

# Corporate CordaKYC - Deployment Instructions

## About this page

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- Pre-requisites
- Creating an Azure Cloud Platform VM
  - Setup an Azure VM
    - Create a Resource Group
    - Launch the VM
    - Connect to your VM
  - Configure Network Access
- Deploy Corda KYC to Azure
  - Deployment Steps
  - Log into your Azure VM:
  - Download scripts to your VM
  - Run Install Script
  - Ensure the service is running
  - Bootstrap the Corda KYC application
  - Test Your Deployment
  - Redeploy components of the KYC solution
  - Uninstall and start over
- FAQs

By the end of this walkthrough you will deploy the Corda KYC Application to Corda Testnet. Then you'll be able to use the Corda KYC Application (CorDapp) to interact with other "banks" and "customers". Corda Testnet allows CorDapps to interact with one another with well established identities in a peer to peer manner.

This guide will take you through the steps to set up a virtual machine (VM) on the Azure Cloud Platform and then deploy the KYC application to this Azure VM.

There are two different kinds of applications you can deploy: "bank" and "customer". This guide will allow you to deploy either or both roles. If you deploy both roles please do so on separate VMs.

## Pre-requisites

This is a highly technical guide so development experience is recommended.

The Azure UI changes frequently so the screenshots may differ from what you see.

There are many steps, please take care to follow all steps as skipping a step can result in confusing issues. If you need support please contact [austin.moothart@r3.com](mailto:austin.moothart@r3.com)

- Ensure you have a registered Microsoft Azure account which can create virtual machines and you are logged on to the Azure portal: <https://portal.azure.com>.

### Step 1

## Creating an Azure Cloud Platform VM

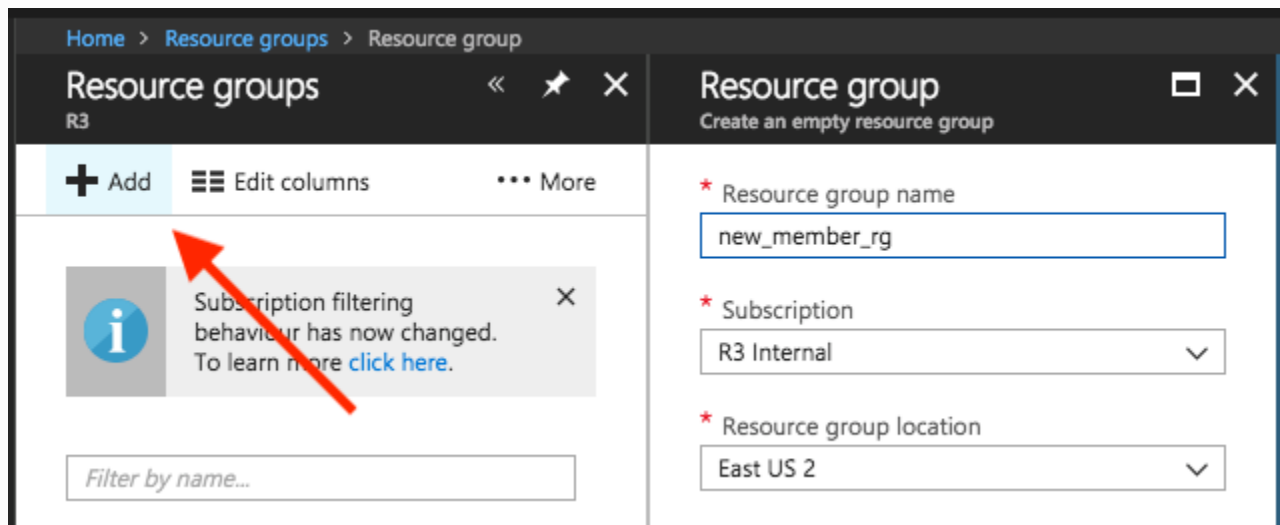
### Setup an Azure VM

Browse to <https://portal.azure.com> and log in with your Microsoft account.

### Create a Resource Group

Create a resource group in the Azure portal <https://portal.azure.com/#create/Microsoft.ResourceGroup>

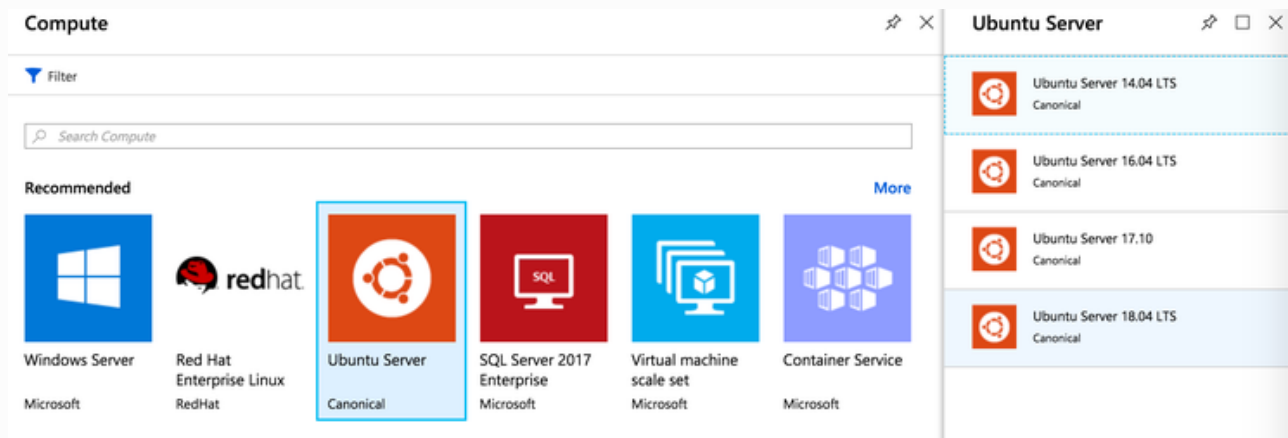
The resource group will hold all of the services that you create in Azure. For more information see Microsoft's documentation: <https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-overview> For more information see Microsoft's documentation: <https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-overview>



## Launch the VM

Next we're going to create a basic Azure VM to host the Corda application. Click "Virtual Machines" in the left navigation and click "Add" to create a new VM.

In this example we are going to use an Ubuntu server. Select "Ubuntu Server 18.04 LTS" and click "Create".



Azure provides a wizard to walk through to configure your new VM

### Step 1 Basics:

#### Required fields

- Name: this is the name of your VM in the Azure Portal. For example: "kyc-bank-q4" and "kyc-customer-q4" was used for R3 hosted Corda applications
- User name: the username for logging into the VM
- Authentication type: an SSH key or a password for your user. *Recommendation: if you prefer simple access use a password.*
  - Choose the authentication you prefer, both SSH and password will work
  - If you would like to use an SSH key (Mac/Linux) run this command: `ssh-keygen -t rsa`
  - Follow the steps for key generation and ensure the keys are stored under `~/.ssh/`
- Resource group: choose the resource group we created earlier from the "Use existing" dropdown.
- Location: Select a cloud region geographically near to your location to host your VM.
- Click on OK.

Home > Virtual machines > Compute > Ubuntu Server > Ubuntu Server 16.04 LTS > Create virtual machine > Basics

## Create virtual machine

### Basics

- 1 Basics  
Configure basic settings
- 2 Size  
Choose virtual machine size
- 3 Settings  
Configure optional features
- 4 Summary  
Ubuntu Server 16.04 LTS

\* Name

VM disk type

SSD

\* User name

\* Authentication type

SSH public key Password

\* SSH public key

\* Login with Azure Active Directory (Preview)

Enabled Disabled

Subscription

R3 Internal

\* Resource group

Create new Use existing

\* Location

East US 2

OK

### Step 2 Size:

Choose the "D4S\_V3 Standard" option and click "Select". The Corda KYC Can also run on "D2S\_V3 Standard" if you'd like to run on lower compute VM instances.

Home > Virtual machines > Compute > Ubuntu Server > Ubuntu Server 16.04 LTS > Create virtual machine > Choose a size

## Create virtual machine

1 Basics Done ✓

2 Size Choose virtual machine size >

3 Settings Configure optional features >

4 Summary Ubuntu Server 16.04 LTS >

### Choose a size

Browse the available sizes and their features

Search:

Compute type: Show all compute types

Disk type: SSD only

RECOMMENDED	SKU	TYPE	COMPUTE TYPE	VCPUS	GB RAM	DATA DISKS
	B1s	Standard	General purpose	1	1	2
	B1ms	Standard	General purpose	1	2	2
	B2s	Standard	General purpose	2	4	4
	B2ms	Standard	General purpose	2	8	4
	B4ms	Standard	General purpose	4	16	8
	B8ms	Standard	General purpose	8	32	16
★	D2s_v3	Standard	General purpose	2	8	4
★	D4s_v3	Standard	General purpose	4	16	8
	D8s_v3	Standard	General purpose	8	32	16
	D16s_v3	Standard	General purpose	16	64	32
	D32s_v3	Standard	General purpose	32	128	32

### Step 3 Settings:

Only one setting needs to change: "Select inbound public ports". Choose "**SSH (22)**" and "**HTTP (80)**" from the list as this is how we will log into the machine. There is a warning about exposing this port to the Internet which we will ignore because this is a temporary instance.

\* Public inbound ports  None  Allow selected ports

\* Select inbound ports

These ports will be exposed to the internet. Use the Advanced controls to limit inbound traffic to known IP addresses. You can also update inbound traffic rules later.

Click "OK"

### Step 4:

Your instance is now ready to create. Click Create and wait a few minutes for your instance to provision and start running.

You can find your new VM by clicking on "Virtual Machines" in the left navigation again

Home > Virtual machines > Compute > Ubuntu Server > Ubuntu Server 16.04 LTS > Create virtual machine > Create

## Create virtual machine

1 Basics Done ✓

2 Size Done ✓

3 Settings Done ✓

4 Summary Ubuntu Server 16.04 LTS >

Validation passed

### Offer details

Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs.

Ubuntu Server 16.04 LTS  
by Canonical  
Terms of use | privacy policy  
Pricing details

Standard D4s v3  
by Microsoft  
Terms of use | privacy policy  
0.2200 USD/hr  
Pricing for other VM sizes

**Azure resource**  
You may use your Azure monetary commitment funds or subscription credits for these purchases. Prices presented are retail prices and may not reflect discounts associated with your subscription.

### Summary

Basics

Subscription: \_\_\_\_\_ P2 Internet

Terms of use

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with each Marketplace offering above, (b) authorize Microsoft to charge or bill my current payment method for the fees associated with my use of the offering(s), including applicable taxes, with the same billing frequency as my Azure subscription, until I discontinue use of the offering(s), (c) agree that

**Create** Download template and parameters

## Connect to your VM

Once your instance is running click on the "Connect" button and copy the ssh command. For example:

```
ssh <username>@<VM public ip>
```

If you used an SSH key it will look like:

```
ssh -i ~/.ssh/<private key> <username>@<VM public ip>
```

Enter the ssh command into your terminal. At the prompt to continue connecting type yes.

- For password: then enter the password you configured earlier
- For SSH: enter the key's password if you set one

Once logged you should see a terminal that looks like this:

```
Welcome to Ubuntu 16.04.4 LTS (GNU/Linux 4.13.0-1014-azure x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
  http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

austin@kyc-customer-1:~$
```

Success! Hang onto this session, we'll come back to it shortly.

## Configure Network Access

Because this VM is on the public internet access is closed by default so we need to configure access.

### Open application ports

Back in the Azure portal for your VM click on networking:

Resource group (change): austinmoochart  
 Status: Running  
 Location: East US 2  
 Subscription (change): R3 Internal  
 Subscription ID: 4d17756c-2dac-4309-ba94-f85b5a36146f

Computer name: pw-test  
 Operating system: Linux  
 Size: Standard B1s (1 vcpu, 1 GB memory)  
 Public IP address: 40.70.132.201  
 Virtual network/subnet: austinmoochartvnet688/default  
 DNS name: Configure

Tags (change): Click here to add tags

Show data for last: 1 hour 6 hours 12 hours 1 day 7 days 30 days

**CPU (average)**  
 0.54 %

**Network (total)**  
 NETWORK IN: 9.77 MB  
 NETWORK OUT: 4.04 MB

Click on add inbound port rule

Virtual network/subnet: austinmoochartvnet688/default  
 Public IP: 104.209.173.95  
 Private IP: 10.0.1.26  
 Accelerated networking: Disabled

**INBOUND PORT RULES**  
 Network security group docs-nsg (attached to network interface: docs569)  
 Impacts 0 subnets, 1 network interfaces

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
300	SSH	22	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBo...	Any	Any	AzureLoadBala...	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

**OUTBOUND PORT RULES**  
 Network security group docs-nsg (attached to network interface: docs569)  
 Impacts 0 subnets, 1 network interfaces

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
65500	DenyAllOutBound	Any	Any	Any	Any	Deny

Add 1 rules with all required ports with any name and any priority:  
 Port range: 8080,8282,10002-10004,10103,1416 Name: kyc

**kyc**
✕

cordapp-trials

Save
✕ Discard
⋮ More

---

**\* Source** ⓘ

Any

**\* Source port ranges** ⓘ

\*

**\* Destination** ⓘ

Any

**\* Destination port ranges** ⓘ

8080,8282,10002-10004,10103,1416

**\* Protocol**

Any

TCP

UDP

**\* Action**

Allow

Deny

**\* Priority** ⓘ

330

**\* Name**

kyc

**Description**

## Public Azure DNS

We're going to Azure's DNS service for simplicity. You can configure this from the VM overview screen by clicking "configure" under "DNS name".

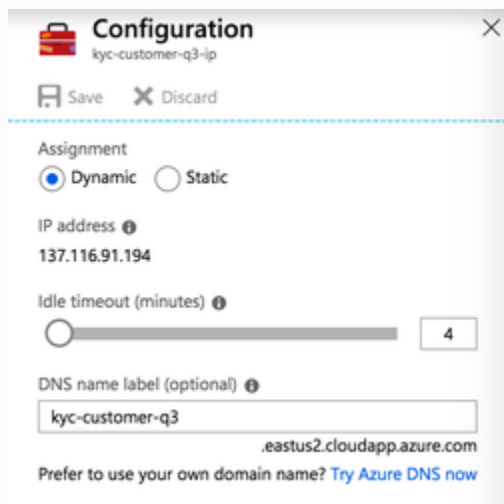
<p>Resource group <a href="#">(change)</a> <b>austinmoothart</b></p> <p>Status Running</p> <p>Location East US 2</p> <p>Subscription <a href="#">(change)</a> <b>R3 Internal</b></p> <p>Subscription ID 4d17756c-2dac-4309-ba94-f85b5a36146f</p> <p>Tags <a href="#">(change)</a> <a href="#">Click here to add tags</a></p>	<p>Computer name docs</p> <p>Operating system Linux</p> <p>Size Standard B1s (1 vcpus, 1 GB memory)</p> <p>Public IP address <b>104.209.173.95</b></p> <p>Virtual network/subnet <b>austinmoothartvnet688/default</b></p> <p>DNS name <b>Configure</b></p>
--	--

Provide a host name you'd like to use. Examples for this project include:



- kyc-bank-q4 => <http://kyc-bank-q4.eastus2.cloudapp.azure.com>
- kyc-customer-q4 => <http://kyc-customer-q4.eastus2.cloudapp.azure.com>

*Note: please use a different host name than our examples.*



Congratulations! You've successfully deployed and configured an Azure VM. Once you're ready, move onto "Deploy Corda KYC to Azure" below.

## Step 2

# Deploy Corda KYC to Azure

In this next section we'll deploy Corda KYC to your Azure VM from pre-built Docker containers. The deployment process is scripted, we'll walk through each step of the scripted deployment process.

### Bank vs Customer role

You will see references to "bank" and "customer" in the documentation. Each time you see this you should use the role that you're trying to deploy and not necessarily what you see in documentation.

## Deployment Steps

1. Log into your Azure VM
2. Upload scripts to your VM
3. Run install script
4. Ensure the service is running
5. Bootstrap your KYC Cordapp
6. Test your deployment

## Log into your Azure VM:

SSH into your instance using the same command from the Azure deployment guide:

```
ssh <username>@<VM public ip>
```

OR

```
ssh -i ~/.ssh/<private key> <username>@<VM public ip>
```

### Introduction to SSH

SSH allows you to remotely log into a computer with a command line.

Windows: Many engineers like using Putty to connect to remote machines: <https://www.putty.org/>

Mac: Using terminal you should have access to the command "ssh" which you can use to run the above command.

NOTE: many trial participants encounter connectivity issues reaching their Azure VMs. Please check any firewall restrictions your company has in place as these commonly block access.

## Download scripts to your VM

There is one script for deployment and sample customer data provided to help you run the Corda KYC trial. These are available on basecamp:

```
wget -O cordapp-trial.sh https://public.3.basecamp.com/p/kPKebNKpnkC2MBrEZDLJuPmu/upload/download/cordapp-trial
sudo chmod a+x cordapp-trial.sh
```

The trial script has 3 options: install, uninstall and bootstrap.

1. --install => Deploys Corda KYC
2. --uninstall => Remove Corda KYC
3. --bootstrap => Loads starting data for the KYC use case and joins the trial business network

If you're deploying a customer node then download the data R3 posted for you company from Basecamp: <https://3.basecamp.com/4051272/buckets/9293063/vaults/1384658891>

```
wget -O /tmp/corda/customerData.json <the public url for your JSON from Basecamp>
```

### Customer data download link

The link for the public url will be in the notes of the file that is hosted on basecamp. For example:



The customer data is available at /tmp/corda/customerData.json => Data for your fake company in the trial.

### Testnet Identity

Please ensure the R3 team has approved and configured your testnet account prior to proceeding.

## Run Install Script

The first command to run is `./cordapp-trial.sh --install`. From your ssh session run this script and answer the 5 questions which are asked. Ensure to provide accurate answers or the deployment may fail. The following are example answers from a successful customer deployment:

- Which KYC role would you like to deploy? (attester/bank/customer/datastore)
  - customer
- Enter the Azure Host Name for your Azure VM
  - <mybank-kyc-customer>.eastus2.cloudapp.azure.com
- Enter a one time access key from Corda Testnet (see below for one time key instructions)
  - 73f14f04-cb4b-4323-930f-c8cd27516daa
- What country will be on your X500 directory?
  - US
- What locality will be on your X500 directory?
  - New York

```
r3@kyc-customer-q3:~$ ./install.sh
CORDA TESTNET
Which KYC role would you like to deploy? (attester/bank/customer/datastore)
customer
Enter the Azure Host Name for your Azure VM
kyc-customer-q3.eastus2.cloudapp.azure.com
Enter a one time access key from Corda Testnet
419e6c16-fc92-4a9d-9e2f-fc03f5b7a739
What country will be on your X500 directory?
US
What locality will be on your X500 directory?
New York
```

## One time Access Key

Retrieve your one time key by logging into <https://testnet.corda.network/platform>

Once logged in, copy the text in the "Copy this script to your terminal" box. We only need the UUID at this time. You do not need to press the "Copy" button.

Paste this UUID into the build script in your Azure terminal.

**Deploy your Corda node**

Deploy in the cloud **RECOMMENDED**

- 1 Setup your cloud configuration
  - AWS
  - Google
- 2 Copy this script to your terminal
 

i\_KEY=d9a7ef95-b35e-4423-af75- Copy

---

Deploy locally

- 1 Setup your local environment
 

Router Configuration
- 2 Download your pre-configured Corda node
 

Download

**Next**

## Wait

The script takes several minutes to run as all the components are downloaded and installed.

Once completed check the logs to see if there were any errors. If so, resolve them and try again (see uninstall) or contact R3 to get support.

## Ensure the service is running

The services take about 60 seconds to start up. You can check on their status by using: `sudo docker ps -a`

The running services should look like this. Check the status and make sure no container has "exited".

```
r3@kyc-customer-q3:~$ sudo docker ps -a
CONTAINER ID        IMAGE                                     COMMAND                  CREATED            STATUS              PORTS
75b2ed6950ab       cordapptrials.azurecr.io/kyc-ui:v1.0   "entrypoint.sh"        3 minutes ago     Up 3 minutes       8080/tcp, 8181/tcp, 8282/tcp, 0.0.0.0:420
0->4200/tcp, 8383/tcp
af5233c63f12       cordapptrials.azurecr.io/kyc-customer-services:v1.0 "entrypoint.sh"        3 minutes ago     Up 3 minutes       0.0.0.0:8080->8080/tcp, 0.0.0.0:8181->818
1/tcp, 0.0.0.0:8282->8282/tcp, 5005/tcp, 0.0.0.0:8383->8383/tcp
customer_service
fcbb083781e0       cordapptrials.azurecr.io/kyc-customer-cordapp:v1.1 "docker-entrypoint.sh" 4 minutes ago     Up 3 minutes       0.0.0.0:10002-10004->10002-10004/tcp, 0.0
.0.0:10103->10103/tcp
customer_cordapp
```

## Debug commands

- Tail the logs:
  - `sudo docker logs -f customer_cordapp`
  - `sudo docker logs -f customer_service`
  - `sudo docker logs -f customer_ui`
- Restart a Docker container
  - `sudo docker restart customer_cordapp`
  - `sudo docker restart customer_bank`
  - `sudo docker restart customer_ui`
- Log into a Docker container
  - `sudo docker exec -it customer_cordapp bash`
    - Note: logs are available in `/opt/corda/logs`
  - `sudo docker exec -it customer_service bash`
  - `sudo docker exec -it customer_ui bash`

## Bootstrap the Corda KYC application

The last step is to load the initial KYC data into your node with a process called "bootstrapping". You can do this by running the `cordapp-trial` script with a flag `--bootstrap`, provided by R3.

Both banks and customers will set the KYC fields and join the KYC Trial Business Network.

There will be 3 questions. Ensure the answers are accurate or the bootstrapping process may fail. The following are example answers from a successful bootstrap:

- Which KYC role would you like to bootstrap? (attester/bank/customer/datastore)
  - customer
- What host name is your cordapp hosted at?
  - `kyc-customer-q4.eastus2.cloudapp.azure.com`
- Which alternative name on the network do you want to use? (Please note name will be visible to others)
  - Primary Customer KYC Q4 Trial

The response should look similar to:

```
[ "KycFieldMaster Transaction id 002965ED572E17782DABB87FA4E0F56C197D801FDA49A499661C89FE21D823CD committed to ledger.", "KycGroupMaster Transaction id 431FB8DEA585A374CDB454ED68F2BAAFA2E39CDA77D8D6637D6A296FA39EF424 committed to ledger." ]
```

```
[ "KycFieldMaster Transaction id 8FC5AE3E51BA3374A0BF234BFC56D6E021F50C8E91A7E3057F1FC1BFC73E278A committed to ledger.", "KycGroupMaster Transaction id F8B9726F8CFA80044606AF88B06891D620BE40B710A9A1FE1C93B0DF02F85B01 committed to ledger." ] Transaction ids [ CreateProfile: 7887E8F13CB95DF374E65C021C9CF794E8D8083072B7CEE0DF894A56084820D7`, `DocumentUpload: 2D8CC04A1C584295D9F3FD872E8BCB6E9F8736404C32A924010E6AA33C6B95C1`, `HeadlineInfo: 3A383BB1F4B142B8958268539A5822D20A512598019A8F07EBDF53E04EC33951` ] committed to ledger. Default attestation complete with transaction Id: E1B69C38B0054D91BF60A71AFD0CCF6DC36AB0793A6ED77C9AF52A98FC29E6A4
```

## Customer Bootstrapping - Extra Response

There is an additional step with customers to upload sample customer data. Ensure that the bootstrap script also output information like the one below:

```
Transaction ids [ CreateProfile: 545D004992035DAB188682F4B78F5E908DCA880BC158BFC75BA6BAB6F3003FFB`, `DocumentUpload: AA2BB17D7D6A12D6C43F2BA53A9F2656559425F2C55A13D2C543EC9C5F1D63F2`, `HeadlineInfo: 8AB2BA532E6C1C6A2EFAF678493A33FF8B47C76328015235DC543BFC8DE35F38` ] committed to ledger.
```

Default attestation complete with transaction id: 6AF90D361C310E54C20A52BDC355DED7AD7D0168193265F24124B6C21BAF34B5

## Test Your Deployment

You're done! Last step of your deployment, navigate to the newly running services on Azure to see the deployed KYC application:

- {your url}.{your region}.cloudapp.azure.com => KYC UI
- {your url}.{your region}.cloudapp.azure.com:10004 => Cordapp basic UI

## Default login credentials

Default login to Bank

- username: b1
- password: b1

Default login to Customer

- username: c1
- password: c1

## Redeploy components of the KYC solution

In the event that something breaks or you need to update the application you can run the script for the service you want to redeploy. Not yet implemented.

If you redeploy the cordapp make sure to run bootstrap again to reload both KYC, customer and default attester info.

## Uninstall and start over

If at any point you are concerned something broke and you can't make forward progress you can uninstall and start over.

Run "uninstall.sh" and specify which role you are uninstalling. The script will take a moment and you will see output similar to the following:

```
r3@kyc-customer-q3:~$ ./uninstall.sh --role customer
ROLE = customer
customer_cordapp
customer_service
customer_ui
customer_cordapp
customer_service
customer_ui
```

### Uninstall Clears Data

By uninstalling your Corda KYC application this will clear all your data. You will need to rejoin the network and go through the KYC process again.

## FAQs

- How do I get another one time key for a Testnet deployment?
  - Refresh <https://testnet.corda.network/platform> and copy the new key that shows up.
- Why isn't my cordapp showing up in Testnet?
  - New nodes can take up to 10 minutes to appear in the network map list.