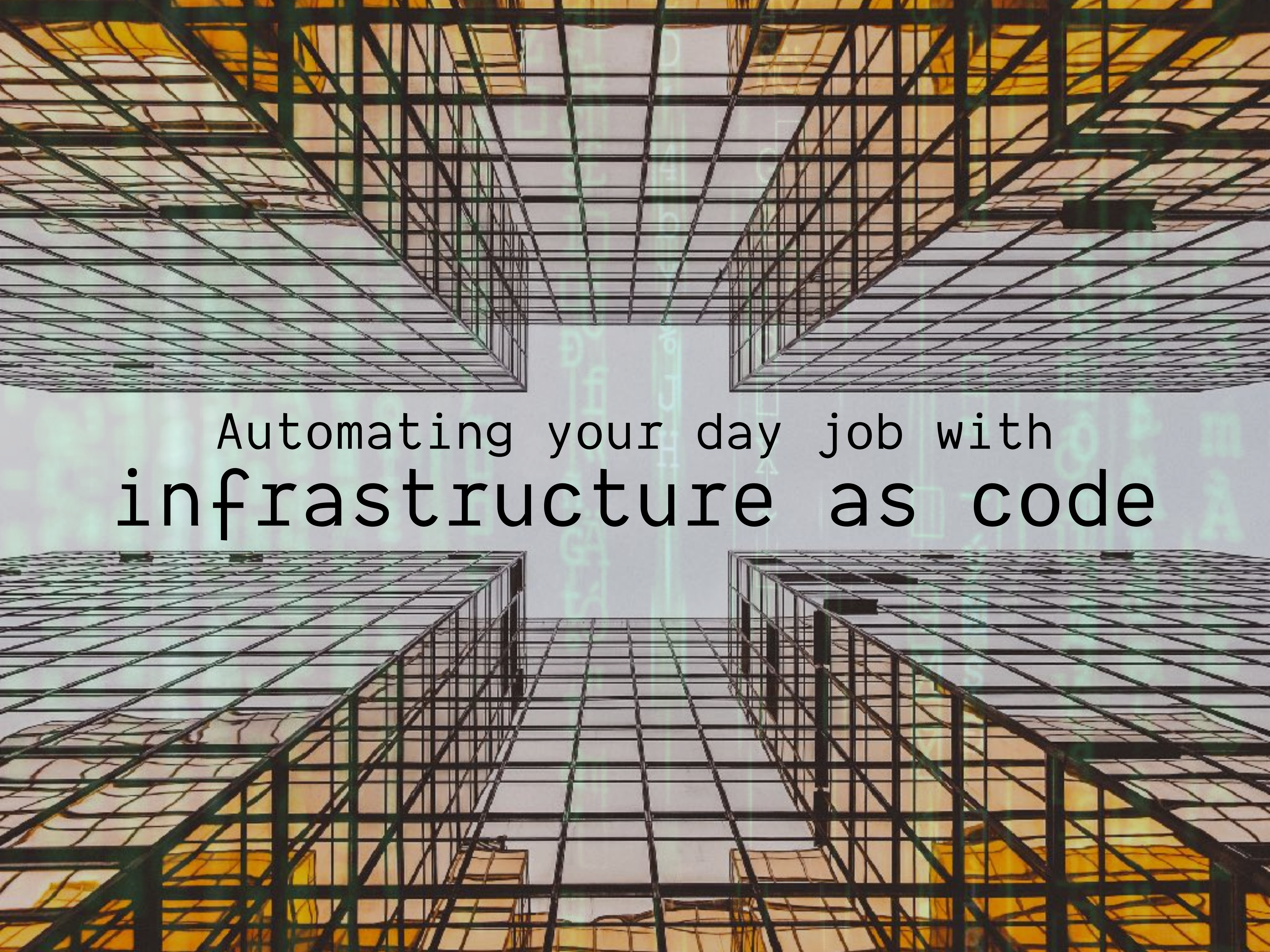


Automating your day job with infrastructure as code

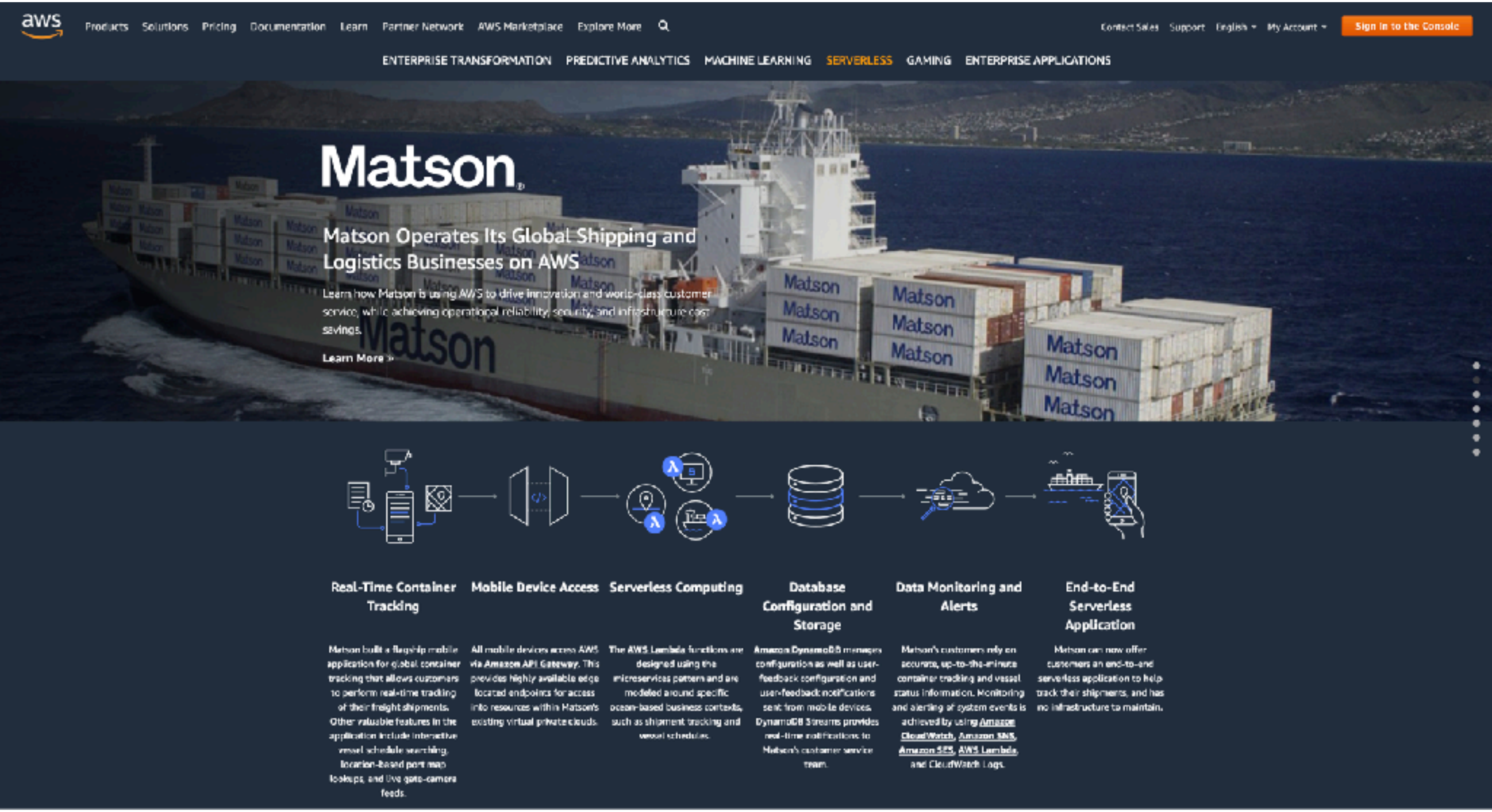
@davetownsend

Dave Townsend

Principal Software Engineer

Innovation & Architecture

Matson



Matson Operates Its Global Shipping and Logistics Businesses on AWS

Learn how Matson is using AWS to drive innovation and world-class customer service, while achieving operational reliability, security, and infrastructure cost savings.

Real-Time Container Tracking

Matson built a flagship mobile application for global container tracking that allows customers to perform real-time tracking of their freight shipments. Other valuable features in the application include interactive vessel schedule searching, location-based port map lookups, and live gate-camera feeds.

Mobile Device Access

All mobile devices access AWS via Amazon API Gateway. This provides highly available edge located endpoints for access into resources within Matson's existing virtual private clouds.

Serverless Computing

The AWS Lambda functions are designed using the microservices pattern and are modeled around specific ocean-based business contexts, such as shipment tracking and vessel schedules.

Database Configuration and Storage

Amazon DynamoDB manages configuration as well as user-feedback configuration and user-feedback notifications sent from mobile devices. DynamoDB Streams provides real-time notifications to Matson's customer service team.

Data Monitoring and Alerts

Matson's customers rely on accurate, up-to-the-minute container tracking and vessel status information. Monitoring and alerting of system events is achieved by using Amazon CloudWatch, Amazon SNS, Amazon SES, AWS Lambda, and CloudWatch Logs.

End-to-End Serverless Application

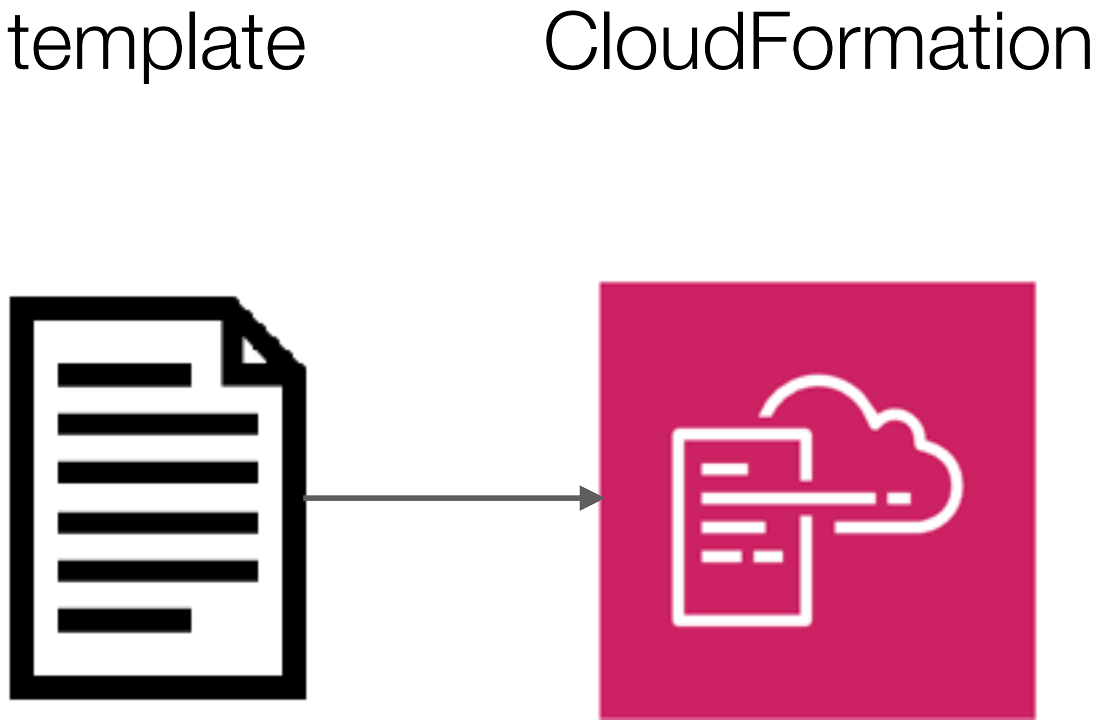
Matson can now offer customers an end-to-end serverless application to help track their shipments, and has no infrastructure to maintain.

agenda

what is IaC?
why should we use IaC?
how to use IaC.

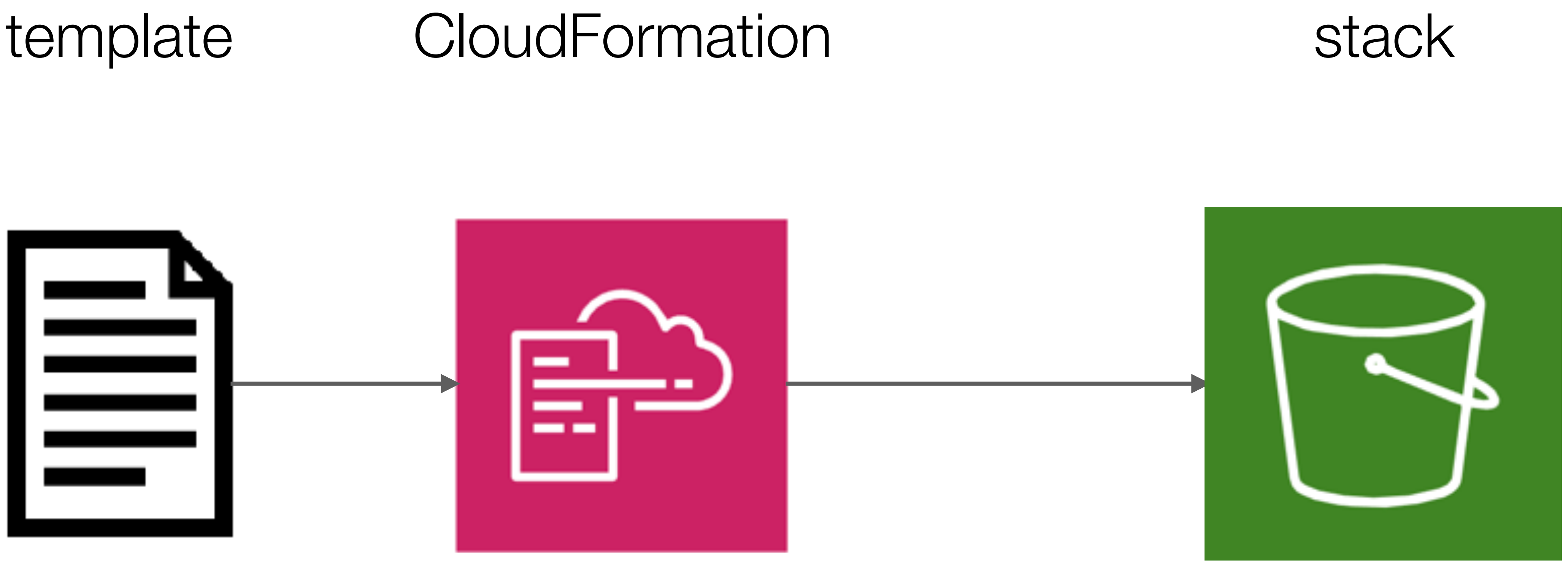
10k foot view

template



template

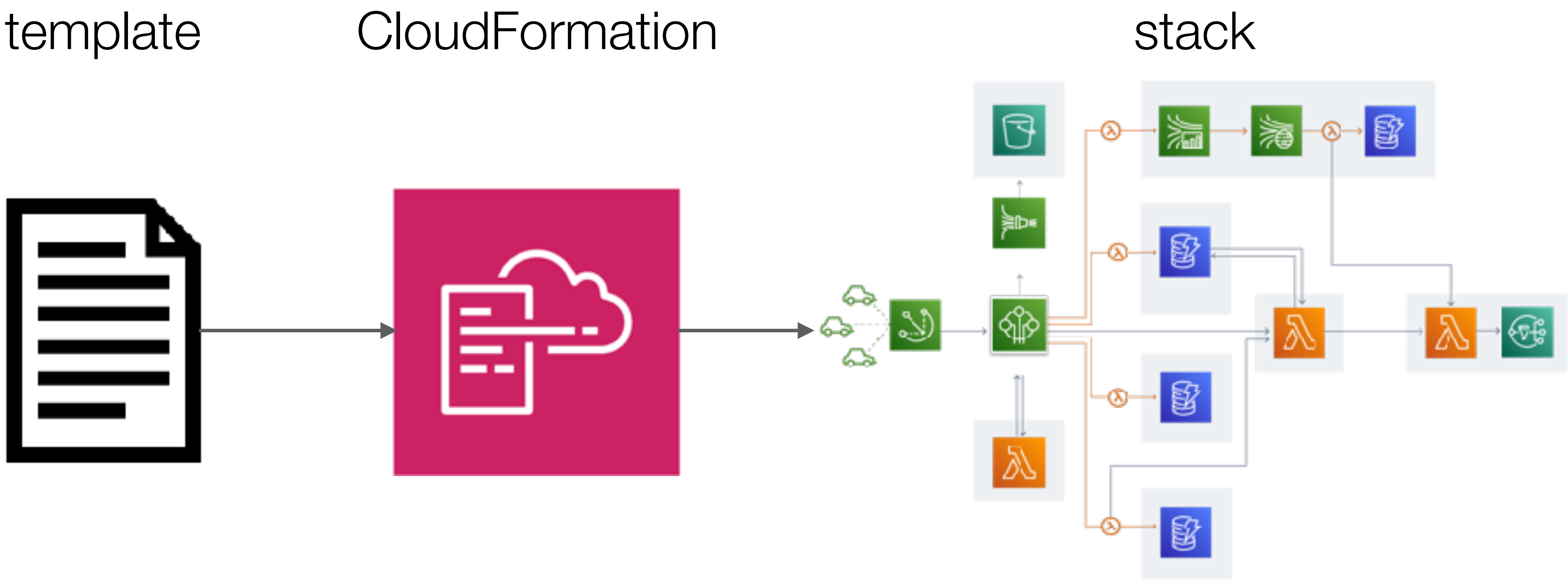
CloudFormation



template

CloudFormation

stack



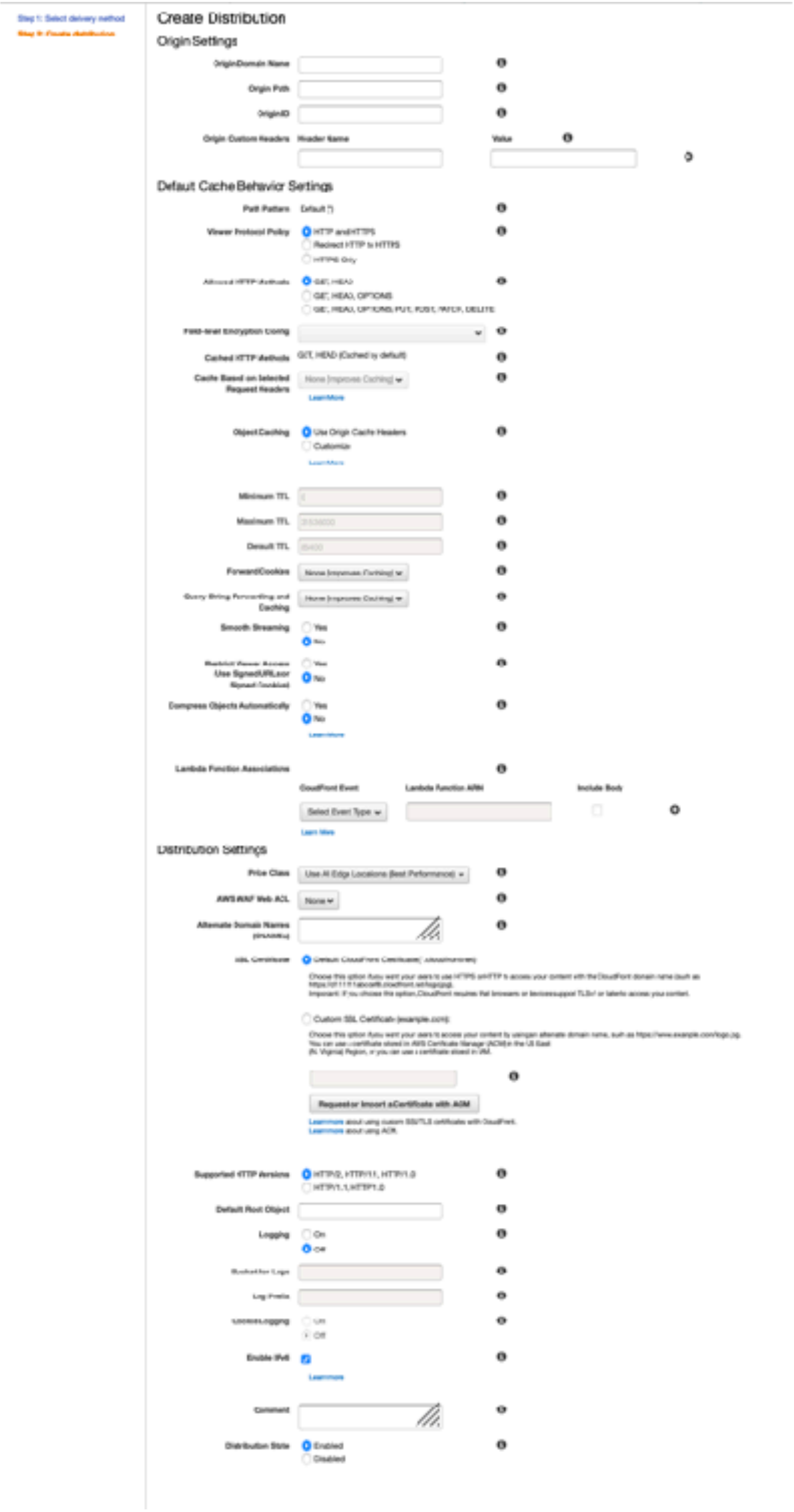
template

CloudFormation

stack

why?

this…



Step 1: Select delivery method

Step 2: Create distribution

Create Distribution

Origin Settings

Origin Domain Name

Origin Path

Origin ID

Origin Custom Headers — Header Name — Value

Default Cache Behavior Settings

Path Pattern: Default (*)

Viewer Protocol Policy: ● HTTP and HTTPS ○ Redirect HTTP to HTTPS ○ HTTPS Only

Allowed HTTP Methods: ● GET, HEAD ○ GET, HEAD, OPTIONS ○ GET, HEAD, OPTIONS, PUT, POST, PATCH, DELETE

Field-level Encryption Config

Cached HTTP Methods: GET, HEAD (Cached by default)

Cache Based on Selected Request Headers: None (Improves Caching)
Learn More

Object Caching: ● Use Origin Cache Headers ○ Customize
Learn More

Minimum TTL: 0

Maximum TTL: 31536000

Default TTL: 86400

Forward Cookies: None (Improves Caching)

Query String Forwarding and Caching: None (Improves Caching)

Smooth Streaming: ○ Yes ● No

Restrict Viewer Access (Use Signed URLs or Signed Cookies): ○ Yes ● No

Compress Objects Automatically: ○ Yes ● No
Learn More

Lambda Function Associations

CloudFront Event: Select Event Type — Lambda Function ARN — Include Body □
Learn More

Distribution Settings

Price Class: Use All Edge Locations (Best Performance)

AWS WAF Web ACL: None

Alternate Domain Names (CNAMEs)

SSL Certificate: ● Default CloudFront Certificate (*.cloudfront.net)

Choose this option if you want your users to use HTTPS or HTTP to access your content with the CloudFront domain name (such as https://d111111abcdef8.cloudfront.net/logo.jpg).
Important: If you choose this option, CloudFront requires that browsers or devices support TLSv1 or later to access your content.

○ Custom SSL Certificate (example.com):

Choose this option if you want your users to access your content by using an alternate domain name, such as https://www.example.com/logo.jpg.
You can use a certificate stored in AWS Certificate Manager (ACM) in the US East
(N. Virginia) Region, or you can use a certificate stored in IAM.

Request or Import a Certificate with ACM

Learn more about using custom SSL/TLS certificates with CloudFront.
Learn more about using ACM.

Supported HTTP Versions: ● HTTP/2, HTTP/1.1, HTTP/1.0 ○ HTTP/1.1, HTTP/1.0

Default Root Object

Logging: ○ On ● Off

Bucket for Logs

Log Prefix

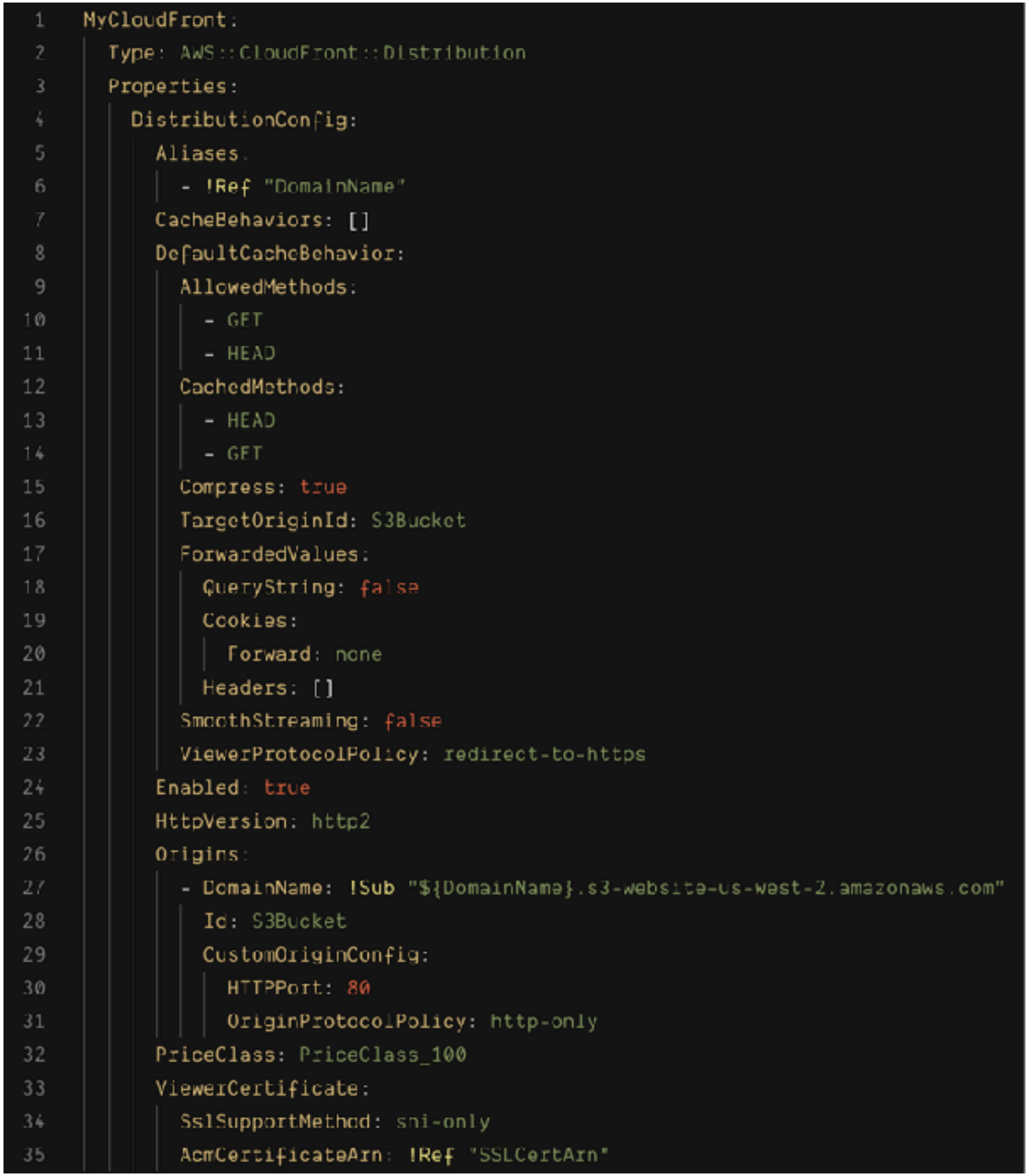
Cookie Logging: ○ On ● Off

Enable IPv6: ☑
Learn more

Comment

Distribution State: ● Enabled ○ Disabled vs.

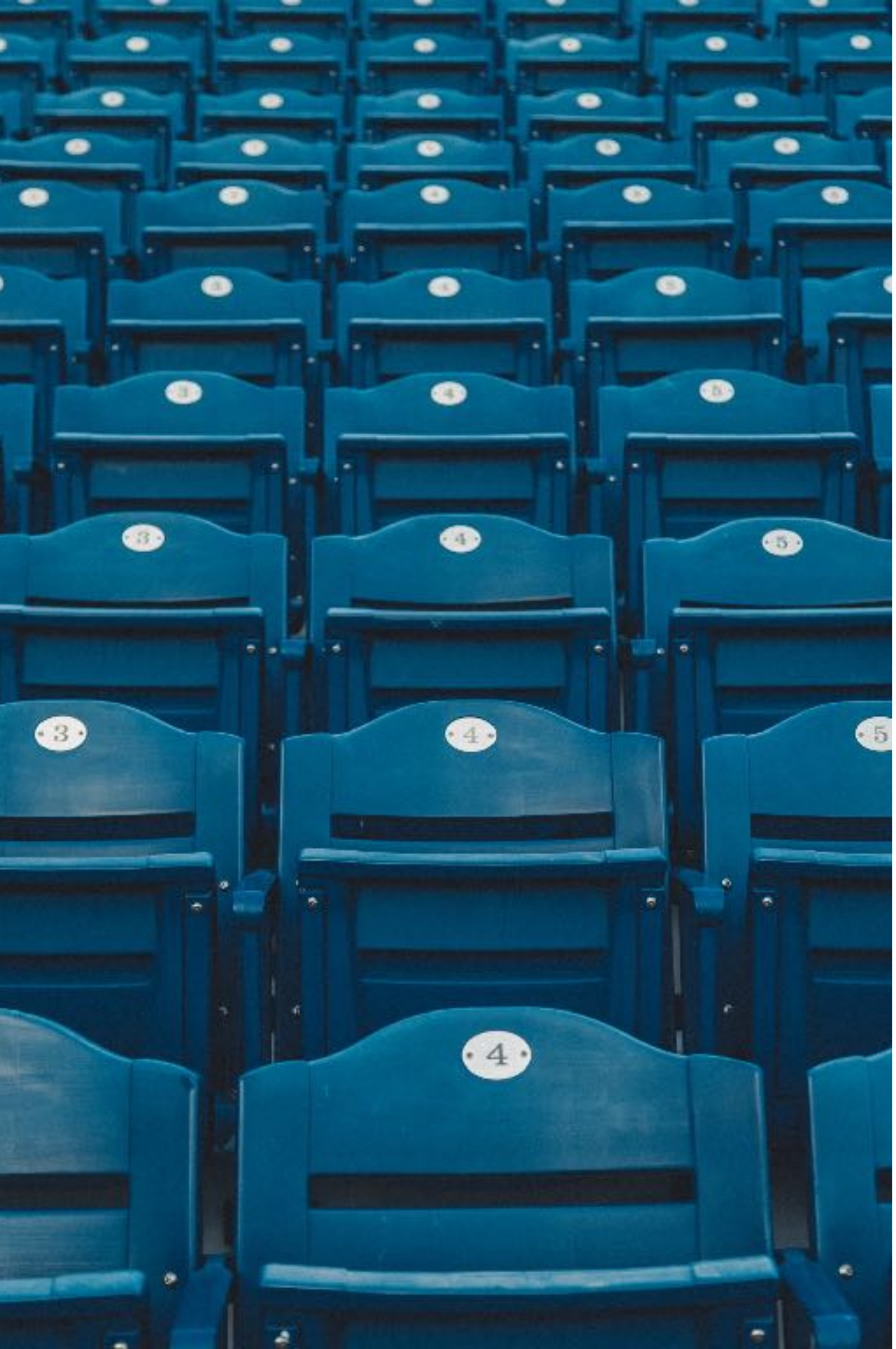
this.



```yaml
MyCloudFront:
  Type: AWS::CloudFront::Distribution
  Properties:
    DistributionConfig:
      Aliases:
        - !Ref "DomainName"
      CacheBehaviors: []
      DefaultCacheBehavior:
        AllowedMethods:
          - GET
          - HEAD
        CachedMethods:
          - HEAD
          - GET
        Compress: true
        TargetOriginId: S3Bucket
        ForwardedValues:
          QueryString: false
          Cookies:
            Forward: none
          Headers: []
        SmoothStreaming: false
        ViewerProtocolPolicy: redirect-to-https
      Enabled: true
      HttpVersion: http2
      Origins:
        - DomainName: !Sub "${DomainName}.s3-website-us-west-2.amazonaws.com"
          Id: S3Bucket
          CustomOriginConfig:
            HTTPPort: 80
            OriginProtocolPolicy: http-only
      PriceClass: PriceClass_100
      ViewerCertificate:
        SslSupportMethod: sni-only
        AcmCertificateArn: !Ref "SSLCertArn"
```

initial time investment.
buuut…

automation



deterministic

environment parity

disaster recovery

deeper understanding of the architecture

more control of the entire stack

The Decision Book

tooling landscape

AWS CloudFormation

AWS CloudFormation

5 point plan for adopting IaC

1. start learning CloudFormation, now
2. stop requesting resources
3. don’t use the console to create resources (experiments ok)
4. build *everything* you need with IaC (start in a sandbox)
5. **submit templates, not tickets!** 👊😎

we can take this further…

use CI/CD to build the stacks

🤩

> “*Every cloud workflow in the org should share the same command to start a deployment:*
> `git push`

Richard Boyd
Cloud Data Engineer at @IRobot

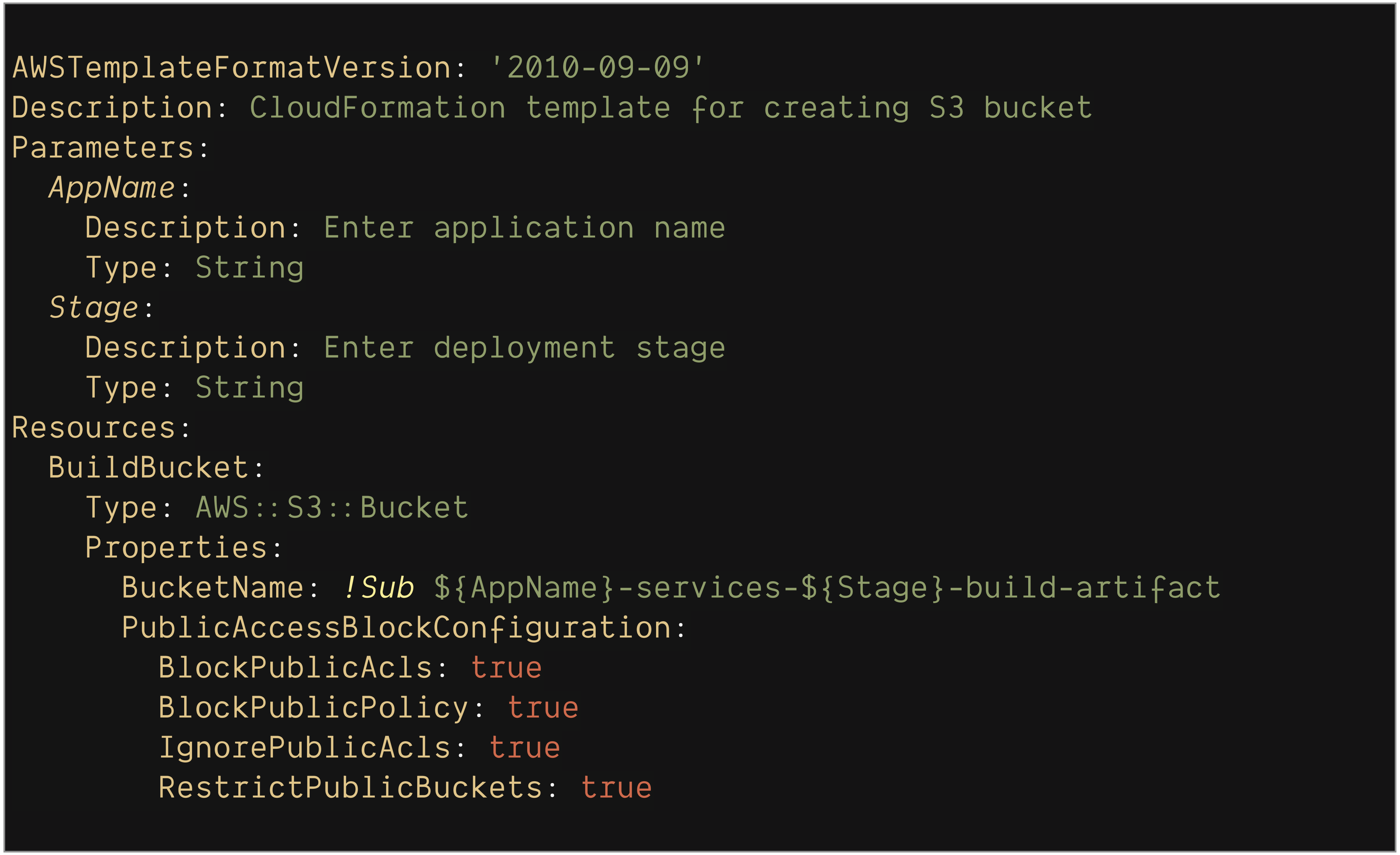
CloudFormation basics

templates, stacks and change sets

templates

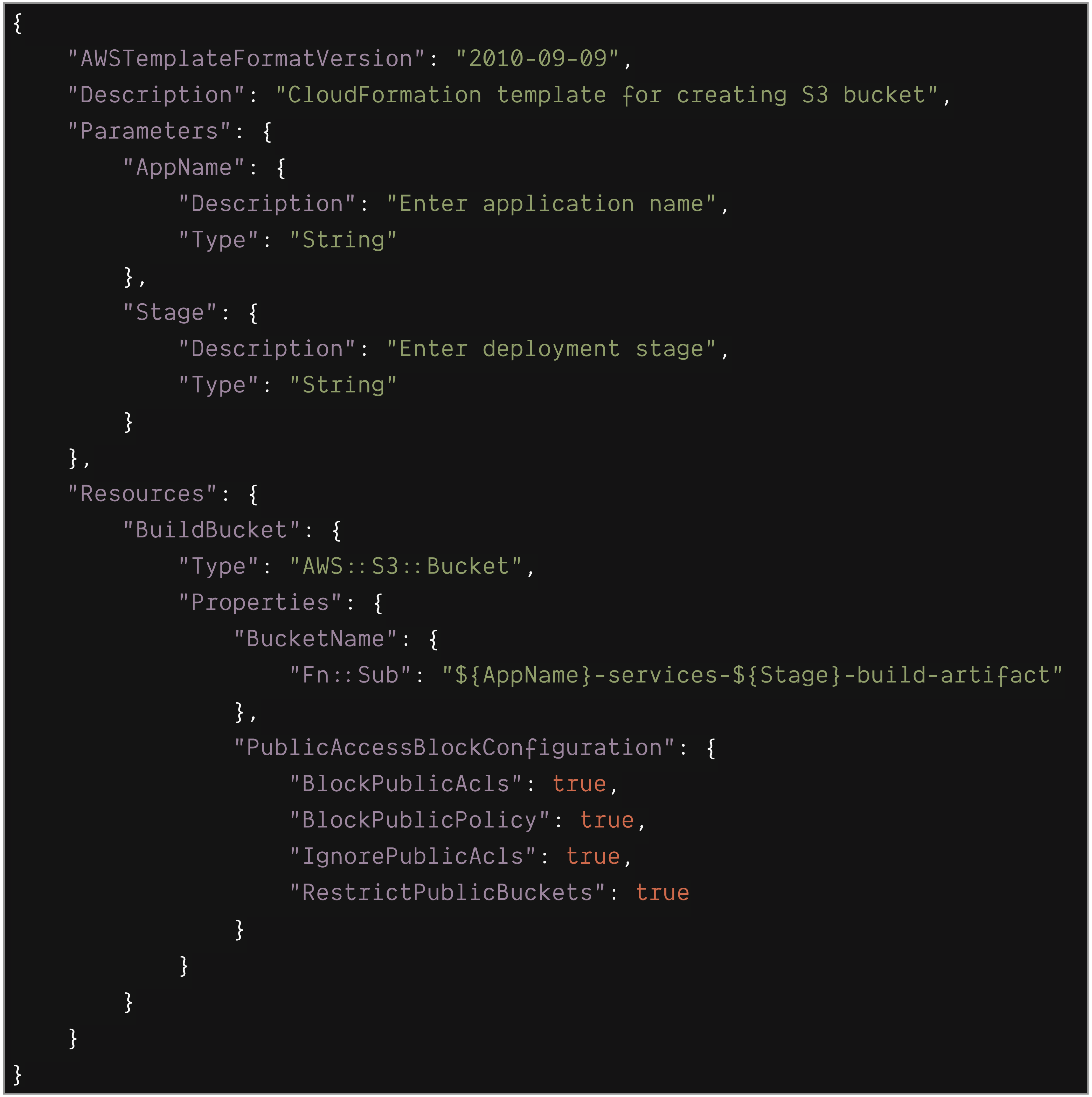
```
AWSTemplateFormatVersion: '2010-09-09'
 Resources:
  MyBucket:
    Type: AWS::S3::Bucket
```

CloudFormation template (yaml based)



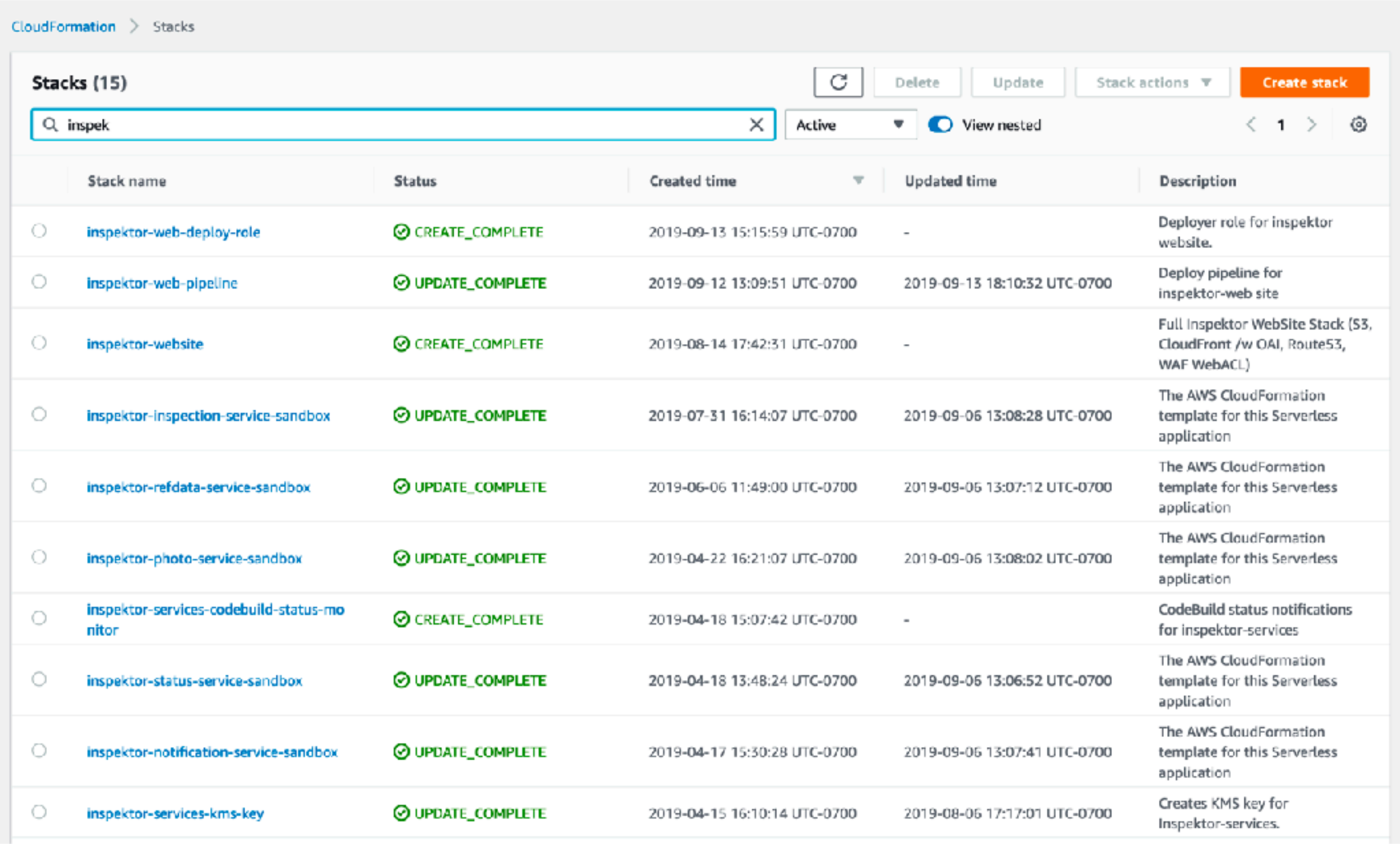
```yaml
AWSTemplateFormatVersion: '2010-09-09'
Description: CloudFormation template for creating S3 bucket
Parameters:
  AppName:
    Description: Enter application name
    Type: String
  Stage:
    Description: Enter deployment stage
    Type: String
Resources:
  BuildBucket:
    Type: AWS::S3::Bucket
    Properties:
      BucketName: !Sub ${AppName}-services-${Stage}-build-artifact
      PublicAccessBlockConfiguration:
        BlockPublicAcls: true
        BlockPublicPolicy: true
        IgnorePublicAcls: true
        RestrictPublicBuckets: true
```

CloudFormation template (json based)



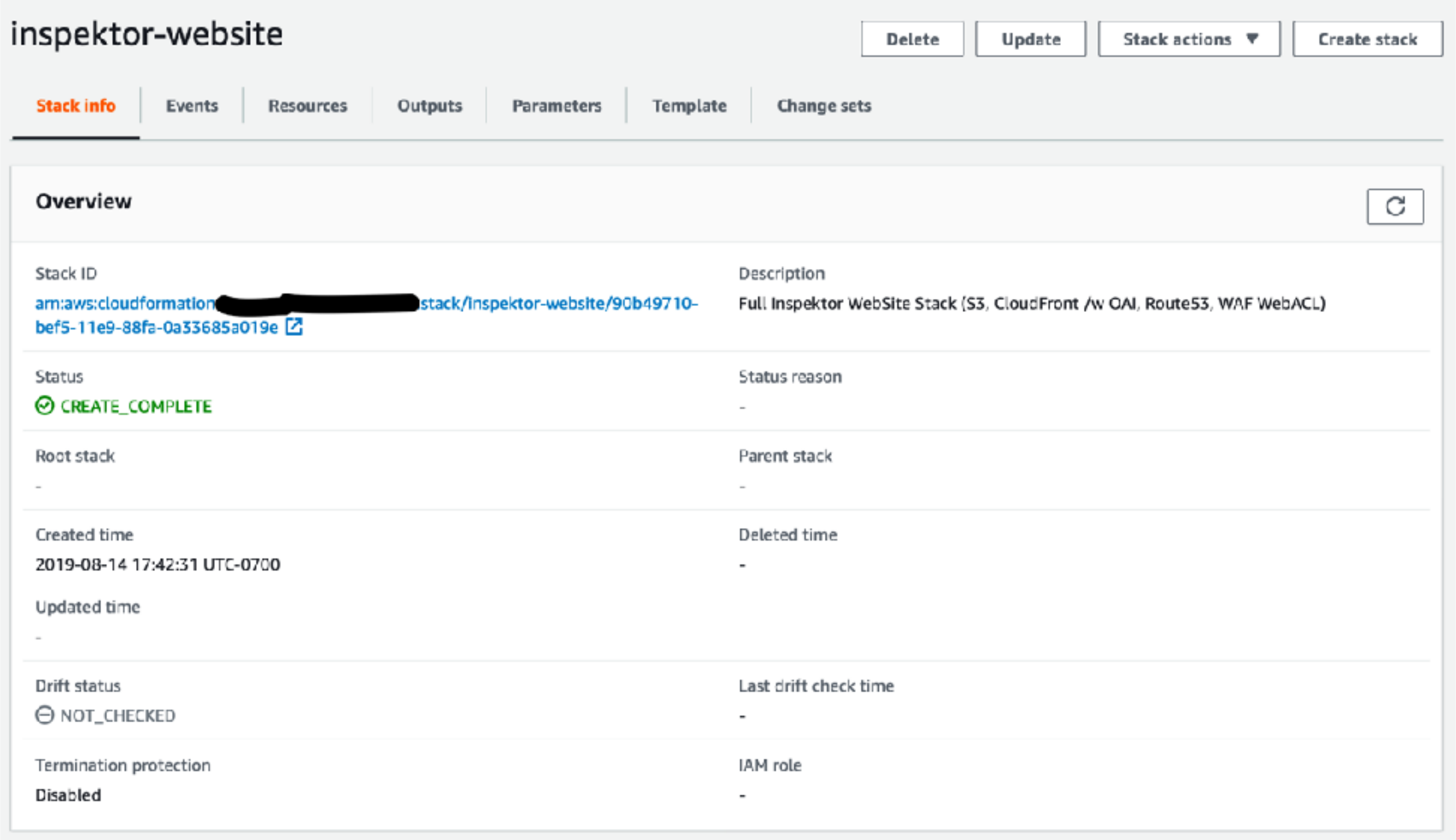
```json
{
    "AWSTemplateFormatVersion": "2010-09-09",
    "Description": "CloudFormation template for creating S3 bucket",
    "Parameters": {
        "AppName": {
            "Description": "Enter application name",
            "Type": "String"
        },
        "Stage": {
            "Description": "Enter deployment stage",
            "Type": "String"
        }
    },
    "Resources": {
        "BuildBucket": {
            "Type": "AWS::S3::Bucket",
            "Properties": {
                "BucketName": {
                    "Fn::Sub": "${AppName}-services-${Stage}-build-artifact"
                },
                "PublicAccessBlockConfiguration": {
                    "BlockPublicAcls": true,
                    "BlockPublicPolicy": true,
                    "IgnorePublicAcls": true,
                    "RestrictPublicBuckets": true
                }
            }
        }
    }
}
```

stacks



	Stack name	Status	Created time ▼	Updated time	Description
○	inspektor-web-deploy-role	✓ CREATE_COMPLETE	2019-09-13 15:15:59 UTC-0700	-	Deployer role for inspektor website.
○	inspektor-web-pipeline	✓ UPDATE_COMPLETE	2019-09-12 13:09:51 UTC-0700	2019-09-13 18:10:32 UTC-0700	Deploy pipeline for inspektor-web site
○	inspektor-website	✓ CREATE_COMPLETE	2019-08-14 17:42:31 UTC-0700	-	Full Inspektor WebSite Stack (S3, CloudFront /w OAI, Route53, WAF WebACL)
○	inspektor-inspection-service-sandbox	✓ UPDATE_COMPLETE	2019-07-31 16:14:07 UTC-0700	2019-09-06 13:08:28 UTC-0700	The AWS CloudFormation template for this Serverless application
○	inspektor-refdata-service-sandbox	✓ UPDATE_COMPLETE	2019-06-06 11:49:00 UTC-0700	2019-09-06 13:07:12 UTC-0700	The AWS CloudFormation template for this Serverless application
○	inspektor-photo-service-sandbox	✓ UPDATE_COMPLETE	2019-04-22 16:21:07 UTC-0700	2019-09-06 13:08:02 UTC-0700	The AWS CloudFormation template for this Serverless application
○	inspektor-services-codebuild-status-monitor	✓ CREATE_COMPLETE	2019-04-18 15:07:42 UTC-0700	-	CodeBuild status notifications for inspektor-services
○	inspektor-status-service-sandbox	✓ UPDATE_COMPLETE	2019-04-18 13:48:24 UTC-0700	2019-09-06 13:06:52 UTC-0700	The AWS CloudFormation template for this Serverless application
○	inspektor-notification-service-sandbox	✓ UPDATE_COMPLETE	2019-04-17 15:30:28 UTC-0700	2019-09-06 13:07:41 UTC-0700	The AWS CloudFormation template for this Serverless application
○	inspektor-services-kms-key	✓ UPDATE_COMPLETE	2019-04-15 16:10:14 UTC-0700	2019-08-06 17:17:01 UTC-0700	Creates KMS key for Inspektor-services.

stacks



inspektor-website

Overview

Stack ID
arn:aws:cloudformation[redacted]stack/inspektor-website/90b49710-bef5-11e9-88fa-0a33685a019e

Description
Full Inspektor WebSite Stack (S3, CloudFront /w OAI, Route53, WAF WebACL)

Status
CREATE_COMPLETE

Status reason
-

Root stack
-

Parent stack
-

Created time
2019-08-14 17:42:31 UTC-0700

Deleted time
-

Updated time
-

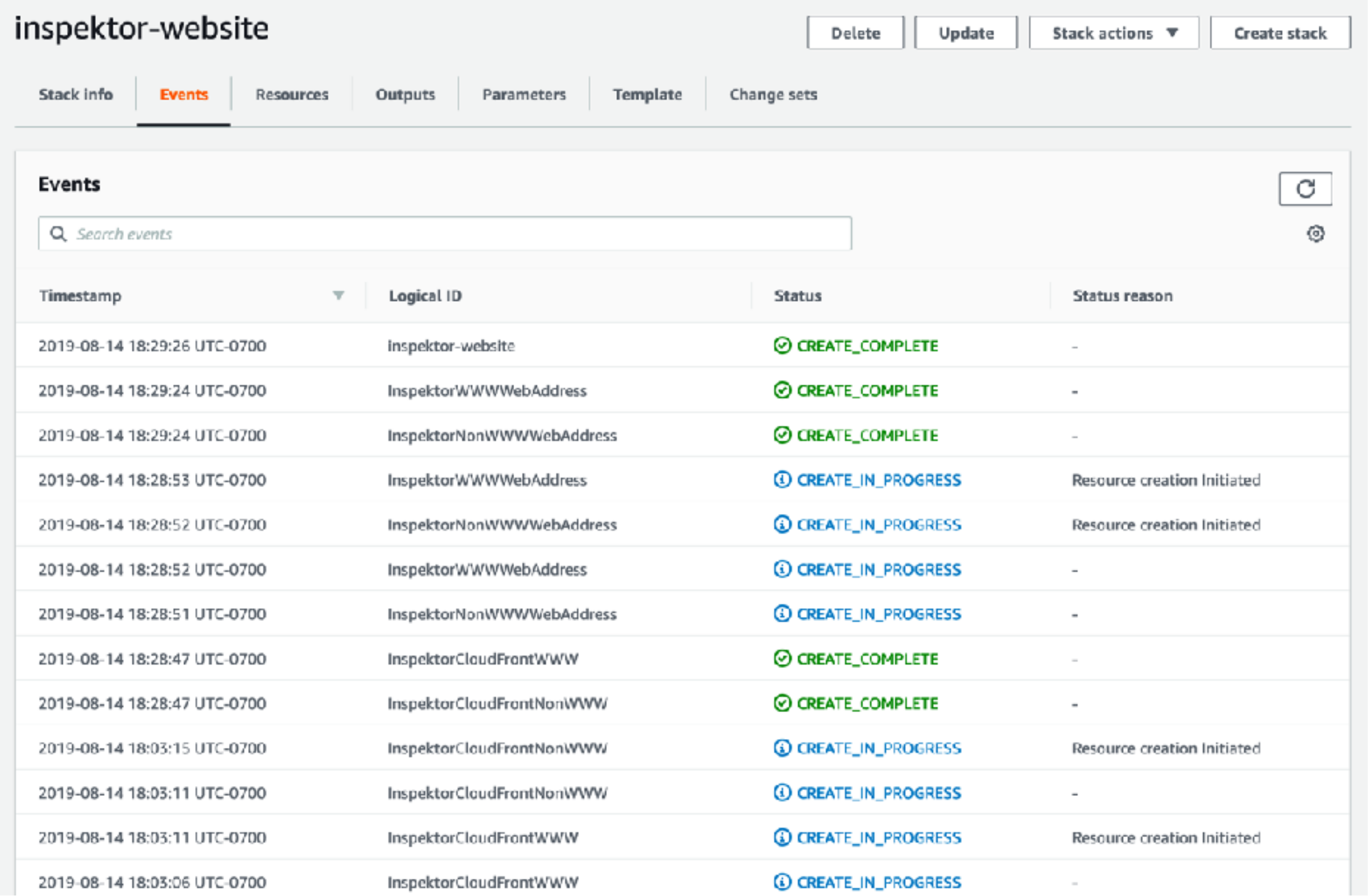
Drift status
NOT_CHECKED

Last drift check time
-

Termination protection
Disabled

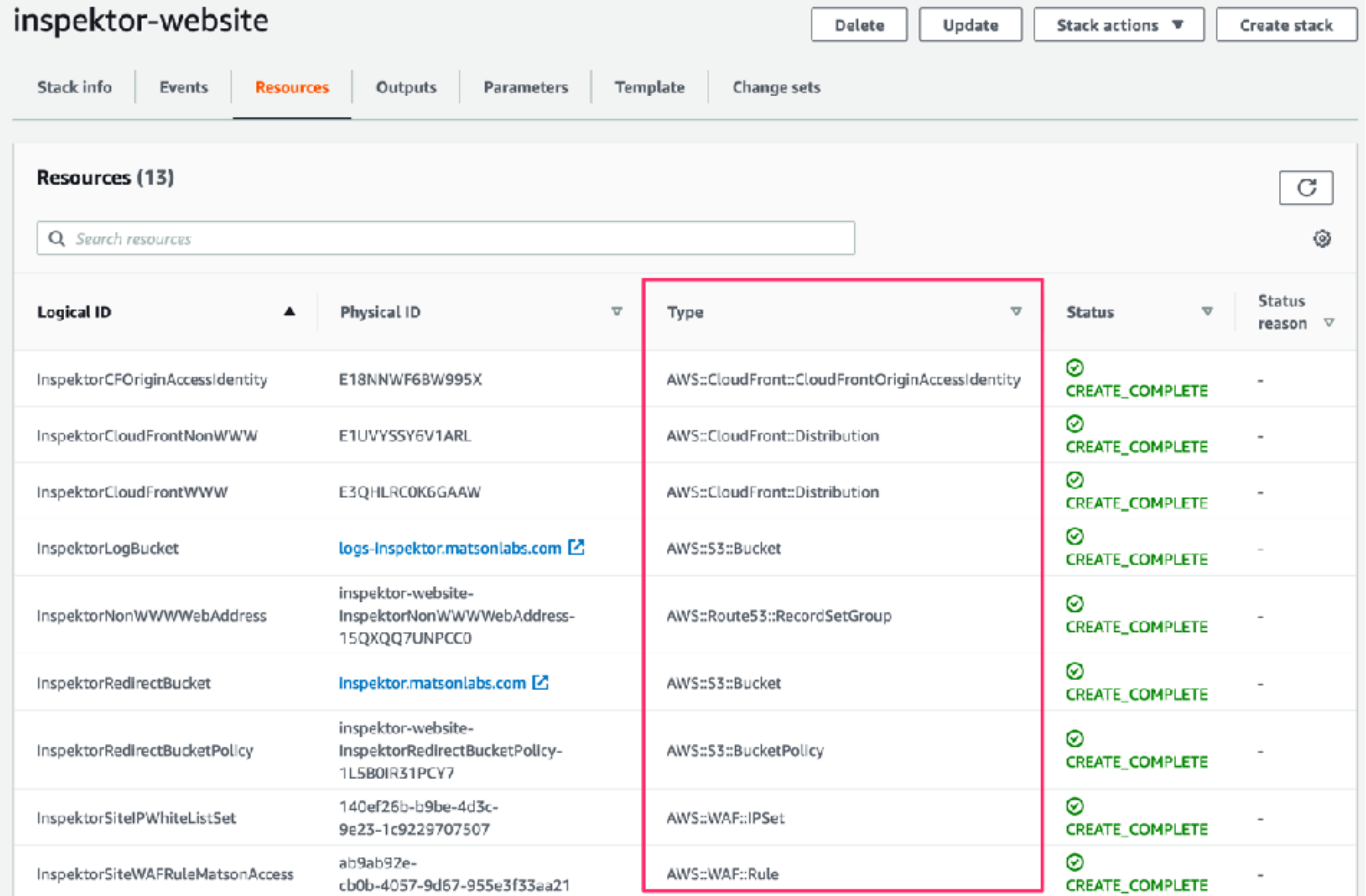
IAM role
-

stacks



Timestamp	Logical ID	Status	Status reason
2019-08-14 18:29:26 UTC-0700	inspektor-website	CREATE_COMPLETE	-
2019-08-14 18:29:24 UTC-0700	InspektorWWWWebAddress	CREATE_COMPLETE	-
2019-08-14 18:29:24 UTC-0700	InspektorNonWWWWebAddress	CREATE_COMPLETE	-
2019-08-14 18:28:53 UTC-0700	InspektorWWWWebAddress	CREATE_IN_PROGRESS	Resource creation Initiated
2019-08-14 18:28:52 UTC-0700	InspektorNonWWWWebAddress	CREATE_IN_PROGRESS	Resource creation Initiated
2019-08-14 18:28:52 UTC-0700	InspektorWWWWebAddress	CREATE_IN_PROGRESS	-
2019-08-14 18:28:51 UTC-0700	InspektorNonWWWWebAddress	CREATE_IN_PROGRESS	-
2019-08-14 18:28:47 UTC-0700	InspektorCloudFrontWWW	CREATE_COMPLETE	-
2019-08-14 18:28:47 UTC-0700	InspektorCloudFrontNonWWW	CREATE_COMPLETE	-
2019-08-14 18:03:15 UTC-0700	InspektorCloudFrontNonWWW	CREATE_IN_PROGRESS	Resource creation Initiated
2019-08-14 18:03:11 UTC-0700	InspektorCloudFrontNonWWW	CREATE_IN_PROGRESS	-
2019-08-14 18:03:11 UTC-0700	InspektorCloudFrontWWW	CREATE_IN_PROGRESS	Resource creation Initiated
2019-08-14 18:03:06 UTC-0700	InspektorCloudFrontWWW	CREATE_IN_PROGRESS	-

stacks



inspektor-website

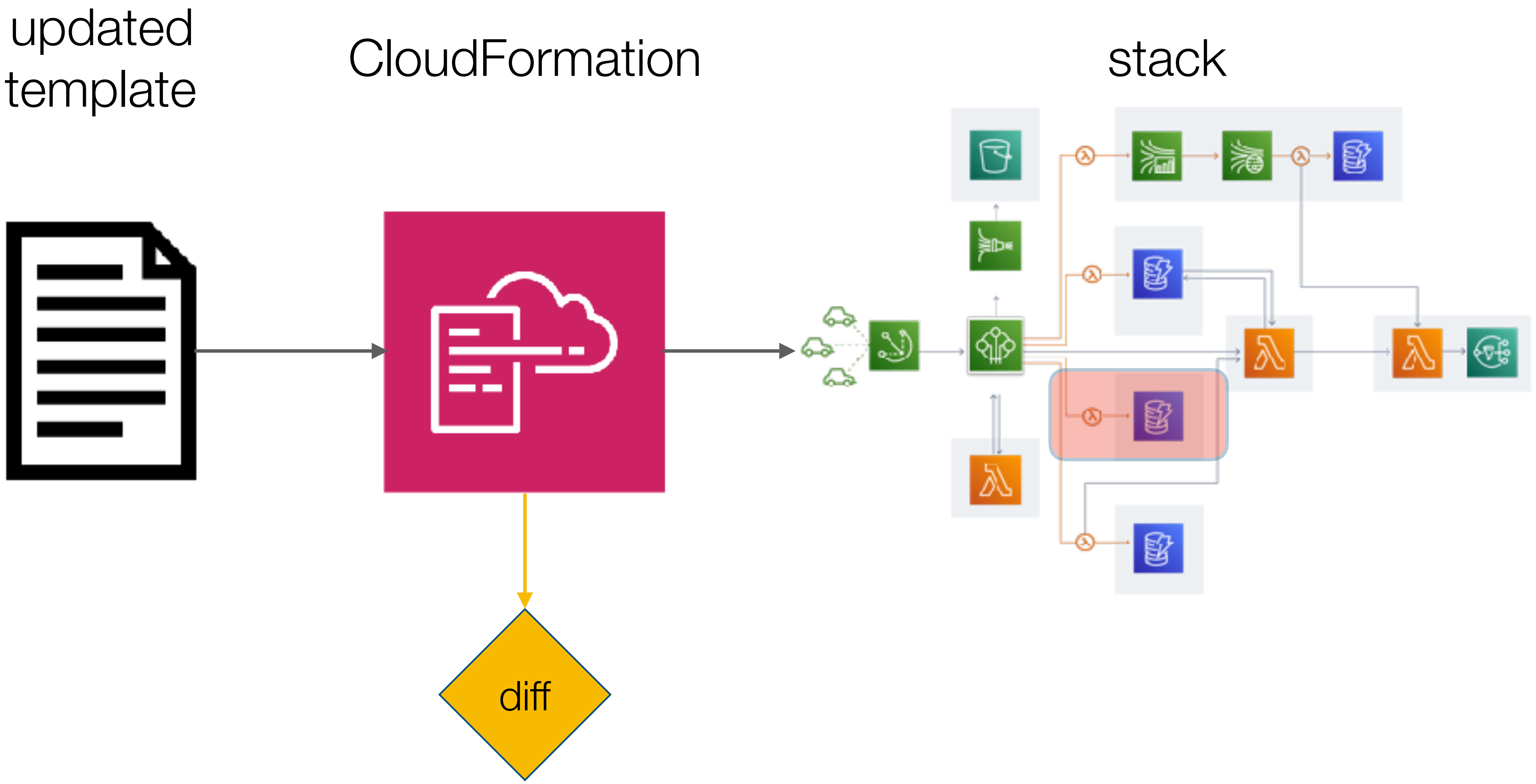
Resources (13)

Logical ID ▲	Physical ID	Type	Status	Status reason
InspektorCFOriginAccessIdentity	E18NNWF6BW995X	AWS::CloudFront::CloudFrontOriginAccessIdentity	✓ CREATE_COMPLETE	-
InspektorCloudFrontNonWWW	E1UVYSSY6V1ARL	AWS::CloudFront::Distribution	✓ CREATE_COMPLETE	-
InspektorCloudFrontWWW	E3QHLRC0K6GAAW	AWS::CloudFront::Distribution	✓ CREATE_COMPLETE	-
InspektorLogBucket	logs-Inspektor.matsonlabs.com	AWS::S3::Bucket	✓ CREATE_COMPLETE	-
InspektorNonWWWWebAddress	inspektor-website-InspektorNonWWWWebAddress-15QXQQ7UNPCC0	AWS::Route53::RecordSetGroup	✓ CREATE_COMPLETE	-
InspektorRedirectBucket	Inspektor.matsonlabs.com	AWS::S3::Bucket	✓ CREATE_COMPLETE	-
InspektorRedirectBucketPolicy	inspektor-website-InspektorRedirectBucketPolicy-1L5B0IR31PCY7	AWS::S3::BucketPolicy	✓ CREATE_COMPLETE	-
InspektorSiteIPWhiteListSet	140ef26b-b9be-4d3c-9e23-1c9229707507	AWS::WAF::IPSet	✓ CREATE_COMPLETE	-
InspektorSiteWAFRuleMatsonAccess	ab9ab92e-cb0b-4057-9d67-955e3f33aa21	AWS::WAF::Rule	✓ CREATE_COMPLETE	-

stacks

create
update
delete

update process



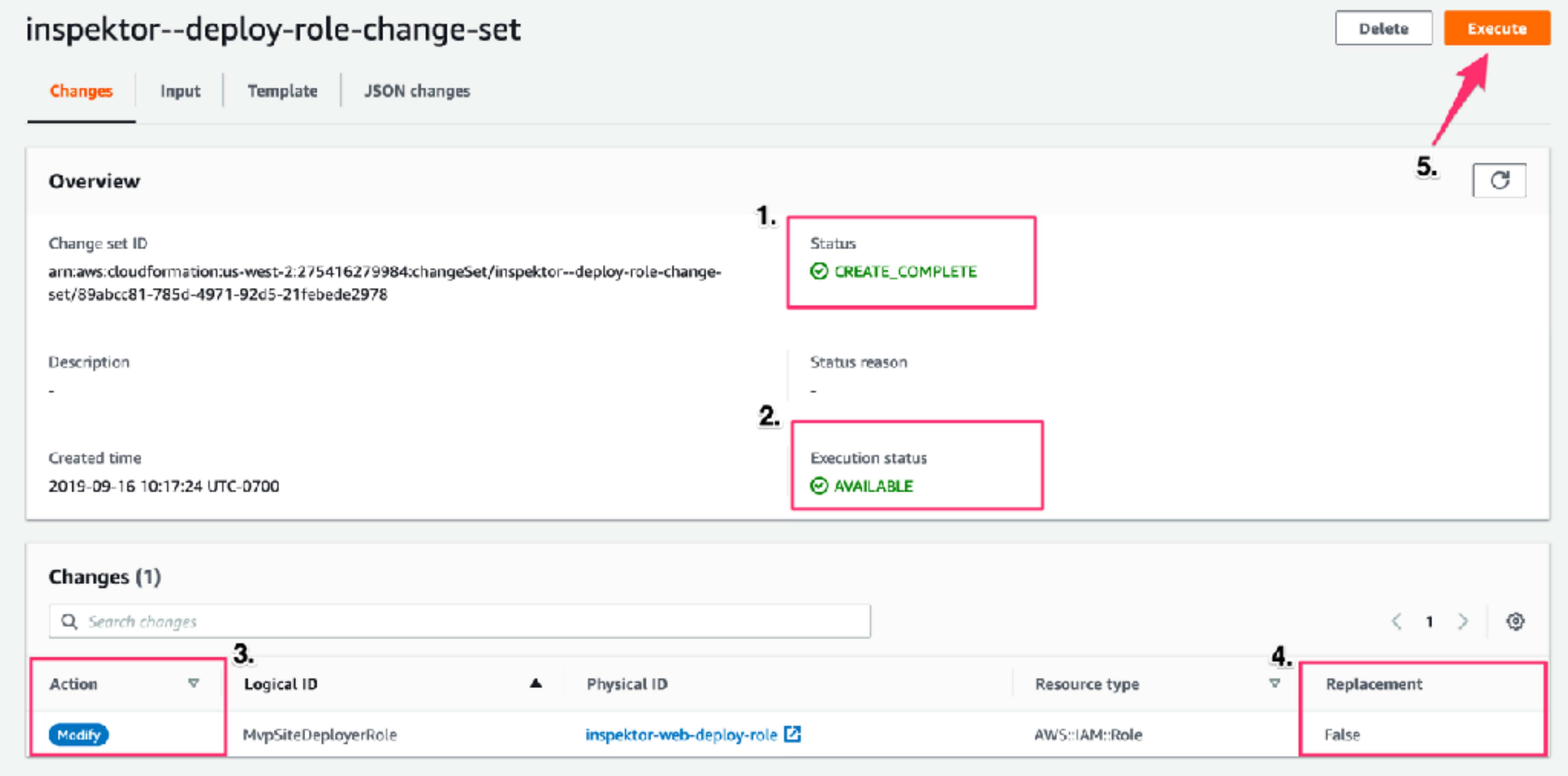
updated template

CloudFormation

stack

diff

change sets



inspektor--deploy-role-change-set

Overview

Change set ID
arn:aws:cloudformation:us-west-2:275416279984:changeSet/inspektor--deploy-role-change-set/89abcc81-785d-4971-92d5-21febede2978

Status
✓ CREATE_COMPLETE

Description
-

Status reason
-

Created time
2019-09-16 10:17:24 UTC-0700

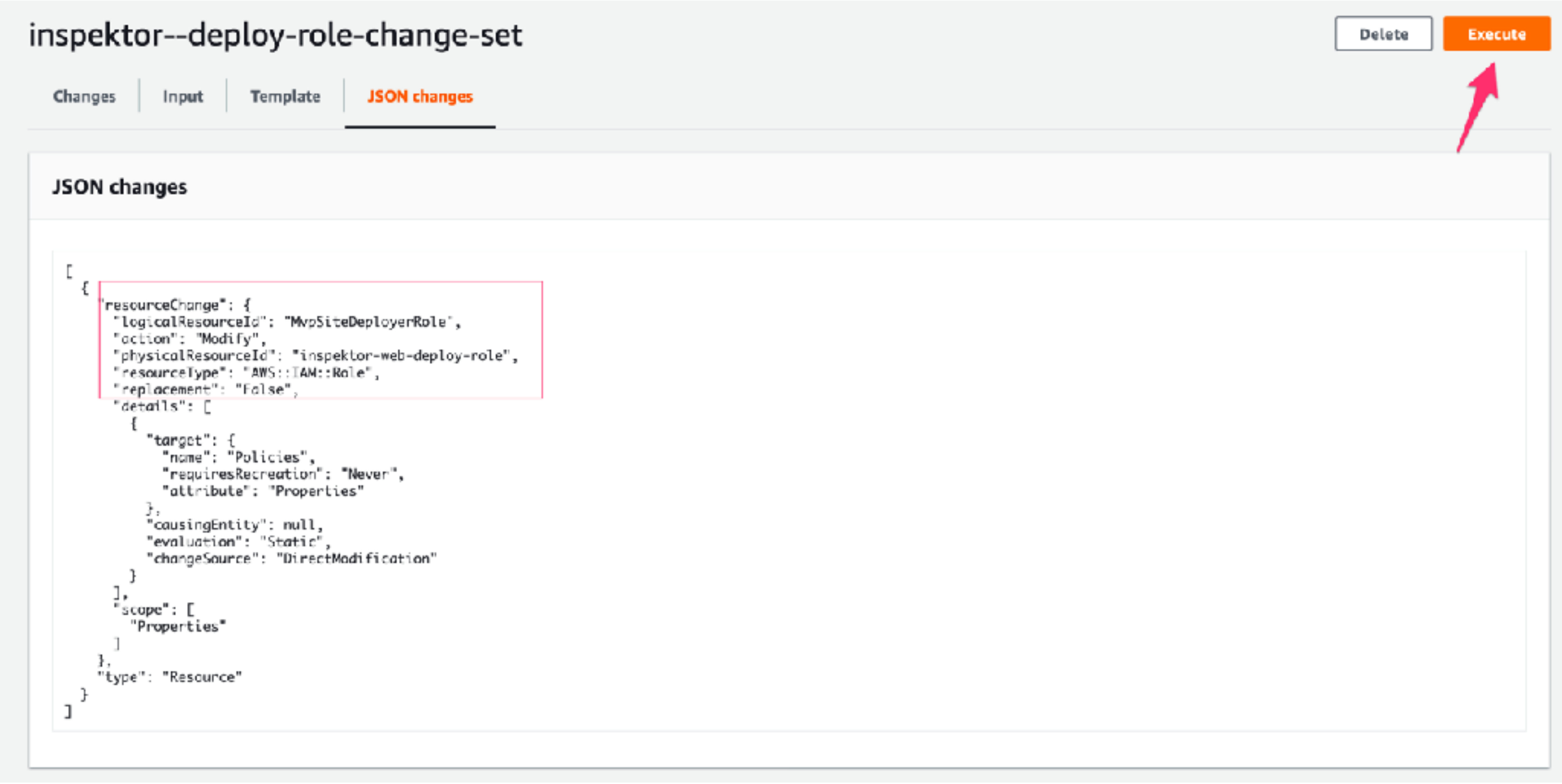
Execution status
✓ AVAILABLE

Changes (1)

Search changes

Action	Logical ID	Physical ID	Resource type	Replacement
Modify	MvpSiteDeployerRole	inspektor-web-deploy-role	AWS::IAM::Role	False

change sets

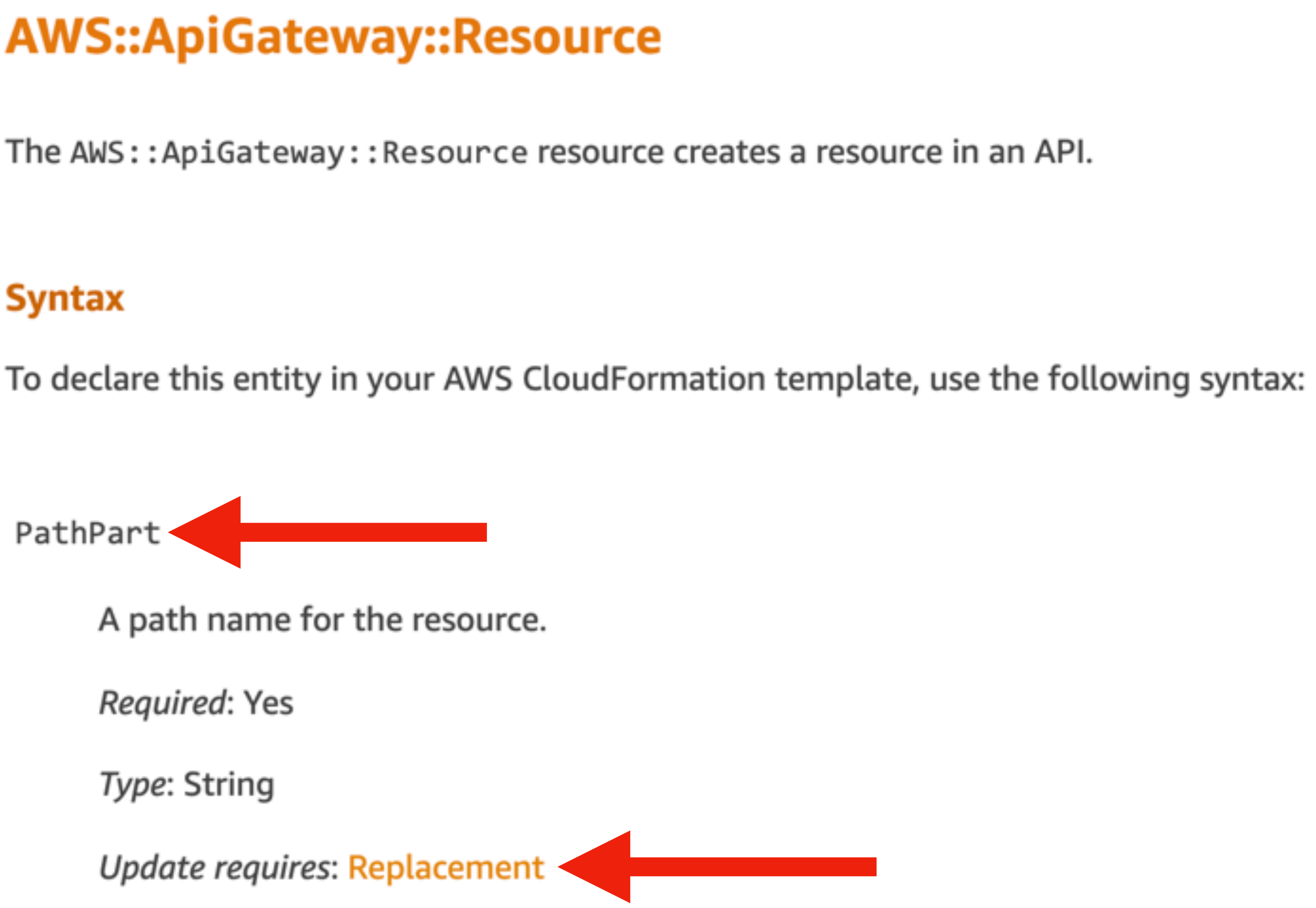


inspektor--deploy-role-change-set

JSON changes

```
[
  {
    "resourceChange": {
      "logicalResourceId": "MvpSiteDeployerRole",
      "action": "Modify",
      "physicalResourceId": "inspektor-web-deploy-role",
      "resourceType": "AWS::IAM::Role",
      "replacement": "False",
      "details": [
        {
          "target": {
            "name": "Policies",
            "requiresRecreation": "Never",
            "attribute": "Properties"
          },
          "causingEntity": null,
          "evaluation": "Static",
          "changeSource": "DirectModification"
        }
      ],
      "scope": [
        "Properties"
      ]
    },
    "type": "Resource"
  }
]
```

update rules example



AWS::ApiGateway::Resource

The `AWS::ApiGateway::Resource` resource creates a resource in an API.

Syntax

To declare this entity in your AWS CloudFormation template, use the following syntax:

`PathPart`

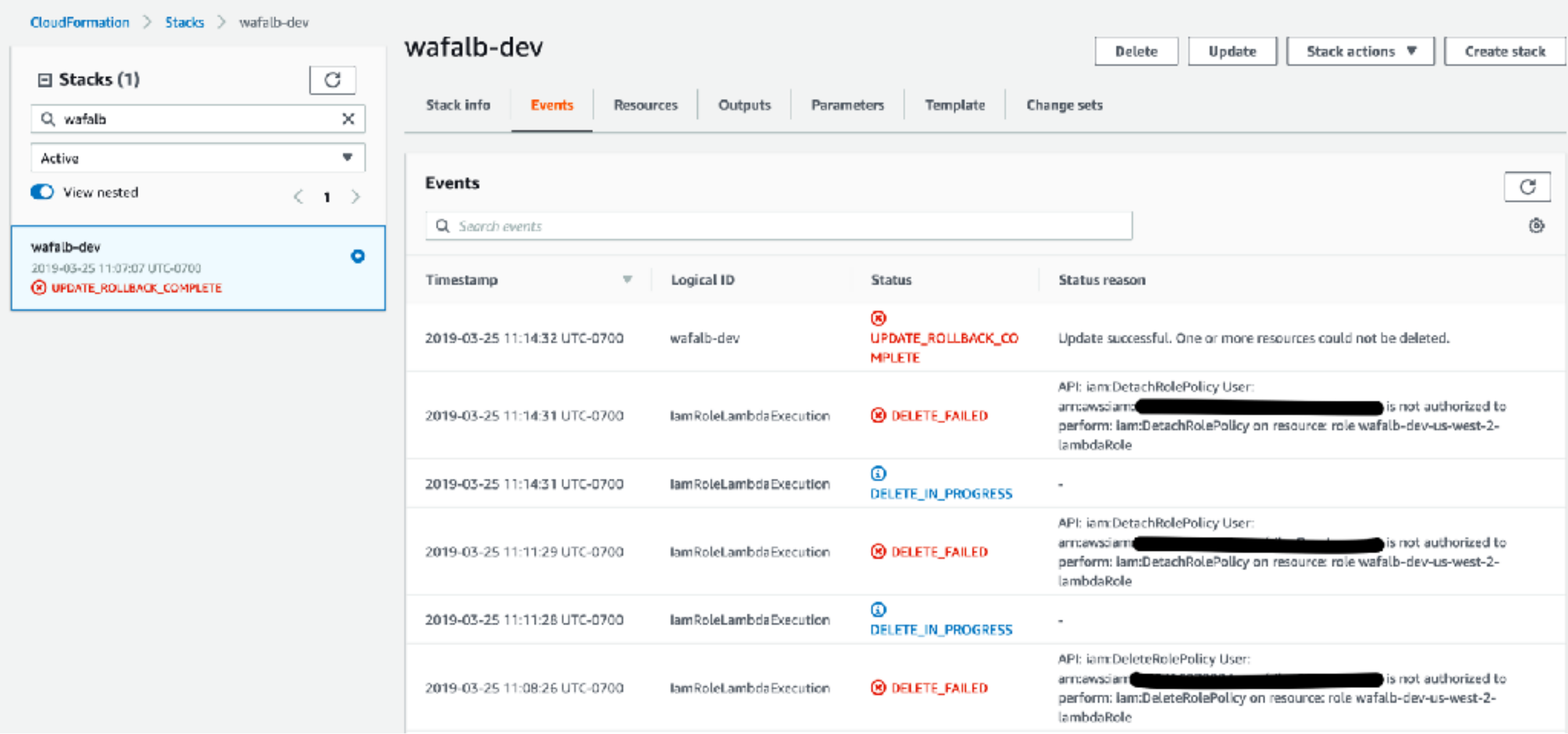
A path name for the resource.

Required: Yes

Type: String

Update requires: Replacement

stack errors



wafalb-dev
2019-03-25 11:07:07 UTC-0700
⊗ UPDATE_ROLLBACK_COMPLETE

wafalb-dev

Events

Timestamp ▼	Logical ID	Status	Status reason
2019-03-25 11:14:32 UTC-0700	wafalb-dev	⊗ UPDATE_ROLLBACK_COMPLETE	Update successful. One or more resources could not be deleted.
2019-03-25 11:14:31 UTC-0700	IamRoleLambdaExecution	⊗ DELETE_FAILED	API: iam:DetachRolePolicy User: arn:aws:iam:[redacted] is not authorized to perform: iam:DetachRolePolicy on resource: role wafalb-dev-us-west-2-lambdaRole
2019-03-25 11:14:31 UTC-0700	IamRoleLambdaExecution	ⓘ DELETE_IN_PROGRESS	-
2019-03-25 11:11:29 UTC-0700	IamRoleLambdaExecution	⊗ DELETE_FAILED	API: iam:DetachRolePolicy User: arn:aws:iam:[redacted] is not authorized to perform: iam:DetachRolePolicy on resource: role wafalb-dev-us-west-2-lambdaRole
2019-03-25 11:11:28 UTC-0700	IamRoleLambdaExecution	ⓘ DELETE_IN_PROGRESS	-
2019-03-25 11:08:26 UTC-0700	IamRoleLambdaExecution	⊗ DELETE_FAILED	API: iam:DeleteRolePolicy User: arn:aws:iam:[redacted] is not authorized to perform: iam:DeleteRolePolicy on resource: role wafalb-dev-us-west-2-lambdaRole

be wary of micro-templates

200 stacks per-account (hard limit)

AWS account management strategy becomes important

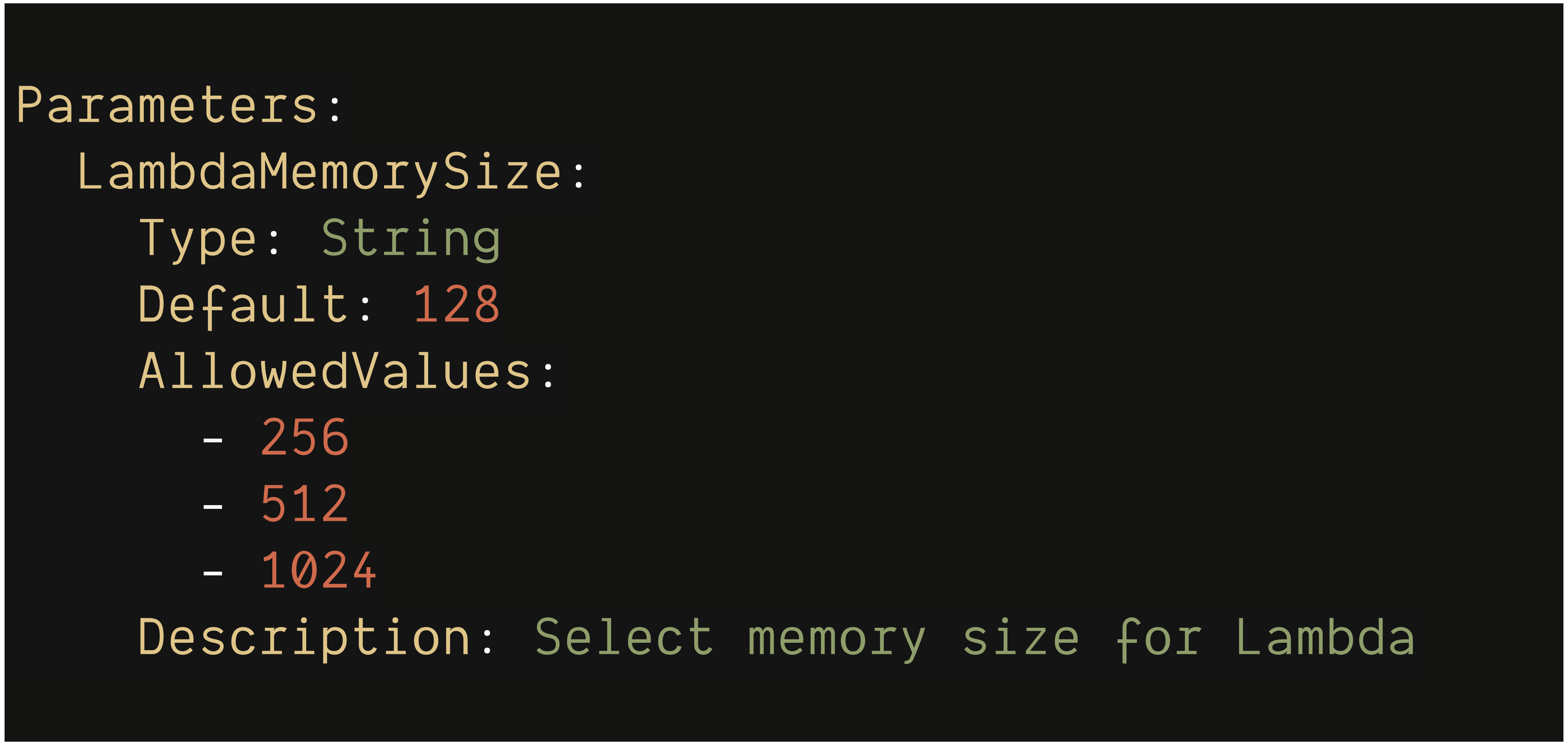
core building blocks

- parameters
- pseudo parameters
- intrinsic functions
- mappings

parameters

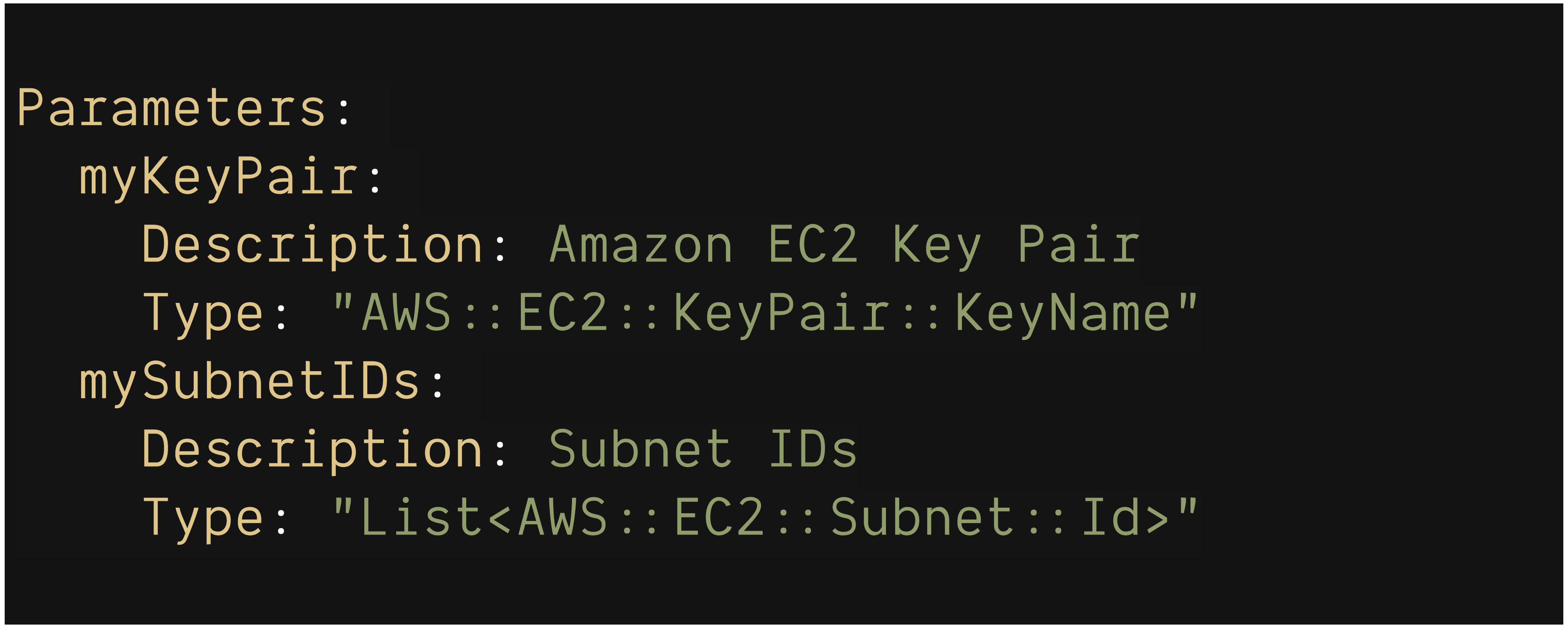
```
AWSTemplateFormatVersion: "2010-09-09"
Parameters:
  SiteBucket:
    Description: Enter the site hosting S3 bucket name
    Type: String

  …

  MyBucket:
    Type: AWS::S3::Bucket
    Properties:
      BucketName: !Ref SiteBucket


  …

  Statement:
    - Effect: Allow
      Action:
        - s3:PutObject
      Resource: !Sub "arn:aws:s3:::${SiteBucket}/*"
```

parameter lists



```
Parameters:
  LambdaMemorySize:
    Type: String
    Default: 128
    AllowedValues:
      - 256
      - 512
      - 1024
    Description: Select memory size for Lambda
```

AWS parameter types



```yaml
Parameters:
  myKeyPair:
    Description: Amazon EC2 Key Pair
    Type: "AWS::EC2::KeyPair::KeyName"
  mySubnetIDs:
    Description: Subnet IDs
    Type: "List<AWS::EC2::Subnet::Id>"
```

pseudo parameters

```
AWS::AccountId
AWS::NotificationARNs
AWS::NoValue
AWS::Partition
AWS::Region
AWS::StackId
AWS::StackName
AWS::URLSuffix
```

pseudo parameters

```
Resources:
  DeployerRole:
    Type: AWS::IAM::Role
    Properties:
      RoleName: !Sub ${AWS::StackName}-role
      AssumeRolePolicyDocument:
        Version: "2012-10-17"
        Statement:
          - Effect: Allow
            Principal:
              AWS: !Sub arn:aws:iam:${AWS::Region}:${AWS::AccountId}:role/
name
              Service: s3.amazonaws.com
            Action: sts:AssumeRole
      Path: /
```

intrinsic functions

```
Fn::Base64
Fn::Cidr
Fn::FindInMap
Fn::GetAtt
Fn::GetAZs
Fn::ImportValue
Fn::Join
Fn::Select
Fn::Split
Fn::Sub
Fn::Transform
Ref
Conditional Functions
```

Sub

Ref

Join

FindInMap

GetAtt

Conditional Functions

Sub

```
!Sub ${String}
```

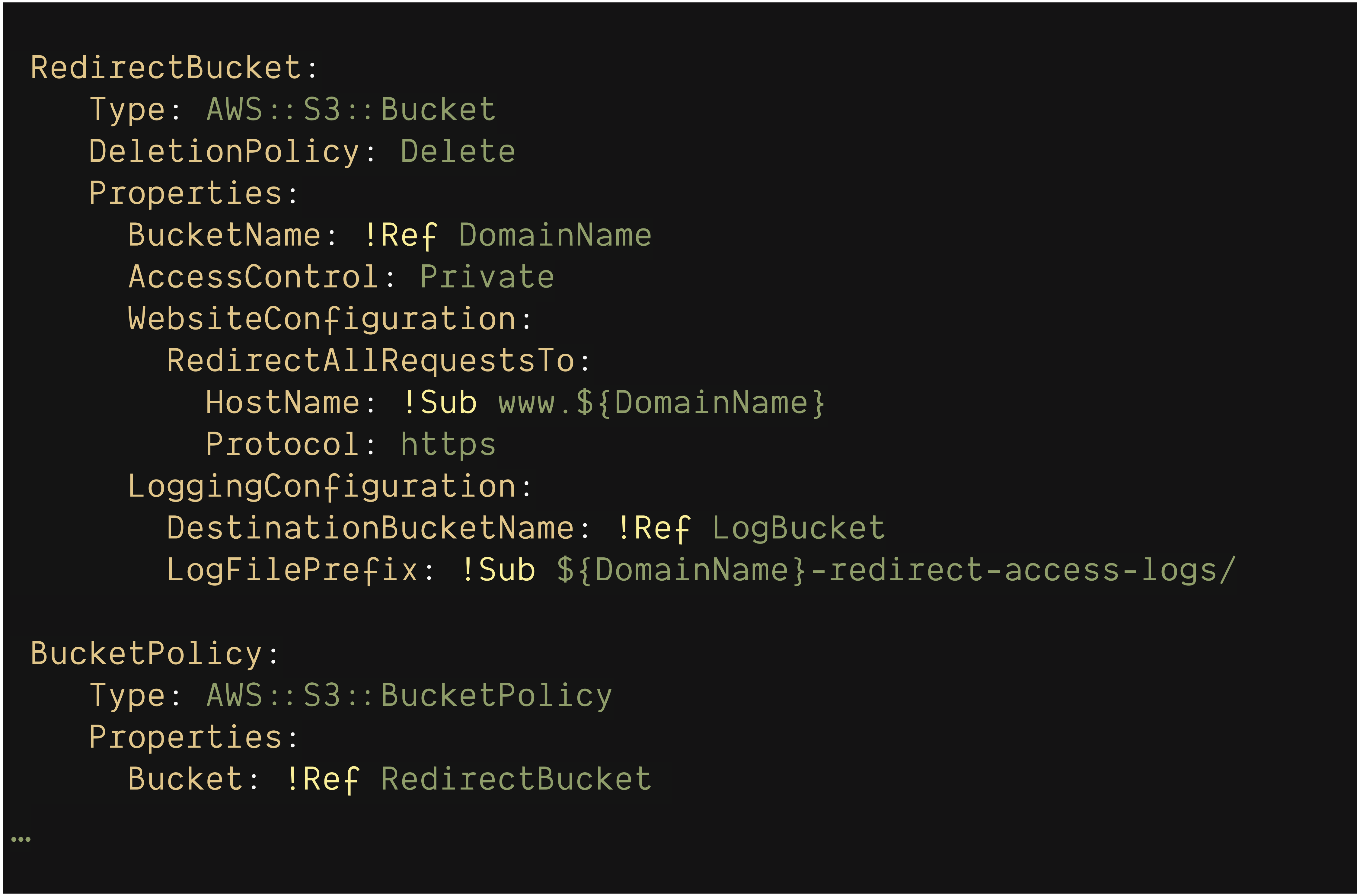
Sub

```
Resources:
  DeployerRole:
    Type: AWS::IAM::Role
    Properties:
      RoleName: !Sub ${AWS::StackName}-role
      AssumeRolePolicyDocument:
        Version: "2012-10-17"
        Statement:
          - Effect: Allow
            Principal:
              AWS: !Sub arn:aws:iam::${AWS::AccountId}:role/${XaccntRoleName}
              Service: s3.amazonaws.com
            Action: sts:AssumeRole
      Path: /
```

Ref

```
!Ref logicalName
```

Ref

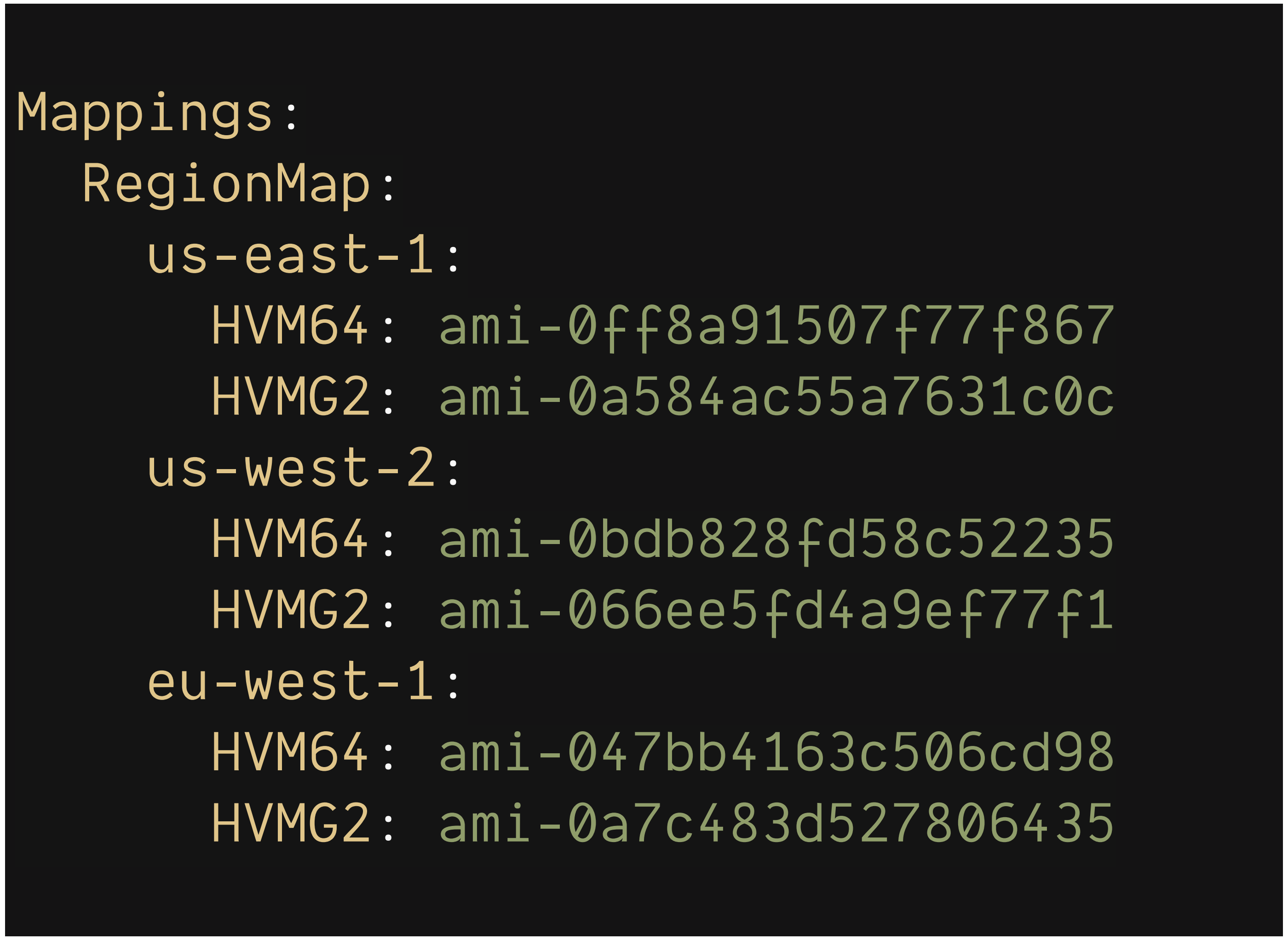


```
RedirectBucket:
   Type: AWS::S3::Bucket
   DeletionPolicy: Delete
   Properties:
     BucketName: !Ref DomainName
     AccessControl: Private
     WebsiteConfiguration:
       RedirectAllRequestsTo:
         HostName: !Sub www.${DomainName}
         Protocol: https
     LoggingConfiguration:
       DestinationBucketName: !Ref LogBucket
       LogFilePrefix: !Sub ${DomainName}-redirect-access-logs/

BucketPolicy:
   Type: AWS::S3::BucketPolicy
   Properties:
     Bucket: !Ref RedirectBucket
…
```

Mappings

```
Mappings:
  Mapping01:
    Key01:
      Name:Value01
    Key02:
      Name:Value02
    Key03:
      Name:Value03
```

Mappings

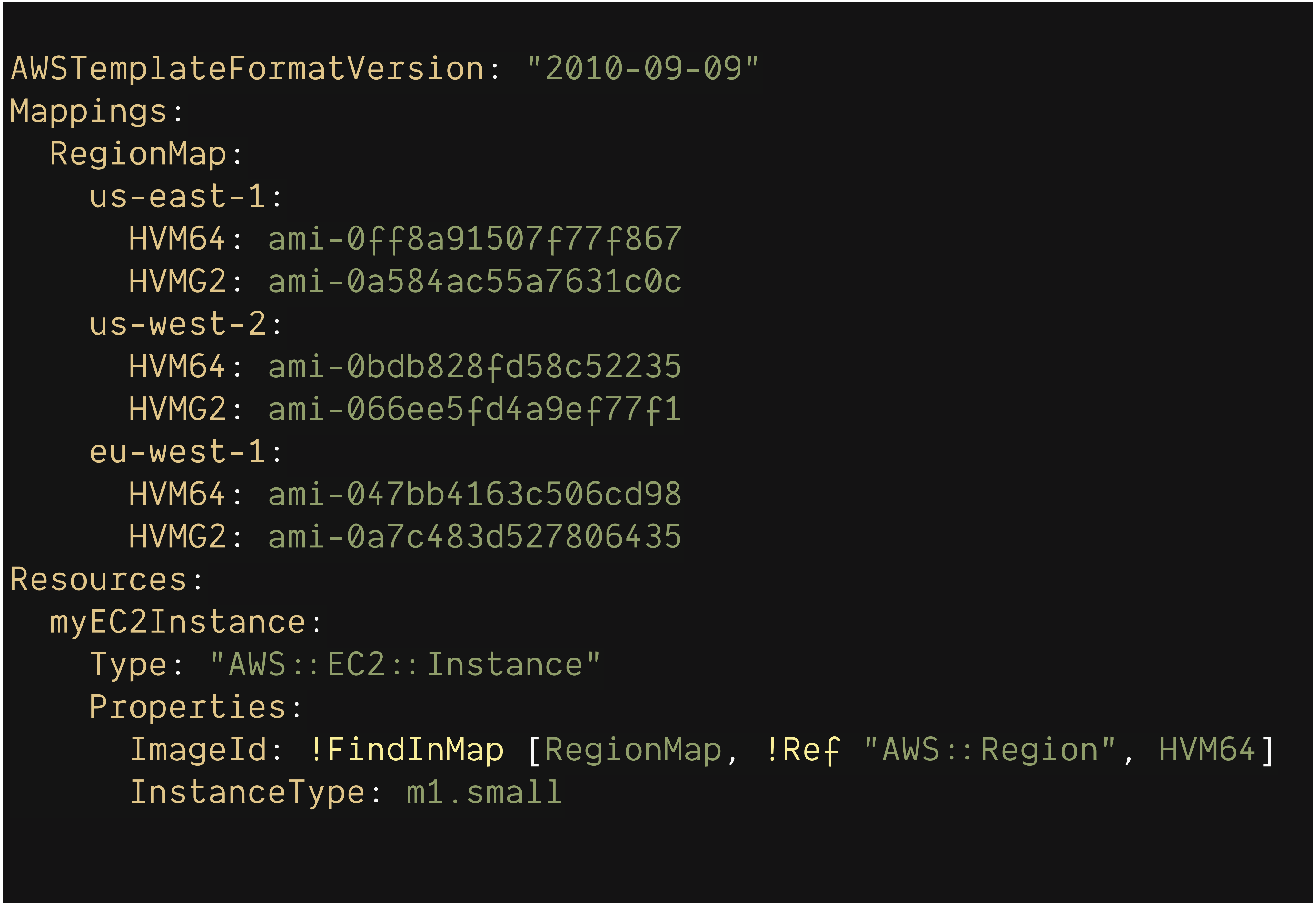


```
Mappings:
  RegionMap:
    us-east-1:
      HVM64: ami-0ff8a91507f77f867
      HVMG2: ami-0a584ac55a7631c0c
    us-west-2:
      HVM64: ami-0bdb828fd58c52235
      HVMG2: ami-066ee5fd4a9ef77f1
    eu-west-1:
      HVM64: ami-047bb4163c506cd98
      HVMG2: ami-0a7c483d527806435
```

FindInMap

```
!FindInMap [ MapName, TopLevelKey, SecondLevelKey ]
```

FindInMap



```yaml
AWSTemplateFormatVersion: "2010-09-09"
Mappings:
  RegionMap:
    us-east-1:
      HVM64: ami-0ff8a91507f77f867
      HVMG2: ami-0a584ac55a7631c0c
    us-west-2:
      HVM64: ami-0bdb828fd58c52235
      HVMG2: ami-066ee5fd4a9ef77f1
    eu-west-1:
      HVM64: ami-047bb4163c506cd98
      HVMG2: ami-0a7c483d527806435
Resources:
  myEC2Instance:
    Type: "AWS::EC2::Instance"
    Properties:
      ImageId: !FindInMap [RegionMap, !Ref "AWS::Region", HVM64]
      InstanceType: m1.small
```

GetAtt

```
!GetAtt logicalNameOfResource.attributeName
```

GetAtt

```
myELB:
  Type: AWS::ElasticLoadBalancing::LoadBalancer
  Properties:
    AvailabilityZones:
      - eu-west-1a
    Listeners:
      - LoadBalancerPort: '80'
        InstancePort: '80'
        Protocol: HTTP
myELBIngressGroup:
  Type: AWS::EC2::SecurityGroup
  Properties:
    GroupDescription: ELB ingress group
    SecurityGroupIngress:
      - IpProtocol: tcp
        FromPort: '80'
        ToPort: '80'
        SourceSecurityGroupOwnerId: !GetAtt myELB.SourceSecurityGroup.OwnerAlias
        SourceSecurityGroupName: !GetAtt myELB.SourceSecurityGroup.GroupName
```

Join

```
!Join: [ delimiter, [ comma-delimited list of values ] ]
```

Join

```
EC2:
  Type: "AWS::EC2::Instance"
  Properties:
    ImageId: ami-xxxxxxx
    InstanceType: t2-micro

Outputs:
  wpadmin:
    Description: WP Admin Login URL
    Value:
      !Join ["", ["http://", !GetAtt EC2.PublicIp, "/wordpress/wp-login.php"]]
```

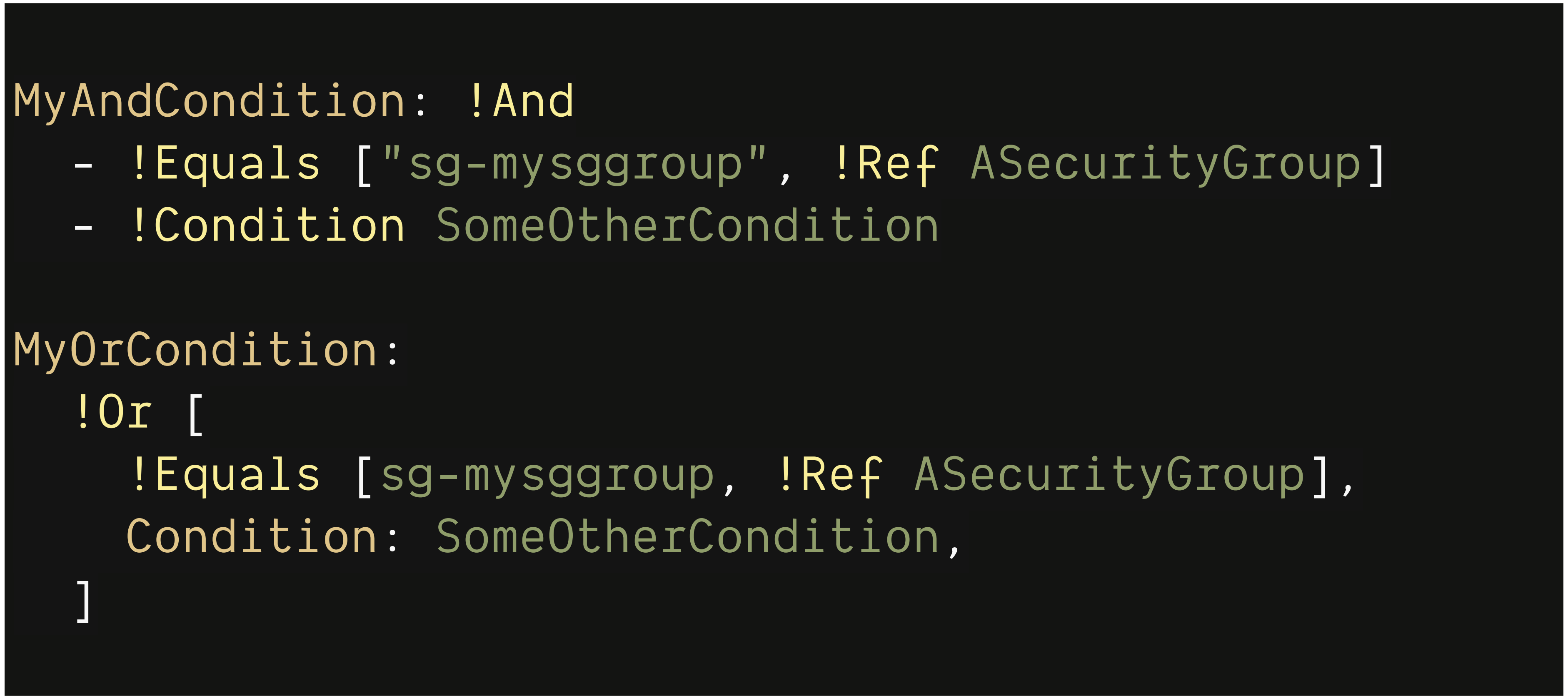
conditional functions

```
!Equals [value_1, value_2]

!Not [condition]

!And [condition]

!Or [condition, …]

!If [condition_name, value_if_true, value_if_false]
```

Equals, Not

```
Conditions:
  isProd: !Equals [!Ref AccountType, "prod"]
  isNotProd: !Not [!Equals [!Ref AccountType, "prod"]]

EC2:
  Type: AWS::EC2::Instance
  Condition: isProd

Lambda:
  Type: AWS::Lambda::Function
  Condition: isNotProd
```

And, Or

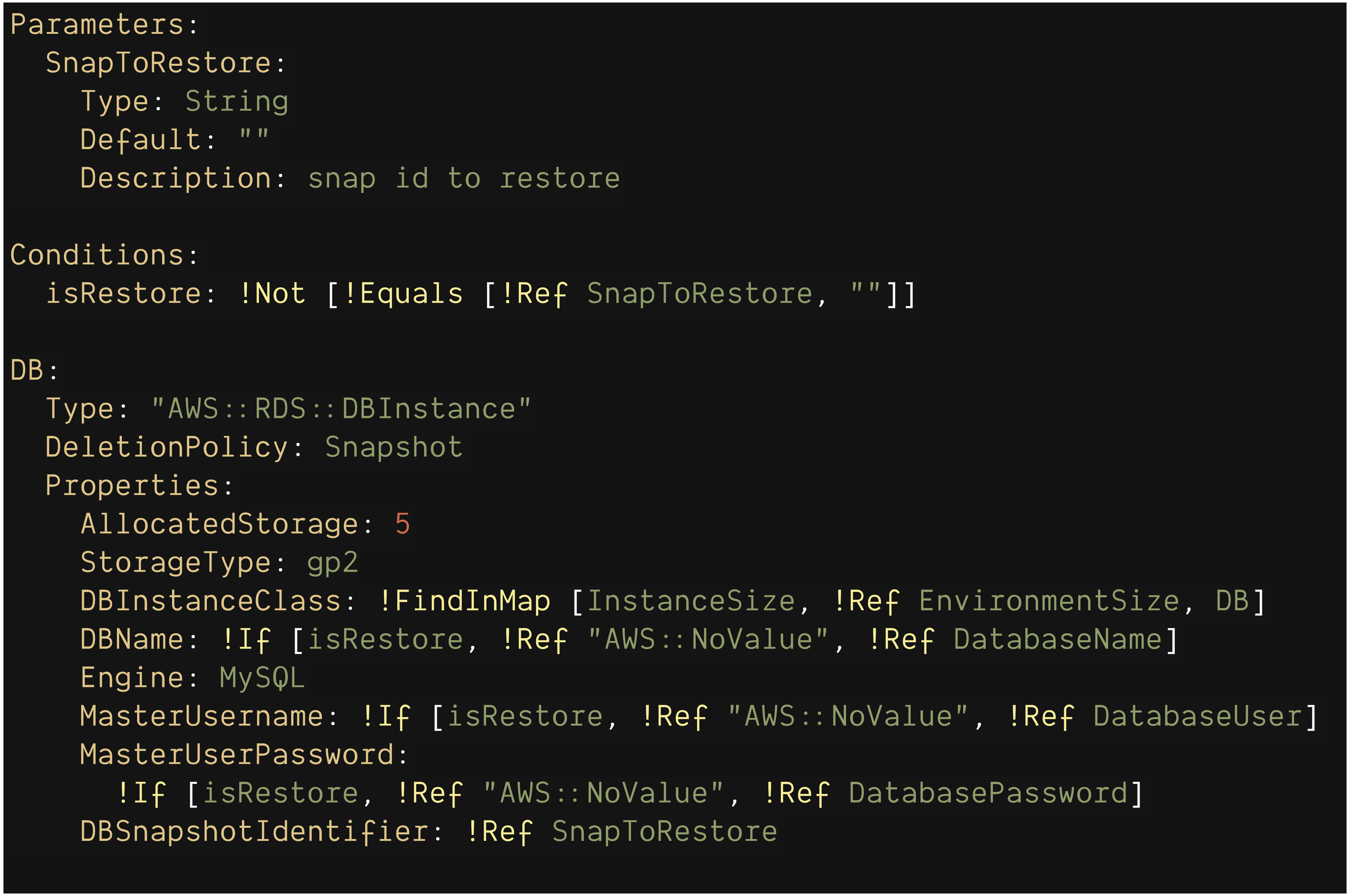


```
MyAndCondition: !And
  - !Equals ["sg-mysggroup", !Ref ASecurityGroup]
  - !Condition SomeOtherCondition

MyOrCondition:
  !Or [
    !Equals [sg-mysggroup, !Ref ASecurityGroup],
    Condition: SomeOtherCondition,
  ]
```

If

```
SecurityGroups:
  - !If [CreateNewSecurityGroup, !Ref NewSecurityGroup, !Ref ExistingSecurityGroup]
```

If cont’d



```
Parameters:
  SnapToRestore:
    Type: String
    Default: ""
    Description: snap id to restore

Conditions:
  isRestore: !Not [!Equals [!Ref SnapToRestore, ""]]

DB:
  Type: "AWS::RDS::DBInstance"
  DeletionPolicy: Snapshot
  Properties:
    AllocatedStorage: 5
    StorageType: gp2
    DBInstanceClass: !FindInMap [InstanceSize, !Ref EnvironmentSize, DB]
    DBName: !If [isRestore, !Ref "AWS::NoValue", !Ref DatabaseName]
    Engine: MySQL
    MasterUsername: !If [isRestore, !Ref "AWS::NoValue", !Ref DatabaseUser]
    MasterUserPassword:
      !If [isRestore, !Ref "AWS::NoValue", !Ref DatabasePassword]
    DBSnapshotIdentifier: !Ref SnapToRestore
```

configuration management

user data
cfn-init
cfn-signal
cfn-hup

resources

CloudFormation Docs
https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/Welcome.html

Introduction to CloudFormation (A Cloud Guru, 2.5 hrs)
https://acloud.guru/learn/aws-cloudformation

Advanced CloudFormation (A Cloud Guru, 12 hrs)
https://acloud.guru/learn/aws-advanced-cloudformation

Presentation Material
https://github.com/davetownsend/presentations/tree/master/2019/IaC

@davetownsend