



CI/CD on AWS

Accelerate delivery with better quality and control

Eren Akbaba

Bilkent University, CS
Solutions Architect, AWS

Agenda

Foundations of CI/CD

Building a CI/CD pipeline on AWS

Customer case studies

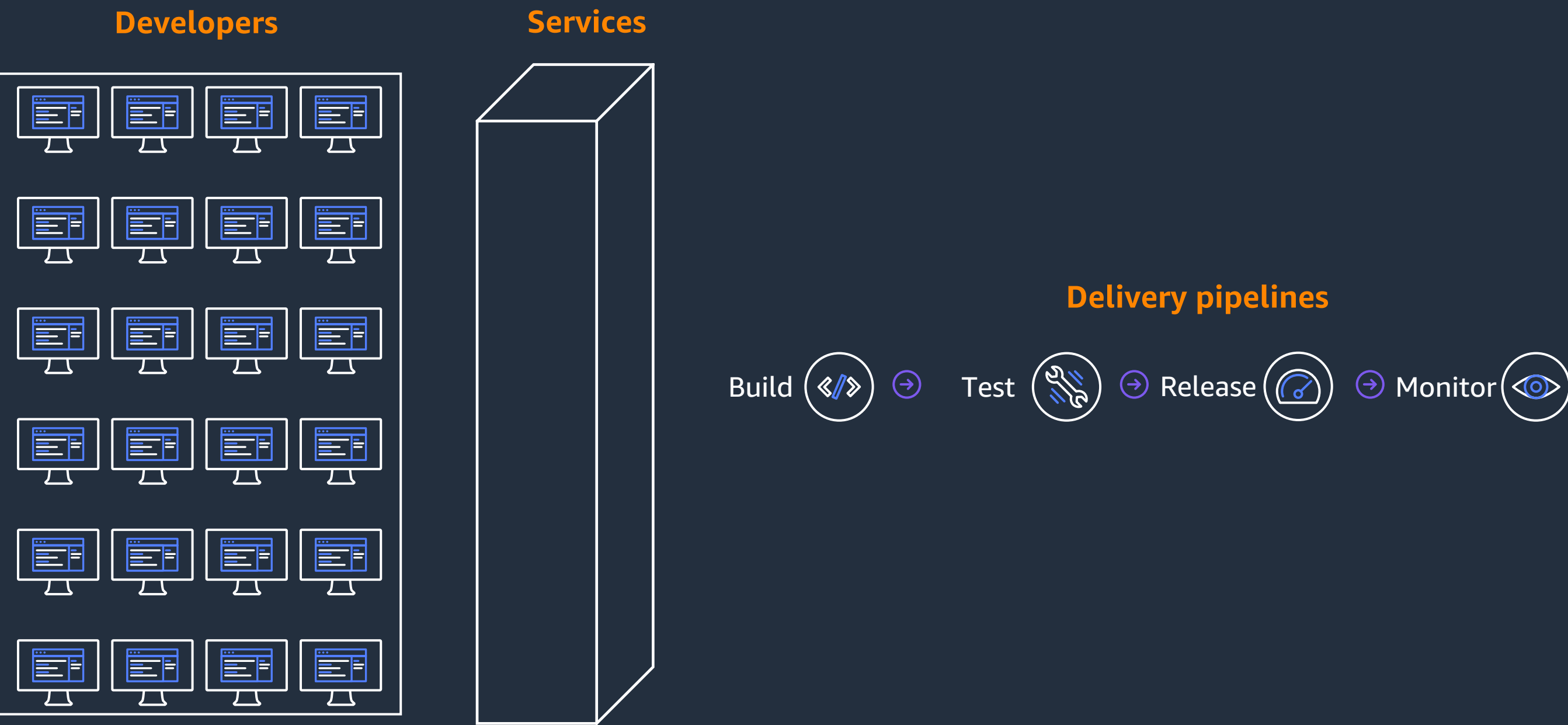
Resources



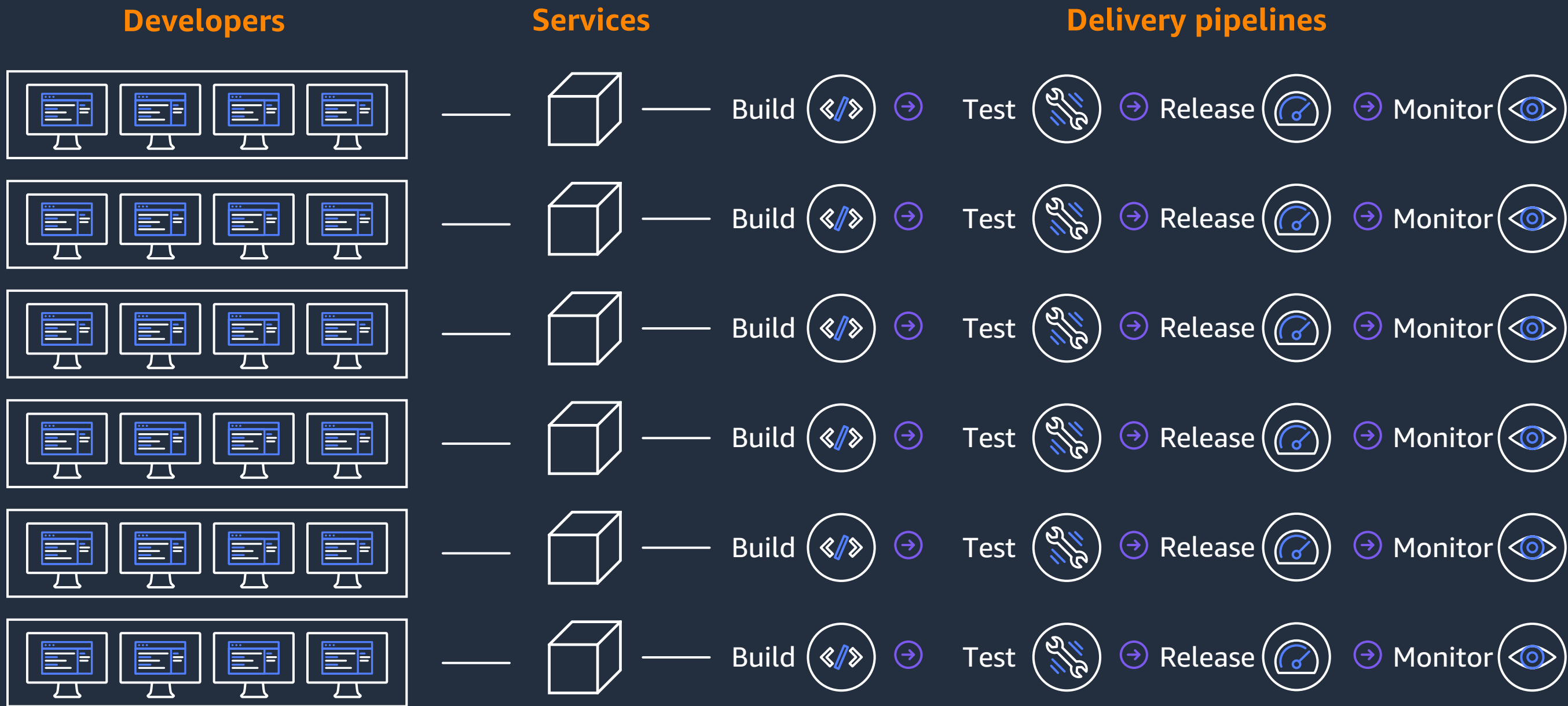
Foundations of CI/CD



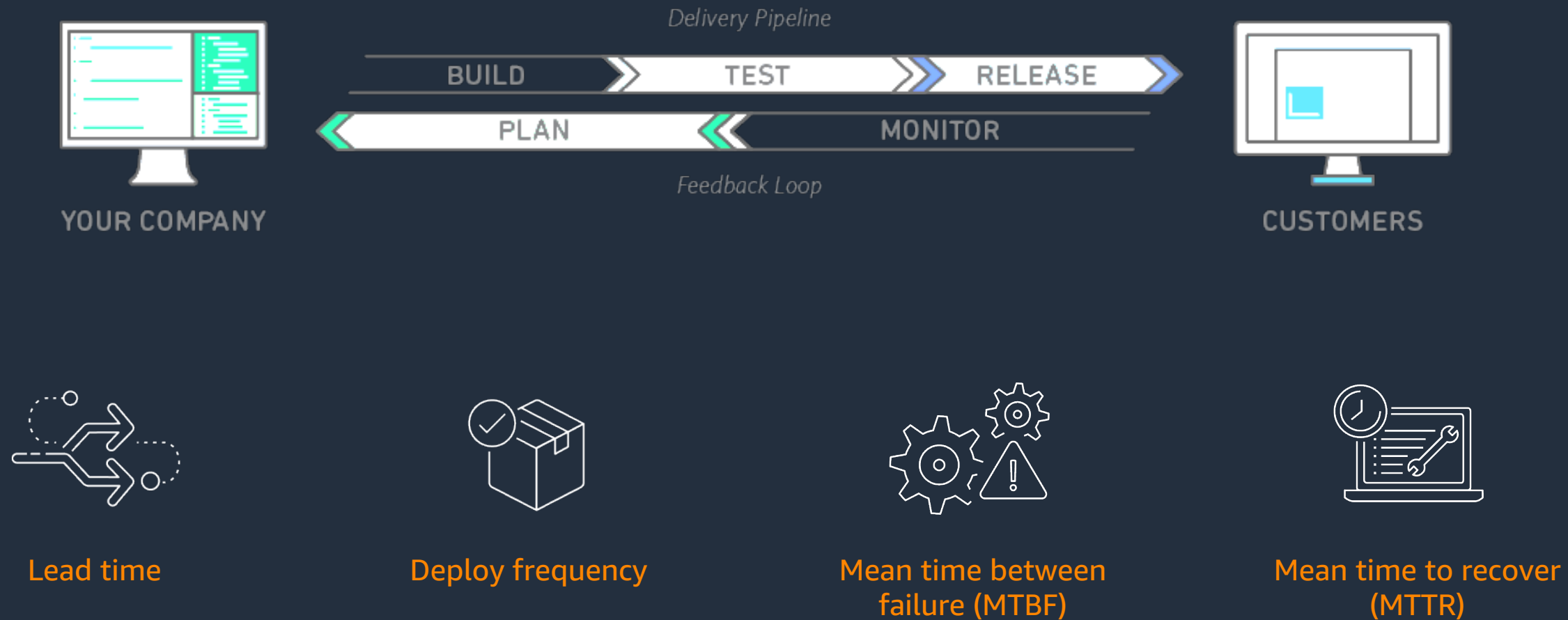
Monolith development lifecycle



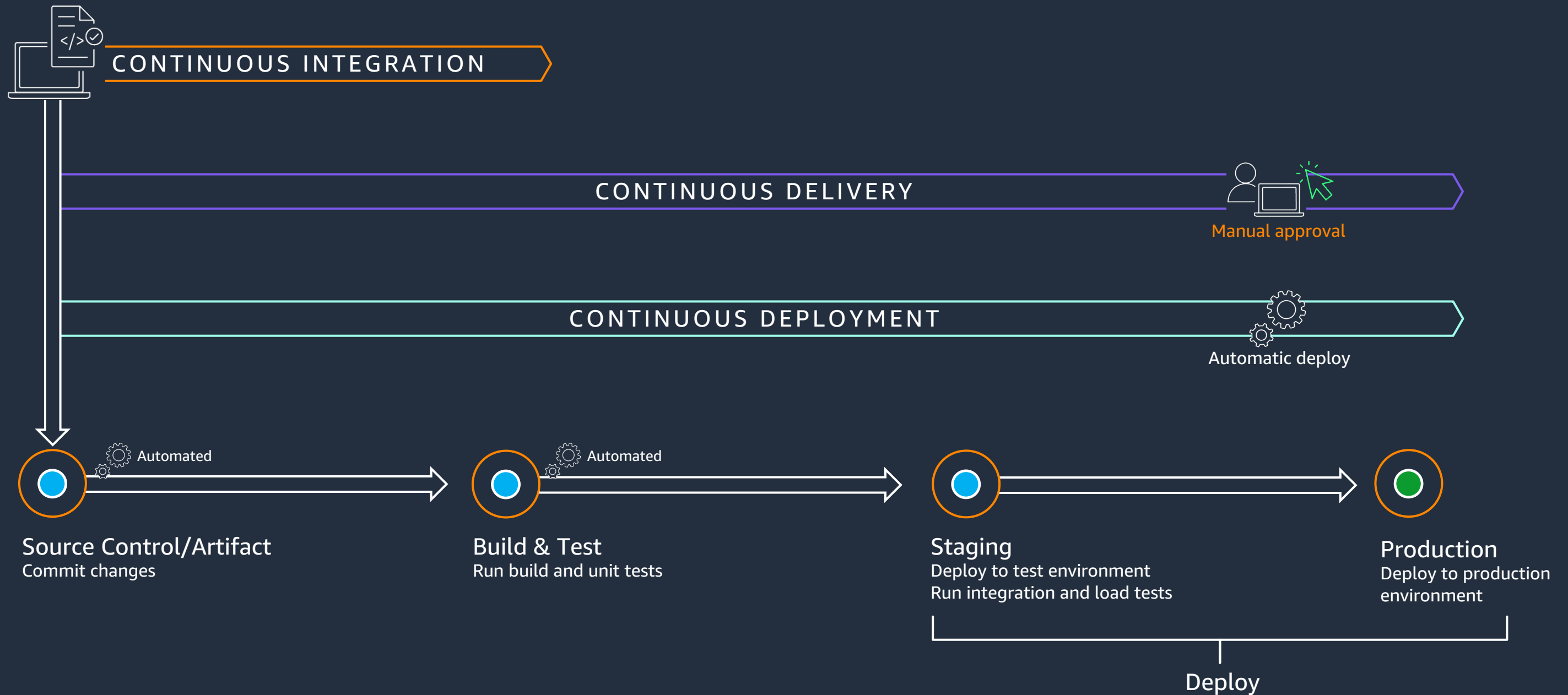
Microservice development lifecycle



Deployment Pipelines



CI/CD Overview



Example pipeline

Development



- Works on **smallest** thing possible
- Explicitly defines **dependencies** (including those needed for testing)
- Publishes **changes** for review
- Peer review **new** code
- **Style** checkers

Should be **fast**

Example pipeline

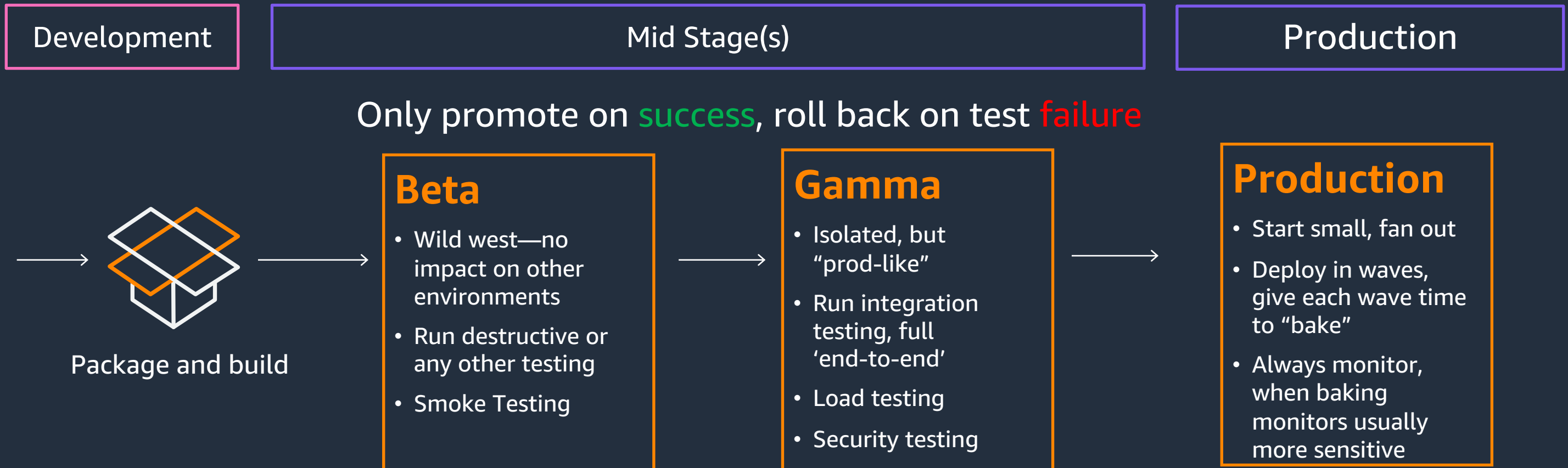
Development



- Builds and runs **unit testing**
- Bundles code and run-time dependencies into a **combined artifact**
- Provenance of **dependencies** is tracked

Should be **thorough**

Example pipeline



Looking for any reason to **fail**

Why organizations adopt CI/CD principles



Accelerate delivery of
new, **high-quality**
services



Reduce **impact** of
changes







Gain **insight** across
resources and
applications



Protect customers
and the business

How CI/CD affects organizations

	 Low	 Medium	 High	 Elite
Deployment frequency	Weekly-monthly	Weekly-monthly	Daily-weekly	On demand
Change lead time	1 week–1 month	1 week–1 month	1–7 days	<1 day
Change failure rate	64%	15%	10%	5%

Only 18% of organizations sit here

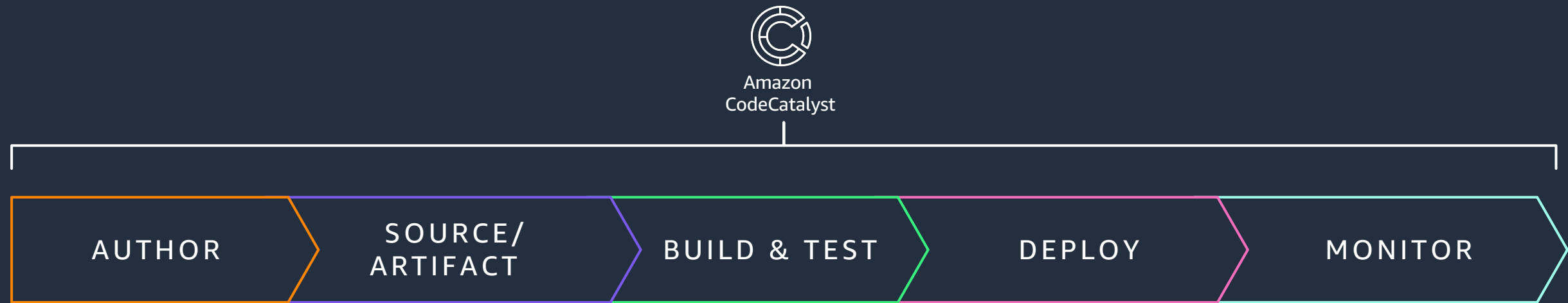
Source: 2023 State of DevOps Report, DORA



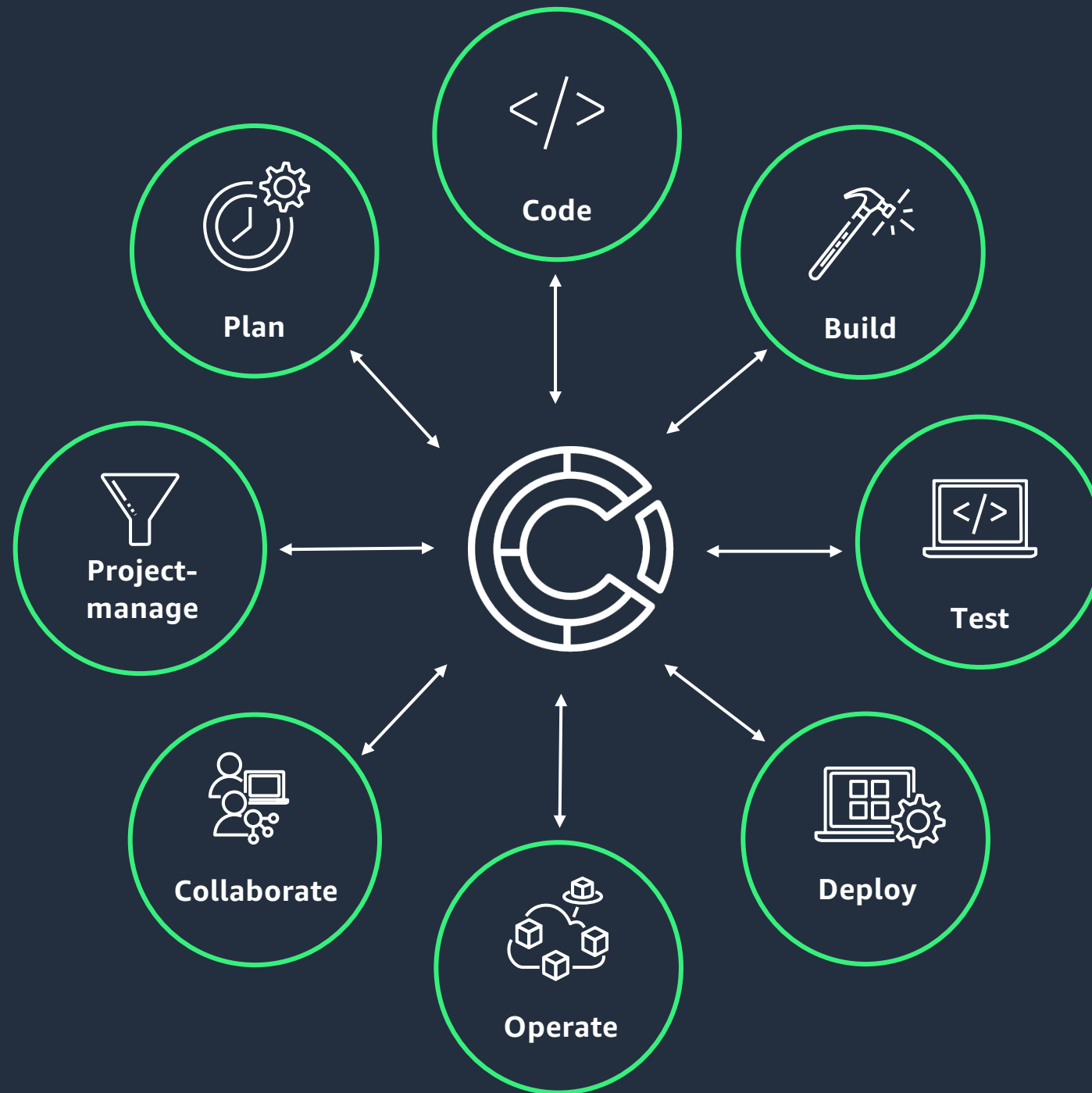
Building a CI/CD pipeline on AWS



CI/CD for modern software delivery



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**

CI/CD for modern software delivery



CI/CD pipeline

AUTHOR



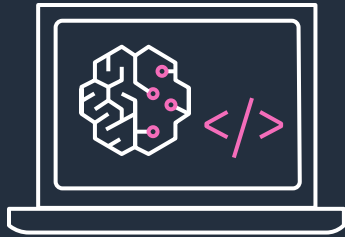
Amazon
CodeWhisperer



AWS Cloud9
AWS IDE Toolkits
AWS SDKs

Amazon CodeWhisperer

BUILD APPLICATIONS FASTER AND MORE SECURELY WITH YOUR AI CODING COMPANION



Generate code
suggestions in real time



Scan code for hard-to-
find vulnerabilities



Flag code that resembles
open-source training
data or filter by default

During preview Amazon ran a productivity challenge, and participants who used Amazon CodeWhisperer were **27% more likely to complete tasks successfully and did so an average of 57% faster** than those who did not use CodeWhisperer.

Use with your tools

BUILD APPLICATIONS FASTER AND MORE SECURELY WITH YOUR AI CODING COMPANION



Code generation



AND



Ruby, C, C++,
Shell scripting, and Scala



AND

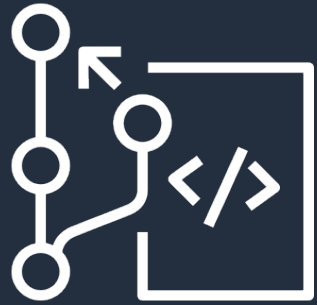
Amazon SageMaker Studio, CLion,
GoLand, WebStorm, Rider, PhpStorm,
RubyMine, and DataGrip



CI/CD pipeline



Source/Artifact services



AWS
CodeCommit

- Secure, highly scalable, managed source control service that hosts **private git repositories**
- Works with **existing git tools**
- No **hardware** to provision and scale
- Highly **available** and **durable**



AWS
CodeArtifact

- Fully managed **artifact repository** service
- Supports **npm, pip, yarn, twine, Maven, NuGet** and **SwiftPM** formats
- Access packages **within VPC**
- No upfront **license cost**



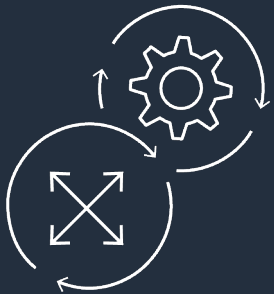
Amazon Elastic
Container Registry

- Fully managed **Docker image registry**
- Managed and **scalable** infrastructure
- Security with **encrypted images** and **vulnerability scans**
- Container images, Helm charts, OCI artifacts

Amazon CodeGuru Security



Onboarding



- **Cloud-based API** allows you to **integrate flexibly** at various stages of the CI/CD pipeline.
- Also **scales** with your workload so you don't need to **manage capacity**.

Triaging / Prioritization



- **Low false positives rate** improves your **operational efficiency** as you have fewer findings to review.

Remediation



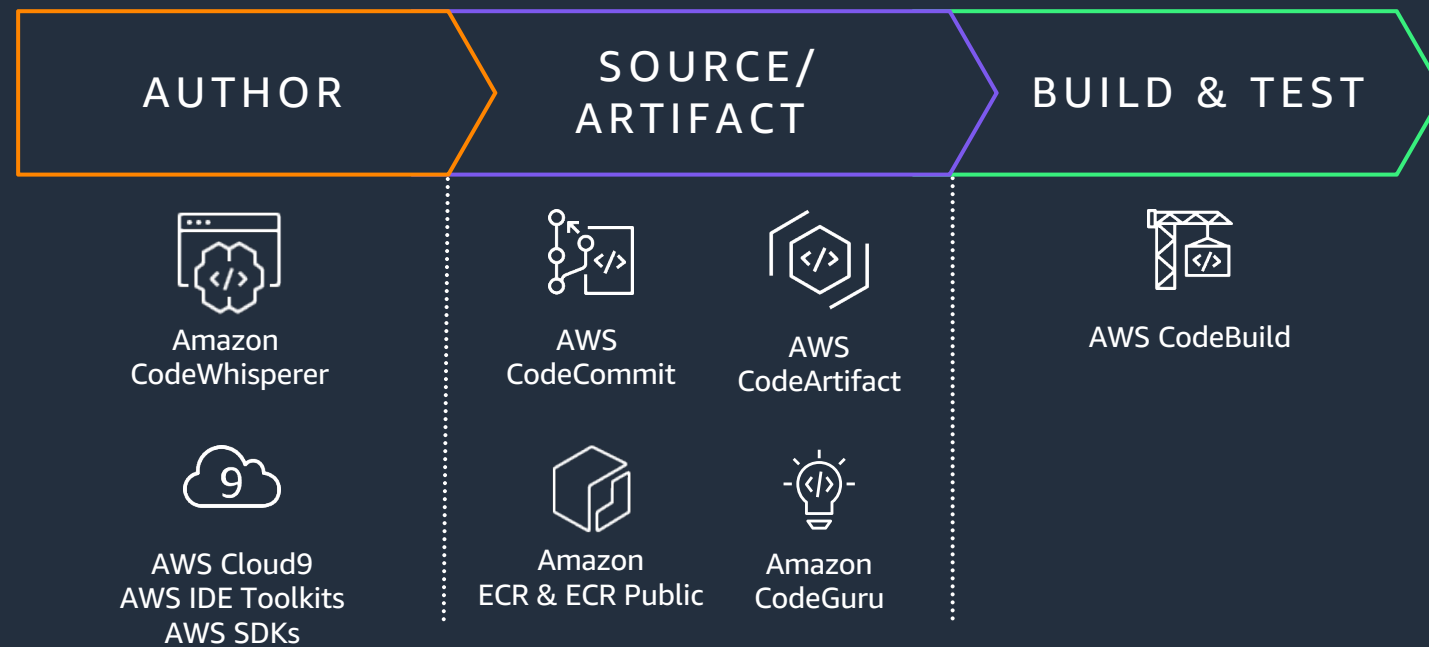
- **Fewer false positives** means you get fewer tickets.
- Your dev teams can now allocate their limited resources to **actual vulnerabilities**.

Closure

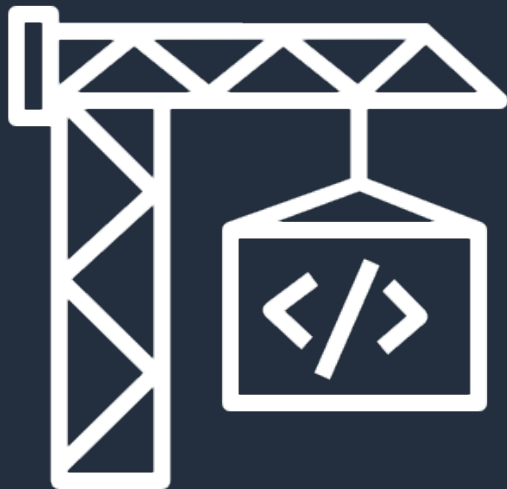


- Bug tracking automatically **detects** and **updates bug status**, providing current and accurate reporting on open vulnerabilities and **closure rate**.

CI/CD pipeline

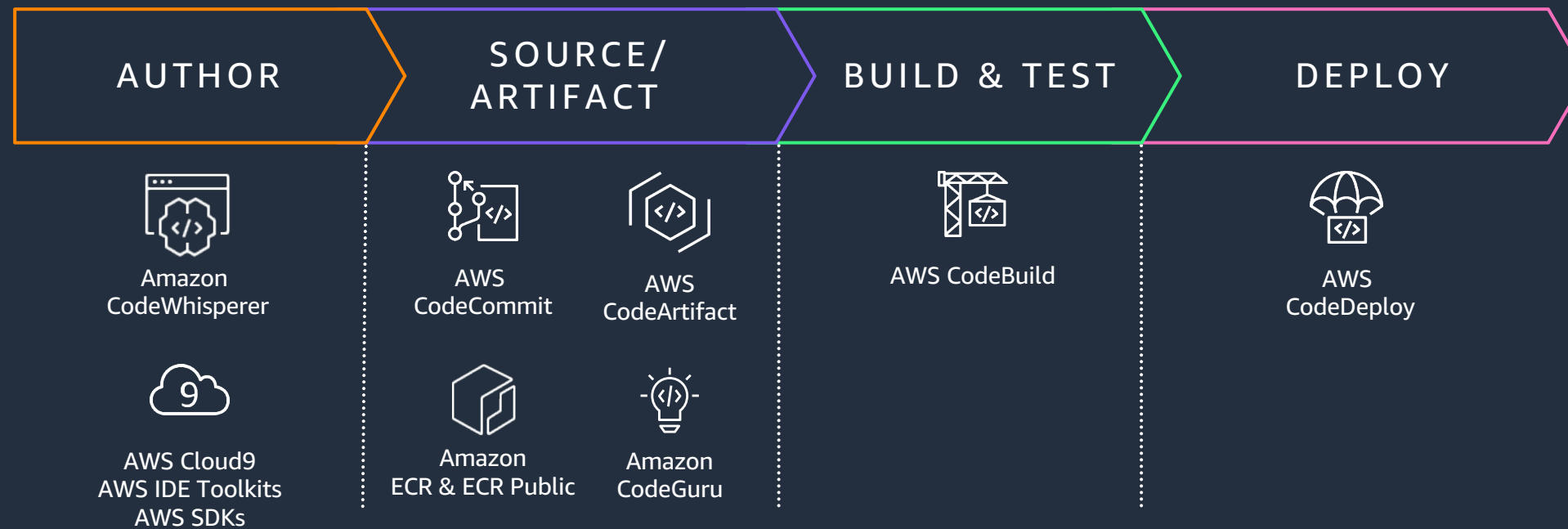


AWS CodeBuild



- 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 **Amazon CloudWatch Events**

CI/CD pipeline



AWS CodeDeploy



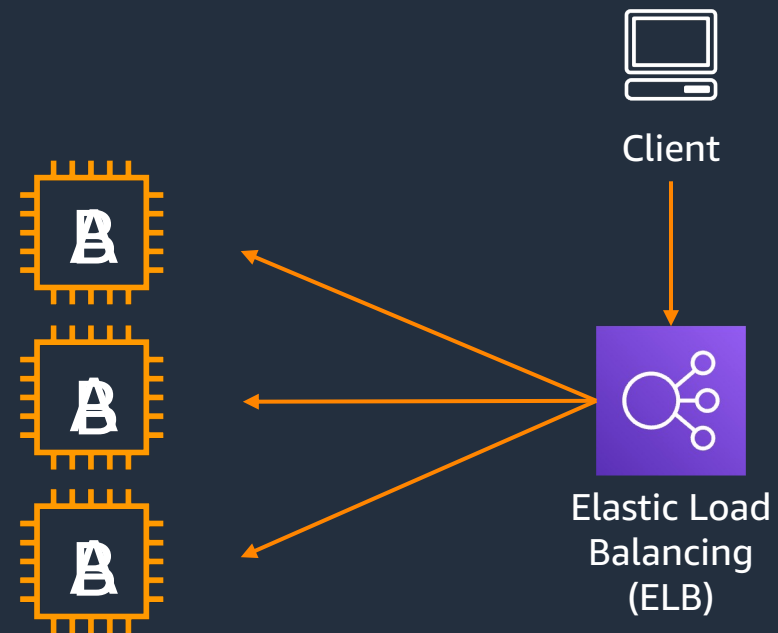
- Automates code deployments to any instance and Lambda
- Handles the complexity of updating your applications
- Avoids downtime during application deployment
- Rolls back automatically if failure detected
- Deploys to Amazon EC2, Lambda, or on-premises servers

Deployment Strategies

A deployment strategy is a way to **change or **upgrade** an application. The aim is to make the change **without downtime** in a way that the users **barely notice** the changes**

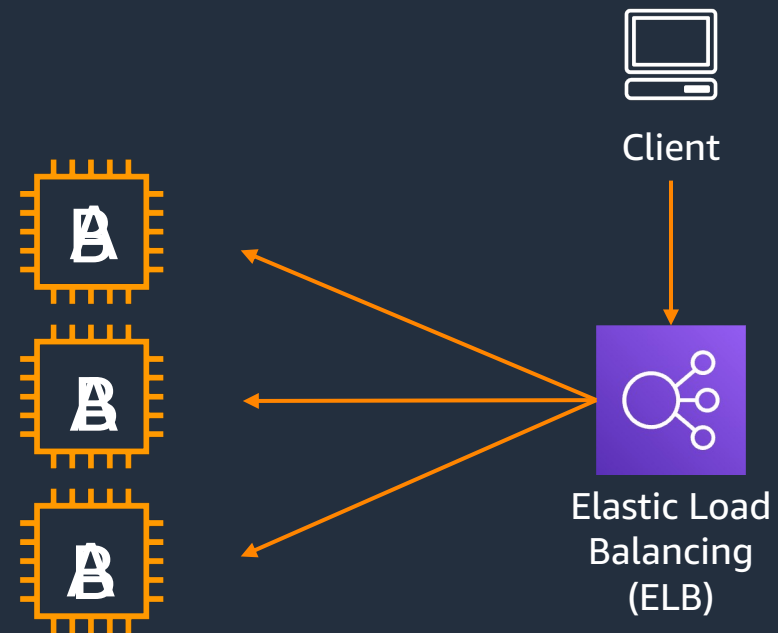
In-place deployments – all at once

Version **A** is terminated, then version **B** is rolled out



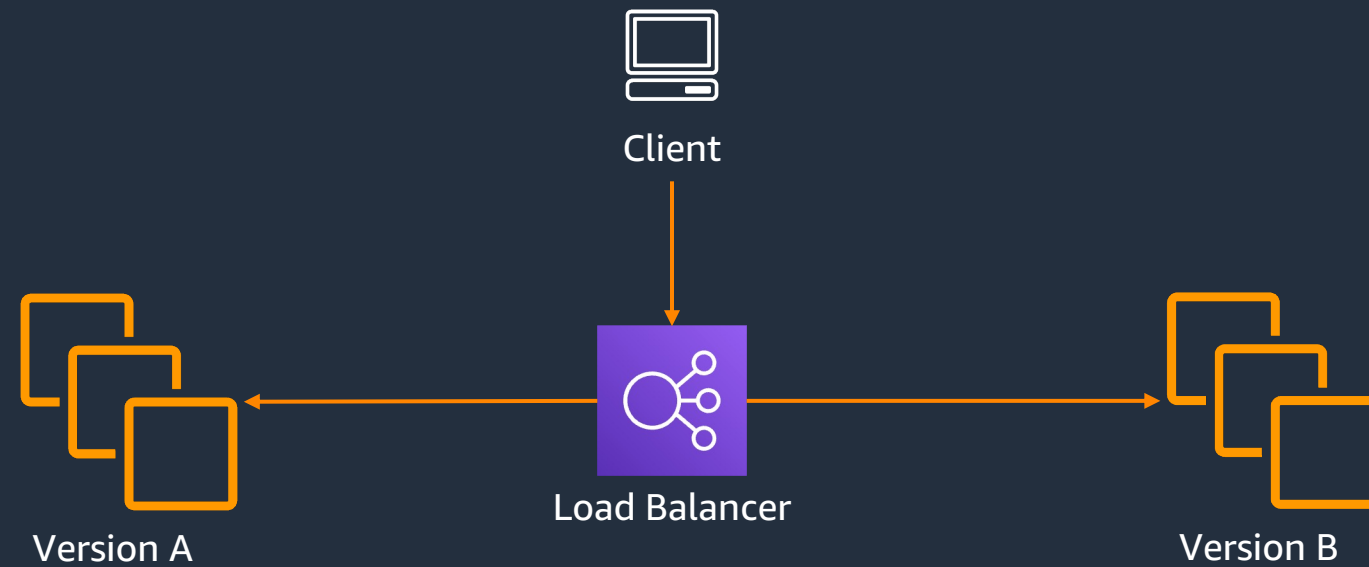
In-place deployments – rolling update

Version **B** is slowly rolled out and replaces version **A**



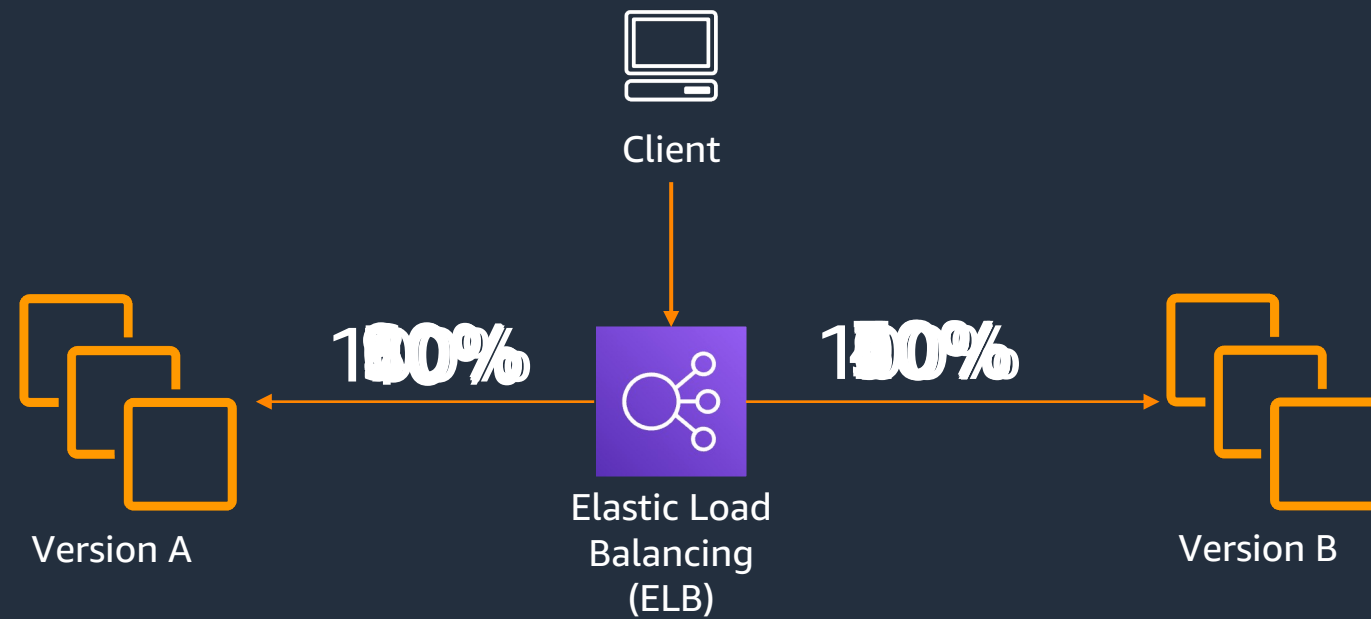
Blue/green deployments

Version **B** is released alongside **A**, and then the traffic is switched to version **B**

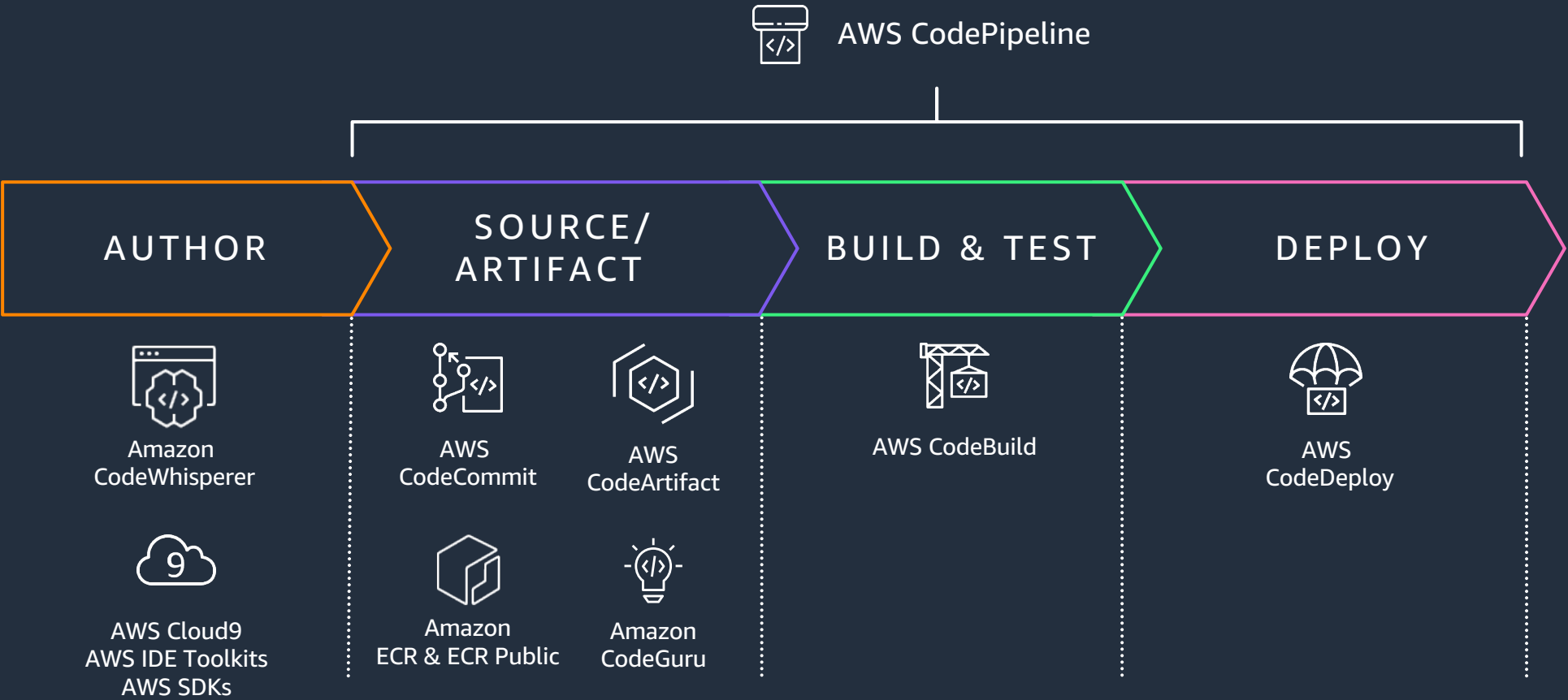


Canary deployments

The **slow rollout** of a new version of an existing application



CI/CD pipeline

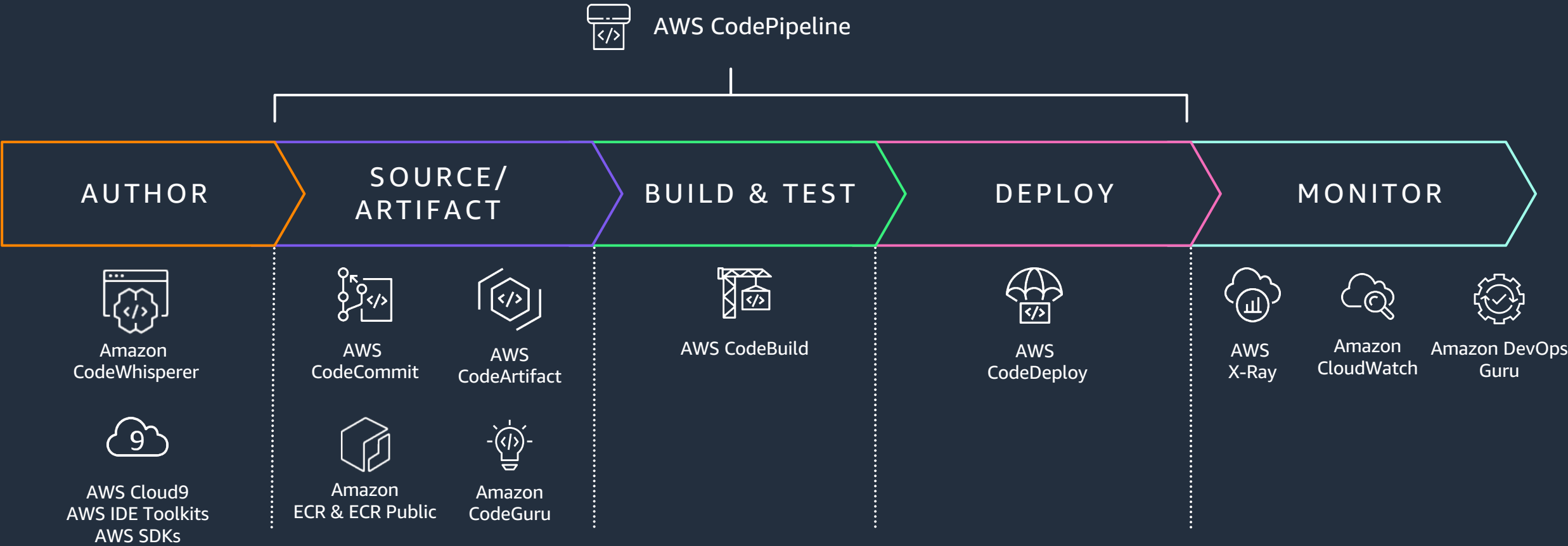


AWS CodePipeline

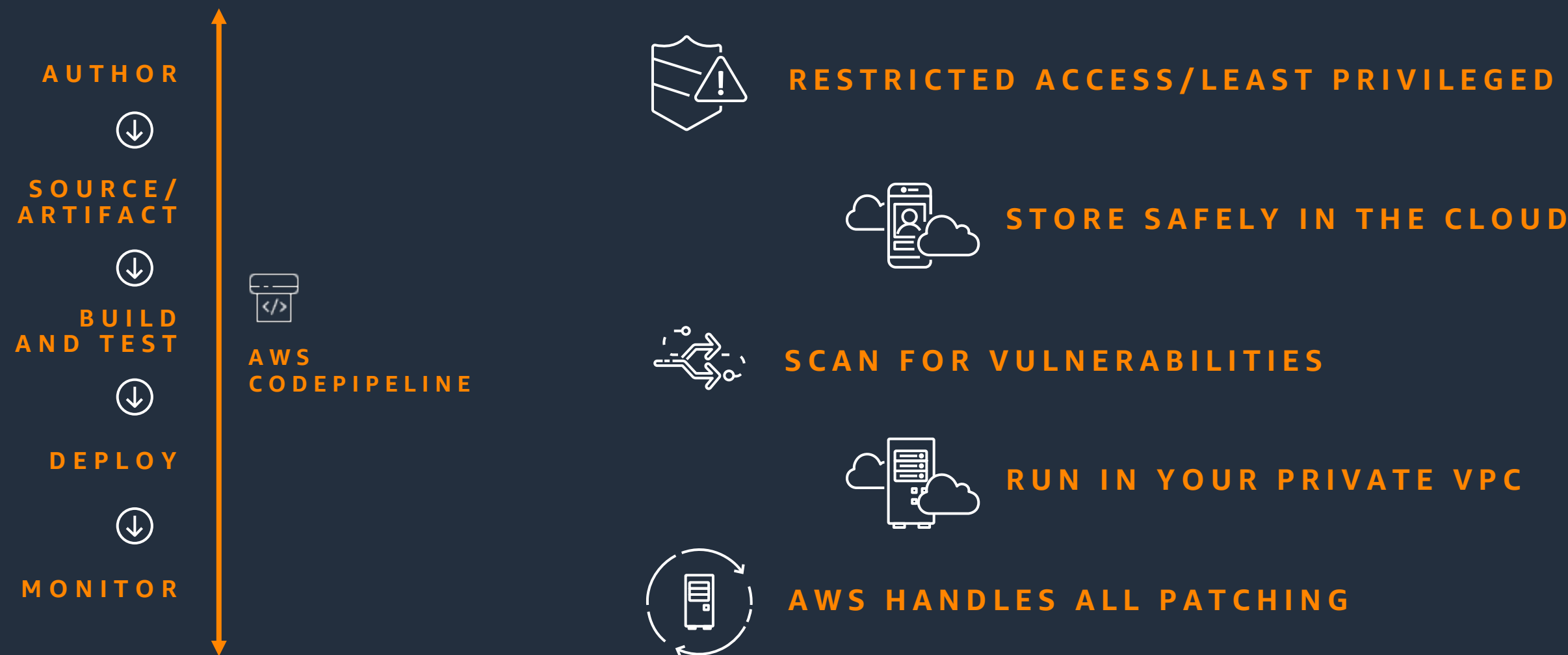


- Continuous delivery service for **fast** and **reliable** application updates
- **Model** and **visualize** your software release process
- **Builds**, **tests**, and **deploys** your code every time there is a **code change**
- Integrates with **third-party tools** and AWS

CI/CD pipeline



At AWS, security is our top priority



Amazon DevOps Guru

ML-powered cloud operations service to improve application availability

Select the entire account
or specific CFN stacks



Account

OR



CloudFormation
Stack

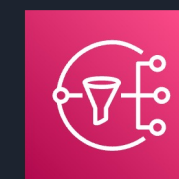
Select coverage

DevOps Guru will start
analyzing metrics/logs
to generate insights



Generate insights

Integrate with OpsCenter
SNS/ServiceLens

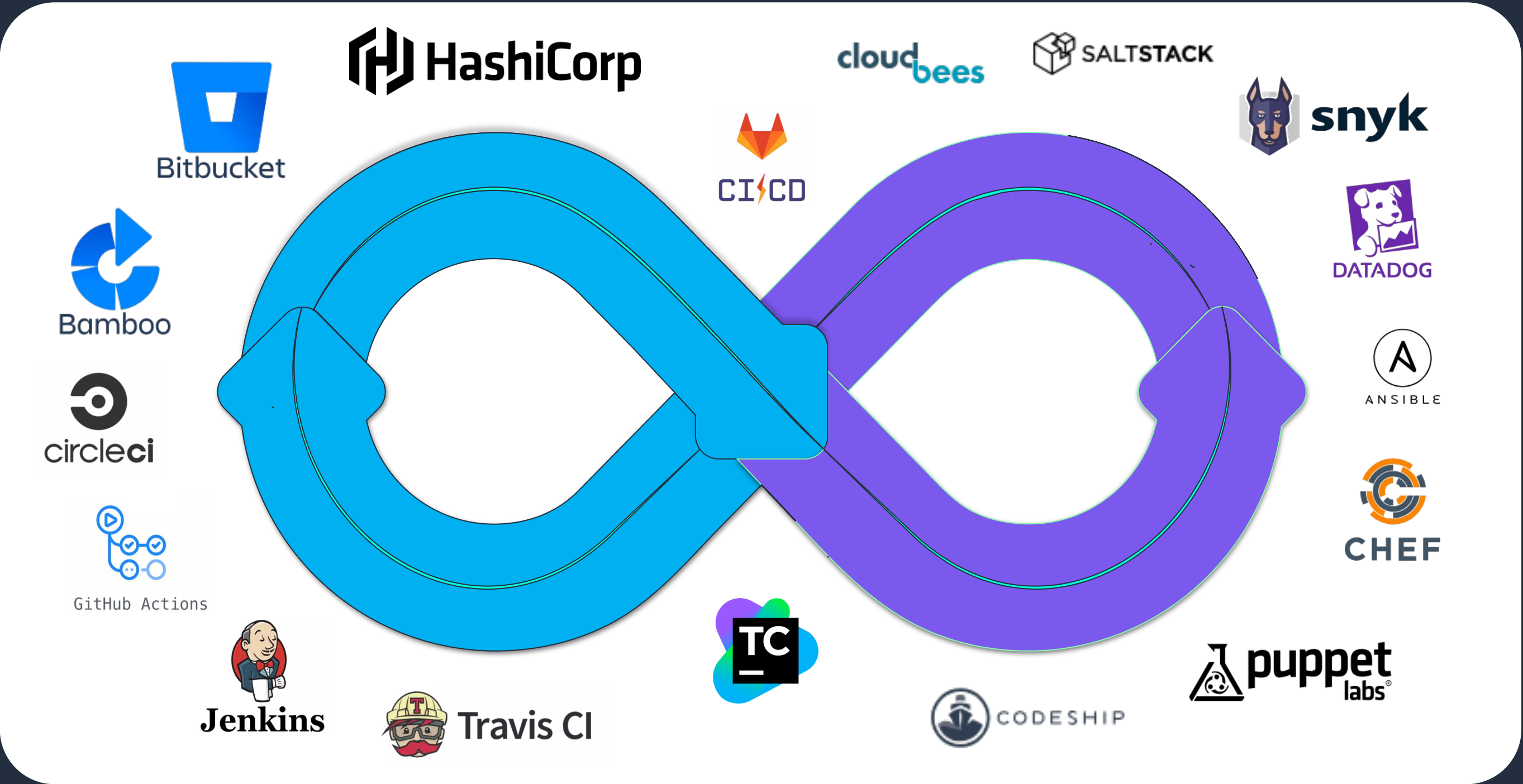


SNS

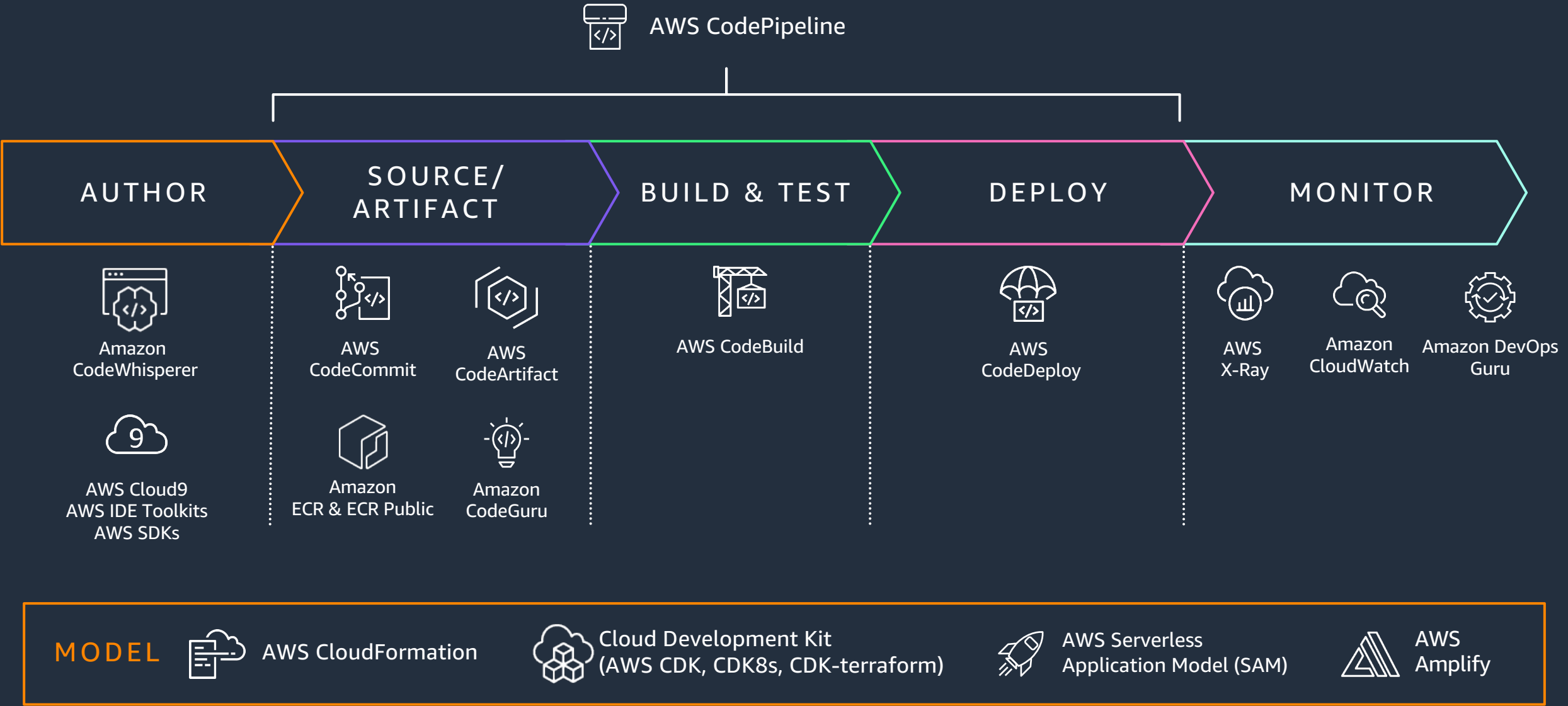


Integrate with your workflow

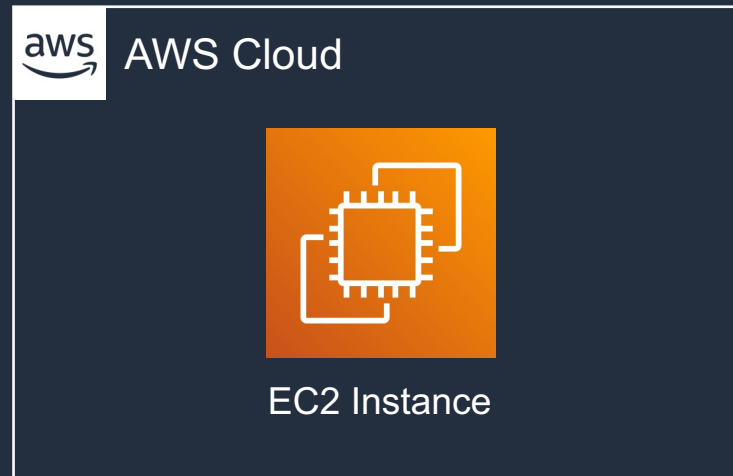
Integrate with popular CI/CD ecosystem



CI/CD pipeline



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
```

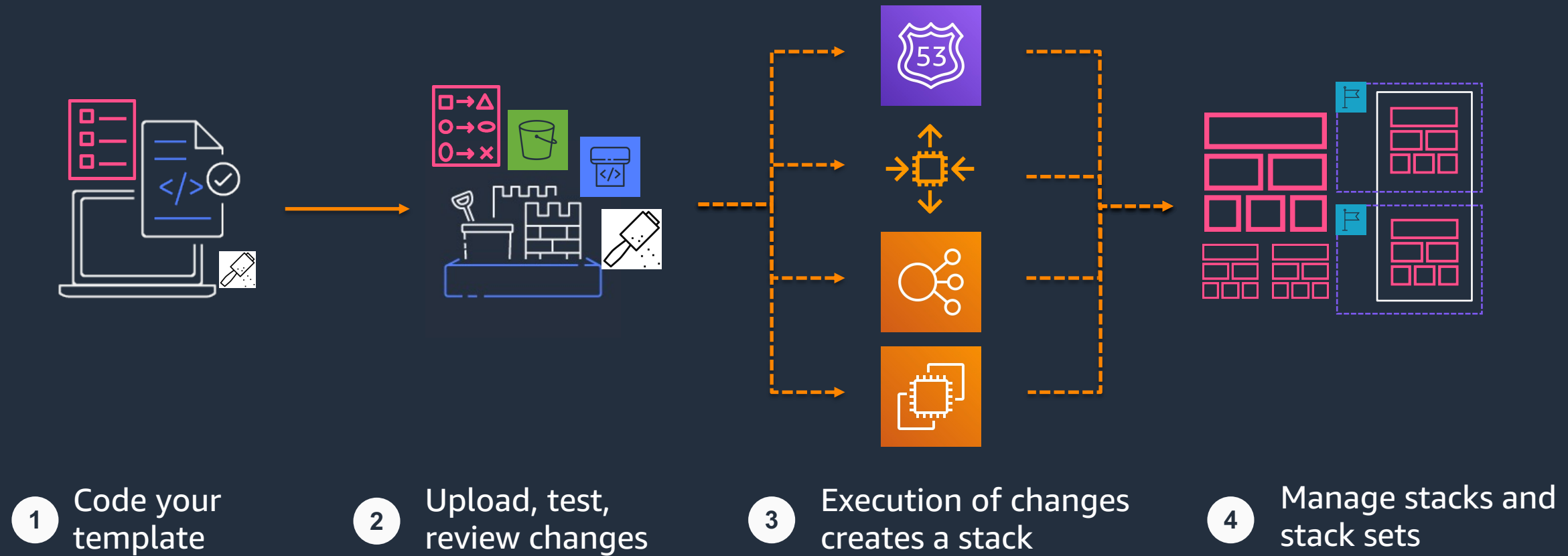
What?

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

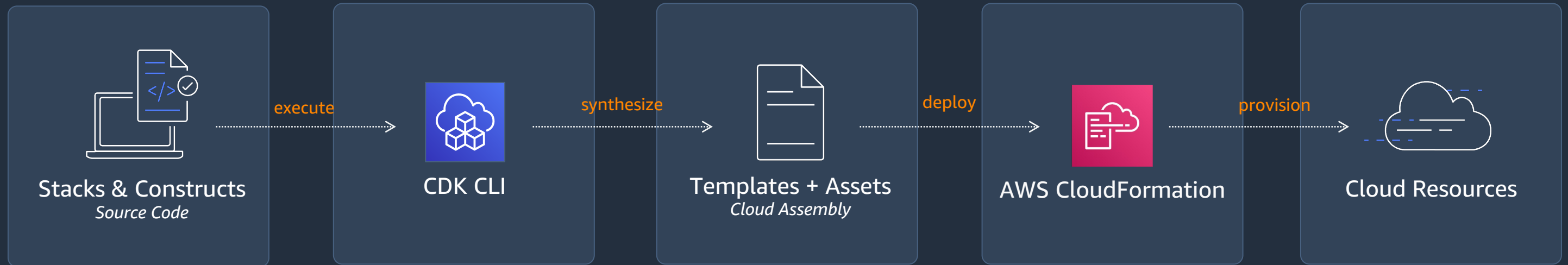
Why?

- Makes infrastructure changes **repeatable** and **predictable**
- **Documents** your infrastructure
- Automates the **provisioning** process
- Eliminates **configuration drift** through automation

IaC with AWS CloudFormation



IaC with AWS Cloud Development Kit (CDK)



 **cdk** init

// create new project

 **npm** run build

// build project

 **cdk** synth

// create templates and assets

 **cdk** diff

// check what will change

 **cdk** deploy

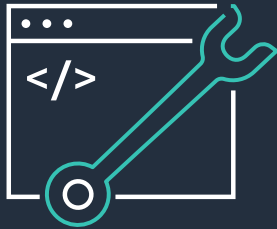
// push changes to your account

Resources



Building modern applications on AWS

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



The Amazon Builders' Library, [>>Link](#)



Deployment Pipeline Reference Architecture, [>>Link](#)



AWS CI/CD Workshop, [>>Link](#)

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