },
    removeMyClass : function(component, event, helper) {
        var trigger = component.find("trigger");
        $A.util.removeClass(trigger, "myClass");
    }
})
```

ui:menuFocusChange

Indicates that the user changed menu item focus in a menu component.

For example, this event is fired when the user scrolls up and down the menu list, which triggers a focus change in menu items. The `ui:menuList` component registers this event and handles it when it's fired.

```
<aura:registerEvent name="menuFocusChange"  type="ui:menuFocusChange"
                   description="The event fired when the menu list focus changes from one
 menu item to another." />
```

You can handle this event in a `ui:menuList` component instance. This example shows a menu component with two list items.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Contacts"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu"
                     menuFocusChange="{!c.handleChange}">
            <ui:actionMenuItem aura:id="item1" label="All Contacts" />
            <ui:actionMenuItem aura:id="item2" label="All Primary" />
        </ui:menuList>
</ui:menu>
```

ui:menuSelect

Indicates that a menu item has been selected in the menu component.

For example, the `ui:menuList` component registers this event so it can be fired by the component.

```
<aura:registerEvent name="menuSelect"  type="ui:menuSelect"
                    description="The event fired when a menu item is selected." />
```

You can handle this event in a `ui:menuList` component instance. This example shows a menu component with two list items. It handles the `ui:menuSelect` event and `click` events.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Contacts"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu" menuSelect="{!c.selected}">
            <ui:actionMenuItem aura:id="item1" label="All Contacts"
                                   click="{!c.doSomething}"/>
            <ui:actionMenuItem aura:id="item2" label="All Primary"
                                   click="{!c.doSomething}"/>
        </ui:menuList>
</ui:menu>
```

When a menu item is clicked, the `click` event is handled before the `ui:menuSelect` event, which corresponds to `doSomething` and `selected` client-side controllers in the following example.

```
({
    selected : function(component, event, helper) {
        var selected = event.getParam("selectedItem");

        // returns label of selected item
        var selectedLabel = selected.get("v.label");
    },

    doSomething : function(component, event, helper) {
        console.log("do something");
    }
})
```

Attribute Name	Type	Description
`selectedItem`	Component[]	The menu item which is selected
`hideMenu`	Boolean	Hides menu if set to true
`deselectSiblings`	Boolean	Deselects the siblings of the currently selected menu item
`focusTrigger`	Boolean	Sets focus to the `ui:menuTrigger` component

ui:menuTriggerPress

Indicates that a menu trigger is clicked.

For example, the `ui:menuTrigger` component registers this event so it can be fired by the component.

```
<aura:registerEvent name="menuTriggerPress"  type="ui:menuTriggerPress"
                    description="The event fired when the trigger is clicked." />
```

You can handle this event in a component that extends `ui:menuTrigger`, such as in a `ui:menuTriggerLink` component instance.

```
<ui:menu>
    <ui:menuTriggerLink aura:id="trigger" label="Contacts"
menuTriggerPress="{!c.triggered}"/>
        <ui:menuList class="actionMenu" aura:id="actionMenu">
```

```
            <ui:actionMenuItem aura:id="item1" label="All Contacts"
click="{!c.doSomething}"/>
          <ui:actionMenuItem aura:id="item2" label="All Primary" click="{!c.doSomething}"/>

        </ui:menuList>
</ui:menu>
```

This client-side controller retrieves the label of the trigger when it's clicked.

```
({
    triggered : function(component, event, helper) {
        var trigger = component.find("trigger");

        // Get the label on the trigger
        var triggerLabel = trigger.get("v.label");
    }
})
```

ui:validationError

Indicates that the component has validation errors.

To set a handler for the `ui:validationError` event, use the `onError` system attribute on a component that extends `ui:input`, such as `ui:inputNumber`.

The following `ui:inputNumber` component handles an error when the `ui:button` component is pressed. You can fire and handle these events in a client-side controller.

```
<aura:component>
    Enter a number:
    <!-- onError calls your client-side controller to handle a validation error -->
    <!-- onClearErrors calls your client-side controller to handle clearing of errors -->

    <ui:inputNumber aura:id="inputCmp" onError="{!c.handleError}"
onClearErrors="{!c.handleClearError}"/>

    <!-- press calls your client-side controller to trigger validation errors -->
    <ui:button label="Submit" press="{!c.doAction}"/>
</aura:component>
```

For more information, see Validating Fields on page 230.

Attribute Name	Type	Description
`errors`	`Object[]`	An array of error messages

System Event Reference

System events are fired by the framework during its lifecycle. You can handle these events in your Lightning apps or components, and within Salesforce1. For example, these events enable you to handle attribute value changes, URL changes, or when the app or component is waiting for a server response.

aura:doneRendering

Indicates that the initial rendering of the root application has completed.

Note: We don't recommend using the legacy `aura:doneRendering` event except as a last resort. Unless your component is running in complete isolation in a standalone app and not included in complex apps, such as Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may trigger your event handler multiple times.

This event is automatically fired if no more components need to be rendered or rerendered due to any attribute value changes. The `aura:doneRendering` event is handled by a client-side controller. A component can have only one `<aura:handler>` tag to handle this event.

```
<aura:handler event="aura:doneRendering" action="{!c.doneRendering}"/>
```

For example, you want to customize the behavior of your app after it's finished rendering the first time but not after subsequent rerenderings. Create an attribute to determine if it's the first rendering.

```
<aura:component>
    <aura:handler event="aura:doneRendering" action="{!c.doneRendering}"/>
    <aura:attribute name="isDoneRendering" type="Boolean" default="false"/>
    <!-- Other component markup here -->
    <p>My component</p>
</aura:component>
```

This client-side controller checks that the `aura:doneRendering` event has been fired only once.

```
({
  doneRendering: function(cmp, event, helper) {
    if(!cmp.get("v.isDoneRendering")){
      cmp.set("v.isDoneRendering", true);
      //do something after component is first rendered
    }
  }
})
```

Note: When `aura:doneRendering` is fired, `component.isRendered()` returns `true`. To check if your element is visible in the DOM, use utilities such as `component.getElement()`, `component.hasClass()`, or `element.style.display`.

The `aura:doneRendering` handler contains these required attributes.

Attribute Name	Type	Description
`event`	String	The name of the event, which must be set to `aura:doneRendering`.
`action`	Object	The client-side controller action that handles the event.

aura:doneWaiting

Indicates that the app is done waiting for a response to a server request. This event is preceded by an `aura:waiting` event. This event is fired after `aura:waiting`.

Note: We don't recommend using the legacy `aura:doneWaiting` event except as a last resort. The `aura:doneWaiting` application event is fired for every server response, even for responses from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may fire server-side actions and trigger your event handler multiple times.

This event is automatically fired if no more response from the server is expected. The `aura:doneWaiting` event is handled by a client-side controller. A component can have only one `<aura:handler>` tag to handle this event.

```
<aura:handler event="aura:doneWaiting" action="{!c.hideSpinner}"/>
```

This example hides a spinner when `aura:doneWaiting` is fired.

```
<aura:component>
     <aura:handler event="aura:doneWaiting" action="{!c.hideSpinner}"/>
    <!-- Other component markup here -->
    <center><ui:spinner aura:id="spinner"/></center>
</aura:component>
```

This client-side controller fires an event that hides the spinner.

```
({
    hideSpinner : function (component, event, helper) {
        var spinner = component.find('spinner');
        var evt = spinner.get("e.toggle");
        evt.setParams({ isVisible : false });
        evt.fire();
    }
})
```

The `aura:doneWaiting` handler contains these required attributes.

Attribute Name	Type	Description
`event`	String	The name of the event, which must be set to `aura:doneWaiting`.
`action`	Object	The client-side controller action that handles the event.

aura:locationChange

Indicates that the hash part of the URL has changed.

This event is automatically fired when the hash part of the URL has changed, such as when a new location token is appended to the hash. The `aura:locationChange` event is handled by a client-side controller. A component can have only one `<aura:handler event="aura:locationChange">` tag to handle this event.

```
<aura:handler event="aura:locationChange" action="{!c.update}"/>
```

This client-side controller handles the `aura:locationChange` event.

```
({
    update : function (component, event, helper) {
        // Get the new location token from the event
        var loc = event.getParam("token");
        // Do something else
    }
})
```

The `aura:locationChange` handler contains these required attributes.

Attribute Name	Type	Description
`event`	String	The name of the event, which must be set to `aura:locationChange`.
`action`	Object	The client-side controller action that handles the event.

The `aura:locationChange` event contains these attributes.

Attribute Name	Type	Description
`token`	String	The hash part of the URL.
`querystring`	Object	The query string portion of the hash.

aura:systemError

Indicates that an error has occurred.

This event is automatically fired when an error is encountered during the execution of a server-side action. The `aura:systemError` event is handled by a client-side controller. A component can have only one `<aura:handler event="aura:systemError">` tag in markup to handle this event.

```
<aura:handler event="aura:systemError" action="{!c.handleError}"/>
```

This example shows a button that triggers an error and a handler for the `aura:systemError` event .

```
<aura:component controller="namespace.myController">
    <aura:handler event="aura:systemError" action="{!c.showSystemError}"/>
    <aura:attribute name="response" type="Aura.Action"/>
    <!-- Other component markup here -->
    <ui:button aura:id="trigger" label="Trigger error" press="{!c.trigger}"/>
</aura:component>
```

This client-side controller triggers the firing of an error and handles that error.

```
({
    trigger: function(cmp, event) {
        // Call an Apex controller that throws an error
        var action = cmp.get("c.throwError");
        action.setCallback(cmp, function(response){
            cmp.set("v.response", response);
        });
        $A.enqueueAction(action);
    },

    showSystemError: function(cmp, event) {
        // Handle system error
        console.log(cmp);
        console.log(event);
    }
})
```

The `aura:handler` tag for the `aura:systemError` event contains these required attributes.

Attribute Name	Type	Description
`event`	String	The name of the event, which must be set to `aura:systemError`.
`action`	Object	The client-side controller action that handles the event.

The `aura:systemError` event contains these attributes. You can retrieve the attribute values using `event.getParam("`***`attributeName`***`")`.

Attribute Name	Type	Description
`message`	String	The error message.
`error`	String	The error object.

SEE ALSO:

Throwing and Handling Errors

aura:valueChange

Indicates that an attribute value has changed.

This event is automatically fired when an attribute value changes. The `aura:valueChange` event is handled by a client-side controller. A component can have multiple `<aura:handler name="change">` tags to detect changes to different attributes.

```
<aura:handler name="change" value="{!v.items}" action="{!c.itemsChange}"/>
```

This example updates a Boolean value, which automatically fires the `aura:valueChange` event.

```
<aura:component>
    <aura:attribute name="myBool" type="Boolean" default="true"/>

    <!-- Handles the aura:valueChange event -->
    <aura:handler name="change" value="{!v.myBool}" action="{!c.handleValueChange}"/>
    <ui:button label="change value" press="{!c.changeValue}"/>
</aura:component>
```

These client-side controller actions trigger the value change and handle it.

```
({
    changeValue : function (component, event, helper) {
      component.set("v.myBool", false);
    },

    handleValueChange : function (component, event, helper) {
        // handle value change
        console.log("old value: " + event.getParam("oldValue"));
        console.log("current value: " + event.getParam("value"));
    }
})
```

The `valueChange` event gives you access to the previous value (`oldValue`) and the current value (`value`) in the handler action. In this example, `oldValue` returns `true` and `value` returns `false`.

The `change` handler contains these required attributes.

Attribute Name	Type	Description
`name`	String	The name of the handler, which must be set to `change`.
`value`	Object	The attribute for which you want to detect changes.
`action`	Object	The client-side controller action that handles the value change.

SEE ALSO:

Detecting Data Changes with Change Handlers

aura:valueDestroy

Indicates that a component has been destroyed.

This event is automatically fired when a component is being destroyed. The `aura:valueDestroy` event is handled by a client-side controller. A component can have only one `<aura:handler name="destroy">` tag to handle this event.

```
<aura:handler name="destroy" value="{!this}" action="{!c.handleDestroy}"/>
```

This client-side controller handles the `aura:valueDestroy` event.

```
({
    valueDestroy : function (component, event, helper) {
      var val = event.getParam("value");
      // Do something else here
    }
})
```

Let's say that you are viewing a component in Salesforce1. The `aura:valueDestroy` event is triggered when you tap on a different menu item on the Salesforce1 navigation menu, and your component is destroyed. In this example, the `value` parameter in the event returns the component that's being destroyed.

The `<aura:handler>` tag for the `aura:valueDestroy` event contains these required attributes.

Attribute Name	Type	Description
`name`	String	The name of the handler, which must be set to `destroy`.
`value`	Object	The value for which you want to detect the event for. The value that is being destroyed. Always set `value="{!this}"`.
`action`	Object	The client-side controller action that handles the destroy event.

The `aura:valueDestroy` event contains these attributes.

Attribute Name	Type	Description
`value`	String	The component being destroyed, which is retrieved via `event.getParam("value")`.

aura:valueInit

Indicates that an app or component has been initialized.

This event is automatically fired when an app or component is initialized, prior to rendering. The `aura:valueInit` event is handled by a client-side controller. A component can have only one `<aura:handler name="init">` tag to handle this event.

```
<aura:handler name="init" value="{!this}" action="{!c.doInit}"/>
```

For an example, see Invoking Actions on Component Initialization on page 229.

Note: Setting `value="{!this}"` marks this as a value event. You should always use this setting for an `init` event.

The `init` handler contains these required attributes.

Attribute Name	Type	Description
`name`	String	The name of the handler, which must be set to `init`.
`value`	Object	The value that is initialized, which must be set to `{!this}`.
`action`	Object	The client-side controller action that handles the value change.

aura:waiting

Indicates that the app is waiting for a response to a server request. This event is fired before `aura:doneWaiting`.

Note: We don't recommend using the legacy `aura:waiting` event except as a last resort. The `aura:waiting` application event is fired for every server request, even for requests from other components in your app. Unless your component is running in complete isolation in a standalone app and not included in Lightning Experience or Salesforce1, you probably don't want to handle this application event. The container app may fire server-side actions and trigger your event handler multiple times.

This event is automatically fired when a server-side action is added using `$A.enqueueAction()` and subsequently run, or when it's expecting a response from an Apex controller. The `aura:waiting` event is handled by a client-side controller. A component can have only one `<aura:handler>` tag to handle this event.

```
<aura:handler event="aura:waiting" action="{!c.showSpinner}"/>
```

This example shows a spinner when `aura:waiting` is fired.

```
<aura:component>
     <aura:handler event="aura:waiting" action="{!c.showSpinner}"/>
    <!-- Other component markup here -->
    <center><ui:spinner aura:id="spinner"/></center>
</aura:component>
```

This client-side controller fires an event that displays the spinner.

```
({
    showSpinner : function (component, event, helper) {
        var spinner = component.find('spinner');
        var evt = spinner.get("e.toggle");
        evt.setParams({ isVisible : true });
        evt.fire();
    }
})
```

The `aura:waiting` handler contains these required attributes.

Attribute Name	Type	Description
`event`	String	The name of the event, which must be set to `aura:waiting`.
`action`	Object	The client-side controller action that handles the event.

Supported HTML Tags

An HTML tag is treated as a first-class component by the framework. Each HTML tag is translated into an `<aura:html>` component, allowing it to enjoy the same rights and privileges as any other component.

For example, the framework automatically converts a standard HTML `<div>` tag to this component:

```
<aura:html tag="div" />
```

We recommend that you use components in preference to HTML tags. For example, use `ui:button` instead of `<button>`. Components are designed with accessibility in mind so users with disabilities or those who use assistive technologies can also use your app. When you start building more complex components, the reusable out-of-the-box components can simplify your job by handling some of the plumbing that you would otherwise have to create yourself. Also, these components are secure and optimized for performance.

Note that you must use strict XHTML. For example, use `<br/>` instead of `<br>`.

The majority of HTML5 tags are supported.

Some HTML tags are unsafe or unnecessary. The framework doesn't support these tags:

- `applet`
- `base`
- `basefont`
- `embed`
- `font`
- `frame`
- `frameset`
- `isindex`
- `noframes`
- `noscript`
- `object`
- `param`

Avoid `#` in the `href` Attribute of Anchor Tags

The hash mark (`#`) is a URL fragment identifier and is often used in Web development for navigation within a page. Avoid `#` in the `href` attribute of anchor tags in Lightning components as it can cause unexpected navigation changes, especially in the Salesforce1 mobile app. For example, use `href=""` instead of `href="#"`.

SEE ALSO:

Supporting Accessibility

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