Infrastructure as Code deep dive

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Session 300

I will not talk about

Infrastructure as ~~Click~~

~~Why IaC?~~

~~How to do IaC?~~

I will not compare IaC tools

	AWS CLI	AWS CFN	CDK	Terraform	SAM	Serverless
Vendor	AWS	AWS	AWS	HashiCorp	AWS	Serverless
Language	Shell	YAML	TypeScript, Python, Java	DSL	YAML	YAML
Backend	API	API	CFN	API	CFN	API
Drift	No	Yes	No	Yes	No	No
CRUD	No	Yes	Yes	Yes	Yes	Yes
Multi Accounts	No*	Yes	No*	Yes	No*	No
Import	No	Yes	No	Yes	No	No
Infra	Anything	Anything	Anything	Anything	Serverless	Serverless

$ (whoami)

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So what will we talk about then?

Here is a story about a person …

Making our engineer’s life better

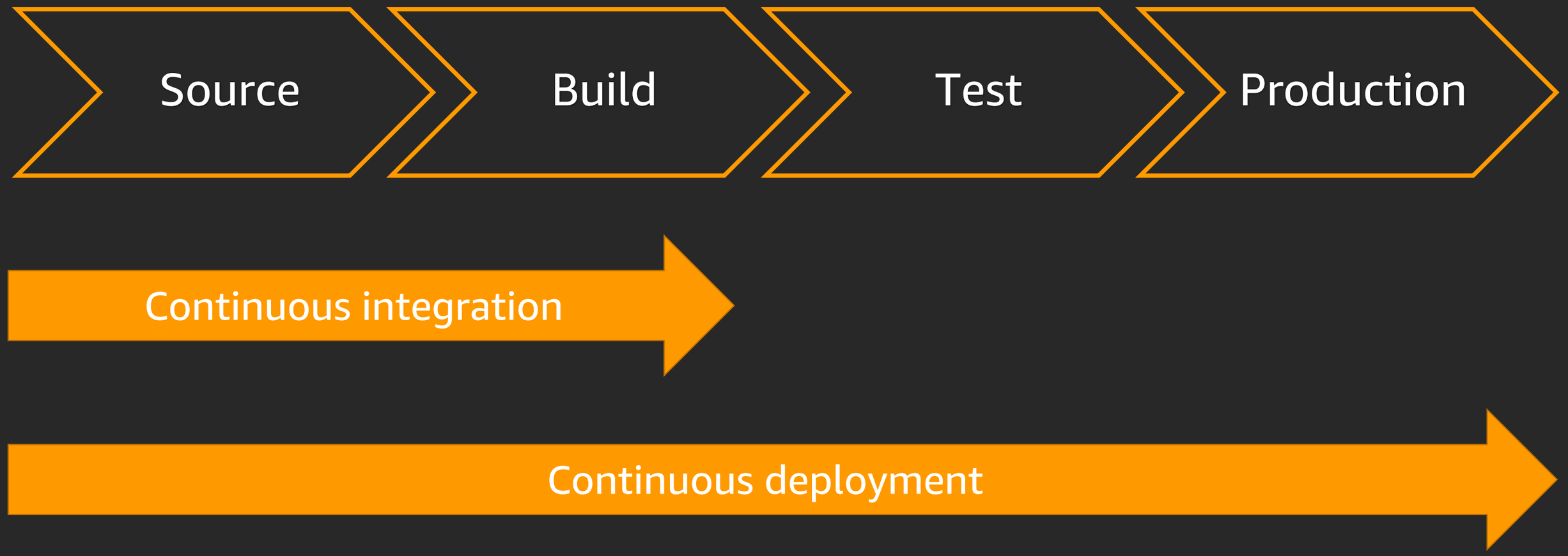

8562hd90096
IK51070 51.

```
1 import cdk = require('@aws-cdk/core');
2 import ec2 = require('@aws-cdk/aws-ec2');
3 import lambda = require('@aws-cdk/aws-lambda');
4 import iam = require('@aws-cdk/aws-iam');
5 import elbv2 = require('@aws-cdk/aws-elasticloadbalancingv2');
6 import elbv2Targets = require('@aws-cdk/aws-elasticloadbalancingv2-targets');
7
8
9 export class AlbGoingGlobalWithServerlessStack extends cdk.Stack {
10   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
11     super(scope, id, props);
12
13     // The code that defines your stack goes here
14
15     // VPC
16     const vpc = new ec2.Vpc(this, 'VPC');
17
18     // The code that defines your stack goes here
19     const getGlobalALB = new lambda.Function(this, 'getGlobalALB', {
20       runtime: lambda.Runtime.NODEJS_8_10,
21       code: lambda.Code.asset('lambda'),
22       handler: 'getStuff.handler',
23       environment: {
24         'STATUS':'200'
25       }
26     });
27
28     // IAM Policy
29     const lambdaDynamoDbStatement = new iam.PolicyStatement();
30     lambdaDynamoDbStatement.addActions('*');
```

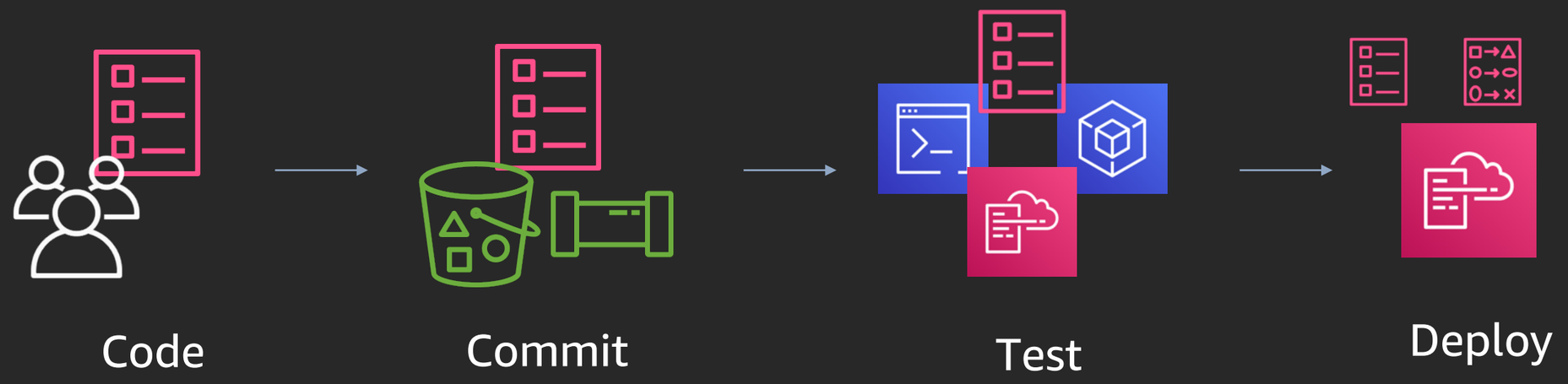
Piece of code

```yaml
AWSTemplateFormatVersion: "2010-09-09"
Description: A CodeCommit Repo and Cloud9 Environment
Resources:
  MyRepo:
    Type: "AWS::CodeCommit::Repository"
    Properties:
      RepositoryName: MyRepo
      RepositoryDescription: Sample Repository for Demo
  MyC9Environment:
    Type: "AWS::Cloud9::EnvironmentEC2"
    Properties:
      Repositories:
        - PathComponent: /cfn
          RepositoryUrl: !GetAtt MyRepo.CloneUrlHttp
      InstanceType: t2.micro
```

Take it through a pipeline



Workflow



Repeat

Delivery of CloudFormation

So what is AWS CloudFormation?

Sample AWS CloudFormation code

- Code is written in files called templates
- A stack is generated from a template
- Templates primarily define resources for an application
- AWS CloudFormation can create over 490 types of resources
- Each resource is configured based on its available properties
- Dependencies can be explicitly declared or implicitly discovered

```yaml
AWSTemplateFormatVersion: "2010-09-09"
Description: A CodeCommit Repo and Cloud9 Environment
Resources:
  MyRepo:
    Type: "AWS::CodeCommit::Repository"
    Properties:
      RepositoryName: MyRepo
      RepositoryDescription: Sample Repository for Demo
  MyC9Environment:
    Type: "AWS::Cloud9::EnvironmentEC2"
    Properties:
      Repositories:
        - PathComponent: /cfn
          RepositoryUrl: !GetAtt MyRepo.CloneUrlHttp
      InstanceType: t2.micro
```

Best practices start in the code editor

```
66      DestinationCidrBlock: '0.0.0.0/0'
67      GatewayId: !Ref IGW
68
69
70      (W40) Security Groups egress with an IpProtocol of -1 found (W40)
71      (W5) Security Groups found with cidr open to world on egress (W5)
72      (W9) Security Groups found with ingress cidr that is not /32 (W9)
73      (W2) Security Groups found with cidr open to world on ingress.  This should never
74      be true on instance.  Permissible on ELB (W2)
75      (W36) Security group rules without a description obscure their purpose and may lead
76      to bad practices in ensuring they only allow traffic from the ports and
77      sources/destinations required. (W36)
78      Peek Problem    No quick fixes available
79
80    SG:
81      Type: "AWS::EC2::SecurityGroup"
82      Properties:
83        GroupDescription: "SSH and HTTP"
84        VpcId: !Ref VPC
85        SecurityGroupIngress:
86          -
87            CidrIp: "0.0.0.0/0"
88            IpProtocol: "tcp"
89            FromPort: 22
90            ToPort: 22
91          -
92            SourceSecurityGroupId: !Ref LBSG
93            IpProtocol: "tcp"
94            FromPort: 80
95            ToPort: 80
96
```

- Use a good (best) editor! 🤔
- Make use of the plugins/tools out there
- Use the AWS Toolkit/Cloudformation plugins for added features.

```
⚠ (W33) EC2 Subnet should not have MapPublicIpOnLaunch set to true (W33) [18, 3]
⚠ (W33) EC2 Subnet should not have MapPublicIpOnLaunch set to true (W33) [29, 3]
⚠ (W40) Security Groups egress with an IpProtocol of -1 found (W40) [81, 3]
⚠ (W5) Security Groups found with cidr open to world on egress (W5) [81, 3]
⚠ (W9) Security Groups found with ingress cidr that is not /32 (W9) [81, 3]
⚠ (W2) Security Groups found with cidr open to world on ingress. This should never be true on instance. Permissible on ELB (W2) [81
⚠ (W36) Security group rules without a description obscure their purpose and may lead to bad practices in ensuring they only allow tra
⚠ (W40) Security Groups egress with an IpProtocol of -1 found (W40) [105, 3]
```

The tool behind it – cfn-nag

```
-------------------------------------------------------------
| FAIL F2
|
| Resources: ["InstanceRole"]
| Line Numbers: [215]
|
| IAM role should not allow * action on its trust policy
-------------------------------------------------------------
| WARN W9
|
| Resources: ["SG", "LBSG"]
| Line Numbers: [82, 106]
|
| Security Groups found with ingress cidr that is not /32
-------------------------------------------------------------
| WARN W36
|
| Resources: ["SG", "LBSG"]
| Line Numbers: [82, 106]
|
| Security group rules without a description obscure their purpose and
 the ports and sources/destinations required.

Failures count: 1
Warnings count: 8
```

- Patterns that indicate insecure infrastructure
- Bring your own rules
- Run against multiple templates
- github.com/stelligent/cfn_nag

```
gem install cfn_nag --user
```

Command line linting with cfn-lint

- Code linter for CloudFormation templates
- Can lint against different regions
- Can be configure directly within cloudformation templates
- github.com/aws-cloudformation/cfn-python-lint


```
pip3 install cfn-lint --user
```

Lint twice, deploy once!

```
➜  cfn-infra-workshop git:(master)
➜  cfn-infra-workshop git:(master) cfn-lint nodes-asg-cfn.yml
W3010 Don't hardcode eu-west-1a for AvailabilityZones
nodes-asg-cfn.yml:23:7

W3010 Don't hardcode eu-west-1b for AvailabilityZones
nodes-asg-cfn.yml:34:7

➜  cfn-infra-workshop git:(master) cfn-lint nodes-asg-cfn.yml --regions eu-north-1
W3010 Don't hardcode eu-west-1a for AvailabilityZones
nodes-asg-cfn.yml:23:7

W3010 Don't hardcode eu-west-1b for AvailabilityZones
nodes-asg-cfn.yml:34:7

E3030 You must specify a valid value for InstanceType (t2.micro).
Valid values are ["c5.12xlarge", "c5.18xlarge", "c5.24xlarge", "c5.2xlarge", "c5.4xlarge", "c5.9xlarge", "c5.large", "c5.metal", "c5.xla$
ge", "c5d.12xlarge", "c5d.18xlarge", "c5d.24xlarge", "c5d.2xlarge", "c5d.4xlarge", "c5d.9xlarge", "c5d.large", "c5d.metal", "c5d.xlarge"$
 "d2.2xlarge", "d2.4xlarge", "d2.8xlarge", "d2.xlarge", "g4dn.12xlarge", "g4dn.16xlarge", "g4dn.2xlarge", "g4dn.4xlarge", "g4dn.8xlarge"$
 "g4dn.xlarge", "i3.16xlarge", "i3.2xlarge", "i3.4xlarge", "i3.8xlarge", "i3.large", "i3.metal", "i3.xlarge", "m5.12xlarge", "m5.16xlarg$
", "m5.24xlarge", "m5.2xlarge", "m5.4xlarge", "m5.8xlarge", "m5.large", "m5.metal", "m5.xlarge", "m5d.12xlarge", "m5d.16xlarge", "m5d.24$
large", "m5d.2xlarge", "m5d.4xlarge", "m5d.8xlarge", "m5d.large", "m5d.metal", "m5d.xlarge", "r5.12xlarge", "r5.16xlarge", "r5.24xlarge"$
 "r5.2xlarge", "r5.4xlarge", "r5.8xlarge", "r5.large", "r5.metal", "r5.xlarge", "r5d.12xlarge", "r5d.16xlarge", "r5d.24xlarge", "r5d.2xl$
rge", "r5d.4xlarge", "r5d.8xlarge", "r5d.large", "r5d.metal", "r5d.xlarge", "t3.2xlarge", "t3.large", "t3.medium", "t3.micro", "t3.nano"$
 "t3.small", "t3.xlarge"]
nodes-asg-cfn.yml:153:7

➜  cfn-infra-workshop git:(master)
```

Test at scale with Taskcat

- Tests AWS Cloudformation templates by deploying them
- Uses cfn-lint out of the box for linting
- Deploys to multiple regions with different parameter sets
- Provides report generation and log collection
- Ability to build and package lambda functions
- github.com/aws-quickstart/taskcat


```
pip3 install taskcat --user
```

Taskcat tests

```yaml
project:
  name: iac-deepdive
  regions:
  - us-west-2
  - eu-north-1
tests:
  us-west-2:
    parameters:
      Key: darko-us-west-2
      InstanceType: t2.micro
      AMI: ami-079f731edfe27c29c
    regions:
      - us-west-2
    template: ./tester-template.yml
  eu-north-1:
    parameters:
      Key: darko-eu-north-1
      InstanceType: t3.micro
      AMI: ami-01a7a49829bda9d79
    regions:
      - eu-north-1
    template: ./tester-template.yml
~
~
1 | .taskcat.yml
```

- Regions
- Blacklisted AZs
- Parameter Sets
- Tags

taskcat test run

```
➜  IaC-DeepDive git:(master) ✗ taskcat test run
 _           _            _
| |_ __ _ ___| | _____ __ _| |_
| __/ _` / __| |/ / __/ _` | __|
| || (_| \__ \   < (_| (_| | |_
 \__\__,_|___/_|\_\___\__,_|\__|



version 0.9.13
[INFO   ] : Lint passed for test us-west-2 on template /Users/dmeszaro/workspace/repos/IaC-DeepDive/tester-template.yml
[INFO   ] : Lint passed for test eu-north-1 on template /Users/dmeszaro/workspace/repos/IaC-DeepDive/tester-template.yml
[S3: -> ] s3://tcat-iac-deepdive-f7tjn6pk/iac-deepdive/tester-template.yml
          ┌ stack Ⓜ tCaT-iac-deepdive-eu-north-1-762869d6831c4a51a13ab38d44037073
          ├ region: eu-north-1
          └ status: CREATE_IN_PROGRESS
          ┌ stack Ⓜ tCaT-iac-deepdive-us-west-2-762869d6831c4a51a13ab38d44037073
          ├ region: us-west-2
          └ status: CREATE_IN_PROGRESS
```

Show it off

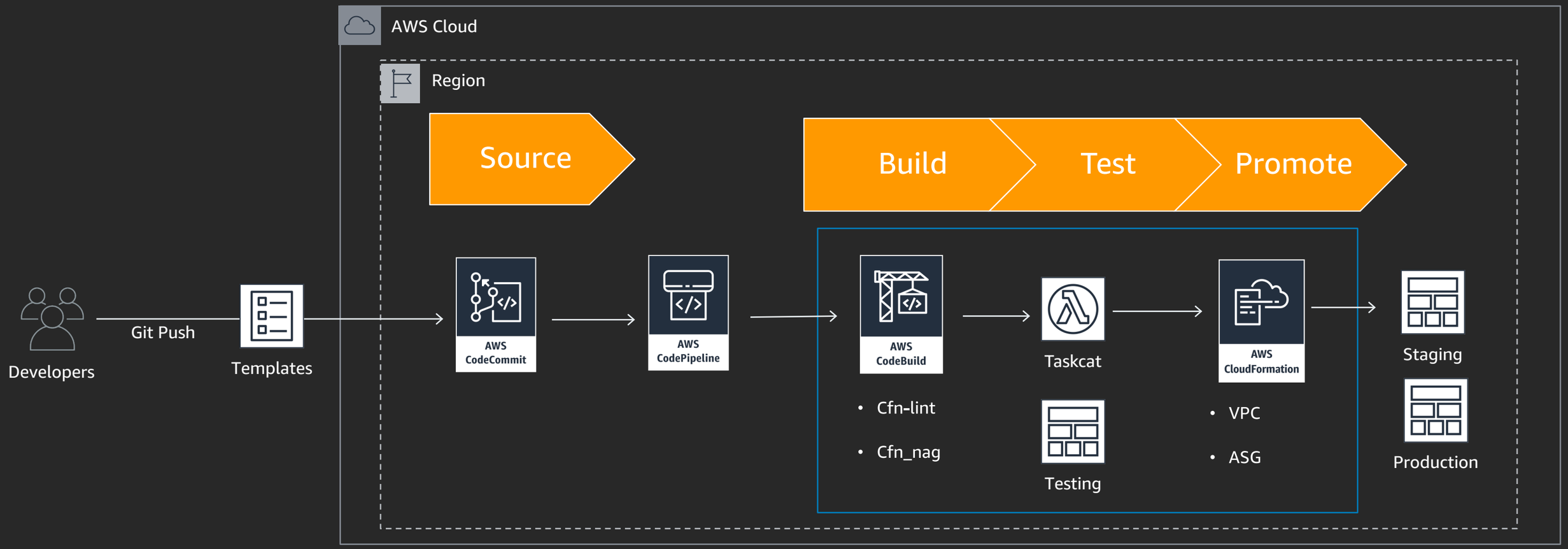
GitHub Repo: https://github.com/aws-quickstart/taskcat
Documentation: http://taskcat.io
Tested on: Wednesday - Feb,26,2020 @ 17:44:15

taskcat

Test Name	Tested Region	Stack Name	Tested Results	Test Logs
eu-north-1	eu-north-1	tCaT-iac-deepdive-eu-north-	CREATE_COMPLETE	View Logs

```
------------------------------------------------------------------------------
Region: eu-north-1
StackName: tCaT-iac-deepdive-eu-north-1-762869d6831c4a51a13ab38d44037073
******************************************************************************
ResourceStatusReason:
Stack launch was successful
******************************************************************************
******************************************************************************
Events:
TimeStamp                       ResourceStatus      ResourceType                            LogicalResourceId                                                   ResourceStatusReason
-------------------------------  ------------------  --------------------------------------  ------------------------------------------------------------------  ----------------------------
2020-02-26 16:43:26.924000+00:00  CREATE_COMPLETE     AWS::CloudFormation::Stack              tCaT-iac-deepdive-eu-north-1-762869d6831c4a51a13ab38d44037073
2020-02-26 16:43:25.016000+00:00  CREATE_COMPLETE     AWS::AutoScaling::AutoScalingGroup      ASG
2020-02-26 16:43:17.226000+00:00  CREATE_COMPLETE     AWS::ElasticLoadBalancingV2::Listener   ALBListener
2020-02-26 16:43:16.702000+00:00  CREATE_IN_PROGRESS  AWS::ElasticLoadBalancingV2::Listener   ALBListener                                                         Resource creation Initiated
2020-02-26 16:43:16.353000+00:00  CREATE_IN_PROGRESS  AWS::ElasticLoadBalancingV2::Listener   ALBListener
2020-02-26 16:43:14.143000+00:00  CREATE_COMPLETE     AWS::ElasticLoadBalancingV2::LoadBalancer ALB
2020-02-26 16:42:32.189000+00:00  CREATE_IN_PROGRESS  AWS::AutoScaling::AutoScalingGroup      ASG                                                                 Resource creation Initiated
2020-02-26 16:42:31.431000+00:00  CREATE_IN_PROGRESS  AWS::AutoScaling::AutoScalingGroup      ASG
2020-02-26 16:42:28.969000+00:00  CREATE_COMPLETE     AWS::AutoScaling::LaunchConfiguration   LaunchConfig
2020-02-26 16:42:28.624000+00:00  CREATE_IN_PROGRESS  AWS::AutoScaling::LaunchConfiguration   LaunchConfig                                                        Resource creation Initiated
2020-02-26 16:42:28.094000+00:00  CREATE_IN_PROGRESS  AWS::AutoScaling::LaunchConfiguration   LaunchConfig
2020-02-26 16:42:26.007000+00:00  CREATE_COMPLETE     AWS::IAM::InstanceProfile               InstanceProfile
2020-02-26 16:40:58.049000+00:00  CREATE_COMPLETE     AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssoc
2020-02-26 16:40:57.795000+00:00  CREATE_COMPLETE     AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssocB
2020-02-26 16:40:56.765000+00:00  CREATE_COMPLETE     AWS::EC2::Route                         Route
2020-02-26 16:40:42.719000+00:00  CREATE_IN_PROGRESS  AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssoc                                               Resource creation Initiated
2020-02-26 16:40:42.696000+00:00  CREATE_IN_PROGRESS  AWS::ElasticLoadBalancingV2::LoadBalancer ALB                                                           Resource creation Initiated
2020-02-26 16:40:42.436000+00:00  CREATE_IN_PROGRESS  AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssocB                                              Resource creation Initiated
2020-02-26 16:40:42.108000+00:00  CREATE_IN_PROGRESS  AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssoc
2020-02-26 16:40:41.941000+00:00  CREATE_IN_PROGRESS  AWS::ElasticLoadBalancingV2::LoadBalancer ALB
2020-02-26 16:40:41.751000+00:00  CREATE_IN_PROGRESS  AWS::EC2::SubnetRouteTableAssociation   SubnetRouteTableAssocB
2020-02-26 16:40:41.428000+00:00  CREATE_IN_PROGRESS  AWS::EC2::Route                         Route                                                               Resource creation Initiated
2020-02-26 16:40:40.875000+00:00  CREATE_IN_PROGRESS  AWS::EC2::Route                         Route
2020-02-26 16:40:39.690000+00:00  CREATE_COMPLETE     AWS::EC2::Subnet                        Subnet
2020-02-26 16:40:39.492000+00:00  CREATE_COMPLETE     AWS::EC2::Subnet                        SubnetB
```

CloudFormation – Infrastructure CI/CD



```python

def test_network(string = ""):
    if(string == '0'):
        return 0
    if(string == '1'):
        return 1
    if(string == '2'):
        return 2
    if(string == '3'):
        return 3
    if(string == '4'):
        return 4
    if(string == '5'):
        return 5
    if(string == '6'):
        return 6
    else:
        return -1
```

Best practices (1/3)

- Layer your application to reduce blast radius when updating resources
- Use multiple, isolated environments for testing, production, development, staging, etc.
- Smaller files are easier to write, test, and troubleshoot

Front-end resources	Instances, Auto Scaling groups
Stateful resources	Databases and clusters, queues
Backend services	API endpoints, functions
Monitoring resources	Alarms, dashboards
Base network	VPCs, NAT gateways, VPNs, subnets
Identity & security	IAM users, groups, roles, policies

Best practices (2/3)

- Resource import for stack refactoring
- Drift detection to prevent issues that may cause stack update operations to fail
- Use resource import to fix drift

Expected


```
{
  "ImageId": "ami-f5f41398",
  "InstanceType": "t2.micro",
  "NetworkInterfaces": [
    {
      "AssociatePublicIpAddress": true,
      "DeleteOnTermination": true,
      "DeviceIndex": 0,
      "GroupSet": [
        "sg-4c9ddf3b"
      ],
      "SubnetId": "subnet-0f5c1220"
    }
  ],
  "UserData":
"IyEvYmluL2Jhc2ggLXhlCnl1bSB1cGRhdGUgLXkgYXdzLWNmbi1ib290c3RyYXAKIyBJb
nN0YWxsIHRoZSBmaWxlcyBhbmQgcGFjaZFnZXMgZnJvbSB0aGUgbWV0YWRhdGEKLZ9wdC9
hd3MvYmluL2Nmbi1pbml0IC1ZICAgICAgICAgIC0tc3RhY2sgU2FtcGxlV2ViQXBwQ3Jvc
3NTdGFjayAgICAgICAgIC0tcmVzb3VyY2UgV2ViU2VydmVySW5zdGFuY2UgICAgICAgICA
gLS1jb25maWdzZXRzIEFsbCAgICAgICAgICAtLXJlZ2lvbiB1cy1lYXN0LTEKIyBTaWduY
WwgdGhlIHN0YXR1cyBmcm9tIGNmbi1pbml0Ci9vcHQvYXdzL2Jpbi9jZm4tc2lnbmFsIC1
lICQ/ICAgICAgICAgIC0tc3RhY2sgU2FtcGxlV2ViQXBwQ3Jvc3NTdGFjayAgICAgICAgI
```


Actual


```
{
  "ImageId": "ami-f5f41398",
  "InstanceType": "t2.nano",
  "NetworkInterfaces": [
    {
      "DeleteOnTermination": true,
      "DeviceIndex": 0,
      "GroupSet": [
        "sg-4c9ddf3b"
      ],
      "SubnetId": "subnet-0f5c1220"
    },
    {
      "DeleteOnTermination": false,
      "DeviceIndex": 1,
      "GroupSet": [
        "sg-4c9ddf3b"
      ],
      "SubnetId": "subnet-0f5c1220"
    }
```

Best practices (3/3)

```yaml
Resources:
  MyRDSDB:
    Type: "AWS::RDS::DBInstance"
    Properties:
      DBInstanceClass: db.t2.medium
      AllocatedStorage: ’20’
      Engine: mariadb
      EngineVersion: ’10.2’
      MasterUsername: appadmin
      MasterUserPassword: ‘{{resolve:ssm-secure:ssbRDSmEcntl:1}}'
```

- Parameters and Mappings
- Secrets Manager and SSM Parameter store
- Do not hardcode sensitive information

Delivery of CDK

{ JSON }

```yaml
yaml:
  aint:
    - markup
    - language
```

AWS Cloud Development Kit (AWS CDK)

A multi-language development framework for modeling infrastructure as reusable components

```
class UrlShortener extends Stack {
  constructor(scope: App, id: string, props?: UrlShortenerProps) {
    super(scope, id, props);

    const vpc = new ec2.Vpc(this, 'vpc', { maxAzs: 2 });
    const cluster = new ecs.Cluster(this, 'cluster', { vpc: vpc });
    const service = new patterns.NetworkLoadBalancedFargateService(this, 'sample-app', {
      cluster,
      taskImageOptions: {
        image: ecs.ContainerImage.fromAsset('ping'),
      },
      dom
    });
```

```
domainName
domainZone
```

```
(property) patterns.NetworkLoadBala
ncedServiceBaseProps.domainName?: s
tring | undefined

The domain name for the service, e.g.
"api.example.com."

@default

- No domain name.
```

```
    // Setup AutoScaling policy
    const scaling = service.service.autoScaleTasl
    scaling.scaleOnCpuUtilization('CpuScaling',
      targetUtilizationPercent: 50,
      scaleInCooldown: Duration.seconds(60),
      scaleOutCooldown: Duration.seconds(60)
    });
  }
}
```

Alma Media

Alma Media creates growth together. Today and tomorrow.

Alma Media is a dynamic multi-channel media company based in Finland

- Over 750 million monthly pageviews
- 100+ websites and apps
- 2 billion Lambda function invocations a month

The Challenge

- Alma Media Developers build Serverless event driven systems with AWS Lambda and various AWS Managed Services.
- Wanted even better Developer Experience while writing Infrastructure as Code to support those systems using real programming languages
  - Alma had been using for many years already declarative infrastructure orchestration like CloudFormation and Terraform.
  - They wanted a tool that also provides helpers on handling Lambda function deployments

Alma Media

Alma Media creates growth together. Today and tomorrow.

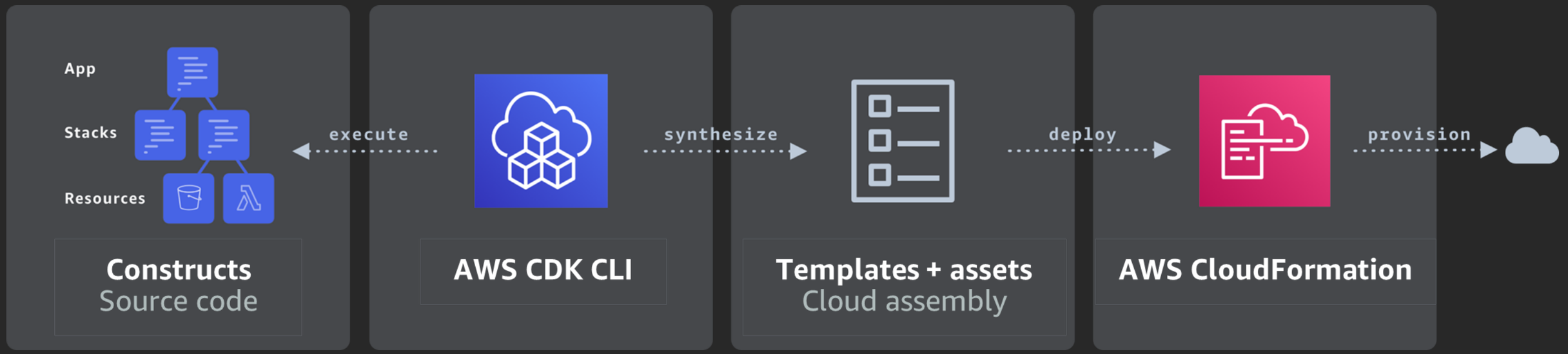
Alma Media develops with AWS Cloud Development Kit (CDK) their Serverless projects

- Improved Developer Experience regarding Infrastructure Orchestration
- Possibility of share and publish high level abstractions
- Using Software Development best practices in their Infrastructure Code
- Easier to define infrastructure that has multiple different environments

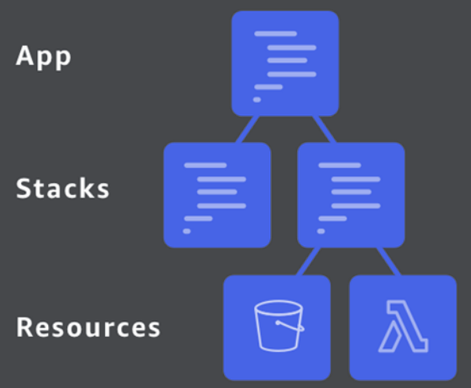
The Future

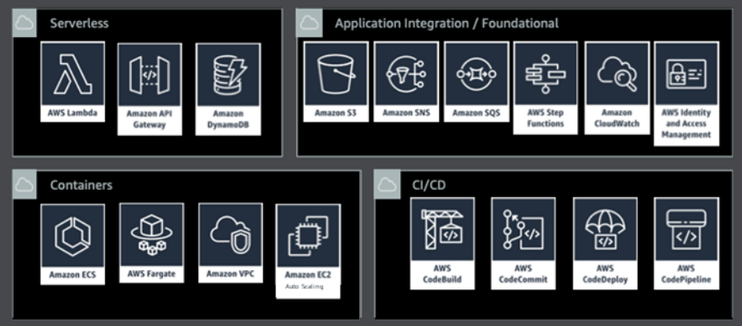
- Share more broadly within the company defined high level abstractions
  - Moreover, they wanted a tool that provides helpers on handling Lambda function deployments
  - Porting existing TypeScript building blocks to other programming languages

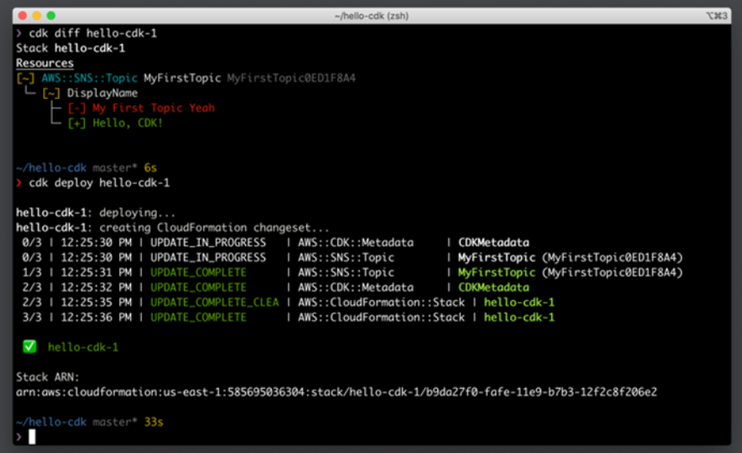
From constructs to the cloud



AWS CDK main components





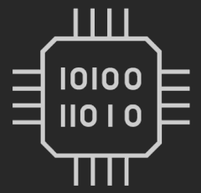


Core framework

AWS Construct Library

AWS CDK CLI

AWS CDK Constructs

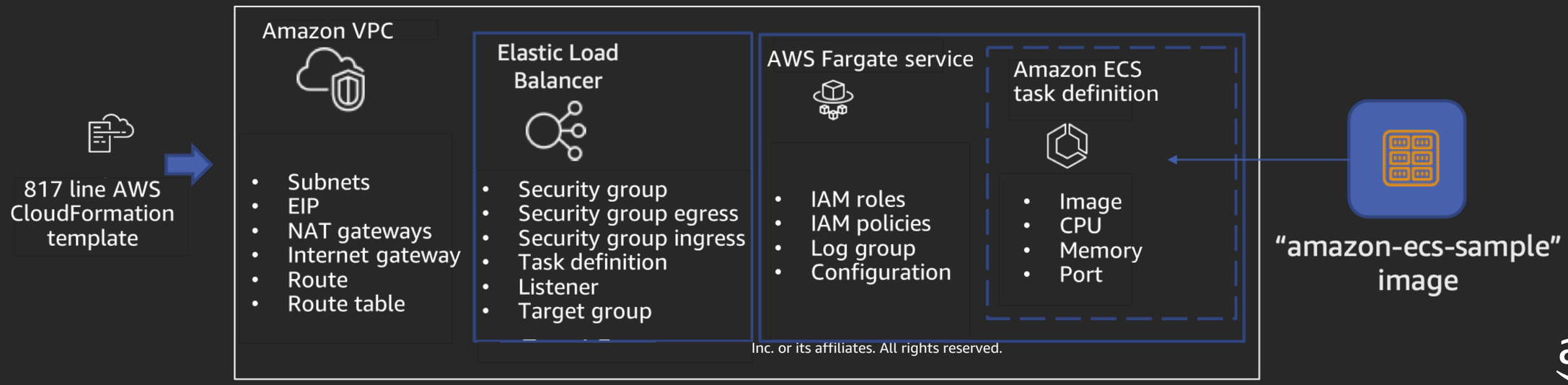


CloudFormation*

AWS Services

Design Patterns

```
new patterns.ApplicationLoadBalancedFargateService(stack, 'MyFargateService',{
  taskImageOptions: {
    image: ecs.ContainerImage.fromRegistry("amazon/amazon-ecs-sample")
  }
});
```



CloudFormation Resource Constructs

```
_zsh_tmux_plugin_run attach-session -t IaC

1  import * as cdk from '@aws-cdk/core';
2  import * as ec2 from '@aws-cdk/aws-ec2';
3
4  export class IacCdkCfnconstructsAppStack extends cdk.Stack {
5    constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
6      super(scope, id, props);
7
8      // Wait - I thought this was CDK!
9      new ec2.CfnVPC(this, "MyCFNVPC",{
10       cidrBlock: "10.0.0.0/16",
11     });
12   }
13 }
~
~
~
~
~
~
~
~
~
~
~
~
<] | ~/workspace/repos/IaC-DeepDive/iac-cdk-cfnconstructs-app/lib/iac-cdk-cfnconstructs-app-stack.ts | 3,0-1          All
:set invnumber
 IaC ⁞<-lint  4:cfn-taskcat  5:cdk-patterns  6:cdk-constructs- 7:cdk-cfnconstructs*Berlin: ❄+3°C ⁞ Wed, Feb 26 - 20:08
```

CloudFormation Resource Constructs

```
➜  iac-cdk-cfnconstructs-app git:(master) ✗
➜  iac-cdk-cfnconstructs-app git:(master) ✗
➜  iac-cdk-cfnconstructs-app git:(master) ✗
➜  iac-cdk-cfnconstructs-app git:(master) ✗ cdk deploy
IacCdkCfnconstructsAppStack: deploying...
IacCdkCfnconstructsAppStack: creating CloudFormation changeset...
 0/3 | 8:07:15 PM | CREATE_IN_PROGRESS   | AWS::CDK::Metadata | CDKMetadata
 0/3 | 8:07:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::VPC      | MyCFNVPC
 0/3 | 8:07:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::VPC      | MyCFNVPC Resource creation Initiated
 0/3 | 8:07:17 PM | CREATE_IN_PROGRESS   | AWS::CDK::Metadata | CDKMetadata Resource creation Initiated
 1/3 | 8:07:17 PM | CREATE_COMPLETE      | AWS::CDK::Metadata | CDKMetadata
```

IaC ⁞<-lint 4:cfn-taskcat 5:cdk-patterns 6:cdk-constructs- 7:cdk-cfnconstructs*Berlin: ❄+3°C ⁞ Wed, Feb 26 - 20:07

Constructs

```
_zsh_tmux_plugin_run attach-session -t IaC
 1 import * as cdk from '@aws-cdk/core';
 2 import * as ec2 from '@aws-cdk/aws-ec2';
 3
 4 export class IacCdkConstructsAppStack extends cdk.Stack {
 5   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
 6     super(scope, id, props);
 7
 8     // Constructs be here
 9     new ec2.Vpc(this, "MyVPC",{
10       cidr: "10.0.0.0/16",
11     });
12   }
13 }
~
~
~
~
~
~
~
~
~
~
~
~
<script] | ~/workspace/repos/IaC-DeepDive/iac-cdk-constructs-app/lib/iac-cdk-constructs-app-stack.ts | 3,0-1          All
:set invnumber
 IaC ⁞<zsh  2:cfn-nag  3:cfn-lint  4:cfn-taskcat  5:cdk-patterns-  6:cdk-constructs*ZBerlin: ☁️+3°C ⁞ Wed, Feb 26 - 19:58
```

Constructs

```
➜ iac-cdk-constructs-app git:(master) ✗ cdk deploy
IacCdkConstructsAppStack: deploying...
IacCdkConstructsAppStack: creating CloudFormation changeset...
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::CDK::Metadata                | CDKMetadata
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::InternetGateway         | MyVPC/IGW (MyVPCIGW30AB6DD6)
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::VPC                     | MyVPC (MyVPCAFB07A31)
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::EIP                     | MyVPC/PublicSubnet1/EIP (MyVPCPublic
Subnet1EIP5EB6147D)
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::EIP                     | MyVPC/PublicSubnet2/EIP (MyVPCPublic
Subnet2EIP6F364C5D)
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::InternetGateway         | MyVPC/IGW (MyVPCIGW30AB6DD6) Resourc
e creation Initiated
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::EIP                     | MyVPC/PublicSubnet2/EIP (MyVPCPublic
Subnet2EIP6F364C5D) Resource creation Initiated
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::EIP                     | MyVPC/PublicSubnet1/EIP (MyVPCPublic
Subnet1EIP5EB6147D) Resource creation Initiated
  0/25 | 8:10:15 PM | CREATE_IN_PROGRESS   | AWS::EC2::VPC                     | MyVPC (MyVPCAFB07A31) Resource creat
ion Initiated
  0/25 | 8:10:17 PM | CREATE_IN_PROGRESS   | AWS::CDK::Metadata                | CDKMetadata Resource creation Initia
ted
  1/25 | 8:10:17 PM | CREATE_COMPLETE      | AWS::CDK::Metadata                | CDKMetadata
```

IaC ⁞<-lint 4:cfn-taskcat 5:cdk-patterns 6:cdk-constructs* 7:cdk-cfnconstructs-Berlin: ❄+3°C ⁞ Wed, Feb 26 - 20:10

Patterns

```
_zsh_tmux_plugin_run
 1 import * as cdk from '@aws-cdk/core';
 2 import * as ecsPatterns from '@aws-cdk/aws-ecs-patterns';
 3 import * as ecs from '@aws-cdk/aws-ecs';
 4
 5 export class IacCdkAppStack extends cdk.Stack {
 6   constructor(scope: cdk.Construct, id: string, props?: cdk.StackProps) {
 7     super(scope, id, props);
 8
 9     // Here be patterns
10     const loadBalancedFargateService = new ecsPatterns.ApplicationLoadBalancedFargateService(this, 'Service', {
11       memoryLimitMiB: 1024,
12       cpu: 512,
13       taskImageOptions: {
14         image: ecs.ContainerImage.fromRegistry("amazon/amazon-ecs-sample"),
15       },
16     });
17   }
18 }
~
~
~
~
~
~
~
<dk-app-stack.ts  [typescript] | ~/workspace/repos/IaC-DeepDive/iac-cdk-app/lib/iac-cdk-app-stack.ts | 4,0-1          All

 IaC ⁞1:[tmux]  2:cfn-nag  3:cfn-lint  4:cfn-taskcat- 5:cdk-patterns*          Berlin: ☁️+3°C ⁞ Wed, Feb 26 - 19:47
```

Patterns

```
_zsh_tmux_plugin_run attach-session -t IaC
rivateSubnet2/DefaultRoute (EcsDefaultClusterMnL3mNNYNVpcPrivateSubnet2DefaultRoute20CE2D89)
35/39 Currently in progress: ServiceLBE9A1ADBC
 36/39 | 8:27:43 PM | CREATE_COMPLETE      | AWS::ElasticLoadBalancingV2::LoadBalancer | Service/LB (ServiceLBE9A1ADBC)
 36/39 | 8:27:46 PM | CREATE_IN_PROGRESS   | AWS::ElasticLoadBalancingV2::Listener     | Service/LB/PublicListener (Servi
ceLBPublicListener46709EAA)
 36/39 | 8:27:46 PM | CREATE_IN_PROGRESS   | AWS::ElasticLoadBalancingV2::Listener     | Service/LB/PublicListener (Servi
ceLBPublicListener46709EAA) Resource creation Initiated
 37/39 | 8:27:46 PM | CREATE_COMPLETE      | AWS::ElasticLoadBalancingV2::Listener     | Service/LB/PublicListener (Servi
ceLBPublicListener46709EAA)
 37/39 | 8:27:49 PM | CREATE_IN_PROGRESS   | AWS::ECS::Service                         | Service/Service/Service (Service
9571FDD8)
 37/39 | 8:27:50 PM | CREATE_IN_PROGRESS   | AWS::ECS::Service                         | Service/Service/Service (Service
9571FDD8) Resource creation Initiated
37/39 Currently in progress: Service9571FDD8
 38/39 | 8:28:51 PM | CREATE_COMPLETE      | AWS::ECS::Service                         | Service/Service/Service (Service
9571FDD8)
 39/39 | 8:28:53 PM | CREATE_COMPLETE      | AWS::CloudFormation::Stack                | IacCdkAppStack

    IacCdkAppStack

Outputs:
IacCdkAppStack.ServiceServiceURL250C0FB6 = http://IacCd-Servi-1668XUAN3EREL-1553285855.us-east-1.elb.amazonaws.com
IacCdkAppStack.ServiceLoadBalancerDNSEC5B149E = IacCd-Servi-1668XUAN3EREL-1553285855.us-east-1.elb.amazonaws.com

Stack ARN:
arn:aws:cloudformation:us-east-1:824852318651:stack/IacCdkAppStack/78993d30-58cd-11ea-a10f-0a5afd1032bb
➜  iac-cdk-app git:(master) ✗
 IaC ⋮<g  3:cfn-lint  4:cfn-taskcat  5:cdk-patterns*  6:cdk-constructs-  7:cdk-cfnco>Berlin: ❄+3°C ⋮ Wed, Feb 26 - 20:32
```

```
➜  iac-cdk-cfnconstructs-app git:(master) ✗ cdk deploy
IacCdkCfnconstructsAppStack: deploying...
IacCdkCfnconstructsAppStack: creating CloudFormation changeset...
 0/3 | 3:08:32 PM | CREATE_IN_PROGRESS   | AWS::CDK::Metadata | CDKMetadata
 0/3 | 3:08:32 PM | CREATE_IN_PROGRESS   | AWS::EC2::VPC      | MyCFNVPC
 1/3 | 3:08:32 PM | CREATE_FAILED        | AWS::EC2::VPC      | MyCFNVPC Value (10.0.0.0/
dParameterValue; Request ID: 0b3d7680-1e5d-4f78-8340-6c716137d8da)
        new IacCdkCfnconstructsAppStack (/Users/dmeszaro/workspace/repos/IaC-DeepDive/iac
        \_ Object.<anonymous> (/Users/dmeszaro/workspace/repos/IaC-DeepDive/iac-cdk-cfnco
        \_ Module._compile (internal/modules/cjs/loader.js:701:30)
        \_ Module.m._compile (/Users/dmeszaro/workspace/repos/IaC-DeepDive/iac-cdk-cfncon
        \_ Module._extensions..js (internal/modules/cjs/loader.js:712:10)
        \_ Object.require.extensions.(anonymous function) [as .ts] (/Users/dmeszaro/works
        \_ Module.load (internal/modules/cjs/loader.js:600:32)
        \_ tryModuleLoad (internal/modules/cjs/loader.js:539:12)
        \_ Function.Module._load (internal/modules/cjs/loader.js:531:3)
        \_ Function.Module.runMain (internal/modules/cjs/loader.js:754:12)
        \_ main (/Users/dmeszaro/workspace/repos/IaC-DeepDive/iac-cdk-cfnconstructs-app/r
        \_ Object.<anonymous> (/Users/dmeszaro/workspace/repos/IaC-DeepDive/iac-cdk-cfnco
        \_ Module._compile (internal/modules/cjs/loader.js:701:30)
        \_ Object.Module._extensions..js (internal/modules/cjs/loader.js:712:10)
        \_ Module.load (internal/modules/cjs/loader.js:600:32)
```

How do we do testing with CDK?

- Snapshot tests
- Fine-grained assertions
- Validation tests

```
npm install --save-dev jest @types/jest @aws-cdk/assert
```

Snapshots

Match my snapshot

```
_zsh_tmux_plugin_run attach-session -t IaC
1  import { SynthUtils } from '@aws-cdk/assert';
2  import { Stack } from '@aws-cdk/core';
3
4  import dlq = require('../lib/dead-letter-queue');
5
6  test('dlq creates an alarm', () => {
7    const stack = new Stack();
8
9    new dlq.DeadLetterQueue(stack, 'DLQ');
10
11   // This expects that the cdk synth output matches the template
12   expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
13
14 });
15
~
~
~
~
~
~
~
<ace/repos/IaC-DeepDive/iac-cdk-testing-lib/test/dead-letter-queue.test.ts | 5,0-1          All

IaC ⋮<6:cdk-constructs  7:cdk-cfnconstructs- 8:cdk-test*Berlin: ⛅ +6°C ⋮ Thu, Feb 27 - 15:38
```

How's my snapshot?

```
➜  iac-cdk-testing-lib git:(master) ✗ npm test

> iac-cdk-testing-lib@0.1.0 test /Users/dmeszaro/workspace/repos/IaC-DeepDive/iac-cdk-testing-l
ib
> jest

 PASS  test/dead-letter-queue.test.ts
  › 1 snapshot written.
 PASS  test/iac-cdk-testing-lib.test.ts

Snapshot Summary
 › 1 snapshot written from 1 test suite.

Test Suites: 2 passed, 2 total
Tests:       3 passed, 3 total
Snapshots:   1 written, 1 total
Time:        2.044s
Ran all test suites.
➜  iac-cdk-testing-lib git:(master) ✗
```

How's my snapshot?

```
_zsh_tmux_plugin_run attach-session -t IaC
// Jest Snapshot v1, https://goo.gl/fbAQLP

exports[`dlq creates an alarm 1`] = `
Object {
  "Resources": Object {
    "DLQ581697C4": Object {
      "Type": "AWS::SQS::Queue",
    },
    "DLQAlarm008FBE3A": Object {
      "Properties": Object {
        "AlarmDescription": "There are messages in the Dead Letter Queue",
        "ComparisonOperator": "GreaterThanOrEqualToThreshold",
        "Dimensions": Array [
          Object {
            "Name": "QueueName",
            "Value": Object {
              "Fn::GetAtt": Array [
                "DLQ581697C4",
                "QueueName",
              ],
            },
          },
        ],
        "EvaluationPeriods": 1,
        "MetricName": "ApproximateNumberOfMessagesVisible",
        "Namespace": "AWS/SQS",
        "Period": 300,
        "Statistic": "Maximum",
        "Threshold": 1,
      },
      "Type": "AWS::CloudWatch::Alarm",
<snap   | ~/workspace/repos/IaC-DeepDive/iac-cdk-testing-lib/test/__snapshots__/dead-letter-queue.test.ts.snap | 2,0-1          Top

 IaC ⁞<int  4:cfn-taskcat  5:cdk-patterns  6:cdk-constructs  7:cdk-cfnconstructs- 8:cdk-test*Berlin: ☁ +6°C ⁞ Thu, Feb 27 - 15:43
```

Not matching a snapshot

```
_zsh_tmux_plugin_run attach-session -t IaC
            "Threshold": 1,
          },
          "Type": "AWS::CloudWatch::Alarm",
        },

      10 |
      11 |       // This expects that the cdk synth output matches the template
    > 12 |    expect(SynthUtils.toCloudFormation(stack)).toMatchSnapshot();
         |                                               ^
      13 |
      14 | });
      15 |

      at Object.<anonymous>.test (test/dead-letter-queue.test.ts:12:46)

 › 1 snapshot failed.
 PASS  test/iac-cdk-testing-lib.test.ts

Snapshot Summary
 › 1 snapshot failed from 1 test suite. Inspect your code changes or run `npm test -- -u` to update them.

Test Suites: 1 failed, 1 passed, 2 total
Tests:       1 failed, 2 passed, 3 total
Snapshots:   1 failed, 1 total
Time:        2.665s
Ran all test suites.
npm ERR! Test failed.  See above for more details.
➜  iac-cdk-testing-lib git:(master) ✗
 IaC ⋮<kcat  5:cdk-patterns  6:cdk-constructs  7:cdk-cfnconstructs- 8:cdk-test*Berlin: ☁ +5°C ⋮ Fri, Feb 28 - 13:08
```

But I want to have more fine grained control!

I expect to have this …

_zsh_tmux_plugin_run attach-session -t IaC

```
 1 import '@aws-cdk/assert/jest';
 2 import { SynthUtils } from '@aws-cdk/assert';
 3 import { Stack } from '@aws-cdk/core';
 4
 5 import dlq = require('../lib/dead-letter-queue');
 6
 7 test('dlq creates an alarm', () => {
 8   const stack = new Stack();
 9
10   new dlq.DeadLetterQueue(stack, 'DLQ');
11
12   expect(stack).toHaveResource('AWS::CloudWatch::Alarm', {
13     MetricName: "ApproximateNumberOfMessagesVisible",
14     Namespace: "AWS/SQS",
15     Dimensions: [
16       {
17         Name: "QueueName",
18         Value: { "Fn::GetAtt": [ "DLQ581697C4", "QueueName" ] }
19       }
20     ],
21   });
22 });
23
24
<t] | ~/workspace/repos/IaC-DeepDive/iac-cdk-testing-lib/test/dead-letter-queue.test.ts | 8,1          All
"test/dead-letter-queue.test.ts" 24L, 560C written
 IaC ⋮<dk-patterns  6:cdk-constructs  7:cdk-cfnconstructs- 8:cdk-test*Berlin: ☁ +6°C ⋮ Fri, Feb 28 - 13:49
```

And this

```
_zsh_tmux_plugin_run attach-session -t IaC

// Check that the DLQ has a max retention period
test('dlq has maximum retention period', () => {
  const stack = new Stack();

  new dlq.DeadLetterQueue(stack, 'DLQ');

  expect(stack).toHaveResource('AWS::SQS::Queue', {
    MessageRetentionPeriod: 1209600
  });
});

<t] | ~/workspace/repos/IaC-DeepDive/iac-cdk-testing-lib/test/dead-letter-queue.test.ts | 52,0-1 97%

IaC ⋮<dk-patterns 6:cdk-constructs 7:cdk-cfnconstructs- 8:cdk-test*Berlin: ☁ +6°C ⋮ Fri, Feb 28 - 13:46
```

Then I fail my specific test

```
tmux new-session -s IaC
    "MessageRetentionPeriod": 1209600
  }.
  - Object type mismatch in:
      {
        "Type": "AWS::SQS::Queue"
      }

    27 |   new dlq.DeadLetterQueue(stack, 'DLQ');
    28 |
  > 29 |   expect(stack).toHaveResource('AWS::SQS::Queue', {
       |                 ^
    30 |     MessageRetentionPeriod: 1209600
    31 |   });
    32 | });

    at Object.<anonymous>.test (test/dead-letter-queue.test.ts:29:17)

 PASS  test/iac-cdk-testing-lib.test.ts

Test Suites: 1 failed, 1 passed, 2 total
Tests:       1 failed, 3 passed, 4 total
Snapshots:   0 total
Time:        1.992s, estimated 3s
Ran all test suites.
npm ERR! Test failed.  See above for more details.
➜  iac-cdk-testing-lib git:(master) ✗

IaC  1:zsh*                                   Berlin: ⛅ +14°C | Thu, Mar 19 - 13:22
```

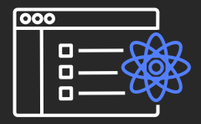
CloudFormation Registry

I use resources outside of AWS!

Introducing the AWS CloudFormation registry

An open approach to managing external resources

Open providers

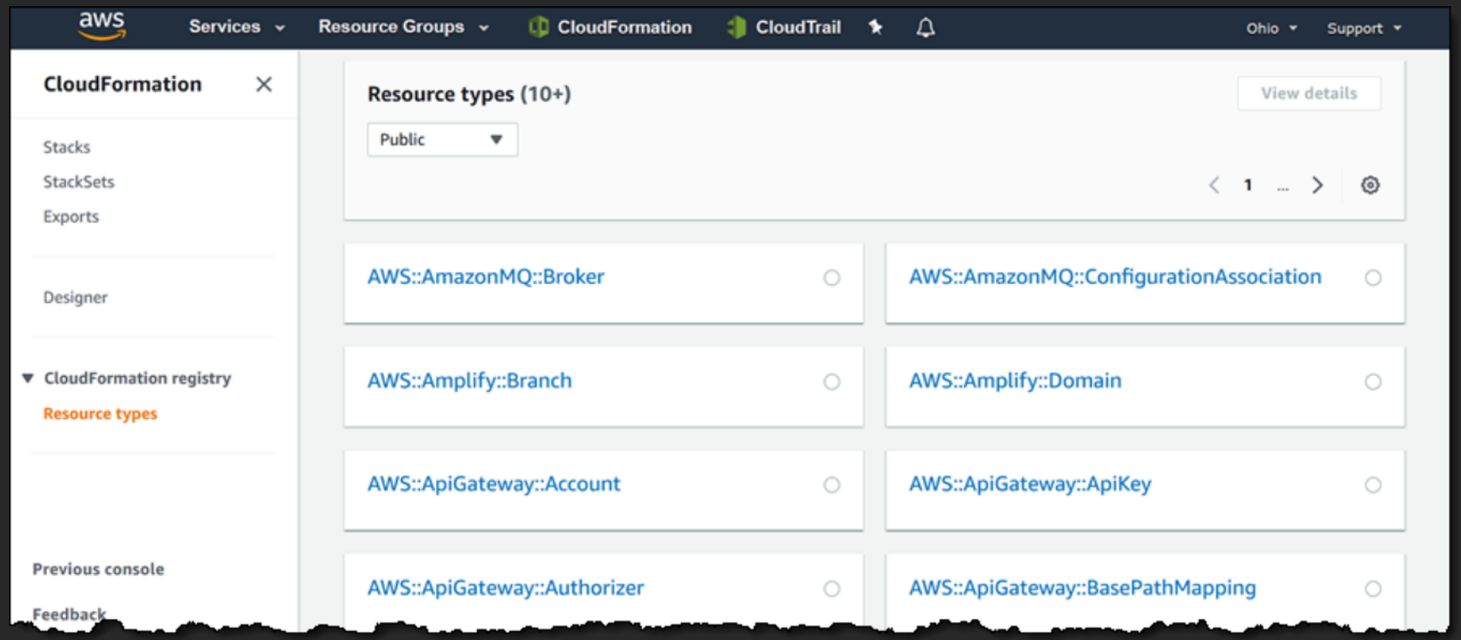


Open CLI

CloudFormation registry

AWS CloudFormation registry and CLI

- Allows AWS CloudFormation to support native and non-AWS resources while inheriting many core benefits like rollbacks
- Use the AWS CloudFormation CLI tool to create resource providers using JSON schema-driven development, generating many of the code assets for you
- Use third-party resource providers as you would use native AWS resource types



There are few things we need for this

Cloudformation CLI

```
➜  go git:(master) ✗ pip3 install --user --upgrade cloudformation-cli-go-plugin
➜  go git:(master) ✗ pip3 install --user --upgrade cloudformation-cli-java-plugin
➜  go git:(master) ✗ pip install git+https://github.com/aws-cloudformation/aws-cloudformation-rpdk-python-plugin.
git#egg=cloudformation-cli-python-plugin

➜  go git:(master) ✗
```

IaC 1:zsh* Berlin: +13°C | Thu, Mar 19 - 16:12

Make sure to pick the correct plugin out there

Available Language Plugins

Language	Plugin Status	GitHub Location	PyPI Installation
Go	General Availability	cloudformation-cli-go-plugin	`cloudformation-cli-go-plugin`
Java	General Availability	cloudformation-cli-java-plugin	`cloudformation-cli-java-plugin`
Python	Developer Preview	cloudformation-cli-python-plugin	N/A

Model your new resource

Model your resource – set it's properties

tmux new-session -s IaC

```
1 {
2     "typeName": "Darko::Unicorn::Factory",
3     "description": "Uncorns for the Masses",
4     "sourceUrl": "https://github.com/aws-cloudformation/aws-cloudformation-rpdk.git",
5     "properties": {
6         "UID": {
7             "description": "The ID given to the Unicorn",
8             "type": "string"
9         },
10        "Name": {
11            "description": "Name of the Unicorn",
12            "type": "string",
13            "minLength": 3,
14            "maxLength": 250
15        },
16        "Superpower": {
17            "description": "Unicorn Superpower",
18            "type": "string",
19            "minLength": 3,
20            "maxLength": 250
21        },
22        "Family": {
23            "description": "Unicorn family in the form of familiy.size  - eg. u3.glorious",
24            "type": "string",
25            "minLength": 3,
<actory.json  [json] | ~/workspace/repos/IaC-DeepDive/registry/go/darko-unicorn-factory.json | 3,1          Top

IaC  1:vim*                                  Berlin: ⛅ +14°C | Thu, Mar 19 - 13:51
```

… and handlers

tmux new-session -s IaC

```
33      ],
34      "readOnlyProperties": [
35          "/properties/UID"
36      ],
37      "primaryIdentifier": [
38          "/properties/UID"
39      ],
40      "handlers": {
41          "create": {
42              "permissions": []
43          },
44          "read": {
45              "permissions": []
46          },
47          "update": {
48              "permissions": []
49          },
50          "delete": {
51              "permissions": []
52          },
53          "list": {
54              "permissions": []
55          }
56      }
57  }
<actory.json  [json] | ~/workspace/repos/IaC-DeepDive/registry/go/darko-unicorn-factory.json | 57,1          Bot

IaC  1:vim*                                   Berlin: ⛅ +14°C | Thu, Mar 19 - 13:51
```

Time to work on those handlers

Our Create handler

```
tmux new-session -s IaC
  Model *Model
}

// Create handles the Create event from the Cloudformation service.
func Create(req handler.Request, prevModel *Model, currentModel *Model) (handler.ProgressEvent, error) {
  if err := validateInput(req, currentModel); err != nil {
    return handler.ProgressEvent{
      OperationStatus:  handler.Failed,
      Message:          err.Error(),
      HandlerErrorCode: cloudformation.HandlerErrorCodeInvalidRequest,
    }, nil
  }
  reqBody, err := marshal(currentModel)
  if err != nil {
    return handler.ProgressEvent{}, err
  }
  response := makeRequest(&RequestInput{
    Method: "POST",
    URL:    APIEndpoint,
    Body:   bytes.NewBuffer(reqBody),
    Action: "Create",
  })
  return response, nil
}

<rce/resource.go  [go] | ~/workspace/repos/IaC-DeepDive/registry/go/cmd/resource/resource.go | 45,0-1        17%

 IaC  1:vim*                                                  Berlin: ⛅ +13°C | Thu, Mar 19 - 14:56
```

Did someone mention tests?

We can also test our resources with sam local

tmux new-session -s IaC

```
{
    "credentials": {
        "accessKeyId": "<access key here>",
        "secretAccessKey": "<secretAccess key here>",
        "sessionToken": "<session token here>"
    },
    "action": "CREATE",
    "request": {
        "clientRequestToken": "4b90a7e4-b790-456b-a937-0cfdfa211dfe",
        "desiredResourceState": {
            "Name": "SuperSaKaramelom",
            "Superpower": "Rainbow maker"
        },
        "logicalResourceIdentifier": "MyUnicorn"
    },
    "callbackContext": null
}
~
~
~
~
~
~
~
~
<ests/create.json  [json] | ~/workspace/repos/IaC-DeepDive/registry/go/sam-tests/create.json | 1,1          All
"sam-tests/create.json" 17L, 500C
 IaC  1:zsh*                                    Berlin: ⛅ +14°C | Thu, Mar 19 - 15:38
```

Executing the test

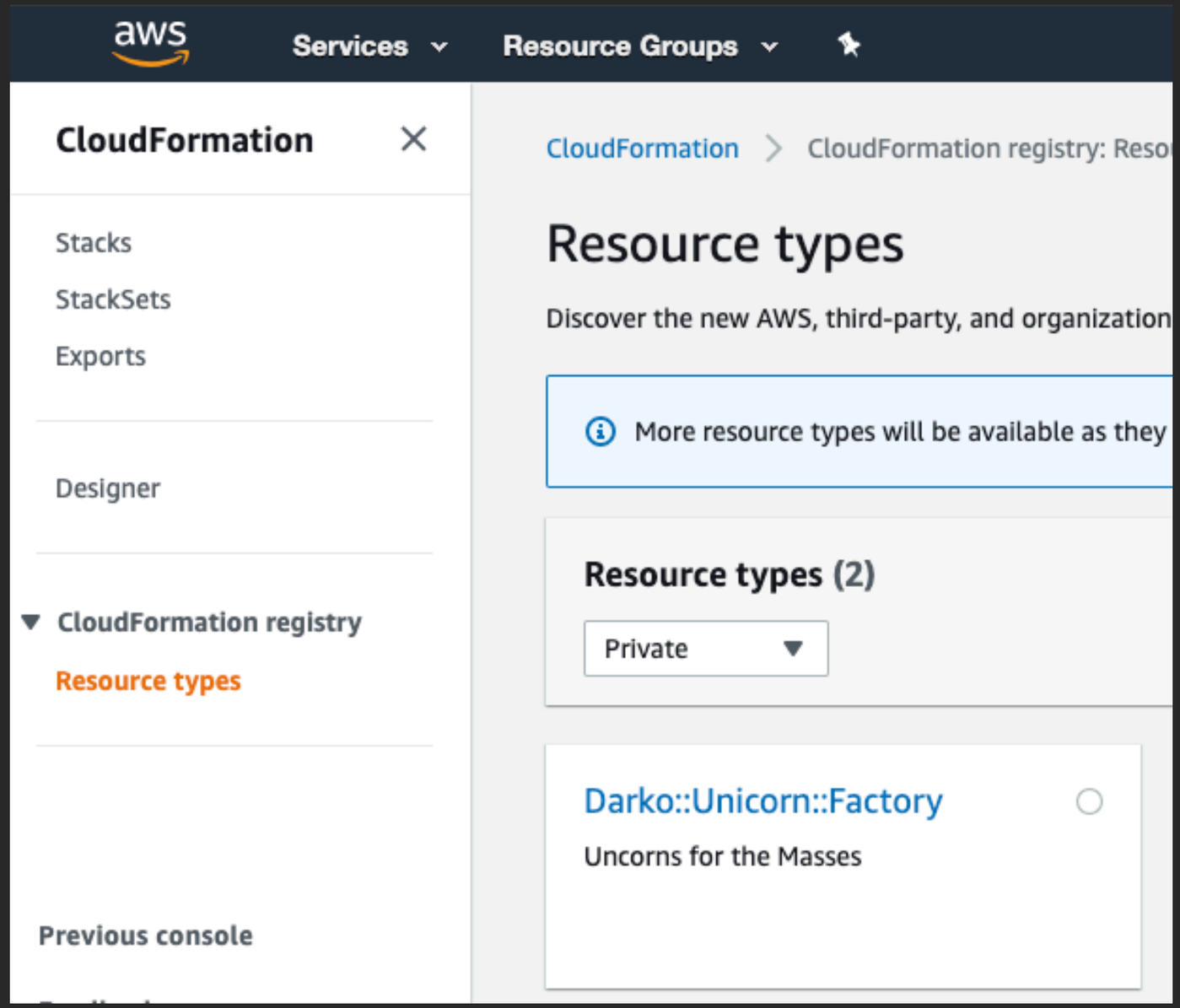
```
tmux new-session -s IaC
➜ go git:(master) ✗ sam local invoke TestEntrypoint --event sam-tests/create.json

Invoking handler (go1.x)

Fetching lambci/lambda:go1.x Docker container image......
Mounting /Users/dmeszaro/workspace/repos/IaC-DeepDive/registry/go/bin as /var/task:ro,delegated inside runtime co
ntainer
2020/03/19 14:59:17 Handler starting in test mode
START RequestId: 55609f2a-8fe8-1fd4-0ca0-42f9a8e15827 Version: $LATEST
2020/03/19 14:59:17 Creating request:
Prev body:
Curr body: {
            "Name": "SuperSaKaramelom",
            "Superpower": "Rainbow maker"
        }
END RequestId: 55609f2a-8fe8-1fd4-0ca0-42f9a8e15827
REPORT RequestId: 55609f2a-8fe8-1fd4-0ca0-42f9a8e15827  Init Duration: 202.83 ms       Duration: 181.97 ms     B
illed Duration: 200 ms  Memory Size: 128 MB     Max Memory Used: 31 MB

{"status":"SUCCESS","message":"Create Complete","resourceModel":{"UID":"5e7388c5e6280703e8ec1c96","Name":"SuperSa
Karamelom","Superpower":"Rainbow maker","Family":""}}
➜ go git:(master) ✗

IaC 1:python3.7*                                                    </html> | Thu, Mar 19 - 15:59
```

Now what? Well let’s upload!

Uploading the resource

```
tmux new-session -s IaC
drwxr-xr-x   3 dmeszaro  1896053708    96B Mar 19 15:30 bin
drwxr-xr-x@  4 dmeszaro  1896053708   128B Mar 19 15:30 cmd
-rwxr-xr-x@  1 dmeszaro  1896053708   1.4K Mar 19 15:29 darko-unicorn-factory.json
-rwxr-xr-x@  1 dmeszaro  1896053708   230B Feb 29 12:51 go.mod
-rwxr-xr-x@  1 dmeszaro  1896053708   2.6K Feb 29 12:51 go.sum
-rwxr-xr-x@  1 dmeszaro  1896053708   864B Mar 19 15:30 resource-role.yaml
-rw-r--r--   1 dmeszaro  1896053708    23K Mar 19 15:30 rpdk.log
drwxr-xr-x   3 dmeszaro  1896053708    96B Mar 19 15:31 sam-tests
-rwxr-xr-x@  1 dmeszaro  1896053708   581B Feb 29 12:51 template.yml
➜  go git:(master) ✗ cfn submit -v
Validating your resource specification...
Packaging Go project
Creating darko-unicorn-factory-role-stack
darko-unicorn-factory-role-stack stack was successfully created
Creating CloudFormationManagedUploadInfrastructure
CloudFormationManagedUploadInfrastructure already exists. Attempting to update
CloudFormationManagedUploadInfrastructure stack is up to date
Successfully submitted type. Waiting for registration with token 'e48d5b17-99e8-4732-969b-7203322f25dd' to comple
te.
Registration complete.
{'ProgressStatus': 'COMPLETE', 'Description': 'Deployment is currently in DEPLOY_STAGE of status COMPLETED; ', 'T
ypeArn': 'arn:aws:cloudformation:eu-west-1:824852318651:type/resource/Darko-Unicorn-Factory', 'TypeVersionArn': '
arn:aws:cloudformation:eu-west-1:824852318651:type/resource/Darko-Unicorn-Factory/00000001', 'ResponseMetadata':
{'RequestId': 'e68fa4ce-85dc-4aed-9561-681cfa959352', 'HTTPStatusCode': 200, 'HTTPHeaders': {'x-amzn-requestid':
'e68fa4ce-85dc-4aed-9561-681cfa959352', 'content-type': 'text/xml', 'content-length': '681', 'date': 'Thu, 19 Mar
 2020 14:35:51 GMT'}, 'RetryAttempts': 0}}
➜  go git:(master) ✗
 IaC  1:zsh*                                   Berlin: ⛅ +14°C | Thu, Mar 19 - 15:37
```

Voila!


aws
Services
Resource Groups
CloudFormation
Stacks
StackSets
Exports
Designer
CloudFormation registry
Resource types
Previous console
CloudFormation
CloudFormation registry: Reso
Resource types
Discover the new AWS, third-party, and organization
More resource types will be available as they
Resource types (2)
Private
Darko::Unicorn::Factory
Uncorns for the Masses

Demo time

Takeaways

Takeaways

Best practices start with the editor! Use proper tools and plugins! ⌨️

Treat Infrastructure code as any other code.

Use testing tools for any framework you write your infrastructure in. 🛠️

Thank you!

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