

Creating CloudFormation Custom Resources using AWS Lambda



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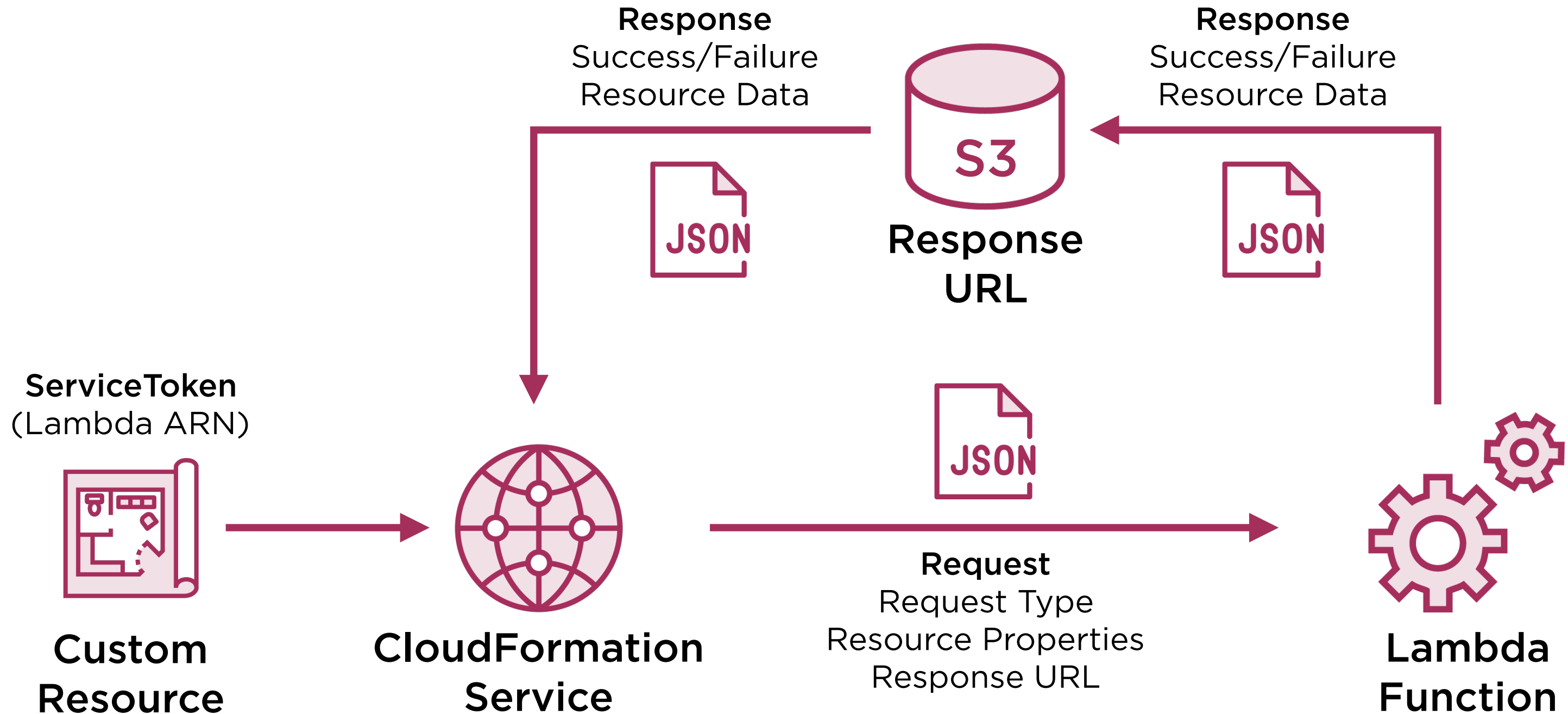
Introduction

CloudFormation Custom Resources

- Custom provisioning logic
 - Provisioning of AWS services
 - Provisioning of external services
- ECS Task Runner custom resource
- Lambda function programming
 - Python
 - Interacting with AWS services
 - Building and publishing functions
- Deploying custom resources

CloudFormation Custom Resources Overview

CloudFormation Custom Resources



Request Object

```
{  
  "RequestType": "CREATE",  
  "ResourceProperties": {  
    "TaskDefinition": "...",  
    "Cluster": "...",  
    "Count": "1",  
    ...  
  },  
  "ResponseUrl": "..."  
}
```

◀ **CREATE, UPDATE or DELETE**

◀ **Custom configuration data
specific to your resource**

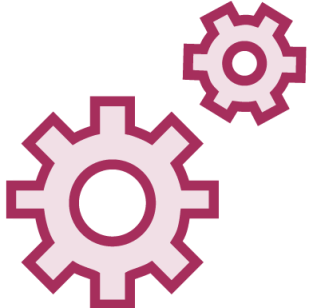
◀ **A pre-signed S3 URL where
CloudFormation expects you
to post a response**

Response Object

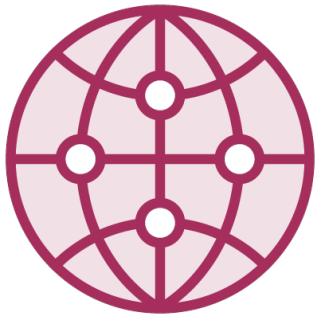
```
{  
  "Status": "SUCCESS",  
  "Reason": "...",  
  "PhysicalResourceId": "...",  
  "ResourceData": {  
    "Arn": "...",  
    "FinishTime": "...",  
    ...  
  }  
}
```

- ◀ **SUCCESS or FAILURE**
- ◀ **Required for failures**
- ◀ **Unique ID for your resource**
- ◀ **Custom information about your resource**

ECS Task Runner
Lambda Function

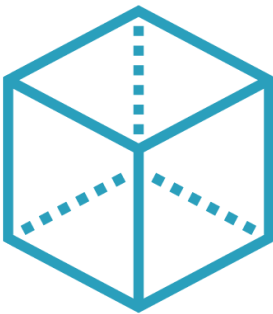


Run Task



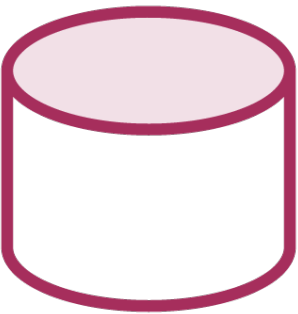
EC2 Container
Service

Schedule
Task



ECS Task
(Container)

Run Migrations



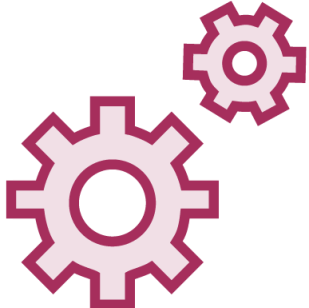
Audit
Database



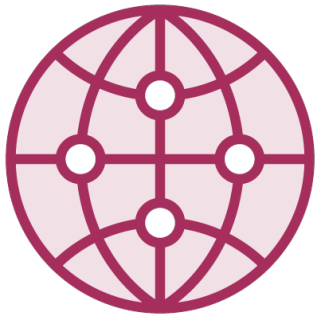
ECS Container Instances

ECS Cluster

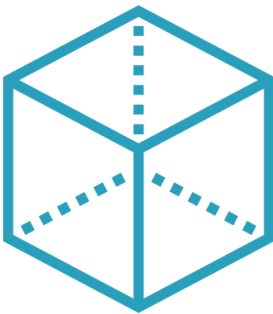
ECS Task Runner
Lambda Function



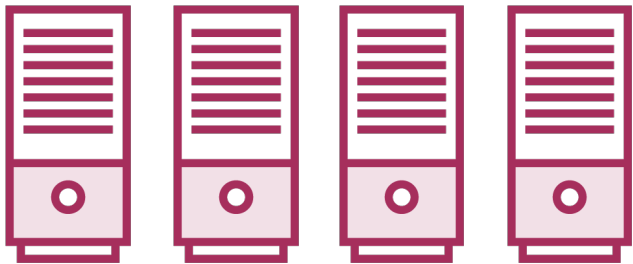
Check Task



EC2 Container
Service



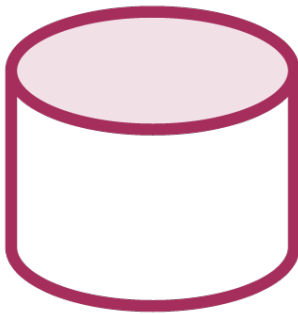
ECS Task
(Container)



ECS Container Instances

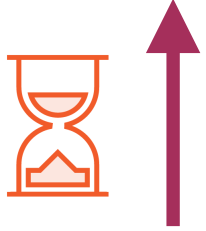
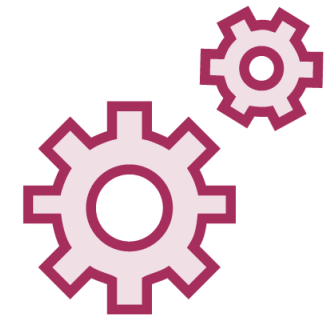
ECS Cluster

Run Migrations

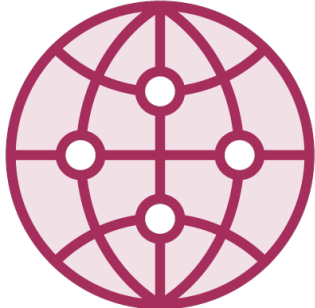


Audit
Database

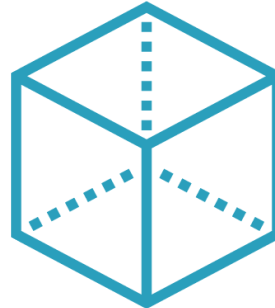
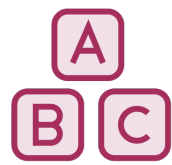
ECS Task Runner
Lambda Function



Task Running



EC2 Container
Service



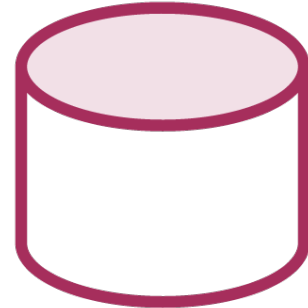
ECS Task
(Container)



ECS Container Instances

ECS Cluster

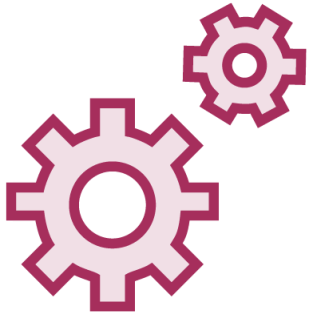
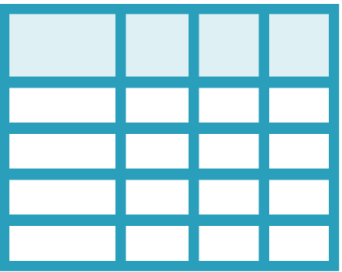
Run Migrations



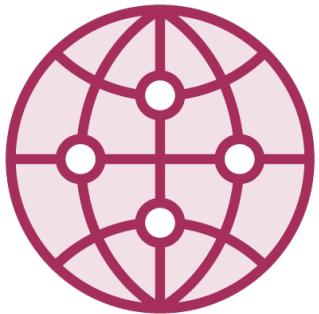
Audit
Database

ECS Task Runner
Lambda Function

Audit Schema

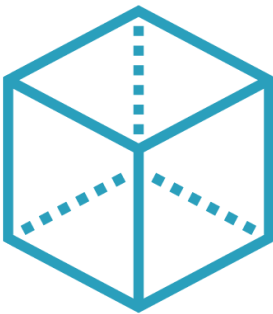


Check Task



EC2 Container Service

Task Complete



ECS Task
(Container)



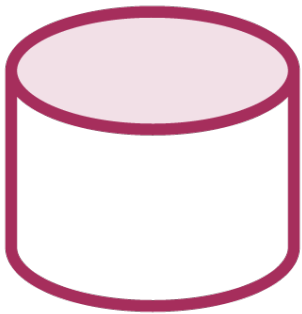
ECS Container Instances

ECS Cluster

Run Migrations

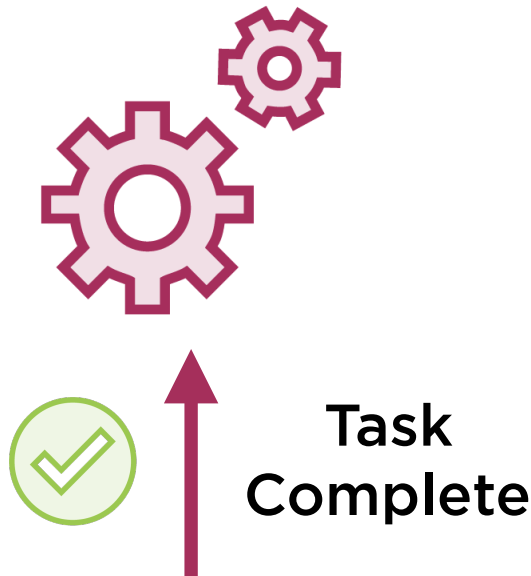


Create Schema



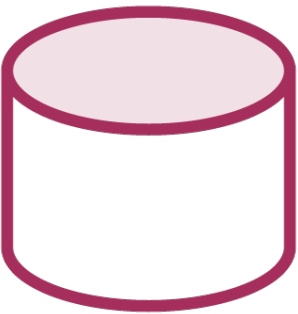
Audit Database

ECS Task Runner
Lambda Function

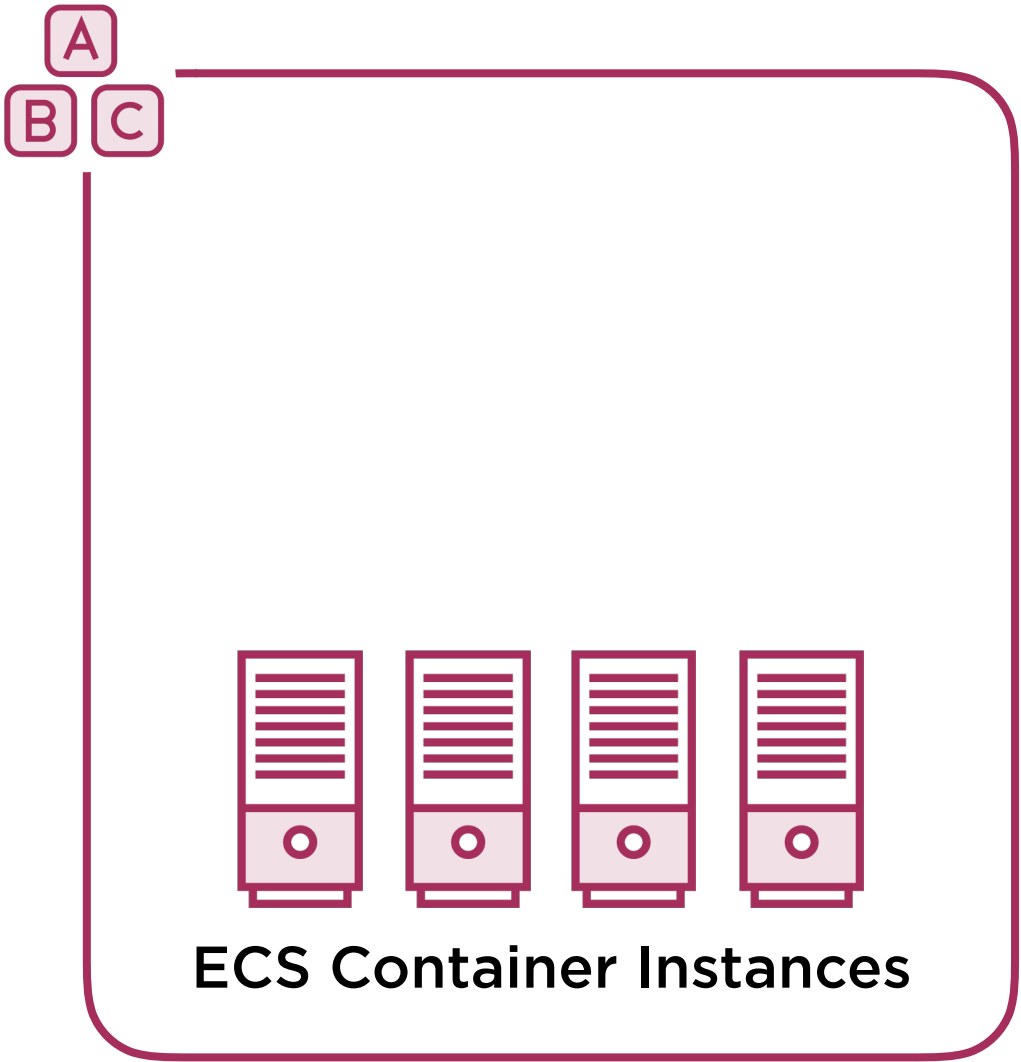


EC2 Container
Service

Audit Schema



Audit
Database



ECS Cluster

Creating a Lambda Function

Creating a Custom Resource

Creating a Custom Resources Project

Handling CloudFormation Requests

Function Code

Executed Code

1. This decorator will only process **Create** requests



```
@handler.create
def handle_create(event, context):
    # Custom logic
    ...
```

2. Decorated function **handle_create** passed to decorator function



```
def cfn_handler(func):
    ...
    def decorator(event, context):
        # Common logic
        ...
        # Invoke custom logic
        result = func(event, context)
        # Common logic
        ...
        return result
    return decorator
```

3. Common pre-processing logic



4. Custom logic executed



5. Common post-processing logic



Validating Input Data

Incoming Event Object

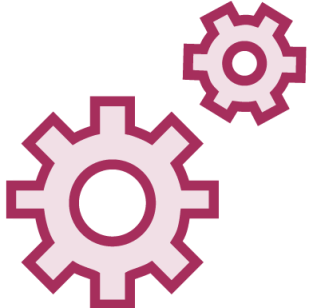
```
{  
  "RequestType": "CREATE",  
  "ResourceProperties": {  
    "Cluster": "...",  
    "TaskDefinition": "...",  
    "Count": "1",  
    ...  
  }  
}
```

- ◀ **REQUIRED** - MUST be a String
- ◀ **REQUIRED** - MUST be a String
- ◀ **OPTIONAL** - MUST be a number between 0 and 10

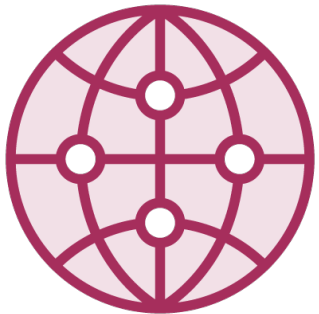
Integrating with the ECS Service

Polling ECS Task Status

ECS Task Runner
Lambda Function

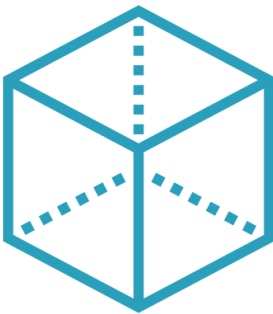
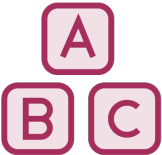


Run Task



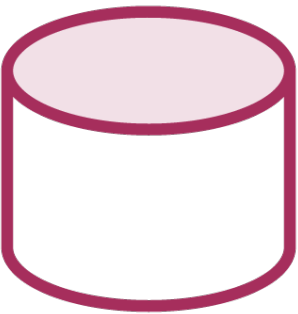
EC2 Container
Service

Schedule
Task

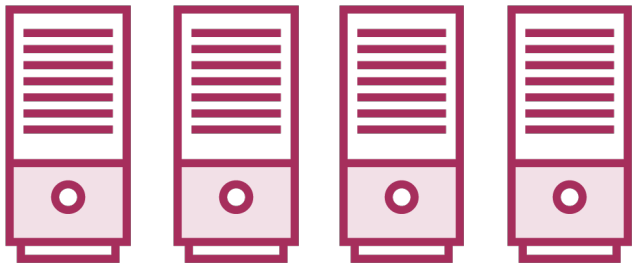


ECS Task
(Container)

Run Migrations



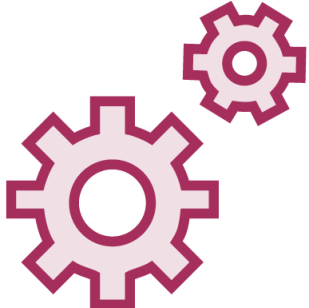
Audit
Database



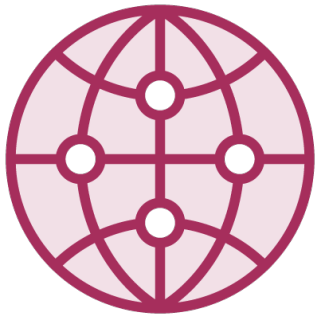
ECS Container Instances

ECS Cluster

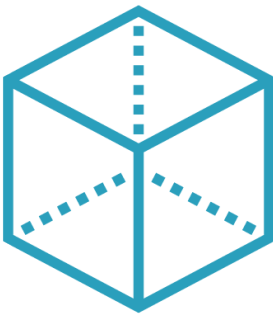
ECS Task Runner
Lambda Function



Check Task



EC2 Container
Service



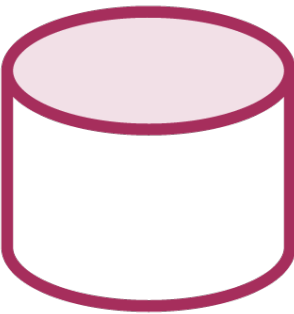
ECS Task
(Container)



ECS Container Instances

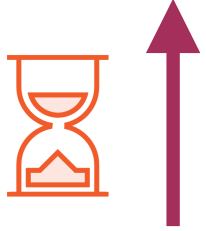
ECS Cluster

Run Migrations

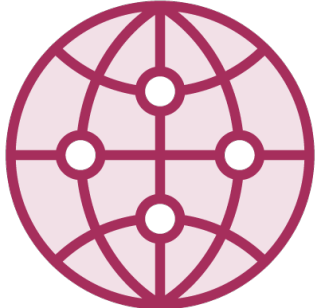


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Database

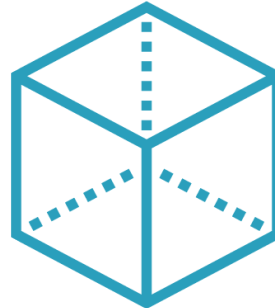
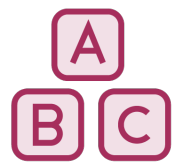
ECS Task Runner
Lambda Function



Task Running



EC2 Container
Service



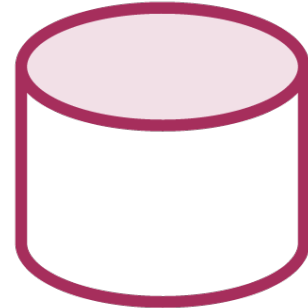
ECS Task
(Container)



ECS Container Instances

ECS Cluster

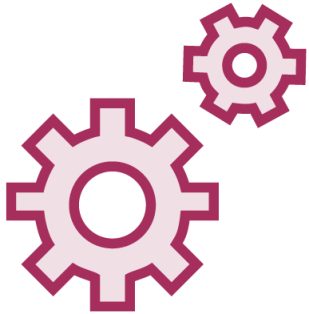
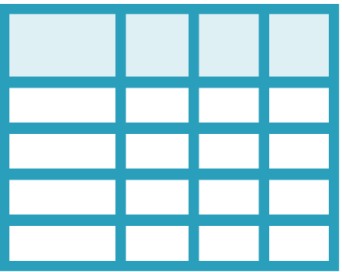
Run Migrations



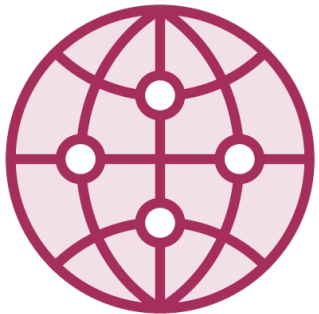
Audit
Database

ECS Task Runner
Lambda Function

Audit Schema

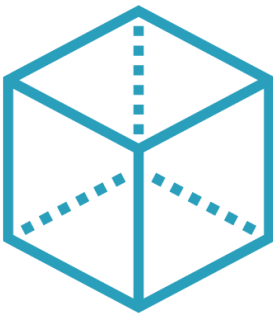


Check Task



EC2 Container
Service

Task
Complete



ECS Task
(Container)



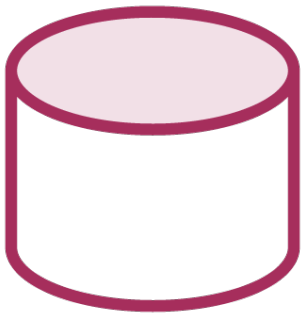
ECS Container Instances

ECS Cluster

Run Migrations



Create Schema



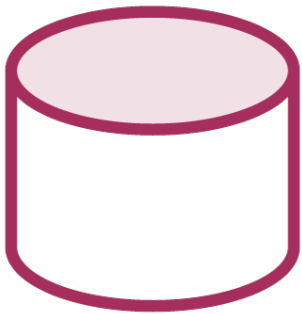
Audit
Database

ECS Task Runner
Lambda Function

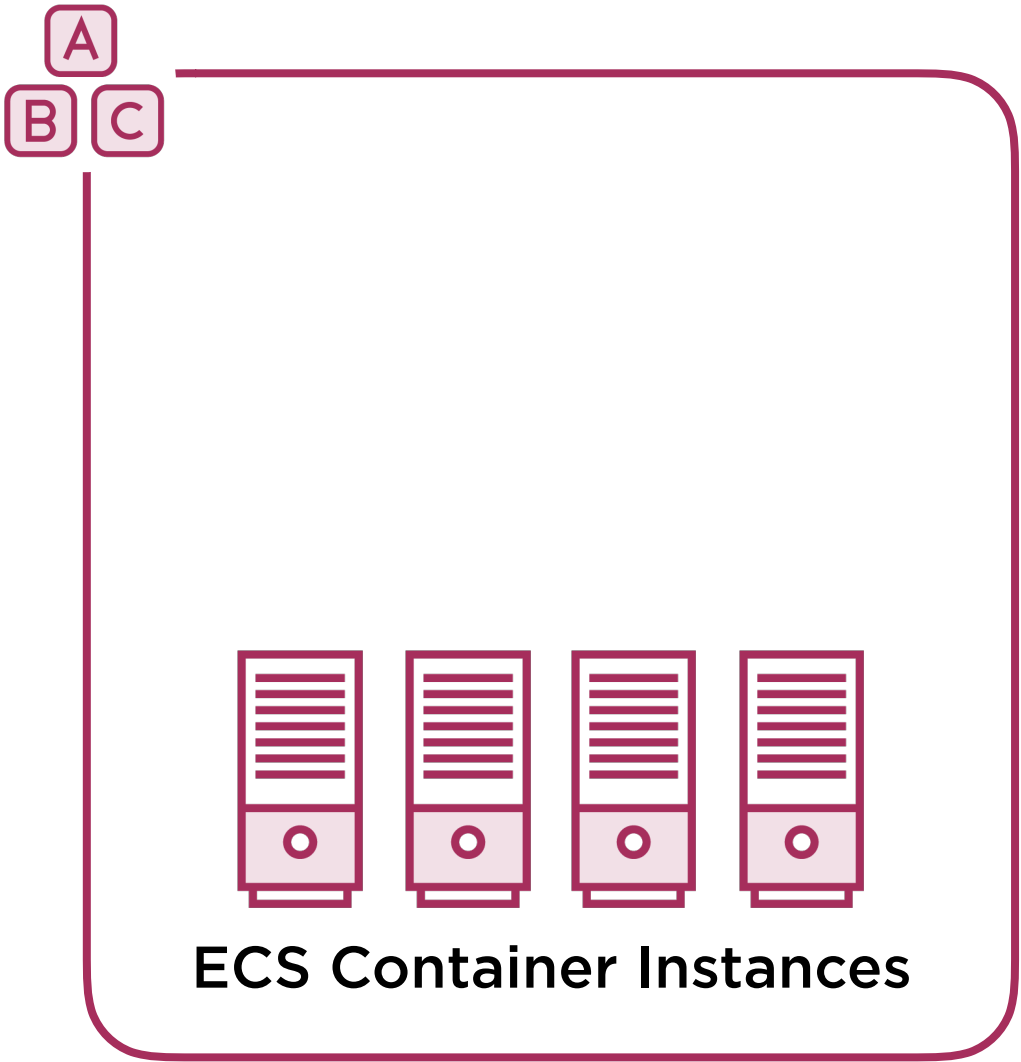


EC2 Container
Service

Audit Schema



Audit
Database



ECS Cluster

Task Result Object

```
{
  "tasks": [
    {
      "taskArn": "string",
      "clusterArn": "string",
      "lastStatus": "string",
      "containers": [
        {
          "name": "string",
          "exitCode": 0,
          ...
        }
      ]
    }
  ],
  "failures": []
}
```

◀ List of created tasks

◀ PENDING, RUNNING or STOPPED
(STOPPED if all containers exited)

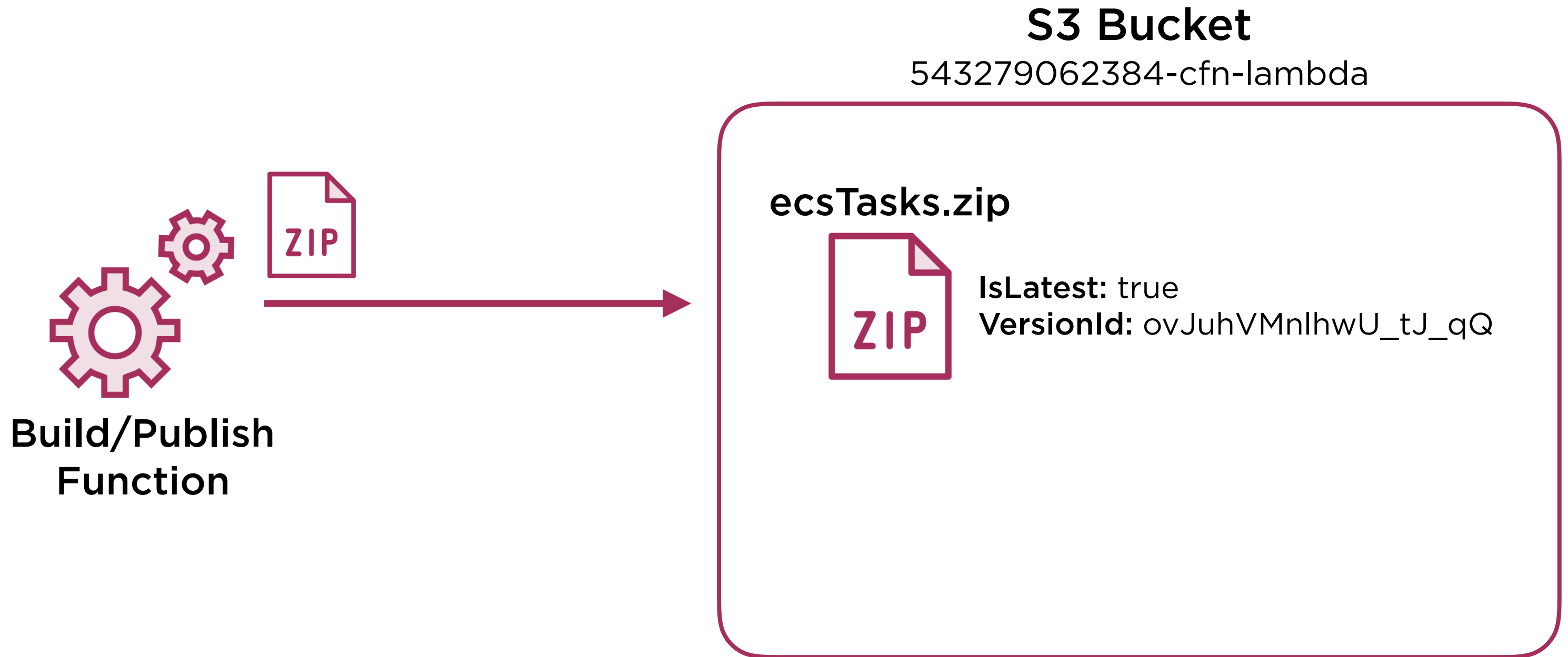
◀ Present if container has exited

◀ Indicates any failures that occurred
when attempting to run the task

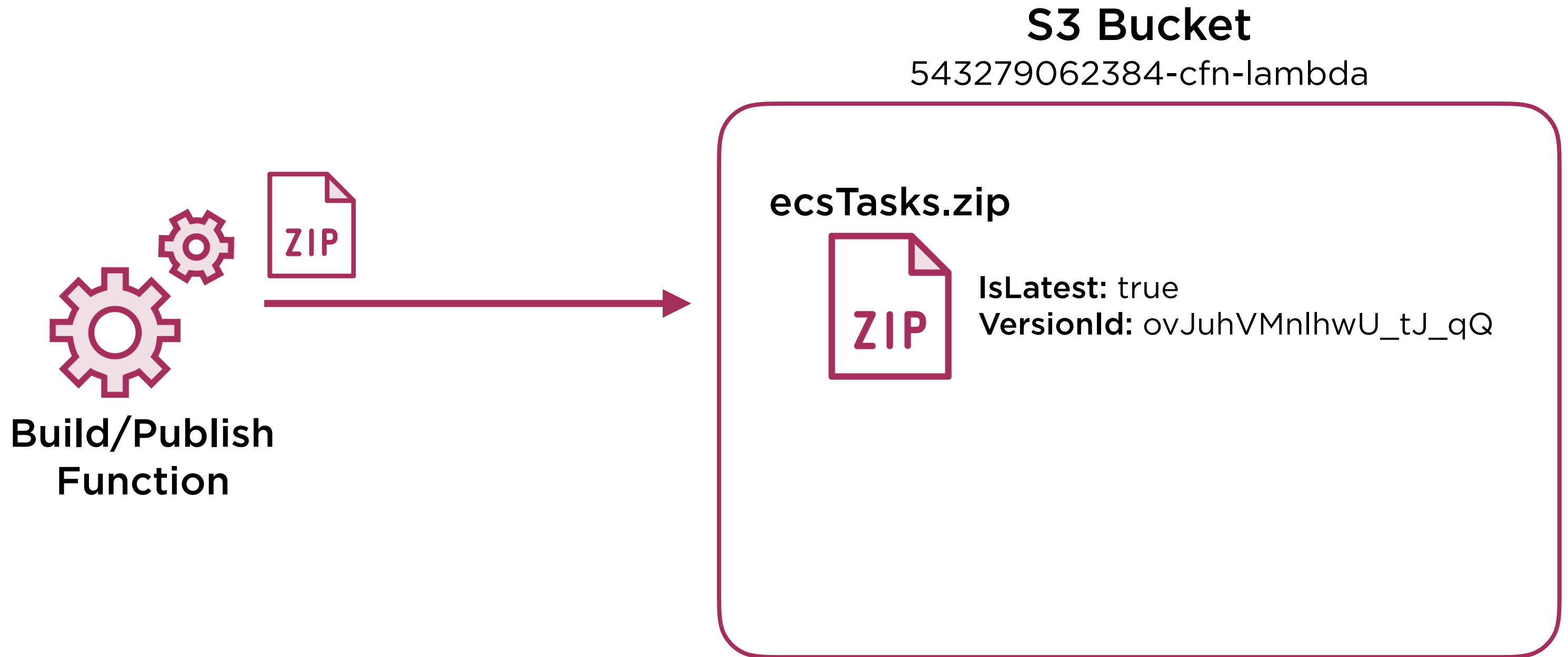
Building Lambda Functions

Publishing Lambda Functions

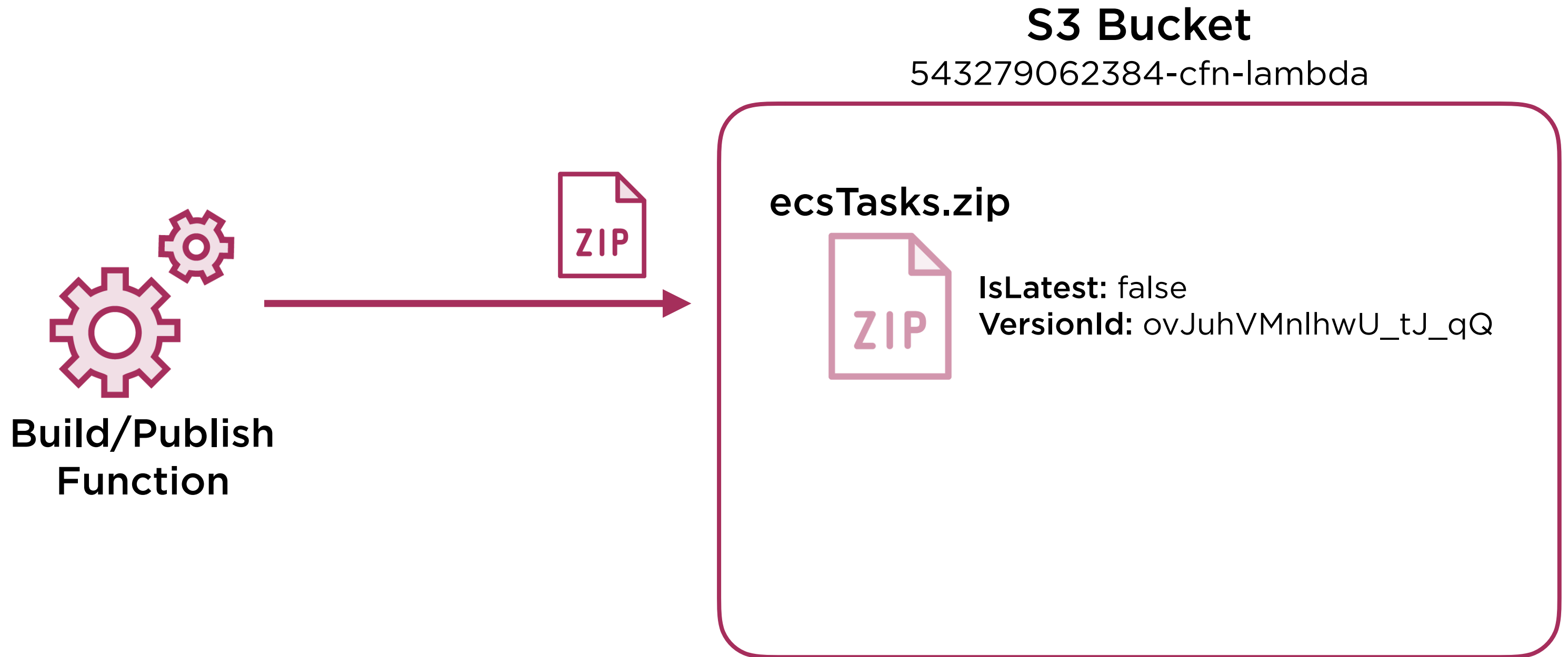
S3 Object Versioning



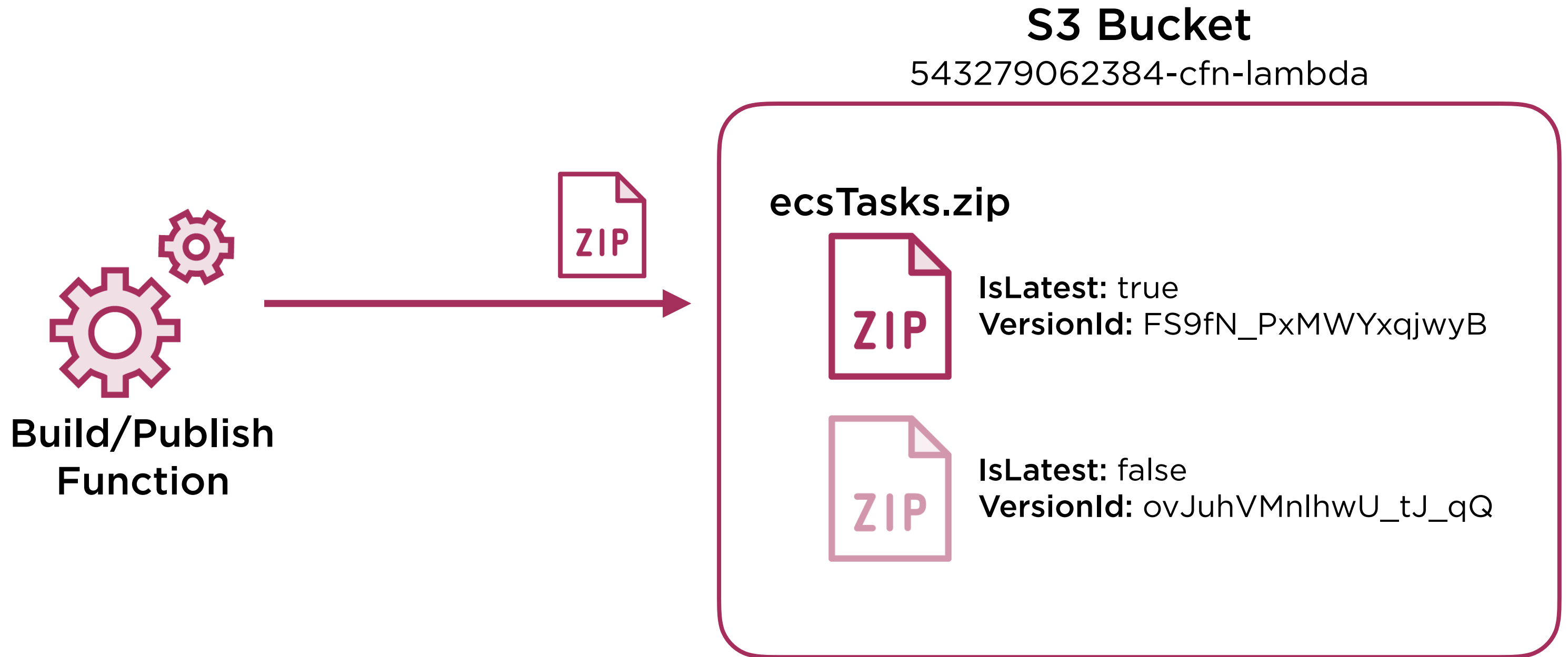
S3 Object Versioning



S3 Object Versioning

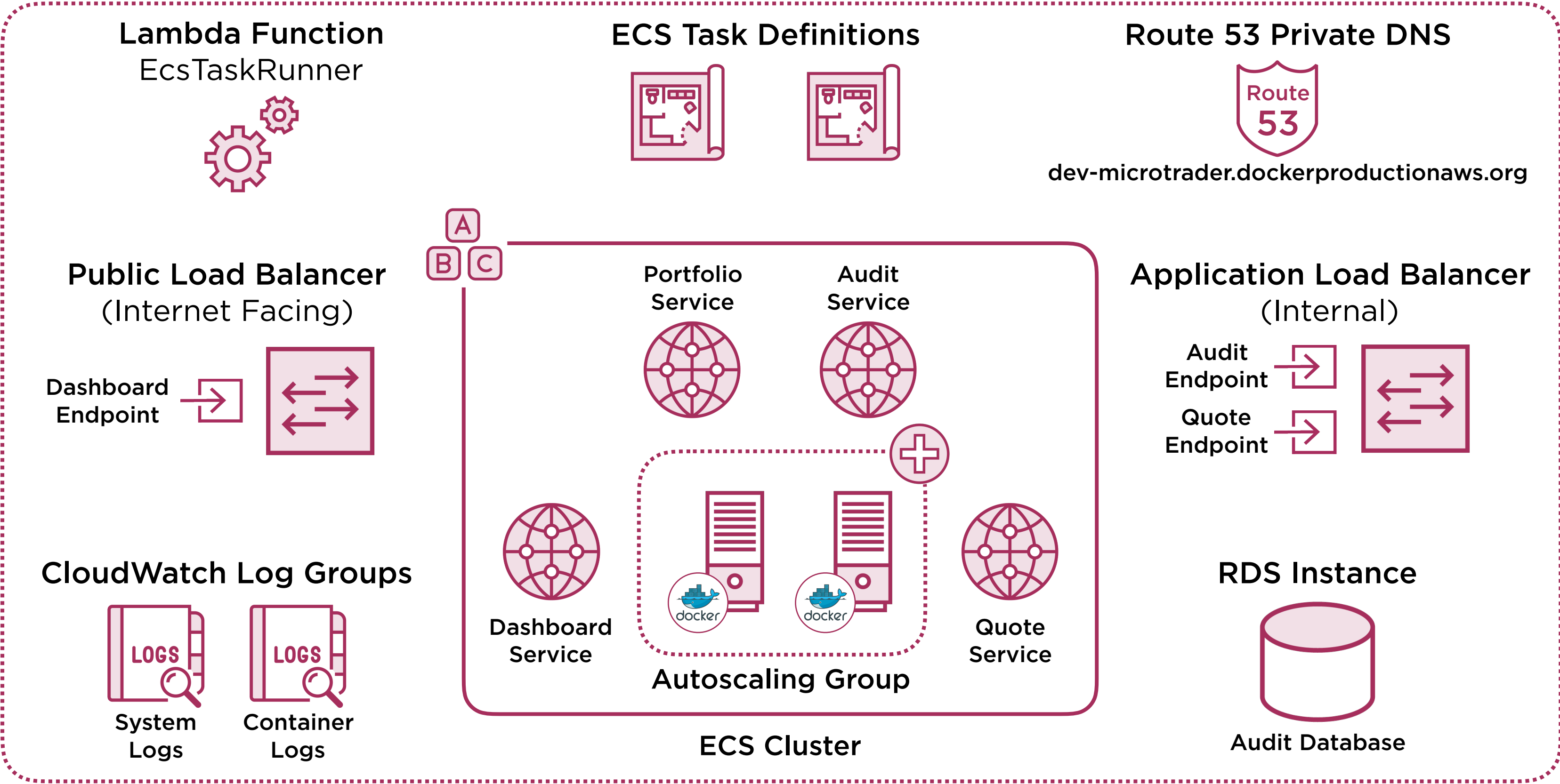


S3 Object Versioning



Creating Lambda Functions in CloudFormation

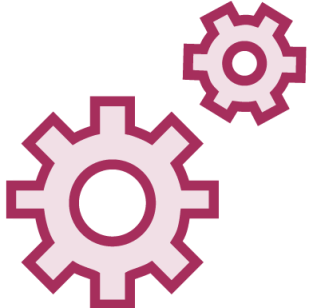
Microtrader Application Stack



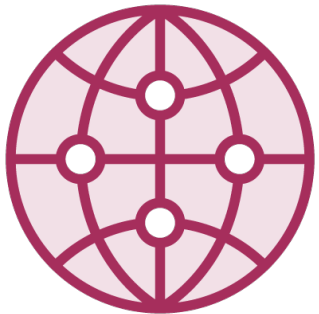
Deploying CloudFormation Custom Resources

Handling Update and Delete Requests

ECS Task Runner
Lambda Function



Stop Task



EC2 Container
Service

Stop
Task



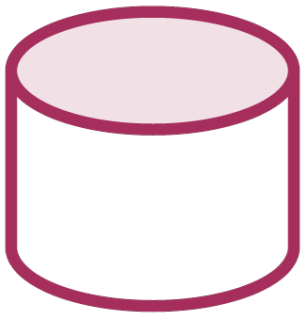
ECS Task
(Container)



ECS Container Instances

ECS Cluster

Running Task
(Run Migrations)

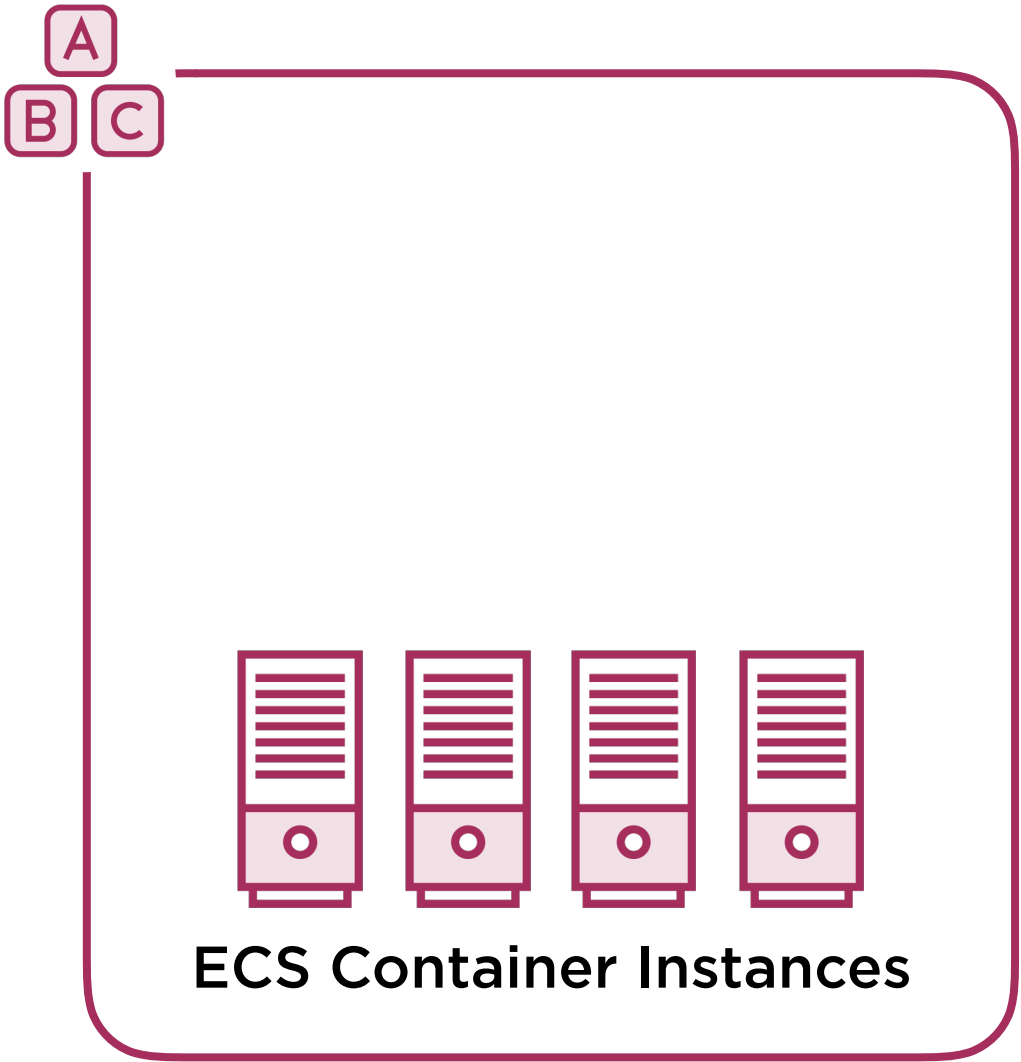


Audit
Database

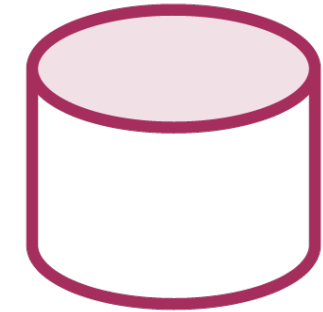
ECS Task Runner
Lambda Function



EC2 Container
Service

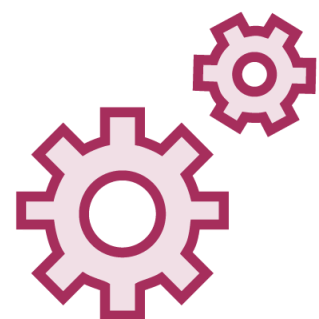


ECS Cluster

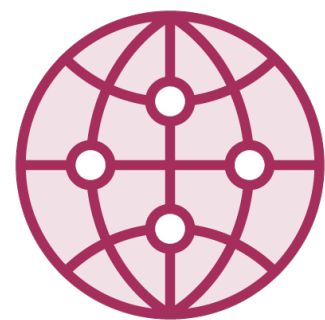


Audit
Database

ECS Task Runner
Lambda Function



Check Task
Running

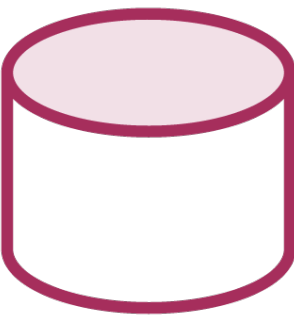


EC2 Container
Service



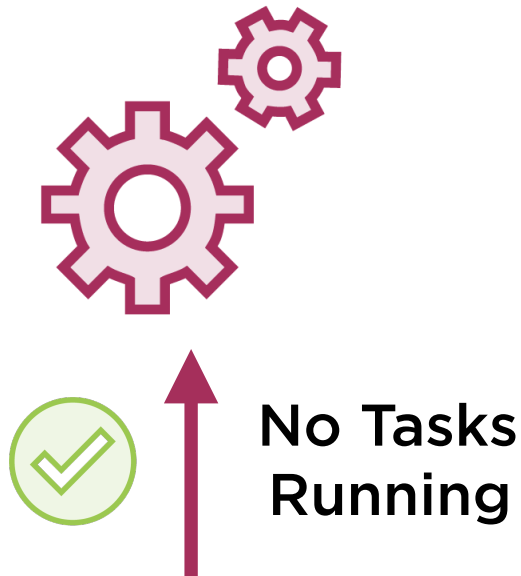
ECS Container Instances

ECS Cluster

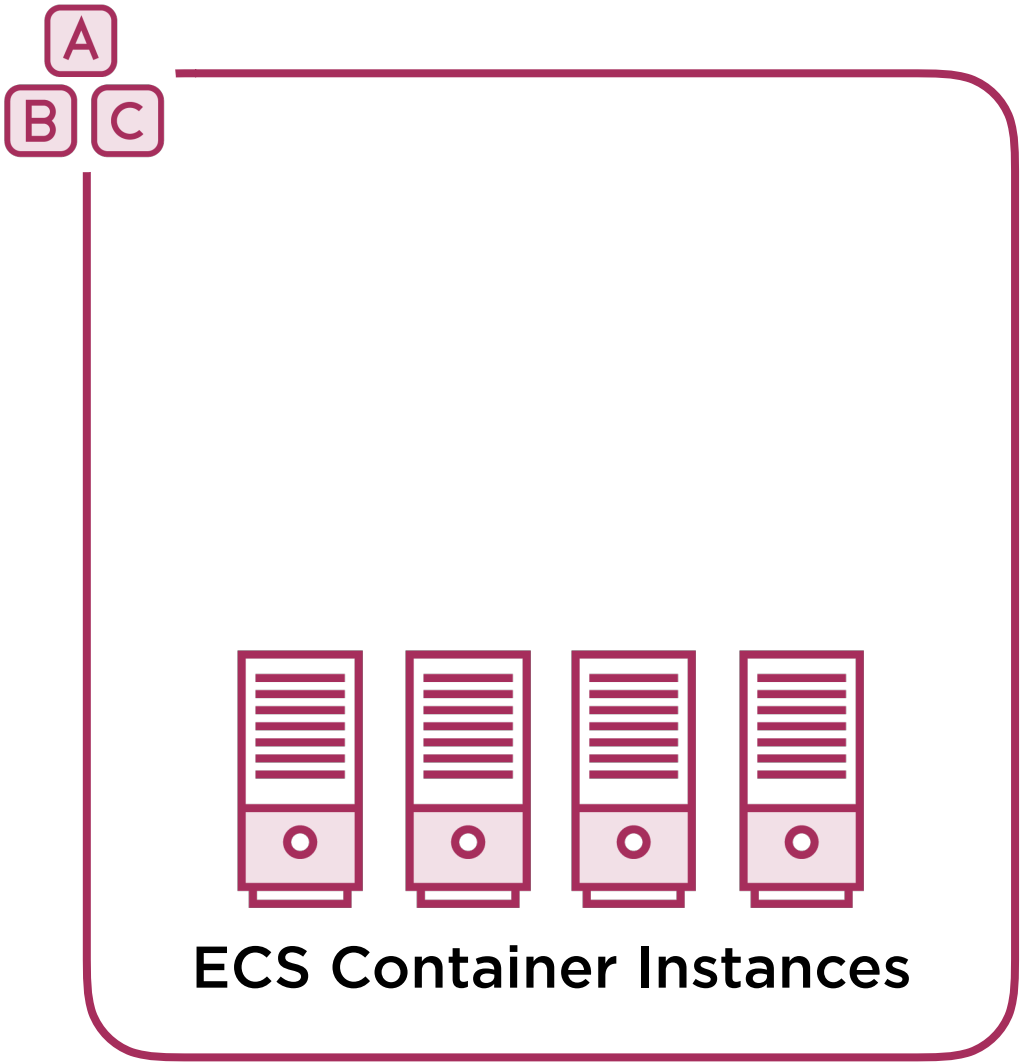
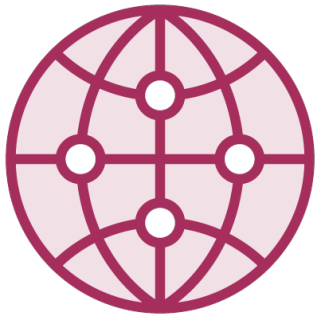


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Database

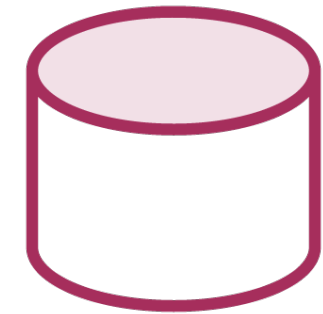
ECS Task Runner
Lambda Function



EC2 Container
Service



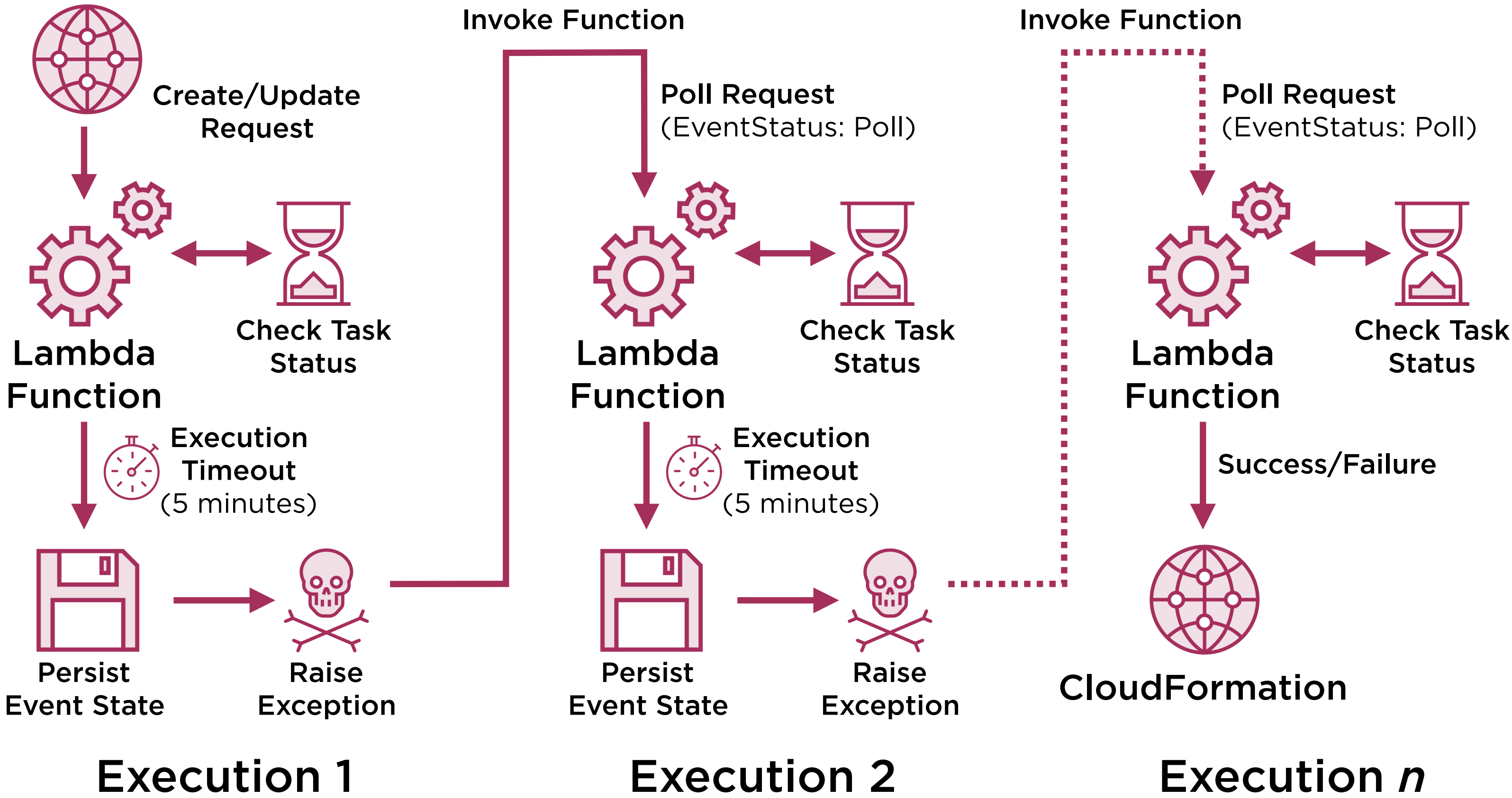
ECS Cluster



Audit
Database

Handling Long Running ECS Tasks

CloudFormation



Summary

Creating CloudFormation Custom Resources

- Lambda functions to perform your own provisioning logic
- Create, Update, Delete lifecycle
- cfn-lambda-handler
- Polling for long running tasks
- ECS task runner custom resource
- Custom resource development
- Custom resource deployment