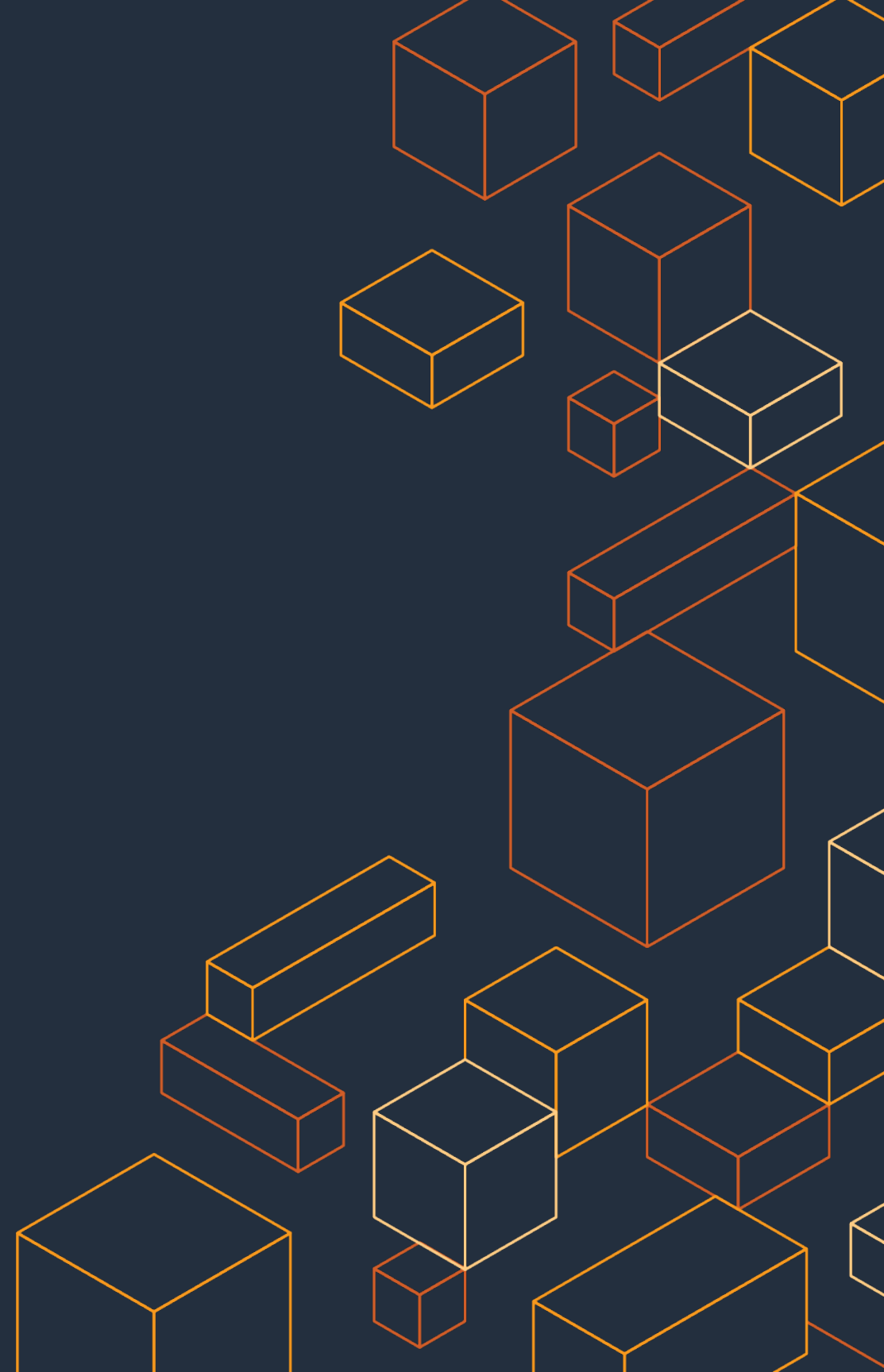




CI/CD on AWS

Accelerate delivery with better quality and control

Adamu Haruna, AWS Finland



Agenda

Foundations of CI/CD

Release Process

Amazon CI/CD Tools

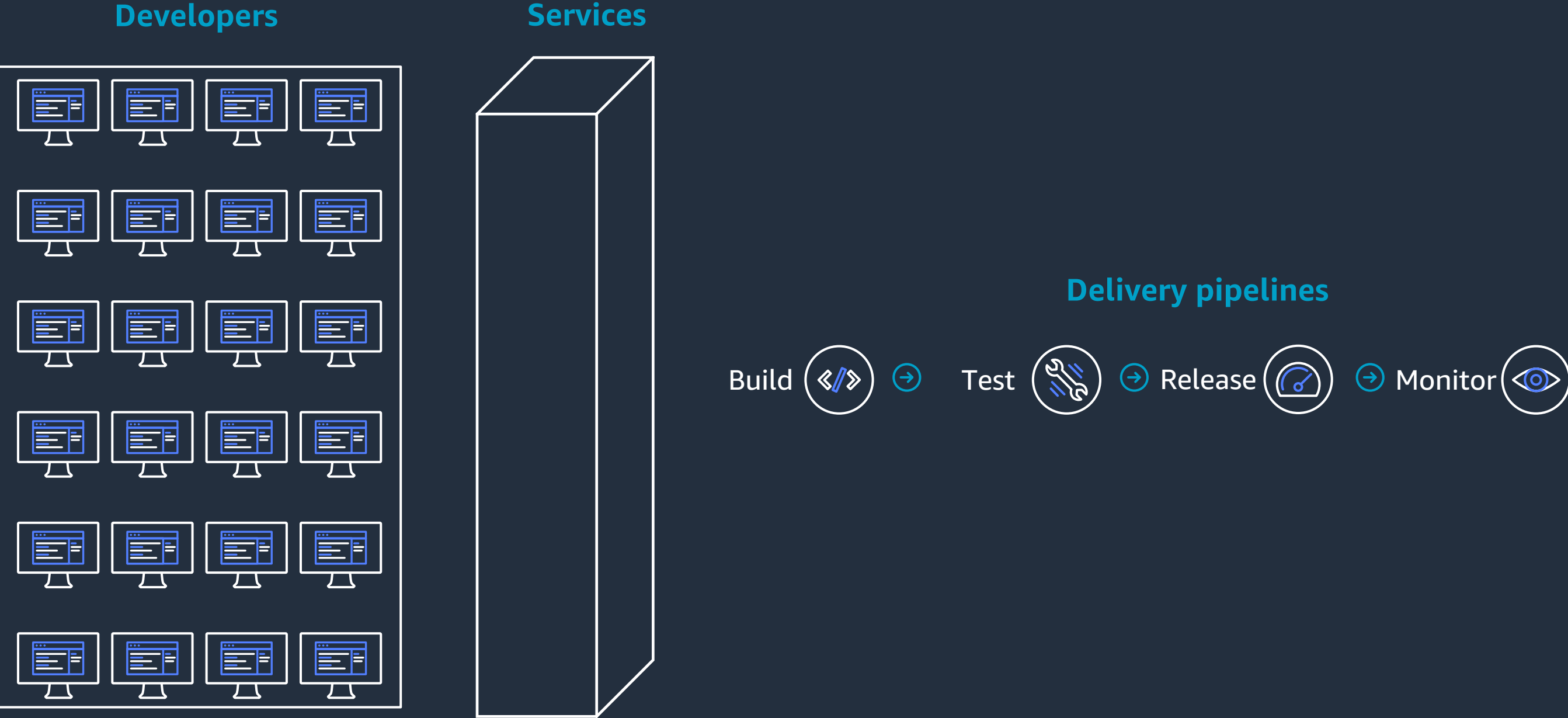
Infrastructure as Code

What's Next?

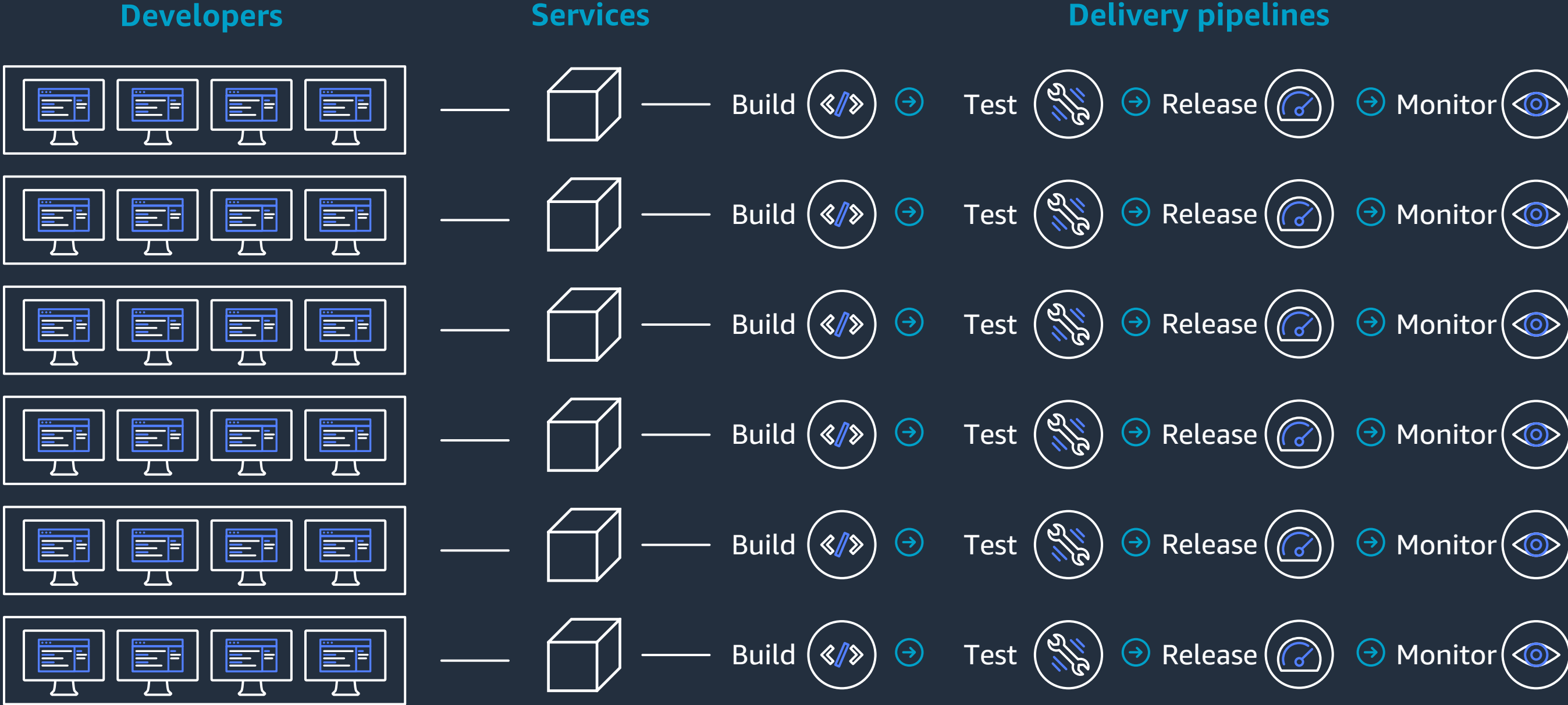


Foundations of CI/CD

Monolith development lifecycle



Microservice development lifecycle



Key reasons for organizations to adopt CI/CD principles

- Accelerate the delivery of new, high-quality services
- Reduce the impact of changes
- Gain insight across resources and applications
- Protect customers and the business

Effects of CI/CD

Deployment frequency

Weekly-monthly



Hourly-daily

Change lead time

1-6 months



1-7 days

Change failure rate

46%-60%



0%-15%



48% of software teams

Source: 2019 State of DevOps Report, DORA



Release process stages



- Check-in source code such as .java files
- Peer review new code

- Compile code
- Unit tests
- Style checkers
- Create container images and function deployment packages

- Integration testing with other systems
- Load testing
- UI testing
- Security testing

- Deploy to production environments
- Monitor code in production to quickly detect errors

Release lifecycle



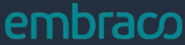
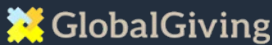
Continuous Delivery vs Continuous Deployment



Operation excellence for CI/CD






- Monitor the deployment process
- Integration with Incident management System
- Establish Operation Model
- Use Monitoring tools for monitoring and dashboard

Internal and external customers across industries




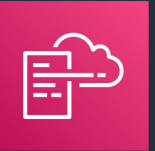
By way of introduction...

CI/CD tools



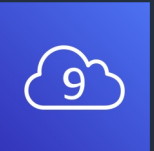
AWS CodeStar AWS CodeBuild AWS CodeCommit AWS CodeDeploy AWS CodePipeline

Infrastructure as code



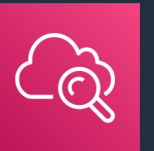
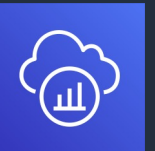
AWS CloudFormation AWS CDK

IDE



AWS Cloud9

Monitoring & tracing









AWS X-Ray Amazon CloudWatch

Web apps





AWS Elastic Beanstalk

IDE and DevOps toolkits




Visual Studio Code IntelliJ PyCharm Visual Studio Eclipse VSTS

CLI and scripting tools



AWS CLI Tools for PowerShell

Languages












Amazon Corretto

Mobile



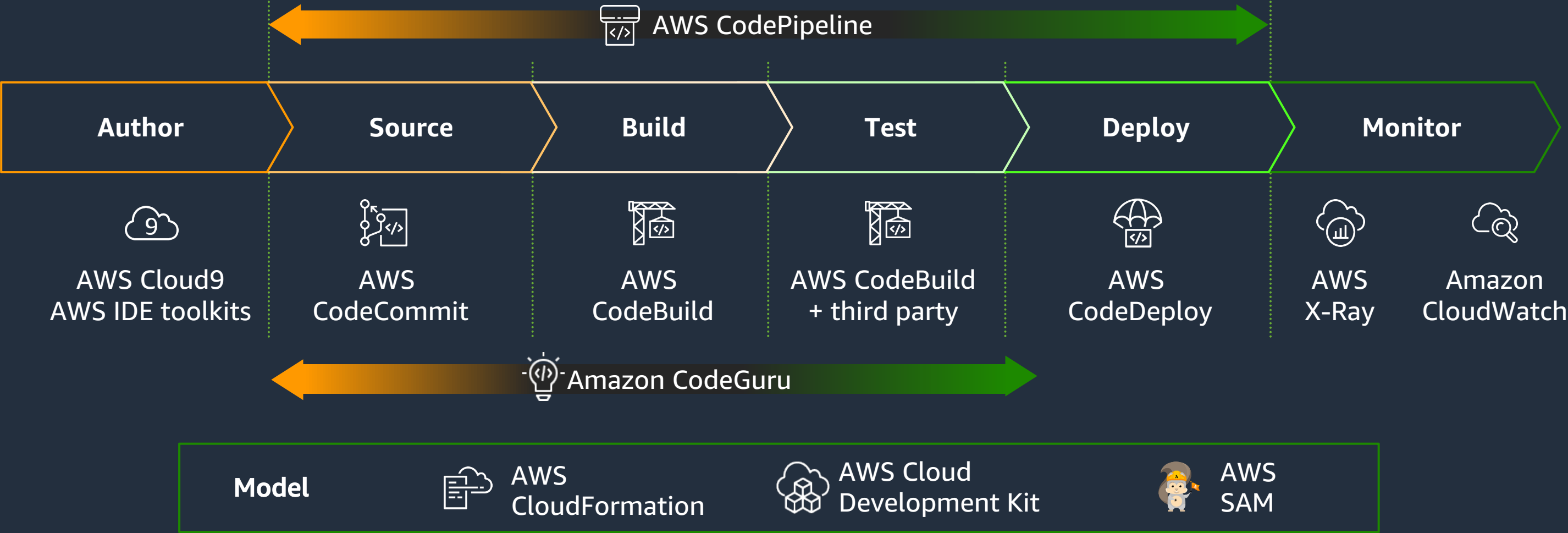
AWS Amplify

SDKs



JavaScript Python PHP .NET Ruby Java Go Node.js C++

CI/CD for modern software delivery



AWS Cloud9 for cloud-based development



AWS Cloud9

A cloud IDE for writing, running, and debugging code

- Code with just a browser
- Start new projects quickly
- Code together in real time
- Build serverless applications with ease
- Direct terminal access

Support for local development

JET
BRAINS



AWS Toolkit for CLion
C, C++



AWS Toolkit for GoLand
Go



AWS Toolkit for IntelliJ IDEA
Java, Python



AWS Toolkit for PyCharm
Python



AWS Toolkit for PhpStorm
PHP



AWS Toolkit for Rider
.NET



AWS Toolkit for RubyMine
Ruby



AWS Toolkit for Webstorm
Node.js

Build, debug, and deploy applications on AWS with IDE Toolkits for popular desktop IDEs



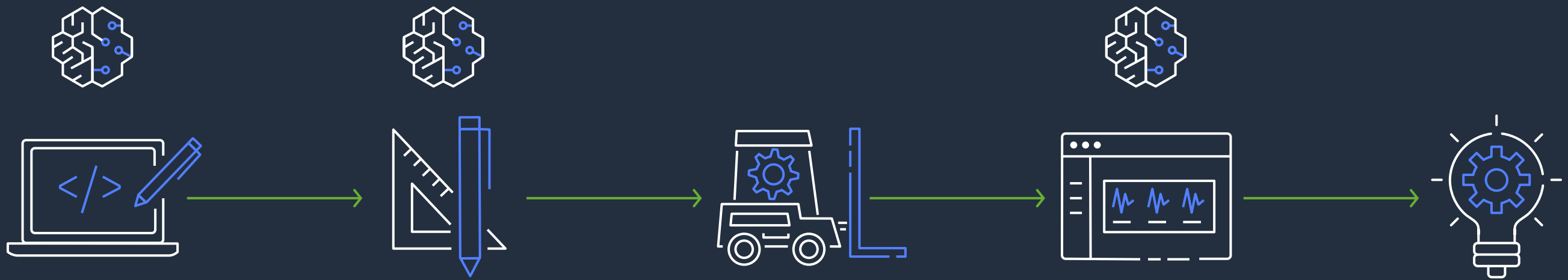
AWS Toolkit for Visual Studio Code
.NET, Node.js



AWS Toolkit for Visual Studio
.NET

Amazon CodeGuru

USING MACHINE LEARNING (ML) TO BUILD AND RUN HIGH-PERFORMING APPLICATIONS

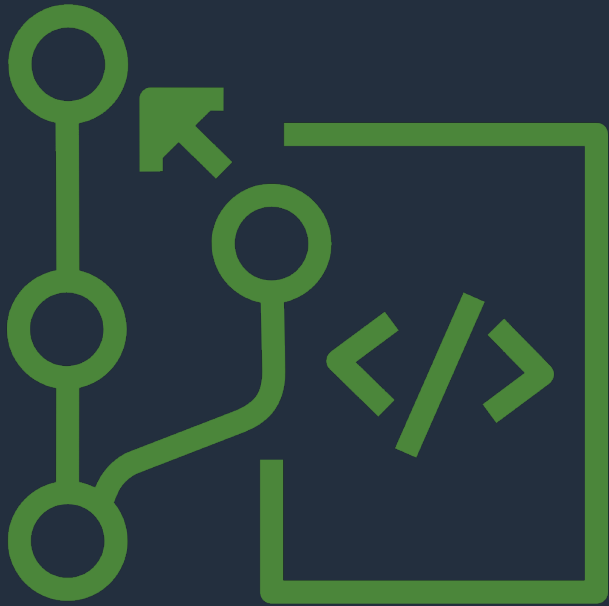


Built-in **code reviews** with intelligent recommendations

Detect and **optimize** the expensive lines of code pre-production

Easily identify **application inefficiencies** in production environment

AWS CodeCommit



- Secure, highly scalable, managed source control service that hosts private git repositories
- Works with existing git tools
- Integrates with AWS services like IAM, Amazon EventBridge, Amazon SNS
- No hardware to provision and scale
- Highly available and durable (backed by s3)

AWS CodeBuild



- Fully managed build service that compiles source code, runs tests, and produces software packages
- Scales continuously and processes multiple builds concurrently
- No build servers to manage
- Pay by the minute, only for the compute resources you use
- Monitor builds through CloudWatch Events

AWS CodeDeploy



- Automates code deployments to any instance and Lambda
- Handles the complexity of updating your applications
- Avoids downtime during application deployment
- Rolls back automatically if failure detected
- Deploys to Amazon EC2, Lambda, or on-premises servers

AWS CodePipeline



- Continuous delivery service for fast and reliable application updates
- Model and visualize your software release process
- Builds, tests, and deploys your code every time there is a code change
- Integrates with third-party tools and AWS

Amazon Web Services (AWS) observability portfolio



Amazon CloudWatch

Complete visibility of cloud resources and applications

Monitor applications

Respond to performance changes

Optimize resource utilization

Get a unified view of operational health



AWS X-Ray

Analyze and debug production, distributed applications

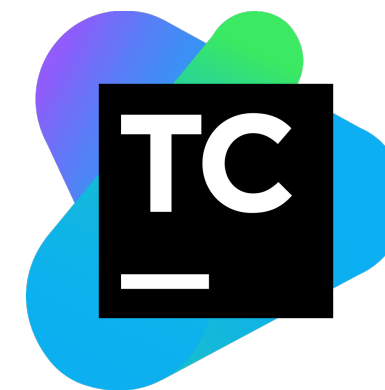
Identify performance bottlenecks

Troubleshoot root cause

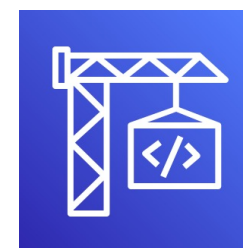
Trace user requests

For simple & complex applications

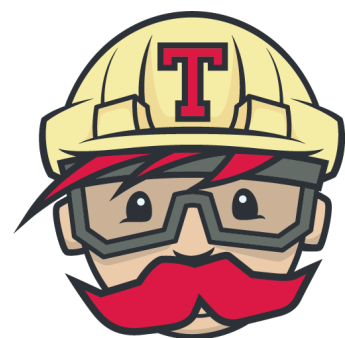
Integrate with popular CI/CD ecosystem



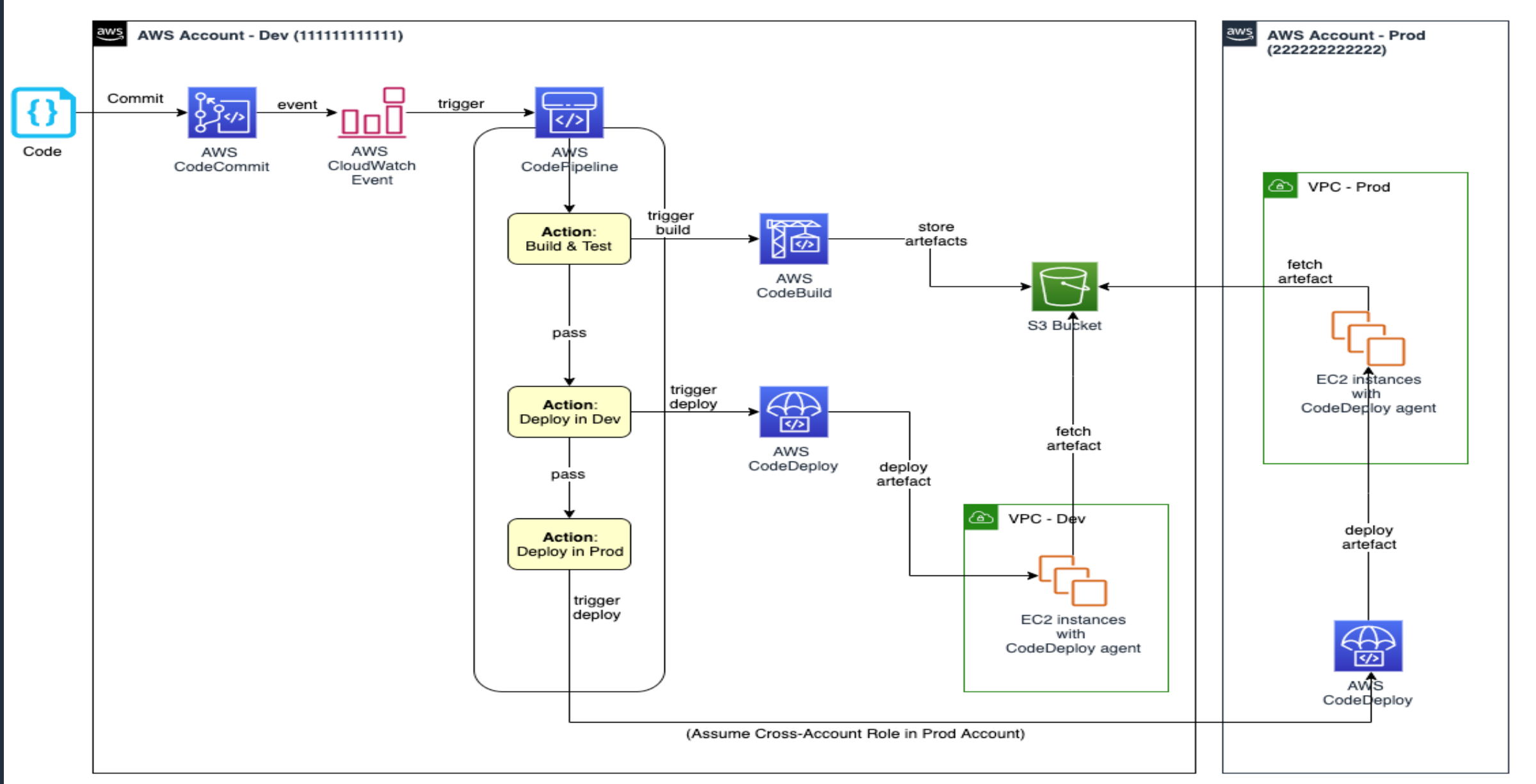
Jenkins



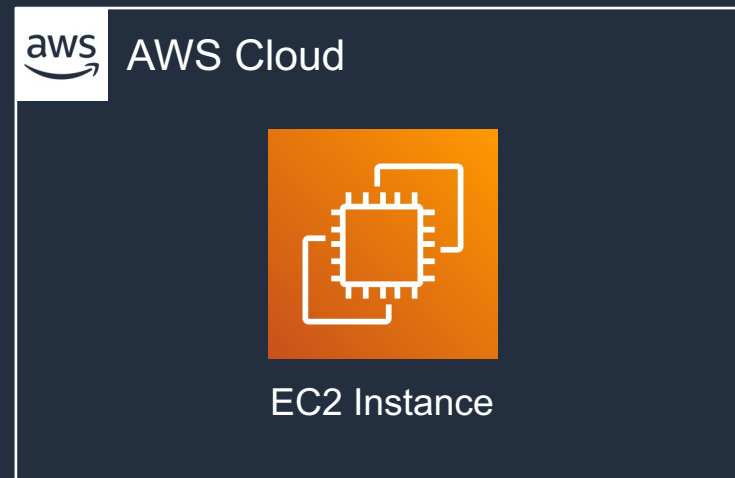
AWS CodeBuild



CI/CD with AWS CodeCommit, AWS CodeBuild, AWS CodeDeploy, and AWS CodePipeline



Infrastructure as Code (IaC)



```
AWSTemplateFormatVersion: "2010-09-09"  
Description: Creates an EC2 Instance  
Resources:  
  MyEC2Instance:  
    Type: "AWS::EC2::Instance"  
    Properties:  
      ImageId: "ami-0ff8a91507f77f867"  
      InstanceType: t2.micro
```

What?

1. Writing code to create, configure, and deploy infrastructure components
2. Infrastructure includes: networking, compute, databases, security, management tools, etc.

Why?

1. Makes infrastructure changes **repeatable and predictable**
2. Documents your infrastructure
3. Automates the provisioning process
4. Eliminates configuration drift through automation

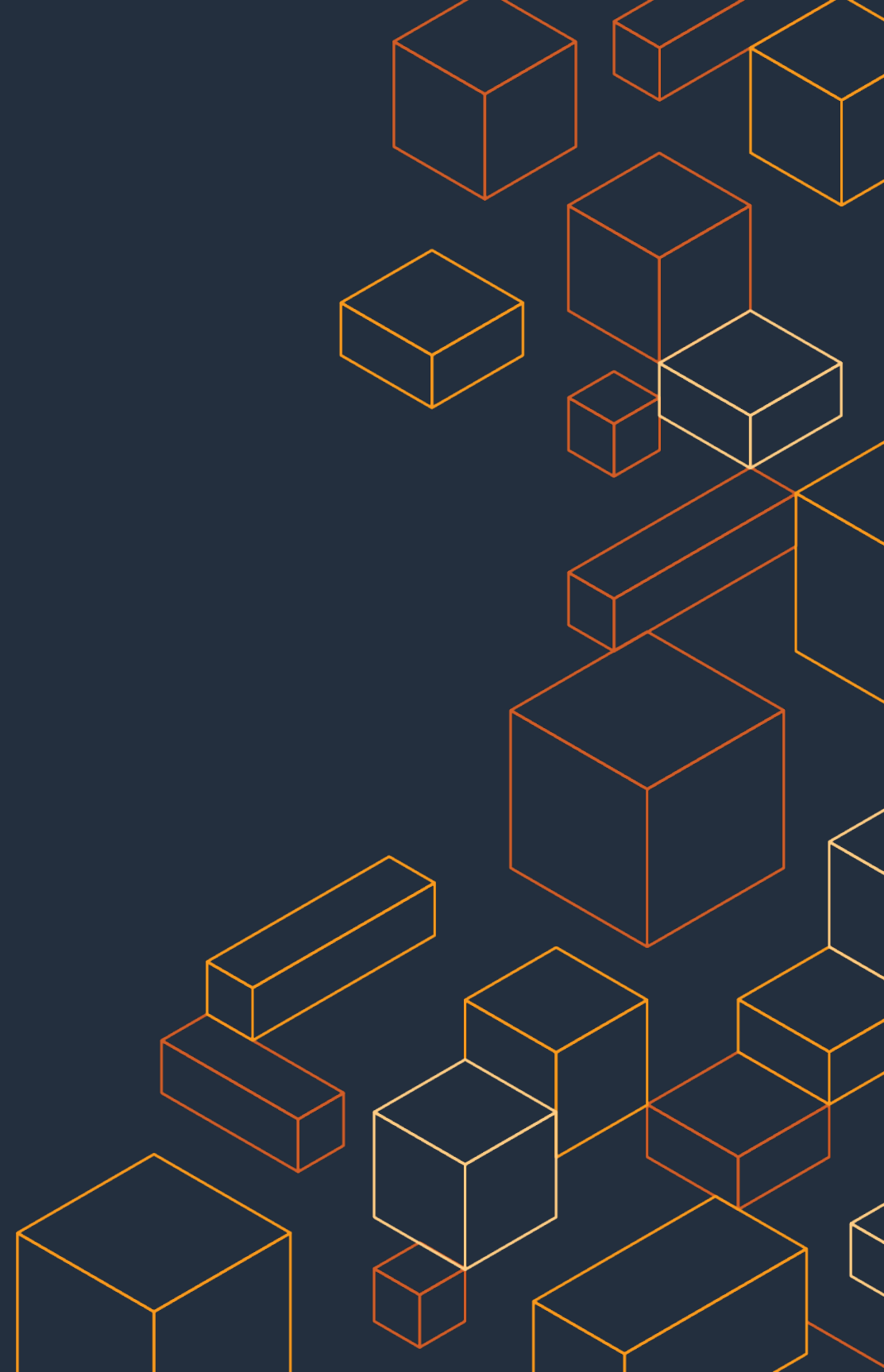
Infrastructure as Code with AWS CloudFormation



- Simplified way to create and manage a collection of AWS resources
- Enables orderly and predictable provisioning and updating of resources
- Enables version control of your AWS infrastructure
- Only pay for the resources you create



What's Next?



Extending CloudFormation with Serverless Application Model (SAM)



- Framework for building serverless applications
- Shorthand syntax to express functions, APIs, databases, and event source mappings
- Model with YAML, deploy using AWS CloudFormation
- Open source

AWS Serverless Application Model (SAM)

SAM CLI

Serverless Toolbox

- Development
- Debugging
- Build
- Packaging
- Deployment
- ..and more!

SAM Template

CloudFormation extension
optimized for serverless

Shorthand syntax to express
serverless pattern

Model with YAML

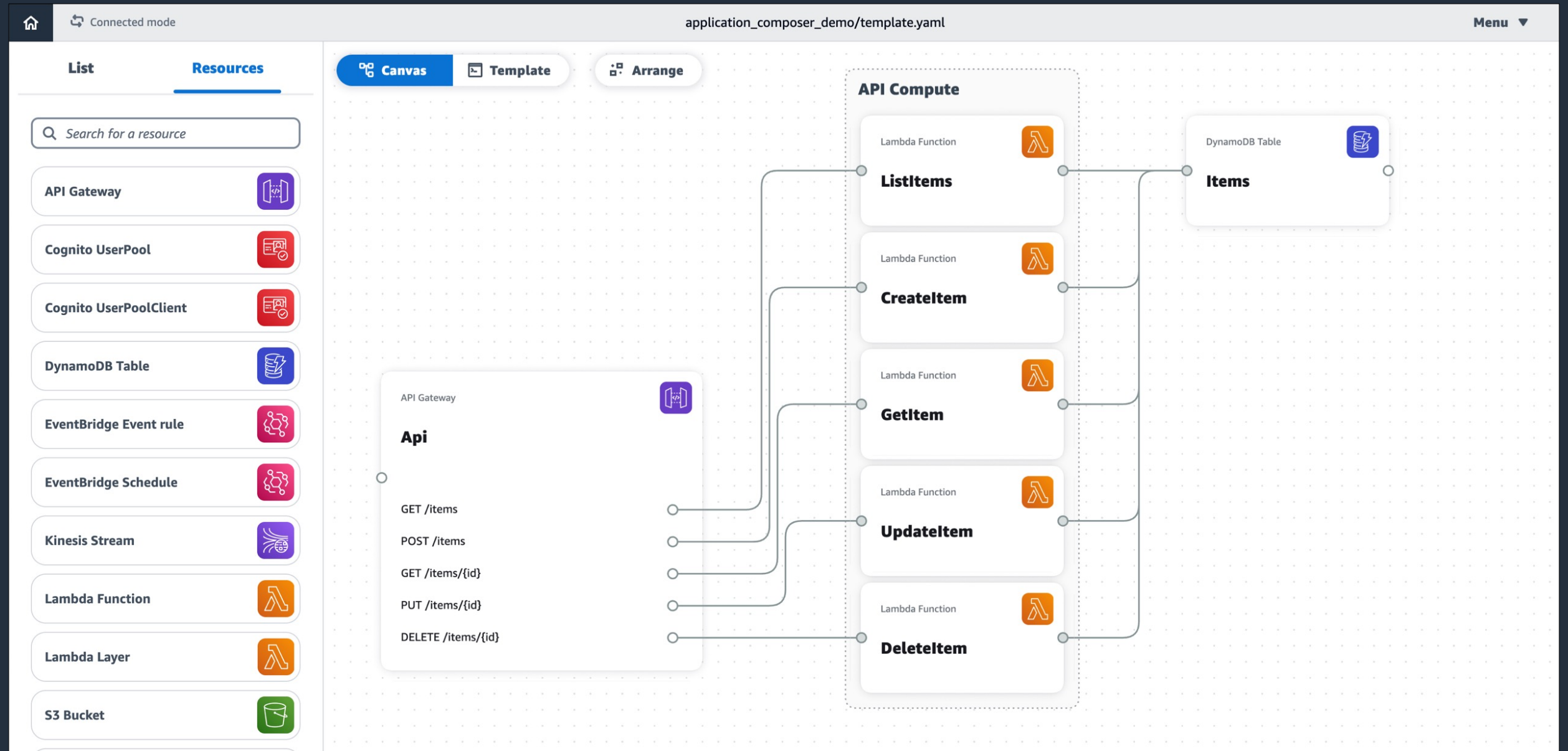
AWS Application Composer



AWS Application Composer

- Helps you **visually compose** and **configure** AWS services into serverless applications.
- Backed by Infrastructure as Code (IaC)
- **Visual builder** that makes it easier to design a serverless application architecture by:
 - **Dragging**
 - **Grouping**
 - **Connecting**AWS services in a visual canvas

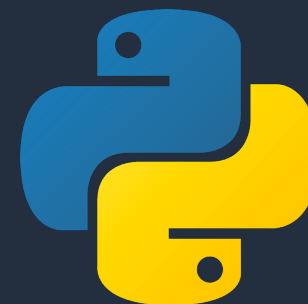
AWS Application Composer



Shorten the learning curve with AWS Cloud Development Kit (CDK)

Brings cloud infrastructure to developers in ways they can understand

- Build cloud infrastructure with the languages they already know
- Use their existing tools and workflows
- Helpful abstractions that remove the need to learn the details
- Vibrant and fast-growing community of developers



Coming soon

CDK Example

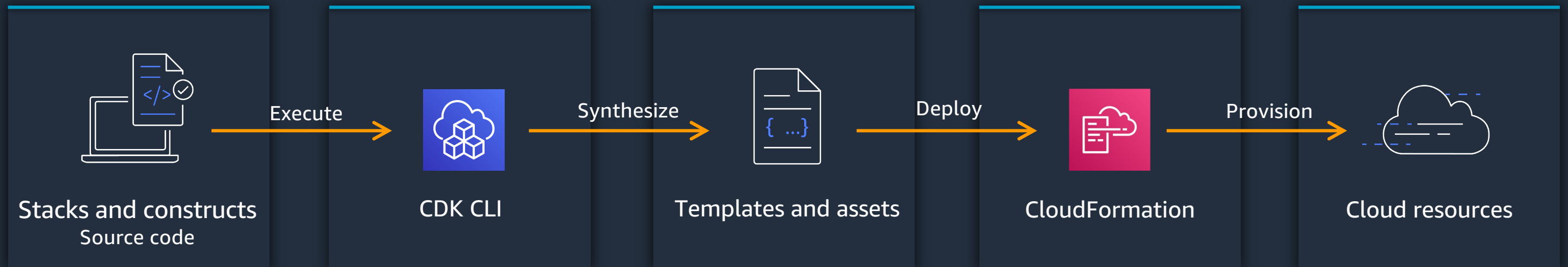







```
class BonjourFargate extends cdk.Stack {
  constructor(scope: cdk.App, id: string, props?: cdk.StackProps) {
    super(scope, id, props);

    const vpc = new ec2.Vpc(this, 'MyVpc', { maxAzs: 2 });
    const cluster = new ecs.Cluster(this, 'Cluster', { vpc });

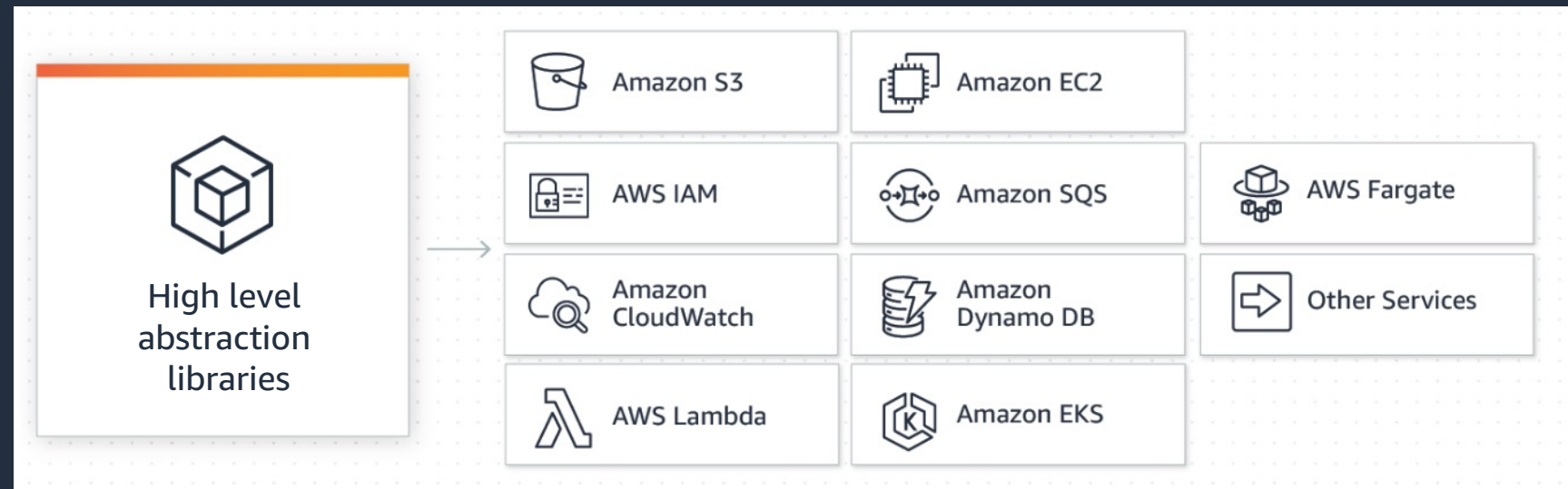
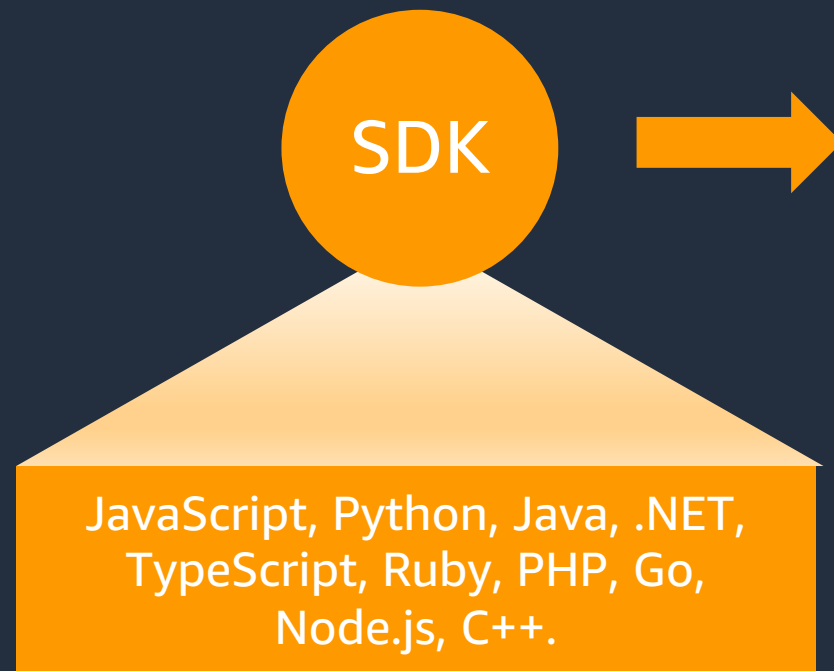
    new ecs_patterns.ApplicationLoadBalancedFargateService(this, "FargateService", {
      cluster,
      taskImageOptions: {
        image: ecs.ContainerImage.fromRegistry("amazon/amazon-ecs-sample"),
      },
    });
  }
}
```

How AWS CDK works



-  `cdk init` // create new project
-  `npm run build` // build project
-  `cdk synth` // create templates and assets
-  `cdk diff` // check what will change
-  `cdk deploy` // push changes to the cloud

AWS SDKs simplifies the use of AWS services



- Higher level abstractions, saving developers time to concentrate on logic rather than low level API calls
- Best practices by default (e.g., retries, credential handling)

Amazon CodeWhisperer



ENTERPRISE ADMINISTRATIVE CONTROLS, SIMPLE SIGN-UP, AND SUPPORT FOR NEW LANGUAGES

A screenshot of an IDE interface. The top bar shows 'AWS' and a file named 'get_save_image.py'. The Explorer on the left shows 'Connected with AWS Builder ID' and 'Select IAM Credentials to View R...'. The main editor shows Python code for an API runtime. The code includes imports for os, json, boto3, requests, and botocore.exceptions. It defines two functions: 'get_file(url)' which uses requests.get to fetch a file, and 'upload_image(file, filename)' which uses boto3 to upload a file to S3. A handler function is also shown, which calls these two functions and returns a JSON response. The IDE interface also shows 'DEVELOPER TOOLS' on the left, including 'CodeWhisperer (Preview)' with options like 'Pause Auto-Suggestions', 'Run Security Scan', and 'Open Code Reference Log'.

- Generates code recommendations based on the code and comments in your IDE
- Supports Python, Java, JavaScript, C#, TypeScript
- Available in popular IDEs - Visual Studio Code, JetBrains, AWS Cloud9, AWS Lambda
- Integrate with AWS IAM Identity Center or use AWS Builder ID

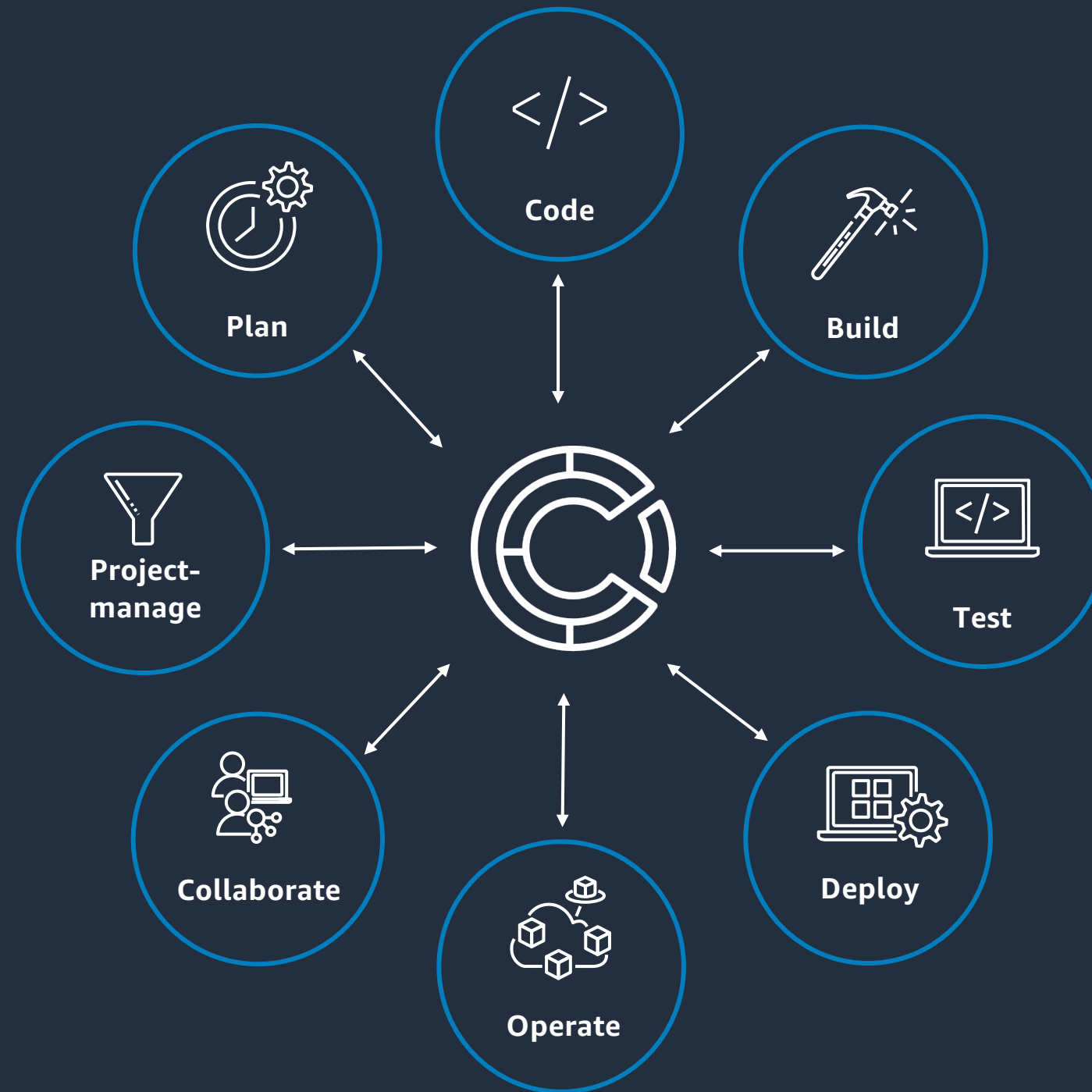
Preview



Putting it All Together



Amazon CodeCatalyst: Unified Software Development Service



- ✓ Managed
- ✓ All-in-one
- ✓ Integrated
- ✓ Security-focused
- ✓ Flexible

Amazon CodeCatalyst: benefits



**Accelerate
project
setup**



**Automate
daily
workflows**



**Automate
environments**

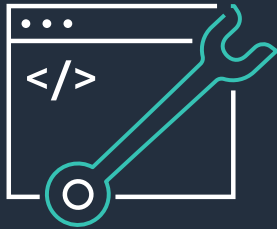


**Fluidly
collaborate**

44

Building modern applications on AWS

RESOURCES CREATED BY THE EXPERTS AT AWS TO HELP YOU BUILD AND VALIDATE DEVELOPER SKILLS



Enable rapid innovation by developing your skills in designing, building, and managing modern applications



Learn to modernize your applications with free digital training and classroom offerings, including Architecting on AWS, Developing on AWS, and DevOps Engineering on AWS



Validate expertise with the AWS Certified DevOps – Professional or AWS Certified Developer – Associate exams

Visit the developer learning path at aws.amazon.com/training/learn-about/developer/

Guidance from Amazon's leading engineers on how to build modern cloud applications

The Amazon Builders' Library

How Amazon builds and operates software



Architecture, software delivery, and operations

By Amazon's senior technical executives and engineers

Real-world practices with detailed explanations

Content available for free on the website

Example Builders' Library content

ARCHITECTURE

LEVEL 300



Leader election in distributed systems

Author: Marc Brooker


Improving efficiency, reducing coordination, and simplifying architectures by using leader election.

^



SOFTWARE DELIVERY AND OPERATIONS

LEVEL 300




Going faster with continuous delivery

Author: Mark Mansour


Automating the software testing and deployment process for speed and reliability

^



SOFTWARE DELIVERY AND OPERATIONS

LEVEL 400




Implementing health checks

Author: David Yanacek

Automatically detecting and mitigating server failures without unintended consequences from fleet-wide false positives.

^



ARCHITECTURE

LEVEL 400



Workload isolation using shuffle-sharding

Author: Colm MacCarthaigh

Shuffle Sharding is one of our core techniques for drastically limiting the scope of impact of operational issues

^



Resources

AWS CI/CD Workshop - <https://aws-ci-cd.workshop.aws/>

CodePipeline Tutorial - <https://docs.aws.amazon.com/codepipeline/latest/userguide/tutorials.html>

- Review Youtube Video on CodePipeline - <https://www.youtube.com/watch?v=zMa5gTLrzmQ>

CodeBuild Tutorial - <https://docs.aws.amazon.com/codebuild/latest/userguide/getting-started.html>

- Review Youtube Video on Building CodeBuild Locally - <https://youtu.be/N3pW4ZCeCxA>

CodeDeploy Tutorials - <https://docs.aws.amazon.com/codedeploy/latest/userguide/tutorials.html>

- Review Youtube Video on Blue/Green Deployment with CodeDeploy - <https://www.youtube.com/watch?v=xThOQuhJ2Pw>

CodeCommit Tutorial - <https://docs.aws.amazon.com/codecommit/latest/userguide/getting-started-cc.html>

- Review Youtube Video on CodeCommit - <https://www.youtube.com/watch?v=SWqh7LvxKqI>

CodeArtifact Tutorial - <https://docs.aws.amazon.com/codeartifact/latest/ug/getting-started.html>

- Review Youtube Video on CodeArtifact - <https://www.youtube.com/watch?v=pxV5E83S7Bw>

CDK Workshop - <https://cdkworkshop.com/>

Code Review and App Performance with CodeGuru Workshop - <https://codeguru-codereview-appperformance.workshop.aws/en/>

AWS CI/CD pipeline with CodeGuru & UnitTest to improve code quality - <https://codequality.workshop.aws/en/>

CI/CD for Serverless Applications using SAM - <https://cicd.serverlessworkshops.io/>

Complete CI/CD with AWS CodeCommit, AWS CodeBuild, AWS CodeDeploy, and AWS CodePipeline -

<https://aws.amazon.com/blogs/devops/complete-ci-cd-with-aws-codecommit-aws-codebuild-aws-codedeploy-and-aws-codepipeline/>



Thank you !

