

D E V 3 0 9

CI/CD for Serverless and Containerized Applications

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re:Invent

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Agenda

CI/CD for modern applications

Continuous integration

Continuous deployment

Infrastructure as code

Demo

What is a modern application?

Approaches to modern application development

- Simplify environment management with serverless technologies
- Reduce the impact of code changes with microservice architectures
- Automate operations by modeling applications & infrastructure as code
- Accelerate the delivery of new, high-quality services with CI/CD
- Gain insight across resources and applications by enabling observability
- Protect customers and the business with end-to-end security & compliance

Approaches to modern application development



AWS Lambda

Serverless functions

Event-driven
Many language runtimes
Data source integrations
No server management



AWS Fargate

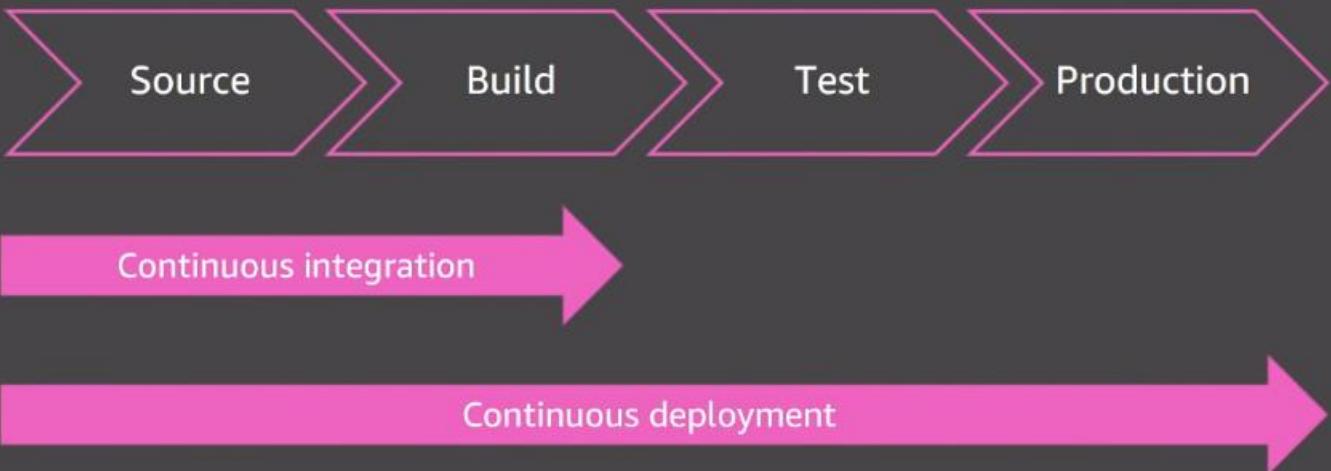
Serverless containers

Long-running
Abstracts the OS
Fully managed orchestration
Fully managed cluster scaling

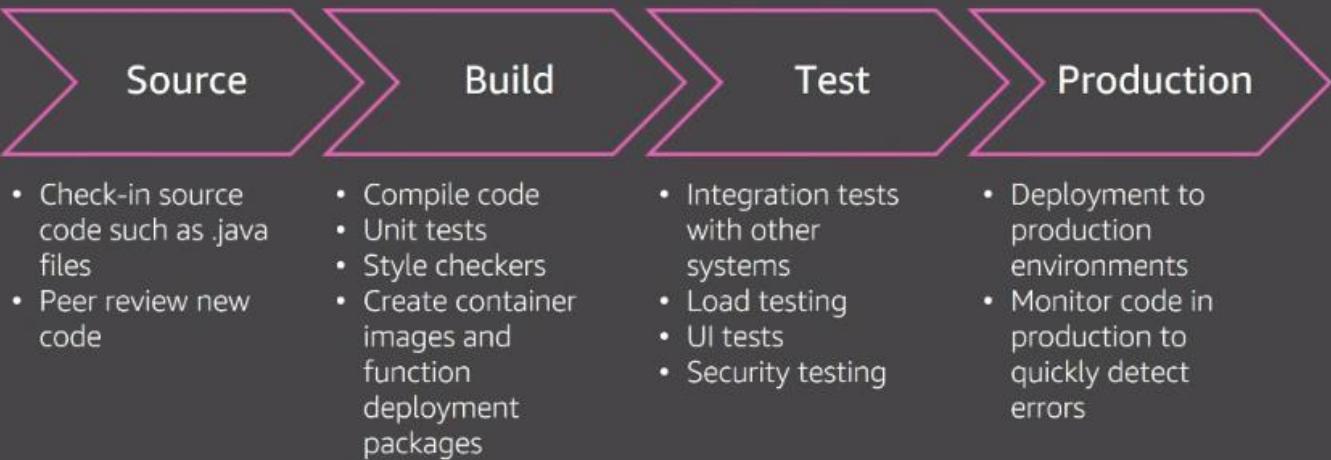
Approaches to modern application development

- Simplify environment management with serverless technologies
- Reduce the impact of code changes with microservice architectures
- Automate operations by modeling applications & infrastructure as code
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Release process stages



Release process stages



Effects of CI/CD

Deployment frequency	Weekly – monthly	→	Hourly – daily
Change lead time	One – six months	→	One – seven days
Change failure rate	46 - 60%	→	0 - 15%
48% of software teams			

Source: 2018 DORA State of DevOps Report

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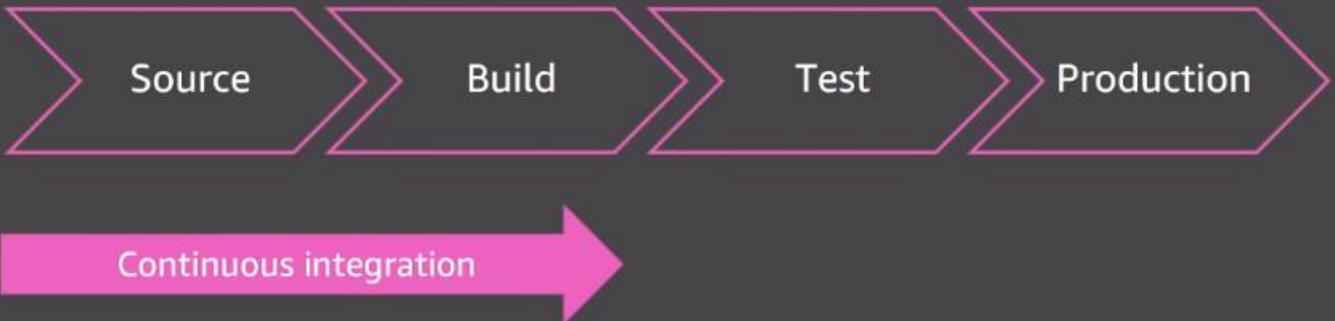
Pillars of releasing modern applications

Continuous integration

Continuous deployment

Infrastructure as code

Continuous integration goals



Continuous integration goals

Continuous integration

1. Automatically kick off a new release when new code is checked in
2. Build and test code in a consistent, repeatable environment
3. Continually have an artifact ready for deployment
4. Continually close feedback loop when build fails

AWS CodePipeline



- Continuous delivery service for fast and reliable application updates
- Model and visualize your software release process
- Builds, tests, and deploys your code every time there is a code change
- Integrates with third-party tools and AWS

AWS CodePipeline: Supported sources

Automatically kick off release and pull latest source code

Pick branch

AWS CodeCommit
GitHub

Pick object or folder

Amazon Simple Storage Service (Amazon S3)

AWS CodePipeline: Supported sources



New

AWS CodePipeline now uses
Amazon Elastic Container Registry
(Amazon ECR) as a pipeline source

We can now also trigger a build off a new Docker image in ECR as a pipeline source

AWS CodePipeline: Supported sources

Automatically kick off release and pull latest source code

Pick branch

AWS CodeCommit

GitHub

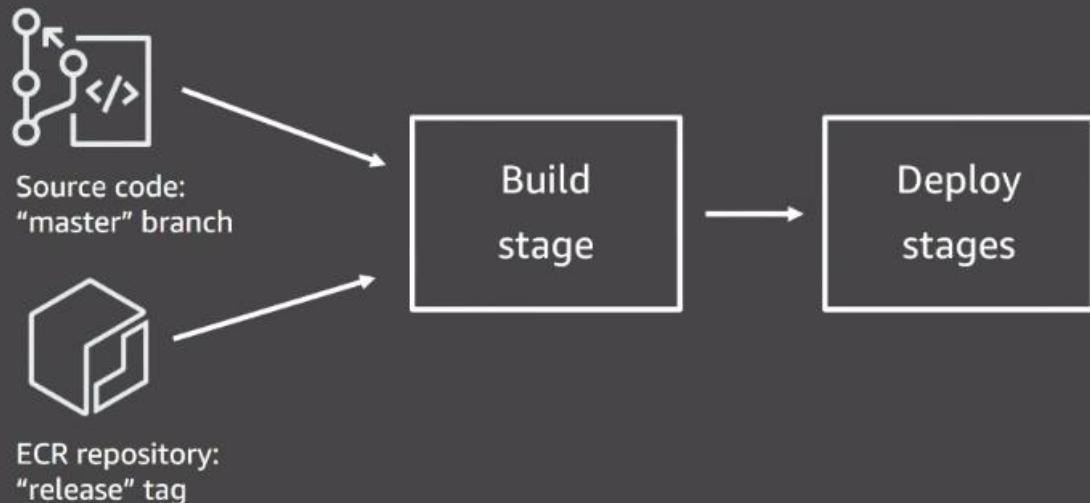
Pick object or folder

Amazon S3

Pick Docker tag

Amazon ECR

AWS CodePipeline: ECR source action



AWS CodePipeline: Supported triggers

Automatically kick off release

Amazon CloudWatch Events

- Scheduled (nightly release)
- AWS Health events (Fargate platform retirement)

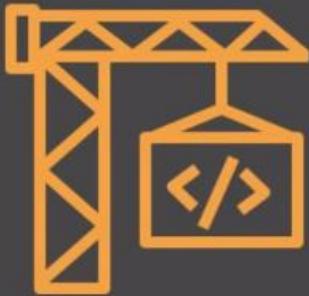
Available in CloudWatch Events console, API, SDK, CLI, and AWS CloudFormation

Webhooks

- DockerHub
- Quay
- Artifactory

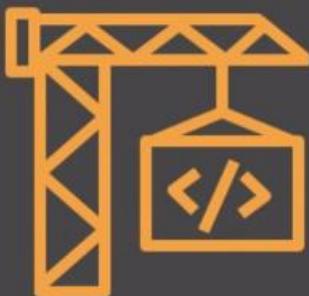
Available in CodePipeline API, SDK, CLI, and CloudFormation

AWS CodeBuild



- Fully managed build service that compiles source code, runs tests, and produces software packages
- Scales continuously and processes multiple builds concurrently
- No build servers to manage
- Pay by the minute, only for the compute resources you use
- Monitor builds through CloudWatch Events

AWS CodeBuild



- Each build runs in a new Docker container for a consistent, immutable environment
- Docker and AWS CLI are installed in every official CodeBuild image
- Provide custom build environments suited to your needs through the use of Docker images

AWS CodeBuild: Lambda buildspec

```
version: 0.2

phases:
  build:
    commands:
      - npm ci
      - npm test
      - >
        aws cloudformation package
        --template-file template.yml
        --output-template template-output.yml
        --s3-bucket $BUCKET

  artifacts:
    type: zip
    files:
      - template-output.yml
```

AWS CodeBuild: Docker buildspec

```
version: 0.2

phases:
  build:
    commands:
      - $(aws ecr get-login --no-include-email)
      - docker build -t $IMAGE_REPO_NAME:$IMAGE_TAG .
      - docker tag $IMAGE_REPO_NAME:$IMAGE_TAG $ECR_REPO:$IMAGE_TAG
      - docker push $ECR_REPO:$IMAGE_TAG
```

Continuous integration goals

Continuous integration

1. Automatically kick off a new release when new code is checked in
2. Build and test code in a consistent, repeatable environment
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4. Continually close feedback loop when build fails

Pillars of releasing modern applications

Continuous
integration

Continuous
deployment

Infrastructure
as code

Continuous deployment goals



Continuous deployment goals

Continuous deployment

1. Automatically deploy new changes to staging environments for testing
2. Deploy to production safely without impacting customers
3. Deliver to customers faster: Increase deployment frequency, and reduce change lead time and change failure rate

AWS CodeDeploy



- Automates code deployments to any instance and Lambda
- Handles the complexity of updating your applications
- Avoid downtime during application deployment
- Roll back automatically if failure detected
- Deploy to Amazon EC2, Lambda, or on-premises servers

CodeDeploy-Lambda deployments

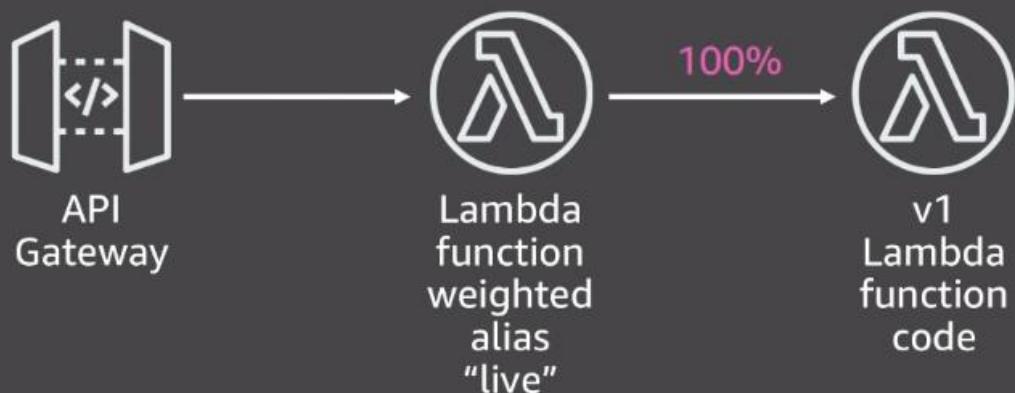
- Shifts traffic using Lambda function weighted aliases
- Choose canary ("shift 10% of traffic for 10 minutes, then shift rest") or linear ("shift 10% more traffic every 10 minutes")
- Validation "hooks" enable testing at each stage of the deployment
- Fast rollback in seconds if case of hook failure or CloudWatch alarms
- Monitor deployment status and history via console, API, Amazon Simple Notification Service (Amazon SNS) notifications, and CloudWatch Events

CodeDeploy-Lambda deployments

Enable in your serverless application template

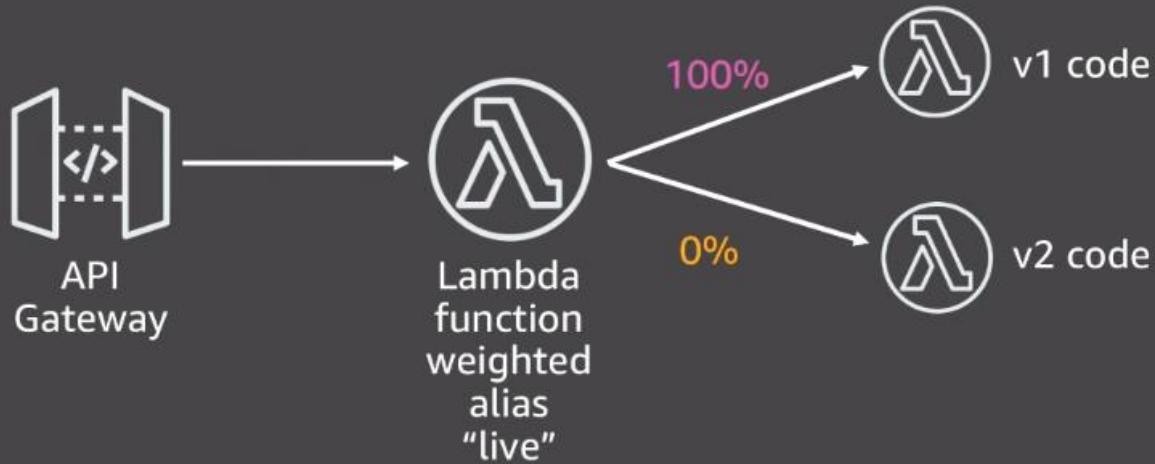
```
Resources:  
  GetFunction:  
    Type: AWS::Serverless::Function  
    Properties:  
      DeploymentPreference:  
        Type: Canary10Percent10Minutes  
      Alarms:  
        - !Ref ErrorsAlarm  
      Hooks:  
        PreTraffic: !Ref PreTrafficHook
```

CodeDeploy-Lambda canary deployment



CodeDeploy-Lambda canary deployment

Run hook against v2 code before it receives traffic



CodeDeploy-Lambda canary deployment

Wait for 10 minutes, roll back in case of alarm



CodeDeploy-Lambda canary deployment

Complete deployment



AWS CodeDeploy



New

AWS CodeDeploy now automates blue-green deployments to AWS Fargate and Amazon Elastic Container Service (ECS)

CodeDeploy-ECS blue-green deployments

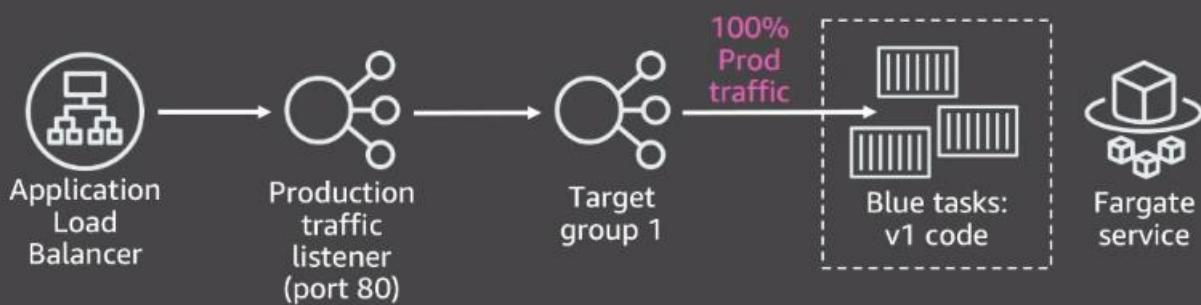
- Provisions “green” tasks, then flips traffic at the load balancer
- Validation “hooks” enable testing at each stage of the deployment
- Fast rollback to “blue” tasks in seconds if case of hook failure or CloudWatch alarms
- Monitor deployment status and history via console, API, Amazon SNS notifications, and CloudWatch Events
- Use “CodeDeploy-ECS” deploy action in CodePipeline or “aws ecs deploy” command in Jenkins

CodeDeploy-ECS appspec

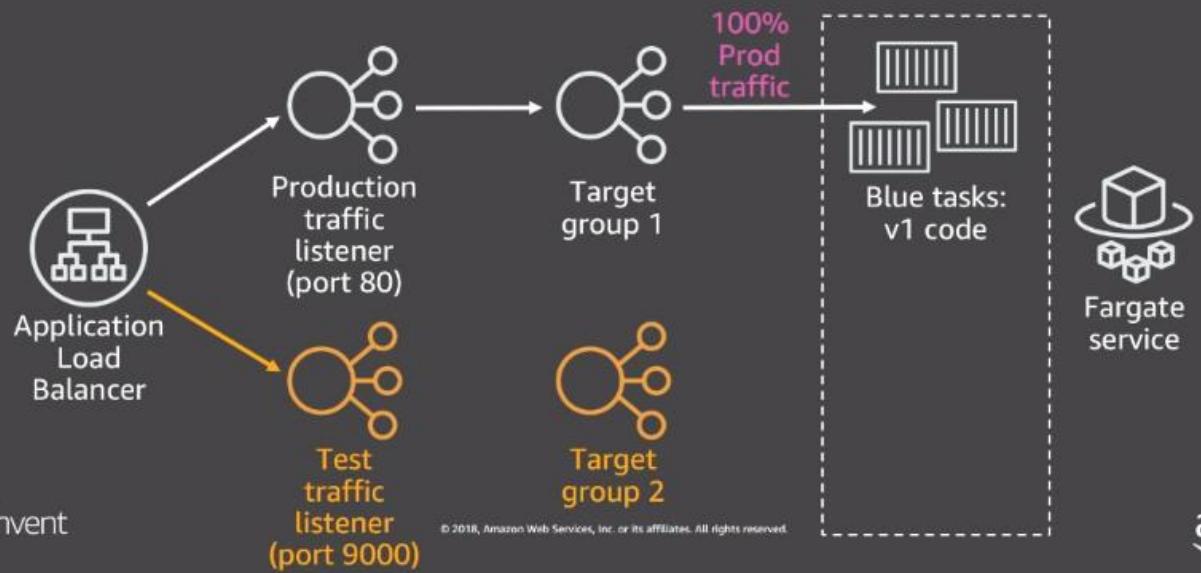
```
version: 1.0
Resources:
- TargetService:
  Type: AWS::ECS::Service
  Properties:
    - TaskDefinition: "my_task_definition:8"
    LoadBalancerInfos:
      - ContainerName: "SampleApp"
        ContainerPort: 80

Hooks:
- BeforeInstall: "LambdaFunctionToExecuteAnythingBeforeNewRevisionInstallation"
- AfterInstall: "LambdaFunctionToExecuteAnythingAfterNewRevisionInstallation"
- AfterAllowTestTraffic: "LambdaFunctionToValidateAfterTestTrafficShift"
- BeforeAllowTraffic: "LambdaFunctionToValidateBeforeTrafficShift"
- AfterAllowTraffic: "LambdaFunctionToValidateAfterTrafficShift"
```

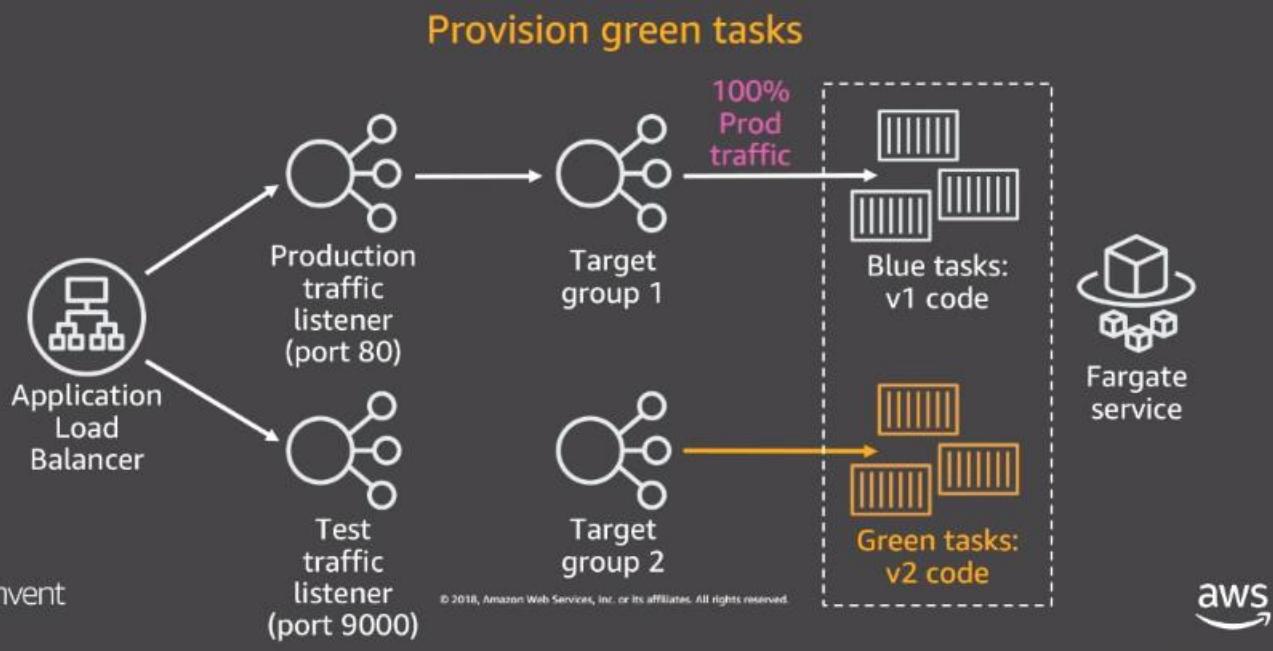
CodeDeploy-ECS blue-green deployment



CodeDeploy-ECS blue-green deployment

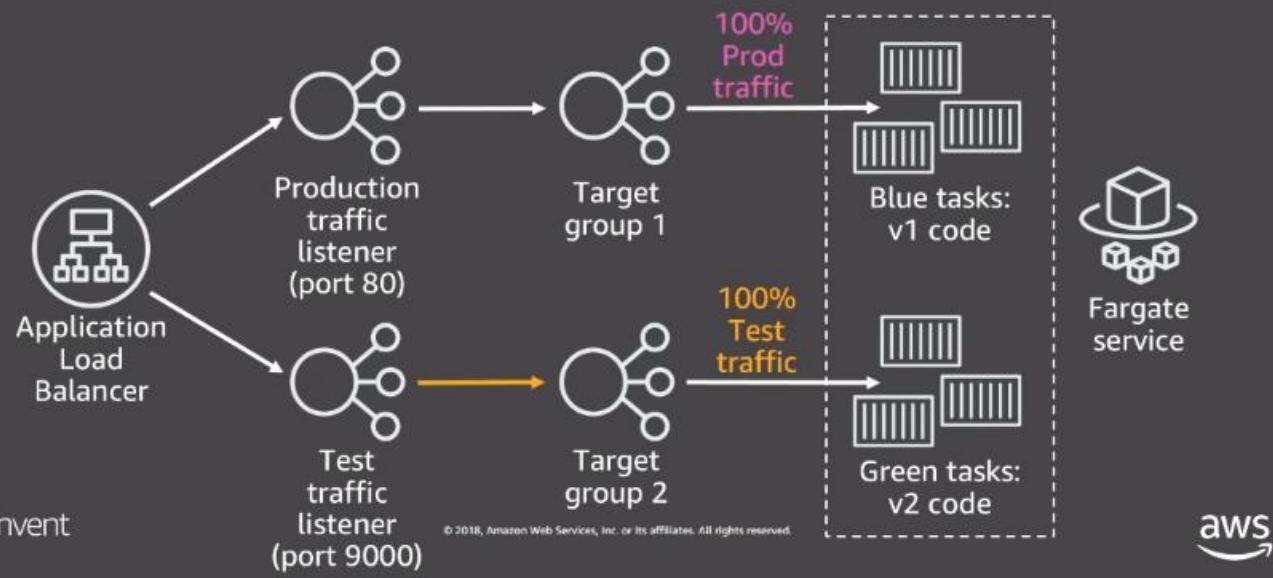


CodeDeploy-ECS blue-green deployment



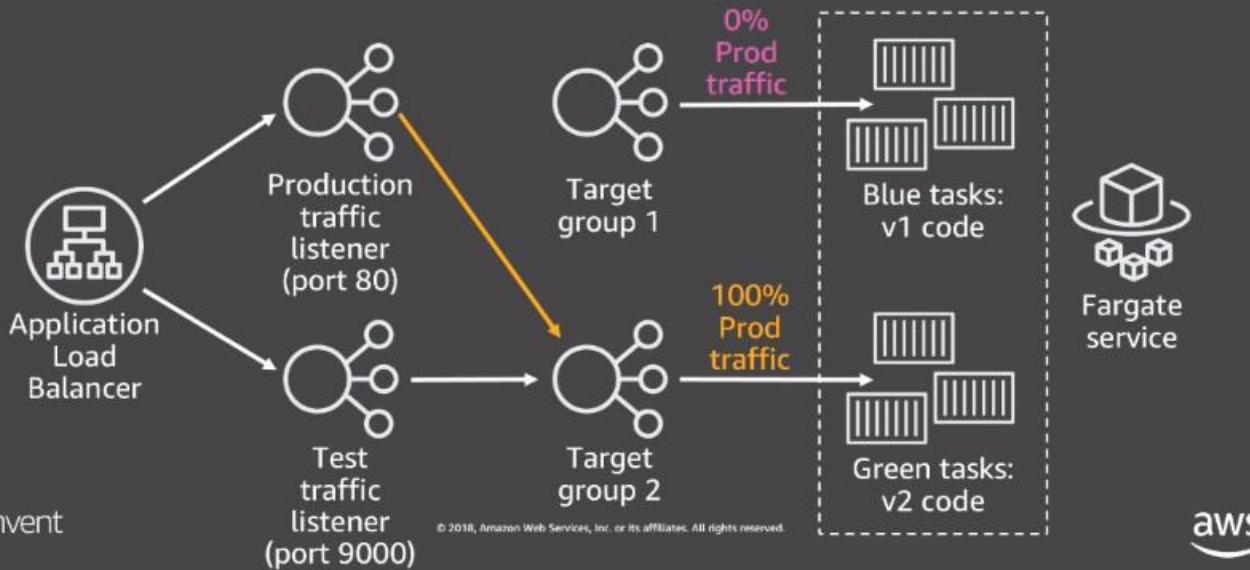
CodeDeploy-ECS blue-green deployment

Run hook against test endpoint before green tasks receive prod traffic



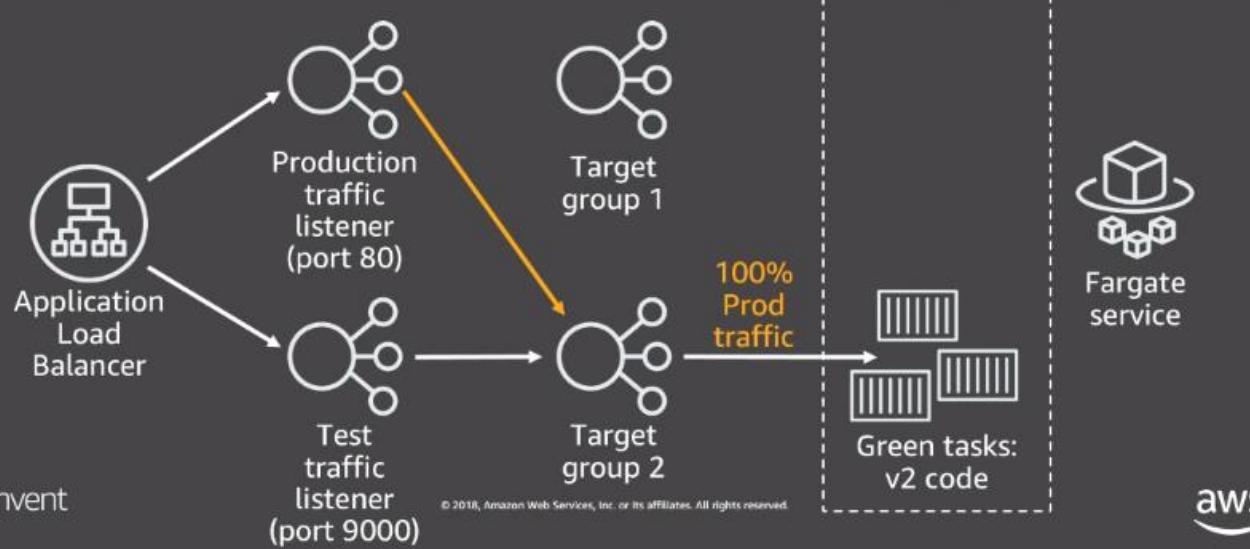
CodeDeploy-ECS blue-green deployment

Flip traffic to green tasks, rollback in case of alarm



CodeDeploy-ECS blue-green deployment

Drain blue tasks



Container image tagging for deployments

- Docker tags are resolved when each container starts, not just during deployments
- Deploying “latest” or “prod” can result in untested code in production after a scale-out event
- Use unique “immutable” tags for deployments

Container image tagging for deployments



Container image tagging for deployments

Build pushes new “latest” image



Container image tagging for deployments

Service scales up, launching new tasks



Container image tagging for deployments

Deploy using immutable tags

```
{  
  "name": "sample-app",  
  "image": "amazon/amazon-ecs-  
           sample@sha256:3e39d933b1d948c92309bb583b5a1f3d28f0119e1551ca1fe538ba414a41af48d"  
}  
  
{  
  "name": "sample-app",  
  "image": "amazon/amazon-ecs-sample:build-b2085490-359f-4eaf-8970-6d1e26c354f0"  
}
```

SHA256 Digest

Build ID

Container image tagging for deployments

Compute immutable tags during build

SHA256 Digest

```
export IMAGE_URI=`docker inspect --format='{{index .RepoDigests 0}}' my_image:$IMAGE_TAG
```

Example Result:

```
amazon/amazon-ecs-sample@sha256:3e39d933b...
```

Build ID

```
export IMAGE_TAG=build-`echo $CODEBUILD_BUILD_ID | awk -F":" '{print $2}'`
```

Example Result:

```
build-b2085490-359f-4eaf-8970-6d1e26c354f0
```

Container image tagging for deployments



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Container image tagging for deployments

Build pushes new image tagged with new build ID



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Container image tagging for deployments

Service scales up, launching new tasks



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aws

Container image tagging for deployments

Deployment updates service's task definition, replacing tasks



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aws

Continuous deployment goals

Continuous deployment

1. Automatically deploy new changes to staging environments for testing
2. Deploy to production safely without impacting customers
3. Deliver to customers faster: Increase deployment frequency, and reduce change lead time and change failure rate

Pillars of releasing modern applications

Continuous integration

Continuous deployment

Infrastructure as code

Infrastructure as code goals

Source

Build

Test

Production

Infrastructure as code

Infrastructure as code goals

Infrastructure as code

1. Make infrastructure changes repeatable and predictable
2. Release infrastructure changes using the same tools as code changes
3. Replicate production environment in a staging environment to enable continuous testing

Continuous testing with infrastructure as code

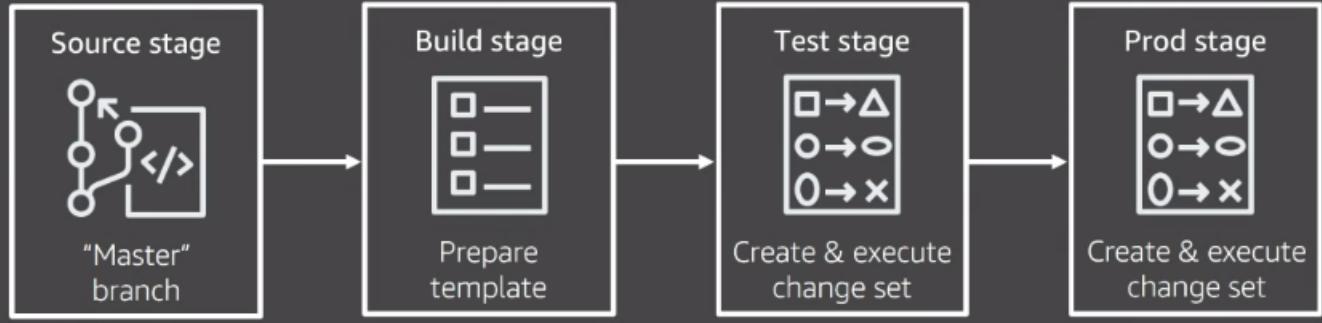
Validate an artifact (Build stage)

- Unit tests
- Static analysis
- Mocked dependencies and environments
- Vulnerability image scans

Validate an environment (Test stages)

- Integration tests against real dependencies and real environments
- Load testing
- Penetration testing
- Monitoring to test impact of deployments on environment

Release infrastructure-as-code



Model function environments with AWS Serverless Application Model (SAM)



- Open source framework for building serverless applications on AWS
- Shorthand syntax to express functions, APIs, databases, and event source mappings
- Transforms and expands SAM syntax into AWS CloudFormation syntax on deployment
- Supports all AWS CloudFormation resource types

<https://aws.amazon.com/serverless/sam/>

SAM template

```
AWSTemplateFormatVersion: '2010-09-09'
Transform: AWS::Serverless-2016-10-31
Resources:
  GetFunction:
    Type: AWS::Serverless::Function ←
      Properties:
        Handler: index.get
        Runtime: nodejs6.10
        CodeUri: src/
        Policies: AmazonDynamoDBReadOnlyAccess
    Events:
      GetResource:
        Type: Api ←
          Properties:
            Path: /resource/{resourceId}
            Method: get
  Table:
    Type: AWS::Serverless::SimpleTable ←
      AWS::Invent
```

Shorthand
syntax to
express
functions,
tables, and
events



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SAM template

```
AWSTemplateFormatVersion: '2010-09-09'  
Transform: AWS::Serverless-2016-10-31  
Resources:  
  GetFunction:  
    Type: AWS::Serverless::Function  
    Properties:  
      Handler: index.get  
      Runtime: nodejs6.10  
      CodeUri: src/  
      Policies: AmazonDynamoDBReadOnlyAccess  
    Events:  
      GetResource:  
        Type: Api  
        Properties:  
          Path: /resource/{resourceId}  
          Method: get  
Table:  
  Type: AWS::Serverless::SimpleTable
```

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Just 18 lines of SAM syntax creates many resources:

- AWS Lambda function
- Amazon API Gateway
- Amazon DynamoDB table
- AWS Identity and Access Management (IAM) roles



Use SAM CLI to package and deploy SAM templates

pip install --user aws-sam-cli

sam init

sam build

New

sam package

sam deploy

CodePipeline

Use CloudFormation deployment actions with any SAM application

Jenkins

Use SAM CLI plugin

Model container environments with AWS Cloud Development Kit (CDK)



Developer Preview

- Open source framework to define cloud infrastructure in Typescript
- Provides library of higher-level resource types (“construct” classes) that have AWS best practices built in by default, packaged as npm modules
- Provisions resources with CloudFormation
- Supports all CloudFormation resource types

<https://awslabs.github.io/aws-cdk>

CDK template

```
import ec2 = require('@aws-cdk/aws-ec2');
import ecs = require('@aws-cdk/aws-ecs');
import cdk = require('@aws-cdk/cdk');

class BonjourFargate extends cdk.Stack {
  constructor(parent: cdk.App, name: string, props?: cdk.StackProps) {
    super(parent, name, props);

    const vpc = new ec2.VpcNetwork(this, 'MyVpc', { maxAZs: 2 });
    const cluster = new ecs.Cluster(this, 'Cluster', { vpc });

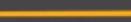
    new ecs.LoadBalancedFargateService(
      this, "FargateService",
      {
        cluster,
        image: ecs.DockerHub.image("amazon/amazon-ecs-sample"),
      });
  }
}

const app = new cdk.App();
new BonjourFargate(app, 'Bonjour');
app.run();
```

AWS Invent

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High-level VPC class includes VPC, subnets, security groups, internet gateway, NAT gateways, and route tables



This is an example CDK template for a Fargate service with a LB in front of it.

CDK template

```
import ec2 = require('@aws-cdk/aws-ec2');
import ecs = require('@aws-cdk/aws-ecs');
import cdk = require('@aws-cdk/cdk');

class BonjourFargate extends cdk.Stack {
  constructor(parent: cdk.App, name: string, props?: cdk.StackProps) {
    super(parent, name, props);

    const vpc = new ec2.VpcNetwork(this, 'MyVpc', { maxAZs: 2 });
    const cluster = new ecs.Cluster(this, 'cluster', { vpc });

    new ecs.LoadBalancedFargateService(
      this, "FargateService", {
        cluster,
        image: ecs.DockerHub.image("amazon/amazon-ecs-sample"),
      });
  }
}

const app = new cdk.App();
new BonjourFargate(app, 'Bonjour');
app.run();
```

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High-level Fargate class includes ECS service, ECS task definition, Application Load Balancer, listener rule, target group, and optionally Amazon Route 53 alias record



CDK template

```
import ec2 = require('@aws-cdk/aws-ec2');
import ecs = require('@aws-cdk/aws-ecs');
import cdk = require('@aws-cdk/cdk');

class BonjourFargate extends cdk.Stack {
  constructor(parent: cdk.App, name: string, props?: cdk.StackProps) {
    super(parent, name, props);

    const vpc = new ec2.VpcNetwork(this, 'MyVpc', { maxAZs: 2 });
    const cluster = new ecs.Cluster(this, 'cluster', { vpc });

    new ecs.LoadBalancedFargateService(
      this, "FargateService", {
        cluster,
        image: ecs.DockerHub.image("amazon/amazon-ecs-sample"),
      });
  }
}

const app = new cdk.App();
new BonjourFargate(app, 'Bonjour');
app.run();
```

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22 Lines of
TypeScript code
generate over
400 lines of
CloudFormation
syntax



CDK template

```
applets:  
  MyHelloWorldService:  
    type: '@aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet'  
    properties:  
      image: 'amazon/amazon-ecs-sample'
```

Applets use yaml syntax to provide inputs to the same CDK abstractions

This will also generate all the CF resources for you

Model pipelines with AWS CDK

- Minimize copy-and-paste by using object-oriented language
- Define microservice pipeline “shape” in one class, then re-use it across many pipelines
- CDK includes many high-level constructs for modeling a CodePipeline pipeline, including automatically configuring IAM role policies

You can also use infrastructure as code for your microservice pipelines using the CDK by defining a higher-level class for your pipeline that you can reuse.

CDK pipelines: Construct

```
export class MyMicroservicePipeline extends cdk.Construct {  
  constructor(parent: cdk.Construct, name: string, props: MyMicroservicePipelineProps) {  
    super(parent, name);  
  
    const pipeline = new codepipeline.Pipeline(this, 'Pipeline', {  
      pipelineName: props.serviceName,  
    });  
  
    const githubAccessToken = new cdk.SecretParameter(this, 'GitHubToken', {  
      ssmParameter: 'GitHubToken' });  
    new codepipeline.GitHubSourceAction(this, 'GitHubSource', {  
      stage: pipeline.addStage('Source'),  
      owner: 'myorg',  
      repo: props.serviceName,  
      oauthToken: githubAccessToken.value  
    });  
  }  
}
```

This is a truncated example of a pipeline class that we can use as code in our repo.

CDK pipelines: Stack

```
import cdk = require('@aws-cdk/cdk');
import { MyMicroservicePipeline } from './pipeline';

class MyMicroservicePipelinesStack extends cdk.Stack {
    constructor(parent: cdk.App, name: string, props?: cdk.StackProps) {
        super(parent, name, props);

        new MyMicroservicePipeline(this, 'Pipeline1', { 'serviceName': 'Microservice1' });
        new MyMicroservicePipeline(this, 'Pipeline2', { 'serviceName': 'Microservice2' });
        new MyMicroservicePipeline(this, 'Pipeline3', { 'serviceName': 'Microservice3' });
        new MyMicroservicePipeline(this, 'Pipeline4', { 'serviceName': 'Microservice4' });
    }
}

const app = new cdk.App();
new MyMicroservicePipelinesStack(app, 'MyMicroservicePipelines');
app.run();
```

You can then easily create new pipelines as above

Use CDK CLI to synthesize and deploy CDK templates

npm install -g aws-cdk

cdk init app --language typescript

cdk synth

cdk deploy

CodePipeline

Use CloudFormation deployment actions with any synthesized CDK application

Jenkins

Use CDK CLI

Infrastructure as code goals

Infrastructure as code

1. Make infrastructure changes repeatable and predictable
2. Release infrastructure changes using the same tools as code changes
3. Replicate production environment in a staging environment to enable continuous testing

Pillars of releasing modern applications

Continuous integration

Continuous deployment

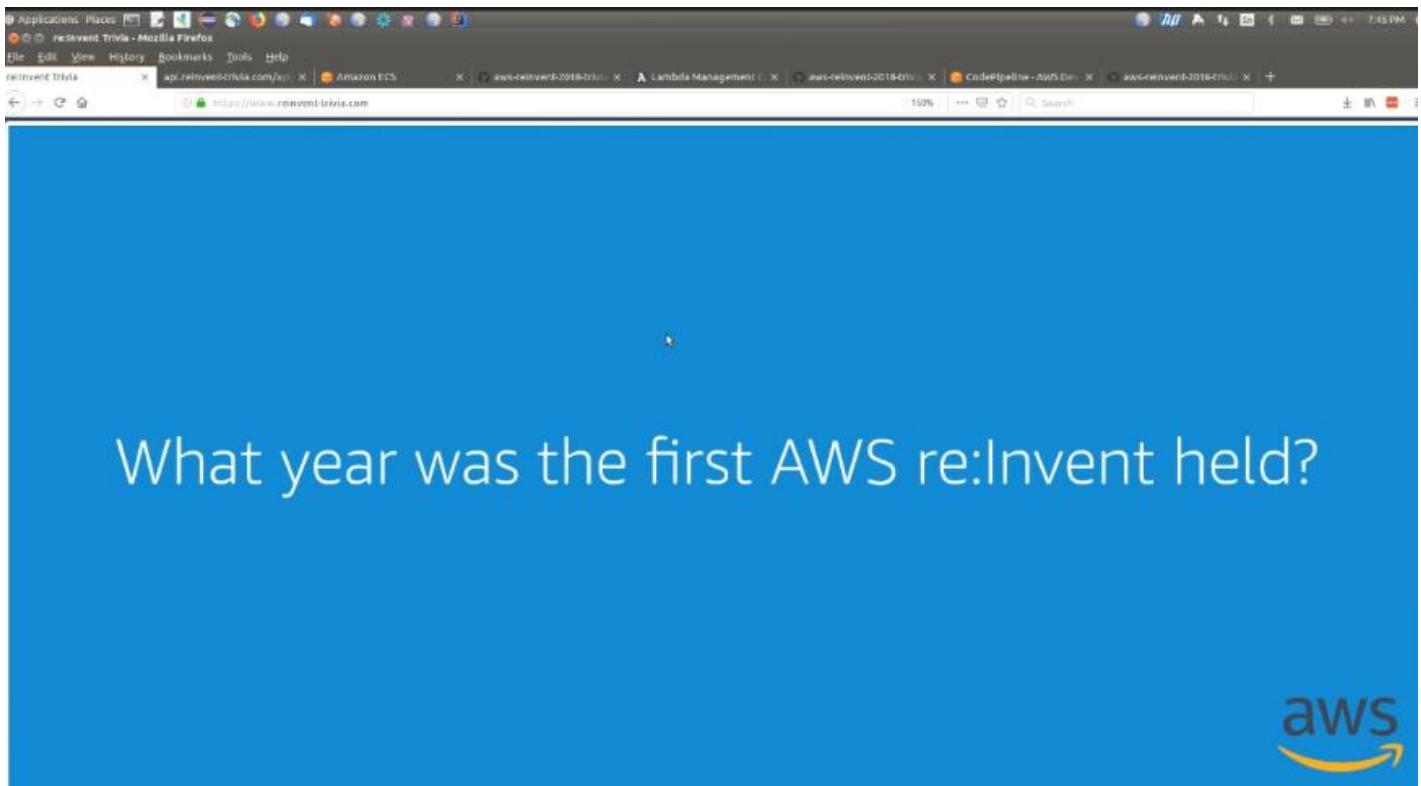
Infrastructure as code

Demo

The screenshot shows a web browser window displaying a Jeopardy-style trivia game. The game board is a 4x4 grid of blue boxes, each containing a monetary value. The columns are labeled: "Know Your History", "The Main Event", "Let's Get Musical", and "People, Places, and Things". The rows are labeled with values: 100, 200, 300, and 400. The browser's address bar shows the URL <https://www.reinvent-trivia.com>. The browser's title bar includes the text "reinvent-trivia" and "AWS re:Invent 2018". Other tabs visible in the browser include "Amazon ECS", "Lambda Management", "CodePipeline - AWS Dev", and "aws-reinvent-2018-471".

Know Your History	The Main Event	Let's Get Musical	People, Places, and Things
100	100	100	100
200	200	200	200
300	300	300	300
400	400	400	400

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A screenshot of the "re:Invent Trivia" game board. The board is organized into four columns representing different categories: "Know Your History", "The Main Event", "Let's Get Musical", and "People, Places, and Things". Each column contains four rows representing different point values: 100, 200, 300, and 400. The cells are blue with white text. The "Know Your History" category has the AWS logo in its top cell. The "The Main Event" category has the value "100" in its top cell. The "Let's Get Musical" category has the value "100" in its top cell. The "People, Places, and Things" category has the value "100" in its top cell. The "The Main Event" category has the value "200" in its second row. The "Let's Get Musical" category has the value "200" in its second row. The "People, Places, and Things" category has the value "200" in its second row. The "The Main Event" category has the value "300" in its third row. The "Let's Get Musical" category has the value "300" in its third row. The "People, Places, and Things" category has the value "300" in its third row. The "The Main Event" category has the value "400" in its fourth row. The "Let's Get Musical" category has the value "400" in its fourth row. The "People, Places, and Things" category has the value "400" in its fourth row.

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This is a static site that is backed by an API that serves up all of the trivia questions and answers. We have it packaged up as a container image being run in our Fargate service.

This screenshot shows a Mozilla Firefox browser window with several tabs open. The active tab displays a JSON object representing a trivia question. The JSON structure is as follows:

```

{
  "id": 1,
  "points": 100,
  "question": "What year was the first AWS re:Invent held?",
  "answer": 2012,
  "answerType": "NUMBER",
  "category": "Know Your History"
}

```

This is a sample data that we get from the Fargate API service to display in our app.

This screenshot shows the AWS CloudWatch Metrics interface for a Fargate cluster named 'default'. The 'Metrics' tab is selected. Key metrics displayed include:

- Status: ACTIVE
- Registered container instances: 0
- Pending tasks count: 0 Fargate, 0 EC2
- Running tasks count: 6 Fargate, 0 EC2
- Active service count: 2 Fargate, 0 EC2
- Draining service count: 0 Fargate, 0 EC2

The 'Services' tab is also visible, showing two services: 'trivia-backend-test' and 'trivia-backend-prod', both in ACTIVE status with a DESIRED task count of 3.

This screenshot shows a GitHub repository page for 'aws-samples / aws-reinvent-2018-trivia-game'. The 'Code' tab is selected, displaying a file named 'fargate-services.yaml'. The code defines two services using the AWS CDK:

```

applets:
  triviabackendtest:
    type: @aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet
    properties:
      image: 'IMAGE_PLACEHOLDER'
      desiredCount: 3
      domainName: 'api-test.reinvent-trivia.com'
      domainZone: 'reinvent-trivia.com'
      certificate: 'arn:aws:acm:us-east-1:131296546870:certificate/21d10493-c95c-4b0a-a7ea-2abeb9922634'
  TriviaBackendProd:
    type: @aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet
    properties:
      image: 'IMAGE_PLACEHOLDER'
      desiredCount: 3

```

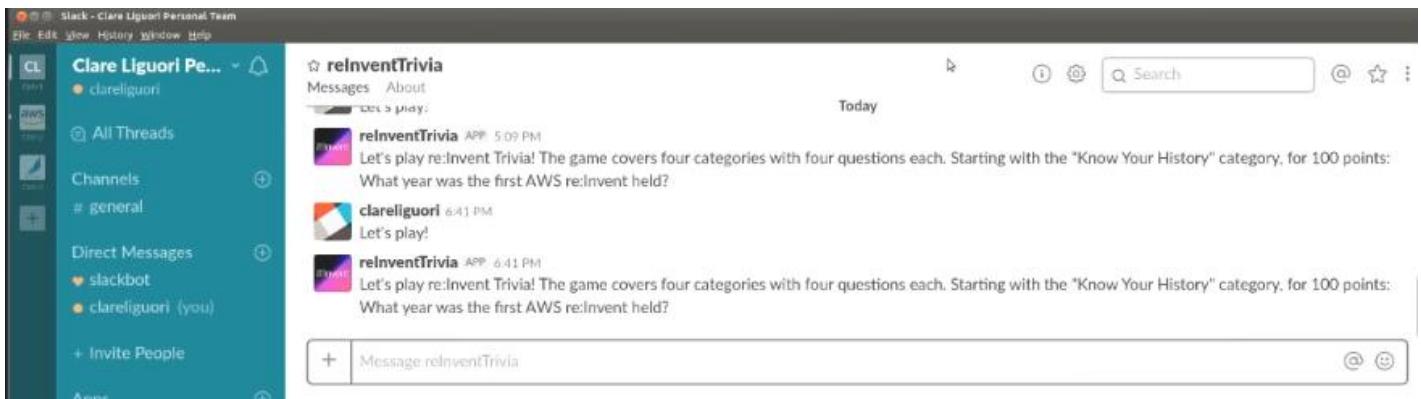
This screenshot shows a GitHub pull request titled "clareliguori Add declarative CDK example for backend". The code snippet is a CDK applet configuration for a trivia game, defining two applets: TriviaBackendTest and TriviaBackendProd. Both applets use the @aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet type, with properties including image ('IMAGE_PLACEHOLDER'), desiredCount (3), domainName ('api-test.reinvent-trivia.com'), domainZone ('reinvent-trivia.com'), and certificate ARNs.

```

18 lines (17 sloc) 690 Bytes
Raw Blame History
1 applets:
2   TriviaBackendTest:
3     type: @aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet
4     properties:
5       image: 'IMAGE_PLACEHOLDER'
6       desiredCount: 3
7       domainName: 'api-test.reinvent-trivia.com'
8       domainZone: 'reinvent-trivia.com'
9       certificate: 'arn:aws:acm:us-east-1:131296546879:certificate/21d10493-c95c-4b0a-a7ea-2abeb9922634'
10  TriviaBackendProd:
11    type: @aws-cdk/aws-ecs:LoadBalancedFargateServiceApplet
12    properties:
13      image: 'IMAGE_PLACEHOLDER'
14      desiredCount: 3
15      domainName: 'api.reinvent-trivia.com'
16      domainZone: 'reinvent-trivia.com'
17      certificate: 'arn:aws:acm:us-east-1:131296546879:certificate/6c38c4a3-42a7-4a1e-8dbe-728b10b6e33f'

```

This is an example of the CDK applet that we used to define our build, test and production deployment stages



We also integrated with Amazon Lex to use in our Slack channel

This screenshot shows the AWS Lambda console under the "Applications" tab. It lists four applications: TriviaBackendHooksProd, TriviaGameChatBotTest, TriviaGameChatBotProd, and TriviaBackendHooksTest. Each application has a status of "UPDATE_COMPLETE" and was last modified 4 days ago.

Name	Description	Last modified	Status
TriviaBackendHooksProd	Validation hooks for trivia backend	4 days ago	UPDATE_COMPLETE
TriviaGameChatBotTest	Chat bot for reinvent trivia game	8 hours ago	UPDATE_COMPLETE
TriviaGameChatBotProd	Chat bot for reinvent trivia game	3 days ago	UPDATE_COMPLETE
TriviaBackendHooksTest	Validation hooks for trivia backend	4 days ago	UPDATE_COMPLETE

Reinvent Trivia | https://reinvent-trivia.com/api | Amazon ECS | AWS Lambda Management | AWS ReInvent-2018-01 | CodePipeline - AWS Dev | AWS ReInvent-2018-02 | +

Services ▾ Resource Groups ▾

AWS Lambda X

Lambda > Applications > TriviaGameChatBotTest

TriviaGameChatBotTest

Overview Deployments Monitoring

▼ Getting started Dismiss

Welcome to your new application view. From here, you can perform application-level actions such as viewing all resources that together make up your application and monitoring performance, errors, and traffic metrics for the application. [Learn more](#)

Set up your development environment

You can use the following AWS tools to build, test, and deploy your applications.

 **AWS Cloud9**
Use AWS Cloud9 to write, run and edit your source code. Cloud9 preconfigures the development environment with all the SDKs, libraries, and plug-ins needed for serverless development.

 **Visual Studio**
Configure the AWS Toolkit for Visual Studio to edit your serverless applications in Microsoft Visual Studio 2015 and later.

 **AWS SAM CLI**
Get SAM CLI to locally build, test, and debug your serverless applications.

 **Eclipse**
Configure the AWS Toolkit for Eclipse to edit and test your serverless applications in Eclipse.

Reinvent Trivia | https://reinvent-trivia.com/api | Amazon ECS | AWS Lambda Management | AWS ReInvent-2018-01 | CodePipeline - AWS Dev | AWS ReInvent-2018-02 | +

Services ▾ Resource Groups ▾

AWS Lambda X

Dashboard Applications Functions

Configure the AWS Toolkit for Eclipse to edit and test your serverless applications in Eclipse.

AWS Lambda Partners provide services and tools that you can use with your Lambda functions. [View all the current AWS Lambda Partners.](#)

▼ SAM template

CloudFormation stack □

```
1 AWSTemplateFormatVersion: '2018-09-09'
2 Description: Chat bot for reinvent trivia game
3 Parameters:
4   TriviaBackendEndpoint:
5     Default: https://api-test.reinvent-trivia.com
6     Type: String
7 Resources:
8   BotAliasErrorMetricGreaterThanZeroAlarm:
9     Properties:
10    AlarmDescription: Lambda Function Error > 0
11    ComparisonOperator: GreaterThanThreshold
12    Dimensions:
13      - Name: Resource
14        Value:
15          Fn::Sub: ${BotFunction}:live
16      - Name: FunctionName
17        Value:
18        Ref: BotFunction
19    EvaluationPeriods: 2
20    MetricName: Errors
21    Namespace: AWS/Lambda
22    Period: 60
```

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AWS Lambda Applications TriviaGameChatBotTest

Deployment history

Timestamp	Status	Status reason
10 minutes ago	UPDATE_COMPLETE	User Initiated
3 days ago	UPDATE_COMPLETE	User Initiated
3 days ago	UPDATE_COMPLETE	User Initiated
3 days ago	UPDATE_ROLLBACK_COMPLETE	The following resource(s) failed to update: [BotFunctionAliasLive]
3 days ago	UPDATE_COMPLETE	
3 days ago	UPDATE_COMPLETE	User Initiated

AWS Lambda Applications TriviaGameChatBotTest

Monitoring

Dashboard: AWS Lambda

Select a dashboard: AWS Lambda

Invocations

Errors

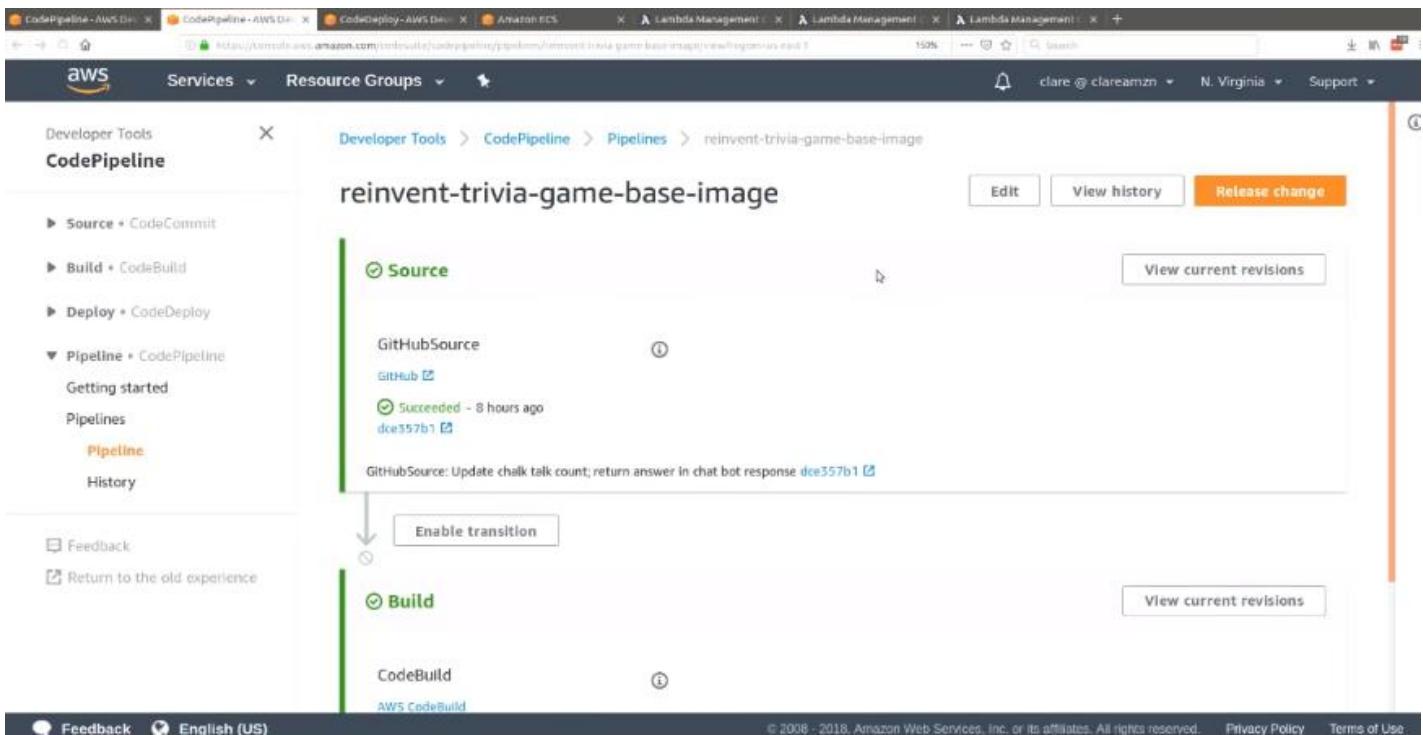
Duration (average)

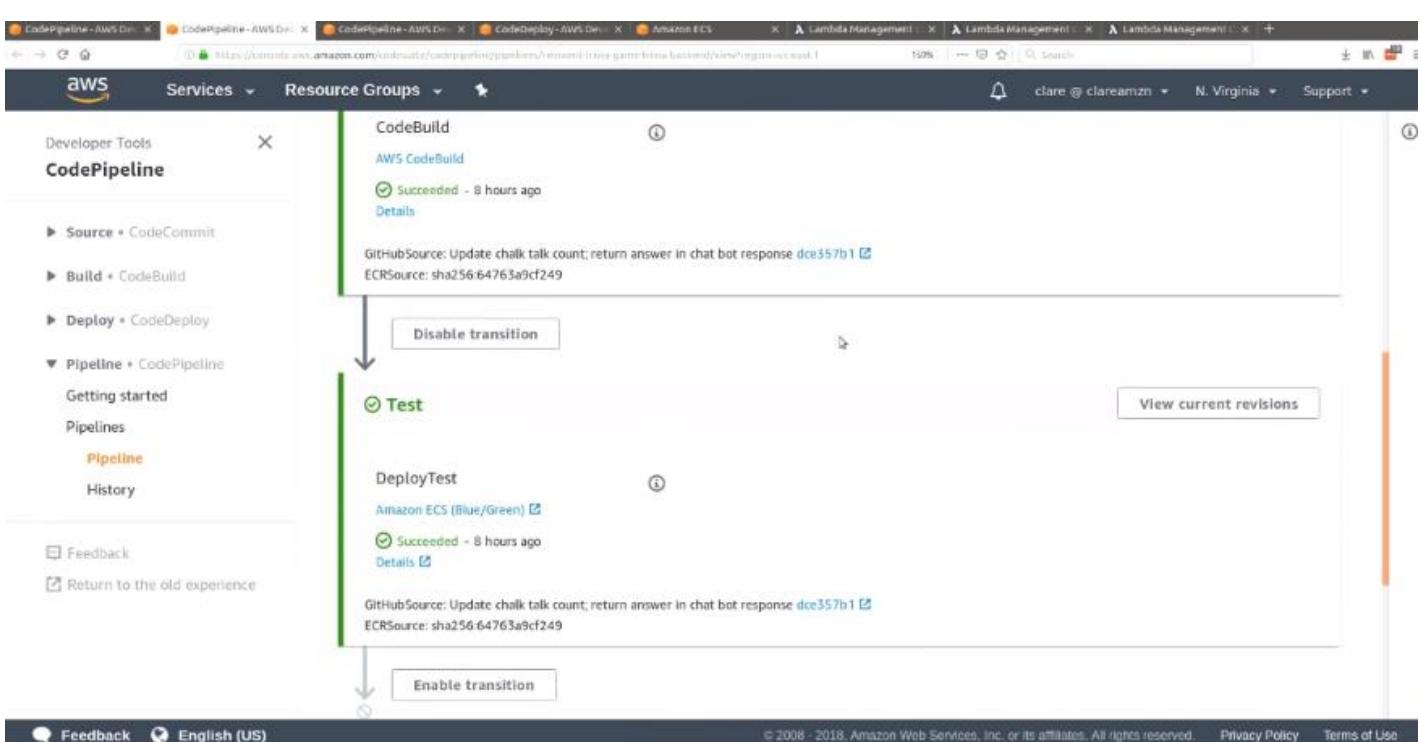
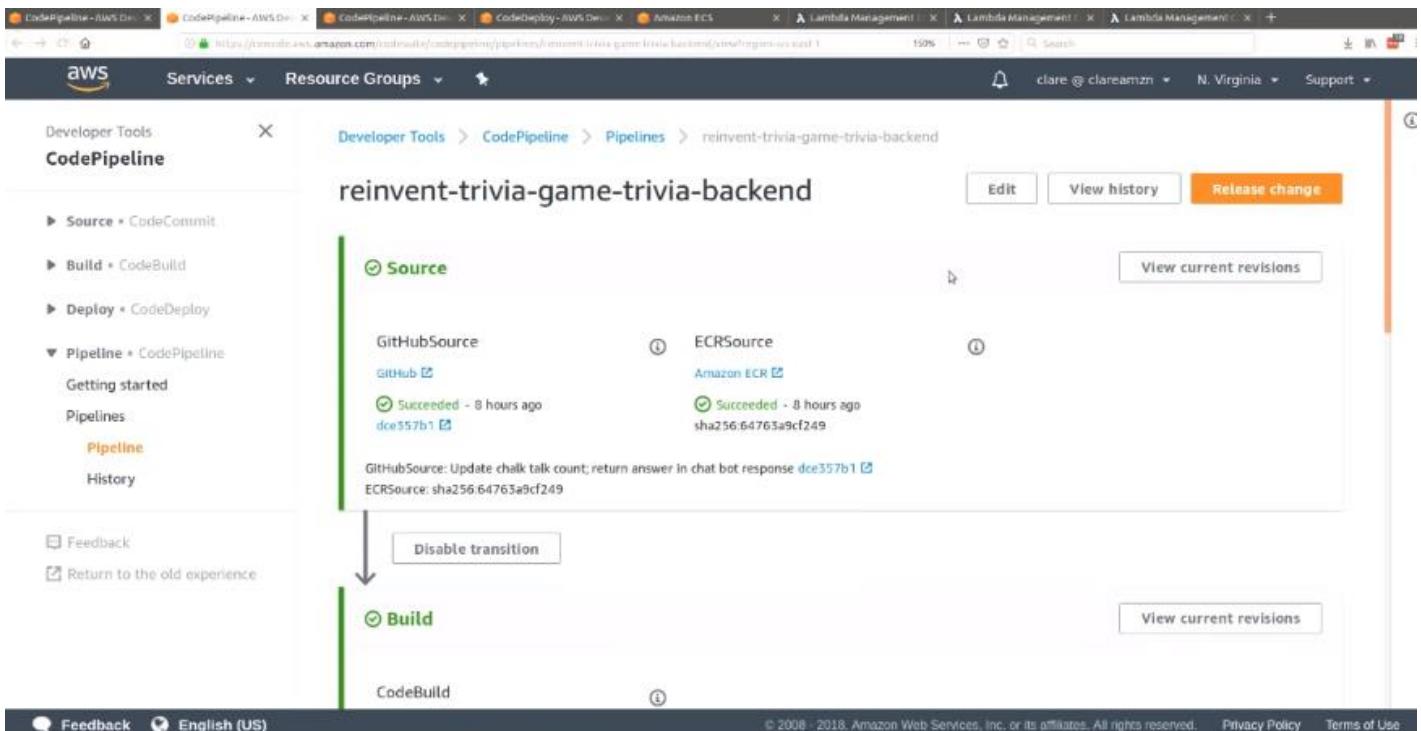
The screenshot shows the AWS CodePipeline console. On the left, there's a sidebar with navigation links: Source (CodeCommit), Build (CodeBuild), Deploy (CodeDeploy), Pipeline (CodePipeline, which is expanded), Getting started, Pipelines (highlighted in orange), Feedback, and Return to the old experience. The main area has tabs for Pipelines and Info. A search bar is at the top. Below it is a table with columns: Name, Updated, and Created. The table lists five pipelines:

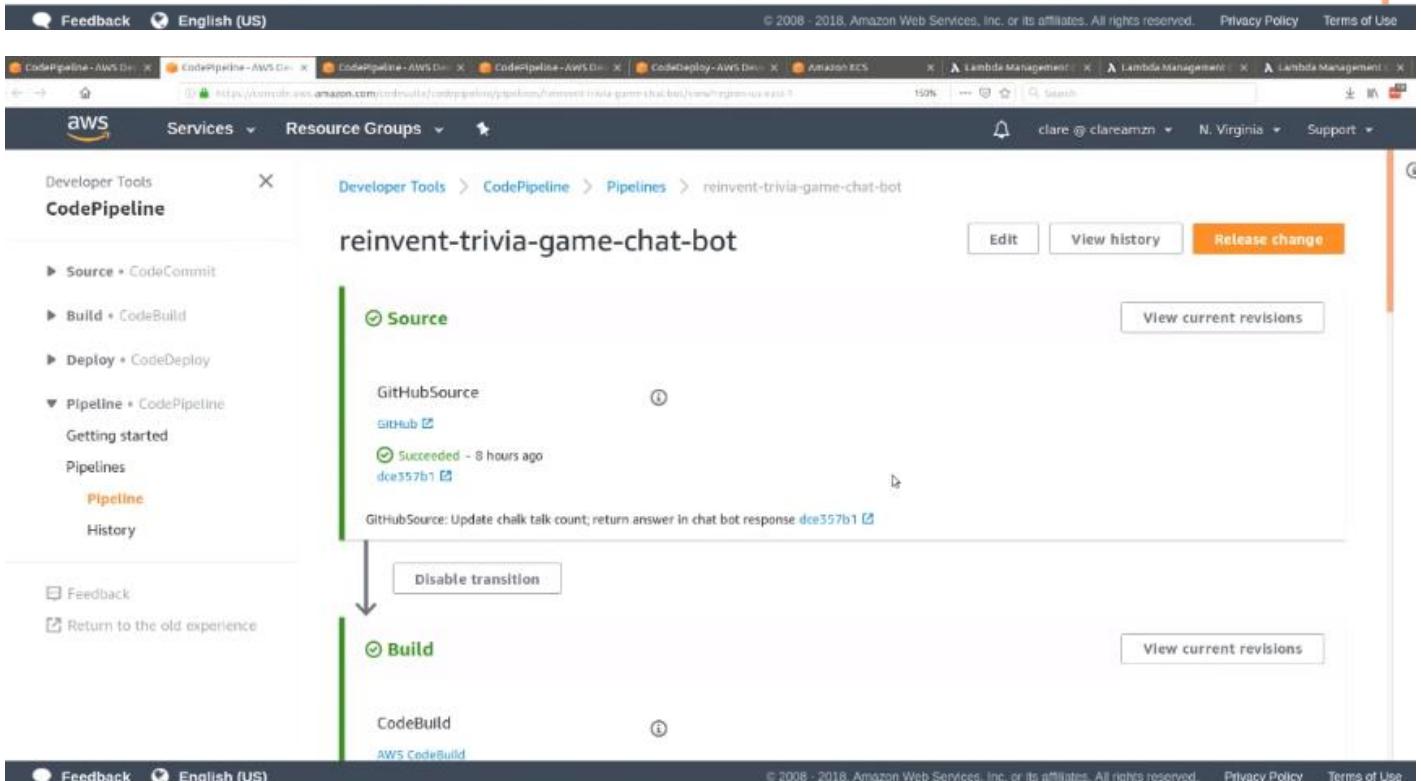
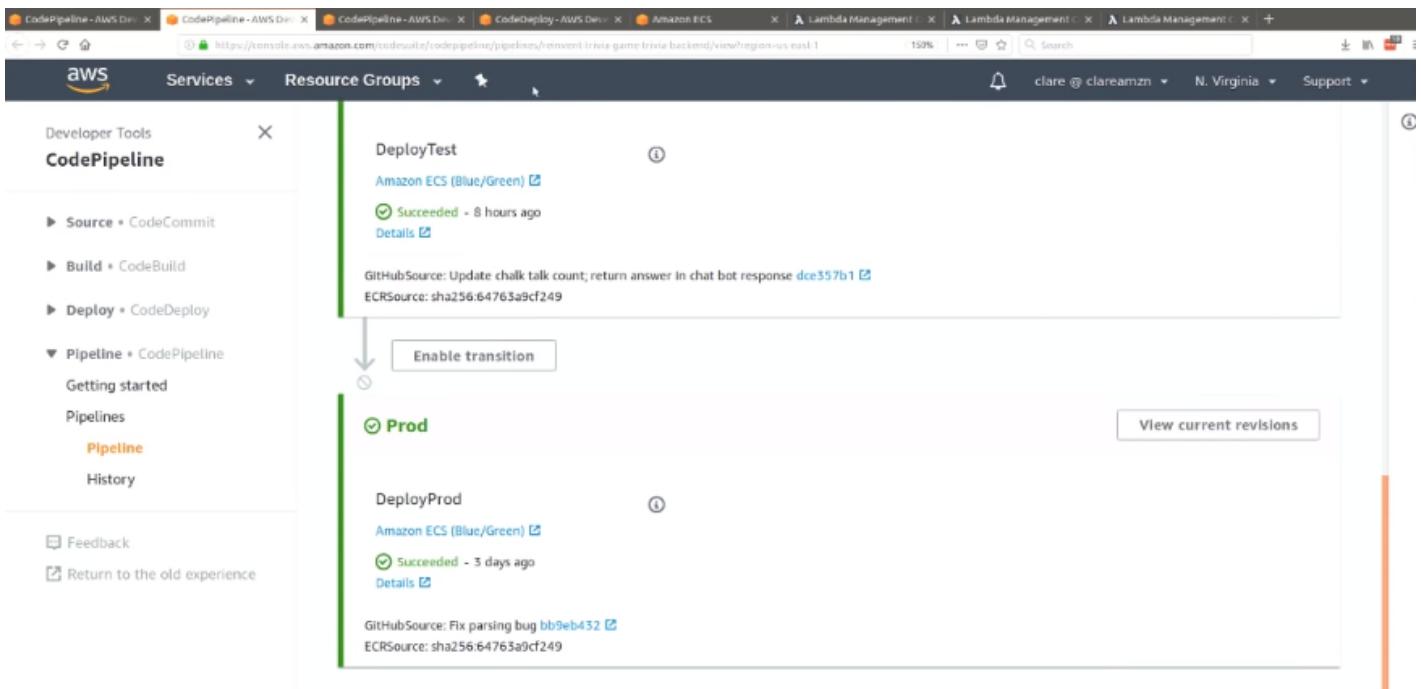
Name	Updated	Created
reinvent-trivia-game-base-image	8 days ago	Nov 15, 2018 12:36 PM
reinvent-trivia-game-chat-bot	8 days ago	Nov 10, 2018 9:30 PM
reinvent-trivia-game-static-site	8 days ago	Nov 9, 2018 9:05 PM
reinvent-trivia-game-static-site-infra	8 days ago	Nov 10, 2018 10:43 AM
reinvent-trivia-game-trivia-backend	4 days ago	Nov 10, 2018 4:13 PM

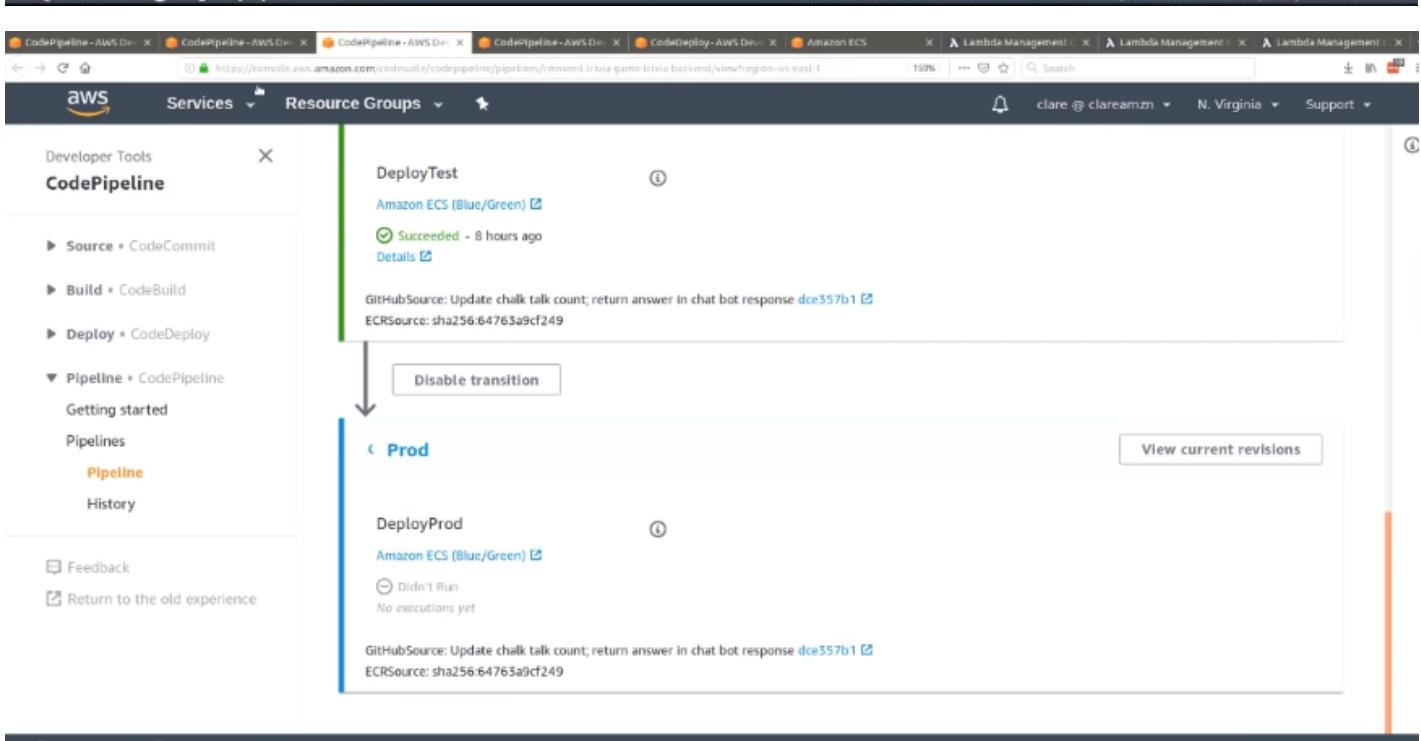
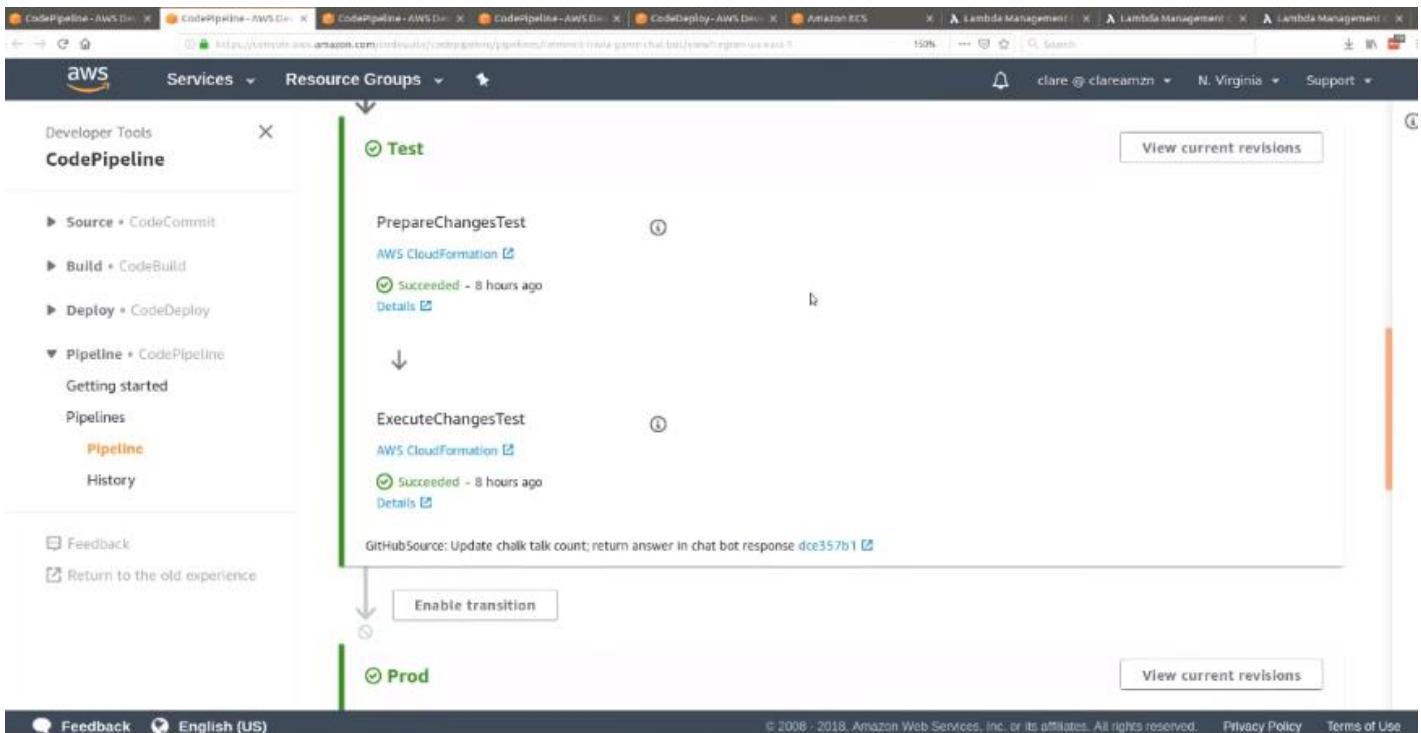
Screenshot of a GitHub repository page for 'aws-samples / aws-reinvent-2018-trivia-game'. The repository is private and has 13 stars. The 'src' directory contains several files related to pipeline configuration:

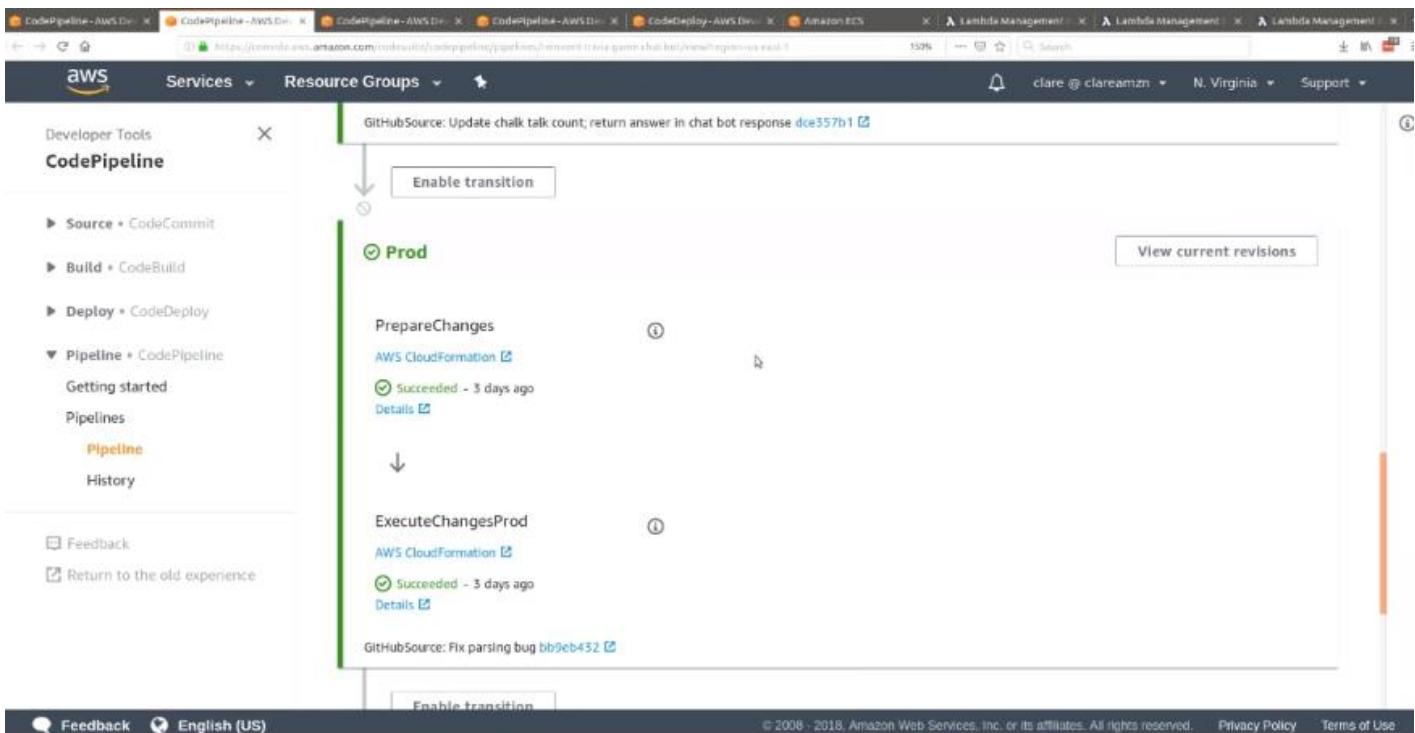
- api-base-image-pipeline.ts: Configure base image pipeline, 12 days ago
- api-service-pipeline.ts: Move buildspec, 12 days ago
- chat-bot-pipeline.ts: Fix stack names in pipelines, 13 days ago
- pipeline.ts: Fix resource permissions, 12 days ago
- static-site-infra-pipeline.ts: Fix stack names in pipelines, 13 days ago
- static-site-pipeline.ts: Update pipeline repo, 13 days ago











CloudFormation

Stacks

Stack details

Change sets

Drifts

StackSets

Exports

Designer

Previous console

CloudFormation > Stacks > undefined: Change sets > StagedChangeSet

StagedChangeSet

Changes Input Template JSON changes

Overview

Change set ID: arn:aws:cloudformation:us-east-1:131296546870:changeSet/StagedChangeSet/4e411dc2-0435-4cd9-bcb6-c5359298f390

Status: CREATE_COMPLETE

Description: Status reason:

Created time: Wed, 28 Nov 2018 03:49:29 GMT

Execution status: AVAILABLE

Delete **Execute**

AWS Services Resource Groups

d-7866KSMSW

[Stop deployment](#) [Stop and roll back deployment](#)

Deployment status		Traffic shifting progress	
Step 1:	Deploying replacement task set	Original	Replacement
Step 2:	Test traffic route setup	Not started	0%
Step 3:	Rerouting production traffic to replacement task set	Not started	Original task set serving traffic
Step 4:	Wait 1 minute 0 seconds	Not started	Replacement task set not serving traffic
Step 5:	Terminate original task set	Not started	

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AWS Services Resource Groups

Revision location		Revision created	Description
89b510da744e7580ff5e335ae0523e37b15e0	Just now	Application revision registered by Deployment ID: d-7866KSMSW	
5f617a00e920308e46e09d1fb7e			

Task set activity

Task set ID	Environment	Task set status	Traffic	Desired count	Running count	Pending count
ecs-svc/92233704937423B0723	Original	PRIMARY	100%	3	3	0
ecs-svc/9223370493477786367	Replacement	ACTIVE	0	3	2	1

Deployment lifecycle events

Event	Duration	Status	Start time	End time
BeforeInstall	less than one second	Succeeded	Nov 27, 2018 7:49 PM	Nov 27, 2018 7:49 PM
Install	-	In progress	Nov 27, 2018 7:49 PM	-

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Screenshot of the AWS Lambda Management console showing deployment lifecycle events for a CodeDeploy deployment.

Deployment lifecycle events:

Event	Duration	Status	Start time	End time
BeforeInstall	less than one second	Succeeded	Nov 27, 2018 7:49 PM	Nov 27, 2018 7:49 PM
Install	-	In progress	Nov 27, 2018 7:49 PM	-
AfterInstall	-	Pending	-	-
AllowTestTraffic	-	Pending	-	-
AfterAllowTestTraffic	-	Pending	-	-
BeforeAllowTraffic	-	Pending	-	-
AllowTraffic	-	Pending	-	-
AfterAllowTraffic	-	Pending	-	-

Screenshot of the AWS Lambda Management console showing the configuration for a CodeDeployHook function.

Designer:

Add triggers: Choose a trigger from the list below to add it to your function.

- API Gateway
- AWS IoT
- Alexa Skills Kit
- Alexa Smart Home
- CloudFront
- CloudWatch Events
- CloudWatch Logs

CodeDeployHook -TriviaBackendHooksProd-pre-traffic-hook

Go back to application TriviaBackendHooksProd

Add triggers from the list on the left

AWS CodeDeploy

Amazon CloudWatch Logs

Resources that the function's role has access to appear here

CodeDeployHook_-TriviaBackendH...

```

18 // Handle the lifecycle event hook execution from the event payload
19 var lifecycleEventHookExecutionId = event.lifecycleEventHookExecutionId;
20 console.log("LifecycleEventHookExecutionId: " + lifecycleEventHookExecutionId);
21
22 // Prepare the validation test results with the deploymentId and
23 // the lifecycleEventHookExecutionId for AWS CodeDeploy.
24 var params = {
25   deploymentId: deploymentId,
26   lifecycleEventHookExecutionId: lifecycleEventHookExecutionId,
27   status: 'Success'
28 };
29
30 // Perform validation or pre-warming steps.
31 // Make a request to the target URL and check the response
32 try {
33   const response = await axios(TARGET_URL);
34   if (response.status != 200) {
35     console.error('Failure status');
36     params.status = 'Failed';
37   } else if (response.data.length != 4) {
38     console.error('Wrong number of categories');
39     params.status = 'Failed';
40   }
41 } catch (err) {
42   console.error(err);
43   params.status = 'Failed';
44 }
45
46 // Pass AWS CodeDeploy the prepared validation test results.
47 try {
48   console.log(params);
49   await codeDeploy.putLifecycleEventHookExecutionStatus(params).promise();
50   console.log('Successfully reported hook results');
51   callback(null, 'Successfully reported hook results');
52 } catch (err) {
53   console.error('Failed to report hook results');
54   console.error(err);
55 }

```

45:1 JavaScript Spaces: 4

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Amazon ECS - Mozilla Firefox

File Edit View History Bookmarks Tools Help

CodePipeline-AWS Dev X CodePipeline-AWS Dev X CodePipeline-AWS Dev X CodeDeploy-AWS Dev X CodePipeline-AWS Dev X CodeDeploy-AWS Dev X Amazon ECS X Lambda Management X Lambda Management X

https://console.aws.amazon.com/lambda/functions/test/1473130410478/execute/10000000000000000000000000000000/details

100% Search

Services Resource Groups

CodeDeployHook_-TriviaBackendH...

Clusters > default > Service: trivia-backend-prod

Service : trivia-backend-prod

Update Delete

Cluster: default Desired count: 3

Status: ACTIVE Pending count: 0

Task definition: trivia-backend:49 Running count: 3

Service type: REPLICA

Launch type: FARGATE

Platform version: 1.2.0

Service role: AWSServiceRoleForECS

Details Tasks Events Auto Scaling Deployments Metrics Tags

Load Balancing

Target Group Name	Container Name	Container Port
Trivi-Servi-FZKPNUIINPOB7	web	80

Network Access

Health check grace period: 0

Allowed VPC: vpc-03fd81be004e51a19

Discover software Subscriptions

Service type: REPLICA Launch type: FARGATE Platform version: 1.2.0 Service role: AWSServiceRoleForECS

Details Tasks Events Auto Scaling Deployments Metrics Tags

Last updated on November 27, 2018 7:51:56 PM (0m ago)

Task status: Running Stopped

< 1-6 > Page size 50

Task	Task Definition	Last status	Desired status	Group	Launch type	Platform version
3106cd2d-b671-4f...	trivia-backend:51	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0
9058ff81-ade1-48...	trivia-backend:51	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0
a209ac3b-c33d-4...	trivia-backend:51	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0
5d00d710-81dc-4...	trivia-backend:49	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0
d1b61c17-46dc-4...	trivia-backend:49	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0
e92c99cc-e535-4...	trivia-backend:49	RUNNING	RUNNING	service:trivia-back...	FARGATE	1.2.0

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Service role: AWSServiceRoleForECS

Details Tasks Events Auto Scaling Deployments Metrics Tags

Task Placement

Strategy: No strategies Constraint: No constraints

Blue/green deployment Stop and rollback deployment

Deployment ID: d-7866KSMsw CodeDeploy deployment group: DgpECS-default-trivia-backend-prod

Type: Blue/green Start time: 2018-11-27 07:49:45

Started by: AWS CodeDeploy End time: -

Status: InProgress Deployment history: DgpECS-default-trivia-backend-prod

Task set ID	Environment	Task set status	Traffic	Desired count	Running count	Pending count
ecs-svc/92233704...	Replacement	ACTIVE	0%	3	3	0
ecs-svc/92233704...	Original	PRIMARY	100%	3	3	0

CodePipeline - AWS Dev X | CodePipeline - AWS Dev X | CodePipeline - AWS Dev X | CodeDeploy - AWS Dev X | CodePipeline - AWS Dev X | CodeDeploy - AWS Dev X | Amazon ECS X | Lambda Management X | Lambda Management X | clare @ claramzn N. Virginia Support

Developer Tools Services Resource Groups

CodeDeploy

Developer Tools > CodeDeploy > Deployments

Deployment history

Deployment Id	Status	Deployment type	Compute platform	Application	Deployment group
d-WL9Y1BGSW	Succeeded	Blue/green	AWS Lambda	TriviaGameChatBotTest-ServerlessDeploymentApplication-1F97L8QWEPPLC	TriviaGameChatBotBotFunctionDeployr1LCZBLWQZ3VNQ
d-5L3ZN80SW	Succeeded	Blue/green	Amazon ECS	AppECS-default-trivia-backend-test	DgpECS-default-triv backend-test
d-0ZX8KJ0QW	Succeeded	Blue/green	AWS Lambda	TriviaGameChatBotProd-ServerlessDeploymentApplication-12RH7V3A5PP8	TriviaGameChatBotBotFunctionDeployr1UXEJ82PPMEAM
d-WOEC9BLQW	Succeeded	Blue/green	Amazon ECS	AppECS-default-trivia-backend-prod	DgpECS-default-triv backend-prod

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Developer Tools Services Resource Groups

CodeDeploy

Developer Tools > CodeDeploy

Deployment lifecycle events

Event	Duration	Status	Start time	End time
BeforeInstall	less than one second	Succeeded	Nov 27, 2018 7:49 PM	Nov 27, 2018 7:49 PM
Install	2 minutes 3 seconds	Succeeded	Nov 27, 2018 7:49 PM	Nov 27, 2018 7:51 PM
AfterInstall	less than one second	Succeeded	Nov 27, 2018 7:51 PM	Nov 27, 2018 7:51 PM
AllowTestTraffic	1 second	Succeeded	Nov 27, 2018 7:51 PM	Nov 27, 2018 7:51 PM
AfterAllowTestTraffic	less than one second	Succeeded	Nov 27, 2018 7:51 PM	Nov 27, 2018 7:51 PM
BeforeAllowTraffic	3 seconds	Succeeded	Nov 27, 2018 7:51 PM	Nov 27, 2018 7:52 PM
AllowTraffic	1 second	Succeeded	Nov 27, 2018 7:52 PM	Nov 27, 2018 7:52 PM
AfterAllowTraffic	less than one second	Succeeded	Nov 27, 2018 7:52 PM	Nov 27, 2018 7:52 PM

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AWS Services Resource Groups

Deployment status

Step 1: Deploying replacement task set Completed ✓ Succeeded

Step 2: Test traffic route setup Completed ✓ Succeeded

Step 3: Rerouting production traffic to replacement task set 100% traffic shifted ✓ Succeeded

Step 4: Wait 1 minute 0 seconds Waiting ↗ In progress

Step 5: Terminate original task set Not started

Traffic shifting progress

Original Replacement

Original task set not serving traffic

Replacement task set serving traffic

0% 100%

Deployment details

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AWS Services Resource Groups

Deployment status

Step 1: Deploying replacement task set Completed ✓ Succeeded

Step 2: Test traffic route setup Completed ✓ Succeeded

Step 3: Rerouting production traffic to replacement task set 100% traffic shifted ✓ Succeeded

Step 4: Wait Wait completed ✓ Succeeded

Step 5: Terminate original task set Completed ✓ Succeeded

Traffic shifting progress

Original Replacement

Original task set not serving traffic

Replacement task set serving traffic

0% 100%

Deployment details

Screenshot of the AWS CodePipeline console showing a pipeline named "DeployTest".

The pipeline consists of two stages:

- DeployTest** (Amazon ECS (Blue/Green)) - Status: Succeeded - 8 hours ago. Details: GitHubSource: Update chalk talk count; return answer in chat bot response dce357b1. ECRSource: sha256:64763a9cf249.
- Prod** (Amazon ECS (Blue/Green)) - Status: Succeeded - Just now. Details: GitHubSource: Update chalk talk count; return answer in chat bot response dce357b1. ECRSource: sha256:64763a9cf249.

A large green arrow points from the first stage to the second stage. A button labeled "Disable transition" is located between the stages.

Screenshot of the AWS CodeDeploy console showing the deployment history for the "TriviaGameChatBot" application.

The deployment history table includes the following columns:

Deployment Id	Status	Deployment type	Compute platform	Application	Deployment group
d-LYSWWRSSW	In progress	Blue/green	AWS Lambda	TriviaGameChatBotProd-ServerlessDeploymentApplication-12RH7V3ASPP8	TriviaGameChatBotBotFunctionDeploy1UXEJ82PPMEAM
d-7B66K5M5W	Succeeded	Blue/green	Amazon ECS	AppECS-default-trivia-backend-prod	DgxECS-default-trivia-backend-prod
d-WL9Y1BG5W	Succeeded	Blue/green	AWS Lambda	TriviaGameChatBotTest-ServerlessDeploymentApplication-1F97L8QWEPLC	TriviaGameChatBotBotFunctionDeploy1LCZBLWQ23VNQ
d-5L3ZN8OSW	Succeeded	Blue/green	Amazon ECS	AppECS-default-trivia-backend-test	DgxECS-default-trivia-backend-test

Screenshot of the AWS CodeDeploy console showing a deployment named "d-LYSWWRSSW".

Deployment status:

- Step 1: Pre-deployment validation - Completed (Succeeded)
- Step 2: Traffic shifting - 10% complete (In progress)
- Step 3: Post-deployment validation - Not started

Traffic shifting progress:

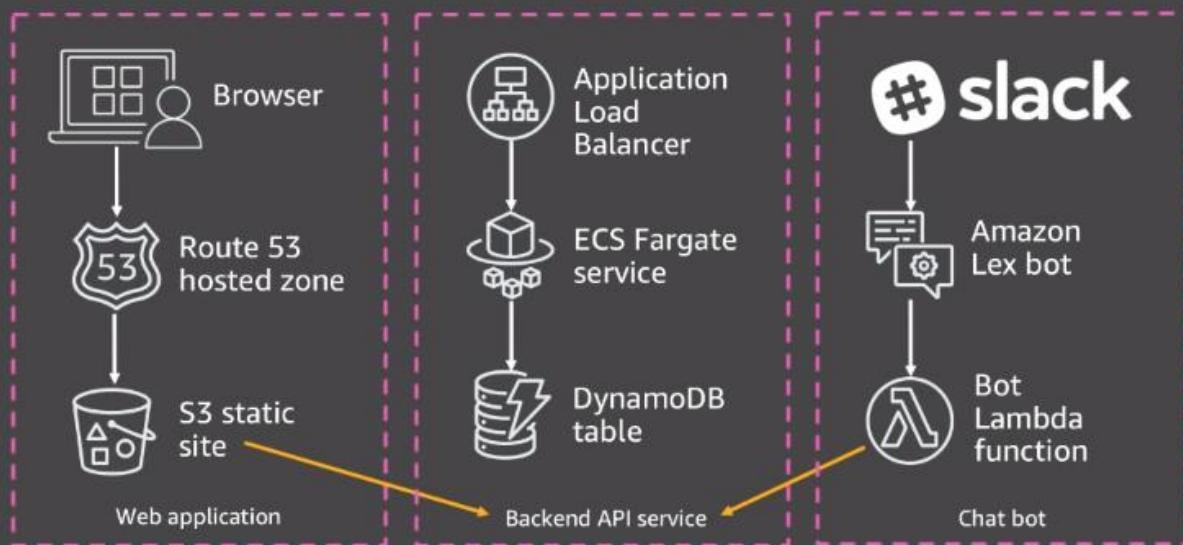
Next: The deployment will shift 90% of traffic from the current version to the replacement version at approximately 5 minute(s) after the deployment started.

Original	Replacement
90%	10%

Deployment results info:

- 90% of traffic
- 10% of traffic

re:Invent Trivia game



Related sessions

SRV325

Leadership Session: Using DevOps, Microservices, and Serverless to Accelerate Innovation

Thursday, Nov 29 | 12:15 – 1:15 pm | Venetian, Level 2, Venetian Theater

SRV305

Inside AWS: Technology Choices for Modern Applications

Wednesday, Nov 28 | 5:30 – 6:30 pm | MGM, Level 3, Premier Ballroom 316

Thursday, Nov 29 | 2:30 – 3:30 pm | Aria East, Level 2, Mariposa 5

DEV327

Beyond the Basics: Advanced Infrastructure as Code Programming on AWS

Thursday, Nov 29 | 4:00 – 5:00 pm | Aria West, Level 3, Ironwood 5

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Thank you!

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