AWS Security Operations

Lab Guide

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Logistics

- **Format:** Overview presentation and lab setup, followed by paced exercises with a section recap.
- **Workshop Duration**: 2 hours
- **Target Audience:** Technical security users (security engineers, architects, DevOps) who have heard of Dome9 and know what Dome9 offers
- The organizing team is comprised of one speaker and 1-2 technical staff to help out and answer questions
- Participants bring their own laptops and have an AWS account setup (preferably beforehand) - **Please do this early on since it takes a few hours for a new AWS account to sync with a CFT template**
- Participants need to download the Cloudformation (**CFT**) template to run this lab - Please download CFT from the Github here

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6. **S3 Security Lab** (20 min)
    i. Exercise 6.1: Identify publicly exposed S3 buckets (2) using Dome9
    ii. Exercise 6.2: S3 Access Controls (ACL)
    iii. Exercise 6.3: S3 Access Controls (Bucket policies)
    iv. Section Wrap Up
7. **Offboarding** (5 min)

AWS Setup

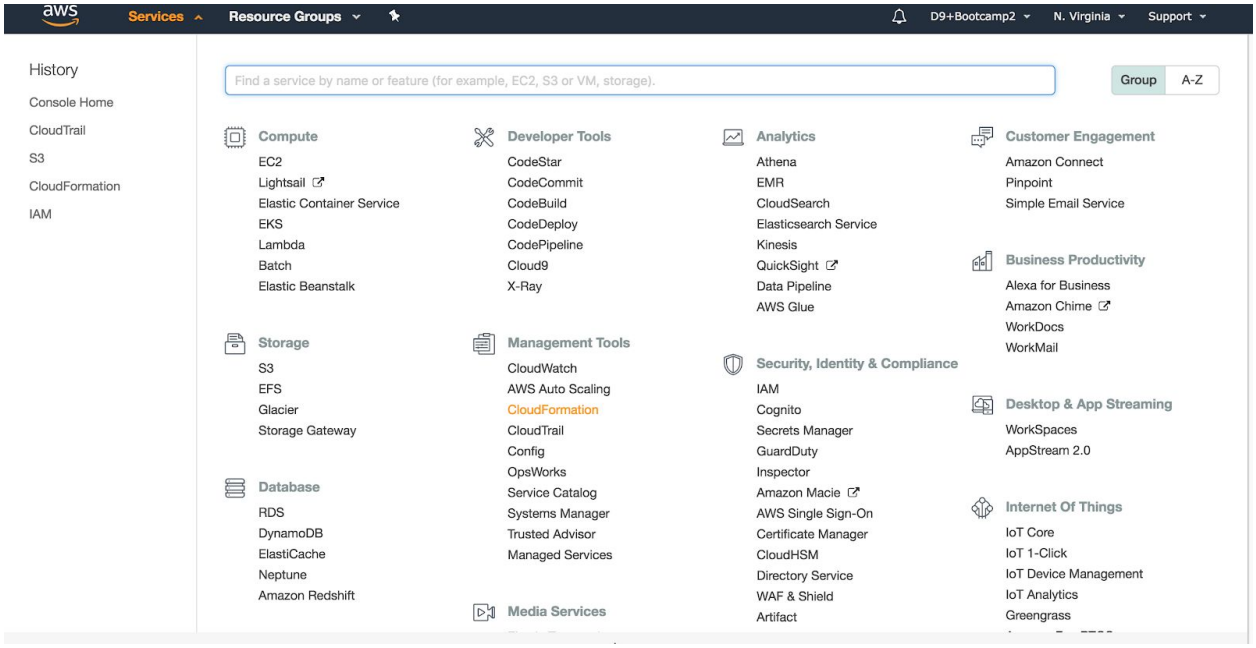
Exercise 1.1: Setup lab environment (Login to your lab AWS account)

The instructor should provide you with an AWS Account for this workshop. Ensure you have an AWS account setup before proceeding.

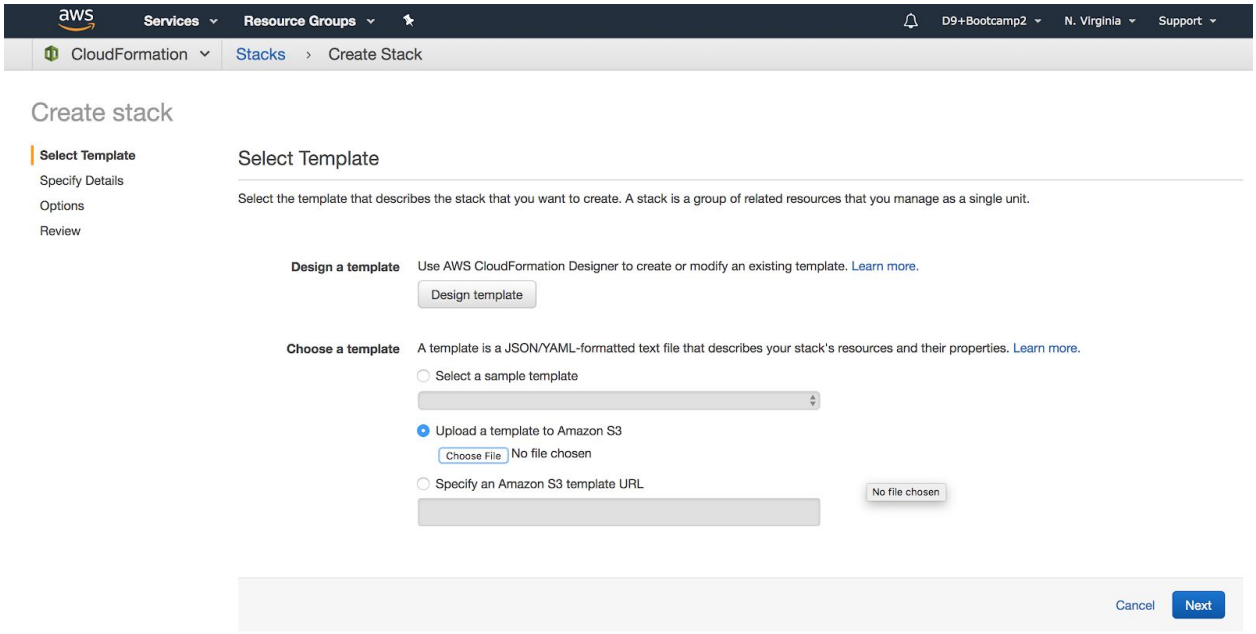
Exercise Complete!

Exercise 1.2: Deploy sandbox AWS environment

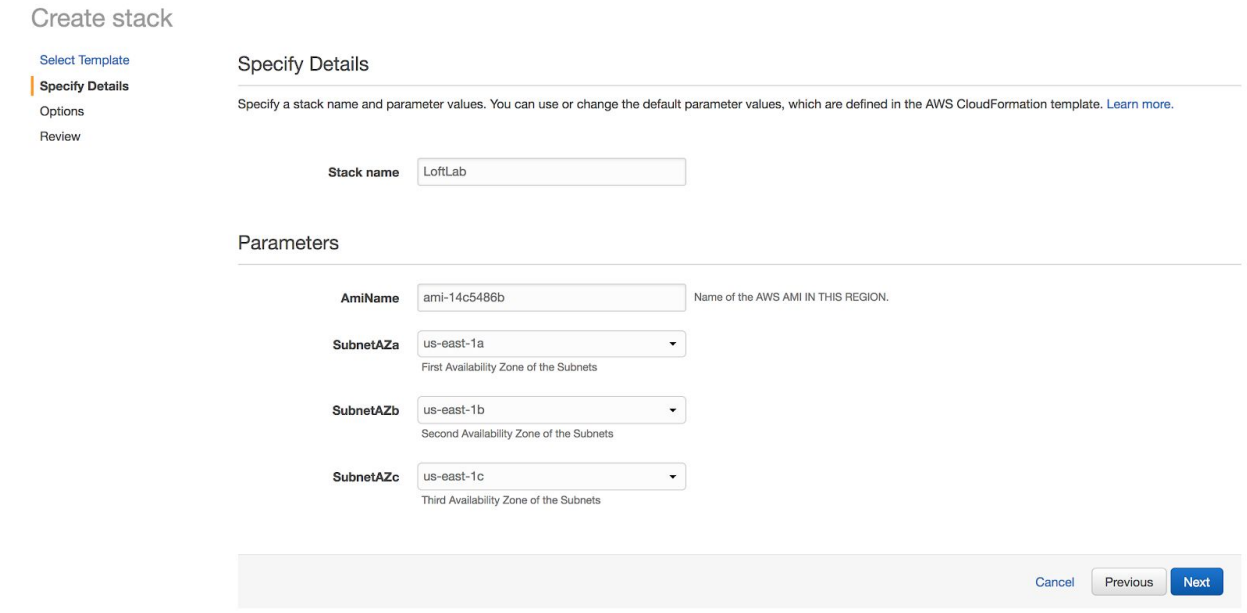
Navigate to AWS Cloudformation



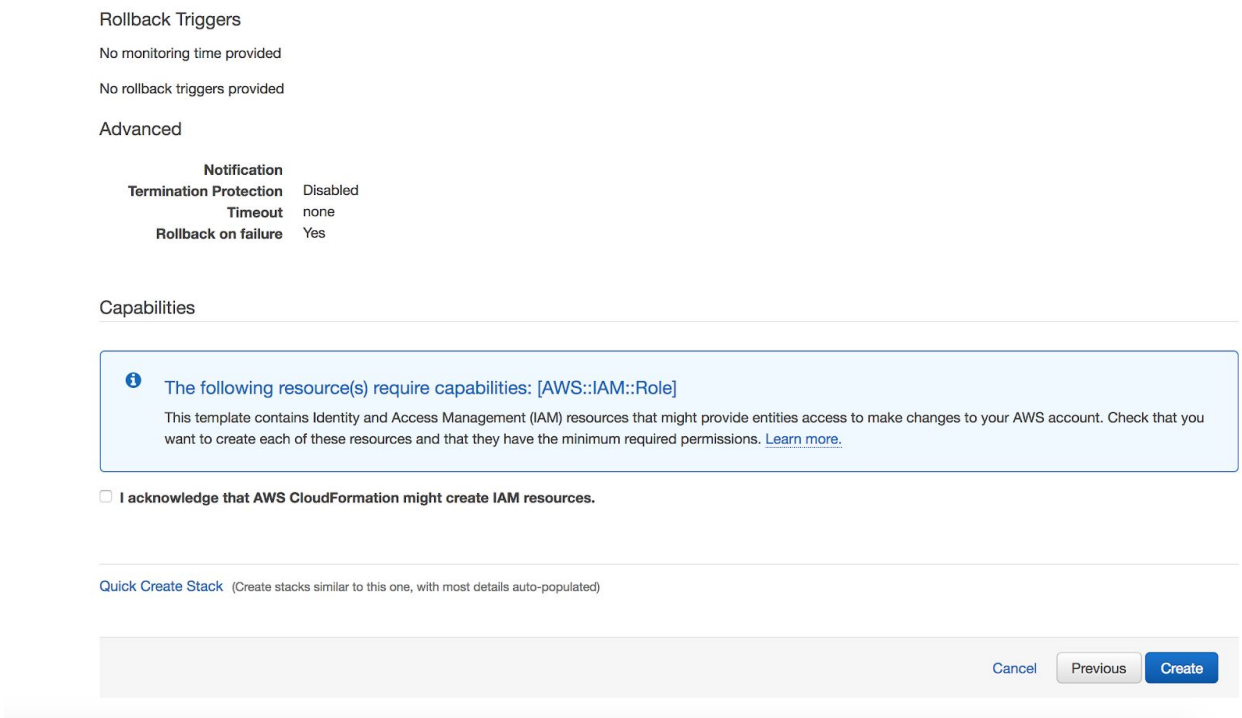
Click on create stack and select “upload a template to S3” and choose the CFT file that you downloaded and click next



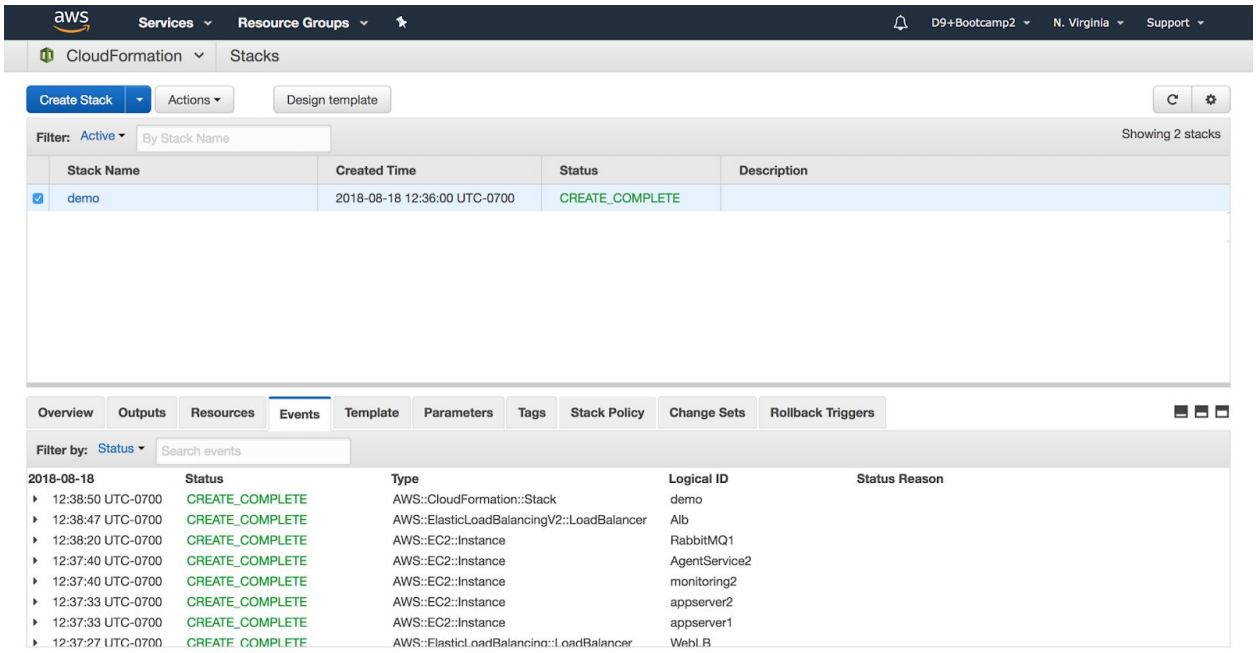
Create a stack name such as “**<yourname>LoftLab”** and select us-east1-a, 1-b, and 1-c for subnetAza, subnetAzb, subnetAzc and click next



Click next **twice** and select "**I acknowledge that AWS Cloudformation might create resources"** and click create.



You will need to wait 5 minutes for the CFT to automatically deploy the environment in your AWS account. At the end you should see the below screen:

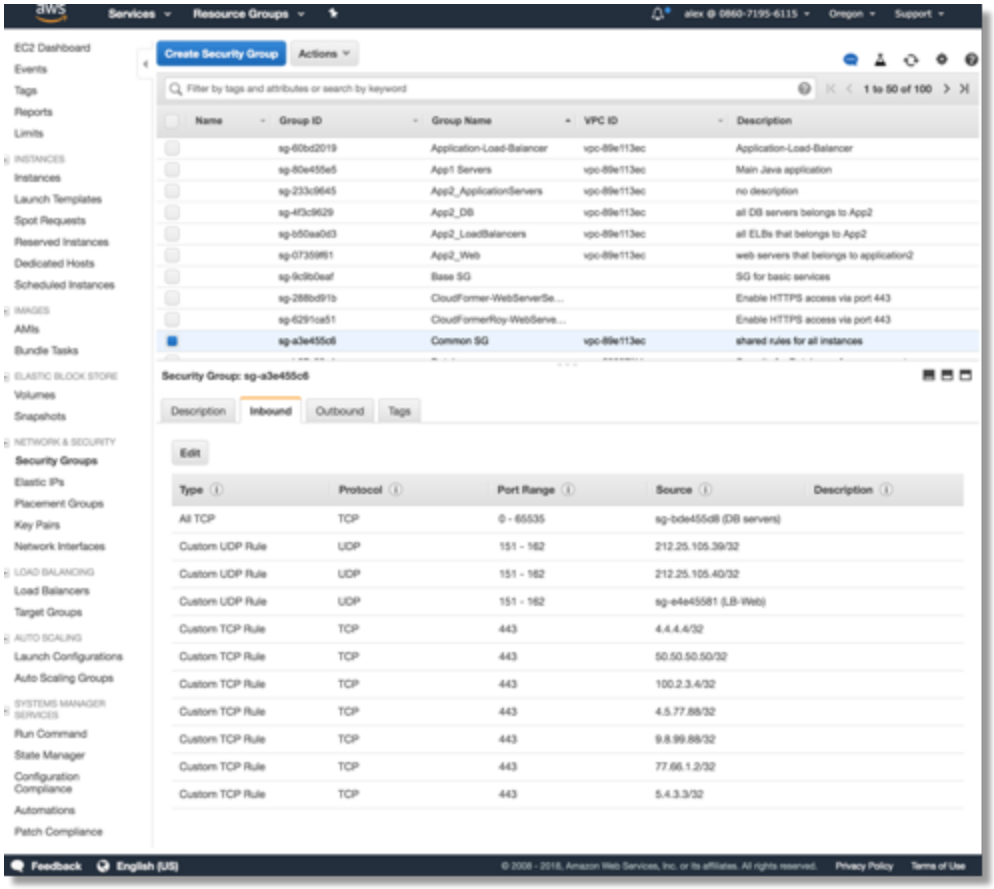


Exercise Complete! You have now deployed the sandbox AWS environment in your account.

AWS Security Policy Lab

Exercise 2.1: Identify zombie security group

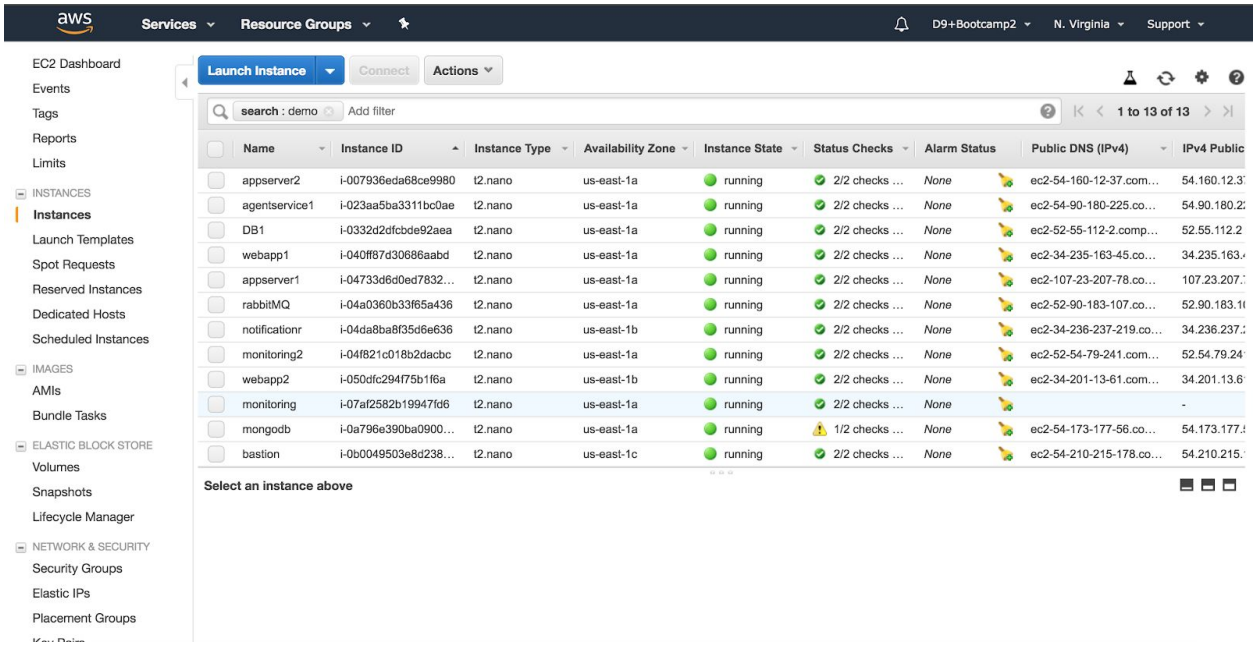
In your AWS account, navigate to **N.Virginia region**. Explore EC2 instances, Security Groups, IAM and other services.



Hint: A zombie security group is a security group that has a permissive rule but has no instances tied to it!

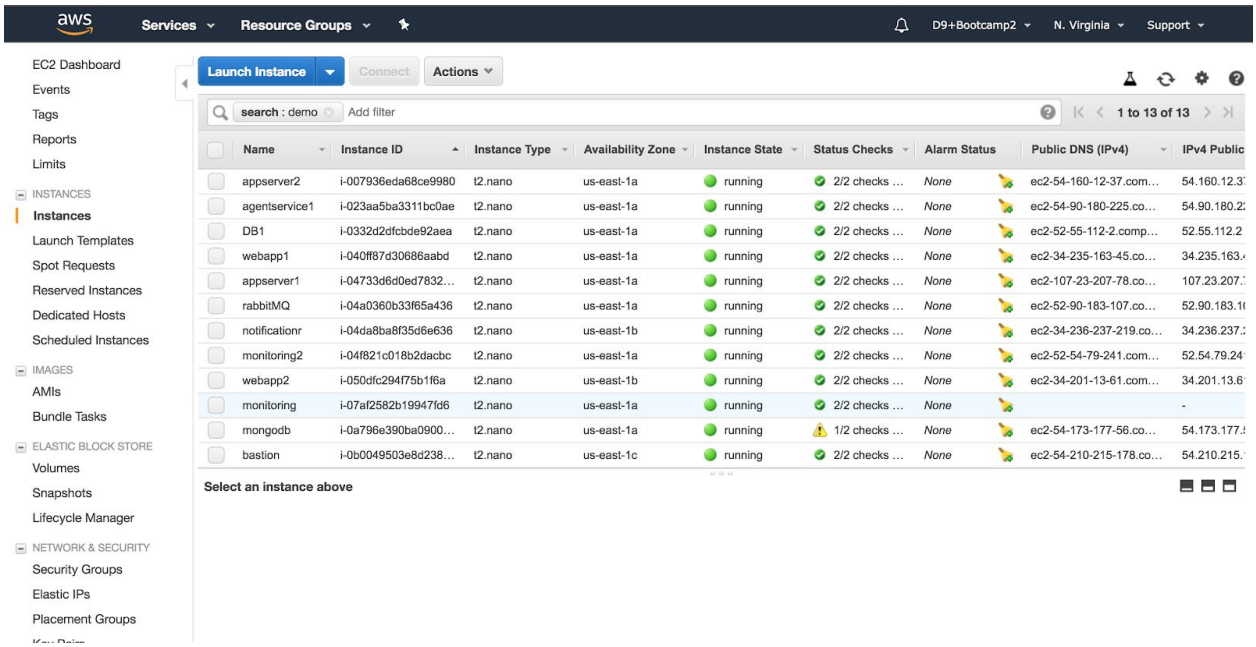
Exercise Complete! You have now found your zombie policy!

Exercise 2.2: Identify an exposed internal asset in the AWS environment - Part 1



There is an internal asset that is exposed to the public. Can you find it?

Exercise 2.3: Identify an exposed internal asset in the AWS environment - Part 2



There is another internal asset that is exposed to the public (this one is harder to find) Good luck!

Exercise Complete! You have now found your exposed assets!

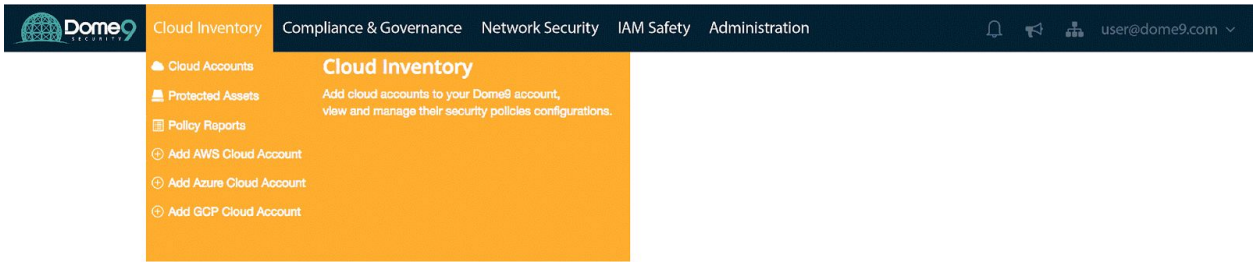
Dome9 Onboarding and Setup

Exercise 3.1: Connect Dome9 to your new AWS account

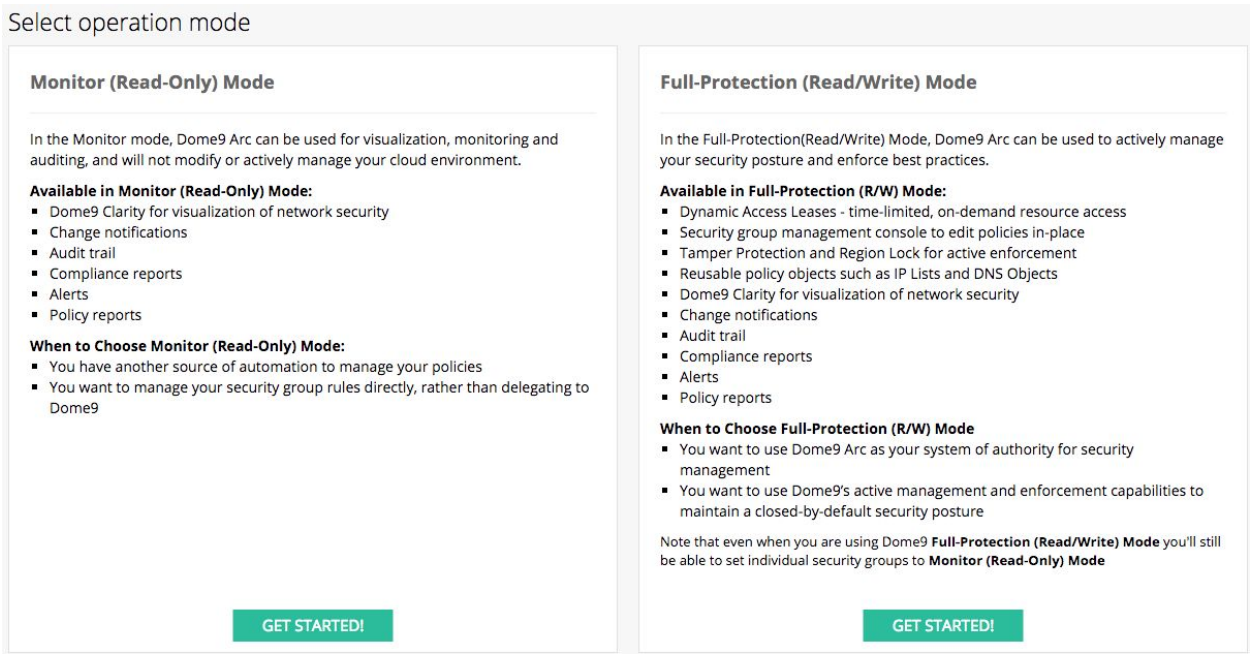
Onboard an AWS account

Onboarding an AWS account involves creating policies and attaching it to roles for Dome9 to use. For simplicity, the policies and roles have already been created. Follow these steps to onboard your AWS account to Dome9.

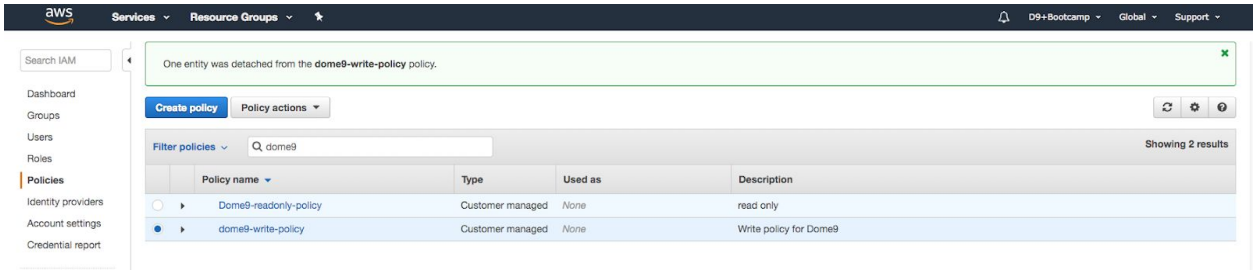
1. On the Dome9 console navigate to **Cloud Inventory** and select Add AWS Account.



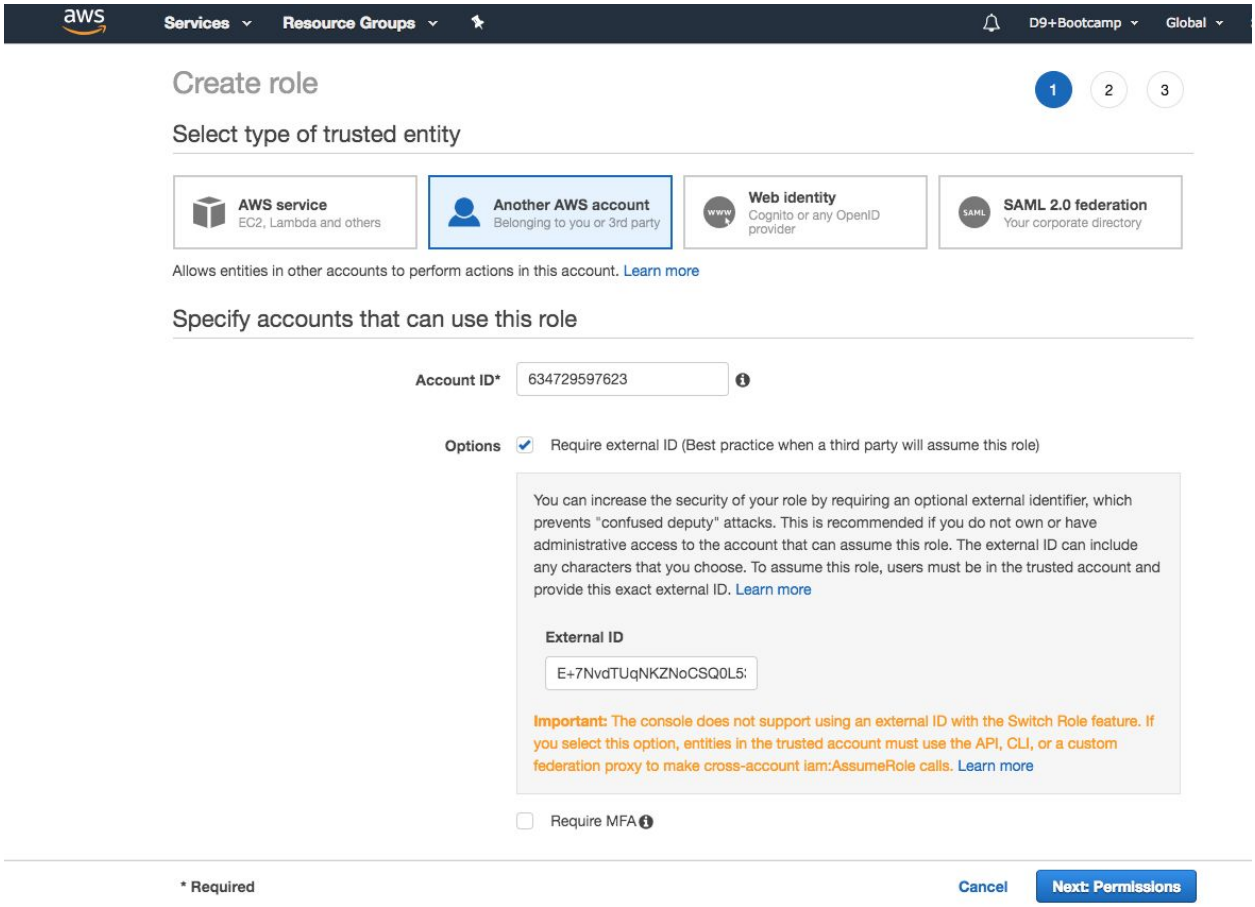
2. Select the Dome9 operation mode, **Read/Write** to be used for the account.



3. Click next again
4. Sign to the AWS console (aws.amazon.com) in a new browser tab or window (keep the Dome9 console open, as you will be switching between the two in the following steps).
5. Click **Services** and select the **IAM**
6. Select **Policies** and search for Dome9 and you should see two policies created. Click and review the policy for **dome9-write**



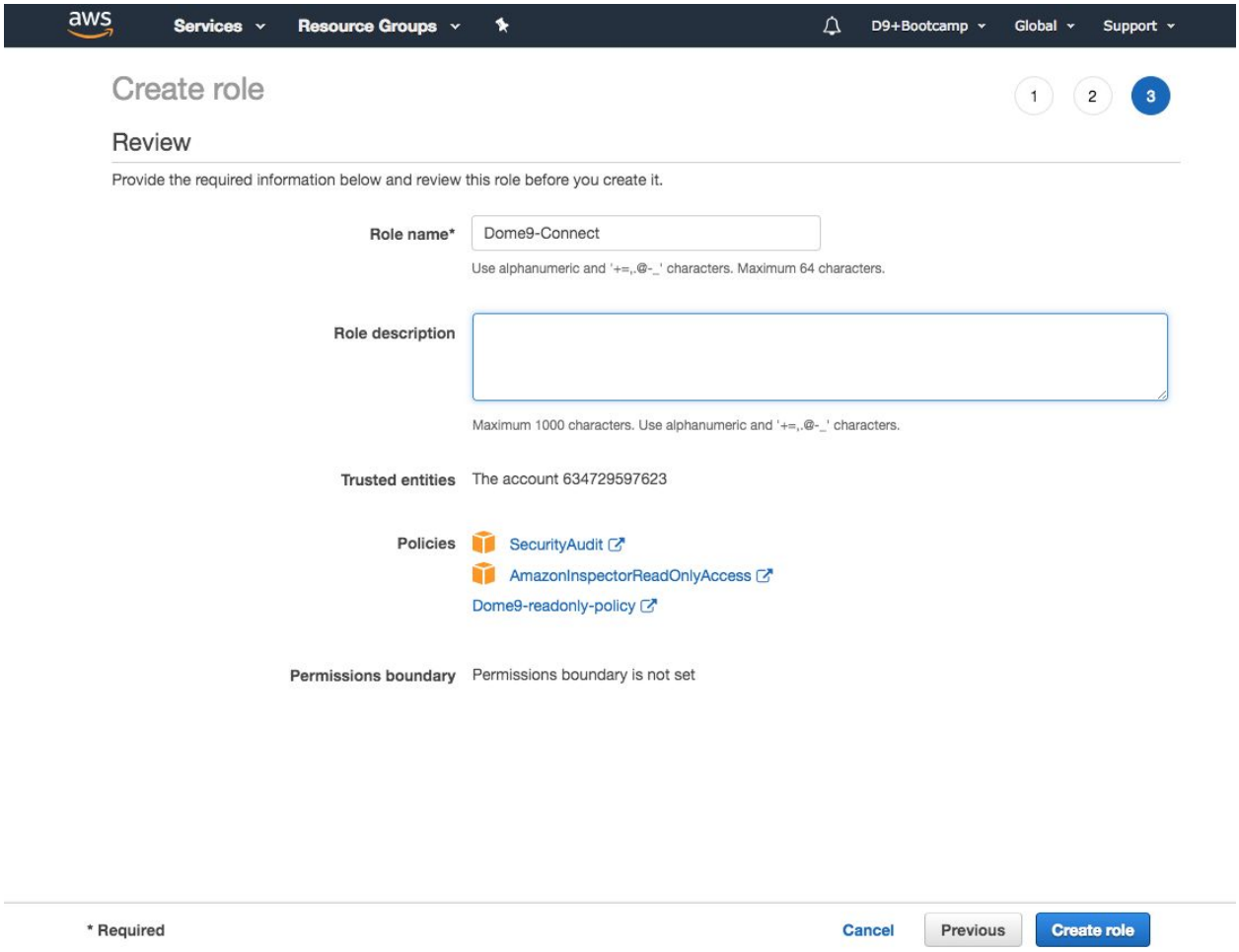
7. In the AWS console, click **Roles** and **"Create new Role"**
8. Select Role Type: **'Another AWS Account',** under options mark the **'Required External ID'** option.
9. Enter the following:
    - AccountId: 634729597623
    - External ID: E+7NvdTUqNKZNoCSQ0L53@64
    - Require MFA: NOT checked



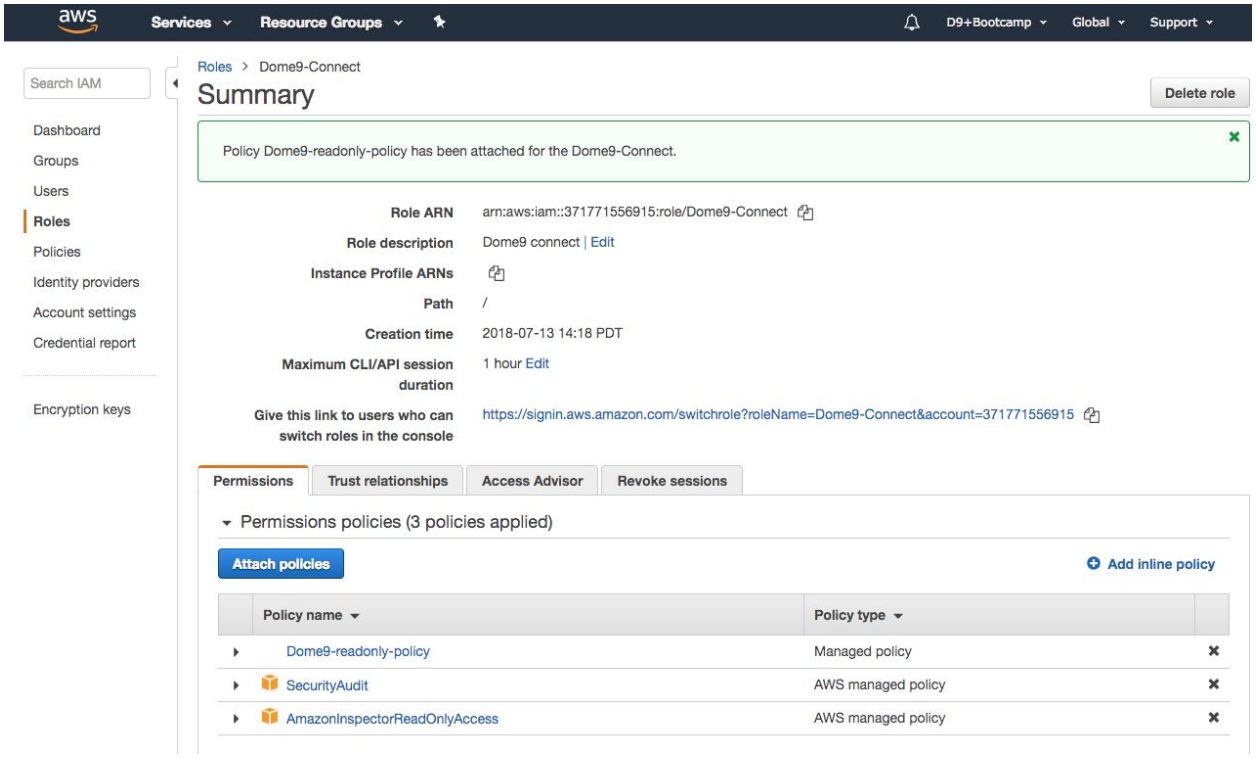
10. **READ-WRITE**: Make sure the following policies are selected:

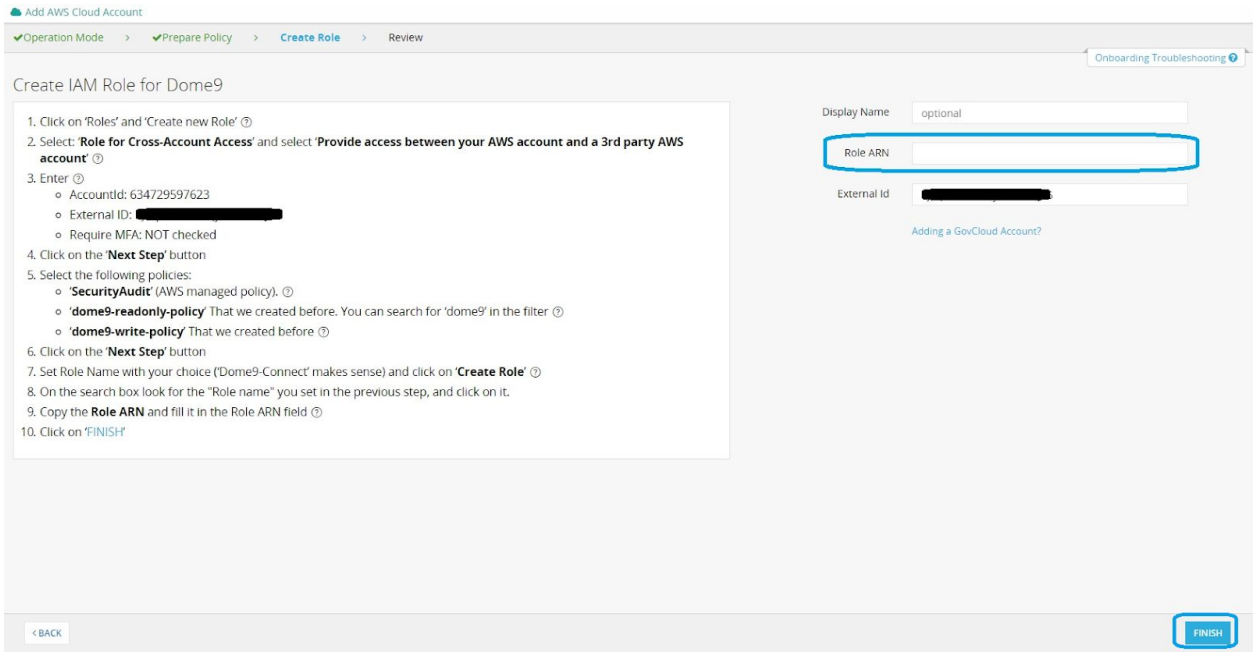
- **SecurityAudit** (AWS managed policy).
- **AmazonInspectorReadOnlyAccess** (AWS managed policy).
- **dome9-write-policy,** that you created before. You can search for 'dome9' in the filter

11. Set Role Name with your choice ('Dome9-Connect' makes sense) and click on **'Create Role'**



12. Copy the **Role ARN** value, and enter it in the **Role ARN** field in the Dome9 console.





13. Click '**Finish**'

14. Review the onboarded cloud account summary.
15. At the end of the onboarding process all the Security Groups will be in **Read-Write** mode.

Exercise Complete! You have now connected your Dome9 to your AWS account

Security Architecture Review Lab

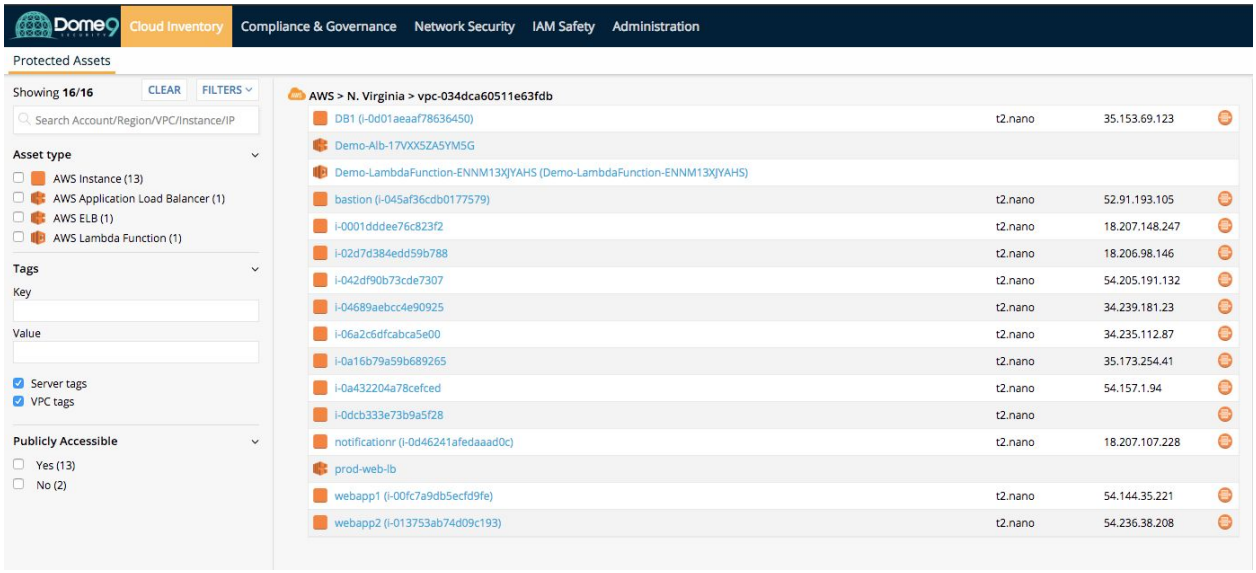
Exercise 4.1: Conduct inventory/asset review

Switch into your Dome9 console for the remaining part of this module

Dome9 presents a single console view of all your assets, on all platforms, from which you can search or filter for specific assets of interest, and see details about their security posture. In this section of the Dome9 console, you can see a summary of all the assets in your VPCs that are protected by Dome9. These assets can include, for example, instances (such as EC2s), RDSs, and load balancers. Dome9 fetches information about these assets from the cloud platforms (AWS, Azure, Google) and presents it in a console view.

1) View your Protected Assets

The main page shows a list of your assets that are protected by Dome9, organized by region. Filter the list using the filters on the left, or search for assets by name in the search bar.



For each asset in the list, the type, and its external IP address (if it has one) are shown.

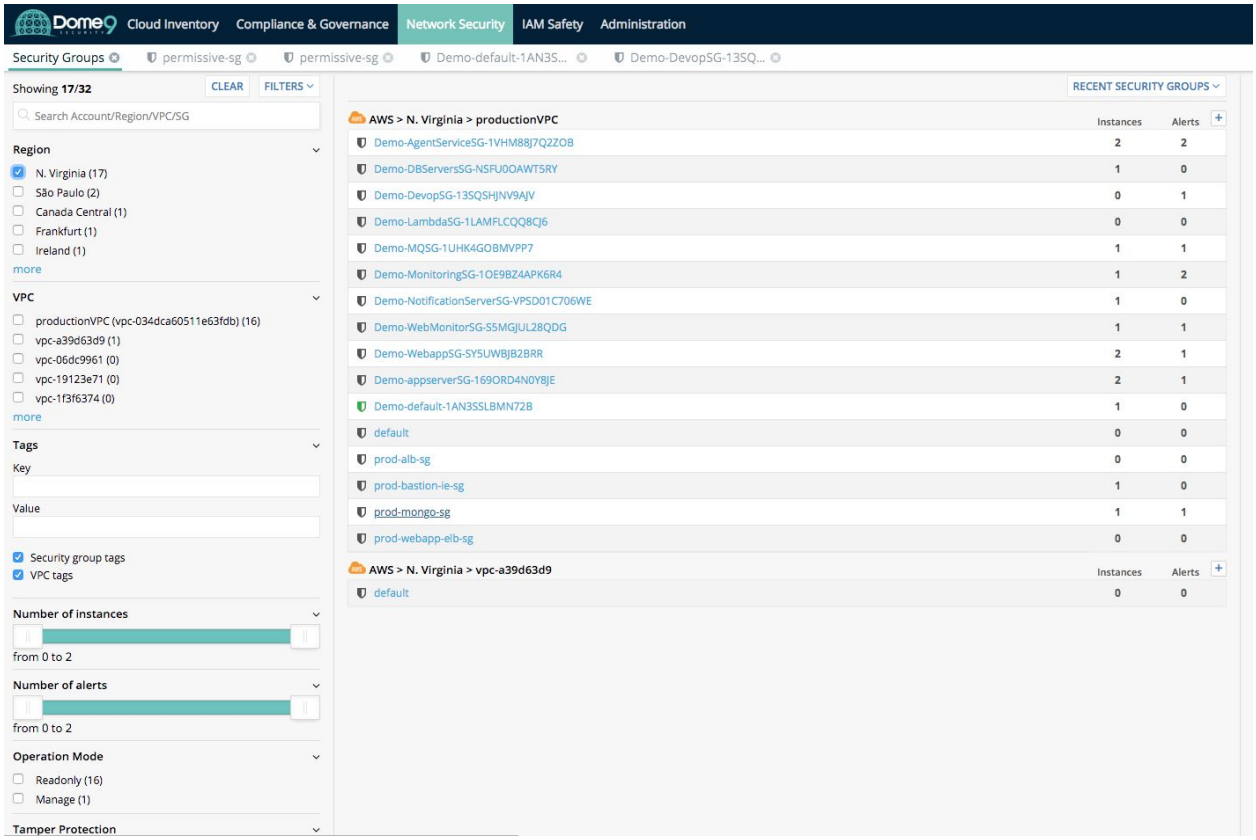
Click on one of the assets in the list to see more details for it.

Please enter how many total EC2 instances are displayed in the google form.

2) View your Security Groups

The main page shows a list of all your managed security groups, in all your Dome9 managed accounts, on all cloud providers.

Filter the list using the search box or filter options on the left. You can filter by account, VPC, cloud region, protection method (full, read-only), and the number of instances or alerts.



Please enter how many total SGs are displayed in the google form.

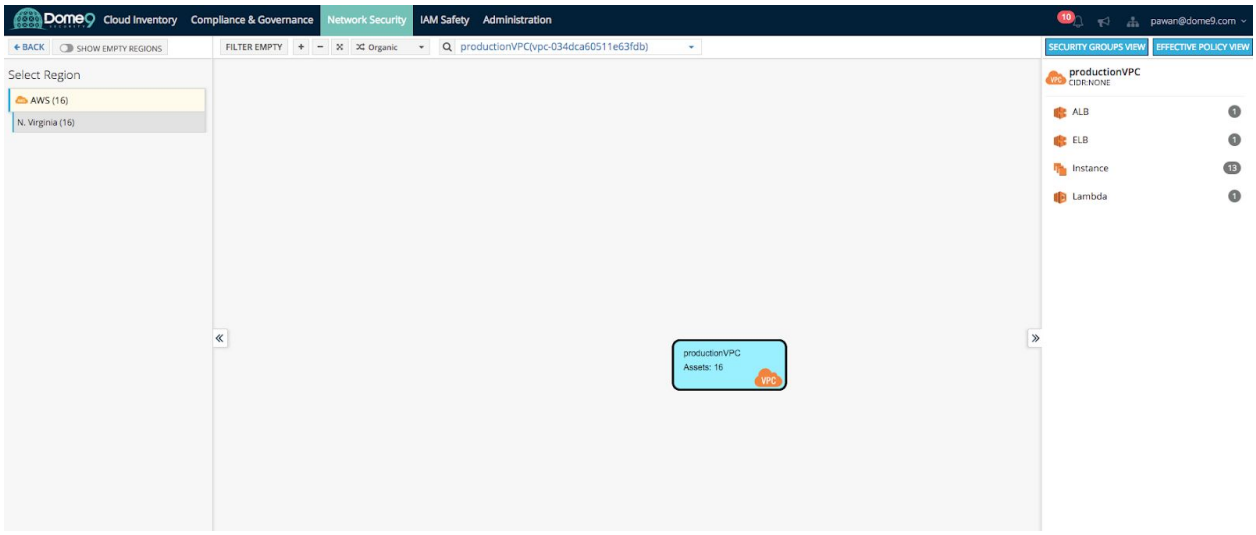
Exercise Complete! You have now explored your AWS instances and reviewed your inventory within the protected asset view of Dome9.

Exercise 4.2: Visualize security architecture

Dome9 Clarity gives a graphical visualization of the security groups in your cloud environment, and their effects on the cloud assets in the environment. It shows the security groups, traffic sources, and permitted traffic paths in the cloud network. The view is organized logically, according to the level of exposure of the Security Group to the external world. You can use Clarity to analyze your cloud network for security issues such as access to sensitive components from the internet, or to troubleshoot it for connectivity issues such as blocked paths to components.

1) Select a cloud environment

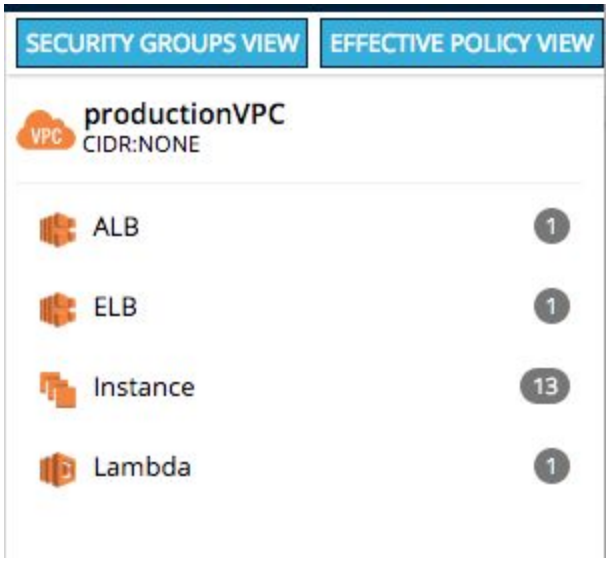
Select **Clarity** from the main menu. A list of your cloud accounts is shown on the left.



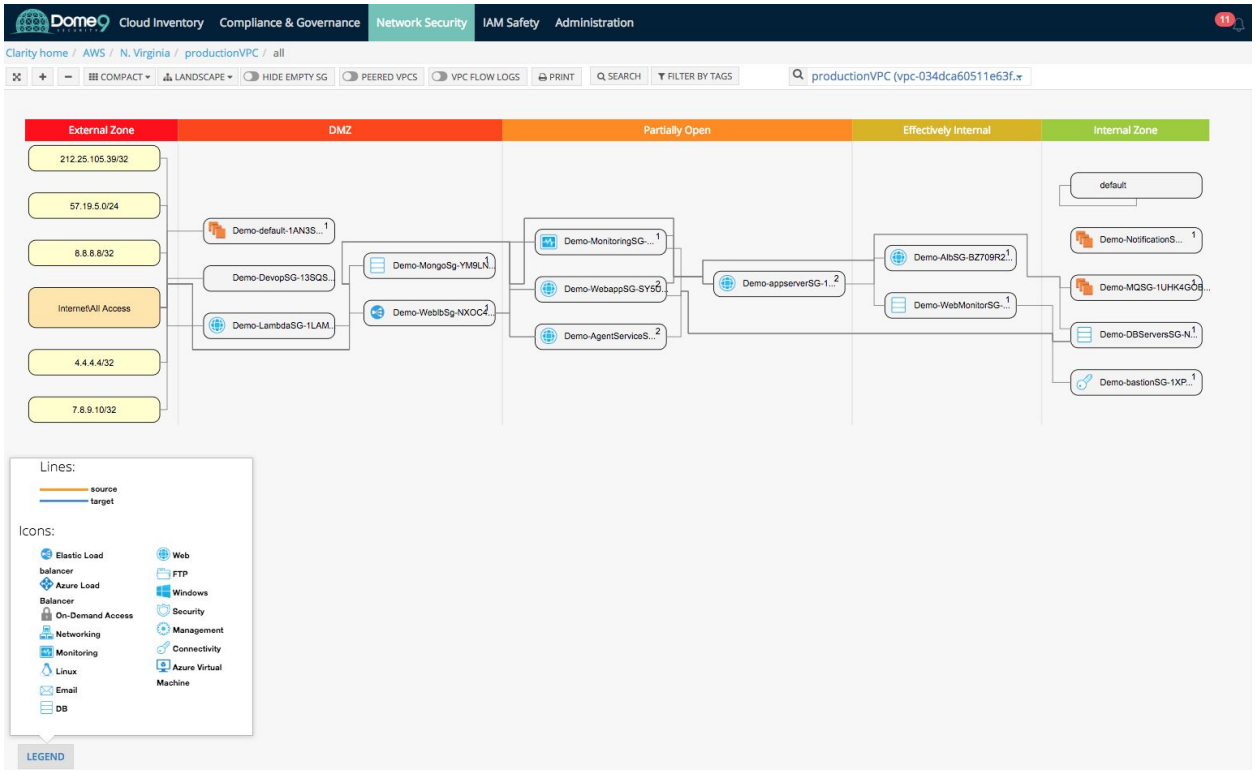
2) View an environment with the Security Group view

In this step, an environment will be visualized with the Security Group view. This view shows all the Security Groups.

a) In Clarity, select a cloud environment in one of your accounts (in the previous section), and then select **Security Groups** from the list in the menu bar on the upper right.

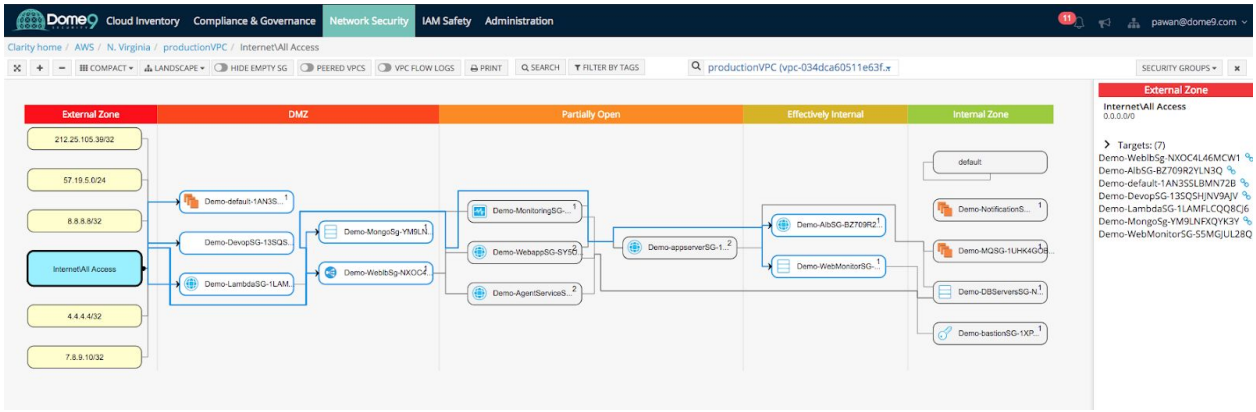


You can tell how the security groups (SG) interact with each other and can now understand whether any internal assets are communicating with the public world based on their inbound and outbound rules. The different swimlanes (which are auto classified by Dome9, so customers don't need to manually create them) represent security groups with various levels of exposure to the public.



b) Click the **Legend** button to show what each icon represents.

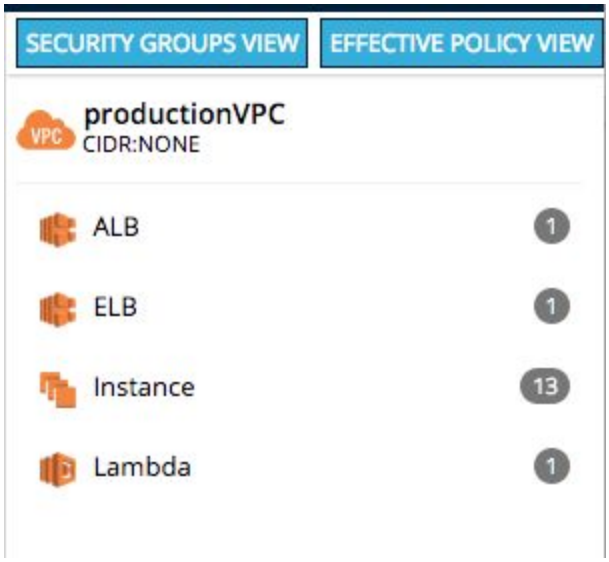
c) Click on **Internet/All Access** block. The source block is highlighted in the view, and the Security Groups that affect this source are highlighted.



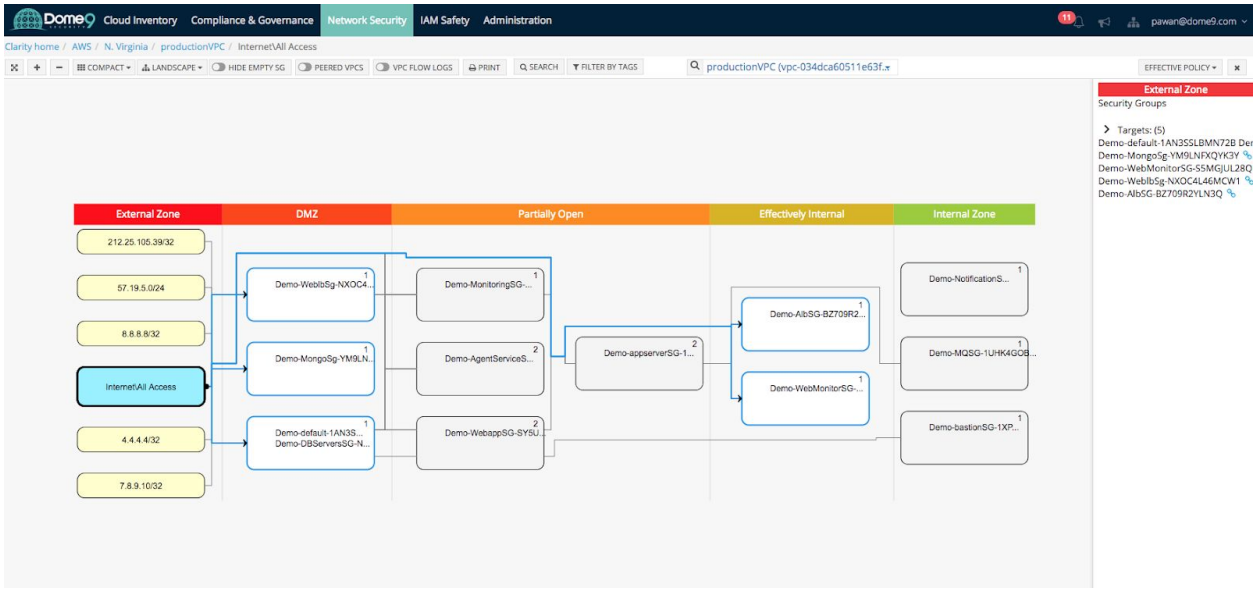
3) <u>View an environment in the Effective Policy view</u>

The Effective Policy view groups Security Groups that affect a common asset, and hides those that do not affect any assets.

a) Select **Effective Policy** in the list in the menu bar at the upper right.



b) This shows the VPC in the Effective Policy view



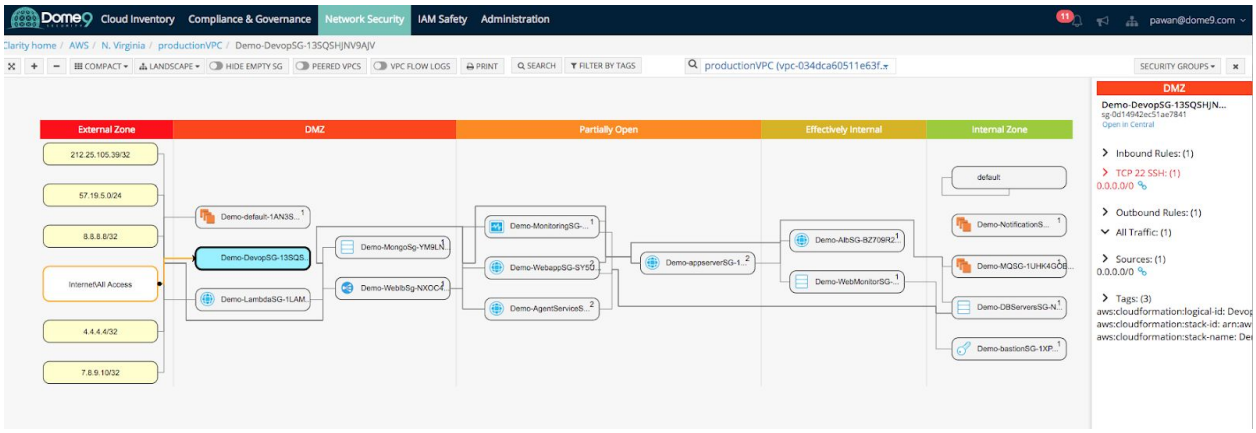
c) This view also shows the Security Groups and Sources, organized by zone. In this view, however, the Security Groups that affect the same asset are grouped together. Security Groups that affect a number of assets may appear several times in the view. Security Groups that do not affect any assets are hidden.

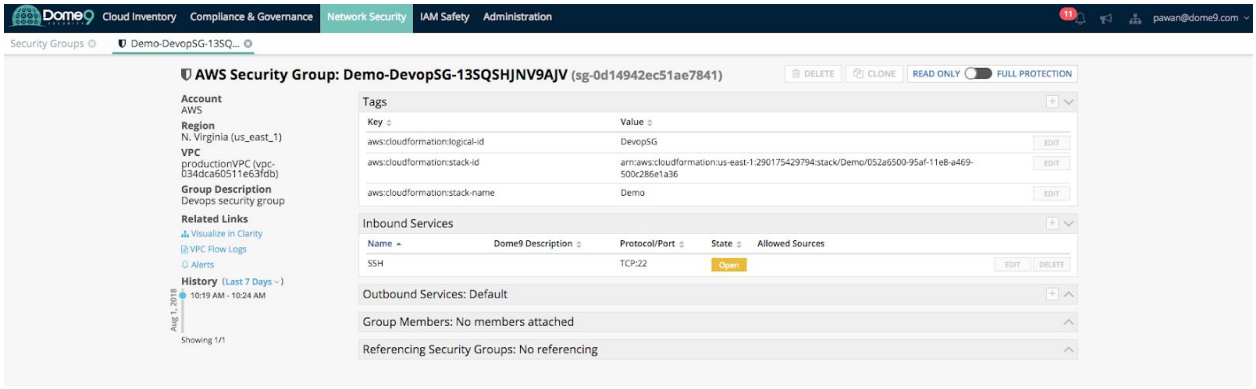
Exercise Complete! You have visualized your AWS security configurations in the VPC from a logical firewall view (SG view) and instance policy view (effective policy view)

Exercise 4.3: Identify zombie security group

Let's go back into Clarity's security group view. See if you can identify a zombie security group. This is a SG that has no instance attached to it but has an exposed policy (TCP 22 0.0.0.0/0) to the public.

Answer: Don't peek just yet..





This is a low severity issue yet is important to be aware of as it is just one click away from exposing your internal servers. With Clarity you can find such issues and take appropriate actions to fix such misconfigurations.

Exercise Complete! You have now identified the zombie security group exposure

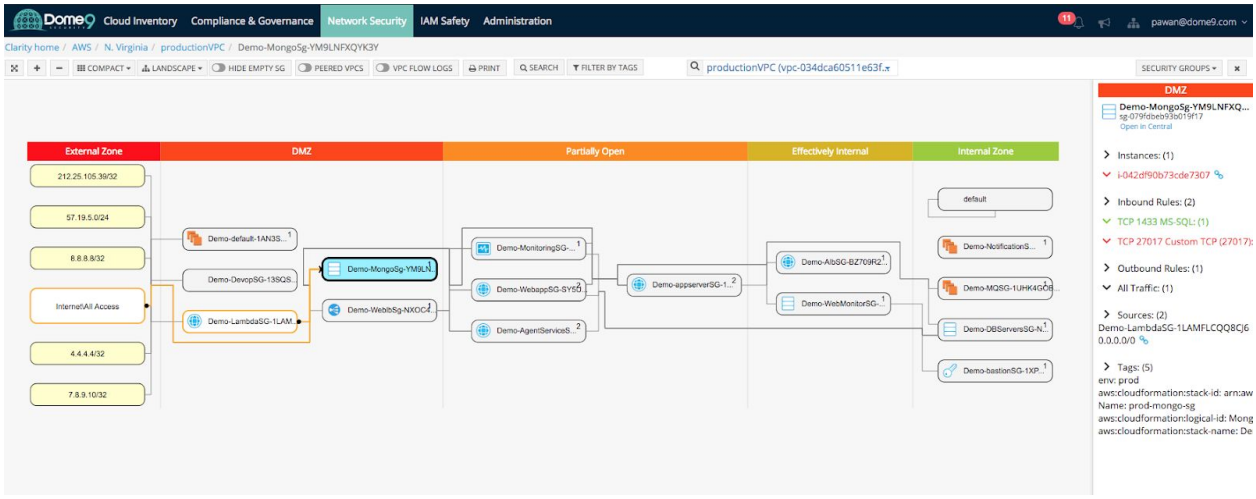
Exercise 4.4: Identify publicly accessible databases

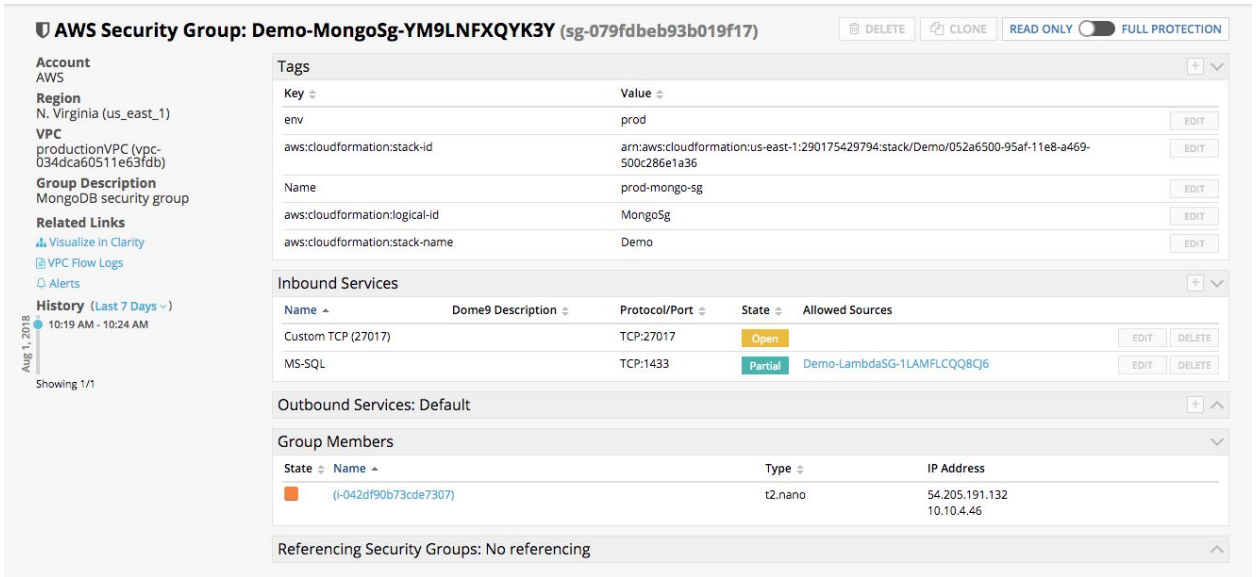
In this section, we will investigate and find 2 different database exposures. Let's jump into Clarity.

Challenge 1: Detect DB Exposure – part 1 (easy)

In Clarity, try to find an exposed DB:

Answer: Here you see that this SG has 0.0.0.0/0 on port 27017 associated with the mongoDB instance. This is a high severity issue as one of your internal DB servers is now wide open. Click on the SG for more details.



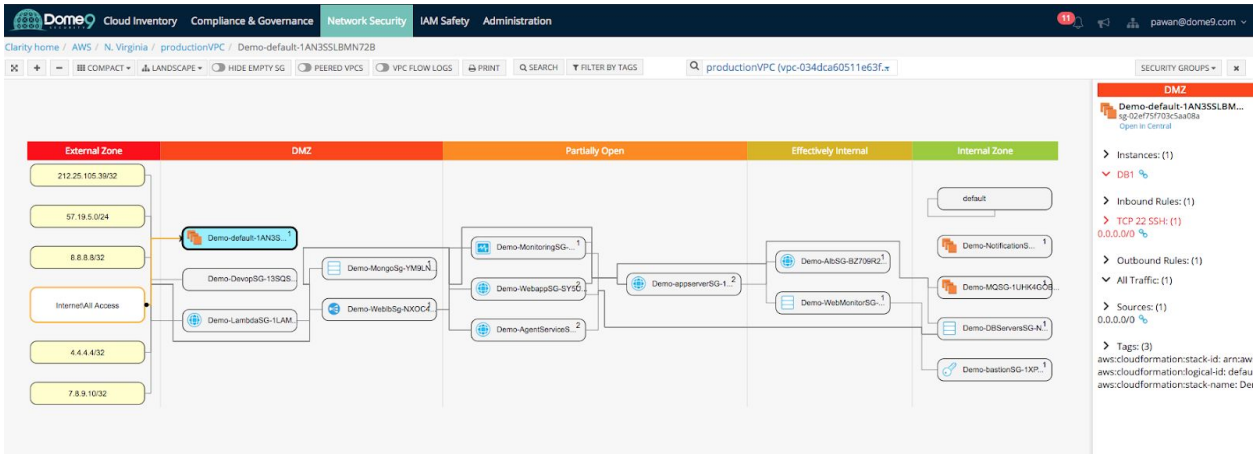


You can see the open port in this view. We will fix these issues in the next lab.

Challenge 2: Detect DB Exposure – part 2 (hard)

Find another exposed DB, this one is a bit tricky.

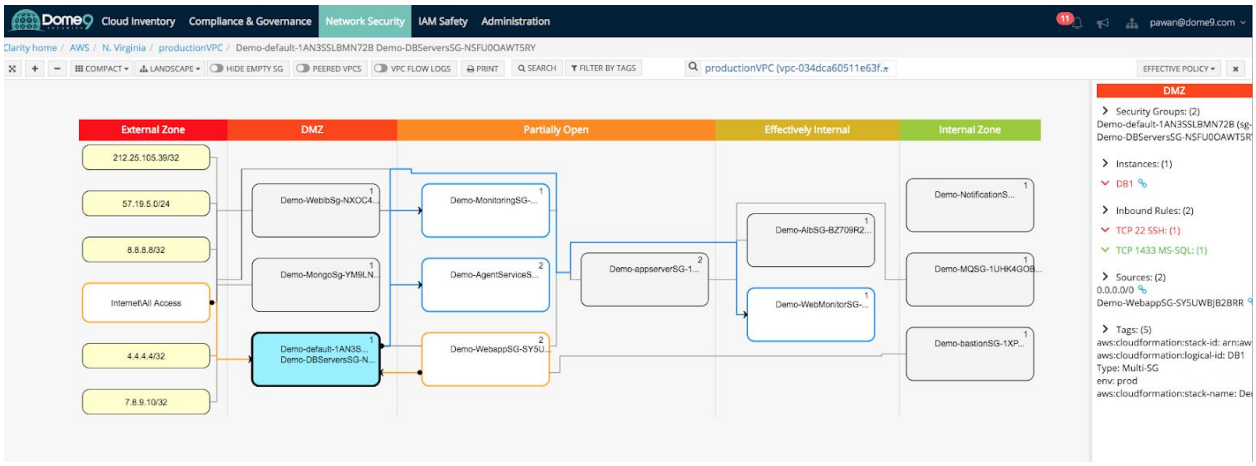
Answer: Click the default SG and hover over the right. Here you see default SG with SSH wide open and that DB1 is associated with this default SG making the database exposed to the public



In the effective policy view below – you can see default SG is in the DMZ zone and has one instance assignment (DB1, which is also part of the DB servers group).

Digging deeper, we realize that even if the rules associated with the security group are correct, an instance can still be assigned to the wrong security group. This is due to a misconfiguration that occurred due to assignment of multiple security groups, and specifically an incorrect default SG to DB1 instance.

The effective policy view brings this to light and tells you what security groups an instance belongs to, and therefore what the effective security policy is. Now it is clear – DB1 is exposed because it belongs to not only the internal DB Servers SG, but also to the Default SG which is in the DMZ.



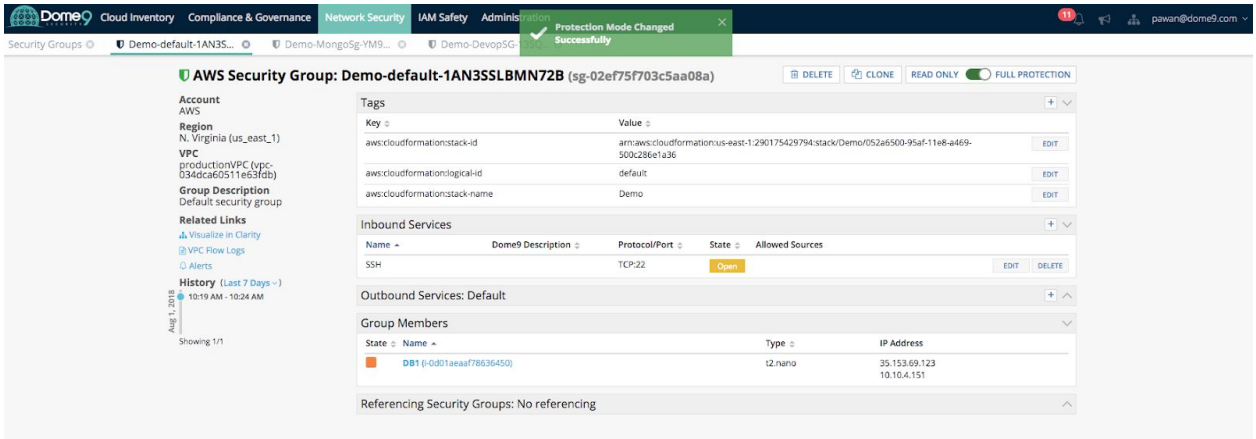
Exercise Complete! You have now investigated both database exposures in Clarity

Security Posture Management Lab

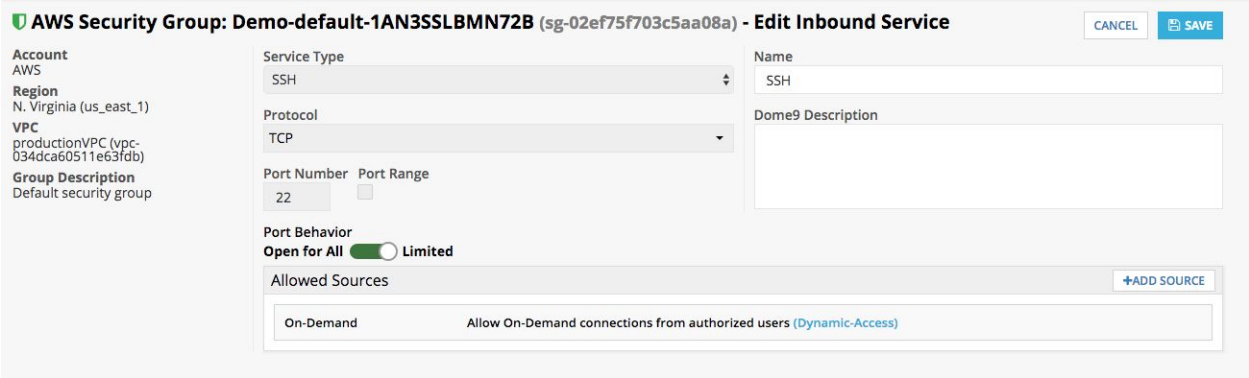
Exercise 5.1: Enforce security policy

Fix misconfiguration in default security group by deleting the open SSH rule. For the purpose of this lab, lets keep it completely closed.

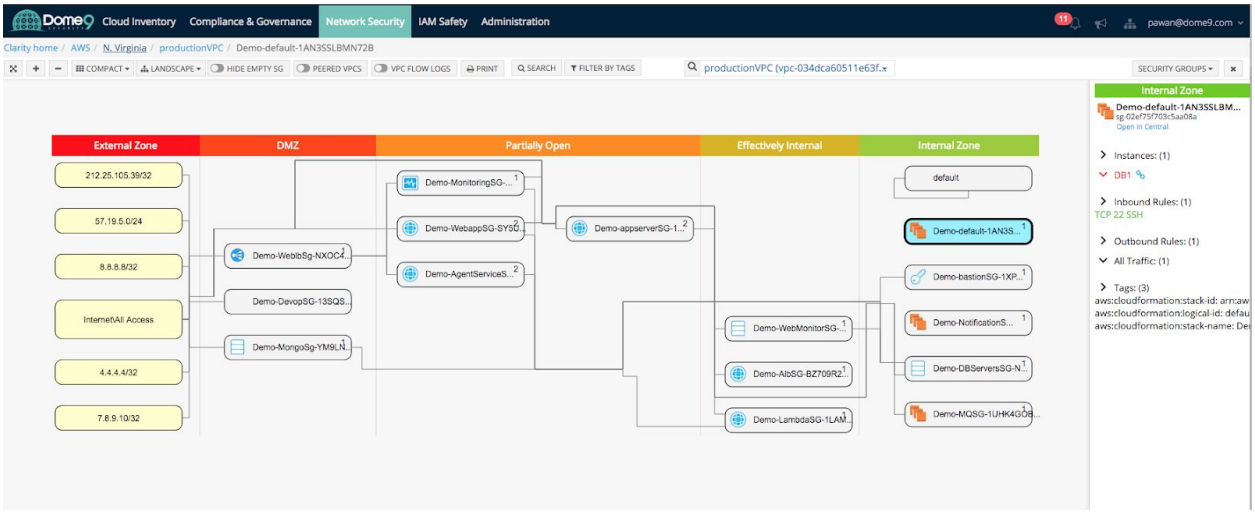
Now back in **Dome9 console** - go to Clarity, click the default SG we saw as the culprit, and turn on full protection mode at the top right in the entity explorer view:



Fix the issue by closing the SG for now



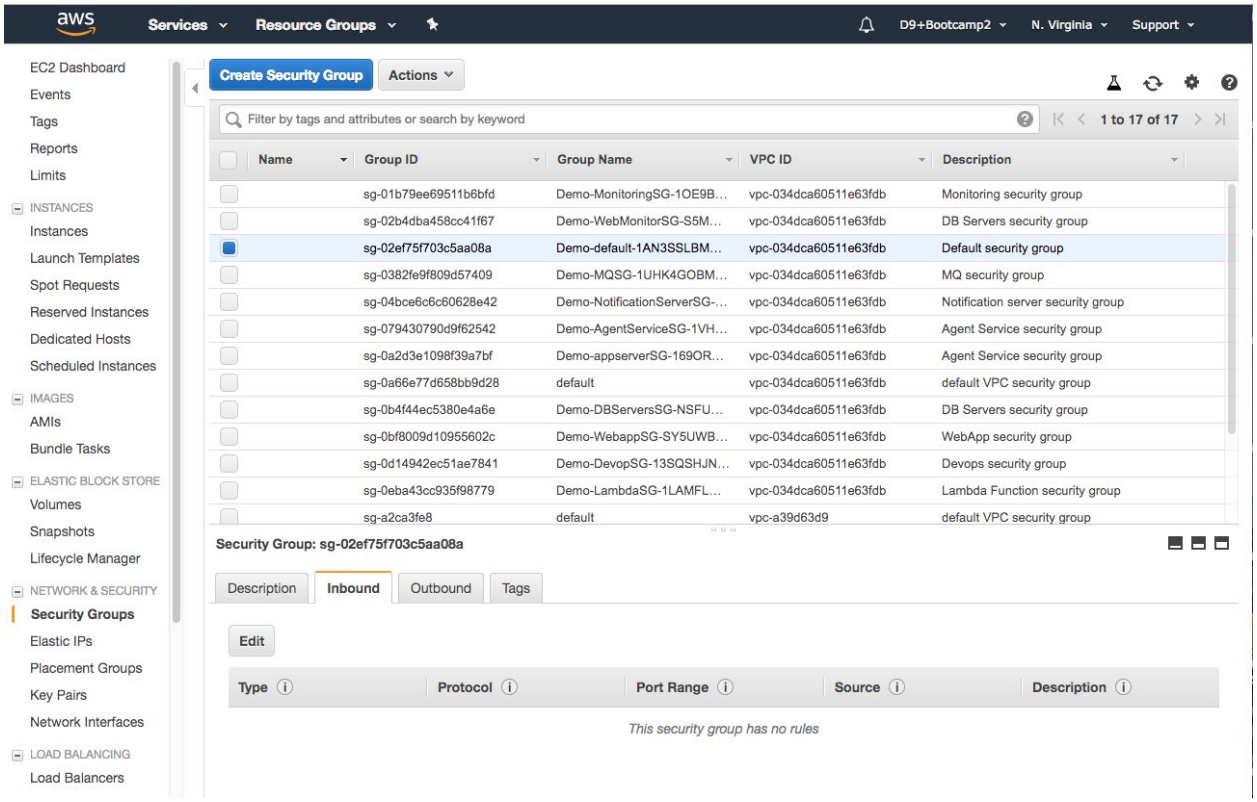
You can also check Clarity to see the correct topology below:



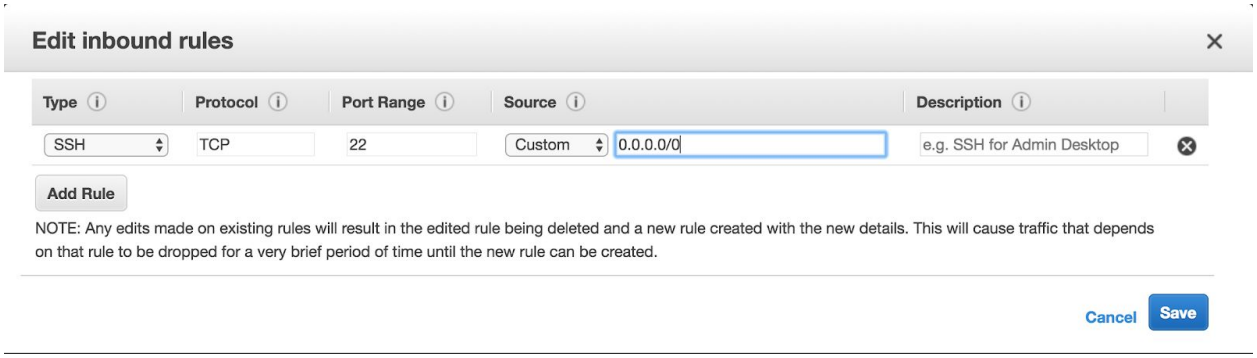
Exercise Complete! You have now fixed the misconfigured security group.

Exercise 5.2: Active protection – SG level

Let's try to mess with this by making changes in the AWS console. Make SG change in AWS by going to the default SG.

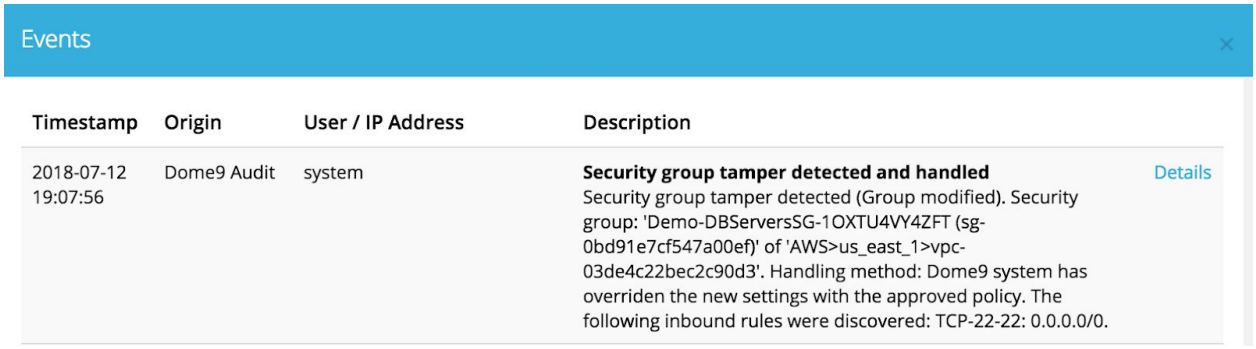


And now enable 0.0.0.0/0 SSH rule for default SG

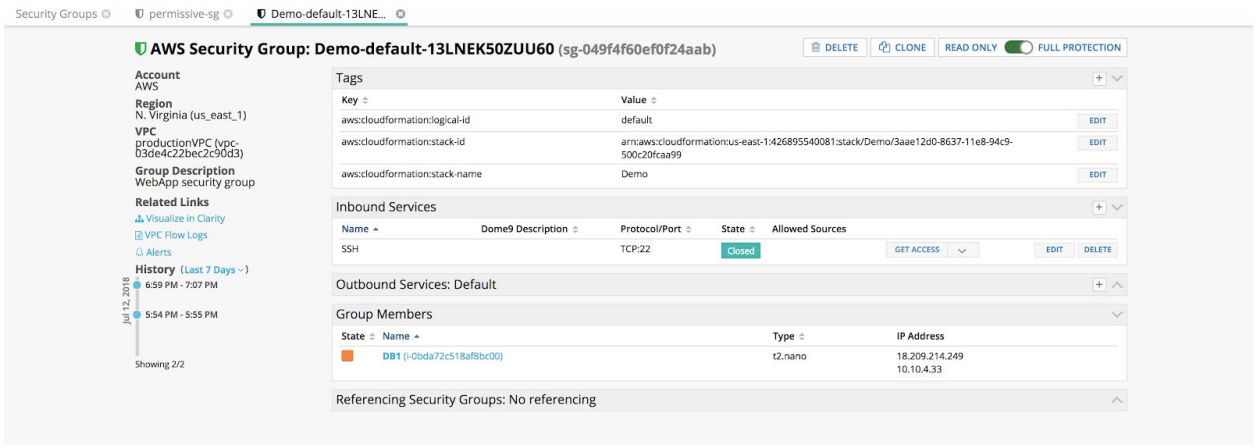


You should now be able to see the change in Dome9 console. Dome9 also rolls configuration back and adds the user event in the audit trail for further analysis.

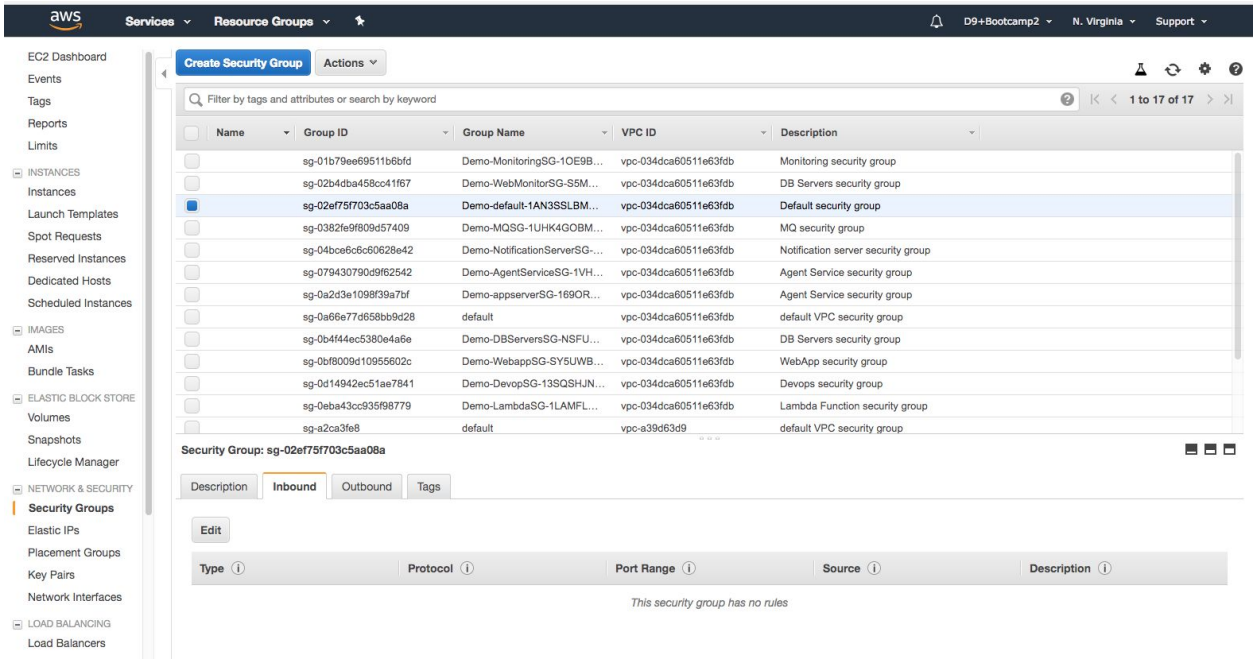
You can see the activity trail in the audit log which is extracted context from CloudTrail



You should see the configuration reversed back to the gold standard configuration



You can also confirm it in the AWS console

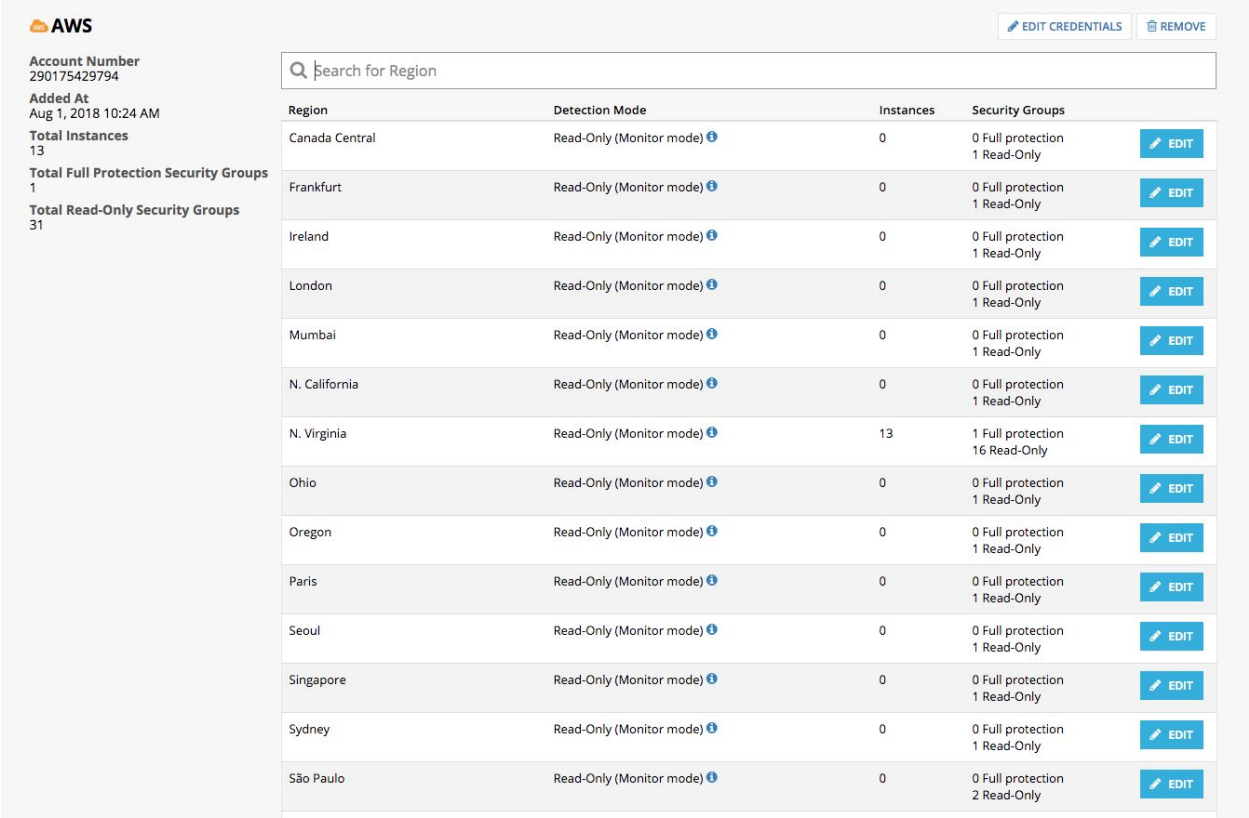


Exercise Complete! You have now enabled enforcement of security policies and eliminate configuration drift at a security group level in AWS

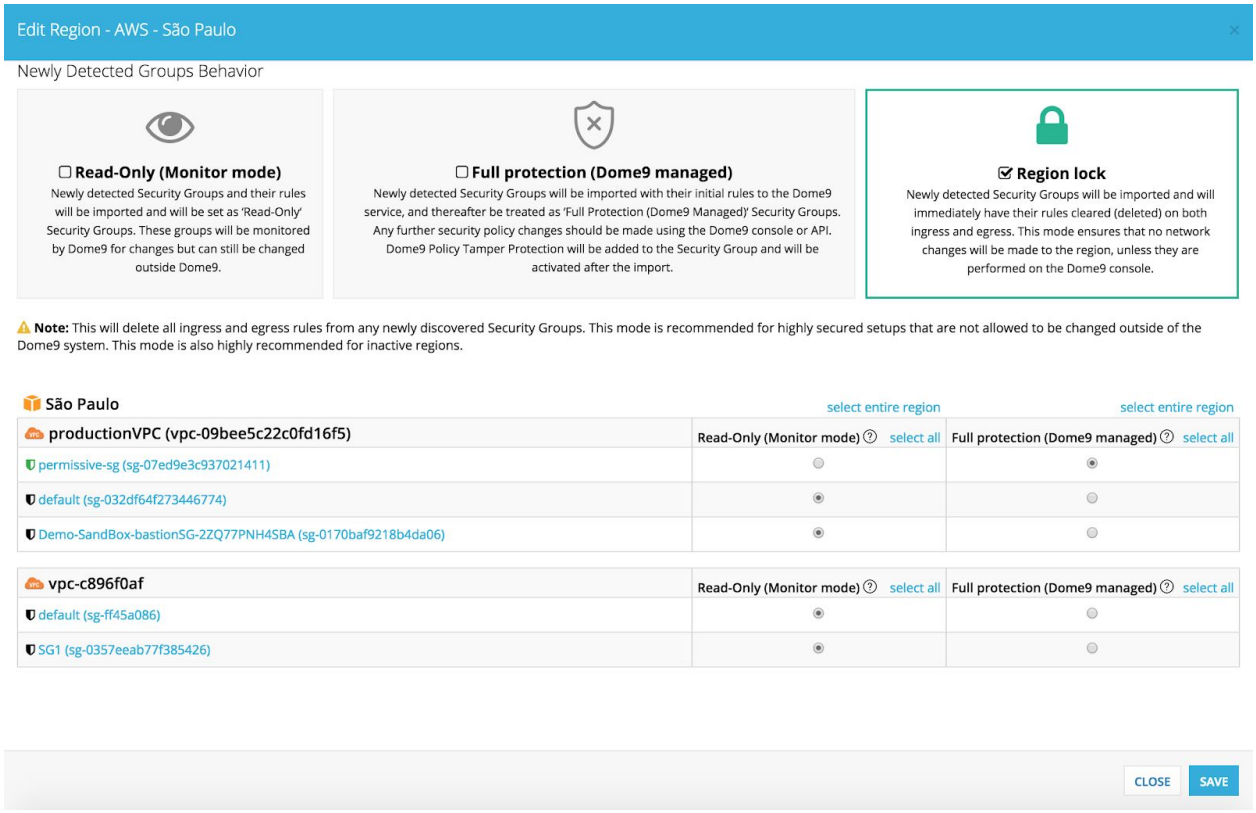
Exercise 5.3: Active protection – Region level

Let's turn on Region Lock first in Dome9 (Lock down Sao Paolo region)

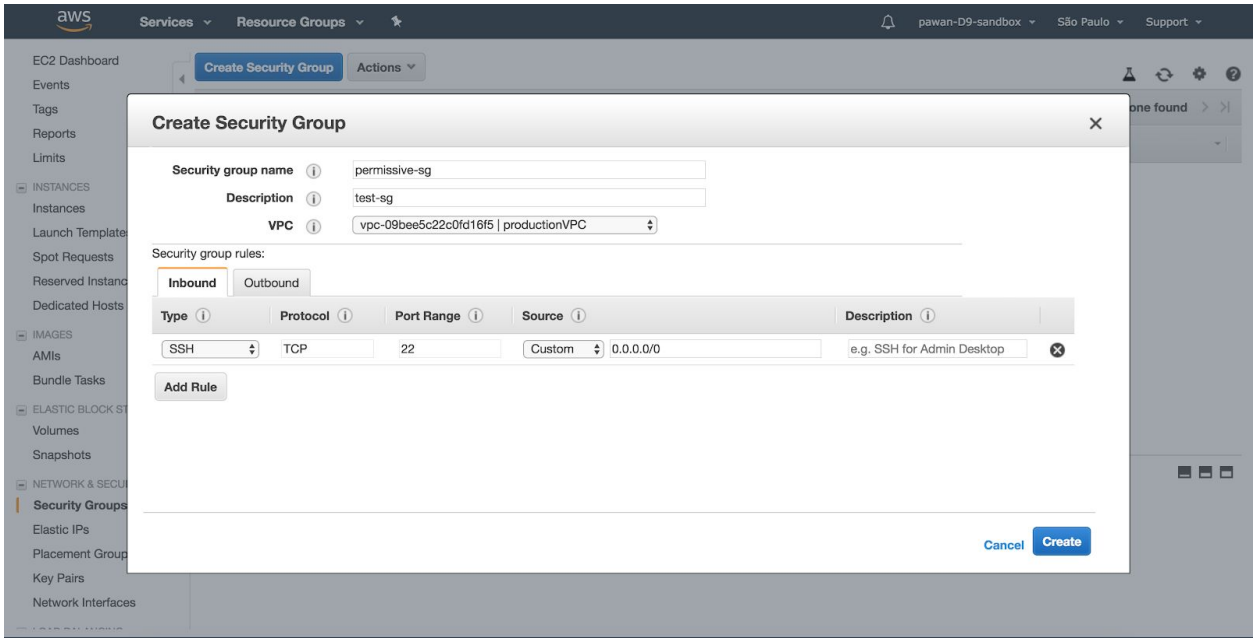
Go to the cloud inventory and select cloud accounts and navigate to Sao Paolo region.



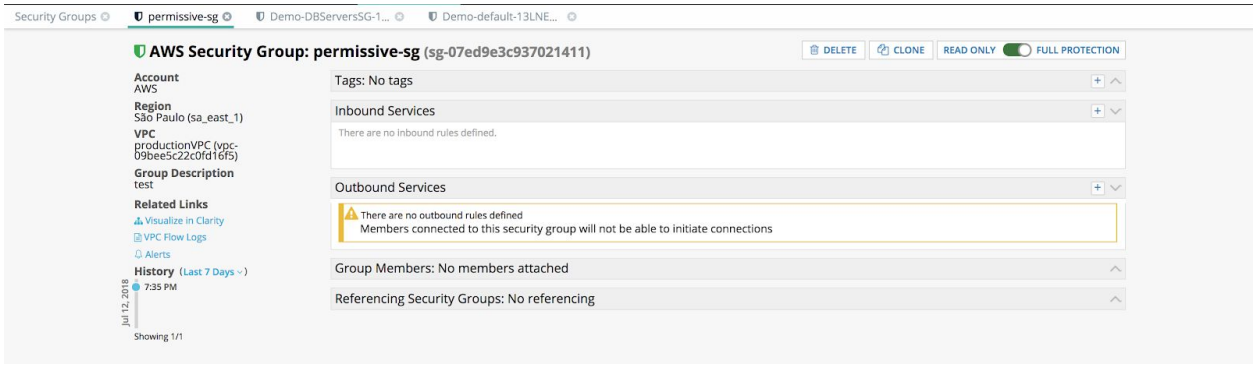
Let’s assume this would be an unused foreign region where you would not expect activity happening. You can turn on Region Lock to ensure no changes are made to this region unless its from within Dome9.



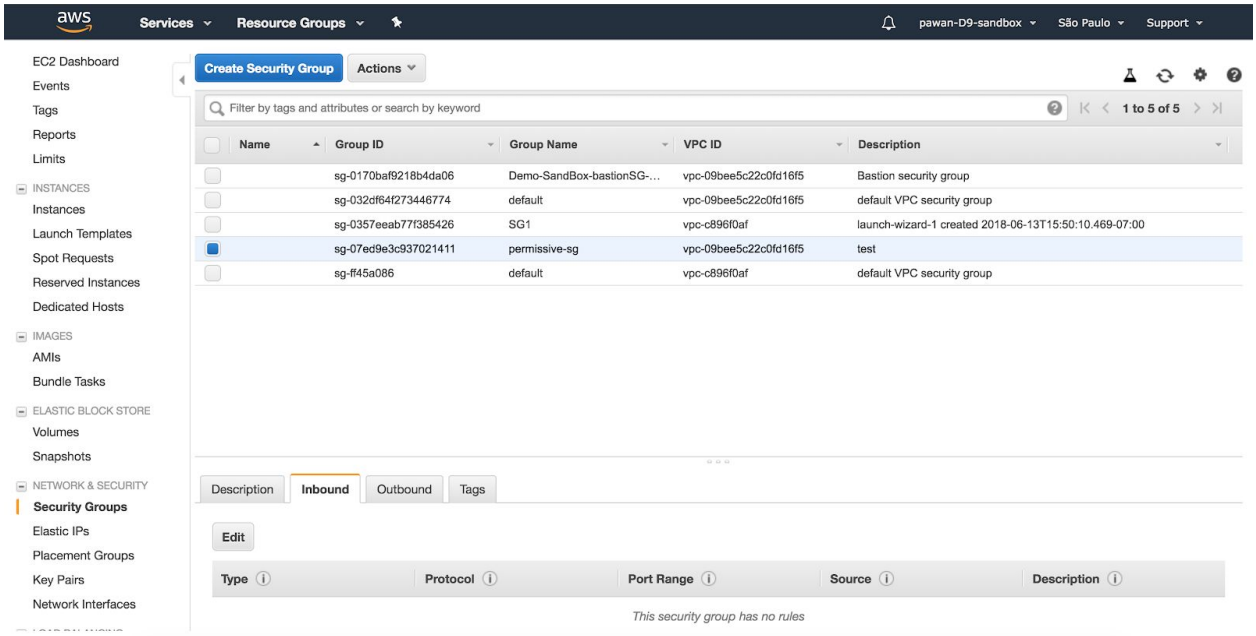
Go to the AWS console and create a new SG in Sao Paolo



Go back to Dome9 console, you should see this new SG's inbound/outbound rules deleted.



You can also confirm it in the AWS console in Sao Paolo



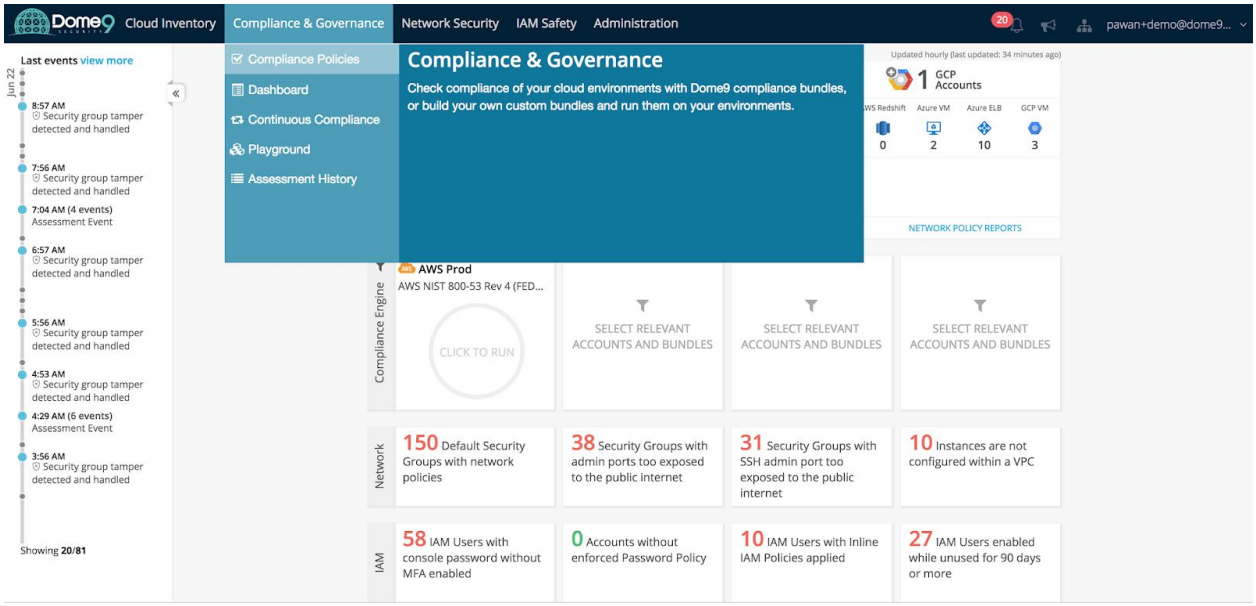
Exercise Complete! You have now enabled enforcement of security policies and eliminate configuration drift at a region level in AWS.

S3 Security Lab

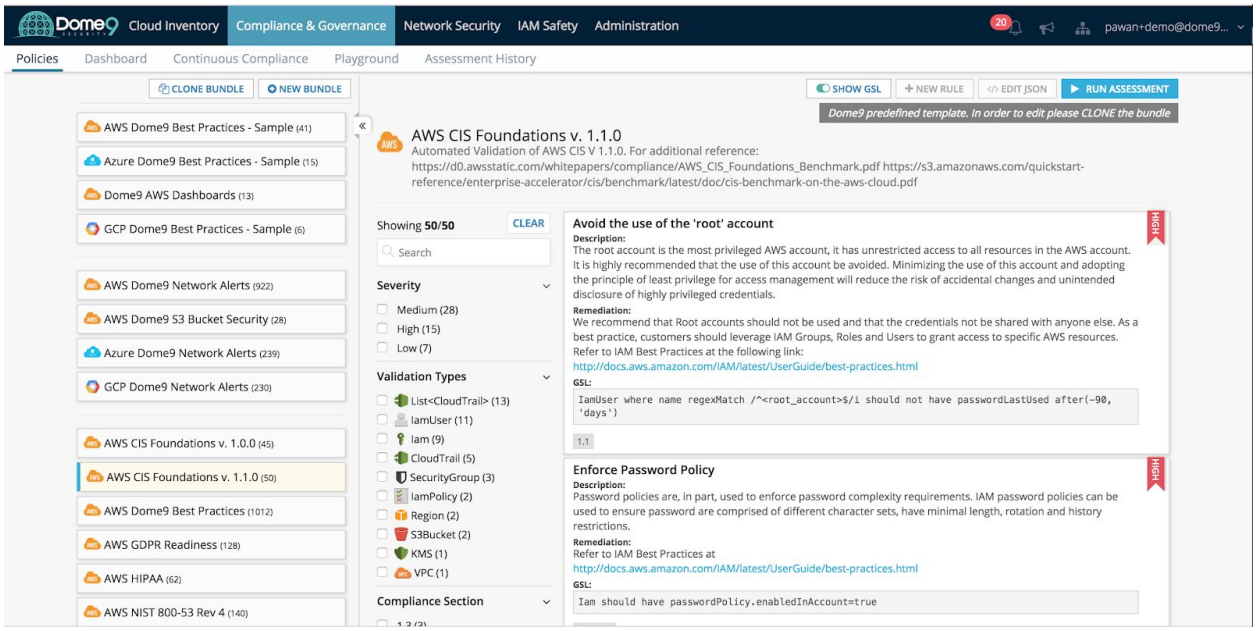
The goal of this exercise is to help you understand how to control S3 bucket access. We will focus on how to ensure specific role can interact with S3 and thereby not allowing any anonymous/outside users have access to sensitive data in the bucket. We will also look at least privilege concept, where you as an admin decide who has access (whitelist) to the most sensitive S3 operations and deny everyone else.

Exercise 6.1: Detecting Exposed Buckets

1. Navigate to Compliance Engine Tab

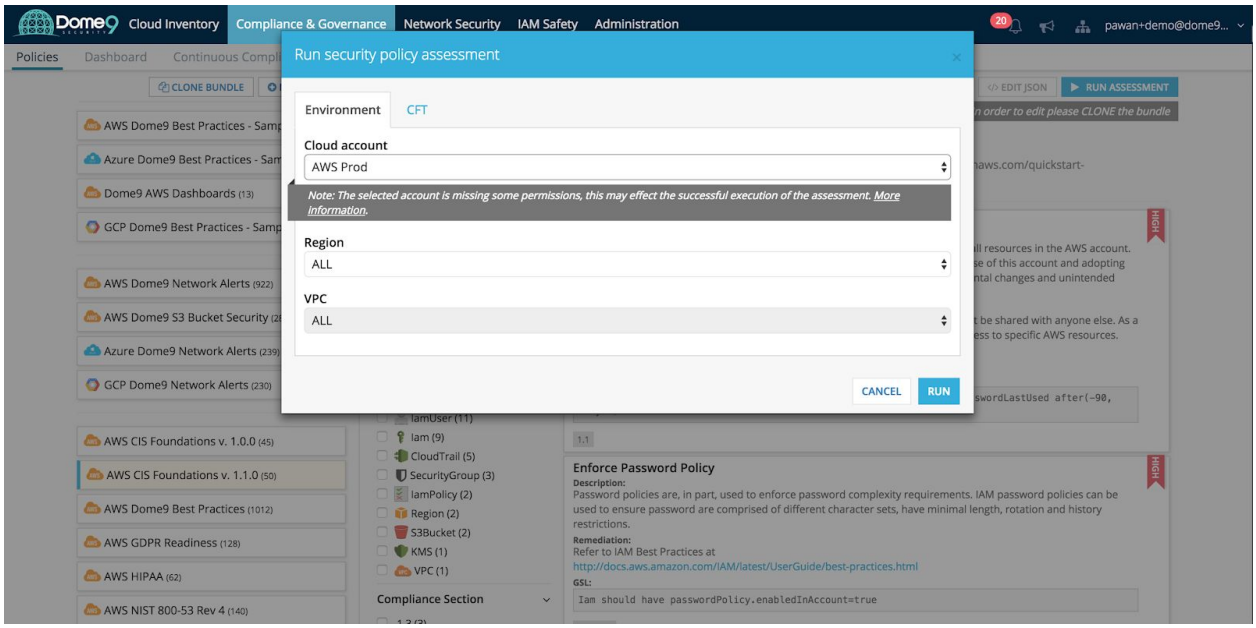


2. Explore Compliance Engine page



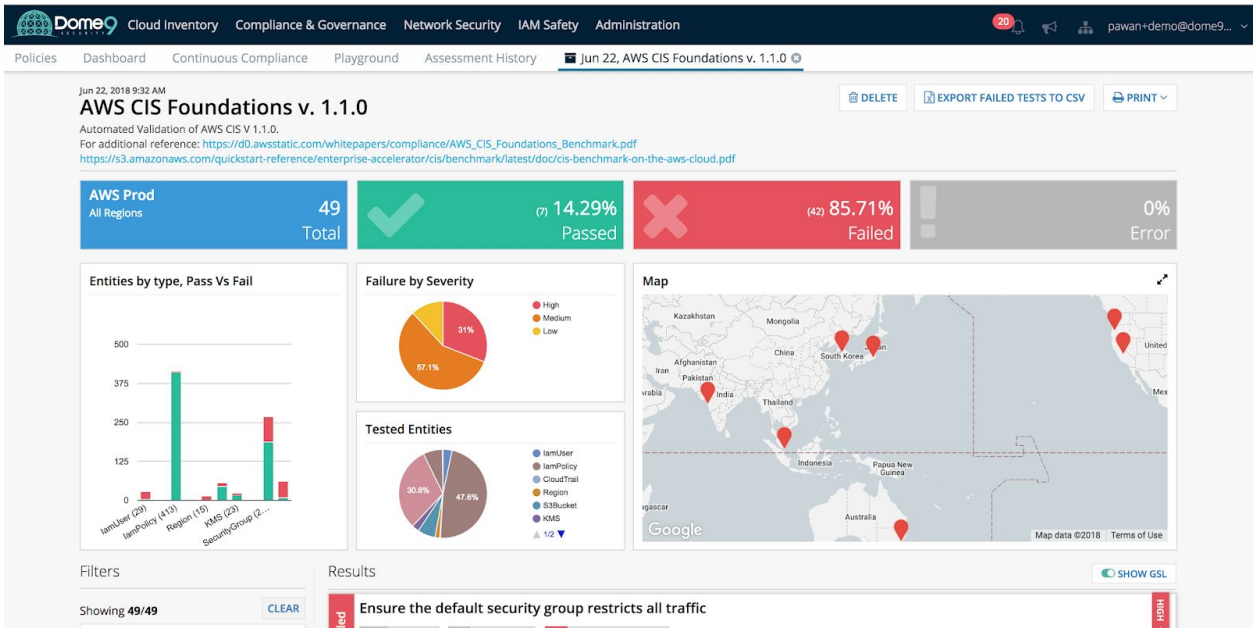
Dome9 Compliance Engine monitors and scans your AWS/Azure/GCP infrastructure to ensure alignment with compliance standards such as PCI-DSS, NIST 800-53, GDPR, CIS etc.

3. Select CIS Benchmarks and run bundle assessment



Select your AWS environment in the cloud account section. Dome9 also provides the option to BYOC (Bring your own CFT) and scan your template before pushing to production.

5. Analyze the report findings



Within a few seconds, the Compliance Engine runs an assessment and provides detailed findings in an easy to use dashboard. You can see the number of test cases passed vs failed, as well as test cases segmented geographically, across regions and by test severities.

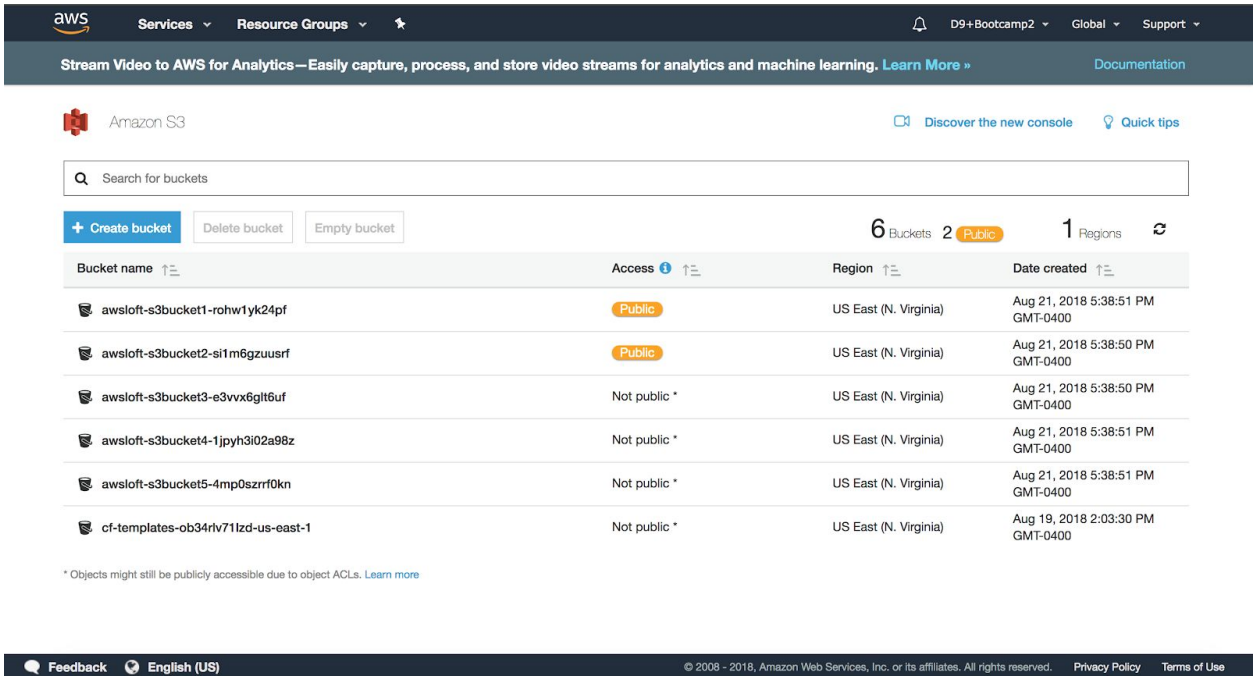
6. Filter Analyze key test results for **S3 buckets**
    1. Ensure buckets are not publicly accessible

How many buckets are publicly accessible?

Exercise Complete! You have now detect publicly exposed buckets!

Exercise 6.2: S3 Access Controls (exposed ACLs)

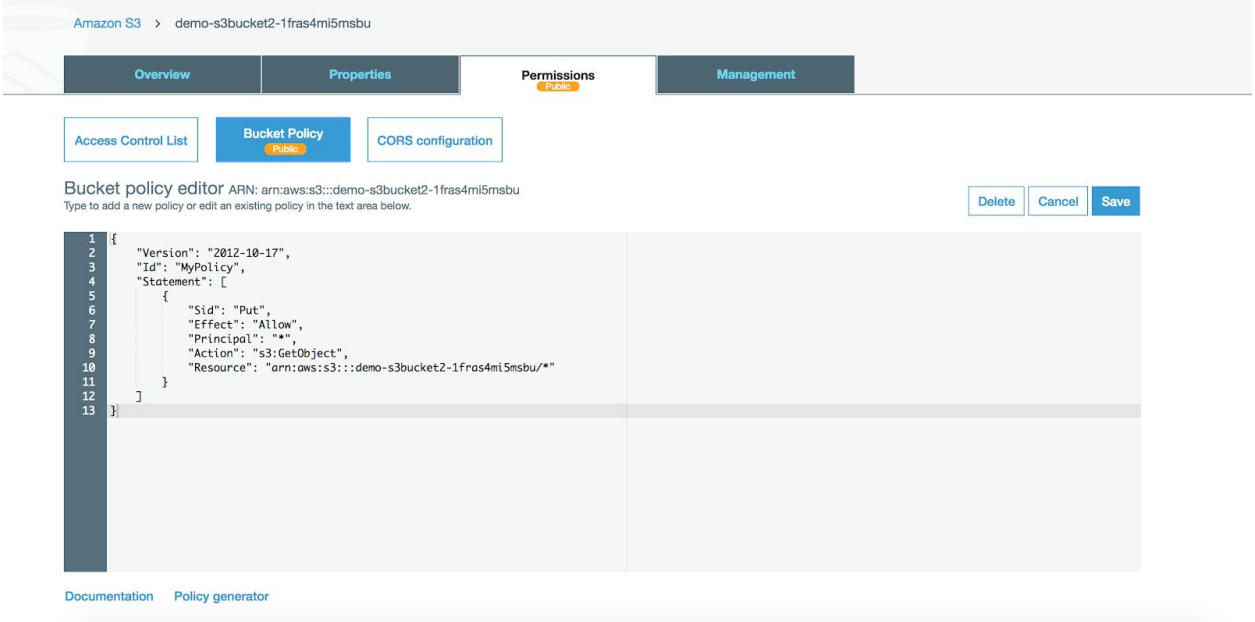
Navigate to the S3 console in AWS console. We will start with bucket 1



Fix <yourCFT>S3Bucket1

Exercise 6.3: S3 Access Controls (Bucket policies)

Now let's move to <yourCFT>S3Bucket2. Write JSON policy (start from the existing configuration seen below)



Bucket Policy: Access Management - Only Allow **S3-Role** to put and get objects in this bucket.

Sample snippet for Principal parameter:

"Principal": {
"AWS": "arn:aws:iam::<ACCOUNT NUMBER>:role/<INSERT S3 ROLE NAME HERE>"
},

Hint: copy/paste the Principal parameter to include S3 role name. It can be found by navigating to **Services** -> **IAM** -> **Roles** -> <your S3 Role Name>

Bucket Policy: Least Privilege enforcement - Ensure deletion of S3 bucket can only be done based on your specific AWS account id (this is important for sensitive buckets that may have other accounts accessing it, and you want to make sure the most critical operations are whitelisted)

Sample JSON to add in your bucket policy (don't forget to add , after previous statement)

```
,
{
        "Sid": "Stmt1526361042800",
        "Effect": "Deny",
        "Principal": "*",
        "Action": "s3:DeleteBucket",
        "Resource": "arn:aws:s3:::<copy your S3 bucket resource name in existing policy>",
        "Condition": {
            "StringNotLike": {
                "aws:userid": "YOURAWSACCOUNTID"
            }
        }
    }
```

Exercise Complete! You have now ensured no buckets are publicly exposed!

Offboarding

Please navigate to the Cloudformation and click the stack and delete stack. You are now done!