

# AWS CI/CD Workshop With Java Application

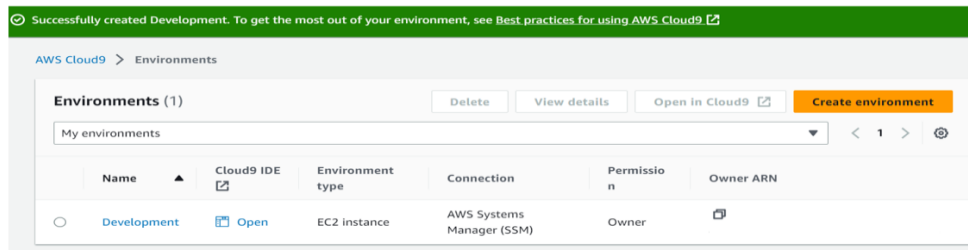
- CI/CD with Java Application workshop illustrates how we can use the AWS developer tools to implement Continuous Integration (CI) and Continuous Deployment (CD) for our application.
- First, I begin by creating cloud9 for cloud-based integrated development environment (IDE) for code editing and terminal use, and next proceed to deploy Cloud Development Kit(CDK) in cloud9 to quickly complete many tasks on AWS.
- And then start building a pipeline by creating a source code repository using CodeCommit to store the Java web application for testing.
- And CodeBuild to build the Java application source code into a deployable web archive.
- CodeDeploy to deploy the application and, finally, CodePipeline to automate the release process from source code all the way to deployment.

Before creating the cloud9 environment, just an intro of AWS Cloud9

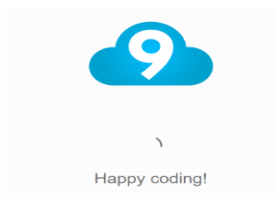
## **AWS Cloud9 IDE :**

- AWS Cloud9 IDE offers a code-editing experience with support for several programming languages and runtime debuggers, as well as a built-in terminal.
- It contains a collection of tools that we use to code, build, run, test, and help to release software to the cloud. We access the AWS Cloud9 IDE through a web browser.
- The role of cloud9 in this workshop is that it is used as a git remote helper that makes it easier to interact with AWS CodeCommit like a local git terminal.
- This tool is installed in cloud9 by default and cloud9 works with AWS CDK to deploy AWS infrastructure components as code. For that, we have to instruct AWS Cloud9 to create an Amazon EC2 instance.
- This type of setup is called an EC2 environment and it stores our project's files locally, for instance.
- In Aws management console in services under developer tools we can find cloud9 in that I have created a cloud9 environment under name development and environment type EC2.

- AWS Cloud9 EC2 development environment running on Amazon Linux.
- The AWS Cloud9 IDE opens in a web browser.



Above it shows successfully created Development after we open cloud IDE it shows happy coding and Once ready, IDE will open to a welcome screen. We can see a terminal window



Now we need to create an infrastructure application stack using AWS CDK in the cloud9

- The AWS CDK is an open-source software development framework for defining cloud infrastructure in code and provisioning it through AWS CloudFormation.
- CDK Use AWS CloudFormation to do infrastructure deployments consistently and repeatedly, including error rollback.
- In this workshop we use a typescript programming language to provision the AWS resource.
- CloudFormation stack contains multiple AWS resources.
- In this workshop, we will simply execute the prebuilt provided CDK application.
- To prepare a CDK Application from our cloud9 environment in a terminal window.
- The below command downloads the CDK application source and extracts the application to our development environment.

```
curl -s https://static.us-east-1.prod.workshops.aws/public/8c4076ba-a416-424d-acc7-06e5cc2de102//static/20-infrastructure/InfrastructureApp.tgz | tar -xzv
```

```
cd InfrastructureApp
```

```

cdk@~/environment $ curl -s https://static.us-east-1.prod.workshops.aws/public/6c4070ba-a816-42d0-ac7f-065cc2de1022/static/20-infrastructure/InfrastructureApp.tg
z | tar -xvz
InfrastructureApp/
InfrastructureApp/.npmignore
InfrastructureApp/test/
InfrastructureApp/test/infrastructure.test.d.ts
InfrastructureApp/test/infrastructure.test.ts
InfrastructureApp/test/infrastructure.test.js
InfrastructureApp/lib/
InfrastructureApp/lib/infrastructure.js
InfrastructureApp/lib/infrastructure.ts
InfrastructureApp/lib/infrastructure.d.ts
InfrastructureApp/cdk.context.json
InfrastructureApp/jest.config.js
InfrastructureApp/cdk.json
InfrastructureApp/README.md
InfrastructureApp/.gitignore
InfrastructureApp/package-lock.json
InfrastructureApp/package.json
InfrastructureApp/lib/
InfrastructureApp/lib/infrastructure-stack.ts
InfrastructureApp/lib/infrastructure-stack.js
InfrastructureApp/lib/infrastructure-stack.d.ts
InfrastructureApp/tsconfig.json
cdk@~/environment $ cd InfrastructureApp
cdk@~/environment/InfrastructureApp $

```

Next Install CDK application dependencies and build the CDK project using

`npm install`

`npm run build`

- `npm install` cmd will install the AWS CDK package globally on our system which then allows us to initialize our first project and start building and deploying code in our AWS account using AWS CDK.
- `npm run build` cmd Use npm to run the TypeScript compiler to check for coding errors and then enable the AWS CDK to execute the project's file. The preceding command runs the TypeScript compiler.

## CDK Bootstrap

- The first time we deploy an AWS CDK app into an environment for a specific AWS account and AWS Region combination, we must install a bootstrap stack.
- This stack includes various resources that the AWS CDK needs to complete its various operations. this stack includes an Amazon S3 bucket that the AWS CDK uses to store templates and assets during its deployment processes.
- To install the bootstrap stack, run the CDK Bootstrap cmd in our terminal window.

After we should see messages from CDK indicating that it bootstrapped our account and region

```

CDKToolkit: creating CloudFormation changeset...
✓ Environment aws://: /us-east-1 bootstrapped.
*****
*** Newer version of CDK is available [2.76.0] ***
*** Upgrade recommended (npm install -g aws-cdk) ***
*****

```

## CDK Deploy

Next, we need to Deploy the CDK application to our account and region using the below cmd

```
cd ~/environment/InfrastructureApp
```

```
cdk deploy
```

```
viveka:~/environment/InfrastructureApp $ cd ~/environment/InfrastructureApp
viveka:~/environment/InfrastructureApp $ cdk deploy

✦ Synthesis time: 4.82s

This deployment will make potentially sensitive changes according to your current security approval level (--require-approval broadening).
Please confirm you intend to make the following modifications:
```

AWS CDK runs the AWS CloudFormation stack template to deploy the stack.

```
Do you wish to deploy these changes (y/n)? y
InfrastructureStack: deploying... [1/1]
InfrastructureStack: creating CloudFormation changeset...
[.....] (25/36)

2:28:17 PM | CREATE_IN_PROGRESS | AWS::CloudFormation::Stack | InfrastructureStack
2:28:40 PM | CREATE_IN_PROGRESS | AWS::IAM::InstanceProfile | DevWebApp01/InstanceProfile
2:28:41 PM | CREATE_IN_PROGRESS | AWS::IAM::InstanceProfile | PrdWebApp01/InstanceProfile
2:28:45 PM | CREATE_IN_PROGRESS | AWS::EC2::NatGateway | VPC/PublicSubnet2/NATGateway
2:28:46 PM | CREATE_IN_PROGRESS | AWS::EC2::NatGateway | VPC/PublicSubnet1/NATGateway
2:28:59 PM | CREATE_IN_PROGRESS | AWS::EC2::Route | VPC/PublicSubnet1/DefaultRoute
2:29:00 PM | CREATE_IN_PROGRESS | AWS::EC2::Route | VPC/PublicSubnet2/DefaultRoute
```

Upon successful deployment, we will see a list of output values in our terminal

```
Outputs:
InfrastructureStack.BucketName = infrastructurestack-artifactsbucket
InfrastructureStack.BuildRoleArn = arn:aws:iam::[redacted]:role/InfrastructureStack-CodeBuildRole
InfrastructureStack.DeployRoleArn = arn:aws:iam::[redacted]:role/InfrastructureStack-CodeDeployRole
InfrastructureStack.DevLocation = http://ec2-18-234-104-67.compute-1.amazonaws.com
InfrastructureStack.PrdLocation = http://ec2-44-204-29-21.compute-1.amazonaws.com
Stack ARN:
arn:aws:cloudformation:us-east-1:[redacted]
✦ Total time: 188.9s
```

which creates the 2 Amazon EC2 instances and s3bucket and code build and code deploy role and DNS for our 2 EC2 server names prdWebApp01 and DevWebApp01.

<input type="checkbox"/> PrdWebApp01			t3.small		Initializing	No alarms	+	us-east-1a
<input type="checkbox"/> DevWebApp01			t3.small		Initializing	No alarms	+	us-east-1a
<input type="checkbox"/> aws-cloud9-D...			t2.micro		2/2 checks passed	No alarms	+	us-east-1a

## Source stage

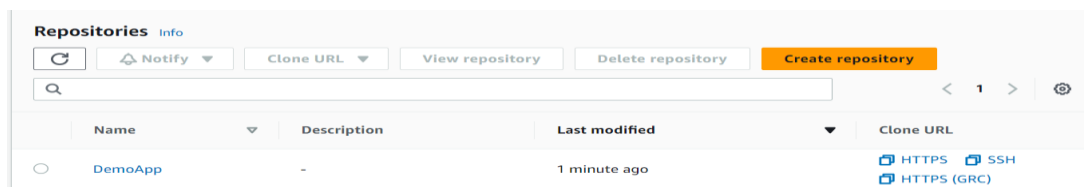
- we can now start building the components required for our CI/CD pipeline. Let's start with creating the source code repository using AWS CodeCommit and adding files to the repository.

## AWS CodeCommit

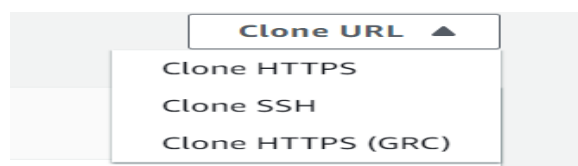
- CodeCommit is one of the AWS continuous integration tools it is similar to Github, CodeCommit is a fully-managed source control service that hosts secure Git-based repositories.
- we can create a code repository using Git commands to interact with our repository we can easily commit, branch and merge our code.
- We can store and version any kind of file, and source code.
- In this workshop, we are using cloud9 as a local git terminal, AWS Cloud9 contains a collection of in-built tools that we can use to write code and build, run, test, and debug.
- We use AWS Cloud9 to create a new repository in a CodeCommit. We create repositories, Clone existing repositories in codecommit, and commit and push code changes to a repository from our AWS Cloud9 EC2 development environment.
- The AWS Cloud9 EC2 development environment is generally preconfigured with the AWS CLI, an Amazon EC2 role, and Git, so in most cases, we can run a few simple commands and start interacting with our central repository.

## Create Repository

In the AWS management console in services under developer tools we can see CodeCommit in that I have created a repository under the name DemoApp



After creating the repository we have to Clone the repository URL by selecting the clone URL button and then selecting clone HTTPS



- Before cloning the repository URL in the cloud9 terminal have to change the directory to the environment directory using `cd ~/environment` cmd
- And clone our Git repository, using the clone URL we just copied earlier
- Using `git clone <our repository URL>`
- A clone is a full copy of a repository, including all logging and versions of files

```
viveka:~/environment $ cd ~/environment
viveka:~/environment $ git clone https://git-codecommit.us-east-1.amazonaws.com/v1/repos/DemoApp
Cloning into 'DemoApp'...
warning: You appear to have cloned an empty repository.
viveka:~/environment $
```

- It shows msg like we have cloned an empty repository so we have added files to our repository
- I have populated my new repository using an already existing public access repository with a demo java application.
- Using this cmd `curl -s https://static.us-east-1.prod.workshops.aws/public/8c4076ba-a416-424d-acc7-06e5cc2de102//static/30-source/DemoApp.tgz | tar -xzv`
- `cd DemoApp`

```
viveka:~/environment $ curl -s https://static.us-east-1.prod.workshops.aws/public/8c4076ba-a416-424d-acc7-06e5cc2de102//static/30-source/DemoApp.tgz | tar -xzv
DemoApp/
DemoApp/com.xml
DemoApp/scripts/
DemoApp/scripts/start_application
DemoApp/scripts/configure_http_port.xml
DemoApp/scripts/install_dependencies
DemoApp/scripts/basic_health_check.sh
DemoApp/scripts/write_codedeploy_config.sh
DemoApp/scripts/stop_application
DemoApp/src/
DemoApp/src/main/
DemoApp/src/main/resources/
DemoApp/src/main/resources/css/
DemoApp/src/main/resources/css/theme.css
DemoApp/src/main/resources/images/
DemoApp/src/main/resources/images/codebuild.png
DemoApp/src/main/resources/images/codecommit.png
DemoApp/src/main/resources/images/codepipeline.png
DemoApp/src/main/resources/images/codedeploy.png
DemoApp/src/main/webapp/
DemoApp/src/main/webapp/WEB-INF/
DemoApp/src/main/webapp/WEB-INF/web.xml
DemoApp/src/main/webapp/WEB-INF/pages/
DemoApp/src/main/webapp/WEB-INF/pages/index.jsp
DemoApp/src/main/java/
DemoApp/src/main/java/com/
DemoApp/src/main/java/com/amazonaws/
DemoApp/src/main/java/com/amazonaws/lab9/
DemoApp/src/main/java/com/amazonaws/lab9/sampleapp/
DemoApp/src/main/java/com/amazonaws/lab9/sampleapp/Configuration.java
DemoApp/src/main/java/com/amazonaws/lab9/sampleapp/IndexController.java
```

- Before making the initial commit, we have to ConfigureGit with my name and email address. This is important for version control systems, as each Git commit uses this information. Using the below cmd

`git config --global user.email "email"`

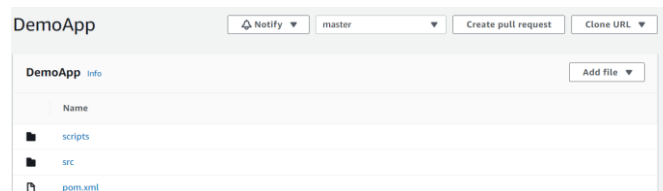
`git config --global user.name "Name"`

```
viveka:~/environment/DemoApp (master) $ git config --global user.email "vivekamano2001@gmail.com"
viveka:~/environment/DemoApp (master) $ git config --global user.name "Viveka"
viveka:~/environment/DemoApp (master) $
```

- Next, we commit our changes to the local Git repository and push our changes to the CodeCommit-hosted repository.
- `Git add .` cmd adds a change in the working directory to the staging area. It tells Git that we want to include updates to a particular file in the next commit.
- `git commit -m "Initial commit"`. This cmd will save all staged changes along with msg
- `git push` cmd is used to upload local repository content(cloud 9)to a codecommit repository.

```
viveka:~/environment/DemoApp (master) $ git commit -m "Initial commit"
[master (root-commit) ] Initial commit
16 files changed, 726 insertions(+)
create mode 100644 pom.xml
create mode 100644 scripts/basic_health_check.sh
create mode 100644 scripts/configure_http_port.xml
create mode 100644 scripts/install_dependencies
create mode 100644 scripts/start_application
create mode 100644 scripts/stop_application
create mode 100644 scripts/write_codedeploy_config.sh
create mode 100644 src/main/java/com/amazonaws/labs/sampleapp/IndexController.java
create mode 100644 src/main/java/com/amazonaws/labs/sampleapp/MvcConfiguration.java
create mode 100644 src/main/resources/css/theme.css
create mode 100644 src/main/resources/images/codebuild.png
create mode 100644 src/main/resources/images/codecommit.png
create mode 100644 src/main/resources/images/codedeploy.png
create mode 100644 src/main/resources/images/codepipe.png
create mode 100644 src/main/webapp/WEB-INF/pages/index.jsp
create mode 100644 src/main/webapp/WEB-INF/web.xml
viveka:~/environment/DemoApp (master) $ git push
Enumerating objects: 32, done.
Counting objects: 100% (32/32), done.
Compressing objects: 100% (24/24), done.
Writing objects: 100% (32/32), 120.27 KiB | 5.23 MiB/s, done.
Total 32 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Validating objects: 100%
To https://git-codecommit.us-east-1.amazonaws.com/v1/repos/DemoApp
* [new branch] master -> master
```

- After git push , in our codecommit repository we can see the files after populating, pushing it to local git(cloud9) to remote repository (code commit)



- Source stage has been completed. Now we have to move on to the build stage, which will test code we build our java application into a deployable artifact. For a Java web app, that artifact is a WAR file.

## Create Build Project

- We create build projects using AWS CodeBuild.
- AWS CodeBuild is a fully managed build service in the cloud. It is a continuous integration service .
- CodeBuild compiles source code, runs unit tests, and produces artifacts that are ready to deploy.
- A build project is used to define how CodeBuild will run a build. It includes information such as where to get the source code, which build environment to use, the build commands to run, and where to store the build output.
- A build environment is the combination of an operating system, programming language runtime, and tools used by CodeBuild to run a build.
- To create code built on the aws management console in services under developer tool tools, we can see code built there.
- In the project configuration panel, I entered DemoApp as the project name.

**Create build project**

**Project configuration**

Project name  
  
A project name must be 2 to 255 characters. It can include the letters A-Z and a-z, the numbers 0-9, and the special characters -, and \_.

Description - optional

Build badge - optional  
☐ Enable build badge

Enable concurrent build limit - optional  
Limit the number of allowed concurrent builds for this project.  
☐ Restrict number of concurrent builds this project can start

► Additional configuration tags

Next, in the source stage, I chose codecommit as a source provider and configured it.

**Source** Add source

Source 1 - Primary

Source provider

Repository

Reference type  
Choose the source version reference type that contains your source code.  
☒ Branch  
☐ Git tag  
☐ Commit ID

Branch  
Choose a branch that contains the code to build.

Commit ID - optional  
Choose a commit ID. This can shorten the duration of your build.

Source version info  
[ref:refs/heads/master](#)

In the Environment panel, a build environment is the combination of an operating system, programming language runtime, and tools used by CodeBuild to run a build. I configured it.

**Environment**

Environment image  
☒ Managed image  
Use an image managed by AWS CodeBuild  
☐ Custom image  
Specify a Docker image

Operating system

The programming language runtimes are now included in the standard image of Ubuntu 18.04, which is recommended for new CodeBuild projects created in the console. See [Docker Images Provided by CodeBuild](#) for details.

Runtimes

Image

Image version

Environment type

Privileged  
☐ Enable this flag if you want to build Docker images or want your builds to get elevated privileges

Service role  
☐ New service role  
Create a service role in your account  
☒ Existing service role  
Choose an existing service role from your account

Role ARN

☒ Allow AWS CodeBuild to modify this service role so it can be used with this build project

► Additional configuration  
Timeout, certificate, VPC, compute type, environment variables, file systems

**Buildspec panel:** Build Specification – a YAML file that describes the collection of commands and settings for CodeBuild to run a build.



Buildspec

Build specifications

☒ Use a buildspec file  
Store build commands in a YAML-formatted buildspec file

☐ Insert build commands  
Store build commands as build project configuration

Buildspec name - optional

By default, CodeBuild looks for a file named buildspec.yml in the source code root directory. If your buildspec file uses a different name or location, enter its path from the source root here (for example, buildspec-two.yml or configuration/buildspec.yml).

## Artifacts panel:

- Build artifacts are files produced by a build. Typically, these include distribution packages, WAR files.
- When creating a build configuration, we specify the paths to the artifacts of our build on the Configuring General Settings page.
- AWS CodeBuild builds our code and stores the artifacts into an Amazon S3 bucket .

Artifacts

Add artifact

Artifact 1 - Primary

Type

Amazon S3

You might choose no artifacts if you are running tests or pushing a Docker image to Amazon ECR.

Bucket name

infrastructurestack-artifactbucket

Name

The name of the folder or compressed file in the bucket that will contain your output artifacts. Use Artifacts packaging under Additional configuration to choose whether to use a folder or compressed file. If the name is not provided, defaults to project name.

WebAppOutputArtifact.zip

☐ Enable semantic versioning  
Use the artifact name specified in the buildspec file

Path - optional

The path to the build output ZIP file or folder.

Example: MyPath/MyArtifact.zip.

Artifacts packaging

☐ None  
The artifact files will be uploaded to the bucket.

☒ Zip  
AWS CodeBuild will upload artifacts into a compressed file that is put into the specified bucket.

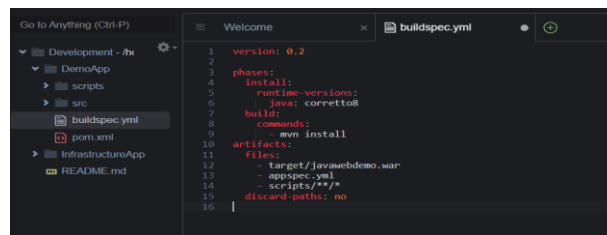
After the overall configuration, The build project was created in CodeBuild

Build projects <span>Info</span>						
	Notify	Start build	View details	Edit	Delete build project	Create build project
<div> <div></div> <div>Your projects</div> <div>&lt; 1 &gt;</div> <div></div> </div>						
Name	Source provider	Repository	Latest build status	Description	Last Modified	
DemoApp	AWS CodeCommit	DemoApp	-	-	1 minute ago	

## Build Specification file

- In this step, we create a build specification (build spec) file. A buildspec is a collection of build commands and related settings, in YAML format, that CodeBuild uses to run a build. Without a build spec, CodeBuild cannot successfully convert our build input into build output or locate the build output artifact in the build environment to upload to our output bucket.

- In the Cloud9 environment, in the DemoApp repository, create this file, name it buildspec.yml, and then save it.



### build spec declaration:

**Version:** 0.2 : version represents the version of the build spec standard being used. This build spec declaration uses the latest version, 0.2.

**Phases :** represents the build phases during which we can instruct CodeBuild to run commands. During the build phase, CodeBuild runs the mvn install command.

- This command instructs Apache Maven to compile, test, and package the compiled Java class files into a built output artifact.
- For each build phase, CodeBuild runs each specified command, one at a time, in the order listed, from beginning to end.

### Artifacts:

- Represent the set of build output artifacts that CodeBuild uploads to the output bucket. Files represent the files to include in the build output.
- CodeBuild uploads the javawebdemo.war file found in the target relative directory in the build environment.
- The file javawebdemo.war and the directory name target are based on the way Apache Maven creates and stores and builds output artifacts for this.

After adding new files to our local git(cloud9) we have to commit the changes in the local Git repository and push the changes to the CodeCommit-hosted repository.

Using this command

```
cd ~/environment/DemoApp
```

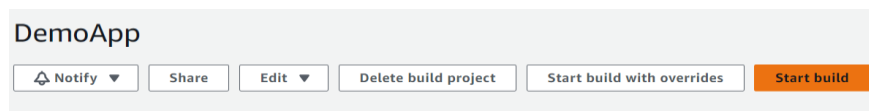
```
git add .
```

```
git commit -m "Add buildspec"
```

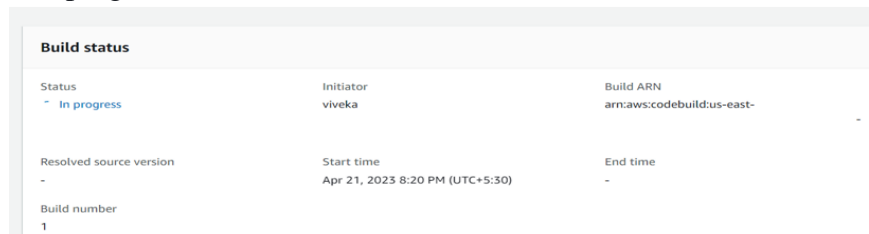
```
git push
```

## Verify Build

- In this step, we instruct AWS CodeBuild to run the build with the settings in the build project. In the build projects, choose demoApp, and then choose Start build. The build starts immediately.



We can see the build has been started. It is in progress in less than a minute. It will change its status from in progress to succeed state.



## Deploy

Now we have a WAR file, we can deploy the application to a server running on an EC2 instance in our test network.

## AWS CodeDeploy

- CodeDeploy is a deployment service that automates application deployments to Amazon EC2 instances.
- AWS CodeDeploy makes it easier for us to rapidly release new features, helps to avoid downtime during deployment, and handles the complexity of updating our applications.

Create an application and deployment group using CodeDeploy.

- On the AWS Management console in services under developer tools, we can find CodeDeploy.

## Application configuration panel

- An Application is a name that uniquely identifies the application we want to deploy. I created DemoApp as application name.
- The Compute platform is the platform on which CodeDeploy deploys an application. Here I configured EC2/On-premises as compute platform.

Developer Tools > CodeDeploy > Applications > Create application

### Create application

Application configuration

Application name  
Enter an application name  
DemoApp  
100 character limit

Compute platform  
Choose a compute platform  
EC2/On-premises

Tags  
Add tag

Cancel Create application

## Deployment Group

Deployment groups include individually tagged instances. In an EC2/On-Premises deployment, a deployment group is a set of individual instances targeted for a deployment. We can add instances to a deployment group by specifying a tag.

### In the Deployment Group Name panel:

Configured development as deployment name

Developer Tools > CodeDeploy > Applications > DemoApp > Create deployment group

### Create deployment group

Application  
Application  
DemoApp  
Compute type  
EC2/On-premises

Deployment group name  
Enter a deployment group name  
Development  
100 character limit

### In the Service Role panel:

- Service roles are used to grant permission to an AWS service so it can access AWS resources. The policies that we attach to the service role determine which resources the service can access and what it can do with those resources.
- For EC2/On-Premises deployments, we should attach the AWSCodeDeployRole policy.
- In an in-place deployment, the instances in the deployment group are updated with the latest application revision.

Service role

Enter a service role  
Enter a service role with CodeDeploy permissions that grants AWS CodeDeploy access to your target instances.  
arn:aws:iam:::role/infrastructureStack-CodeDeployRole

Deployment type

Choose how to deploy your application

☒ In-place  
Updates the instances in the deployment group with the latest application revisions. During a deployment, each instance will be briefly taken offline for its update.

☐ Blue/green  
Replaces the instances in the deployment group with new instances and deploys the latest application revision to them. After instances in the replacement environment are registered with a load balancer, instances from the original environment are deregistered and can be terminated.

## In the Environment Configuration panel

- It is a set of instances associated with an application that we target for deployment. We can add instances to a deployment group by specifying a tag.

The screenshot shows the 'Environment configuration' panel. It has a heading 'Environment configuration' and a sub-heading 'Select any combination of Amazon EC2 Auto Scaling groups, Amazon EC2 instances, and on-premises instances to add to this deployment'. There are two checkboxes: 'Amazon EC2 Auto Scaling groups' (unchecked) and 'Amazon EC2 instances' (checked). Below the checkboxes, it says '2 unique matched instances. [Click here for details](#)'. A note states: 'You can add up to three groups of tags for EC2 instances to this deployment group. One tag group: Any instance identified by the tag group will be deployed to. Multiple tag groups: Only instances identified by all the tag groups will be deployed to.' Below this, there are two tag groups. Tag group 1 has a key 'App' and a value 'DemoApp'. There is also a key 'Env' with a value 'DEV'. Each tag group has a 'Remove tag' button. At the bottom, there is an 'Add tag' button.

## In the Deployment Settings panel:

- The Deployment configuration default and unchecked load balancer and created deployment group

The screenshot shows the 'Deployment settings' panel. It has a heading 'Deployment settings' and a sub-heading 'Deployment configuration'. It says 'Choose from a list of default and custom deployment configurations. A deployment configuration is a set of rules that determines how fast an application is deployed and the success or failure conditions for a deployment.' There is a dropdown menu with 'CodeDeployDefault.AllAtOnce' selected and a 'Create deployment configuration' button. Below this, there is a 'Load balancer' section. It says 'Select a load balancer to manage incoming traffic during the deployment process. The load balancer blocks traffic from each instance while it's being deployed to and allows traffic to it again after the deployment succeeds.' There is an unchecked checkbox 'Enable load balancing'. At the bottom, there is an 'Advanced - optional' section, a 'Cancel' button, and a 'Create deployment group' button.

The screenshot shows a 'Success' message: 'Deployment group created'. Below this, there is a breadcrumb trail: 'Developer Tools > CodeDeploy > Applications > DemoApp > Development'. There are buttons for 'Edit', 'Delete', and 'Create deployment'. Below this, there is a 'Deployment group details' section. It contains a table with the following information:

Deployment group name	Application name	Compute platform
Development	DemoApp	EC2/On-premises
Deployment type	Service role ARN	Deployment configuration
In-place		CodeDeployDefault.AllAtOnce
Rollback enabled	Agent update scheduler	
False	<a href="#">Learn to schedule update in AWS Systems Manager</a>	

- And successfully created a deployment group in code deploy
- Next is to Add Application Specification file, In our Cloud9 environment, we have to create an appspec.yml file in the DemoApp repository with the following content:

```
1 version: 0.0
2 os: linux
3 files:
4   - source: /target/javawebdemo.war
5     destination: /tmp/codedeploy-deployment-staging-area/
6   - source: /scripts/configure_http_port.xml
7     destination: /tmp/codedeploy-deployment-staging-area/
8 hooks:
9   ApplicationStop:
10     - location: scripts/stop_application
11       timeout: 300
12   BeforeInstall:
13     - location: scripts/install_dependencies
14       timeout: 300
15   ApplicationStart:
16     - location: scripts/write_codedeploy_config.sh
17     - location: scripts/start_application
18       timeout: 300
19   ValidateService:
20     - location: scripts/basic_health_check.sh
```

- The application specification file (AppSpec file) is a YAML file used by CodeDeploy to manage a deployment.
- The AppSpec file defines the deployment actions we want AWS CodeDeploy to execute, and consists of two sections. The files section specifies the source files in our revision to be copied and the destination folder in each instance.
- The hooks section specifies the location of the scripts to run during each phase of the deployment. Each phase of a deployment is called a deployment lifecycle event.

### **Appspecfile declaration**

- **Version** :This section specifies the version of the AppSpec file. The only allowed value is 0.0. It is reserved by CodeDeploy for future use.
- **OS**: This section specifies the operating system value of the instance to which we deploy. Linux – for instance, is Amazon Linux
- **Files** :This section specifies the names of files that should be copied to the instance during the deployment's Install event.
- **Source** : instructions identify a file or directory from our revision to copy to the instance .The destination instruction identifies the location of the instance where the files should be copied.
- **Hooks** This section specifies scripts to run at specific deployment lifecycle events during the deployment.

**ApplicationStop** – This deployment lifecycle event occurs even before the application revision is downloaded. We can specify scripts for this event to gracefully stop the application or remove currently installed packages in preparation for a deployment.

**BeforeInstall** – we can use this deployment lifecycle event for preinstall tasks, such as decrypting files and creating a backup of the current version.

**ApplicationStart** –we typically use this deployment lifecycle event to restart services that were stopped during ApplicationStop.

**ValidateService** – This is the last deployment lifecycle event. It is used to verify the deployment was completed successfully.

After adding the appsec file, we have to commit our changes to the local Git repository and push our changes to the CodeCommit-hosted repository.

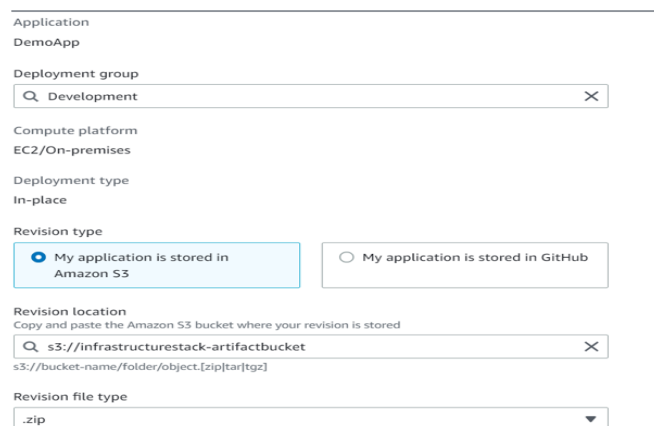
- Trigger a new build for our application so that the deployment artifact stored in S3 will contain our appspec.yml file.
- In the code build for our demoapp project, the selected start build we can see below. Here the build has started it is our second build.



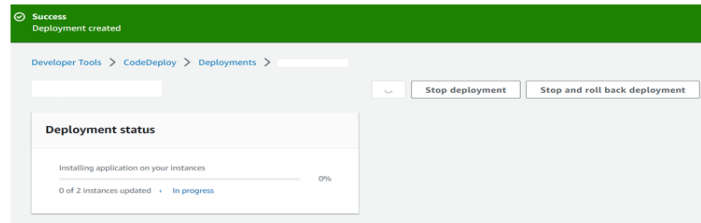
## Verify Deployment:

Verify our application and specification by initiating a deployment using the CodeDeploy console.

- In this step, we will use the CodeDeploy console to verify the success of the deployment. We will use our web browser to view the web page that was deployed to the instance we created .
- In codedeploy in my demoapp application, I selected to create deployment
- In the deployment setting panel, enter s3 bucket name in the revision location field. We will find our bucket name in the output of the CDK application deployment with the key InfrastructureStack.BucketName.

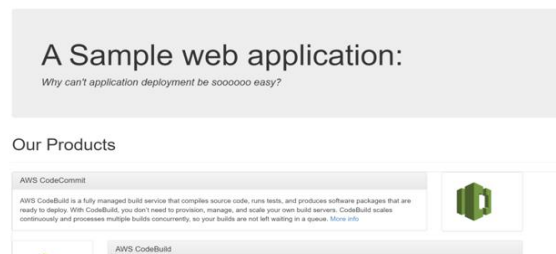


Review the default select option and created deployment



After deployment, status changes from in progress to succeeding the state.

- To check the output of the stack which is created in cdk output, if we copy the InfrastructureStack.DevLocation Ip address and paste it into our browser, it will show the image below in our web browser.



## Pipeline

- Now that we have built and verified the build project and deployment, we are ready to construct the pipeline that moves changes from the source repository to our test server.

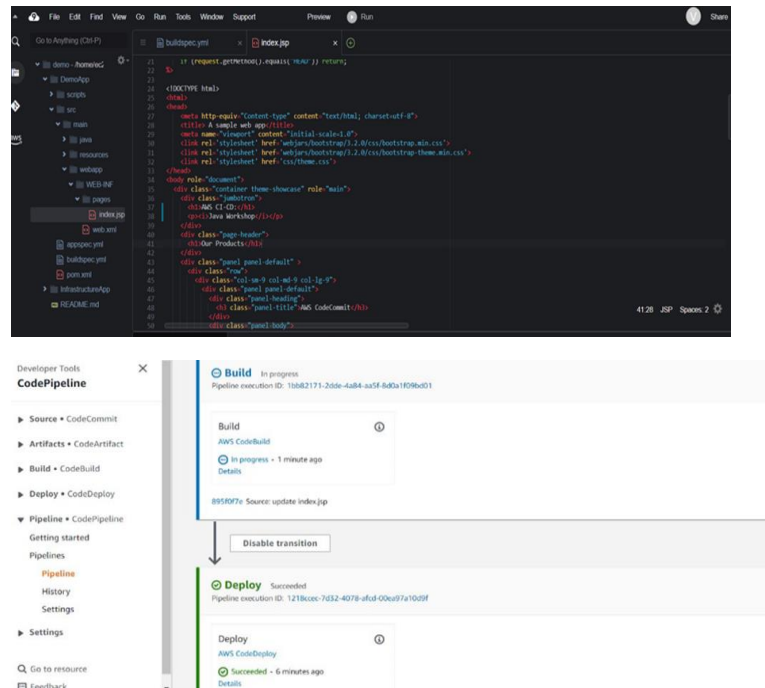
## AWS CodePipeline

- AWS CodePipeline is a continuous integration and continuous delivery service for fast and reliable application and infrastructure updates. We can use CodePipeline to fully model and automate our software release processes.
- On an AWS management console under developer tools, we can see codepipeline
- In that, a pipeline created as a demoapp
- And choose codecommit as source provider
- And in the build panel, configure aws code build as build provider
- In deploy stage, choose code deploy as deploy provider
- Reviewed and created pipeline
- After creating a pipeline, verify our deployment by loading the web application into our browser. We will find our development server location in the output of the CDK application deployment with the key InfrastructureStack.DevLocation.



Experiment with changing the web application and triggering new pipeline executions

- In our Cloud9 IDE and open DemoApp/src/main/webapp/WEB-INF/pages/index.jsp in our editor. changed the title to CI-CD and saved the file.
- And commit our changes to the local Git repository and push our changes to the CodeCommit-hosted repository.
- After that, our pipeline detects the new revision and proceeds through the pipeline stages.



Once deployment succeeds, reload our browser and check our updated title instead of the IP address. It will be changed to a CI-CD .

## Conclusion

We built a CI/CD pipeline using CodePipeline. Our pipeline began with code in CodeCommit, built WAR using CodeBuild and deployed the code to a test network we built with CDK.