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

BOA327

Simplifying your infrastructure with Go, CDK, and cdk8s

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Agenda

Overview

Containers

Kubernetes and cdk8s

Amazon EKS and AWS CDK

Summary

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Abstract away the developer pain



Building applications is hard

With the right automation, it gets a lot easier

You can be more productive and agile, focused on creation and not on admin work

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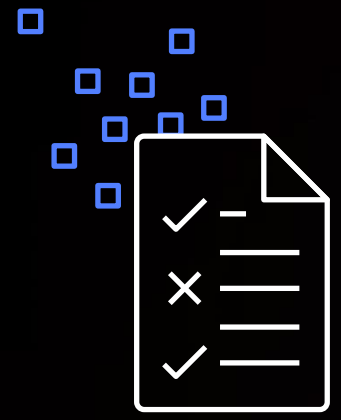
What is YAML?

- Easy for humans to read
- Universal
- Declarative – desired state
- Static



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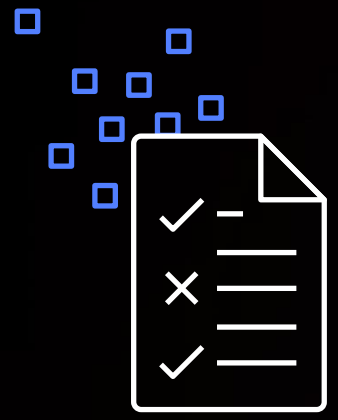
What is YAML?



Easy when you have a few **things**

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What is YAML?



Easy when you have a few **things**



- **Gets harder as you grow!**
- Promotes copying and pasting
- Customizations are manual or require special tooling
- Updates are complex

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General-purpose languages

- Familiar to developers
- Specialized
- Imperative
- Dynamic
- Tools and workflows











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AWS Cloud Development Kit (AWS CDK)

An open-source multi-language software development framework for modeling AWS Cloud infrastructure as reusable components



Familiar
Your language
Just code



Tool support
AutoComplete
Inline documentation



Abstraction
Sane defaults
Reusable classes



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AWS CDK: In a nutshell

```typescript
export class SimpleVpc extends cdk.Stack {
  constructor(scope: cdk.Construct, id: string) {
    super(scope, id);

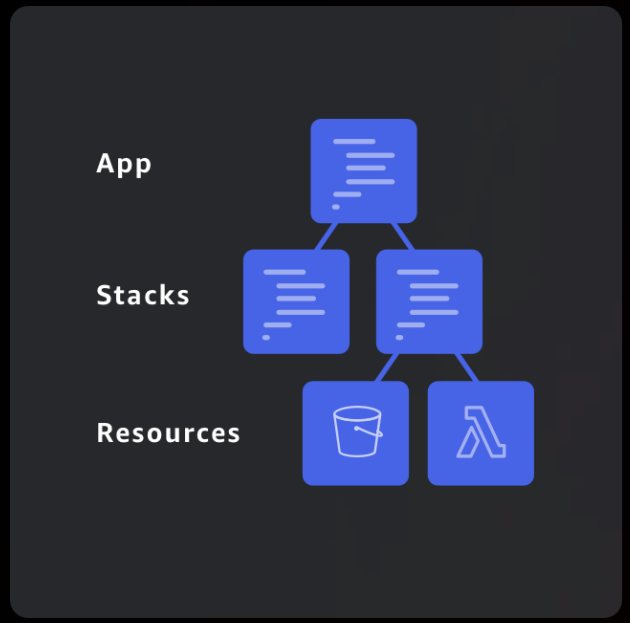
    new ec2.Vpc(this, 'Vpc')
  }
}
```

cdk synth

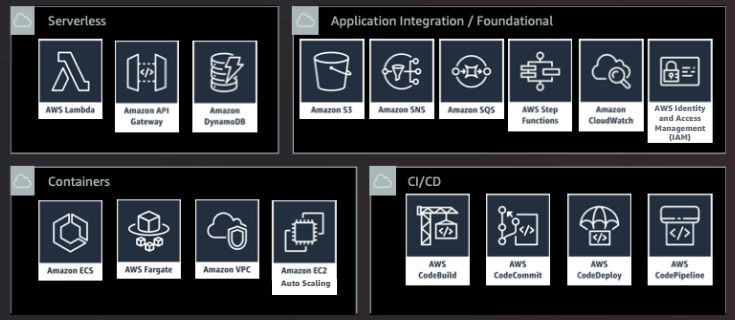


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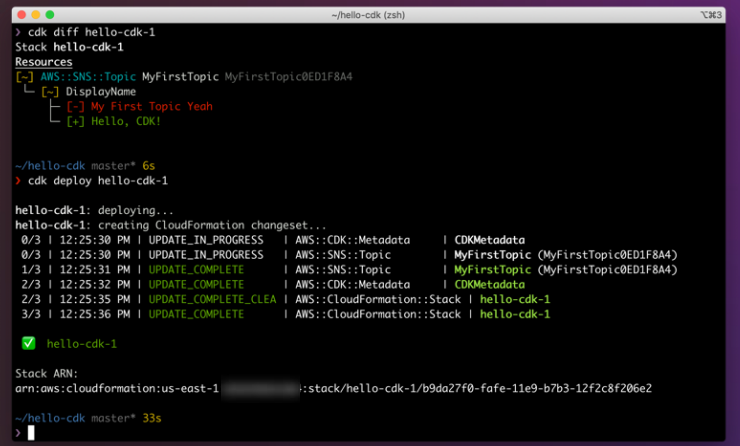
AWS CDK: Main components



Core Framework



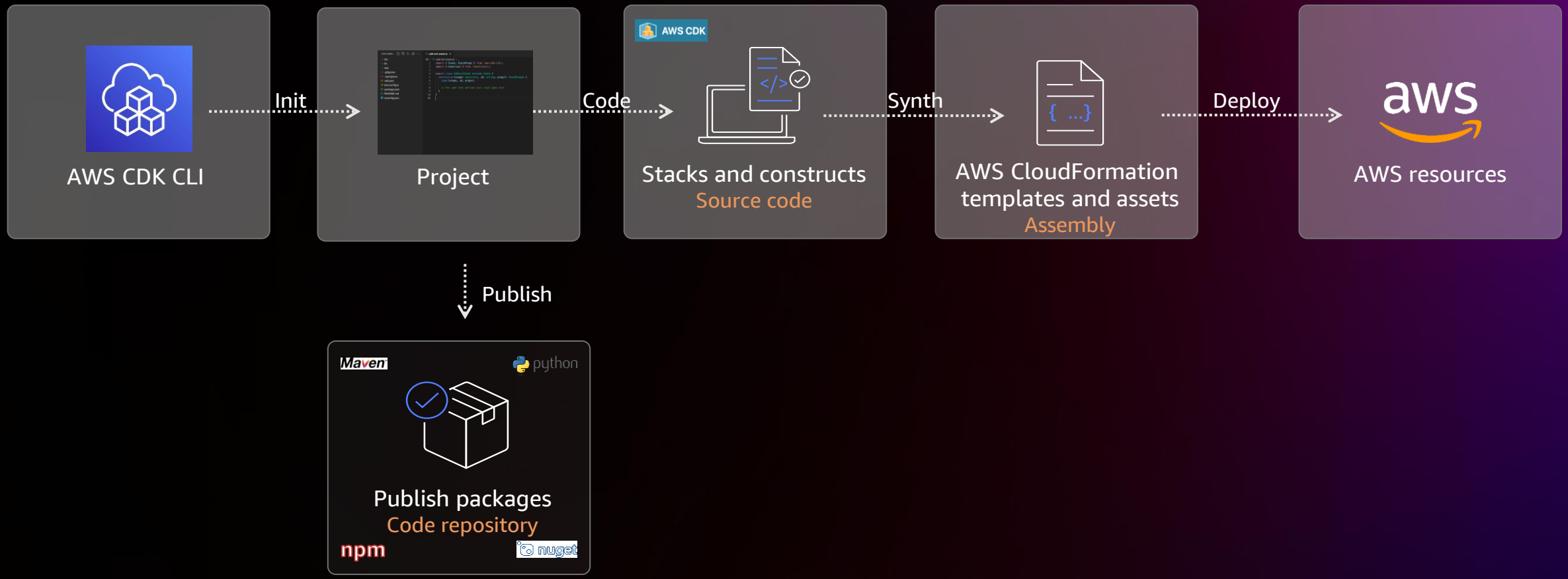
AWS Construct Library



AWS CDK CLI

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AWS CDK: Workflow



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Containers

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“A container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably from one computing environment to another.”

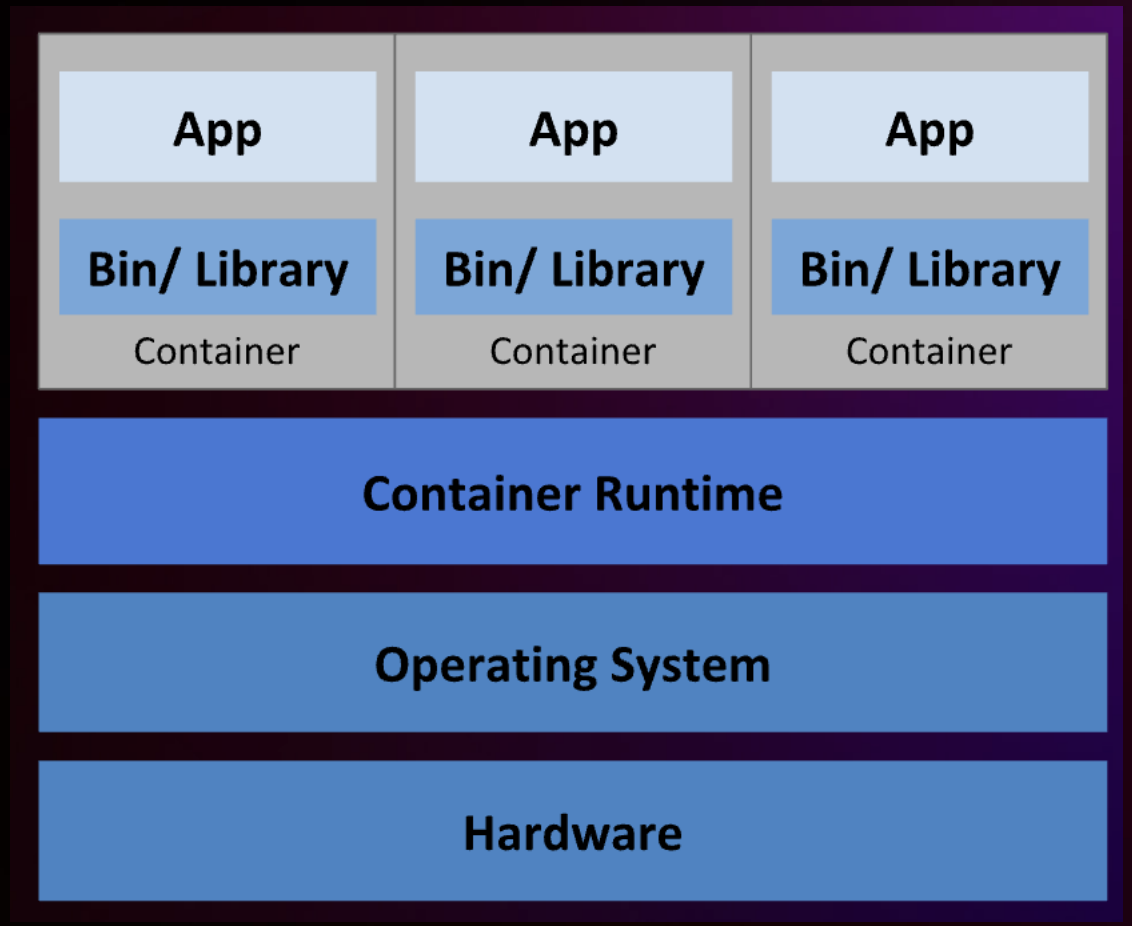
Docker

https://www.docker.com/resources/what-container/

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Containers



https://www.docker.com/resources/what-container/

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But running many containers and different services is hard!

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Kubernetes for container orchestration

Kubernetes is a container orchestration system that started as an open-source project from Google

Heart of the cloud-native movement

Designed to run everywhere, from on-premises to the cloud

Automatic scaling and self-healing

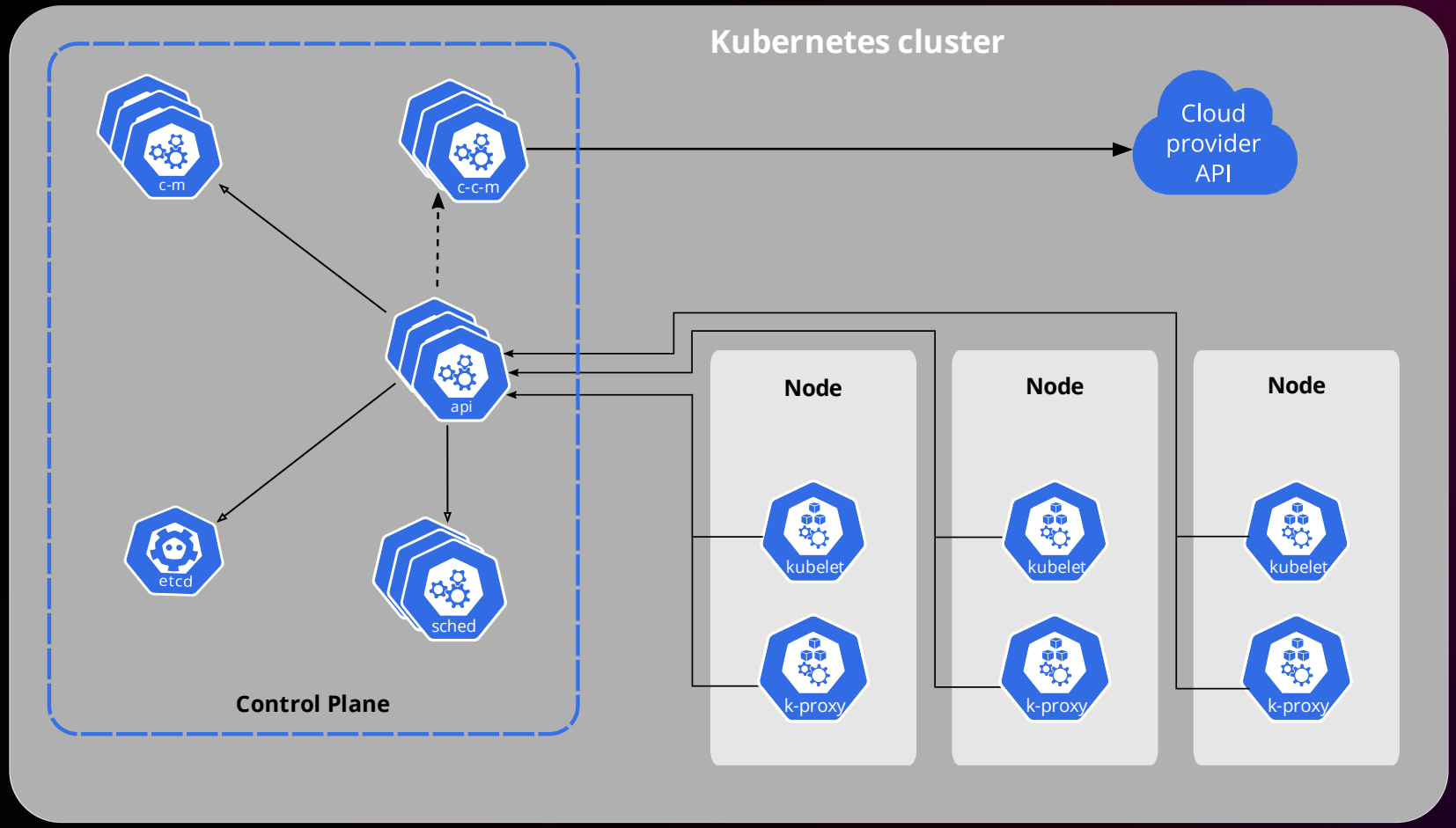
Innovative declarative resource model



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Architecture



https://kubernetes.io/docs/concepts/overview/components/

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Pod

A pod is the basic unit of Kubernetes – it generally represents a container

Most resources have 4 fields:

- apiVersion
- kind
- metadata
- spec

Don’t create these yourself

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    key: value
spec:
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
      protocol: TCP
```

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Deployment

A deployment represents a single app/service – this is the most common resource you'll use

Completely isolated from other deployments by default

Notice the spec.template field is the same as the pod

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
```

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Service

A service is how we make deployments accessible inside and outside our cluster

Three different types

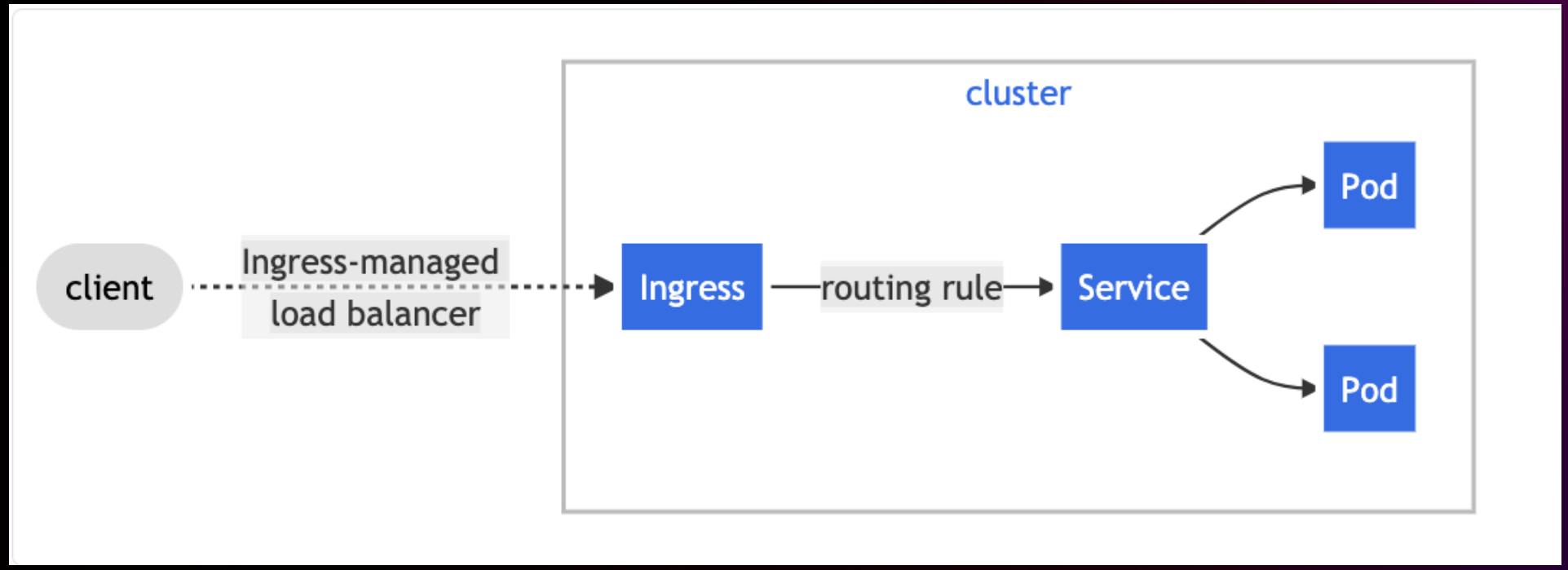
- ClusterIP
- NodePort
- LoadBalancer

```yaml
apiVersion: v1
kind: Service
metadata:
  name: nginx-service
spec:
  type: LoadBalancer
  selector:
    app: nginx
  ports:
    - port: 80
      targetPort: 80
```

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Ingress



https://kubernetes.io/docs/concepts/services-networking/ingress/

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Kubernetes and cdk8s

Cloud Development Kit for Kubernetes

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cdk8s bridges imperative languages with declarative YAML

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CDK for Kubernetes (cdk8s)

An open-source multi-language software development framework for modeling Kubernetes resources as reusable components



Go from code to config

Define Kubernetes applications and architectures using familiar programming languages

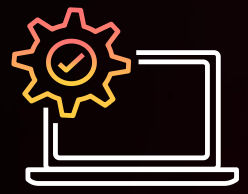
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Go from code to config

Define Kubernetes applications and architectures using familiar programming languages

Cut, copy, and paste

Turn best practices into code libraries and share easily



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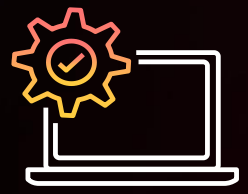
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Turn best practices into code libraries and share easily



Run everywhere

cdk8s runs locally and generates YAML that you can deploy to any cluster, anywhere



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cdk8s: In a nutshell

```typescript
export class MyChart extends Chart {

  constructor(scope: Construct, name: string) {
    super(scope, name);

    new kplus.Deployment(this, 'Deployment', {
      containers: [new kplus.Container({
        image: 'nginx'
      })]
    });

  }
}
```

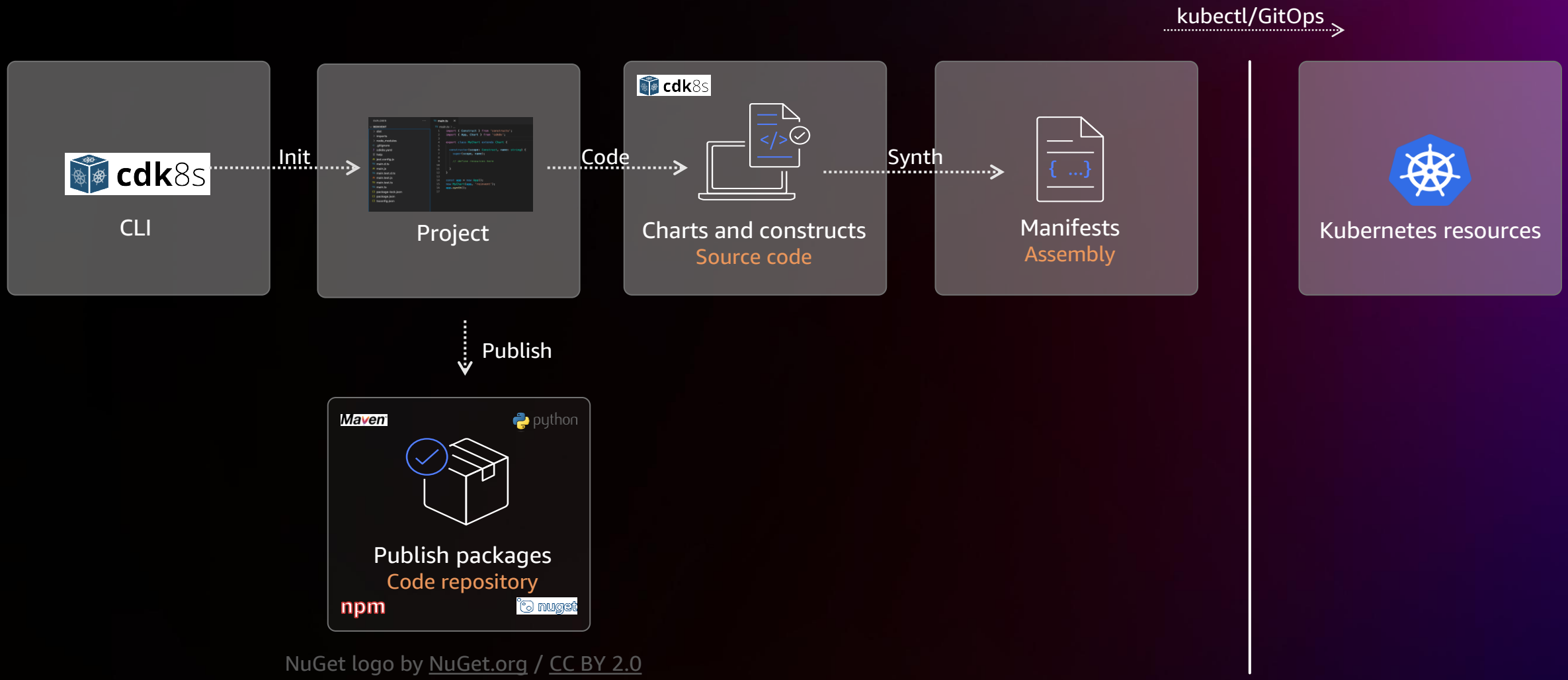
cdk8s synth →

```yaml
apiVersion: "apps/v1"
kind: "Deployment"
metadata:
  name: "reinvent-deployment-58e8fcdb"
spec:
  replicas: 1
  selector:
    matchLabels:
      cdk8s.deployment: "reinvent-Deployment-074884f1"
  template:
    metadata:
      labels:
        cdk8s.deployment: "reinvent-Deployment-074884f1"
    spec:
      containers:
        - env: []
          image: "nginx"
          imagePullPolicy: "Always"
          name: "main"
          ports: []
          volumeMounts: []
      volumes: []
```

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cdk8s: Workflow



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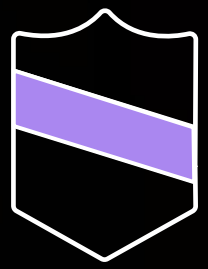
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Amazon EKS with AWS CDK

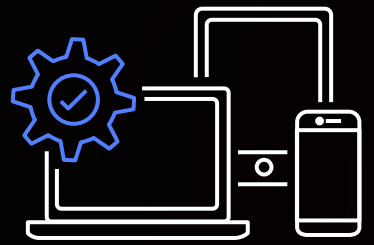
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Amazon Elastic Kubernetes Service (EKS)

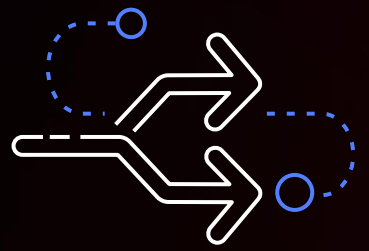
Fully managed Kubernetes service



Security first

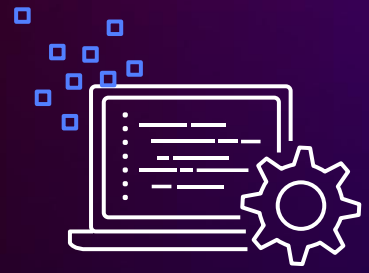


Production workloads



Native and upstream

Seamless integrations



Open-source contribution

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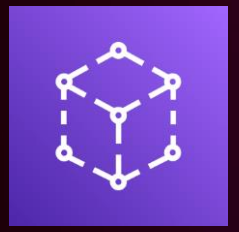
Extending Kubernetes

- Resources, objects, APIs
- Custom resource definition (CRD)
- Custom controllers
- Declarative
- kubectl support





Kubeflow



AWS IAM authenticator

And much, much more

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Using cdk8s with CRDs

Just run cdk8s import!

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Thank you!



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