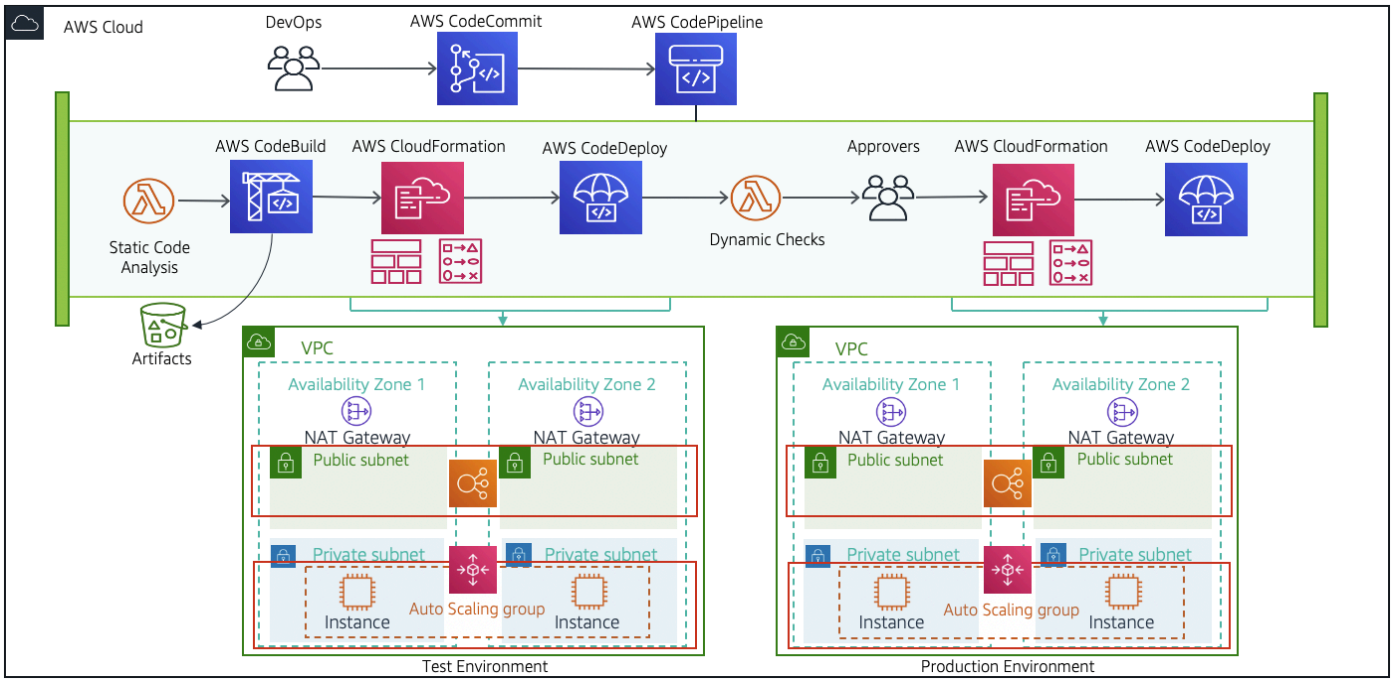
Lab 6: Using AWS DevOps tools for CI/CD pipeline automations

We work on a release pipeline that has failed in the build stage

Objectives of this lab:

1. Understand the architecture of a release pipeline.
2. Perform basic troubleshooting of failed stages in AWS CodePipeline by locating, analyzing logs, and applying fixes as needed.
3. Adjust the configurations of an AWS infrastructure based on test results from the pipeline.
4. Validate and manually approve a change between stage transitions of a pipeline.
5. Add new actions to an existing AWS CodePipeline stage.

NOTE - X-Ray provides an end-to-end view of requests as they travel through your application, making it easier to identify performance bottlenecks and errors.



An **AWS CodeCommit** repository has already been created, and the code for the demo calculator web application has already been uploaded into the AWS CodeCommit repository.

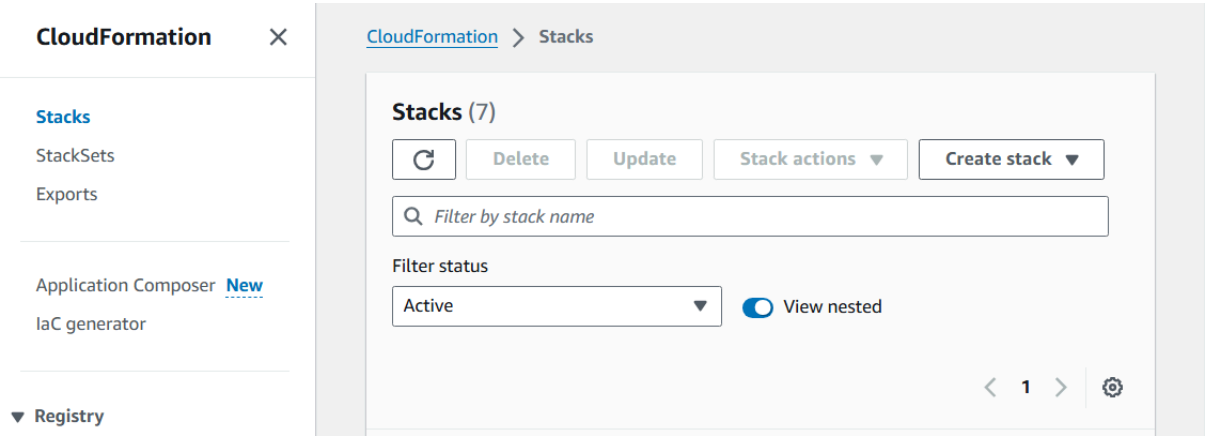
In the **Static_Check stage**, a static analysis of the code is performed using an AWS Lambda function named CFNValidateLambda. The Lambda function uses regular expression language to find patterns and identify security group policy violations, then Lambda fails the pipeline.

Build specification files, commonly referred to as build spec files, are YAML formatted files used by AWS CodeBuild to define the commands and settings for build projects.

Task 1 - Building the Pipeline

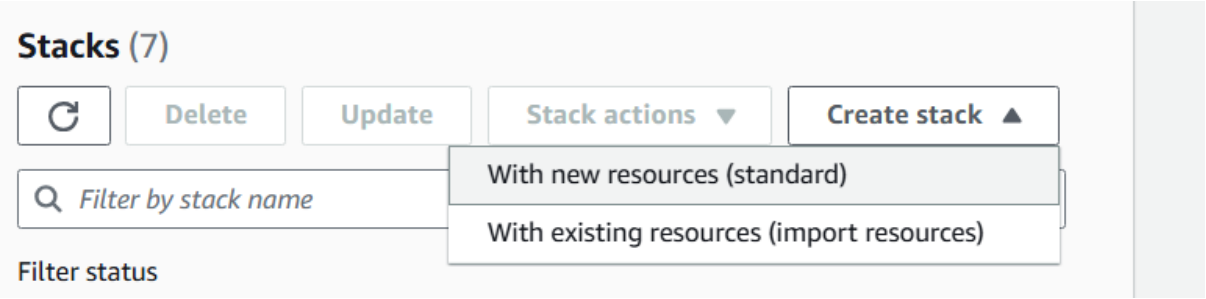
1.1 Search and open CloudFormation in AWS

AWS CloudFormation is a tool provided by Amazon Web Services (AWS) that helps you set up and manage AWS resources using code. Instead of manually configuring resources, you define what you need in a text file, and CloudFormation takes care of the rest.

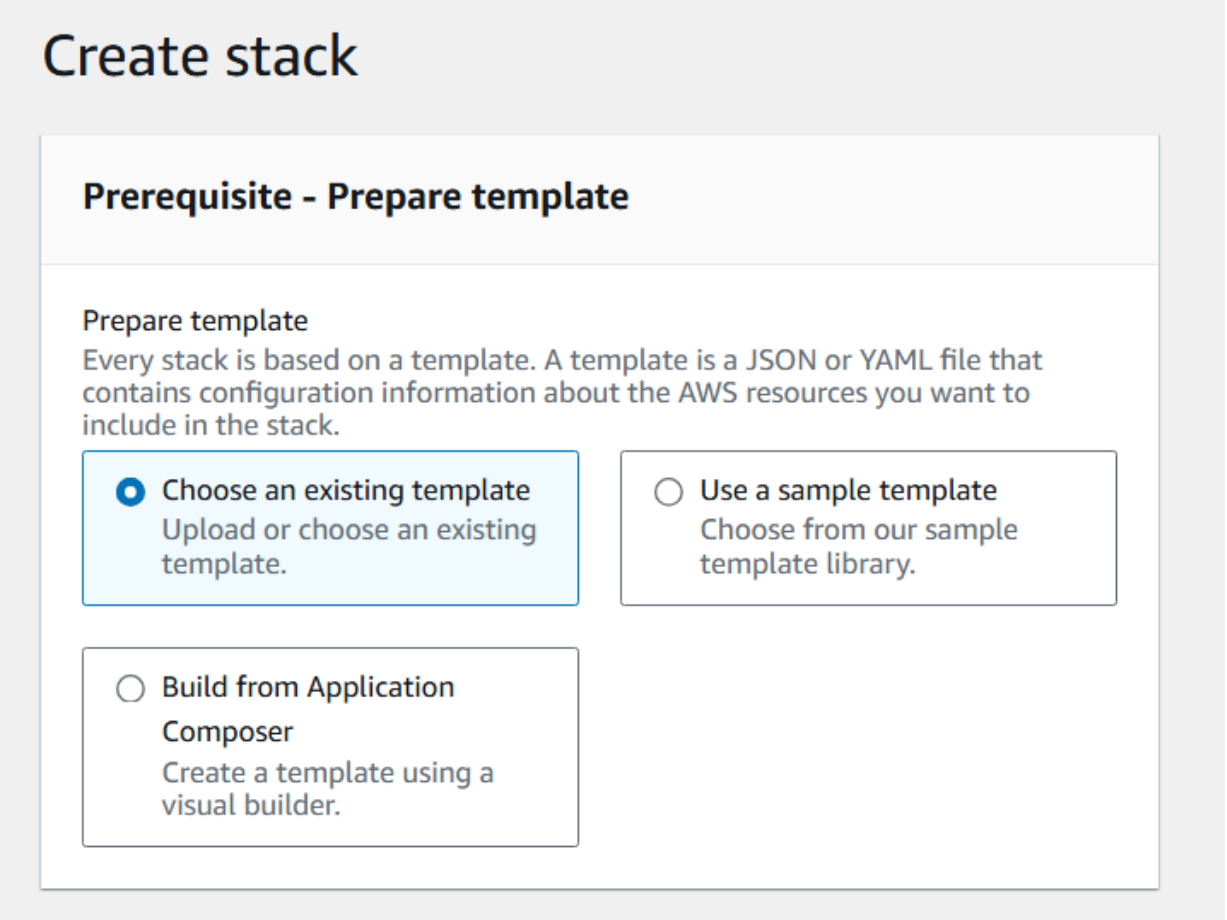


1.2 Click on create standard stack

A stack is a collection of AWS resources that you can manage as a single unit. Stacks enable you to create, update, and delete related resources together, ensuring they are managed consistently.



1.3 For the template, choose existing stack



1.4 Specify the template from S3 bucket, whose location is in lab manual

Specify template

A template is a JSON or YAML file that describes your stack's resources and properties.

Template source

Selecting a template generates an Amazon S3 URL where it will be stored.

- (●) **Amazon S3 URL**
  Provide an Amazon S3 URL to your template.
- ( ) **Upload a template file**
  Upload your template directly to the console.
- ( ) **Sync from Git - *new***
  Sync a template from your Git repository.

Amazon S3 URL

https://ap-south-1-tcprod.s3.amazonaws.com/courses/ILT-TF-200-DEVOPS/

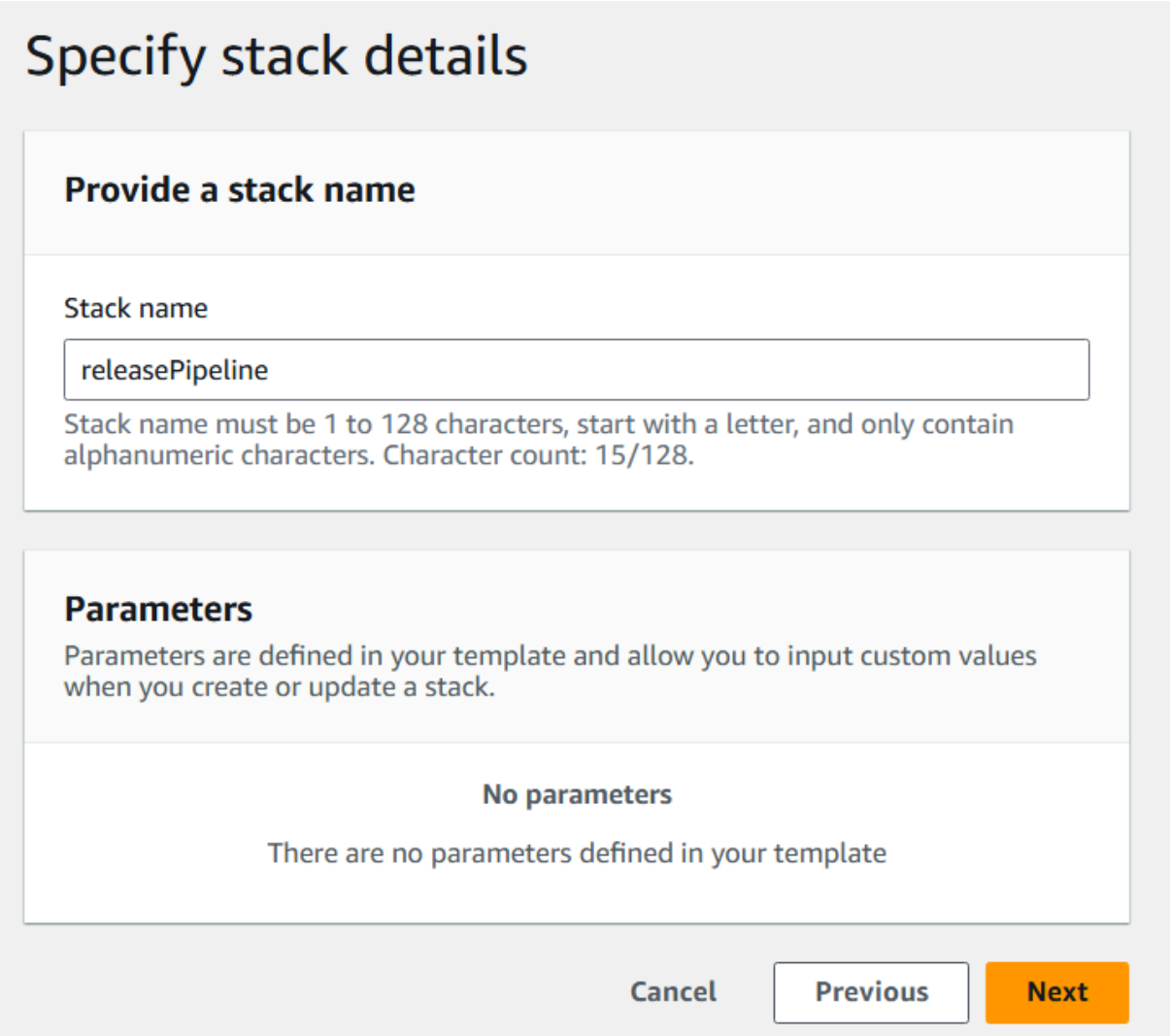
Amazon S3 template URL

S3 URL: https://ap-south-1-tcprod.s3.amazonaws.com/courses/ILT-TF-200-DEVOPS/v3.6.4.prod-bb9fae11/lab-6-DevOpsTools/scripts/releasePipelineTemplate.yaml

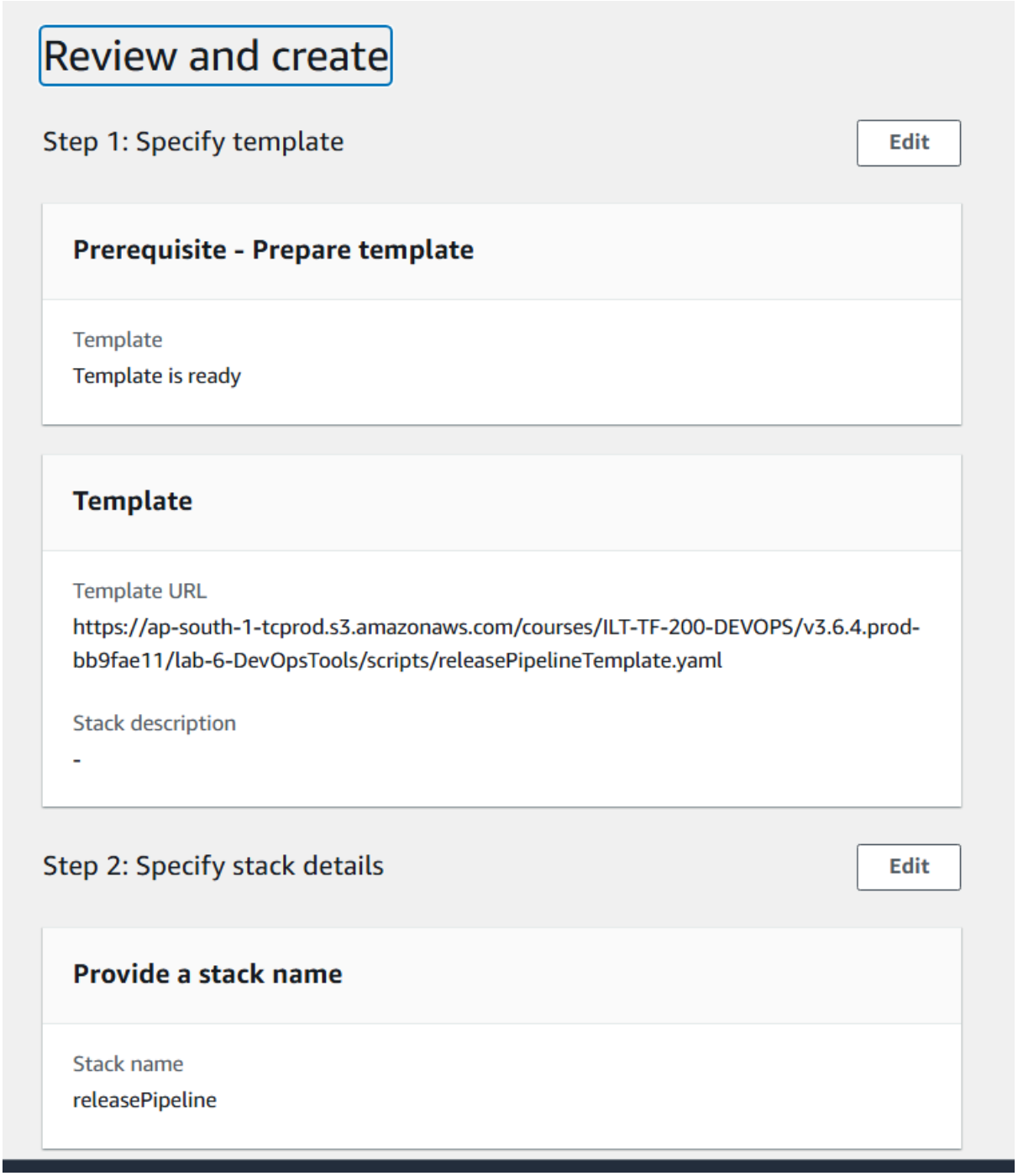
View in Application Composer

1.5 Click next

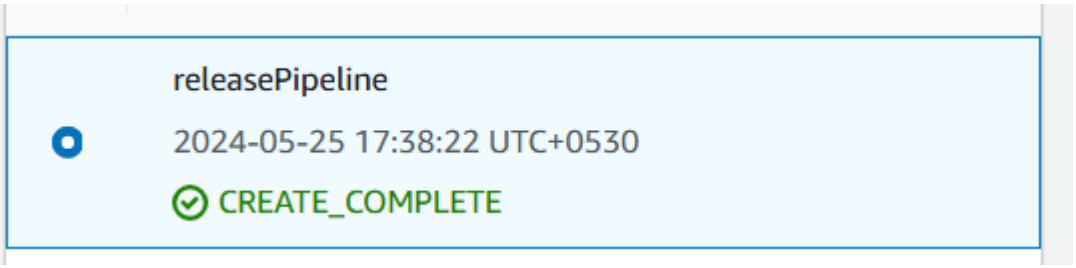
1.6 Give the stack name, and next



1.7 Review the inputs, and proceed

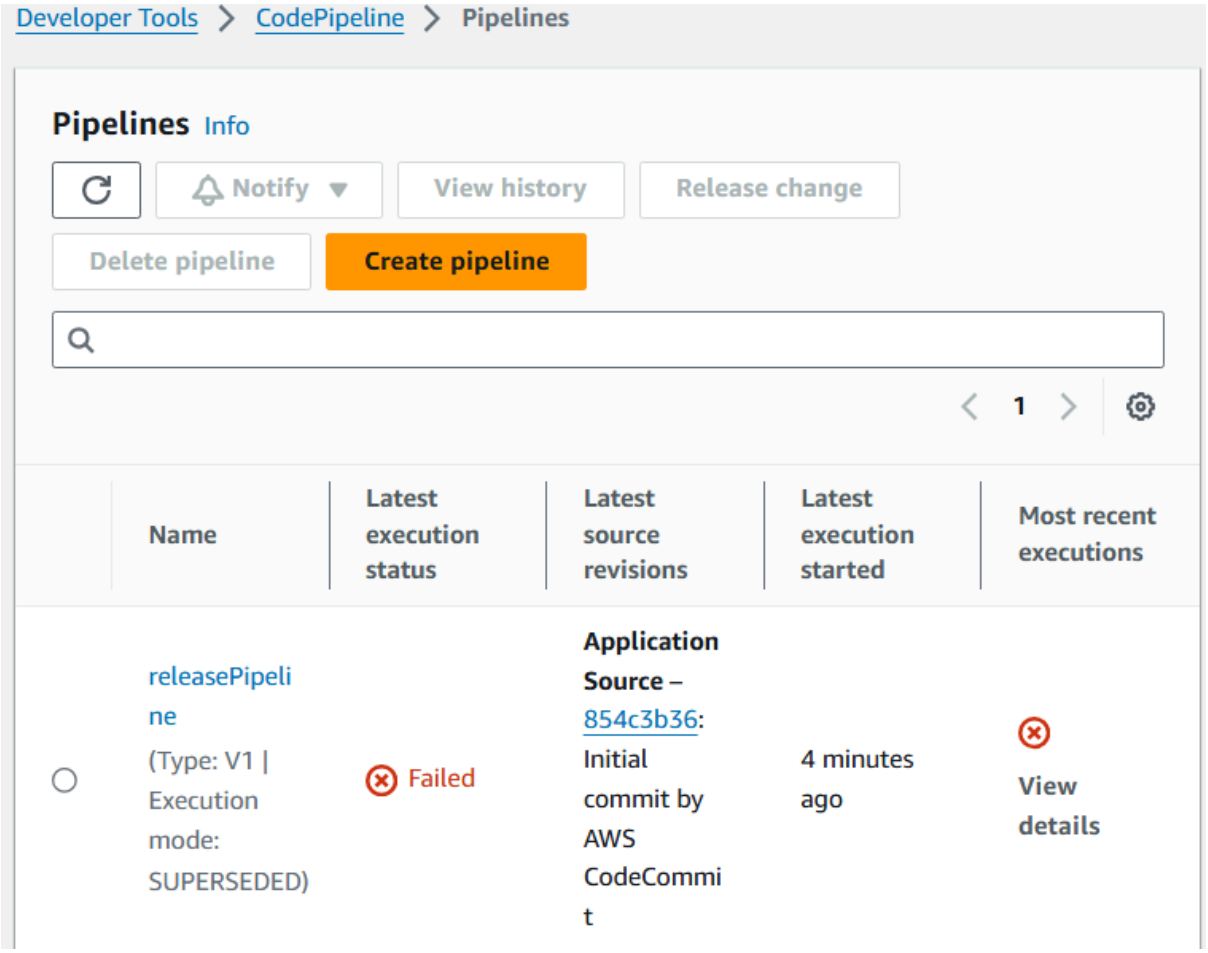


1.8 CloudFormation has finished and the pipeline is ready to use.

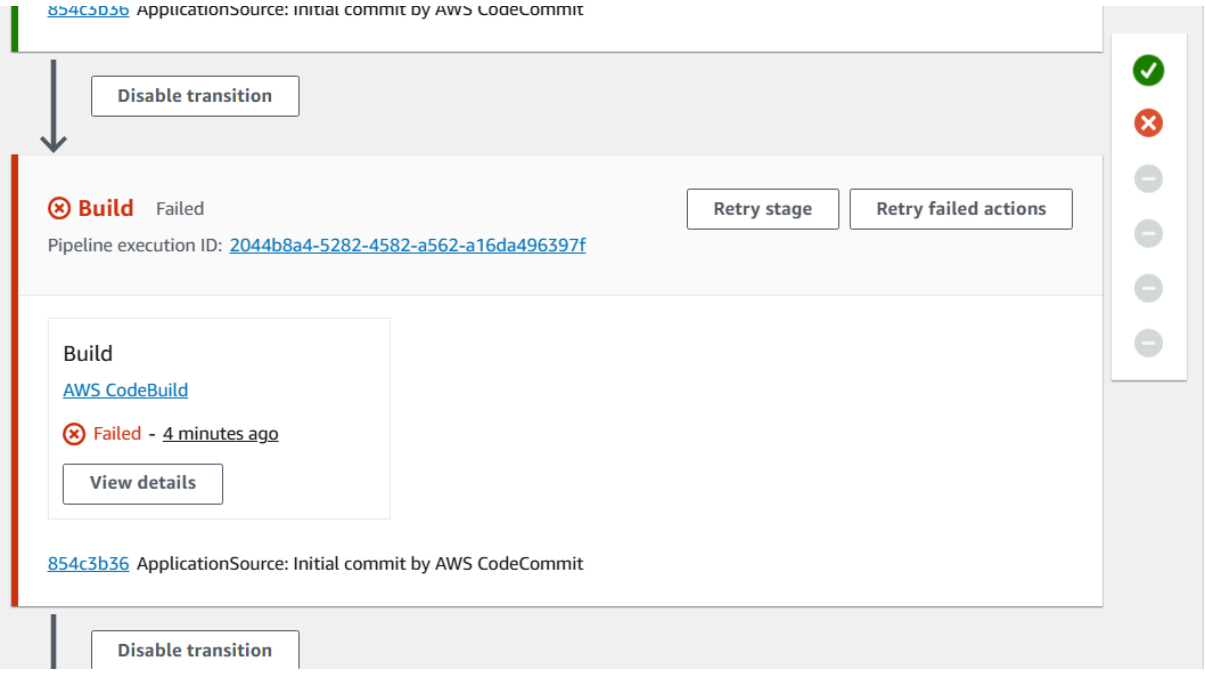


Task 2 - Fixing the build stage

2.1 Open CodePipeline, and choose release pipeline link

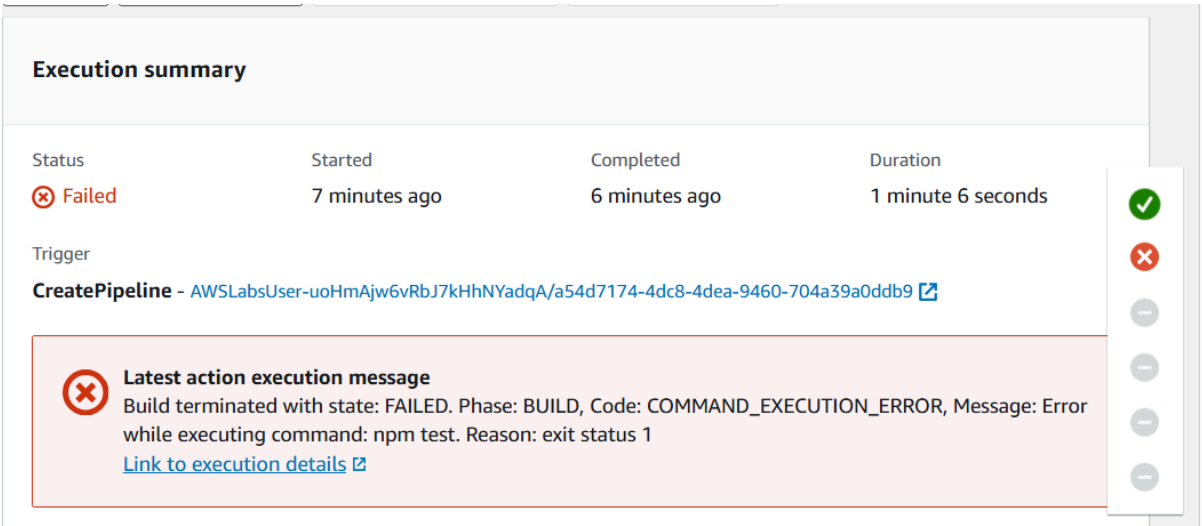


2.2 We see that the build phase for the pipeline has failed.



2.3 Open pipeline execution id, last snapshot

2.4 Select link to exec. Details



CodeBuild page opens and the CodeBuild page shows what happened during the stage's action.

Build status

Status	Initiator	Build ARN
Failed	codepipeline/releasePipeline	arn:aws:codebuild:ap-south-1:773946498214:build/Lab6-BuildProject:ee718346-d3cd-45cc-a489-085d2f73d645
Resolved source version	**Start time**	**End time**
854c3b36d0004374991b63f319592edc9827230a	May 25, 2024 5:38 PM (UTC+5:30)	May 25, 2024 5:39 PM (UTC+5:30)
Build number		
1		

2.5 Scroll down to see the build logs

Entries are timestamped, indicate what ran, and where it ran.

Build logs | Phase details | Reports | Environment variables | Build details | Resource utilization

Showing the last 98 lines of the build log. View entire log

Tail logs

No previous logs

```
1 [Container] 2024/05/25 12:08:34.024489 Running on CodeBuild On-demand
2 [Container] 2024/05/25 12:08:34.024500 Waiting for agent ping
3 [Container] 2024/05/25 12:08:34.226303 Waiting for DOWNLOAD_SOURCE
4 [Container] 2024/05/25 12:08:35.454114 Phase is DOWNLOAD_SOURCE
5 [Container] 2024/05/25 12:08:35.455237 CODEBUILD_SRC_DIR=/codebuild/output/src3184449181/src
6 [Container] 2024/05/25 12:08:35.455666 YAML location is
  /codebuild/output/src3184449181/src/buildspecs/build-with-cache.yml
7 [Container] 2024/05/25 12:08:35.457783 Setting HTTP client timeout to higher timeout for S3 source
8 [Container] 2024/05/25 12:08:35.457883 Processing environment variables
9 [Container] 2024/05/25 12:08:35.630652 Selecting 'nodejs' runtime version '12' based on manual
```

2.6 Scroll down to the very bottom, it shows which state failed

```
81 npm ERR! Test failed.  See above for more details.
82
83 [Container] 2024/05/25 12:09:27.654242 Command did not exit successfully npm test exit status 1
84 [Container] 2024/05/25 12:09:27.659005 Phase complete: BUILD State: FAILED
```

2.7 Scroll just up, and see the cause of the error

Here, it is an assertion error (4==0)

```
  1) Calculator Tests
       Multiply Tests
         returns 0 * 4 = 0:

      AssertionError [ERR_ASSERTION]: 4 == 0
      + expected - actual

      -4
      +0

      at Context.<anonymous> (test/calculator_spec.js:37:11)
      at processImmediate (internal/timers.js:461:21)
```

Another way to phrase what the Assertion Error in the log is saying is, The expected output of the test and the actual output from the test when it ran, are not equivalent to each other.

2.8 Note down the following:

1. Who caused the error: Calculator multiplication tests returned an error during the build process.
2. What the type of error was: Assertion Error in Node.js.
3. When in the build process the error occurred: During the build phase (timestamps are available, if needed).
4. Where the error occurred in the test code: The file path and file name of the test definitions is test/calculator_spec.js. The line number and character location is 37:11.
5. Why this error occurred: The root cause of the error was a mismatch between the value returned from the test and the expected value defined for the test.
6. How this error occurred: Likely a human error, such as a typo, occurred when creating the test code.

Task 3 - Fixing error in the test code

3.1 Open cloud9, and clone the repo in IDE

```
AWSLabsUser-uoHmAjw6vRbJ7kHhNYadqA:~/environment $ /tmp/git-cloning-runner-1716640093512-012920289612.sh
Cloning into '/home/ec2-user/environment/Lab6'...
```

3.2 Open the calculator file code using the file explorer

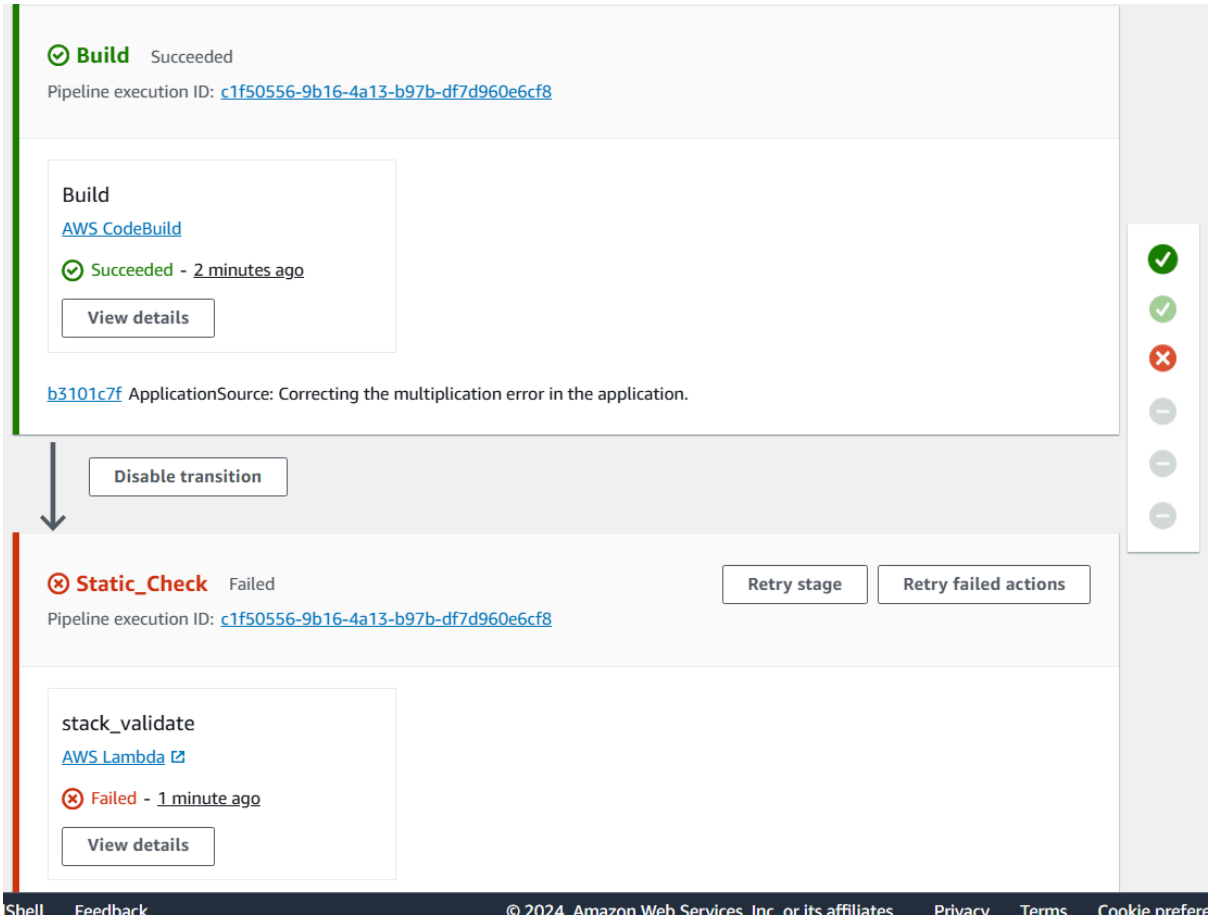
```
calculator.js
1  exports.add = function(a, b) {
2      return a + b;
3  };
4
5  exports.subtract = function(a, b) {
6      return a - b;
7  };
8
9  exports.multiply = function(a, b) {
10     return a + b;
11 };
12
13 exports.divide = function(a, b) {
14     return a / b;
15 };
16
```

3.3 Change line 10 to a*b

3.4 Commit the changes

```
AWSLabsUser-uoHmAjw6vRbJ7kHhNYadqA:~/environment/Lab6 (main) $ git add --all
AWSLabsUser-uoHmAjw6vRbJ7kHhNYadqA:~/environment/Lab6 (main) $ git commit -m 'Correcting the multiplication error in the application
.'
[main b3101c7] Correcting the multiplication error in the application.
 Committer: EC2 Default User <ec2-user@ip-10-192-3-94.ap-south-1.compute.internal>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly:

    git config --global user.name "Your Name"
    git config --global user.email you@example.com

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

 1 file changed, 1 insertion(+), 1 deletion(-)
AWSLabsUser-uoHmAjw6vRbJ7kHhNYadqA:~/environment/Lab6 (main) $
```

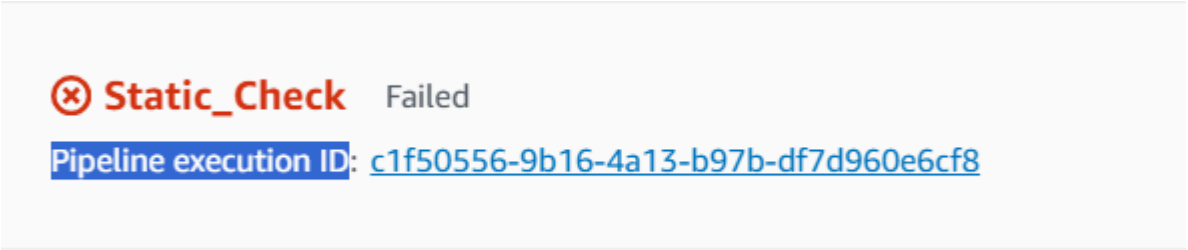
3.5 OPen codepipeline again, we see build stage has passed, but static check has failed



Task 4: Fixing the Lambda Static check

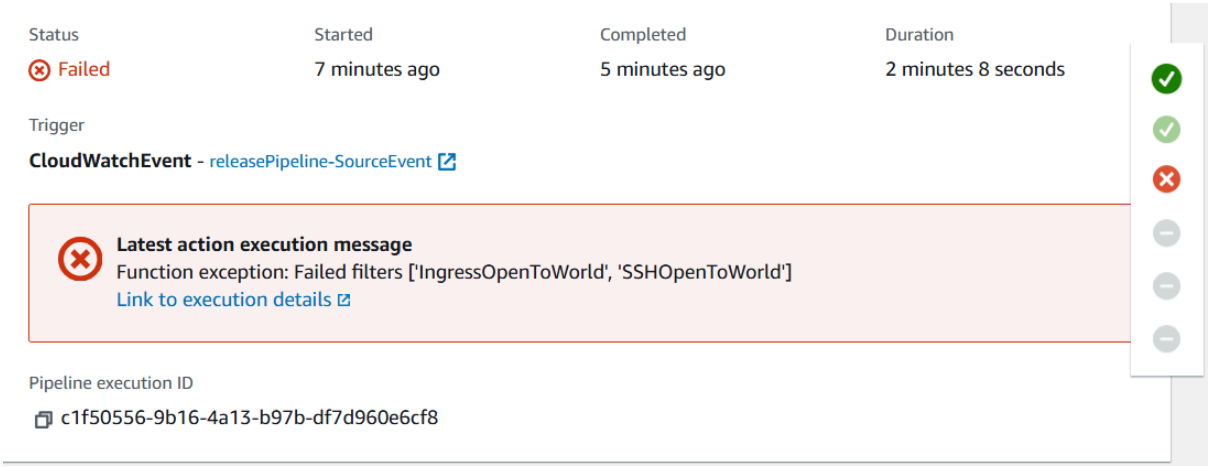
Consider: You may be wondering why this didn't fail the first time the pipeline ran. The code is intentionally written to not process any rules the first time in order to change the order of your troubleshooting. By instructing you to fix the build stage first, you can examine the Lambda function logs while you wait for the initial test environment deployment.

4.1 Click on the Pipeline execution ID



4.2 error:

The Action execution failed message dialog box displays the error returned from the Lambda CFNValidateLambda function. The reason for the failure is that the function found global access to the SSH network ingress ports.



4.3 Return to Cloud9

4.4 Open application.json file from the left pane explorer

```
application.json
30                          "Ref": "AWS::StackName"
31                          },
32                          "security-group"
33                      ]
34                  ]
35              },
36              "GroupDescription": "Security group that allows SSH ingress from all over the world!",
37              "VpcId": {
38                  "Fn::ImportValue": {
39                      "Fn::Sub": "${SharedResourceStack}:VPC"
40                  }
41              },
42              "SecurityGroupIngress": [
43                  {
44                      "IpProtocol": "tcp",
45                      "FromPort": 22,
46                      "ToPort": 22,
47                      "CidrIp": "0.0.0.0/0"
48                  }
49              ]
50          }
51      },
52      "DeploymentGroup": {
53          "Type": "AWS::CodeDeploy::DeploymentGroup",
54          "Properties": {
55              "DeploymentGroupName": {
                                                                    (7 Bytes)   47:43
ash - "ip-10-192-3-94.a ×   Immediate   bash - "ip-10-192-3-94.a ×

git config --global user.name "Your Name"
git config --global user.email you@example.com
```

4.5 On Line 47, change “CidrIp”: “0.0.0.0/0” so that the value is your own private IP address instead, to allow access only from your IP address

```
},
"SecurityGroupIngress": [
    {
        "IpProtocol": "tcp",
        "FromPort": 22,
        "ToPort": 22,
        "CidrIp": "152.58.76.163/32"
    }
```

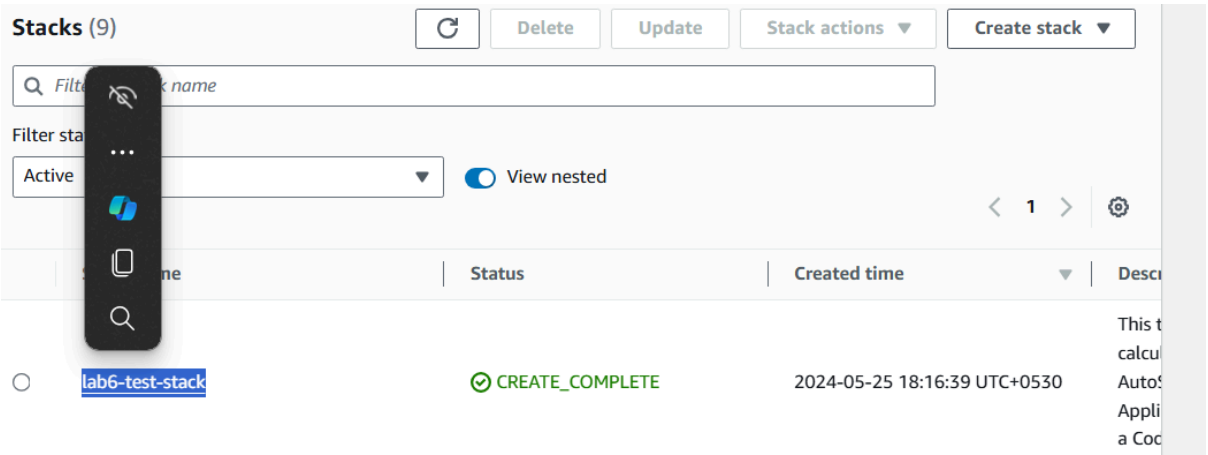
4.6 Save and push the changes

Task 5: Validating in the Test Environment

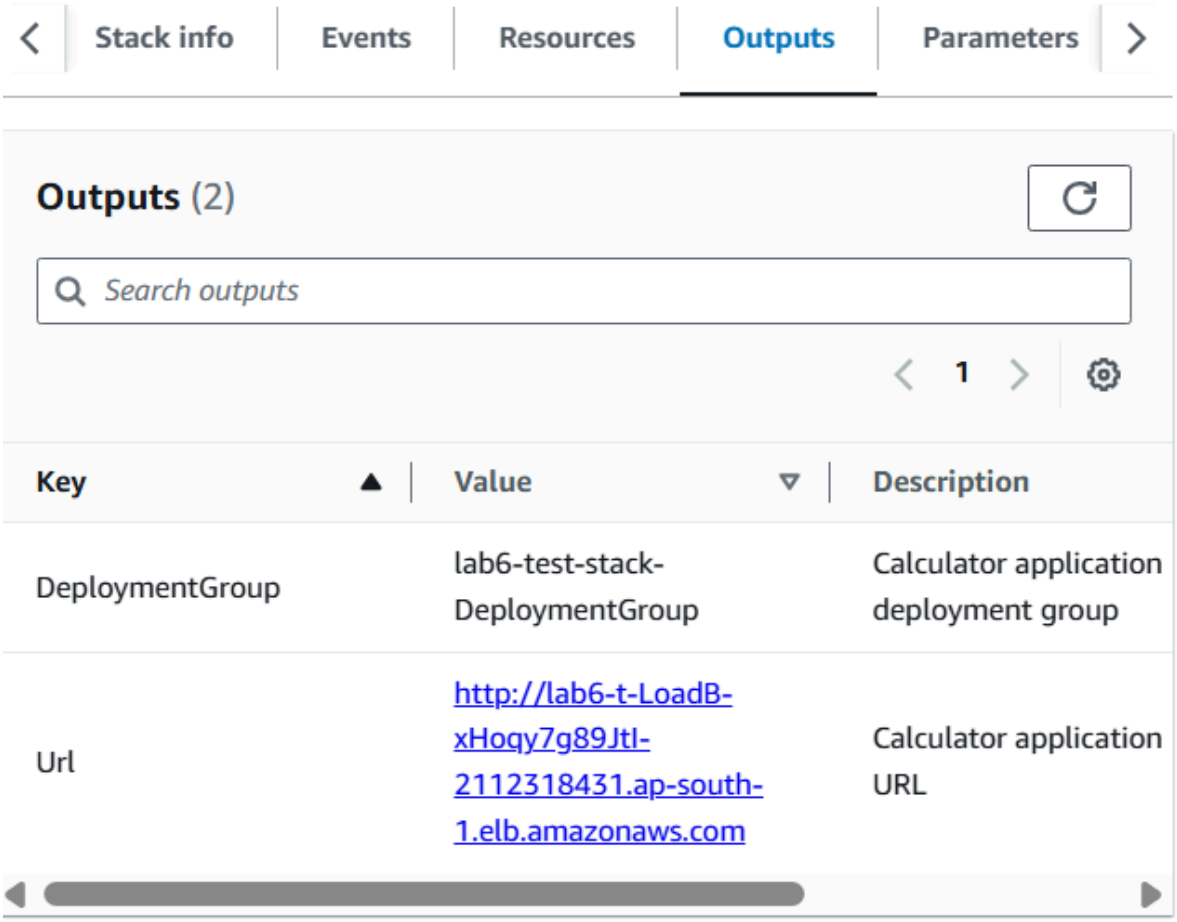
Your pipeline uses these deployment action providers -

1. **AWS CloudFormation** for deploying immutable infrastructure
2. **AWS CodeDeploy** for deploying applications.

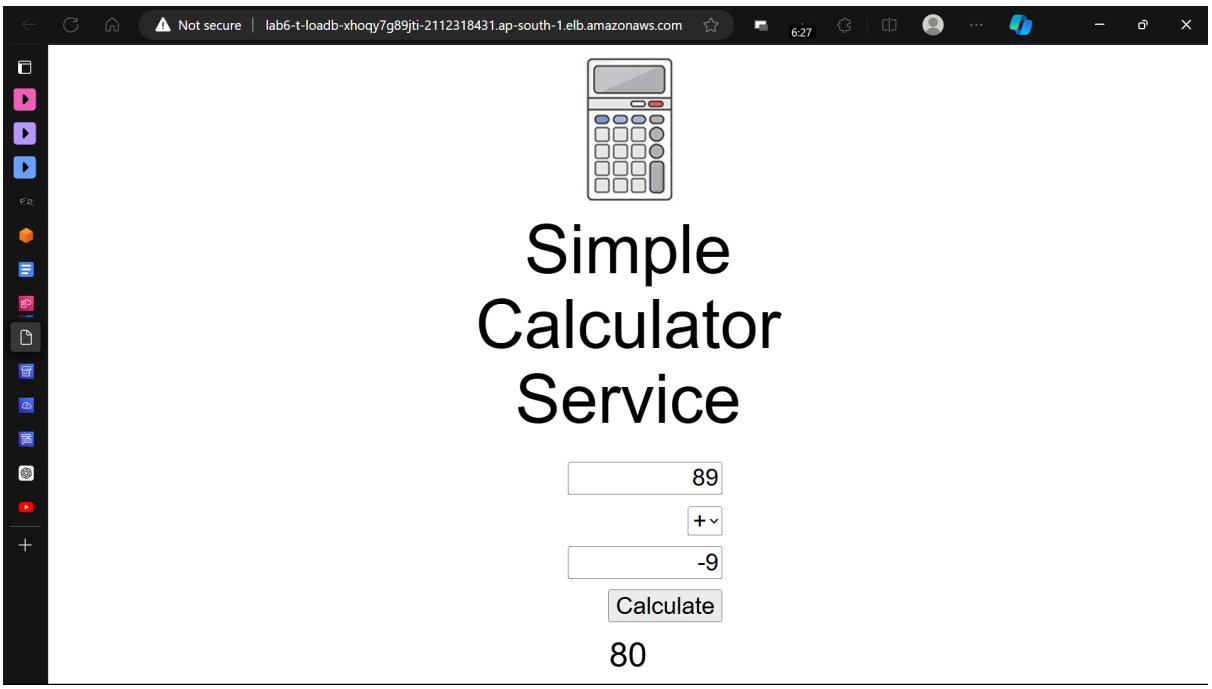
5.1 Open CloudFormation, and select test-stack



5.2 Open Outputs tab, and open the URL in new tab



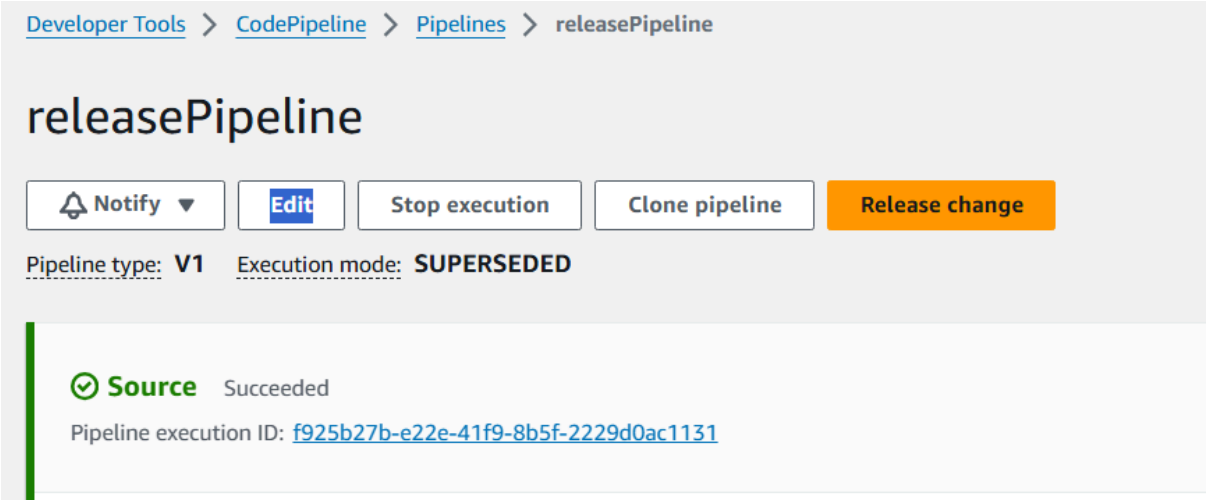
5.3 Our app opens, and it works!!!



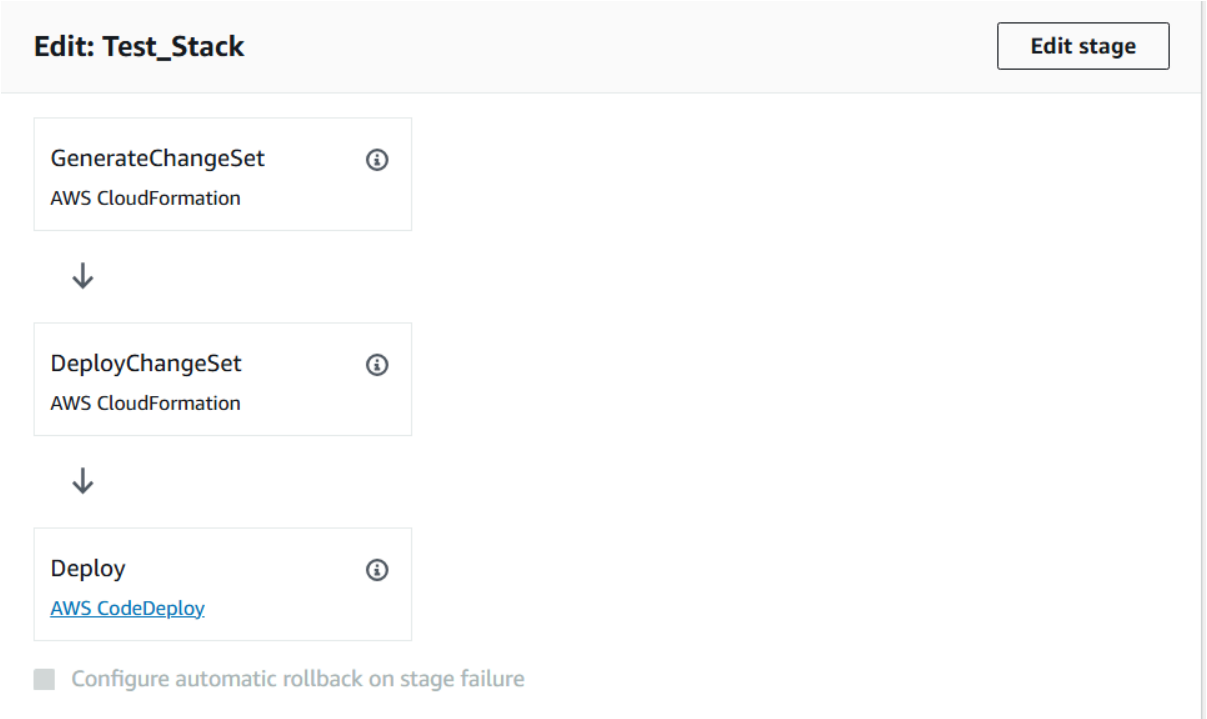
Task 6: Automating the testing of the test environment

In a previous task, wemanually validated and tested that the web application site was responsive. In this task, we use an AWS Lambda function in the release pipeline to automate the validation step for the test environment.

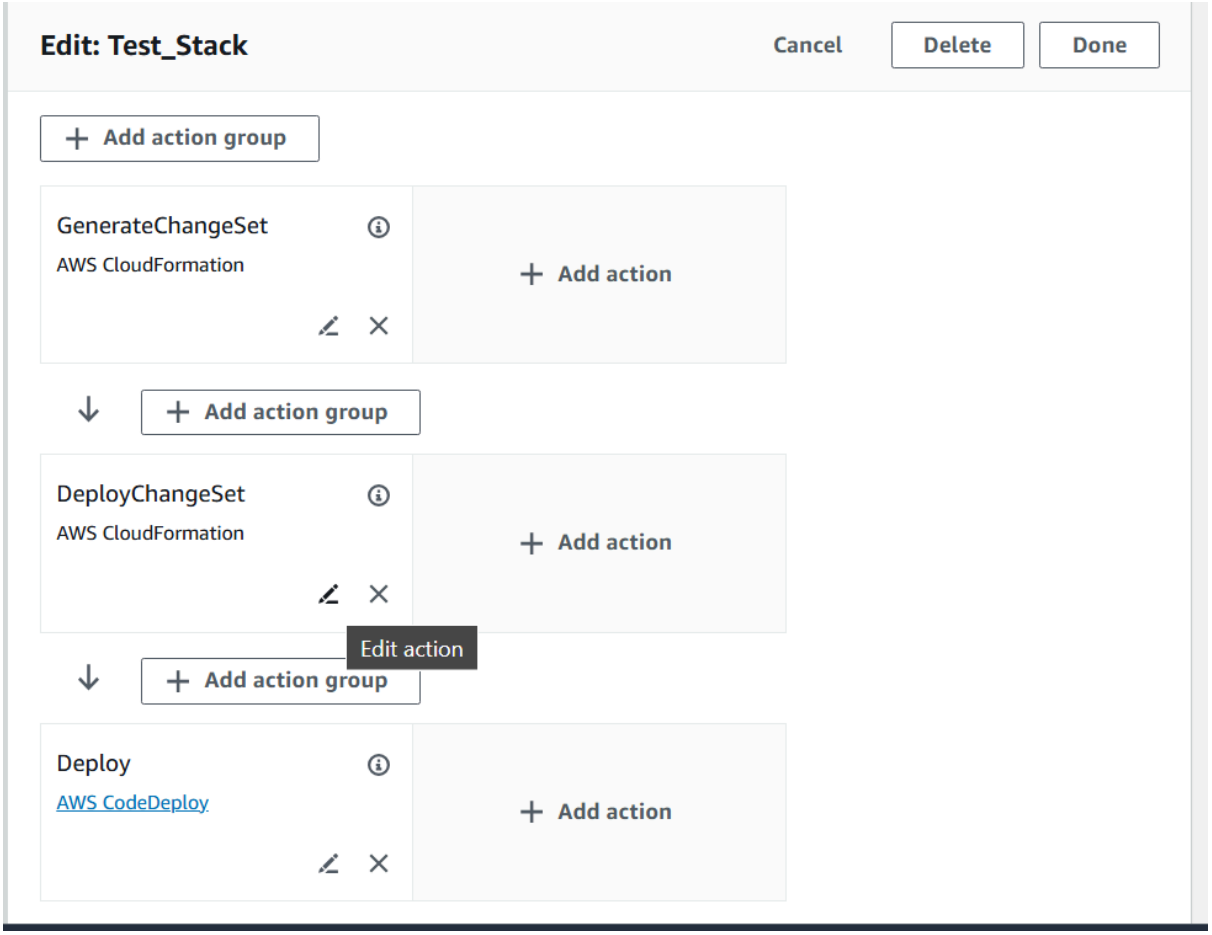
6.1 Go to CodePipeline and choose edit



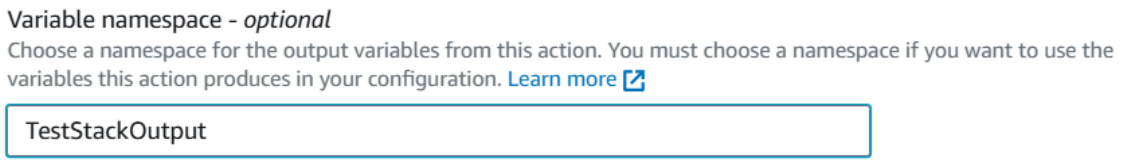
6.2 Choose edit stage in test_stack



6.3 Click on edit in DeployChangeSet

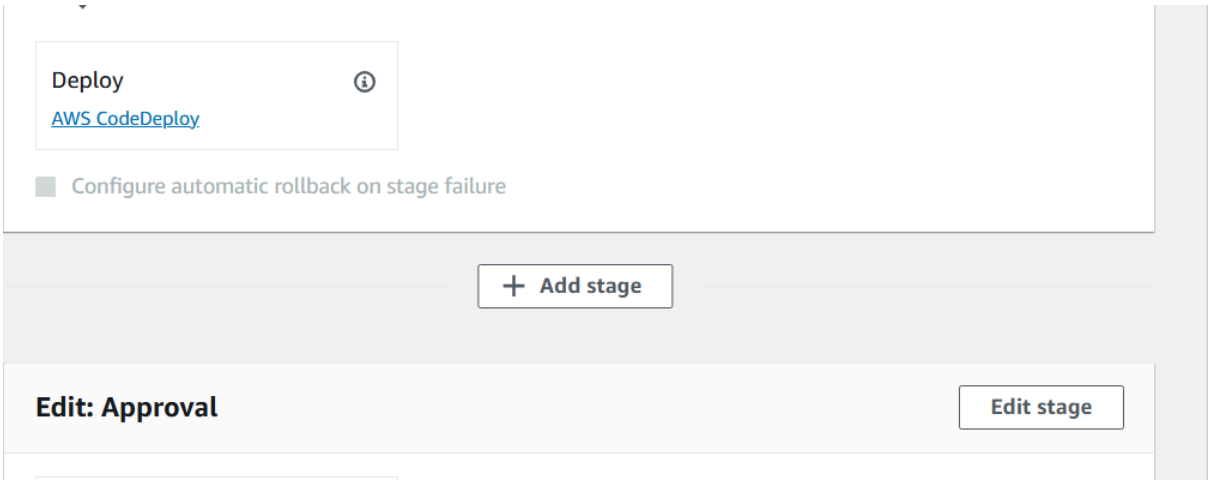


6.4 Fill this value

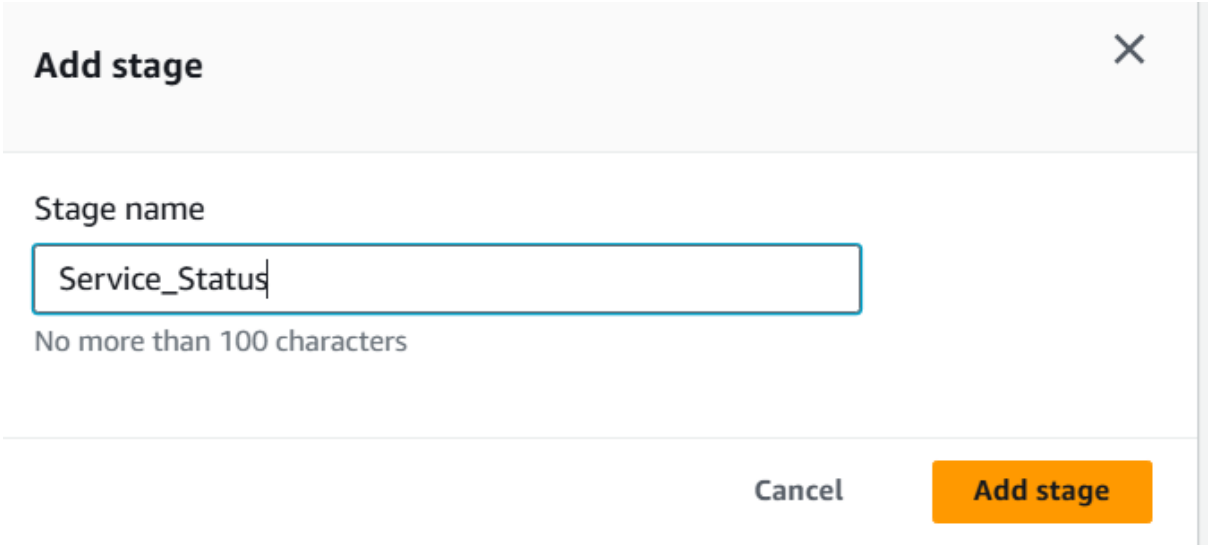


6.5 choose next

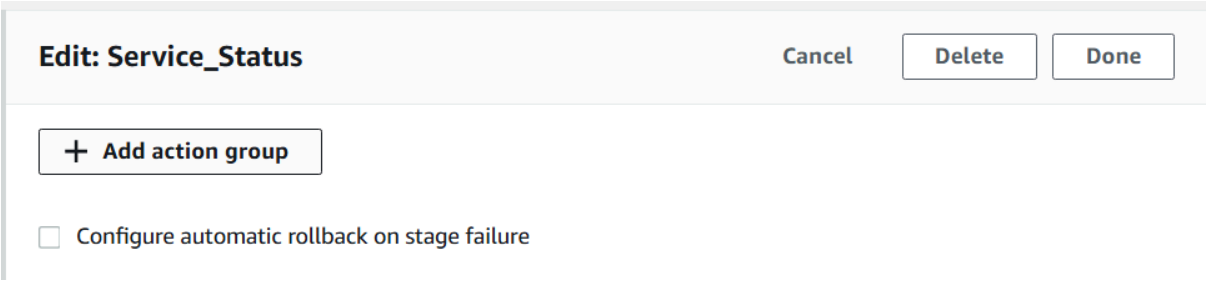
6.6 Click on add stage option after



6.7



6.8 Choose add action grp



6.9 Following values

For **Action name** enter `Test_Status`

For **Action provider** choose **AWS Lambda**

For **Region** , keep the default value. It should be the same AWS Region where your lab was launched or the same AWS Region as your pipeline.

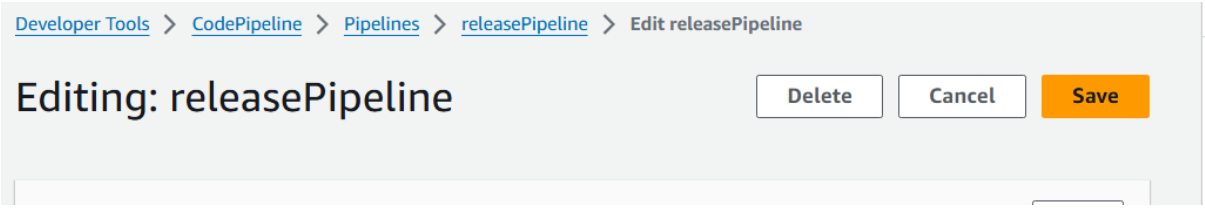
For **Function name** , choose the function name that contains the string **servicestatus** .

For **User parameters** - *optional*, enter `#{TestStackOutput.Url}`

Choose **Done** .

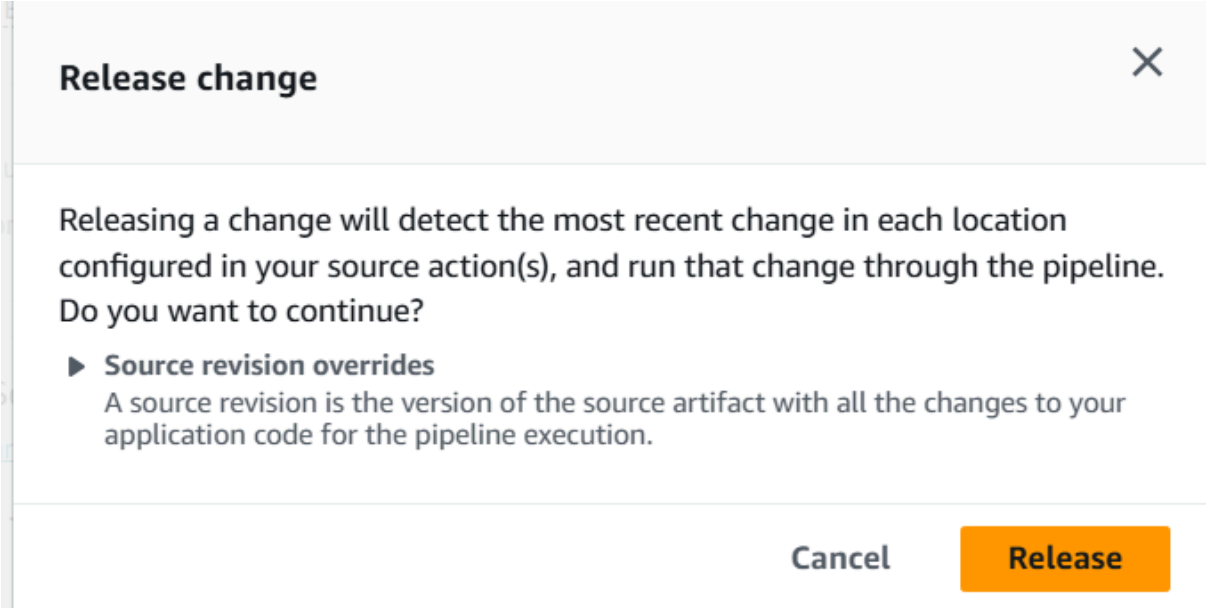
Click on done

6.10 Save the edits in pipeline



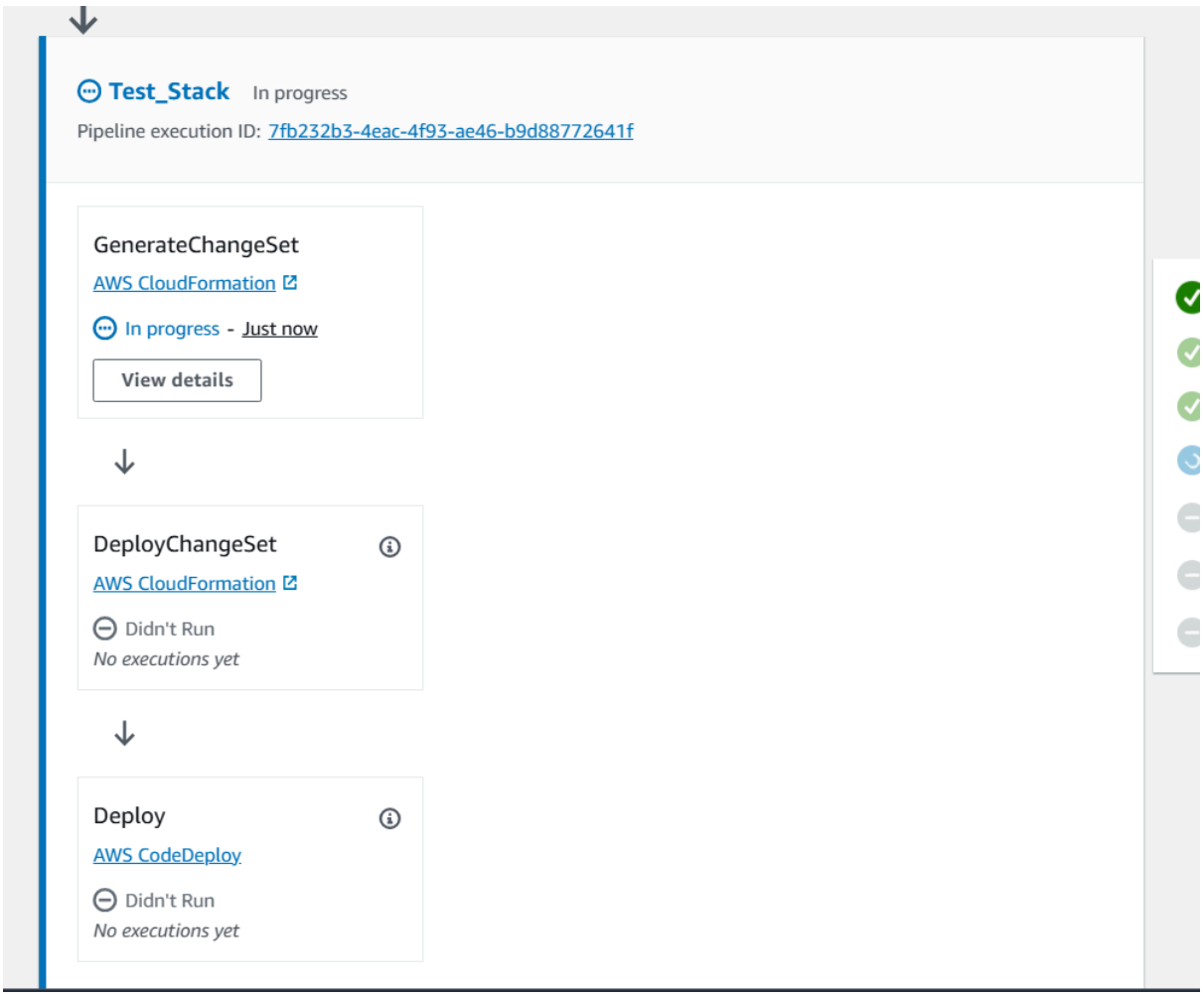
To test the new pipeline stage with the Lambda function, release the most recent change through the pipeline.

6.11 Click on release Pipeline



6.12

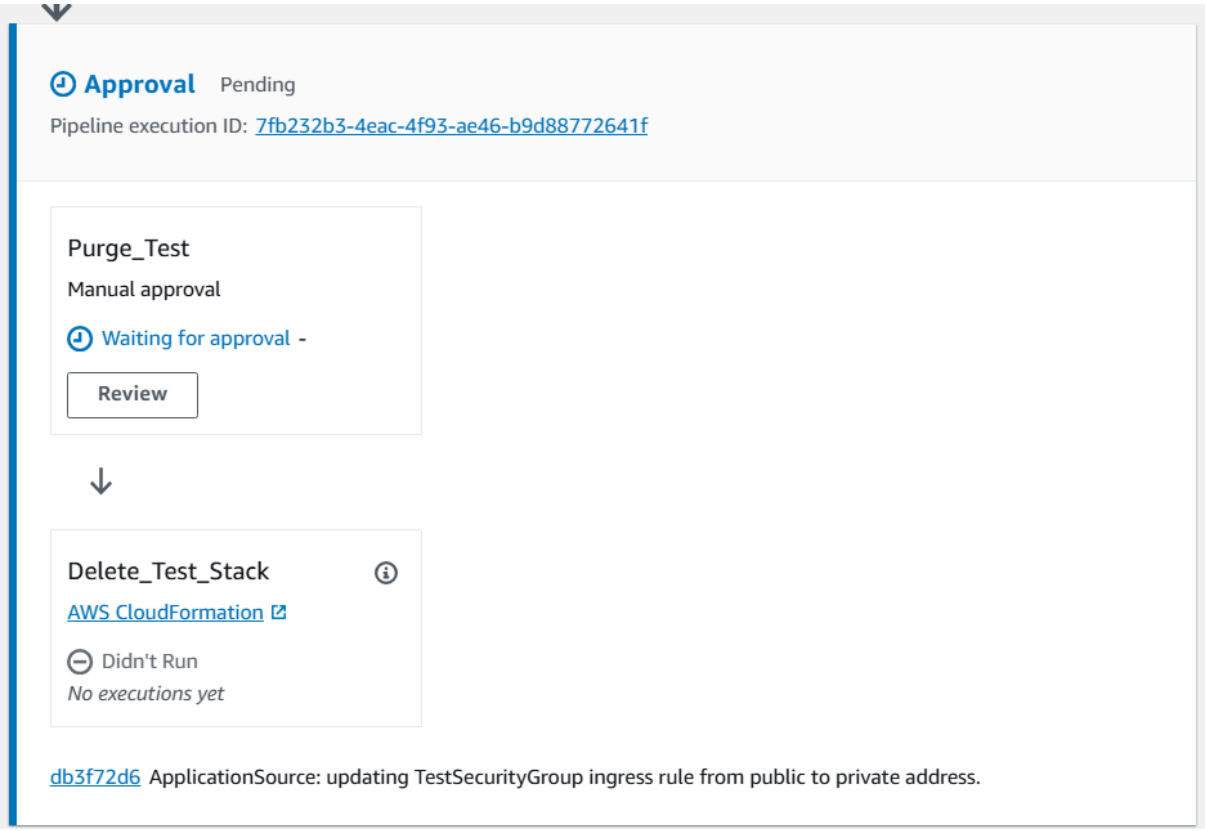
The most recent change will re-run through the pipeline. It might take a few moments for the status of the run to show in the pipeline view.



NOTE - We used the CodePipeline console to configure the DeployChangeSet action in the Test_Stack stage to export it's CloudFormation outputs as variables. You then added a new stage in the release pipeline and added an action in that stage and tested the new stage.

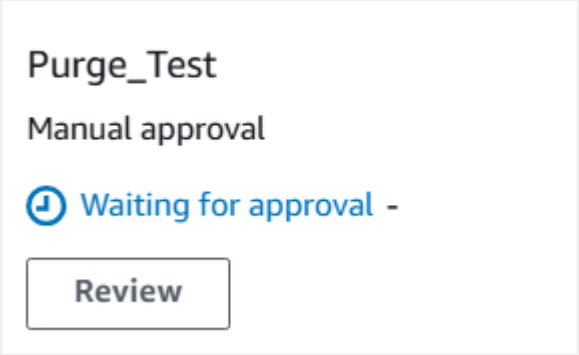
Task 7: Approving the deletion of the Test environment and build the Production environment

7.1 On the CodePipeline console, locate the Approval stage of the pipeline.

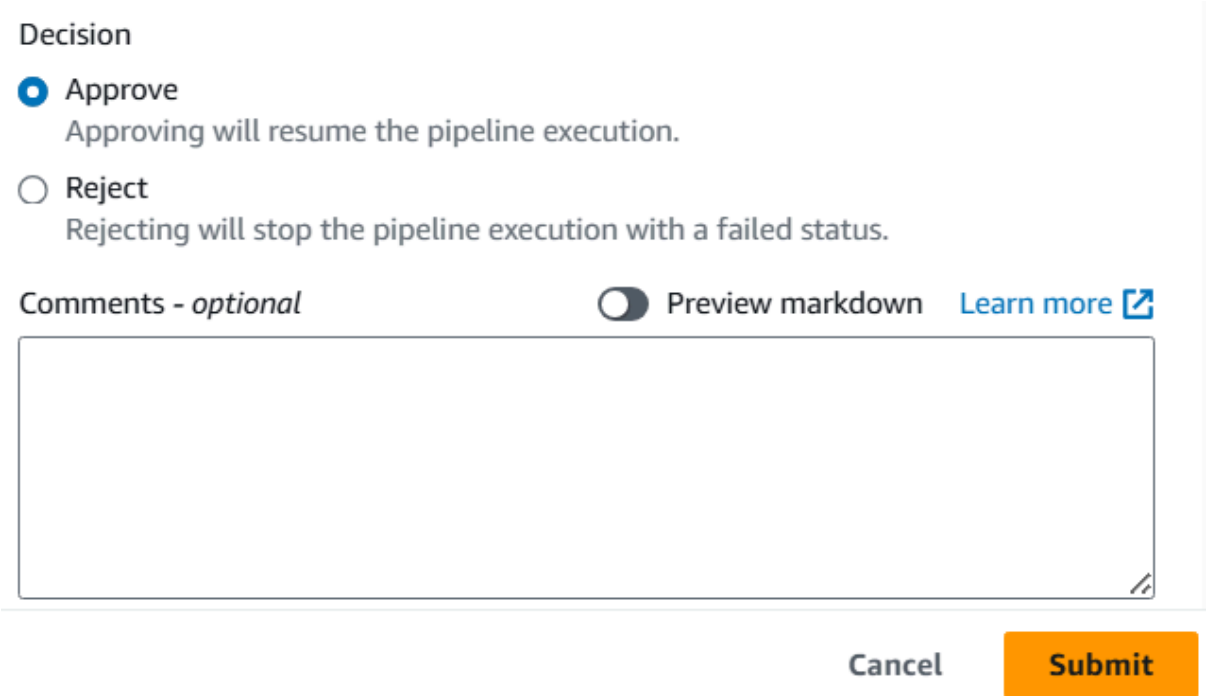


It is in pending state

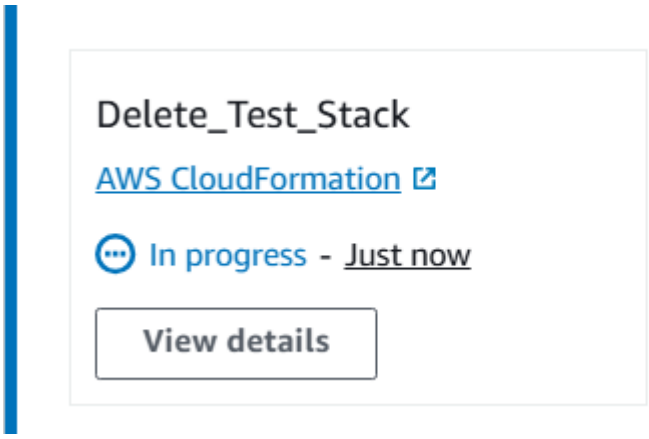
7.2 In the Purge_Test action, choose Review .



7.3 choose approve and submit



7.4 The pipeline performs actions with CloudFormation to delete the test environment stack.



Task 9: Verify the application deployment to Production environment

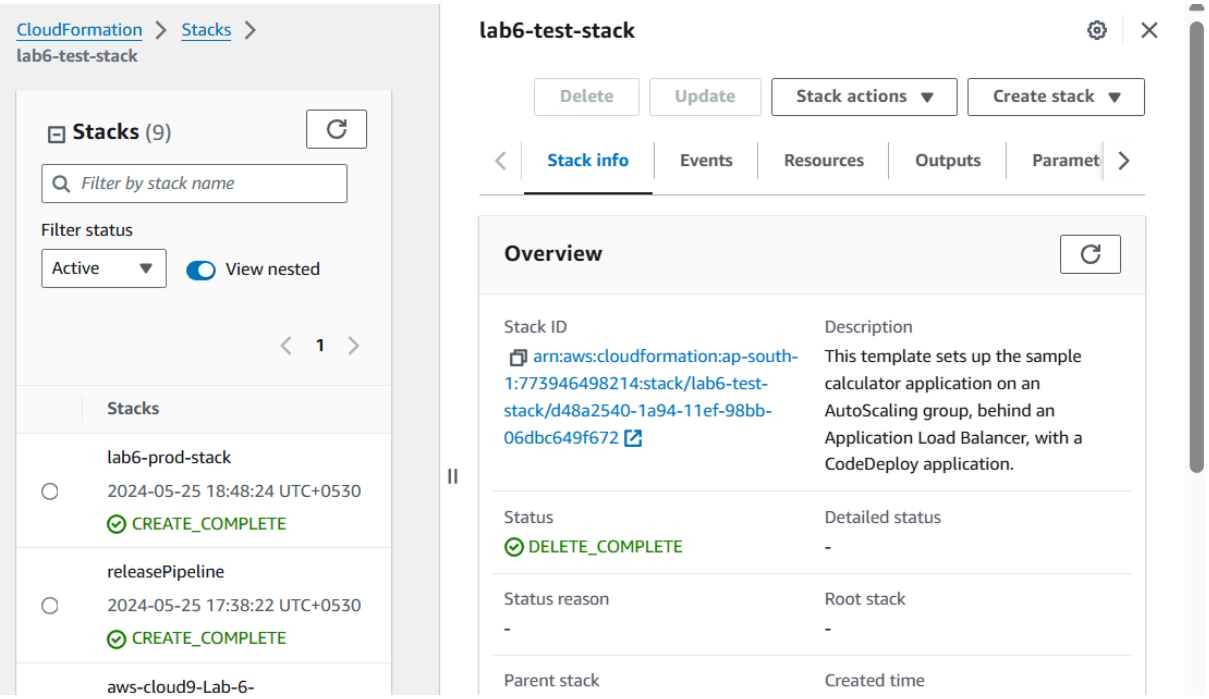
We have to verify:

Verify:

- Test environment was deleted to avoid the unnecessary resource consumption.
- CloudFormation provisioned the Production environment.
- CodeDeploy deployed the web application to Production environment.

9.1 Open CloudFormation again, and we no longer see a stack that contains the string test-stack.

Test-stack shows as deleted;
Only prod-stack is available



9.2 Open the url from prod-stack, to see the calculator once again

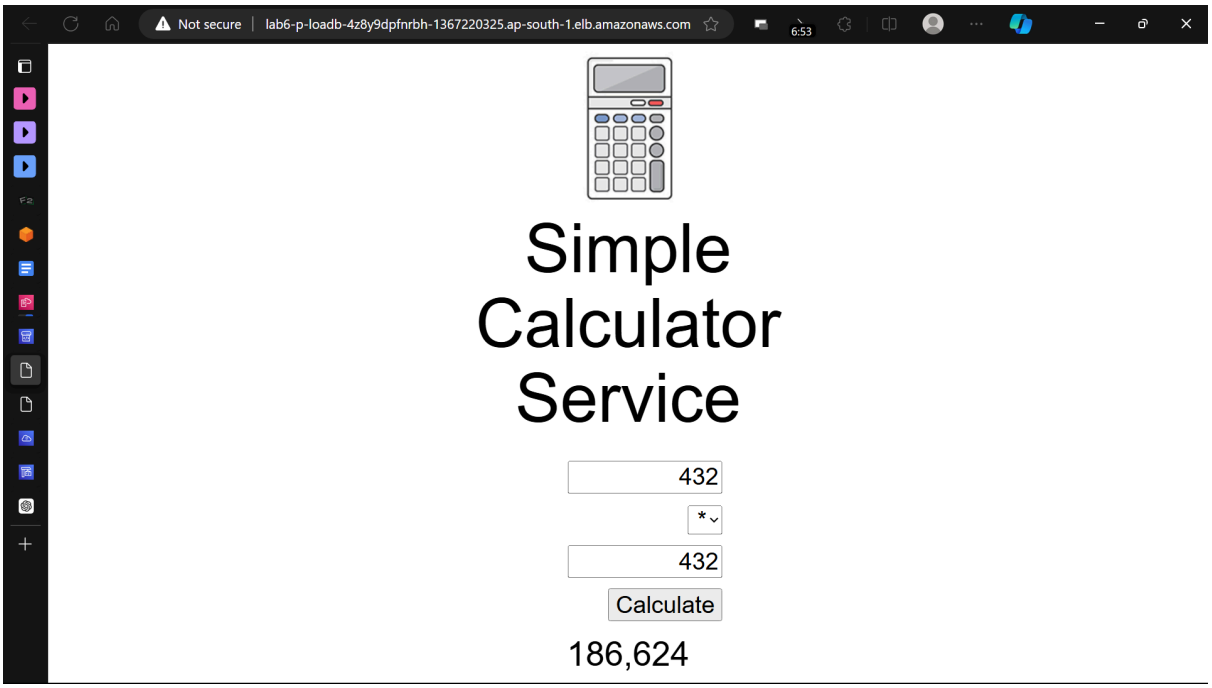
Stack info | Events | Resources | Outputs | Parameters

Outputs (2)

Search outputs

1

Key	Value	Description
DeploymentGroup	lab6-prod-stack-DeploymentGroup	Calculator application deployment group
Url	http://lab6-p-LoadB-4z8Y9dPFNRBh-1367220325.ap-south-1.elb.amazonaws.com	Calculator application URL



Lab complete