
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

DOP202

Building on AWS with AWS tools, services, and SDKs

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AWS

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AWS

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Agenda

- AWS developer tools
- Automated provisioning
- IDE extensions
- SDKs
- CLIs

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What are the needs of a typical developer?



Rich IDE and editor support

Intellisense

“Don’t make us leave the IDE”

“Getting started” project templates



Full featured, easily consumable SDK



Easy debugging and testing



Command line support



CI/CD integration



Support for cross-platform development

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AWS development tools

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IDE integration

- AWS Cloud9
- AWS Toolkit for JetBrains
- AWS Toolkit for Visual Studio
- AWS Toolkit for VS Code
- Amazon CodeWhisperer

Programmable SDK

AWS SDK languages

Command line tools

- AWS CLI
- 'dotnet' CLI extensions
- AWS Tools for PowerShell
- AWS SAM
- AWS Copilot
- Amazon EC2 AMI
- AWS Elastic Beanstalk
- Amazon ECS CLI
- AWS Amplify CLI

DevOps and automation

- AWS CDK
- AWS CloudFormation
- AWS Toolkit for Azure DevOps
- AWS Fault Injection Simulator
- AWS CodePipeline
- AWS CodeBuild
- AWS CodeDeploy
- AWS CodeCommit

Web and mobile tools

- Amplify
- AWS Device Farm
- AWS AppSync

Monitoring & tracing

- Amazon CloudWatch
- AWS X-Ray

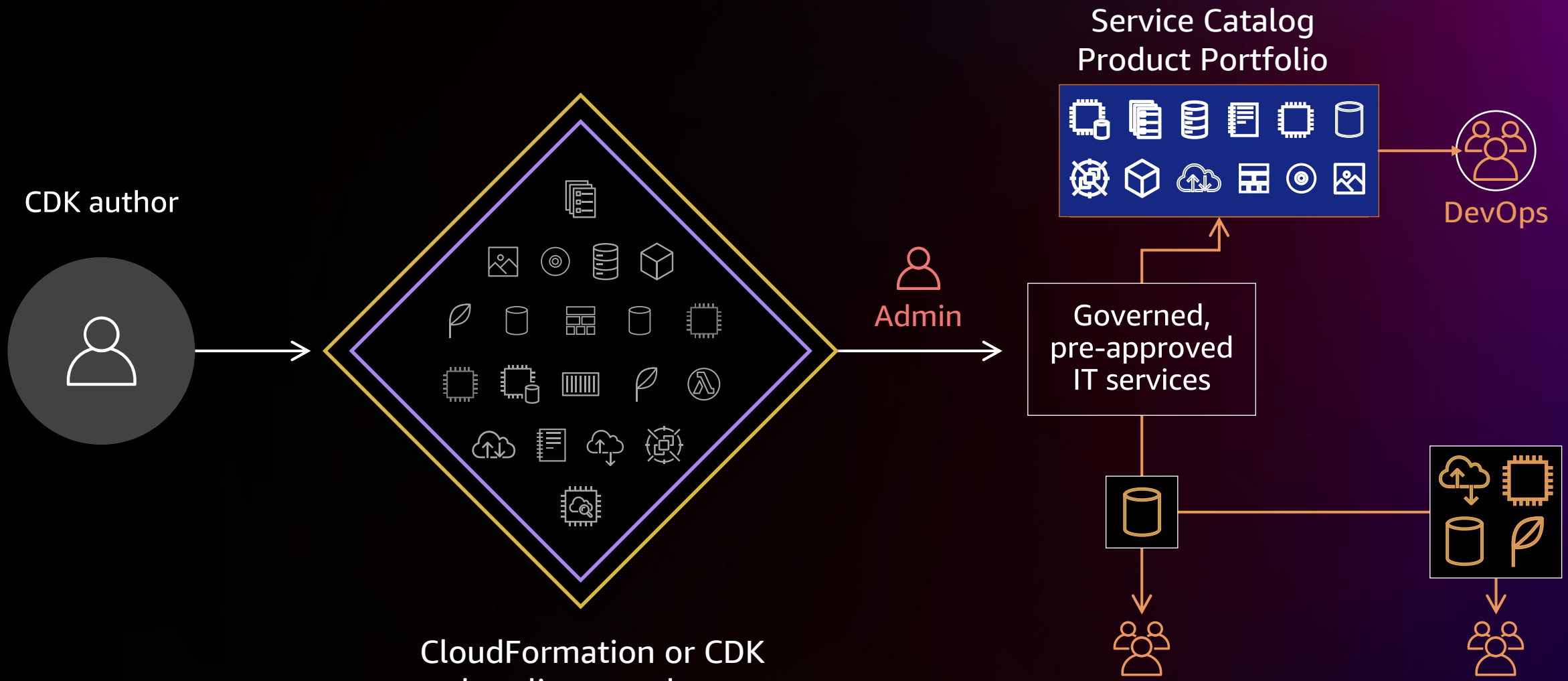
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Automate developer tools and account provisioning with AWS Service Catalog

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Automate provisioning

Provision



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Why use AWS Service Catalog?



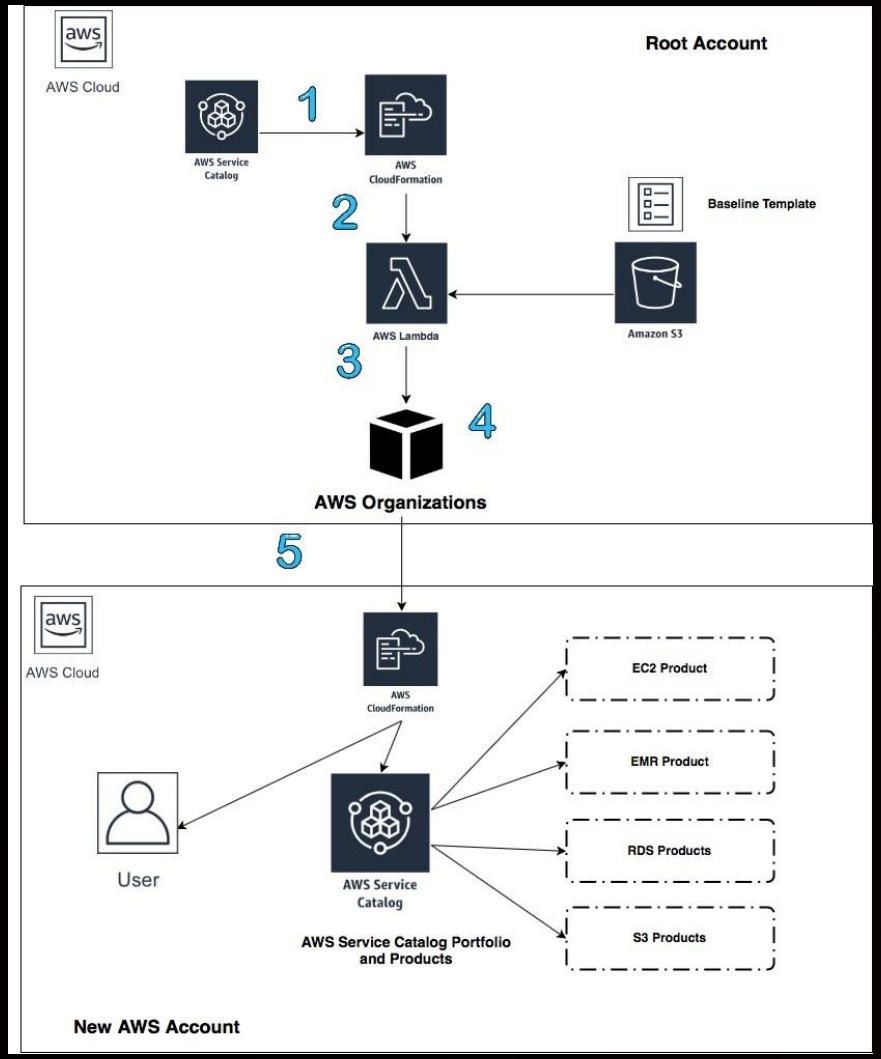
AWS Service Catalog allows you to centrally manage commonly deployed AWS services and provisioned software products

- Centrally manage IT service lifecycle
- Control AWS provisioning (cost, security, governance)
- Self-service portal – one-stop shop
- Standardized deployments
- Version control for AWS users
- Enforce governance and compliance proactively
- Integrate with ITSM tools

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How to provision...



Root

AWS Lambda

Account vending Lambda function

Self-invokes

- Creates AWS account
- Creates organizational unit
- Moves the new AWS account under OU

New developer account

OrganizationAccountAccessRole created by default as part of new account creation

Assumes OrganizationAccountAccessRole and gets the baseline template from the source bucket

- Deletes default VPCs in all the Regions
- Deploys custom VPC

- Creates IAM user
- Creates a new IAM role and attaches the provided policy
- Adds the users to the group with admin privileges
- Creates AWS Service Catalog portfolio and products
- Adds the created products to the portfolio
- Adds the IAM user and IAM role as principals to the portfolio

SageMaker | Amazon RDS for mySQL | Amazon ECS | Amazon EMR

We need containers

App devs

I need a database

DBAs

I need Hadoop

Big Data team

We need to build and train models

Data scientists

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IDE tooling

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Monitoring & tracing

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IDE toolkits

Available for several popular IDEs

- AWS Cloud9 – https://aws.amazon.com/cloud9/
- Visual Studio Code – https://aws.amazon.com/visualstudiocode/
- JetBrains (e.g., IntelliJ, PyCharm) – https://aws.amazon.com/intellij/
- Visual Studio – https://aws.amazon.com/visualstudio/

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IDE toolkit demo review

- Connection to AWS
- New project creation
- CloudFormation deployment
- Resource explorer

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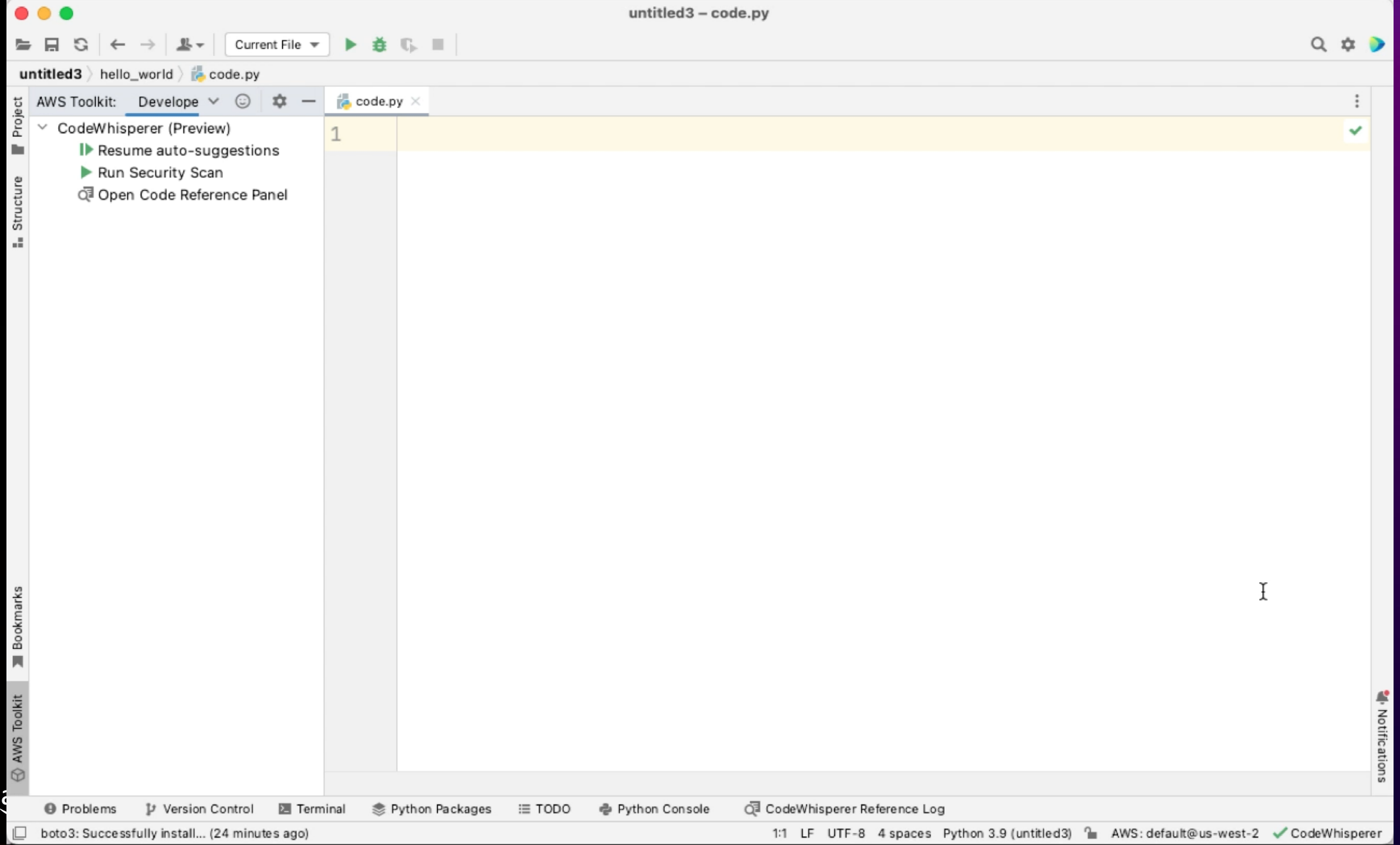
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Amazon CodeWhisperer

- Machine-learning powered coding companion
- Integrated into AWS Cloud9, VS Code, and JetBrains IDEs
- Supported languages
  - Python
  - Java
  - JavaScript
  - more on the way…
- https://aws.amazon.com/codewhisperer/
- Currently in preview



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untitled3 – code.py
Current File
untitled3
hello_world
code.py
AWS Toolkit:
Develope
code.py
CodeWhisperer (Preview)
Resume auto-suggestions
Run Security Scan
Open Code Reference Panel
1
Project
Structure
Bookmarks
AWS Toolkit
Notifications
Problems
Version Control
Terminal
Python Packages
TODO
Python Console
CodeWhisperer Reference Log
boto3: Successfully install... (24 minutes ago)
1:1
LF
UTF-8
4 spaces
Python 3.9 (untitled3)
AWS: default@us-west-2
CodeWhisperer

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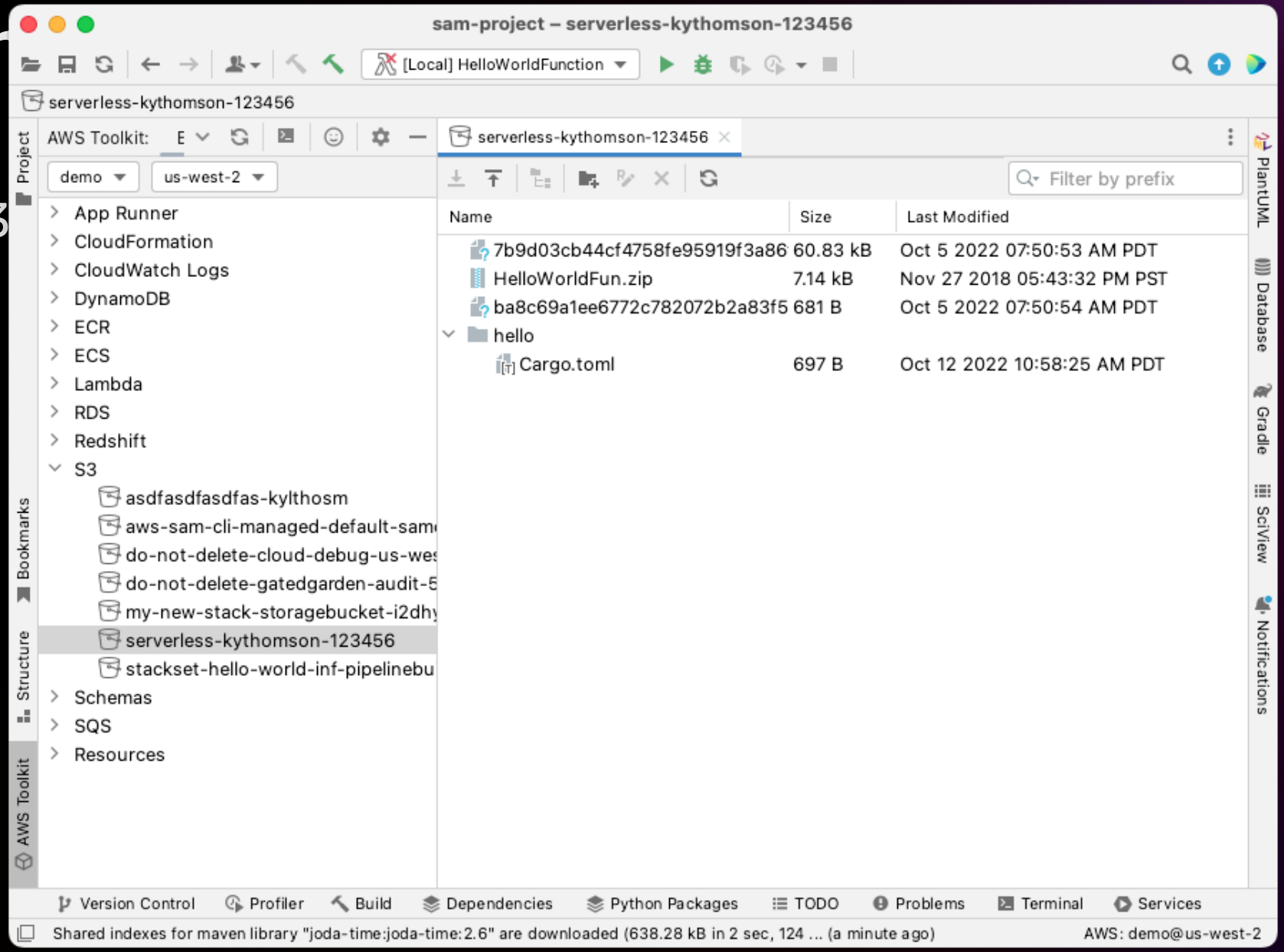
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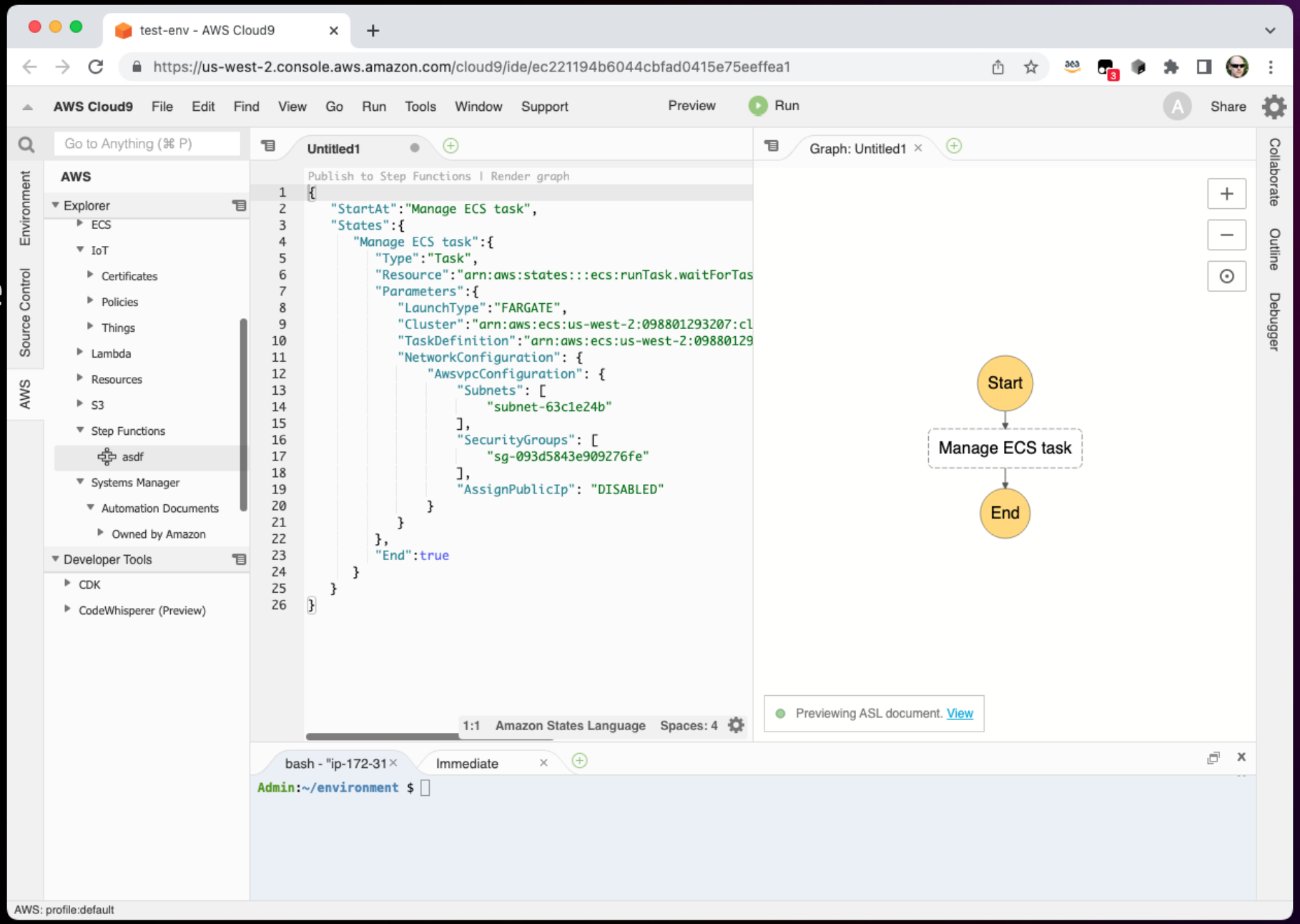
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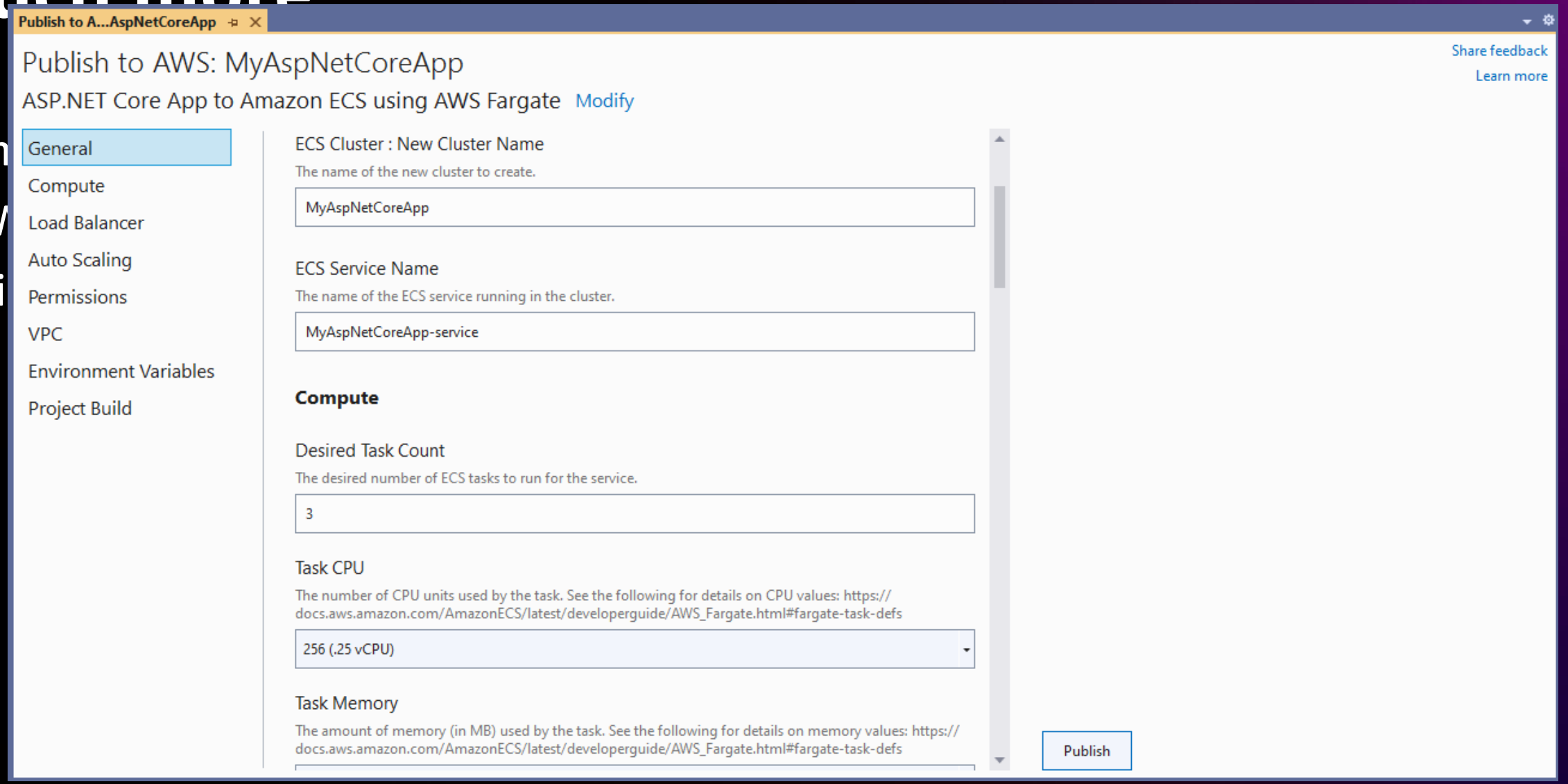
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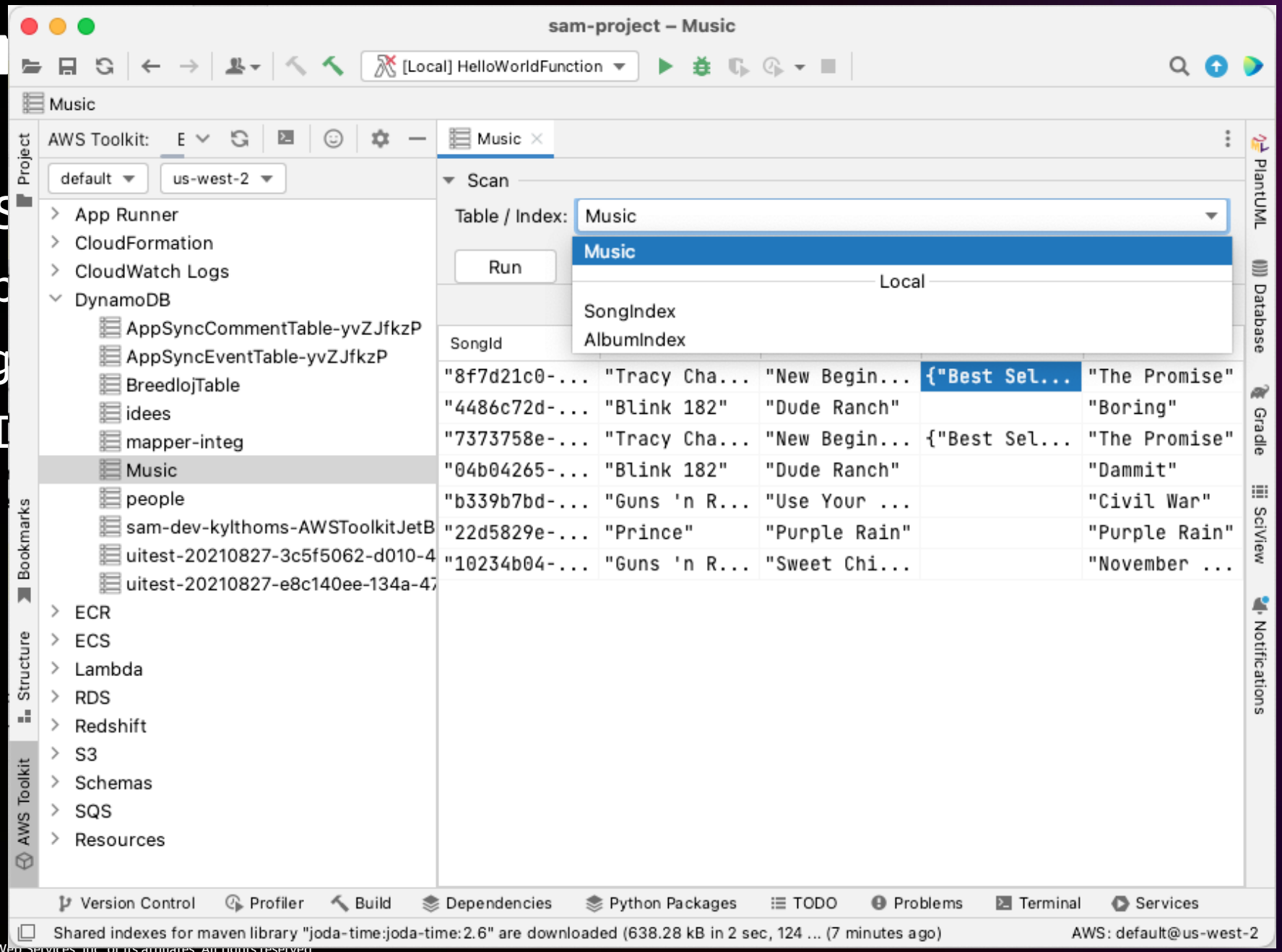
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- Migrating
- Amazon D



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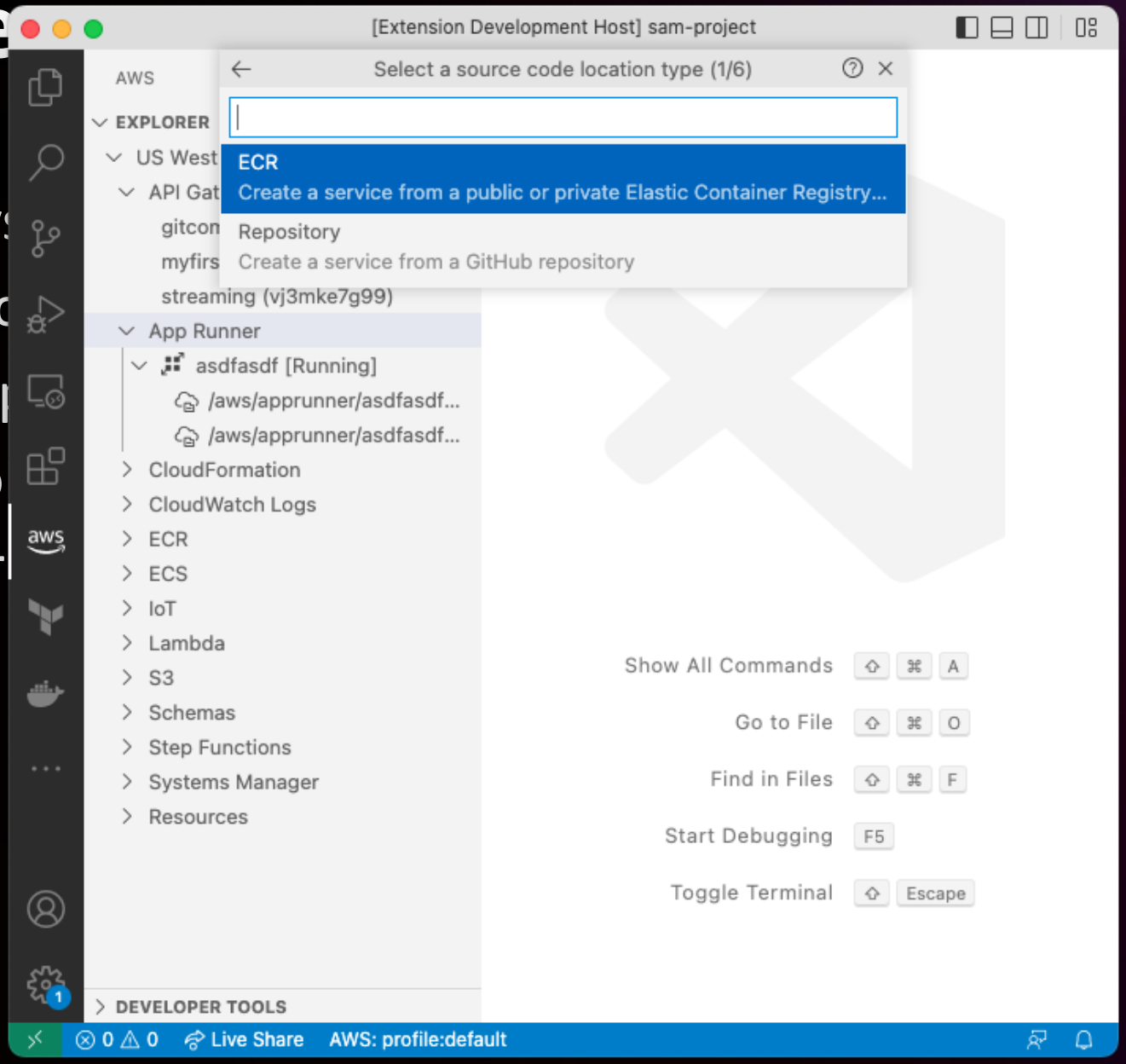
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- Migrating .NET Ap
- Amazon Dynamo
- AWS App Runner



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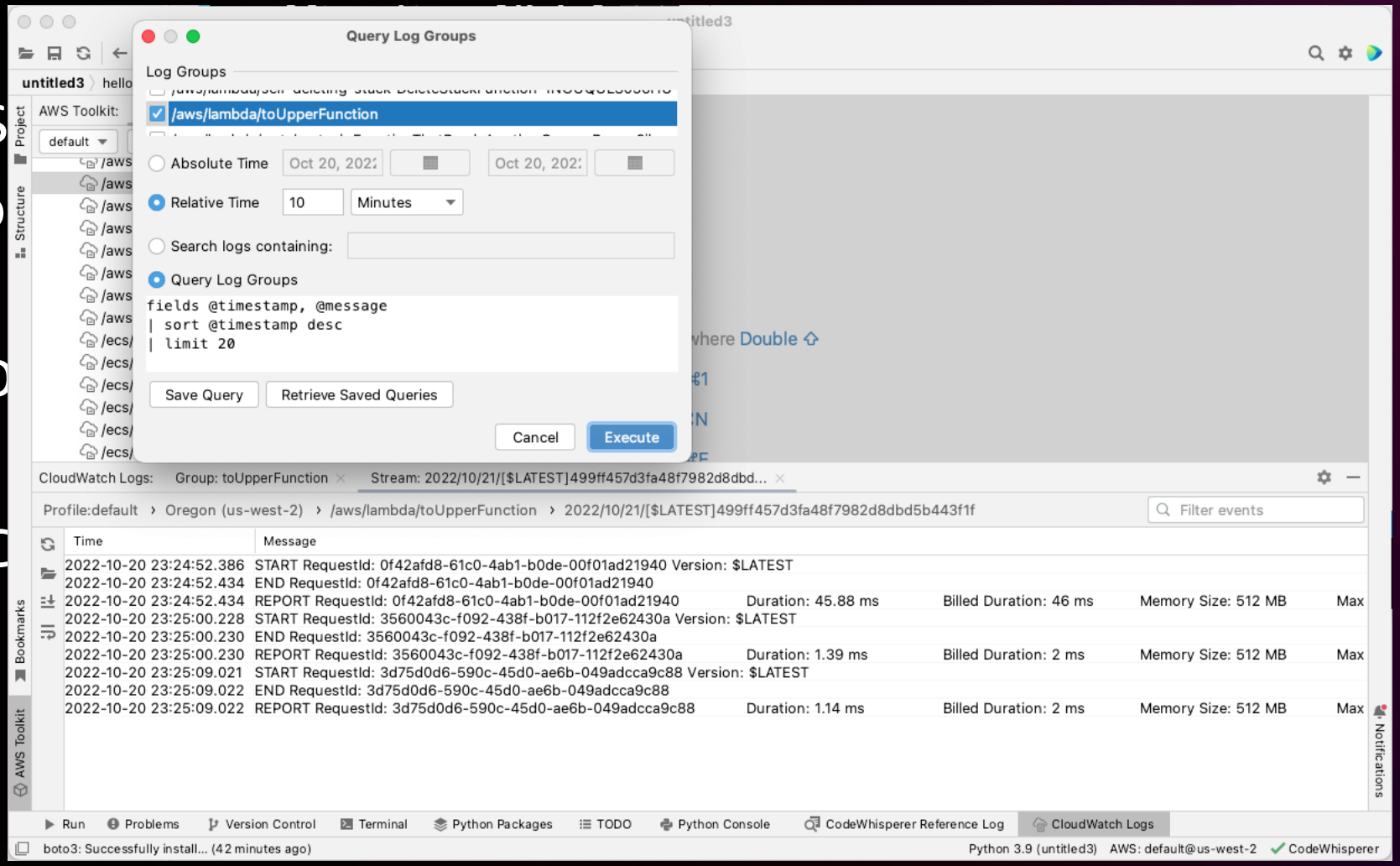
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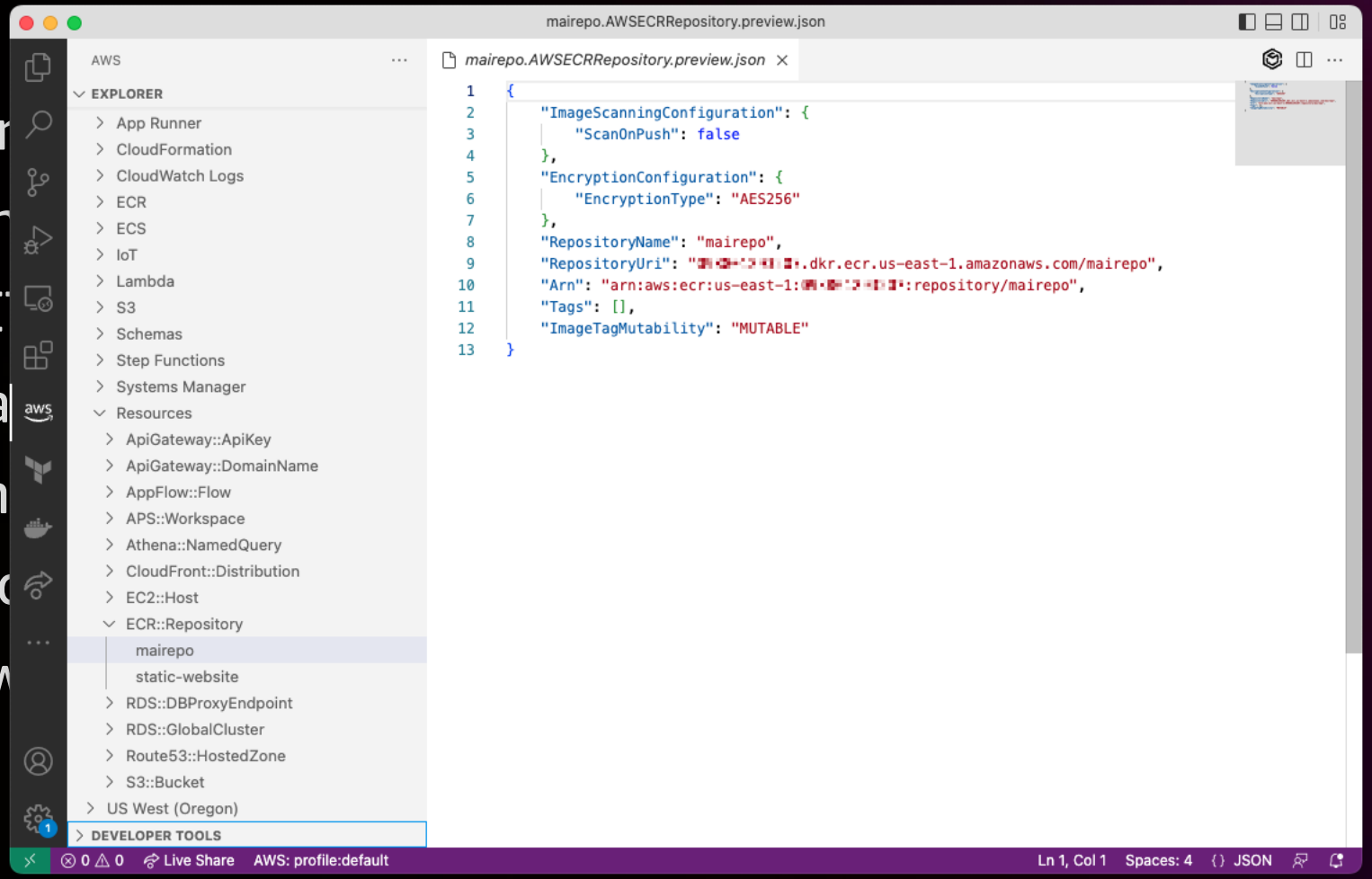
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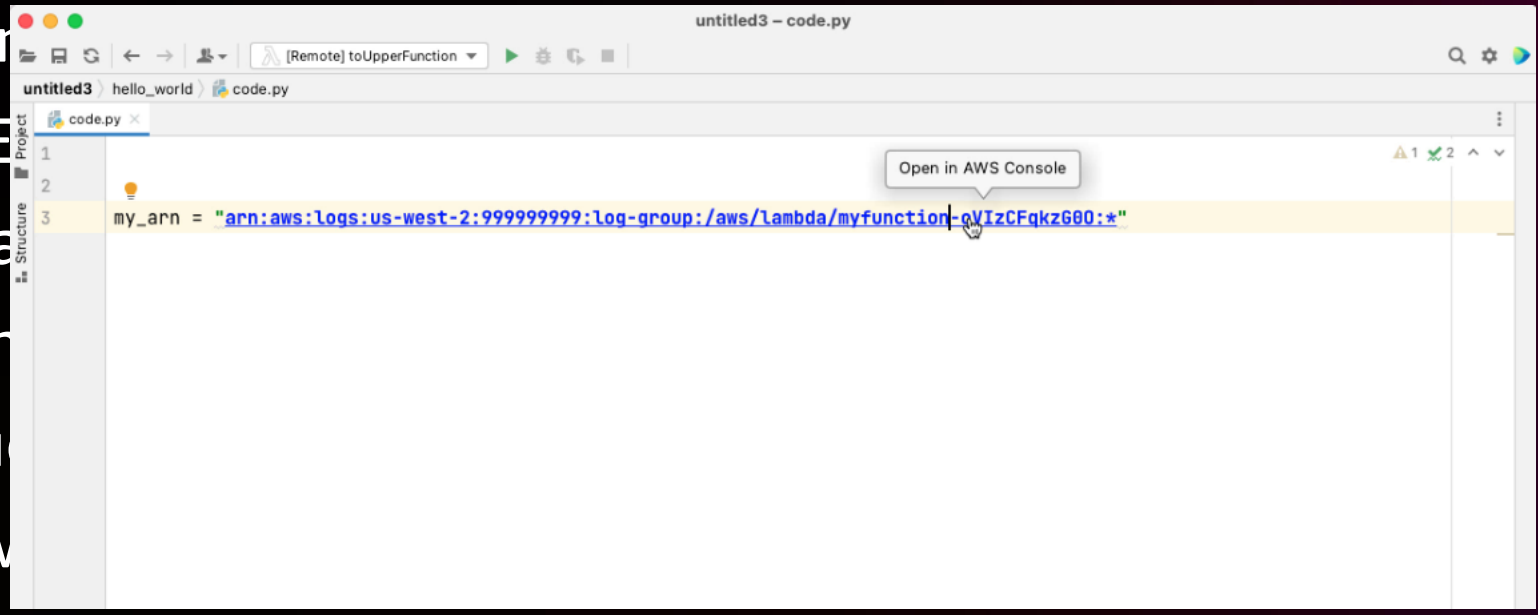
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AWS SDKs

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AWS SDKs



- Libraries for building on AWS
- Available in a variety of programming languages
- Open source
- Consistent feature set across individual libraries

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AWS supported SDKs

AWS SDK languages

- Java
- Python (Boto3)
- .NET
- JavaScript
- C++
- Kotlin
- PHP
- Rust
- Go
- Ruby

Frontend web and mobile SDKs

- Android
- iOS
- Flutter
- Ionic
- Vue
- Angular
- React
- Next.js

Communication and collaboration

- Amazon Chime SDK for JavaScript
- Amazon Chime SDK for Android
- Amazon Chime SDK for iOS

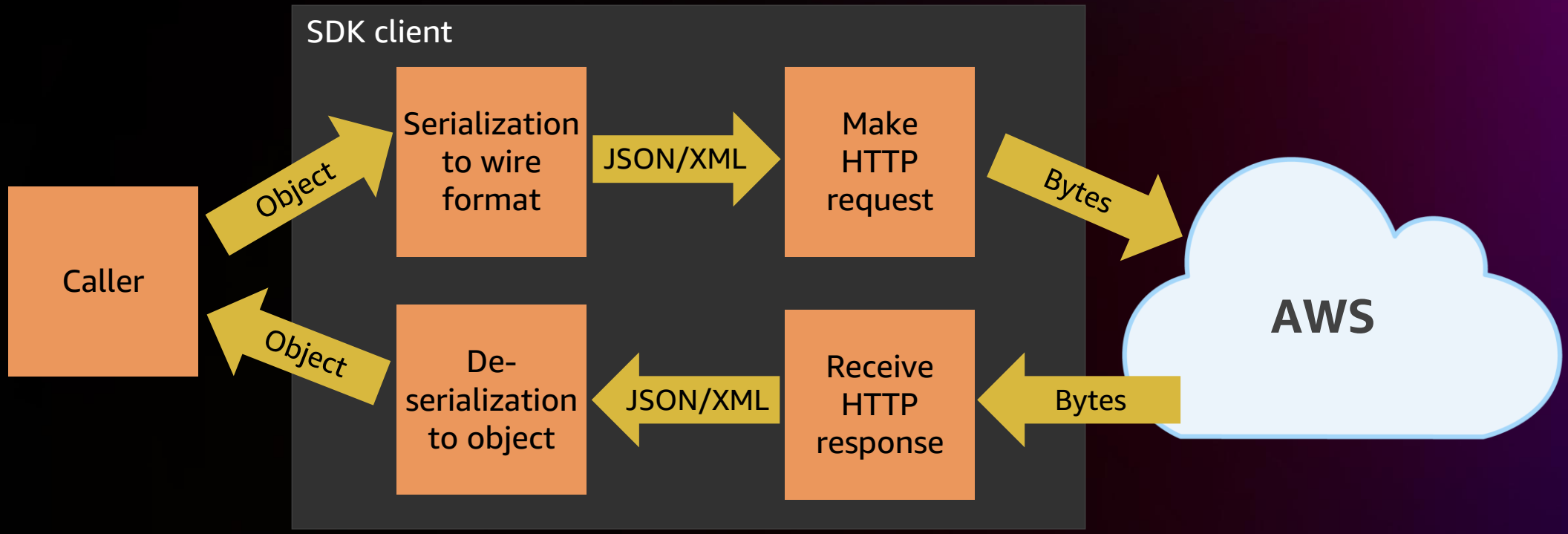
IoT device SDKs

- Embedded C
- Arduino Yún
- Java
- JavaScript
- Python
- C++

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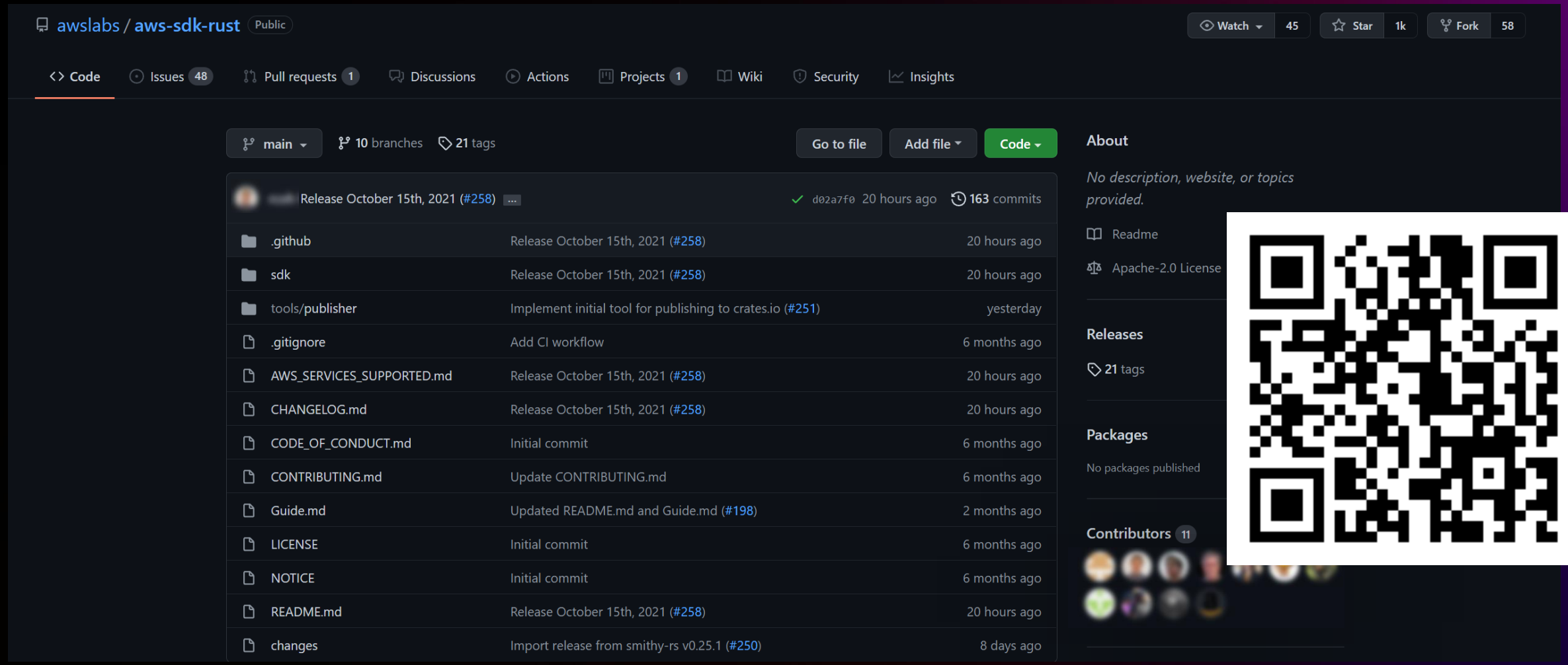
Request lifecycle in the SDK



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AWS SDK for Rust

https://github.com/awslabs/aws-sdk-rust



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How to use it

Cargo.toml

```toml
[package]
name = "a-rust-app"
version = "0.1.0"
authors = ["Jane Doe <jdoe@example.com>"]
edition = "2018"
description = "Does awesome things with AWS"

[dependencies]
aws-config = "0.49.0"
aws-sdk-dynamodb = "0.19.0"
tokio = { version = "1.0", features = ["full"] }
```

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Making a request

Rust

```rust
use aws_sdk_dynamodb::error::ScanError;
use aws_sdk_dynamodb::output::ScanOutput;
use aws_sdk_dynamodb::types::SdkError;

async fn list_tables() -> Result<ScanOutput, SdkError<ScanError>> {
    let config = aws_config::load_from_env().await;
    let client = aws_sdk_dynamodb::Client::new(&config);

    client.scan().table_name("your-table").send().await
}
```

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AWS SDK benefits

- **Ergonomic clients**
  SDKs take the complexity out of coding by providing language-specific APIs for AWS services

- **Modular design**
  Each AWS service is split into its own package, minimizing compile times and binary sizes

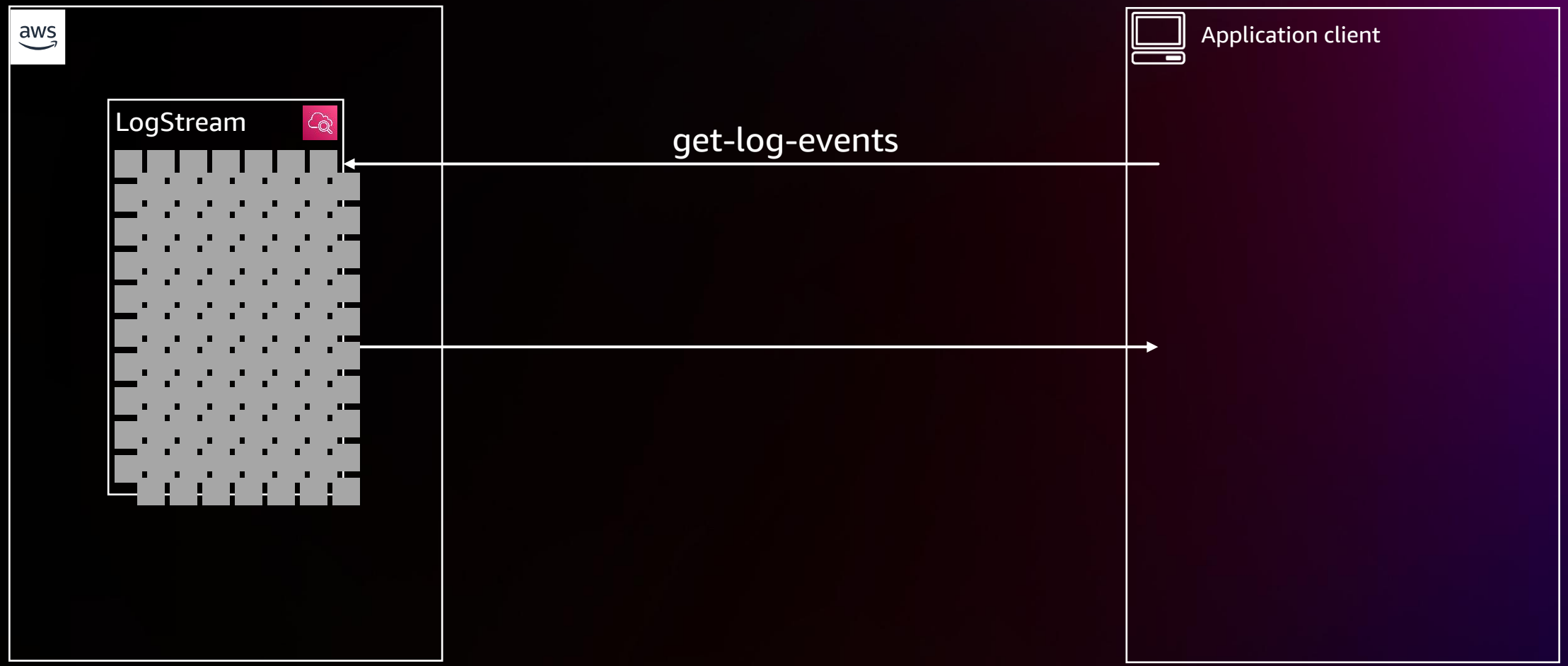
- **Safety**
  Developers can benefit type safety, exception handling, request signing, retries, and many more features to make requests to AWS secure

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SDK advanced features

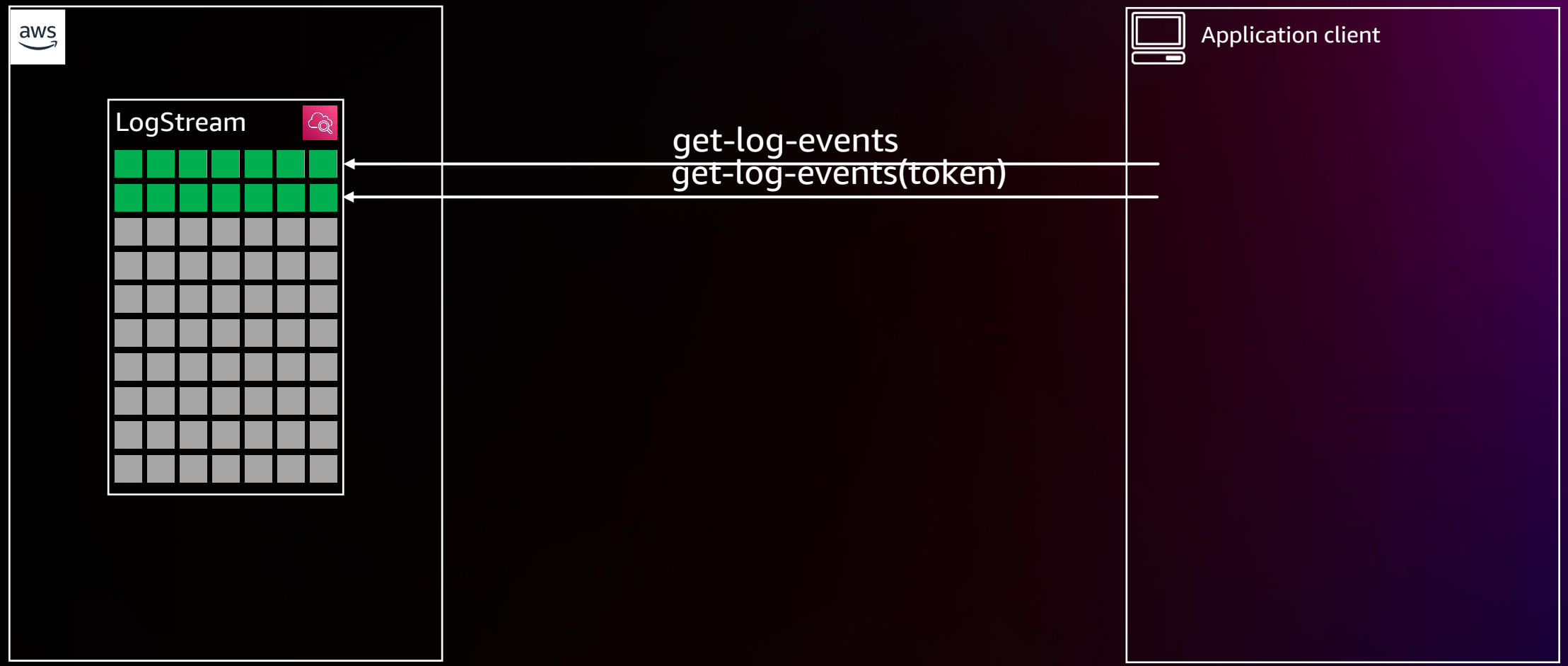
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Pagination



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Pagination



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Pagination – Base API

TypeScript

```typescript
var resp = await client.getLogEvents({
    logGroupName: "/aws/lambda/hello-world",
    logStreamName: "2022/10/17/f3141800cc6c410ebb942e5af23cac33",
});

resp.events.forEach(event => console.log(event.message));
```

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```
var resp = await client.getLogEvents({
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});

resp.events.forEach(event => console.log(event.message));

while (resp.nextForwardToken) {
    resp = await client.getLogEvents({
        logGroupName: "/aws/lambda/hello-world",
        logStreamName: "2022/10/17/f3141800cc6c410ebb942e5af23cac33",
        nextToken: resp.nextForwardToken
    });
    resp.events.forEach(event => console.log(event.message));
}
```

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Pagination – A better way

TypeScript

```
import {paginateGetLogEvents} from "@aws-sdk/client-cloudwatch-logs";
```

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Pagination – A better way

TypeScript

```
import {paginateGetLogEvents} from "@aws-sdk/client-cloudwatch-logs";


const paginator = paginateGetLogEvents({client}, {
    logGroupName: "/aws/lambda/hello-world",
    logStreamName: "2022/10/17/f3141800cc6c410ebb942e5af23cac33",
})

for await (const page of paginator) {
    page.events.forEach(event => console.log(event.message));
}
```

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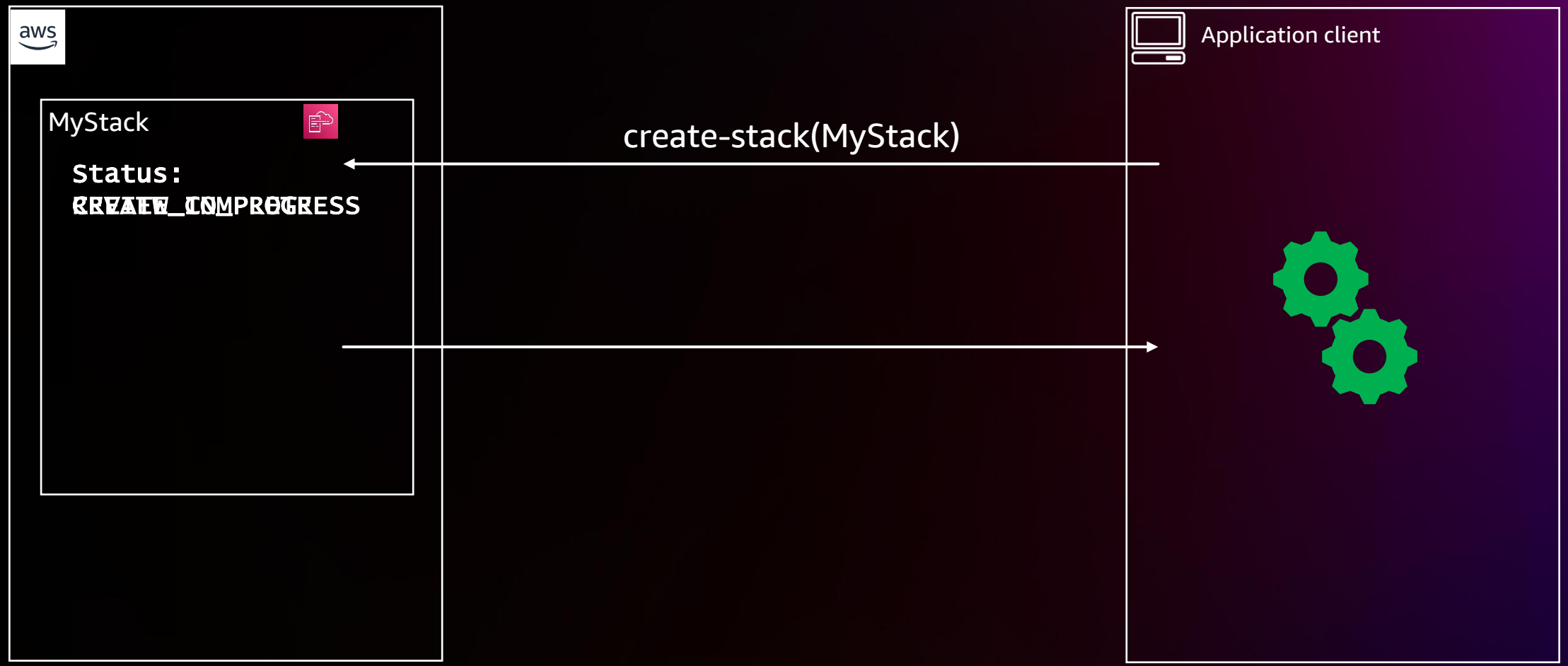
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Pagination: Supported SDKs



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Waiters



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Waiters



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Waiters

TypeScript

```
const stack = await cfnClient.createStack({StackName: "MyStack", TemplateBody: "..."});

const resp = await cfnClient.describeStacks({StackName: stack.StackId});
let status = resp.Stacks[stack.StackId].StackStatus;

while (status != StackStatus.CREATE_COMPLETE) {
    await delay(1000);
    const resp = await cfnClient.describeStacks({StackName: stack.StackId});
    status = resp.Stacks[stack.StackId].StackStatus;
}

console.log(`Stack created: ${stack.StackId}`);
```

But that's not all!

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Waiters

TypeScript

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let status = resp.Stacks[stack.StackId].StackStatus;

while (status != StackStatus.CREATE_COMPLETE || status != StackStatus.CREATE_FAILED) {
    await delay(1000);
    const resp = await cfnClient.describeStacks({StackName: stack.StackId});
    status = resp.Stacks[stack.StackId].StackStatus;
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console.log(`Stack created: ${stack.StackId}`);
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    status = resp.Stacks[stack.StackId].StackStatus;
}
if (status == StackStatus.CREATE_COMPLETE) {
    console.log(`Stack created: ${stack.StackId}`);
} else {
    const resp = await cfnClient.describeStacks({StackName: stack.StackId});
    console.log(`Something went wrong: ${resp.Stacks[stack.StackId].StackStatusReason}`)
}
```

aws

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Waiters

TypeScript

```
import { waitUntilStackCreateComplete } from "@aws-sdk/client-cloudformation";

const stack = await client.createStack({StackName: "MyStack", TemplateBody: "..."});

await waitUntilStackCreateComplete({client, maxWaitTime: 60}, {StackName: stack.StackId});

console.log(`Stack created: ${stack.StackId}`);
```

aws

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Waiters

TypeScript

```
import { waitUntilStackCreateComplete } from "@aws-sdk/client-cloudformation";

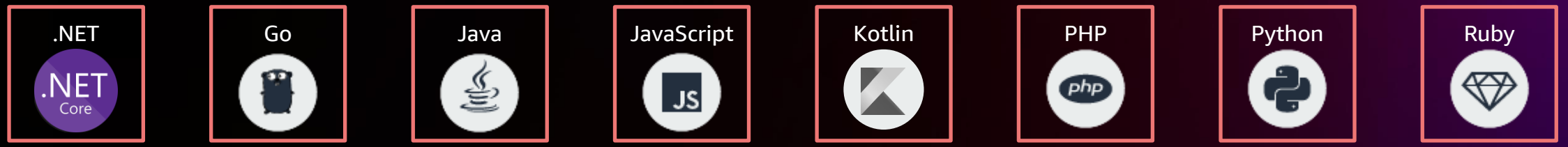
const stack = await client.createStack({StackName: "MyStack", TemplateBody: "..."});

try {
 await waitUntilStackCreateComplete({client, maxWaitTime: 60}, {StackName: stack.StackId});
 console.log(`Stack created: ${stack.StackId}`);
} catch (error) {
 console.log(`Something went wrong: ${error}`)
}
```

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Waiters: Supported SDKs



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CLIs

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AWS development tools

IDE integration

- AWS Cloud9
- AWS Toolkit for JetBrains
- AWS Toolkit for Visual Studio
- AWS Toolkit for VS Code
- Amazon CodeWhisperer

Programmable SDK

AWS SDK languages

Command line tools

- AWS CLI
- 'dotnet' CLI extensions
- AWS Tools for PowerShell
- AWS SAM
- AWS Copilot
- Amazon EC2 AMI
- AWS Elastic Beanstalk
- Amazon ECS CLI
- AWS Amplify CLI

DevOps and automation

- AWS CDK
- AWS CloudFormation
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- AWS Fault Injection Simulator
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- AWS CodeBuild
- AWS CodeDeploy
- AWS CodeCommit

Web and mobile tools

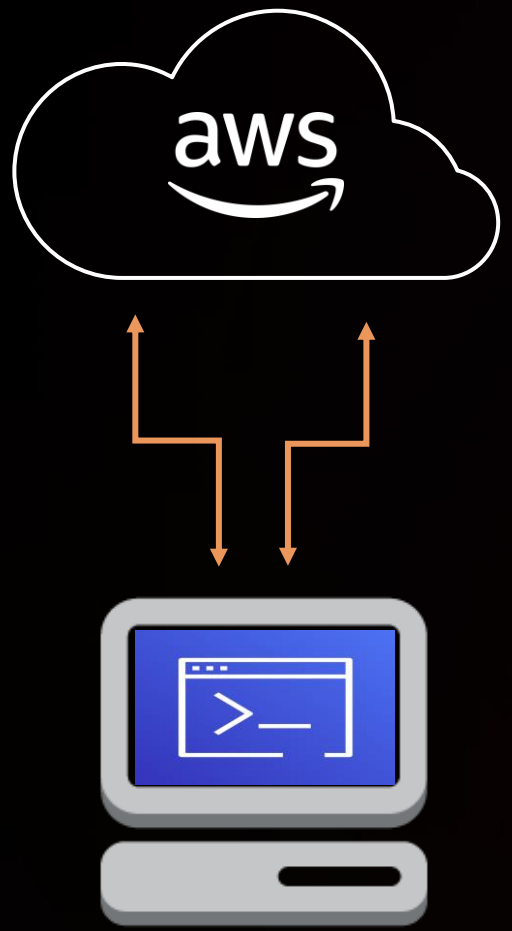
- Amplify
- AWS Device Farm
- AWS AppSync

Monitoring & tracing

- Amazon CloudWatch
- AWS X-Ray

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AWS Command Line Interface



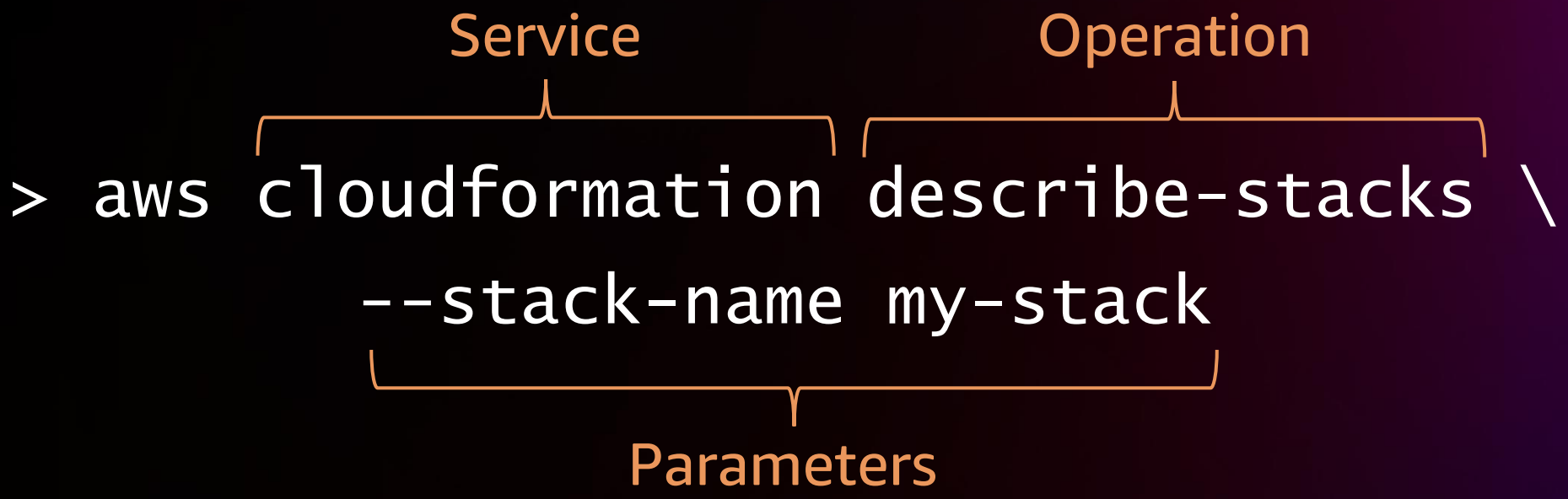
- Unified tool
- Multi-platform

  Linux, macOS, Windows, Docker, AWS CloudShell, Amazon Linux (AL2)

- Access APIs of AWS services
- Equivalent functionality to AWS Management Console
- Open source
- Manage your resources
- https://aws.amazon.com/cli/

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Sample AWS CLI command



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AWS CLI

```
> aws cloudformation describe-stacks --stack-name my-stack
```


```
{
  "Stacks": [
    {
      "StackId": "arn:aws:cloudformation:us-west-2:999999999999:stack/my-stack/1a2a5-45e11ed-816f-02ecd1",
      "StackName": ”my-stack",
      "ChangeSetId": "arn:aws:cloudformation:us-west-2:999999999999:changeSet/samcli-deploy10721/c2a1-7424,
      "Description": "Demo SAM Application",
      "CreationTime": "2022-10-07T02:45:28.339000+00:00",
      "LastUpdatedTime": "2022-10-07T02:45:37.159000+00:00",
      "RollbackConfiguration": {},
      "StackStatus": "CREATE_COMPLETE",
      "DisableRollback": false,
      "NotificationARNs": [],
      "Capabilities": [ "CAPABILITY_IAM” ],
      "Tags": [],
      "EnableTerminationProtection": false,
      "DriftInformation": {
        "StackDriftStatus": "NOT_CHECKED"
      }
    }
  ]
}
```


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Demo –
AWS CloudShell



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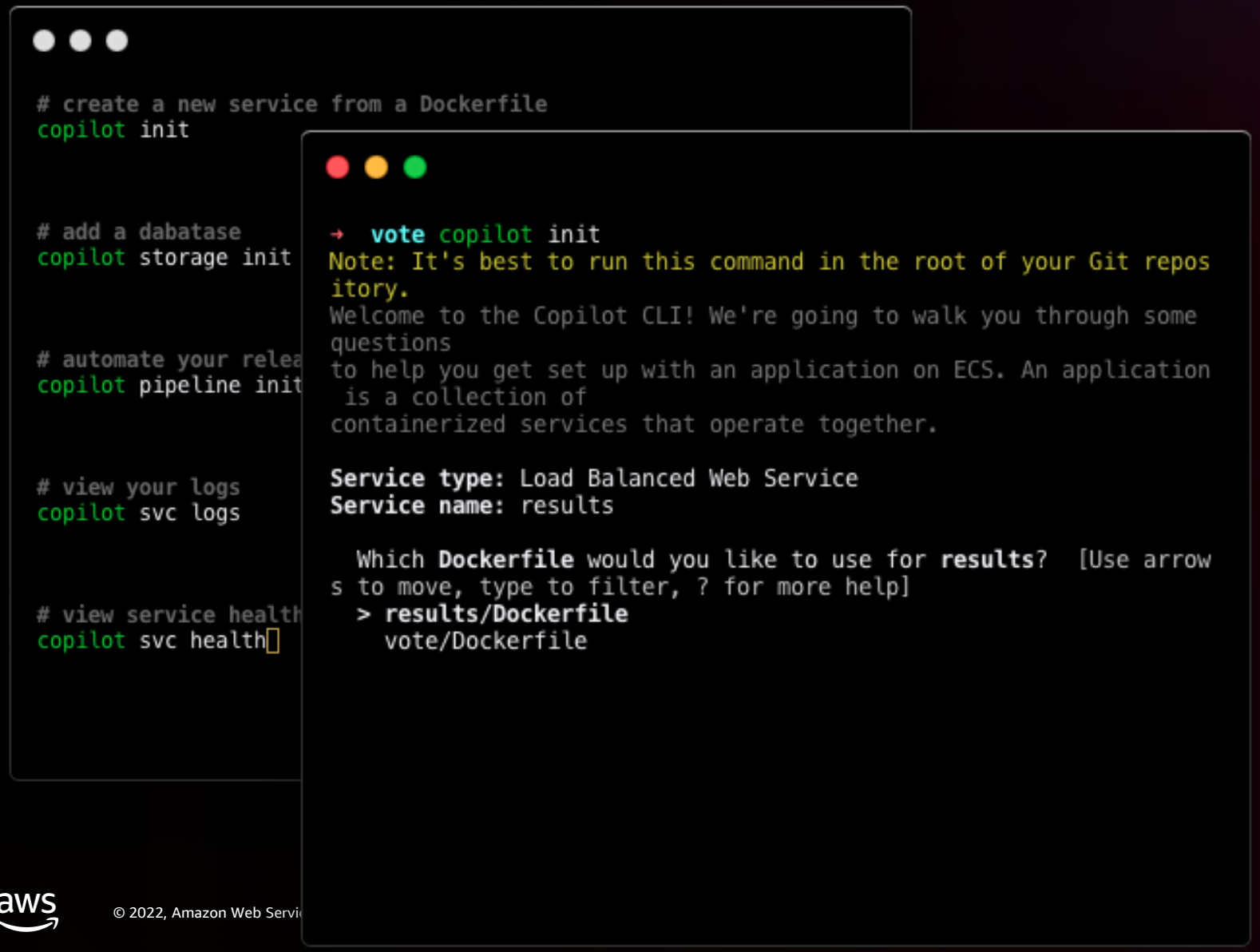
Amazon ECS: AWS Copilot CLI

- Simplifies modeling, creating, and managing Amazon ECS applications
- Without AWS Copilot, you have to
  - Create an ECS task definition
  - Create an ECR image registry
  - Build/push images
  - Create and manage ECS services
- Now – all you need is a Dockerfile
- Open source
- https://go.aws/3Gvj7xQ
- https://aws.github.io/copilot-cli



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Build



Get started with common cloud architectures

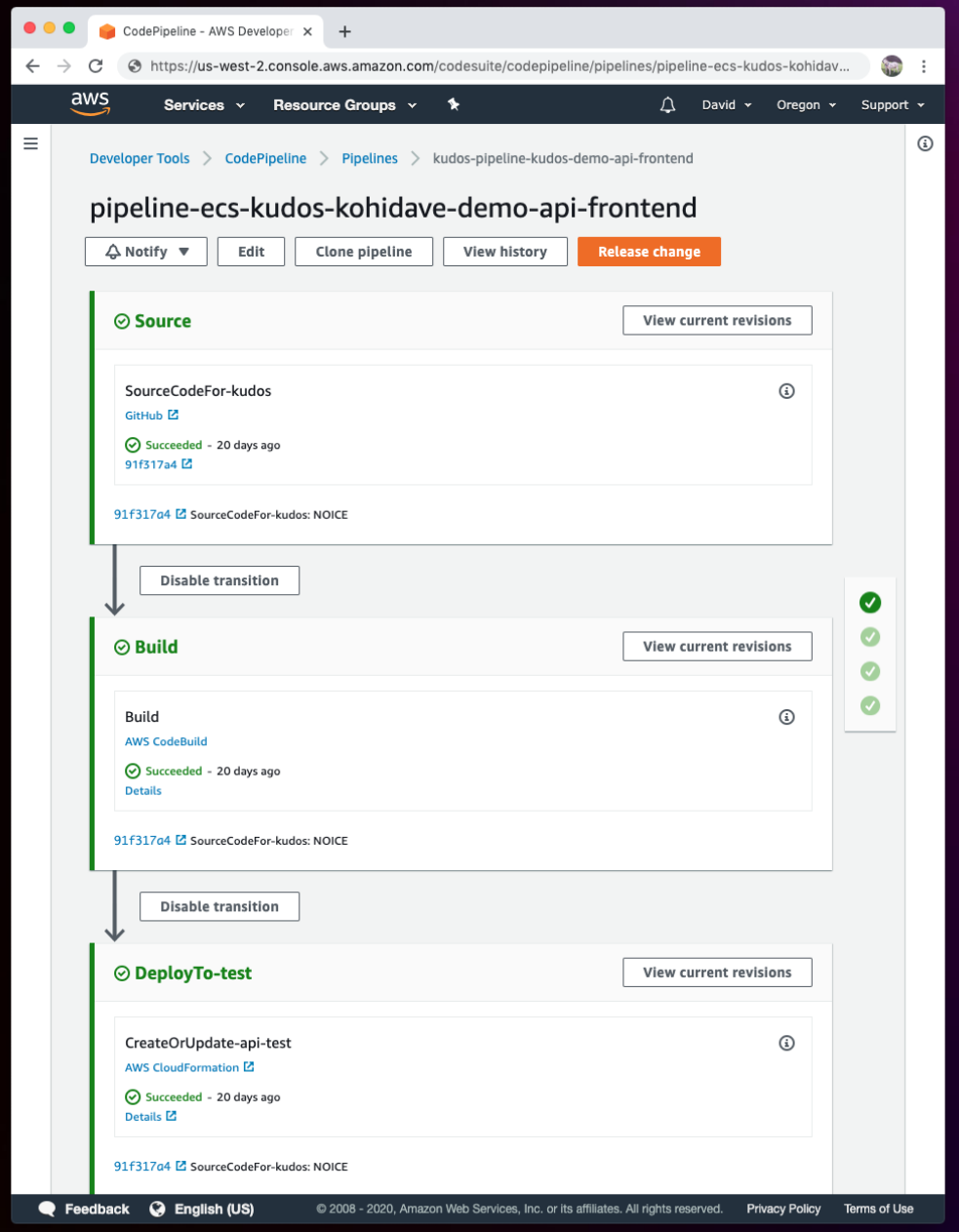
Customize with domains, add-ons for storage, secrets

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Release

Connect your source code in GitHub, Bitbucket, or AWS CodeCommit to a continuous delivery pipeline

```
[~] copilot pipeline init
```



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Operate

```
147dda3888c0:api uttara$ copilot svc status
Found only one deployed service api in environment test
Task Summary

  Running      ▀▀▀▀▀▀▀▀▀▀  7/10 desired tasks are running
  Health       ▀▀▀▀▀▀▀▀▀▀  4/10 passes container health checks

Tasks

  ID        Status      Revision    Started At     Cont. Health
  --        ------      --------    ----------     ------------
  180d1009  PENDING     1           -              UNKNOWN
  2173d164  RUNNING     1           8 seconds ago  HEALTHY
  267fec4f  PENDING     1           -              UNKNOWN
  5c84fb06  RUNNING     1           7 seconds ago  UNKNOWN
  7caf5f82  RUNNING     1           7 seconds ago  HEALTHY
  8441f0b8  RUNNING     1           2 seconds ago  HEALTHY
  85246172  RUNNING     1           9 minutes ago  HEALTHY
  9d117d62  RUNNING     1           8 seconds ago  UNKNOWN
  b8d15718  PENDING     1           -              UNKNOWN
  db9d362f  RUNNING     1           7 seconds ago  UNKNOWN

Alarms

  Name                          Condition                     Last Updated   Health
  ----                          ---------                     ------------   ------
  TargetTracking-service/voting- CPUUtilization > 70.00 for 3 d 5 minutes ago  OK
  app-new-test-Cluster-8nNofShh9 atapoints within 3 minutes
  ENR/voting-app-new-test-api-Se
  rvice-ExhGzbfrLCoC-AlarmHigh-9
  b04dfd8-fcef-461e-8fd4-10cadc1
  1750f

  TargetTracking-service/voting- CPUUtilization < 63.00 for 15   7 minutes ago  INSUFFICIENT_DATA
  app-new-test-Cluster-8nNofShh9 datapoints within 15 minutes
  ENR/voting-app-new-test-api-Se
  rvice-ExhGzbfrLCoC-AlarmLow-23
  31f717-7966-46a7-a43d-45cef458
  05a5
```

View the health

Tail your logs

Shell into a running container

Configure auto scaling

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AWS SAM CLI

- AWS Serverless Application Model (SAM)
  - Shorthand syntax to express functions, APIs, databases, and event source mappings
  - Modeled with CloudFormation compatible YAML
  - Open source
- CLI features
  - Build Lambda functions locally
  - Step-through debug Lambda functions (via the AWS IDE toolkits)
  - Deploy projects via CloudFormation
  - Sync/watch workflows
- https://aws.amazon.com/serverless/sam/



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Summary

- Overview of AWS developer tooling
- Service Catalog and developer accounts
- IDE toolkits
- AWS SDKs
- AWS CLIs

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Thank you!



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