Integrating security testing into your container build pipeline

Kim Kao
Solutions Architect
AWS

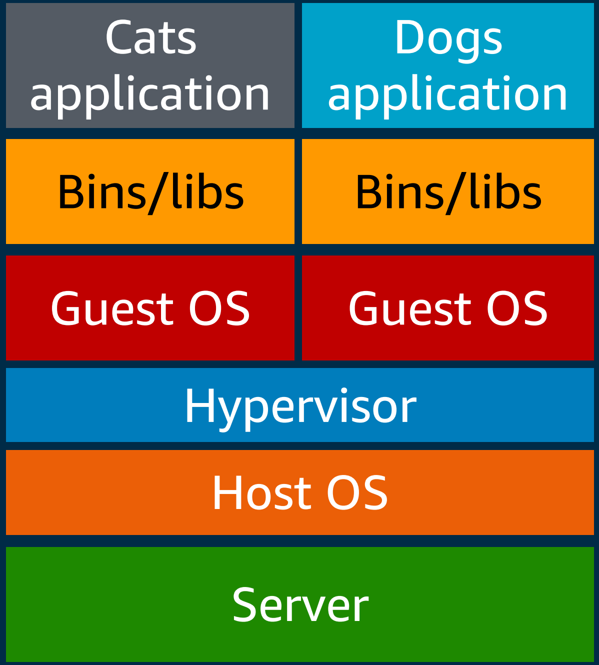
HC Lo
Solutions Architect
AWS

Goals

- Learn about container security using DevSecOps
- Learn about open-source container security tools and standards
- Learn about AWS development tools and DevOps services
- *Have fun while you’re at it!*

Why is container security different?

Virtual machines



Cats application | Dogs application

Bins/libs | Bins/libs

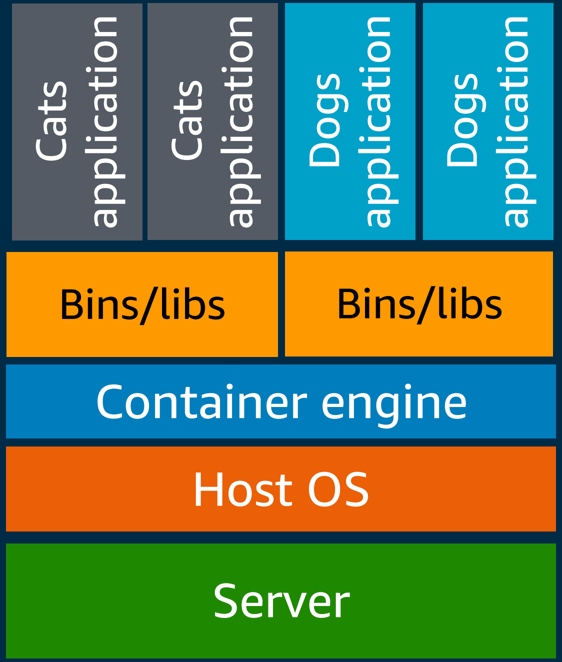
Guest OS | Guest OS

Hypervisor

Host OS

Server

Containers



Cats application | Cats application | Dogs application | Dogs application

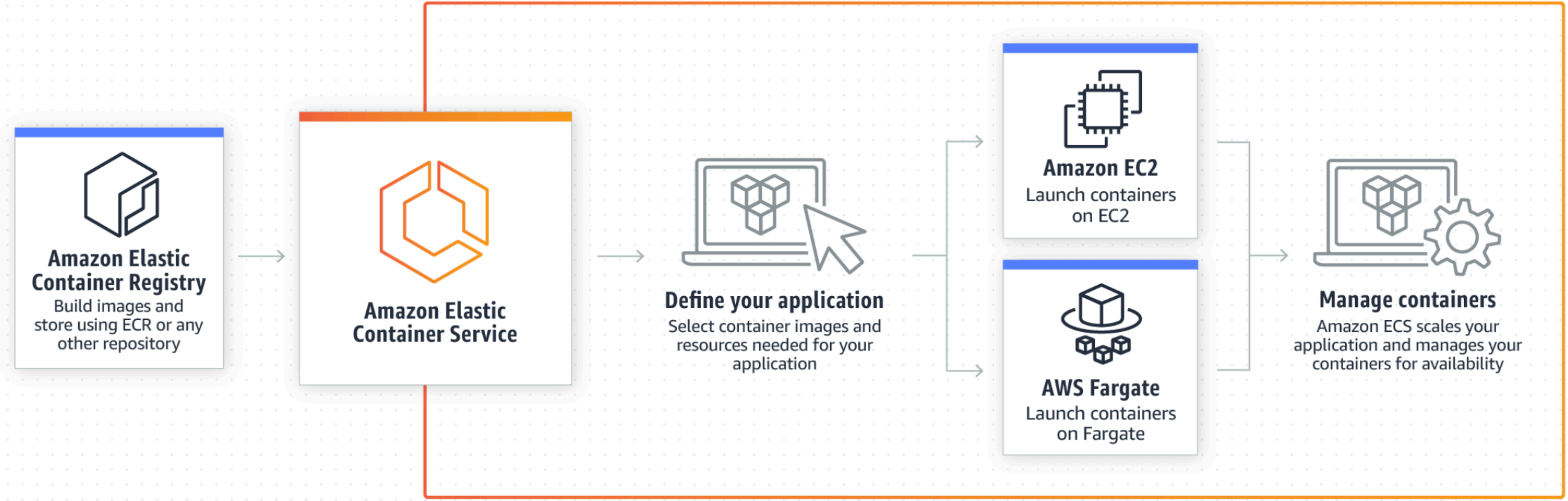
Bins/libs | Bins/libs

Container engine

Host OS

Server

Containers on AWS



Amazon Elastic Container Registry
Build images and store using ECR or any other repository

Amazon Elastic Container Service

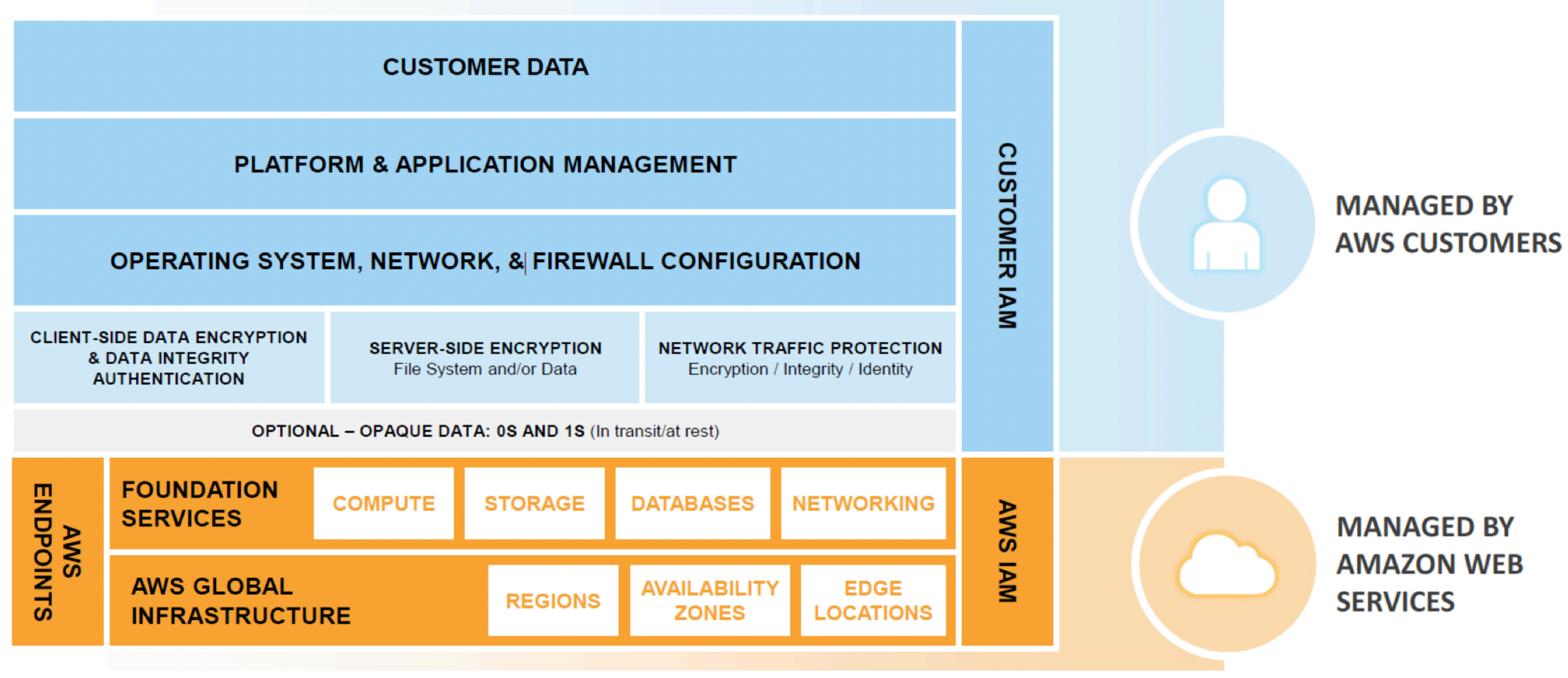
Define your application
Select container images and resources needed for your application

Amazon EC2
Launch containers on EC2

AWS Fargate
Launch containers on Fargate

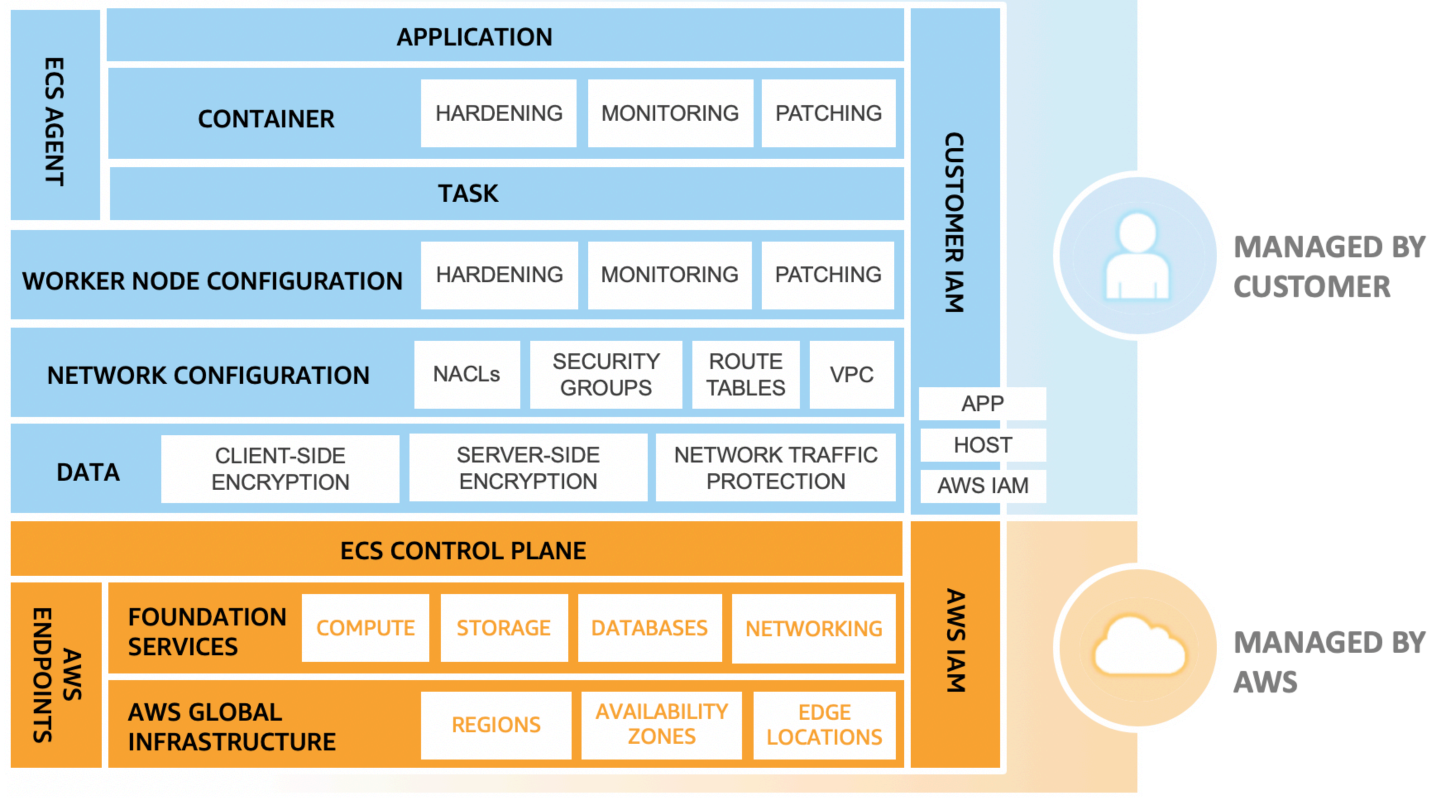
Manage containers
Amazon ECS scales your application and manages your containers for availability

AWS shared responsibility model



CUSTOMER DATA
PLATFORM & APPLICATION MANAGEMENT
OPERATING SYSTEM, NETWORK, & FIREWALL CONFIGURATION
CLIENT-SIDE DATA ENCRYPTION & DATA INTEGRITY AUTHENTICATION
SERVER-SIDE ENCRYPTION File System and/or Data
NETWORK TRAFFIC PROTECTION Encryption / Integrity / Identity
OPTIONAL – OPAQUE DATA: 0S AND 1S (In transit/at rest)
CUSTOMER IAM
AWS ENDPOINTS
FOUNDATION SERVICES
COMPUTE
STORAGE
DATABASES
NETWORKING
AWS GLOBAL INFRASTRUCTURE
REGIONS
AVAILABILITY ZONES
EDGE LOCATIONS
AWS IAM
MANAGED BY AWS CUSTOMERS
MANAGED BY AMAZON WEB SERVICES

Amazon ECS: AWS shared responsibility model



ECS AGENT

APPLICATION

CONTAINER: HARDENING, MONITORING, PATCHING

TASK

WORKER NODE CONFIGURATION: HARDENING, MONITORING, PATCHING

NETWORK CONFIGURATION: NACLs, SECURITY GROUPS, ROUTE TABLES, VPC

DATA: CLIENT-SIDE ENCRYPTION, SERVER-SIDE ENCRYPTION, NETWORK TRAFFIC PROTECTION

CUSTOMER IAM

APP

HOST

AWS IAM

MANAGED BY CUSTOMER

ECS CONTROL PLANE

AWS ENDPOINTS

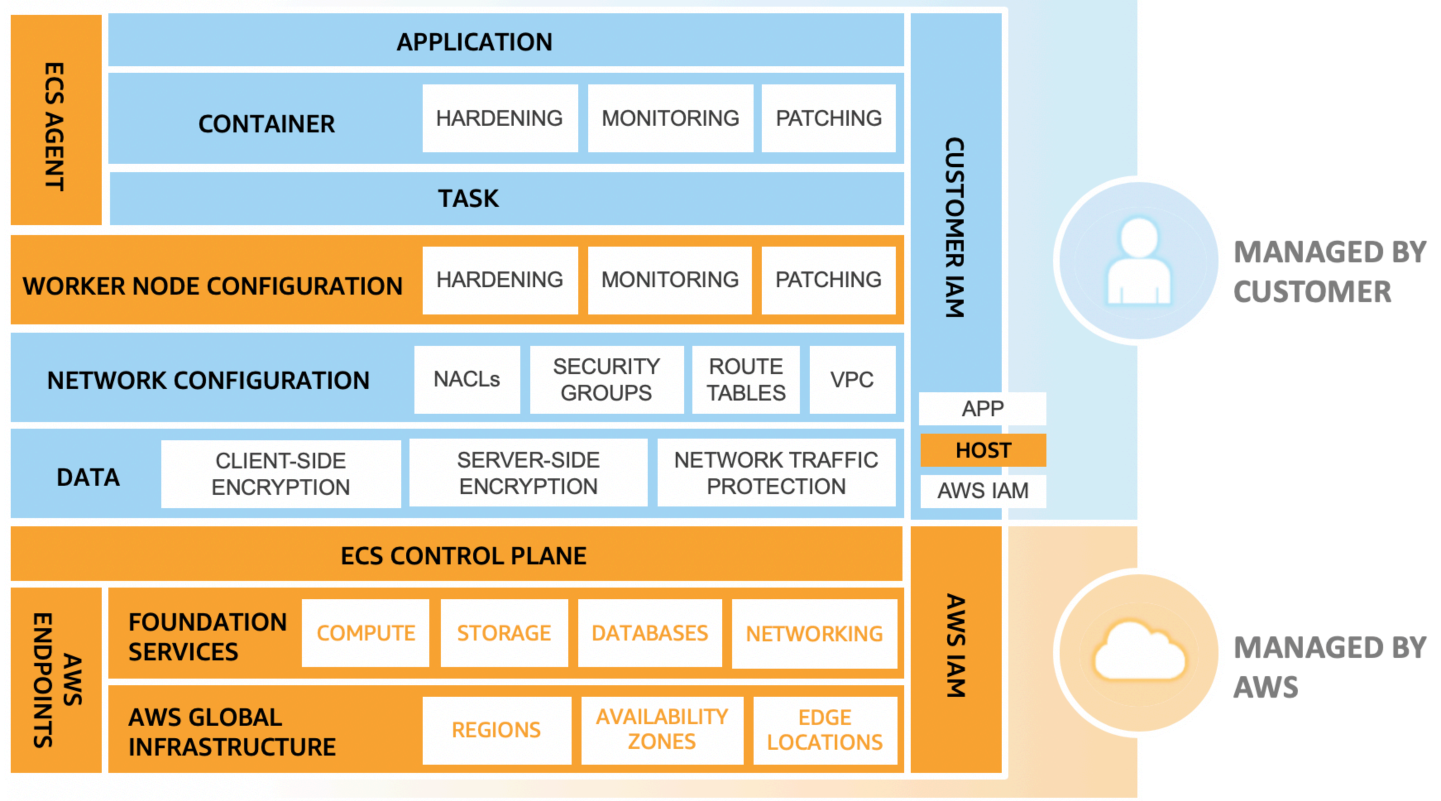
FOUNDATION SERVICES: COMPUTE, STORAGE, DATABASES, NETWORKING

AWS GLOBAL INFRASTRUCTURE: REGIONS, AVAILABILITY ZONES, EDGE LOCATIONS

AWS IAM

MANAGED BY AWS

AWS Fargate: AWS shared responsibility model



Automated pipelines: DevSecOps

Speaking of automation, you should automate everything, including

- Code and container builds
- Infrastructure via infrastructure as code patterns
- Deployments
- Process of making things self-healing
- Security!

Make it fast and easy for your team to do the right thing!

Container security threats

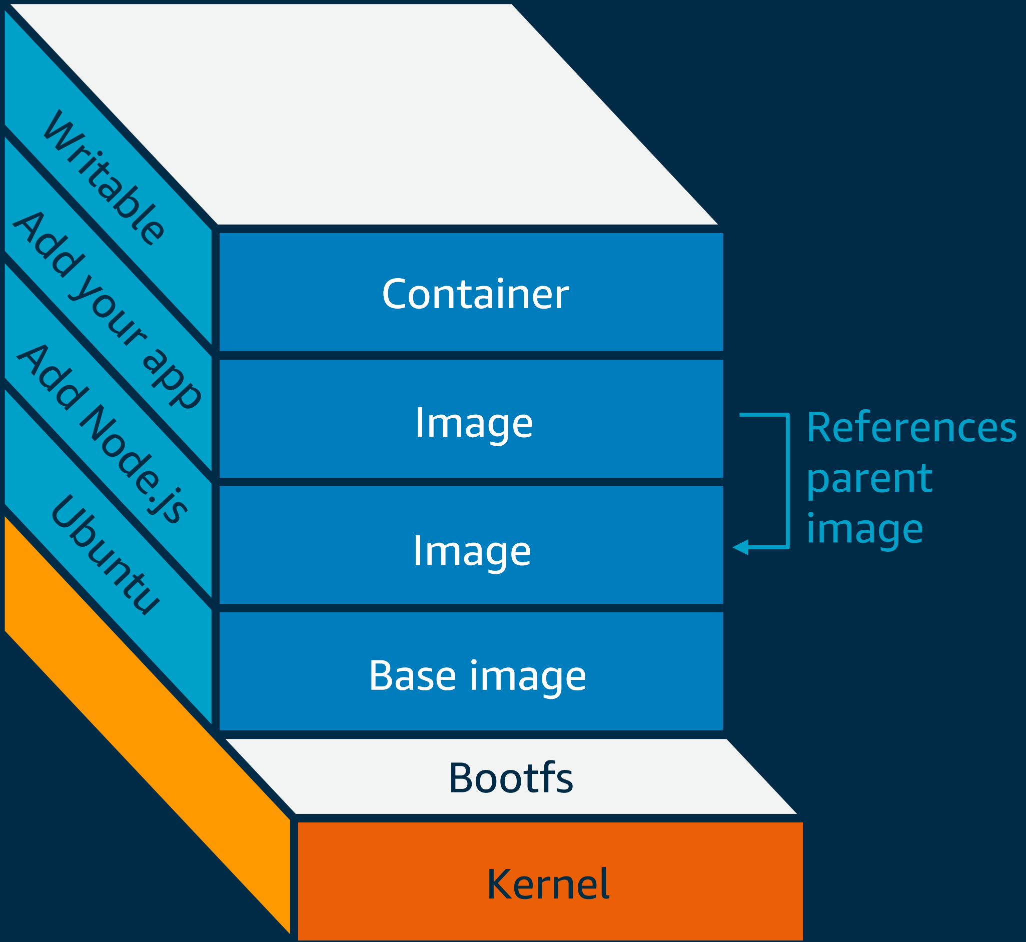
- Host security
- Image security
- Denial of service
- Credentials and secrets
- Container breakouts
- Runtime security

Container security threats

- Host security
- **Image security**
- Denial of service
- **Credentials and secrets**
- Container breakouts
- Runtime security

Security best practices for container images

- **Less is more (secure)**
- No secrets in them
- One service per container
- Minimize container footprint
- Include only what is **needed** at runtime



Security best practices for container images

- Use known and trusted base images
- Scan the image for CVEs
- Specify USER in Dockerfile (otherwise it's a root)
- Use unique and informative image tags
- Be able to tell which commit at a glance

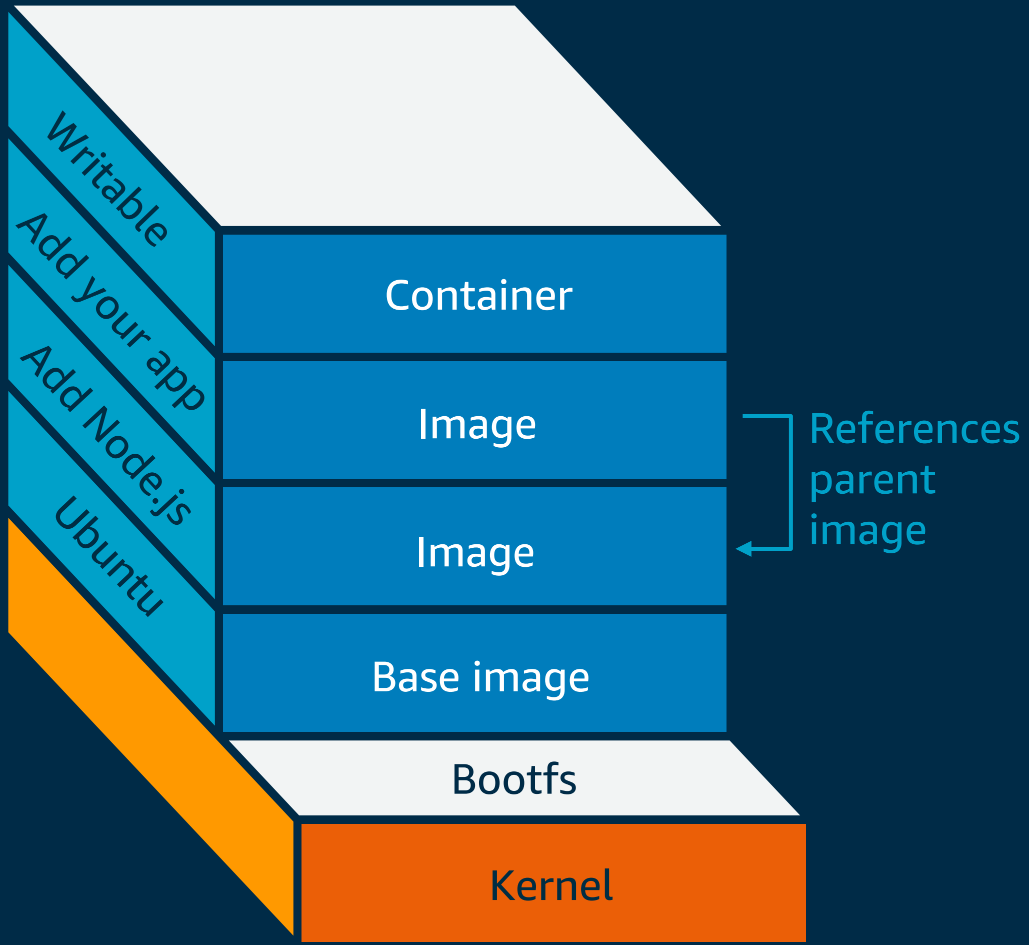
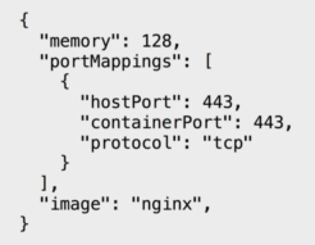


Image security

- Docker linting: Validation of Docker configuration (PCI DSS v3.2.1 Req 2.2)
  - hadolint
  - dockerfile_lint
- Secrets scanning in images (PCI DSS v3.2.1 Req 6.3.1)
  - truffleHog
  - git-secrets
- Vulnerability scanning of images in your build pipeline (PCI DSS v3.2.1 Req 6.1)
  - Anchore Open-Source Engine
  - CoreOS Clair

DevSecOps container pipeline



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    {
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      "protocol": "tcp"
    }
  ],
  "image": "nginx",
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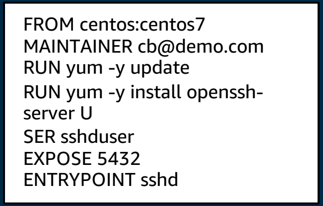
Task definition



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MAINTAINER cb@demo.com
RUN yum -y update
RUN yum -y install openssh-
server U
SER sshduser
EXPOSE 5432
ENTRYPOINT sshd
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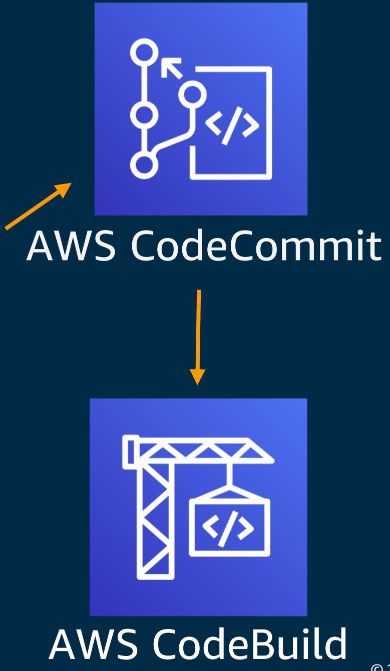
Dockerfile

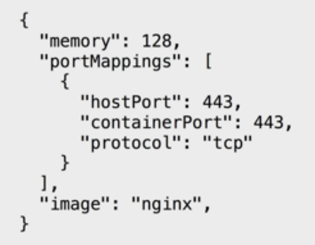


AWS CodeCommit

AWS CodeBuild

DevSecOps container pipeline

Developers   **Sec**urity engineers   **Ops** engineers



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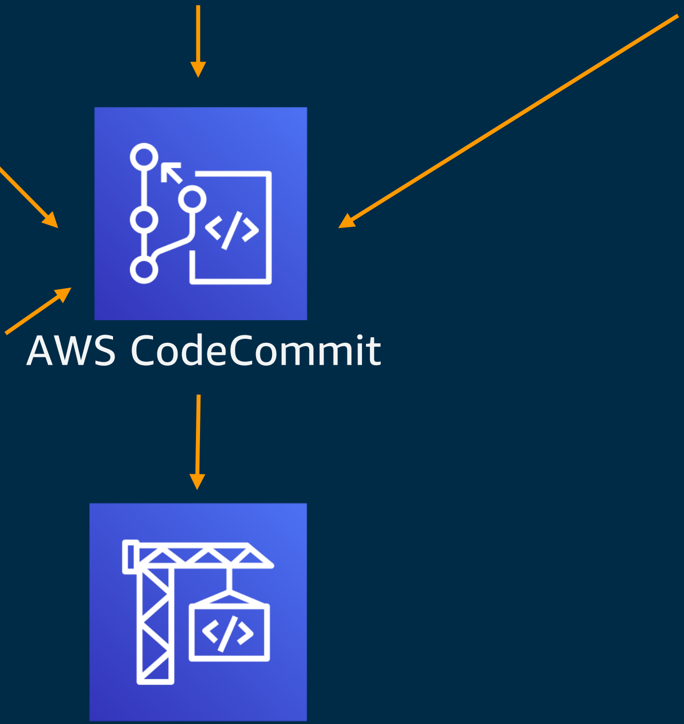

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Dockerfile

DevSecOps container pipeline

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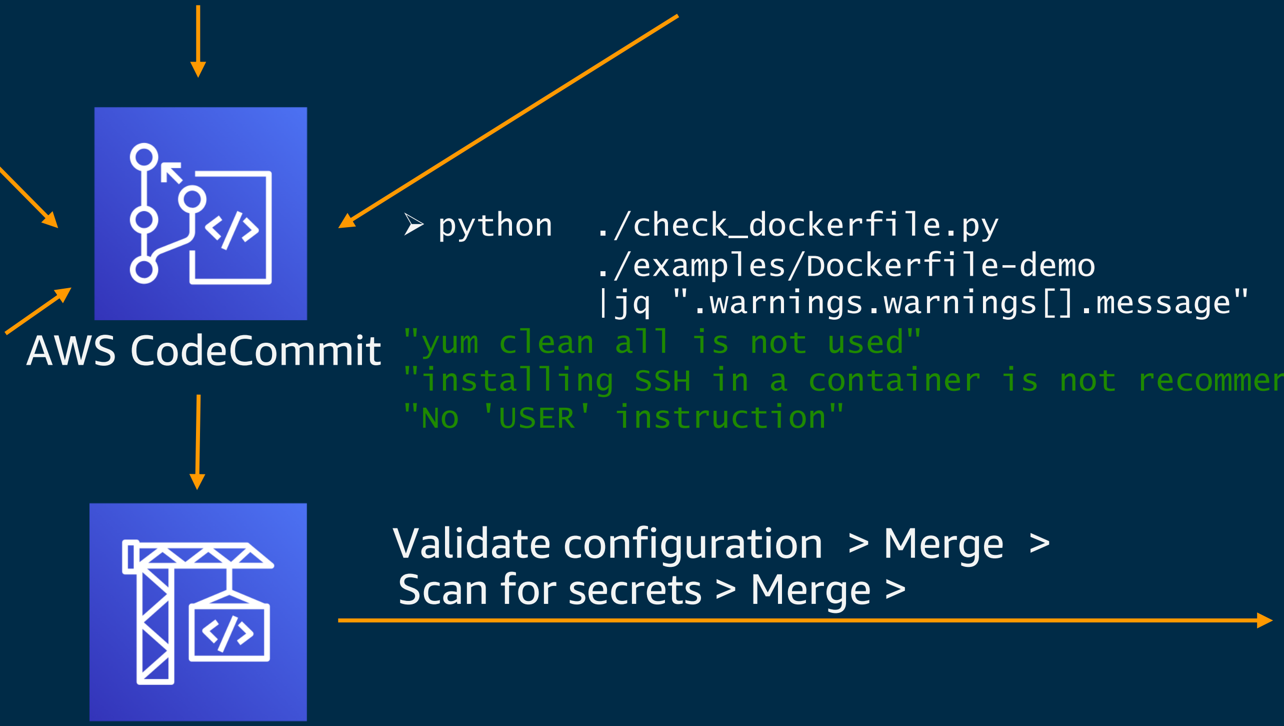
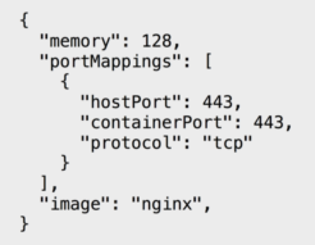
Security engineers

Ops engineers





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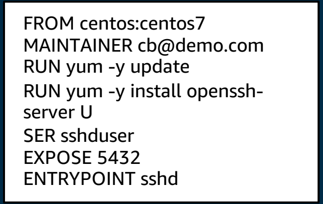

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```

Dockerfile

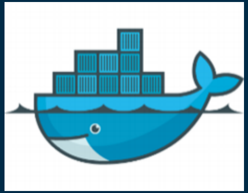
AWS CodeCommit

```
➢ python   ./check_dockerfile.py
           ./examples/Dockerfile-demo
           |jq ".warnings.warnings[].message"
"yum clean all is not used"
"installing SSH in a container is not recommended"
"No 'USER' instruction"
```

Validate configuration > Merge >
Scan for secrets > Merge >

AWS CodeBuild

Docker image



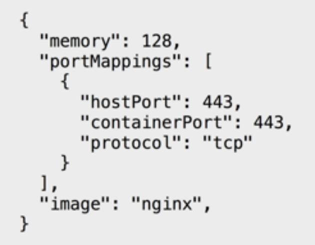
DevSecOps container pipeline

Developers

Security engineers

Ops engineers

Amazon EC2 container registry



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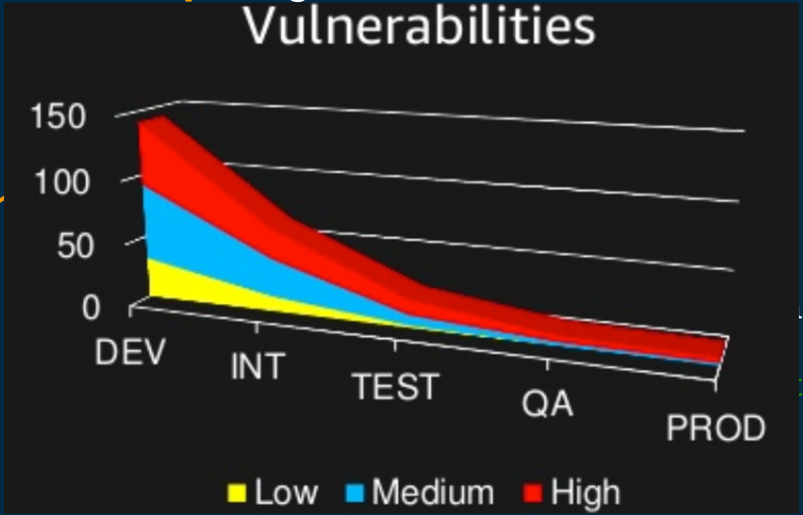
Task definition

AWS CodeCommit



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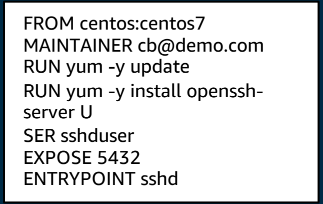
Docker image



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Dockerfile

AWS CodeBuild

Validate configuration > Merge >
Scan for secrets > Merge >
Scan Docker image > Publish >

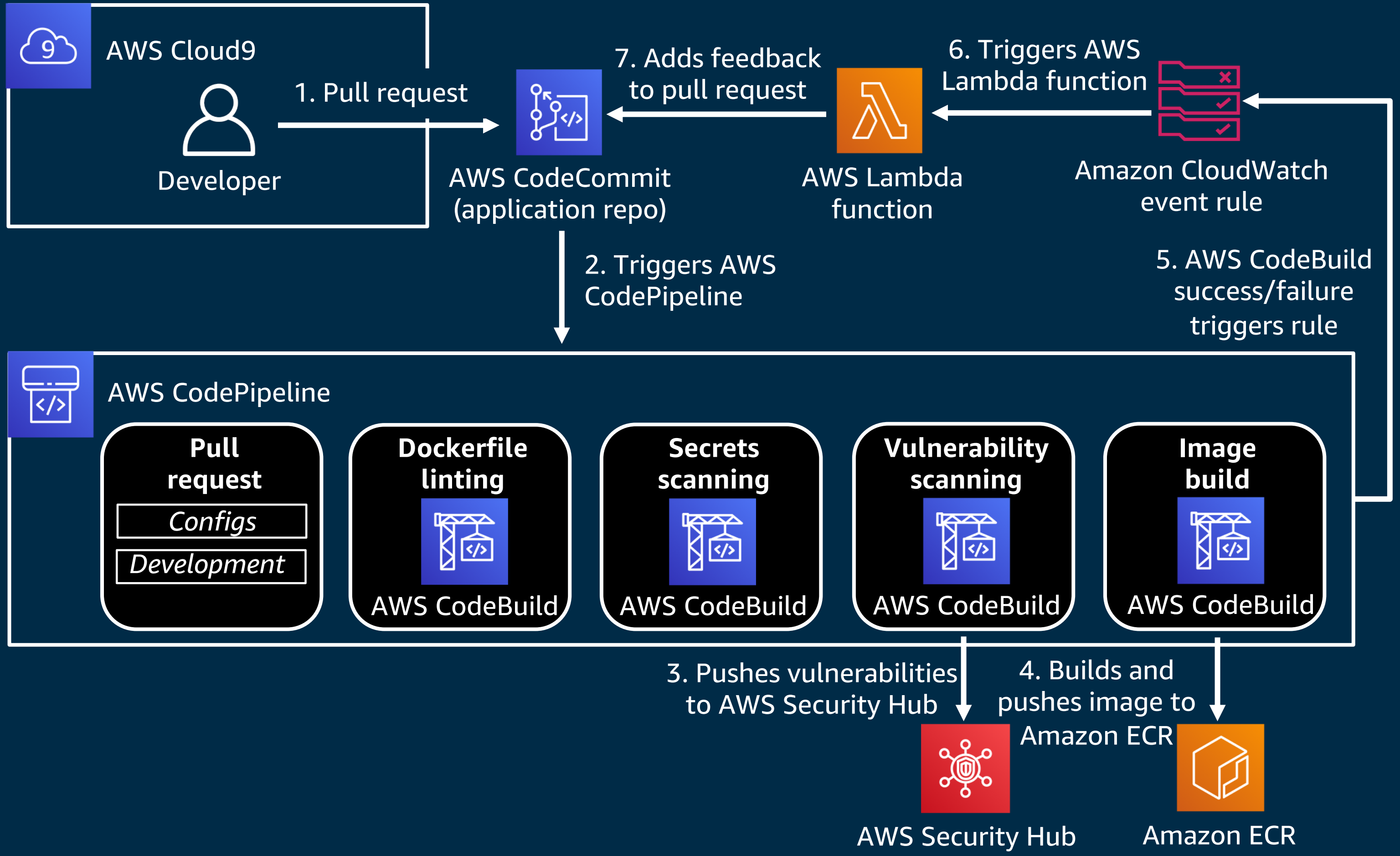
Credentials and secrets

AWS has Parameter Store and AWS Secrets Manager to store your secrets

They are integrated into Amazon ECS, but you need to call them within the pod on Kubernetes via AWS CLI or SDK

Assigning an IAM role to an instance, task, or function means that the right AWS access key and secret to call the AWS CLI or SDK are transparently obtained and rotated

Workshop architecture: From 10,000 feet


AWS Cloud9
Developer
1. Pull request
AWS CodeCommit (application repo)
7. Adds feedback to pull request
AWS Lambda function
6. Triggers AWS Lambda function
Amazon CloudWatch event rule
2. Triggers AWS CodePipeline
5. AWS CodeBuild success/failure triggers rule
AWS CodePipeline
Pull request
Configs
Development
Dockerfile linting
AWS CodeBuild
Secrets scanning
AWS CodeBuild
Vulnerability scanning
AWS CodeBuild
Image build
AWS CodeBuild
3. Pushes vulnerabilities to AWS Security Hub
4. Builds and pushes image to Amazon ECR
AWS Security Hub
Amazon ECR

Let’s build and have fun!

Integrating security testing into your container build pipeline: Workshop prerequisites

- Start with https://container-devsecops.hclo.dev/
- Module 0: Environment Setup (15 min.)

Use
“us-east-2”

Integrating security testing into your container build pipeline: Module 1

- Start with https://container-devsecops.hclo.dev/
- Module 1: Dockerfile linting (15 mins)
  - Create buildspec file
  - Add hadolint configuration
- Module 2: Secrets scanning
- Module 3: Vulnerability scanning
- Module 4: Pipeline testing

Integrating security testing into your container build pipeline: Module 2

- Start with https://container-devsecops.hclo.dev/
- ~~Module 1: Dockerfile linting~~
- Module 2: Secrets scanning (15 mins)
  - Create buildspec file
  - Add truffleHog RegEx configuration
- Module 3: Vulnerability scanning
- Module 4: Pipeline testing

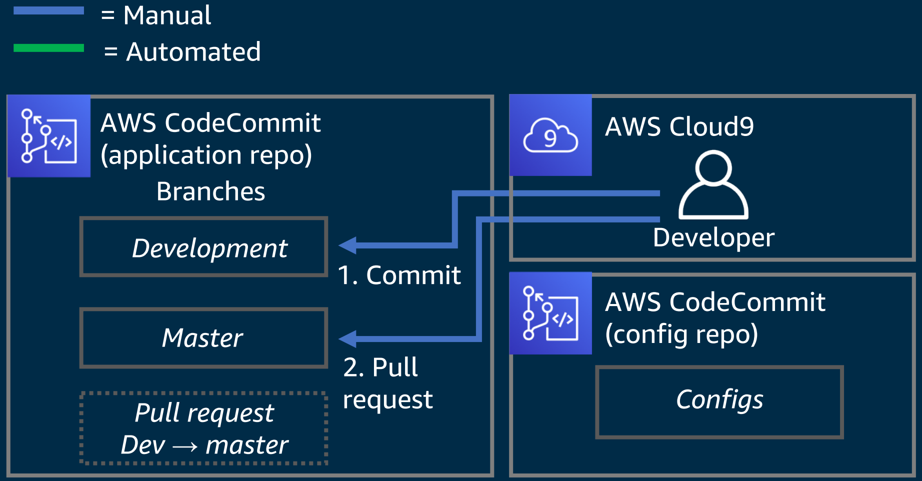
Integrating security testing into your container build pipeline: Module 3

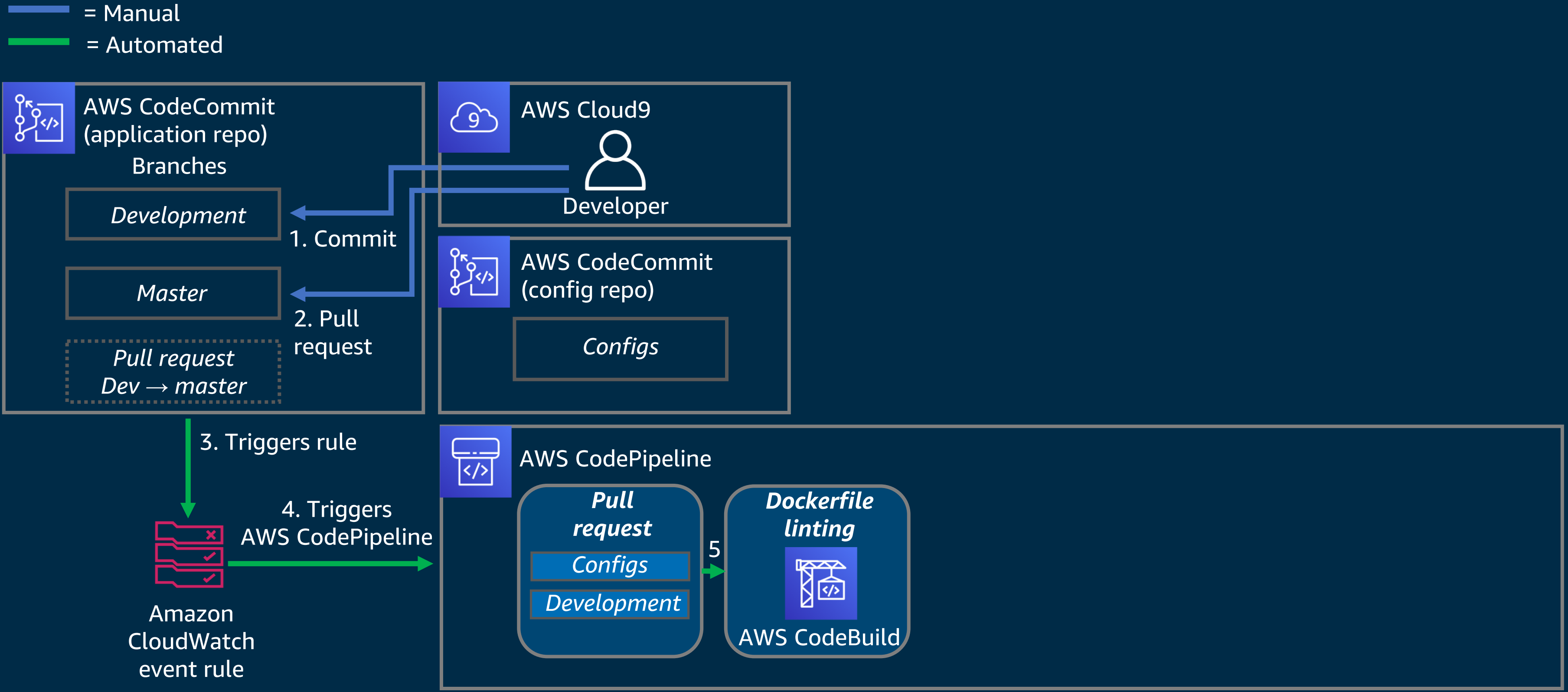
- Start with https://container-devsecops.hclo.dev/
- ~~Module 1: Dockerfile linting~~
- ~~Module 2: Secrets scanning~~
- Module 3: Vulnerability scanning (15 mins)
  - Create buildspec file
  - Add command to run Anchore
- Module 4: Pipeline testing

Integrating security testing into your container build pipeline: Module 4

- Start with https://container-devsecops.hclo.dev/
- ~~Module 1: Dockerfile linting~~
- ~~Module 2: Secrets scanning~~
- ~~Module 3: Vulnerability scanning~~
- Module 4: Pipeline testing (15 mins)
  - Make a commit
  - View feedback loop

Let’s wrap up


= Manual
= Automated
AWS CodeCommit
(application repo)
Branches
Development
Master
Pull request
Dev → master
1. Commit
2. Pull
request
AWS Cloud9
Developer
AWS CodeCommit
(config repo)
Configs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Amazon
CloudWatch
event rule
4. Triggers
AWS CodePipeline
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Pull
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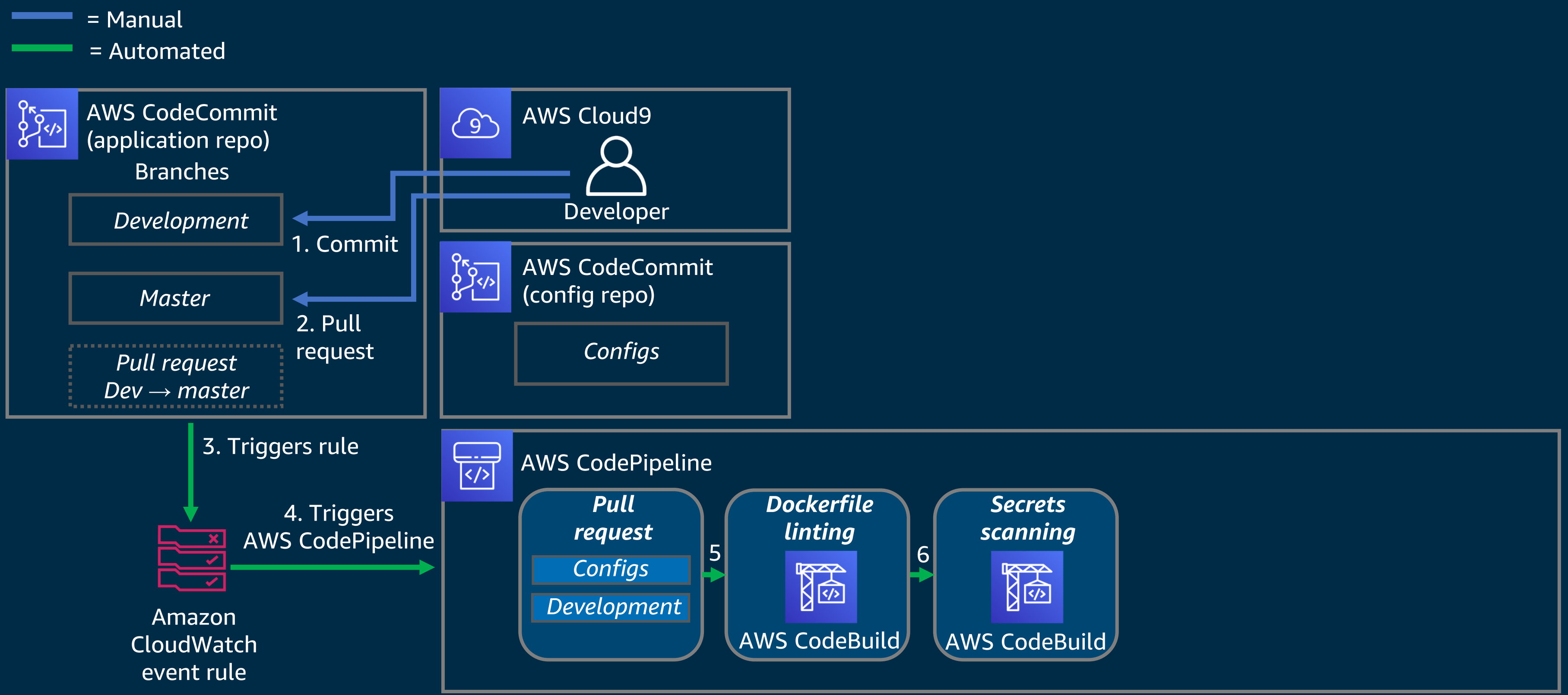
Configs
Development
5
Dockerfile
linting
AWS CodeBuild



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AWS CodePipeline

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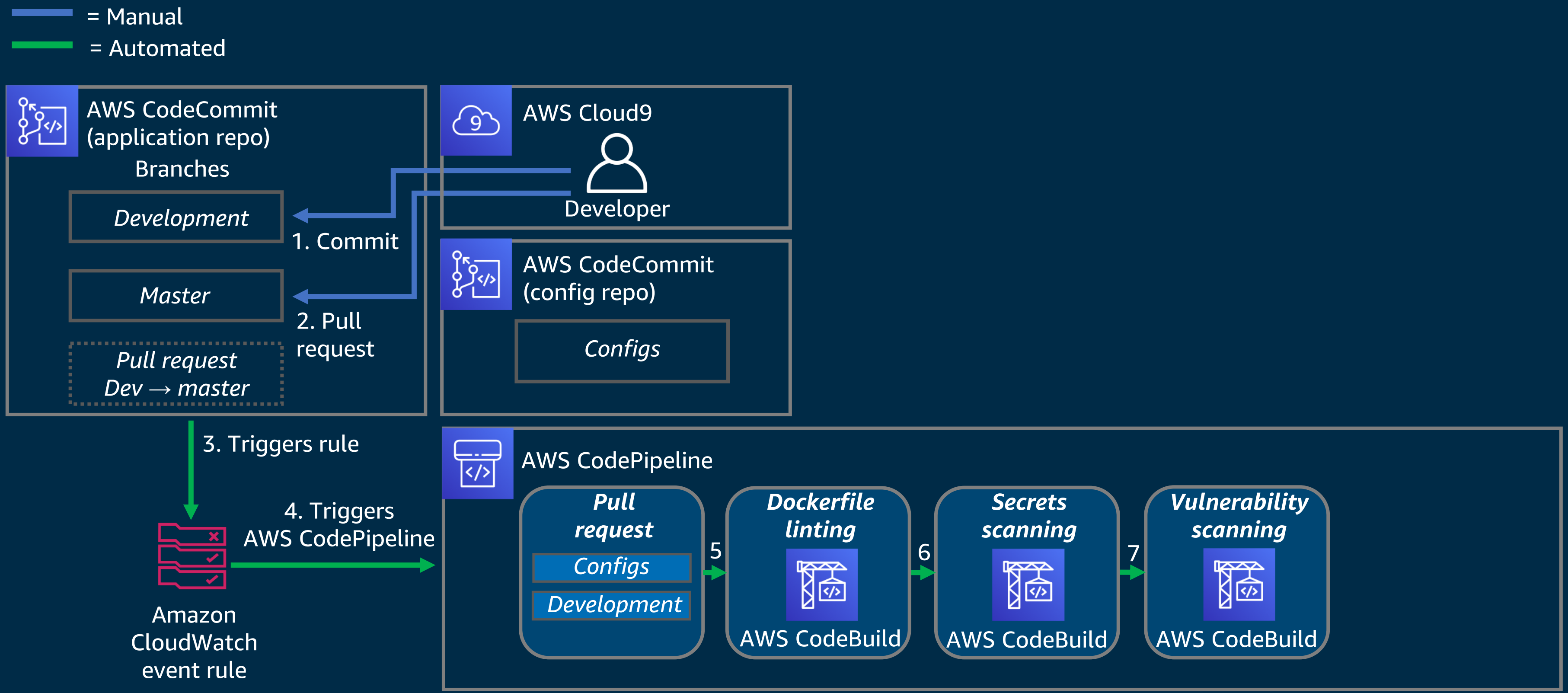
Dockerfile linting

AWS CodeBuild

6

Secrets scanning

AWS CodeBuild



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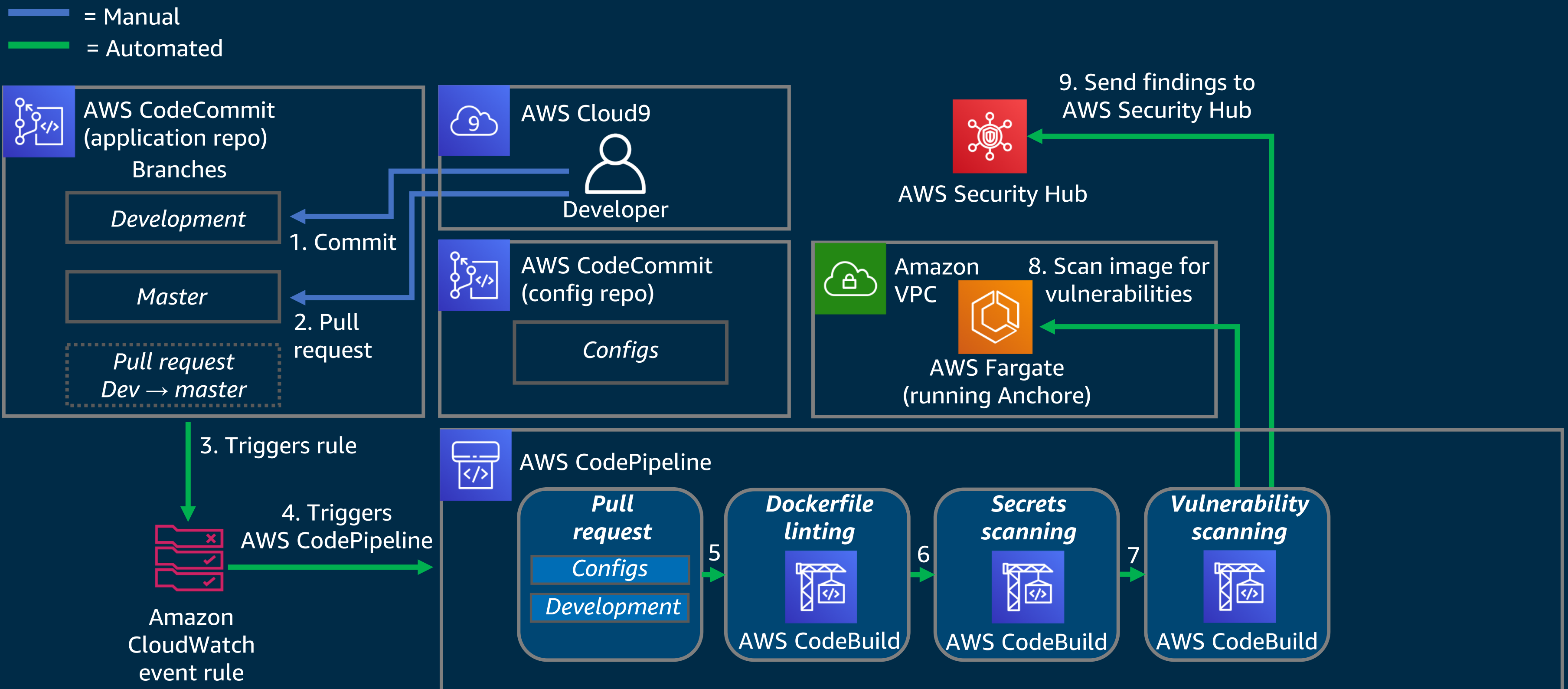
AWS CodeBuild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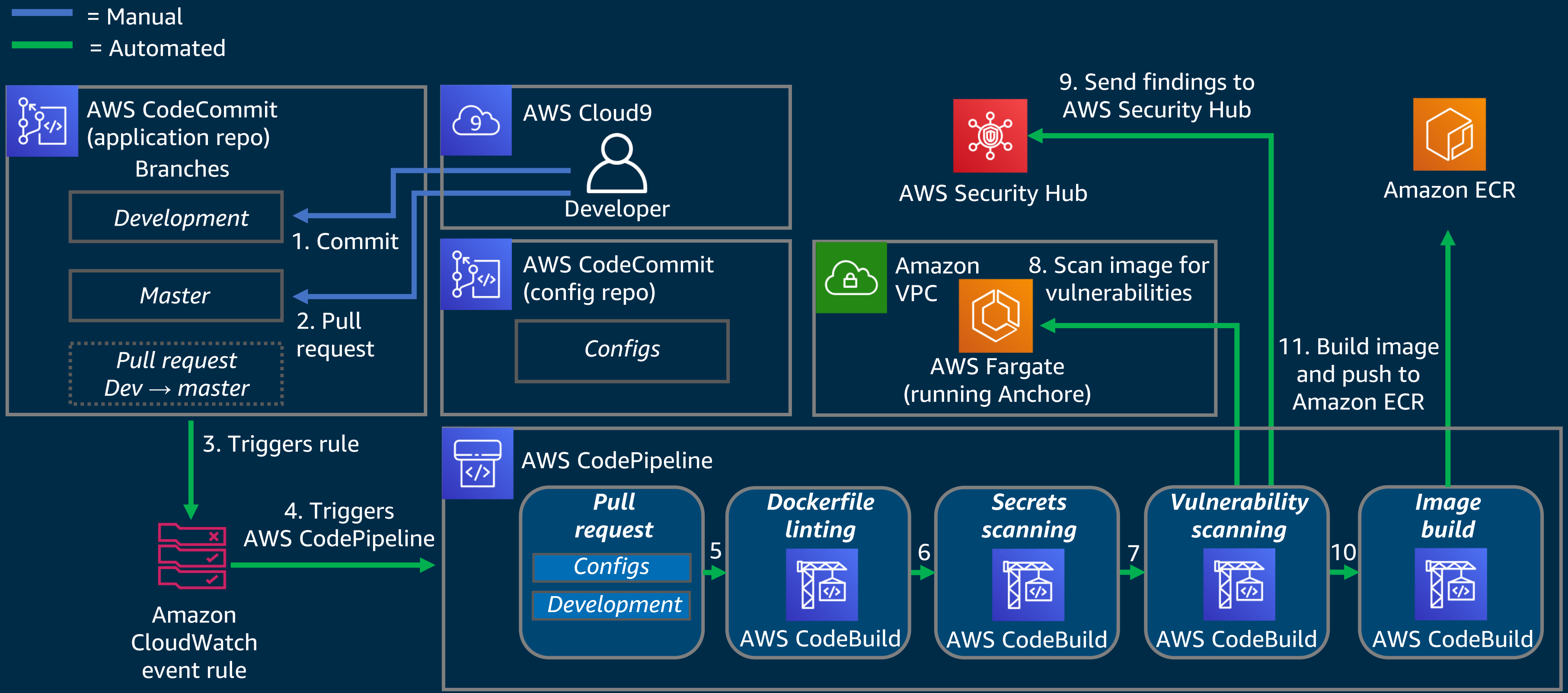

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AWS Security Hub

Amazon ECR

11. Build image and push to Amazon ECR

3. Triggers rule

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AWS CodeBuild

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AWS CodeBuild

7

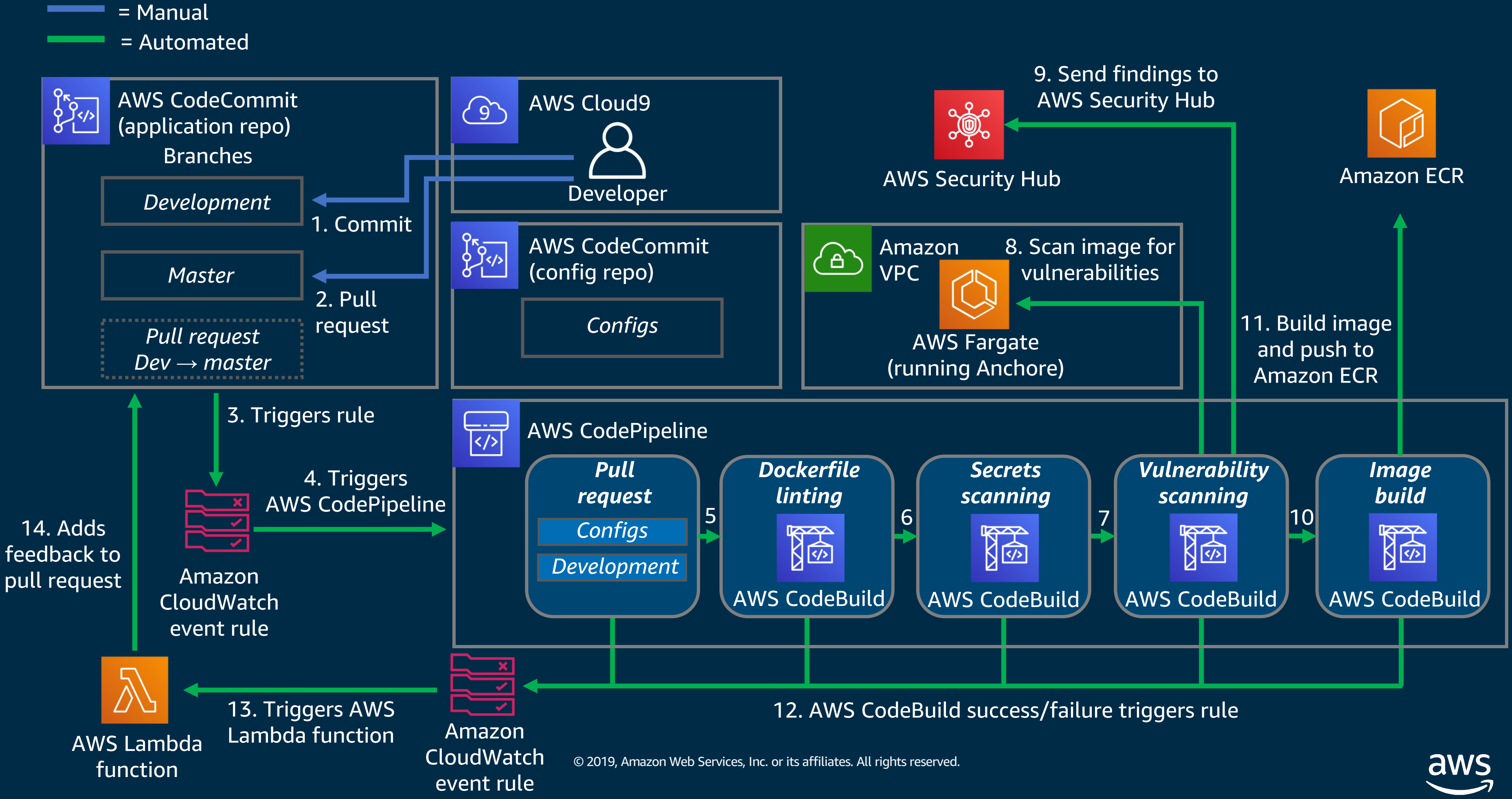
Vulnerability scanning

AWS CodeBuild

10

Image build

AWS CodeBuild



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AWS CodeBuild

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Image build

AWS CodeBuild

AWS Lambda function

13. Triggers AWS Lambda function

Amazon CloudWatch event rule

12. AWS CodeBuild success/failure triggers rule

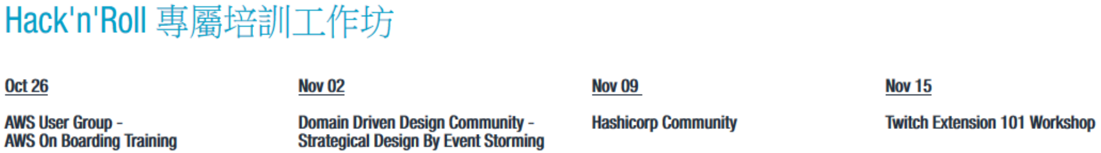
當 AWS 碰上 Twitch最熱血的黑客嘉年華，你還在等什麼？

兩大競賽主題(微服務建置、直播平台)

四場社群工作坊

橫跨產業創新服務 與 線上直播的未來，就在Nov 16-17 Hack'n'Roll！

Hack'n'Roll 專屬培訓工作坊 (報名參賽即可免費參加)



Hack'n'Roll 專屬培訓工作坊

Oct 26

AWS User Group -
AWS On Boarding Training

Nov 02

Domain Driven Design Community -
Strategical Design By Event Storming

Nov 09

Hashicorp Community

Nov 15

Twitch Extension 101 Workshop

活動網頁QRcode

Thank you!