aws SUMMIT

Container-based Architectures on AWS

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Amazon EKS – Now Generally Available

by Jeff Barr | on 05 JUN 2018 | in Amazon Elastic Container Service For Kubernetes, Launch, News | Permalink | Comments | Share

We announced Amazon Elastic Container Service for Kubernetes and invited customers to take a look at a preview during re:Invent 2017. Today I am pleased to be able to let you know that Amazon EKS is available for use in production form. It has been certified as Kubernetes conformant, and is ready to run your existing Kubernetes workloads.

Based on the most recent data from the Cloud Native Computing Foundation, we know that AWS is the leading environment for Kubernetes, with 57% of all companies who run Kubernetes choosing to do so on AWS. Customers tell us that Kubernetes is core to their IT strategy, and are already running hundreds of millions of containers on AWS every week. Amazon EKS simplifies the process of building, securing, operating, and maintaining Kubernetes clusters, and brings the benefits of container-based computing to organizations that want to focus on building applications instead of setting up a Kubernetes cluster from scratch.

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We started in 2014

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Customers running Docker on EC2 from the very beginning…

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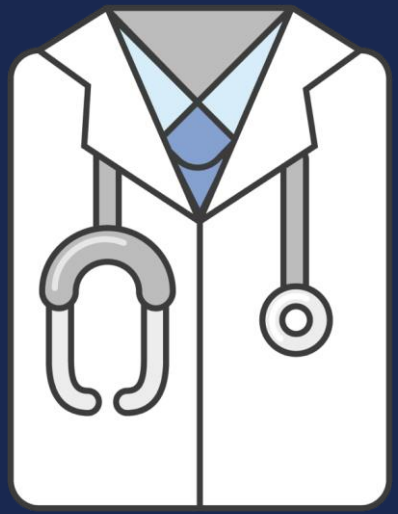
But there were pain points.



Things like scheduling, placing, managing and deploying containers were difficult.

They wanted something to make those pain points better.

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So we built ECS

Amazon Elastic Container Service

Highly scalable, high performance container management system

A managed platform

Cluster management

Container orchestration

Deep AWS integration

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So we built ECS

Amazon Elastic Container Service

Highly scalable, high performance container management system

- **AWS VPC networking mode**
- **Advanced task placement**
- **Deep integration with AWS platform**
- **ECS CLI**
- **Global footprint**
- **Powerful scheduling engines**
- **Auto scaling**
- **CloudWatch metrics**
- **Load balancers**

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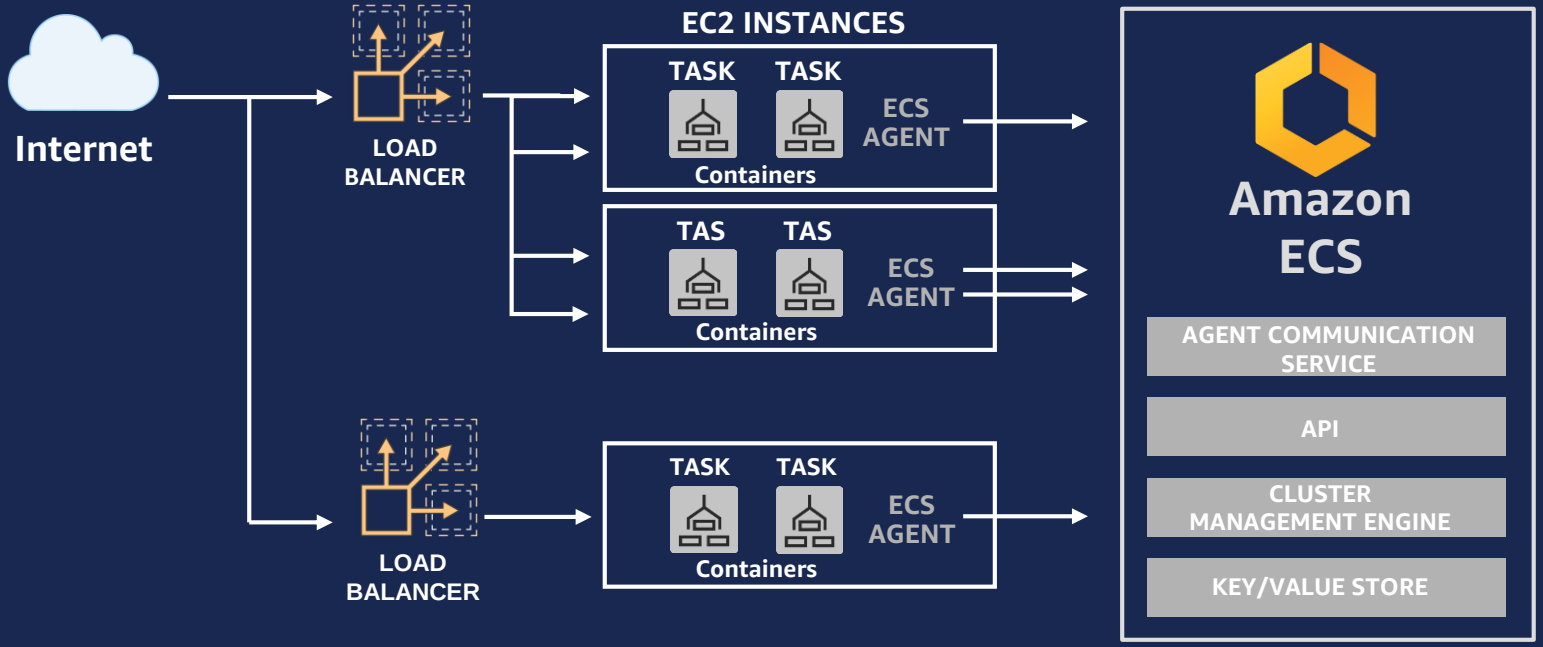
Amazon ECS



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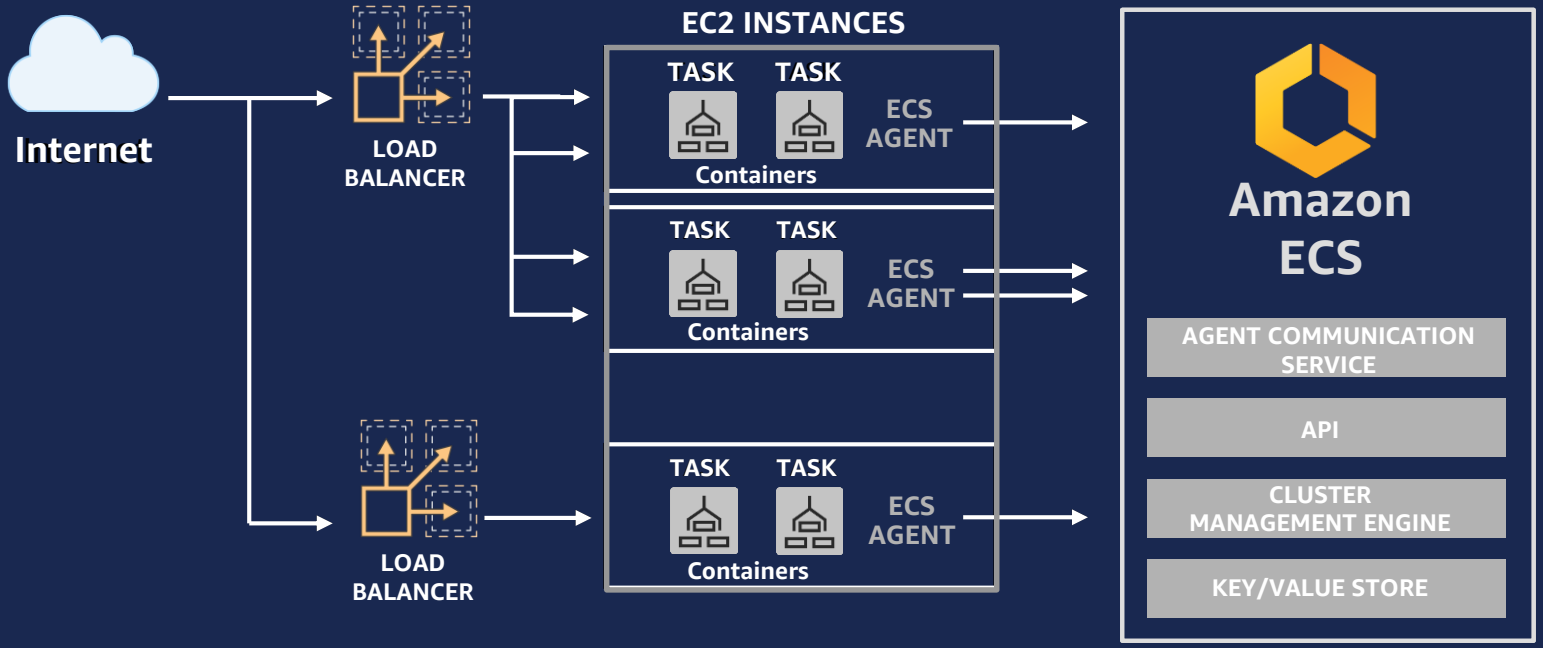
Cluster of hosts



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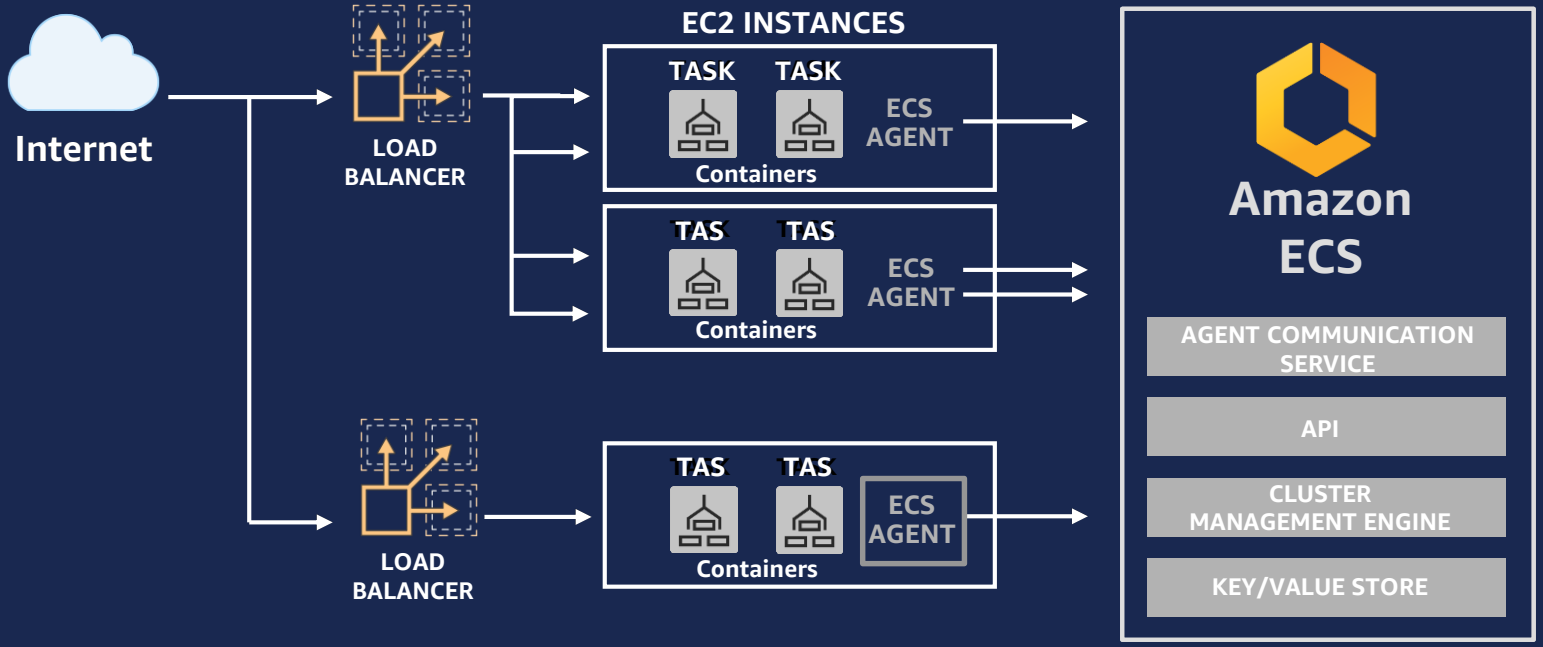
Lightweight agent on each host



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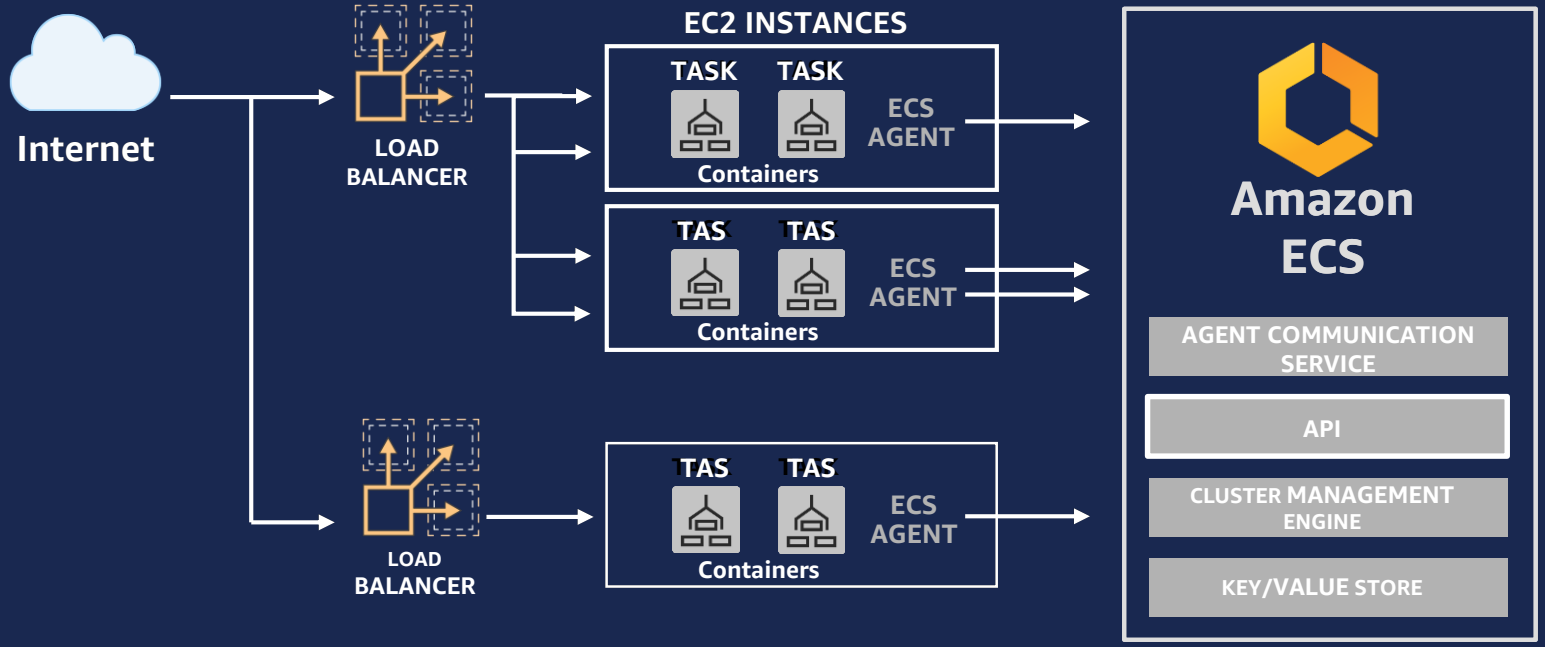
API for launching containers on the cluster



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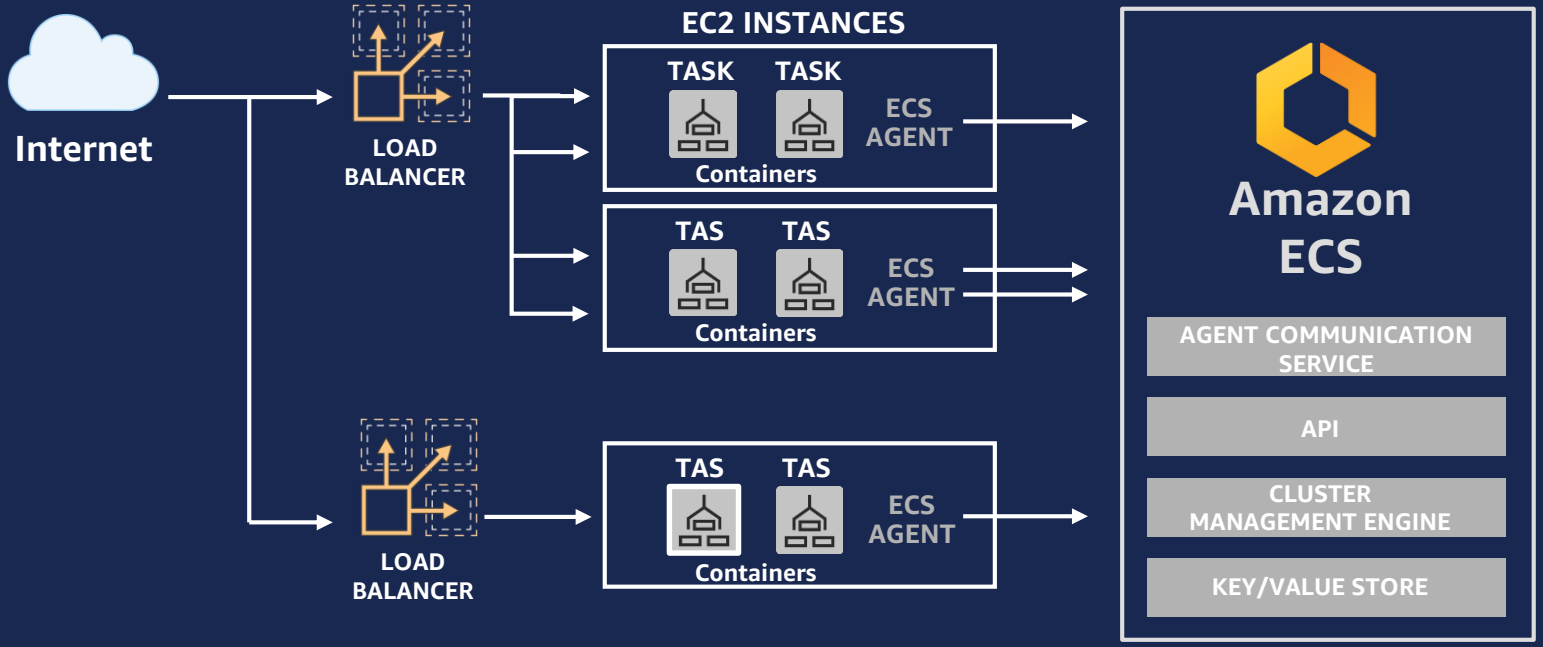
Container task is placed on a host



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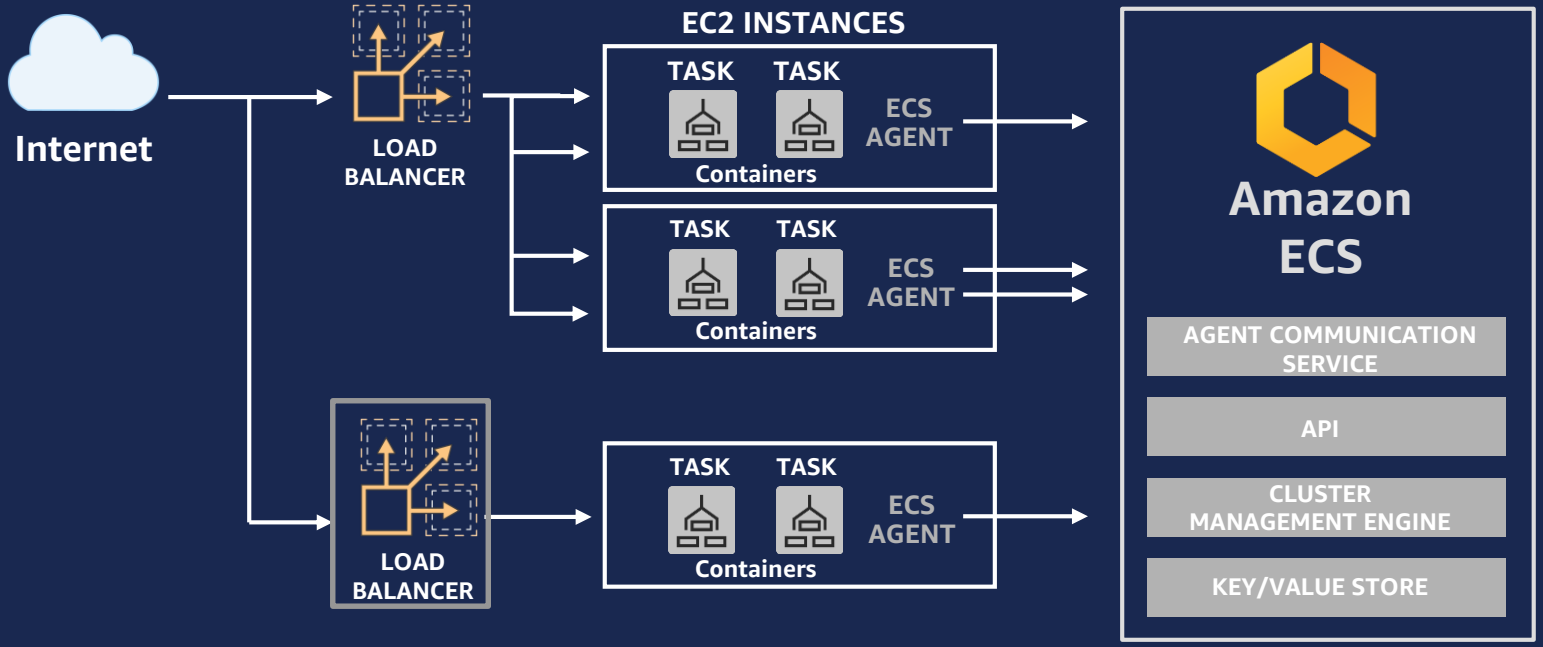
Traffic is sent to your host



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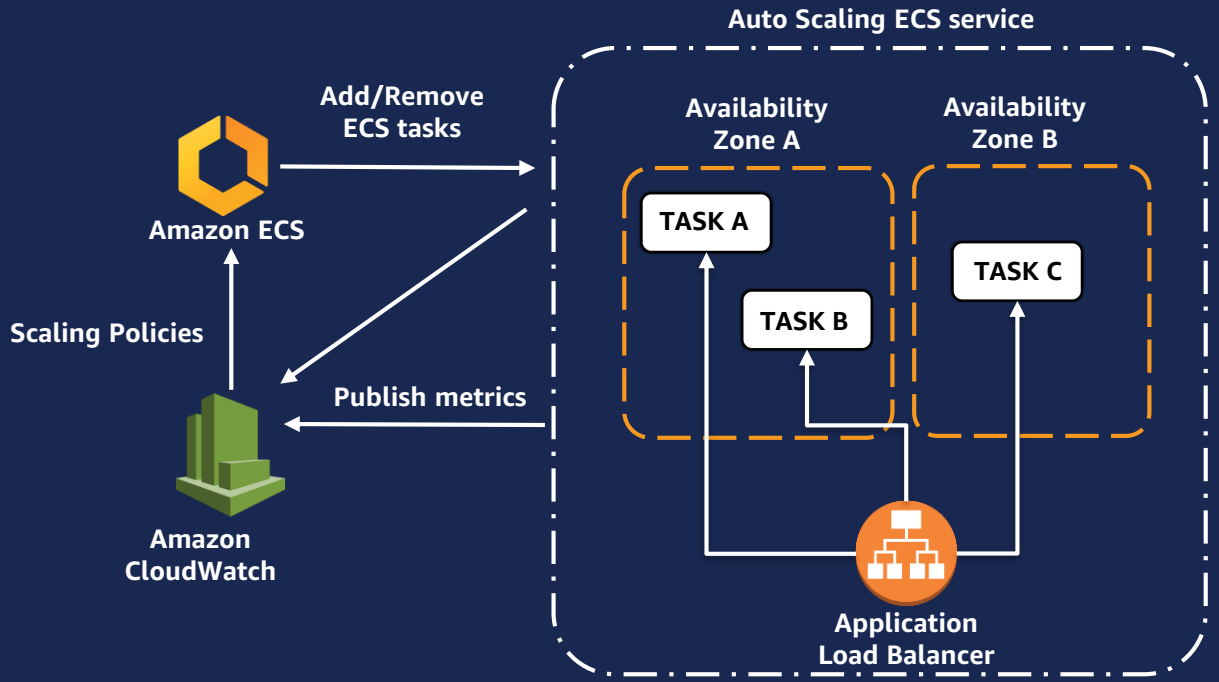
ECS Optimized Amazon Machine Images (AMIs)

- Optimized AMIs available for Linux & Windows
- Bring your own images based on it
- Expects ECS cluster name in user-data
- Update images on SNS update notifications

Automatic Service Scaling



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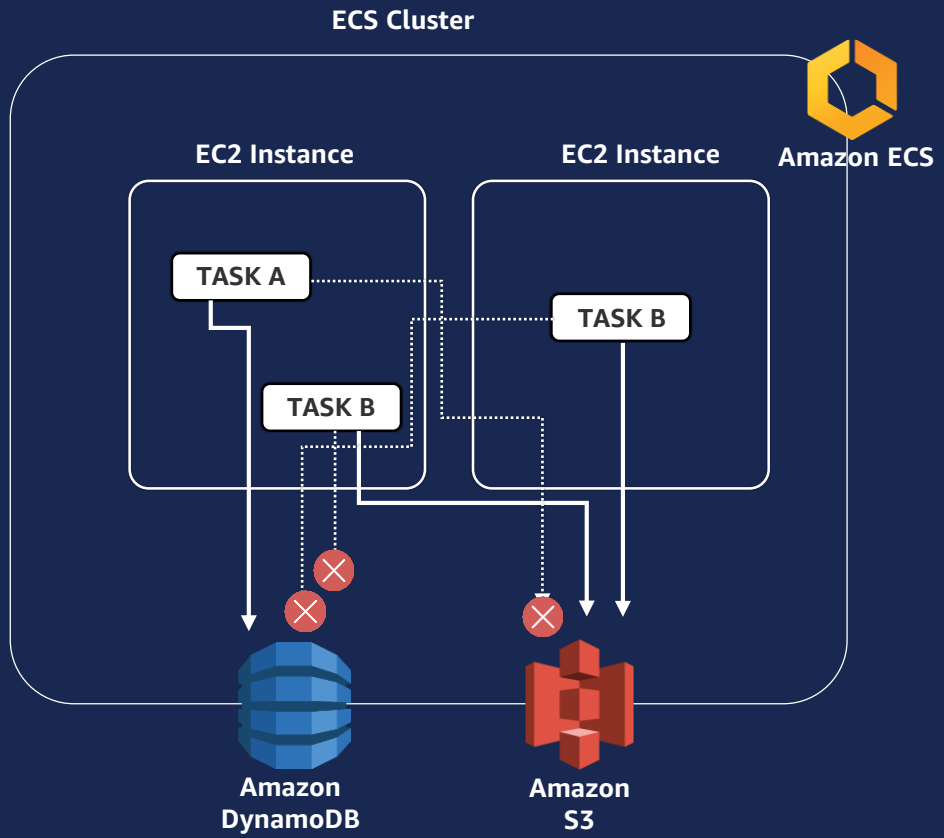
IAM Roles For Tasks



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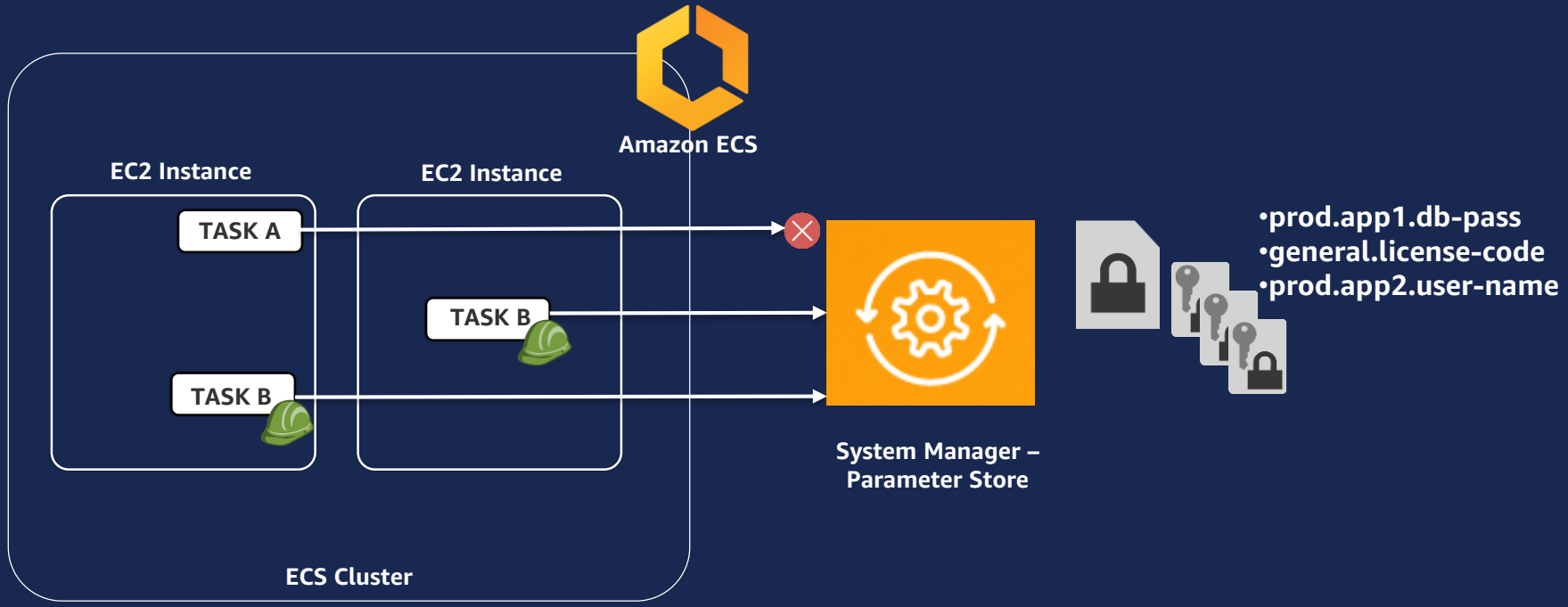
Secrets Management



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Amazon Elastic Container Registry (Amazon ECR)

- Cloud-based Docker image registry
- Fully managed
- Secure – images encrypted at rest, integrated with IAM
- Scalable and Highly Available
- Integrated with Amazon ECS and the Docker CLI

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AWS Fargate

Underlying technology for container management

No cluster or infrastructure to manage or scale

Everything is handled at the container level

Scale seamlessly on demand

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What does Fargate mean?

Not worrying about scaling, underlying infrastructure, cluster resources, capacity, setup.

Just give it a task definition or pod (in 2018), set some resource limits, and away you go.

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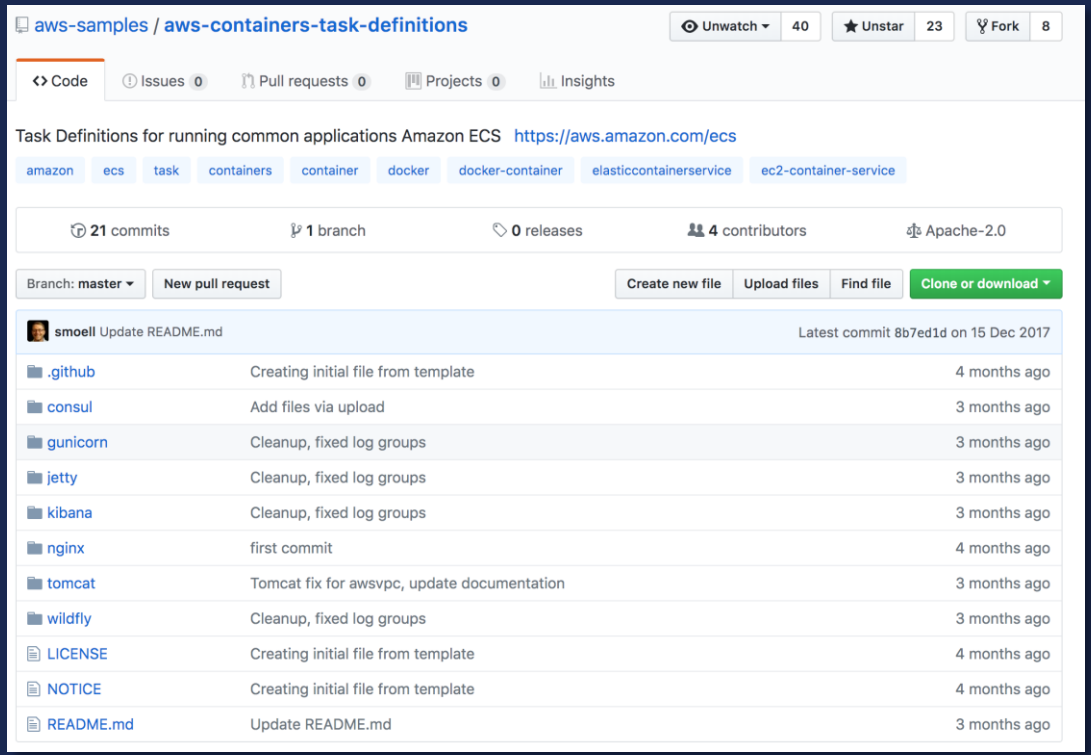
Task Definitions Repository on GitHub



aws-samples / aws-containers-task-definitions

Unwatch 40 | Unstar 23 | Fork 8

Code | Issues 0 | Pull requests 0 | Projects 0 | Insights

Task Definitions for running common applications Amazon ECS https://aws.amazon.com/ecs

amazon ecs task containers container docker docker-container elasticcontainerservice ec2-container-service

21 commits | 1 branch | 0 releases | 4 contributors | Apache-2.0

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

smoell Update README.md — Latest commit 8b7ed1d on 15 Dec 2017

.github	Creating initial file from template	4 months ago
consul	Add files via upload	3 months ago
gunicorn	Cleanup, fixed log groups	3 months ago
jetty	Cleanup, fixed log groups	3 months ago
kibana	Cleanup, fixed log groups	3 months ago
nginx	first commit	4 months ago
tomcat	Tomcat fix for awsvpc, update documentation	3 months ago
wildfly	Cleanup, fixed log groups	3 months ago
LICENSE	Creating initial file from template	4 months ago
NOTICE	Creating initial file from template	4 months ago
README.md	Update README.md	3 months ago

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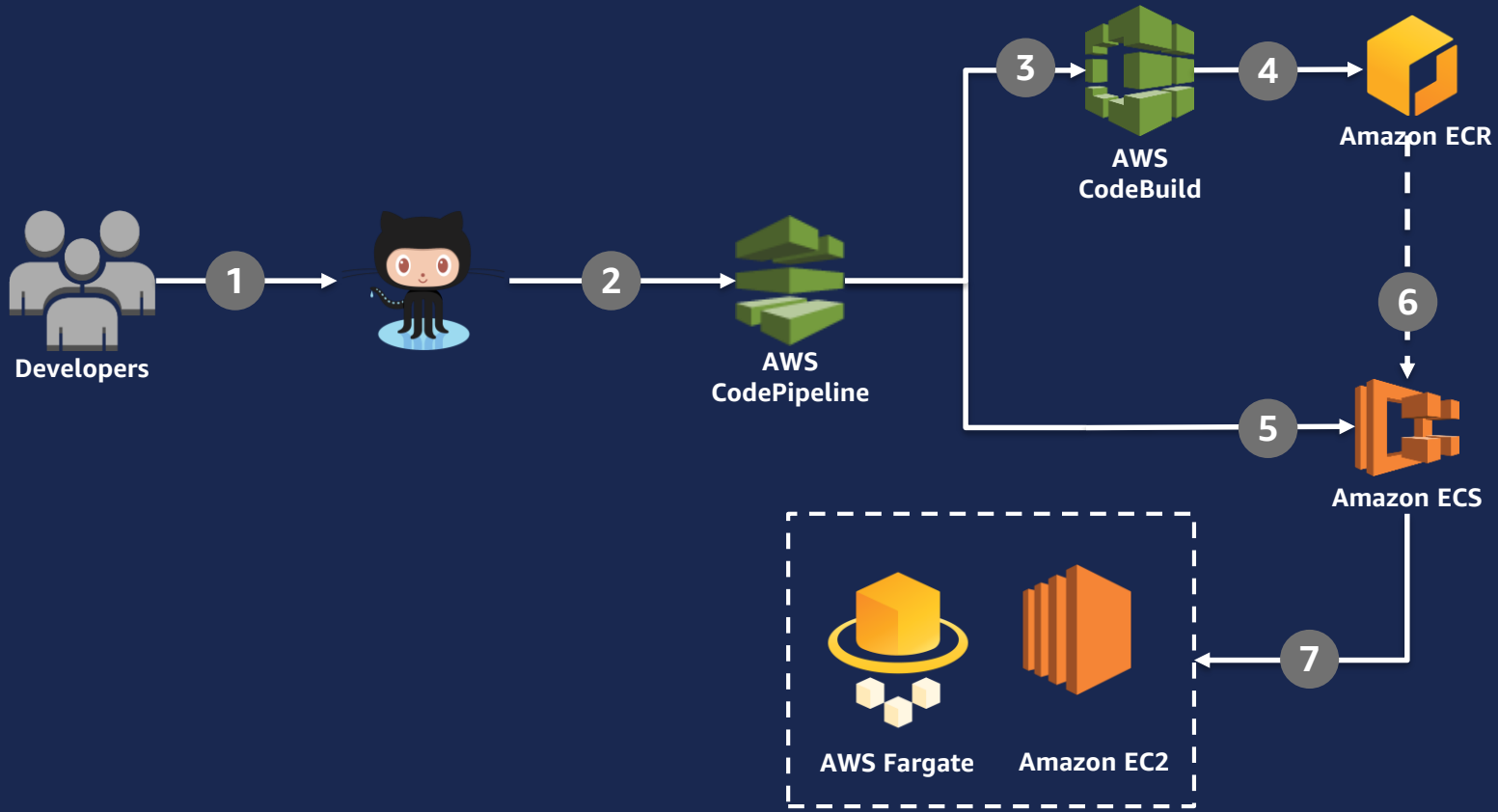
Continuous Deployment in Amazon ECS



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Europe's leading app for ordering taxis
Majority of services on ECS

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mytaxi

10+ million users with 45,000+ taxis across 40+ cities.

With the microservice architecture (140+ services) built on AWS, mytaxi can provide new features to users faster than ever before.

Running entirely on Spot.

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„In November 2015 we moved our Docker **container architecture to Amazon ECS**, and for the first time ever in December we were able to celebrate a **new year** in which our system could **handle the huge number of requests** without any crashes or interruptions.“

-Sebastian Herzberg, System Engineer

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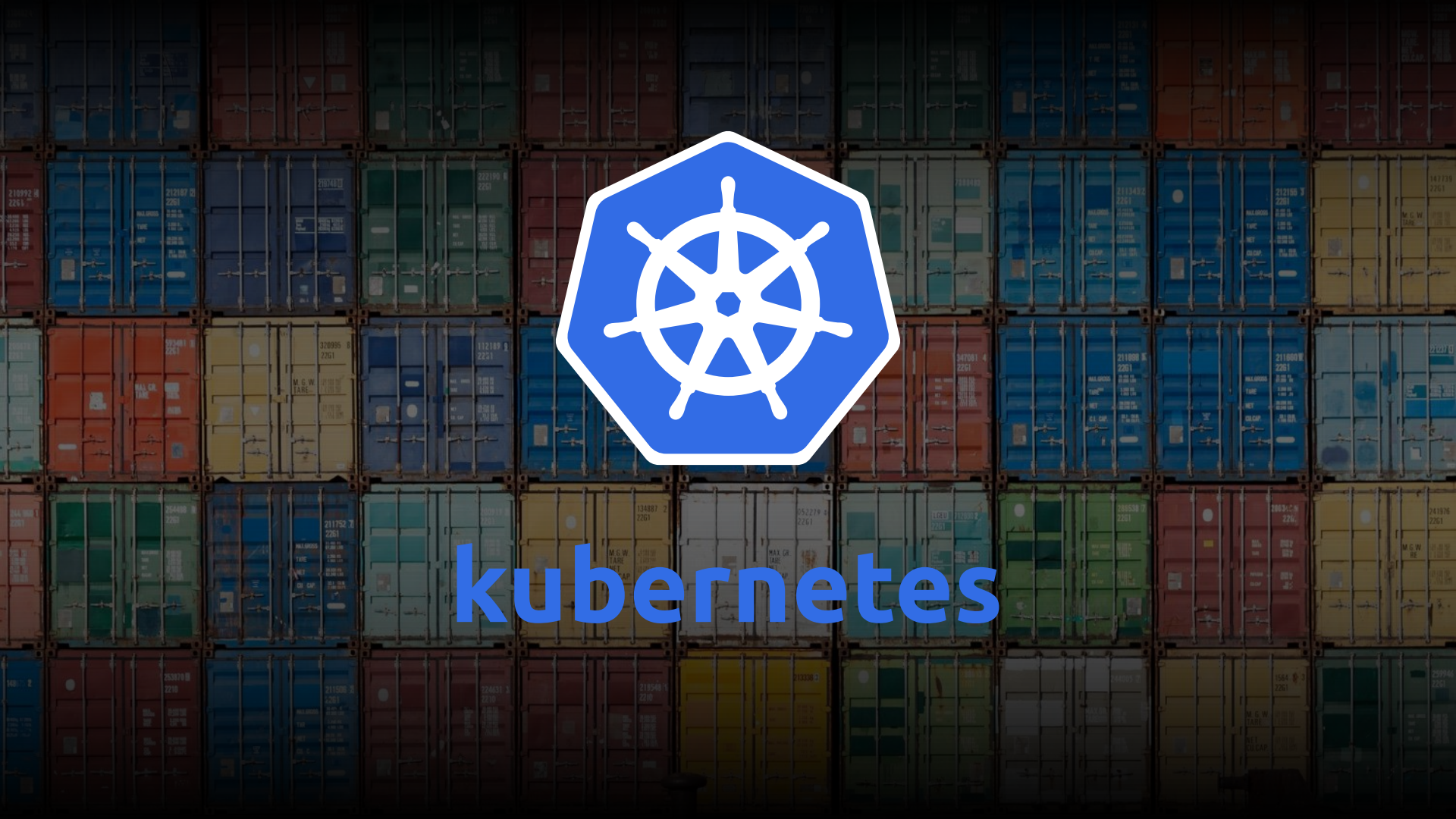
kubernetes

“Run Kubernetes for me.”

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Amazon Elastic Container Service for Kubernetes: EKS

Managed Kubernetes on AWS

Managed Kubernetes control plane

Highly available

Automated version upgrades

Integration with other AWS services

CloudTrail, CloudWatch, ELB, IAM, VPC, PrivateLink

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Elastic Container Service for Kubernetes

- Platform for enterprises to run production grade workloads
- Provides a native and upstream Kubernetes experience
- Not forced to use additional AWS services, but offer seamless integration
- EKS team actively contributes to the Kubernetes project

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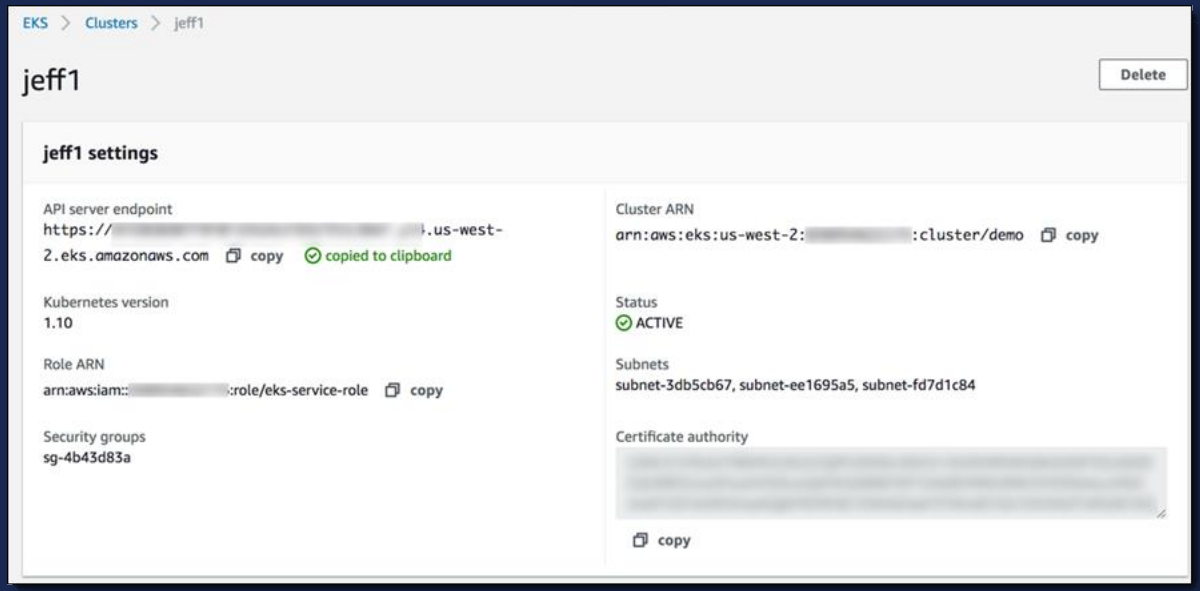
Elastic Container Service for Kubernetes



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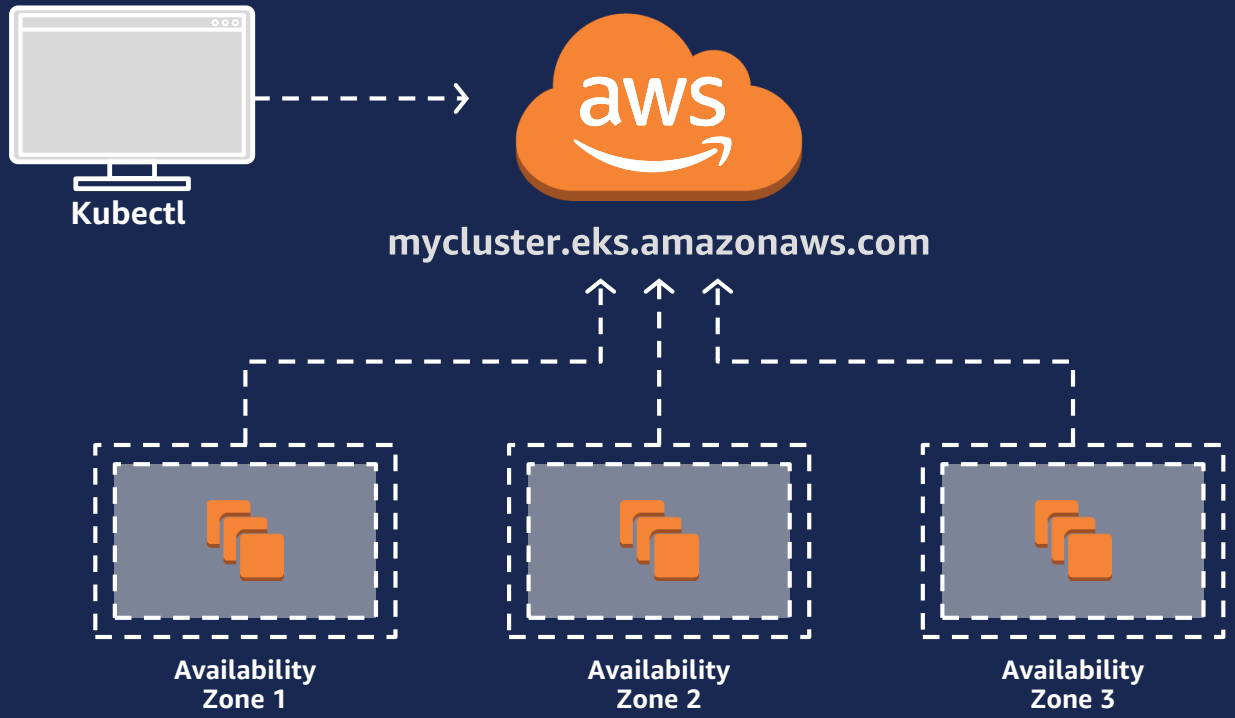
EKS Architecture



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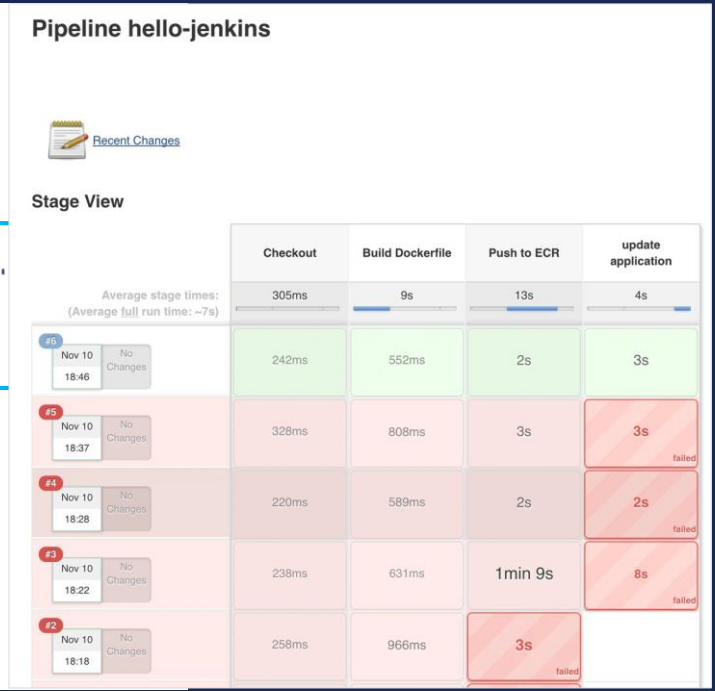
Jenkins – CI/CD with Kubernetes

```
node {

    stage 'Checkout'
    git 'https://github.com/omarlari/aws-container-sample-app.git'

    stage 'Build Dockerfile'
    docker.build('hello')

    stage 'Push to ECR'
    sh ("eval \$(docker run awscli aws ecr get-login --region ${REGION} --no-include-email | sed '
    docker.withRegistry('https://${ECR_REPO}') {
        docker.image('hello').push('${BUILD_NUMBER}')
    }

    stage 'update application'

    kubernetes: { node {
    docker.image('kubectl').inside("--volume=/home/ec2-user/.kube:/config/.kube"){
        sh 'kubectl describe deployment ${APP}'
        sh 'kubectl set image deployment/${APP} hello=${ECR_REPO}/hello:${BUILD_NUMBER}'
        sh 'kubectl describe deployment ${APP}'
        }
    }}
}
```



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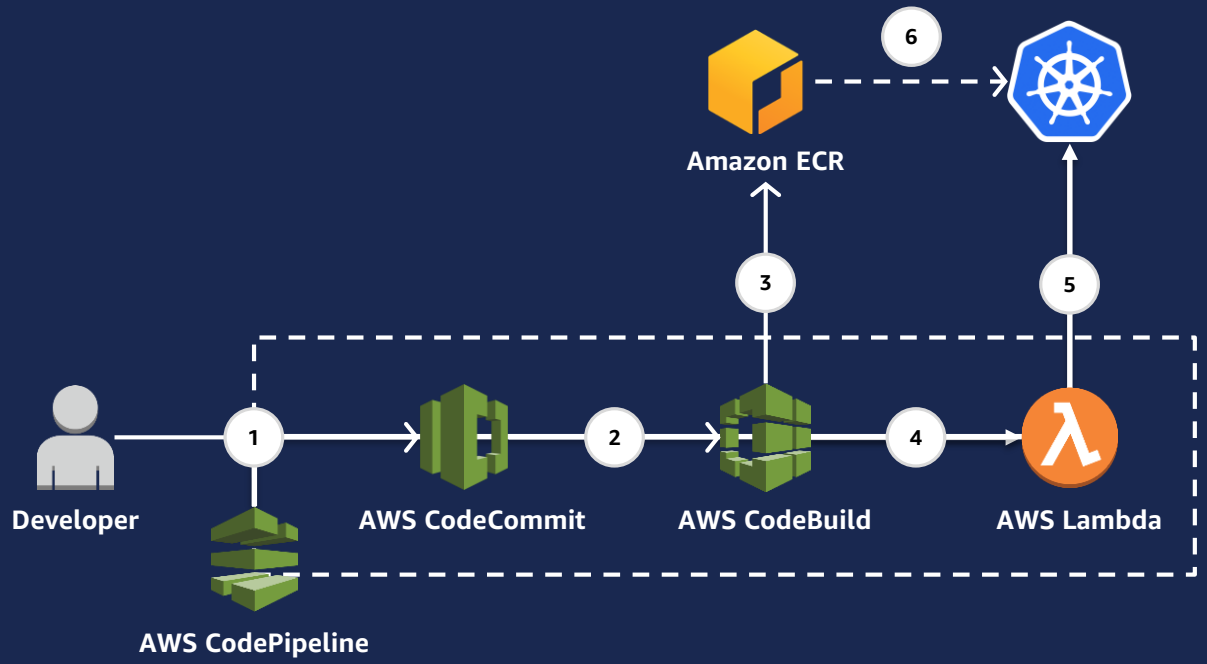
AWS CodePipeline – CI/CD with Kubernetes



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Batch Processing with Containers

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What is batch computing?

Run jobs asynchronously and automatically across one or more computers.

Jobs may have dependencies, making the sequencing and scheduling of multiple jobs complex and challenging.

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Cloud makes Sense for Batch

- Scalable
- Reliable
- Choice:
    - Compute resources (GPUs, RAM- or CPU-bound)
    - Storage resources (fileshares, performance characteristics)
    - Downstream services (e.g. databases, streaming services)
    - Pricing models
- Pay as you go (per second)

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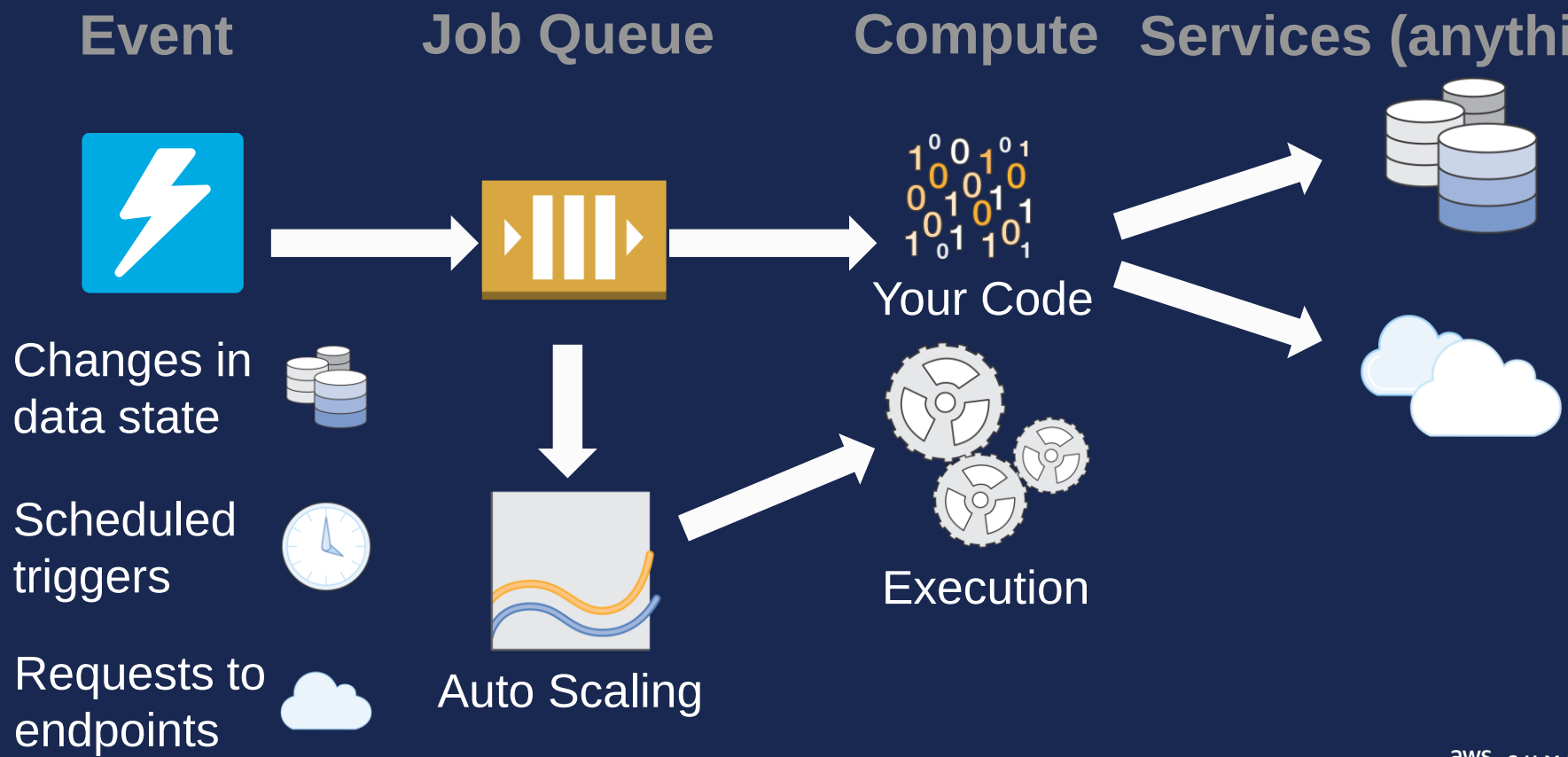
Anatomy of a Batch



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Options for Batch Workloads on AWS

Amazon ECS

AWS Batch

AWS Lambda
(Amazon SQS as built-in event source coming soon)

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Containers make Sense for Batch

- Benefits from container development model
- Polyglot
- Do one thing well
- Black Box – and easy to model

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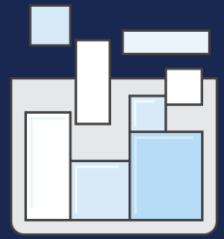
Basic Batch Workflow with ECS

Input is put to S3 Bucket

Event is put to Amazon SQS

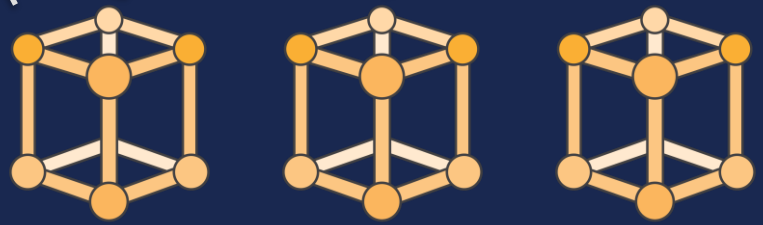
Queue depth is used for scaling



ECS provisions clusters and schedules tasks

Workers poll queue

Output is put to S3 Bucket



Containerized batch workers process files

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Introducing AWS Batch

- **Fully managed batch primitives**
- **Focus on your applications (shell scripts, Linux executables, Docker images) and their resource requirements**
- **We take care of the rest!**

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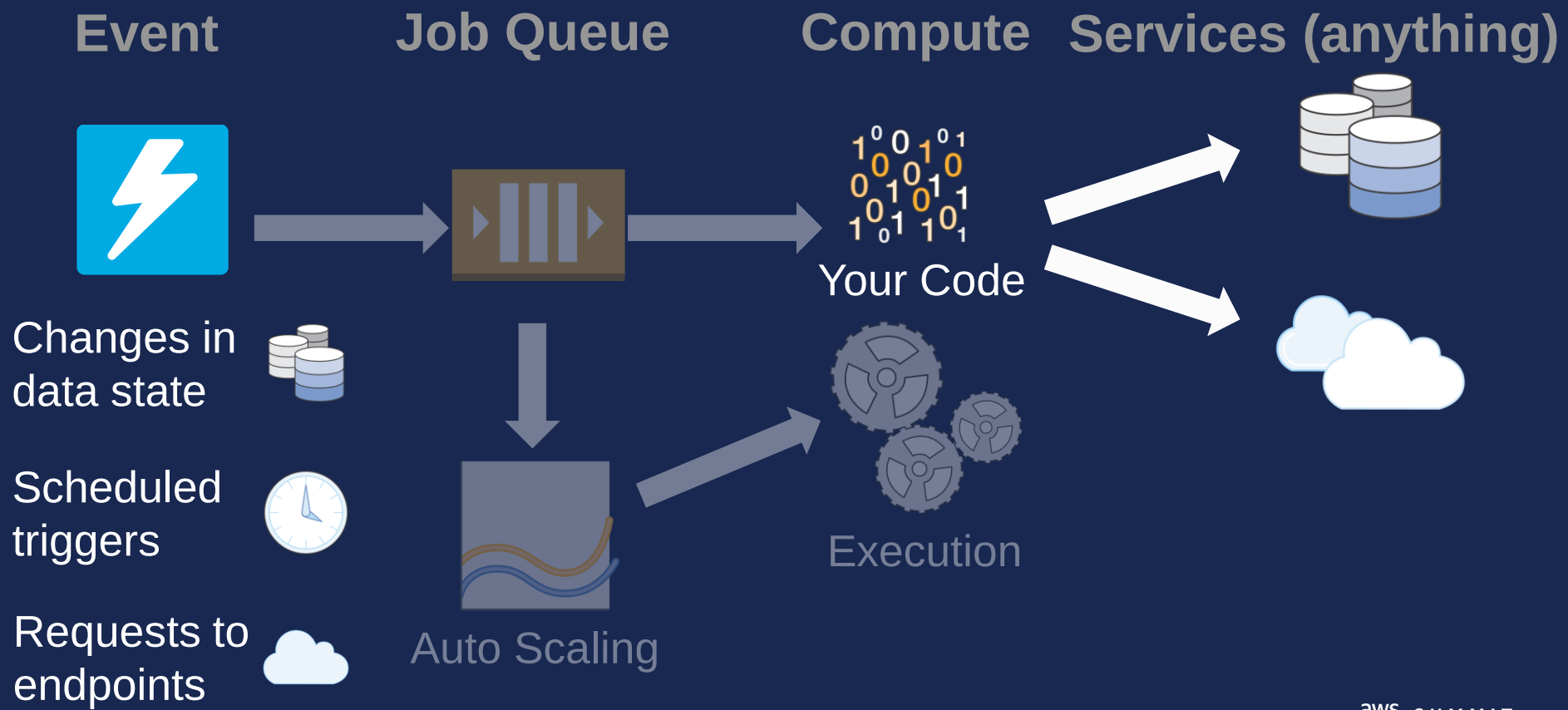
What you need to take care of ...



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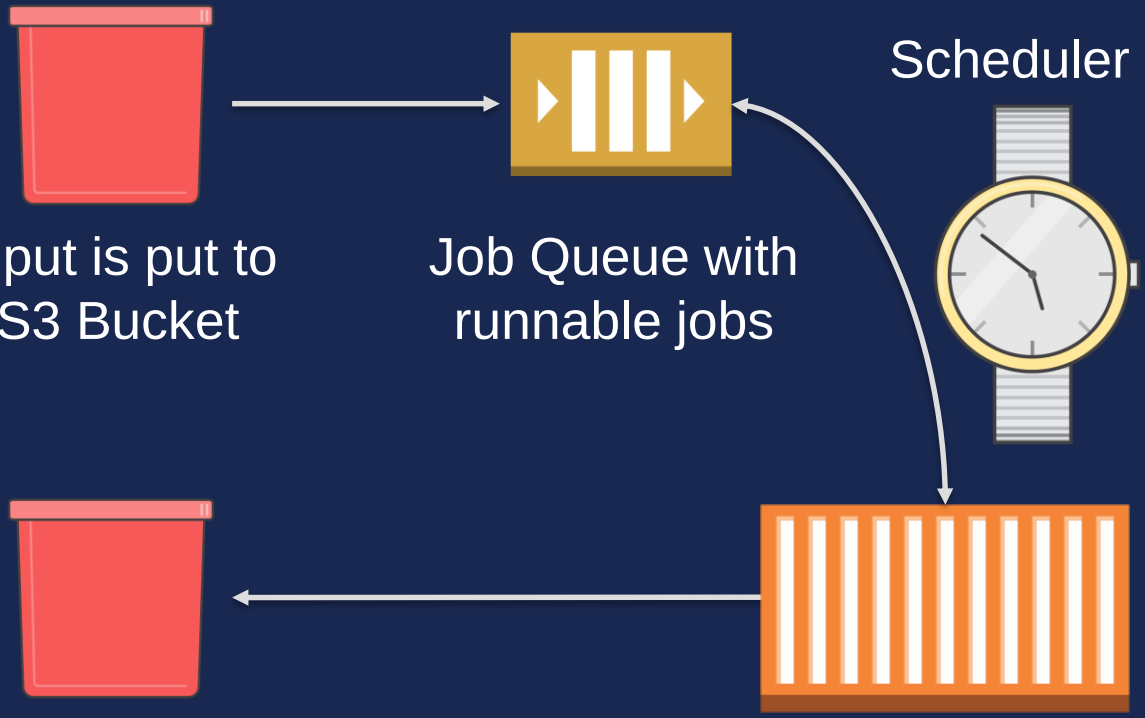
Typical AWS Batch Job Architecture



Job definition

Application Image + config

IAM role

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„Flip Image“ Job‘s Dockerfile

```
FROM amazonlinux:latest

RUN yum update -y
RUN yum install ImageMagick aws-cli -y

ADD flip.sh /usr/local/bin/flip.sh

WORKDIR /tmp
USER nobody

ENTRYPOINT ["/usr/local/bin/flip.sh"]
```

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flip.sh

```
#!/bin/bash
SRCBKT=$1 # SOURCE BUCKET
OBJ=$2 # OBJECT KEY
TRGBKT=$3 # TARGET BUCKET


error_exit() { echo "${1}" >&2; exit 1; }


tmpfile=$(mktemp /tmp/image.XXXXXX)
aws s3 cp "s3://$SRCBKT/$OBJ" "$tmpfile" \ # DOWNLOAD
    || error_exit "Download failed $SRCBKT/$OBJ"
convert -flip "$tmpfile" "$tmpfile" \ # FLIP w/ IMAGEMAGICK
    || error_exit "Failed to flip file"
aws s3 cp "$tmpfile" "s3://$TRGBKT/$OBJ" \ # UPLOAD
    || error_exit "Upload failed $TRGBKT/$OBJ"
```

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AWS Batch Concepts

- Job definitions
- Jobs
- Job queue
- Compute environments

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Job Definitions

AWS Batch job definitions specify how jobs are to be run.

Some attributes in a job definition:

- Container Image
- IAM role associated with the job
- vCPU and memory requirements
- Mount points
- Environment variables
- Retry strategy

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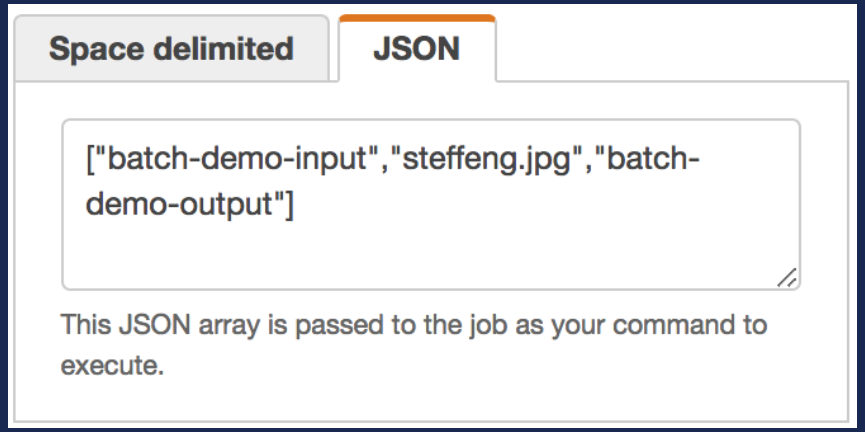
Jobs

Jobs are the unit of work executed by AWS Batch.

Set/ overwrite **Job Definition** attributes, e.g.:

- Command
- Parameters
- Dependencies

E.g. job‘s Command:



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Easily run massively parallel jobs

Start up to 10,000 copies of an application with a single call using Array Jobs.

Efficient way to run:

- **Parametric sweeps**
- **Monte Carlo simulations**
- **Processing a large collection of objects**

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Job Retries

AWS Batch supports up to 10 attempts per job:

- **errors in the AWS Batch job**
- **termination of the Spot Instance**

The `AWS_BATCH_JOB_ATTEMPT` environment variable is set to the container's corresponding job attempt number.

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Compute Environments

Managed

AWS scales and configures your instances for you.

Optional choice:

- On demand/ Spot
- Instance Types/ Mix
- Amazon Machine Image

Unmanaged

You control and manage the instance configuration, provisioning, and scaling.

Full control over scaling and instance provisioning for the ECS cluster used by AWS Batch.

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Bring your own AMIs

Customer Provided AMIs let you set the AMI that is launched as part of a **managed compute environment**.

Makes it possible to configure Docker settings, mount **EBS**/ **EFS** volumes, and configure drivers for **GPU** jobs.

AMIs must be Linux-based, HVM and have a working ECS agent installation.

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Job Queues

Jobs are submitted to Job Queues.

Job queues are assigned to one or more compute environments.

Each job queue has a priority assigned. Jobs in queues with higher priority take precedence.

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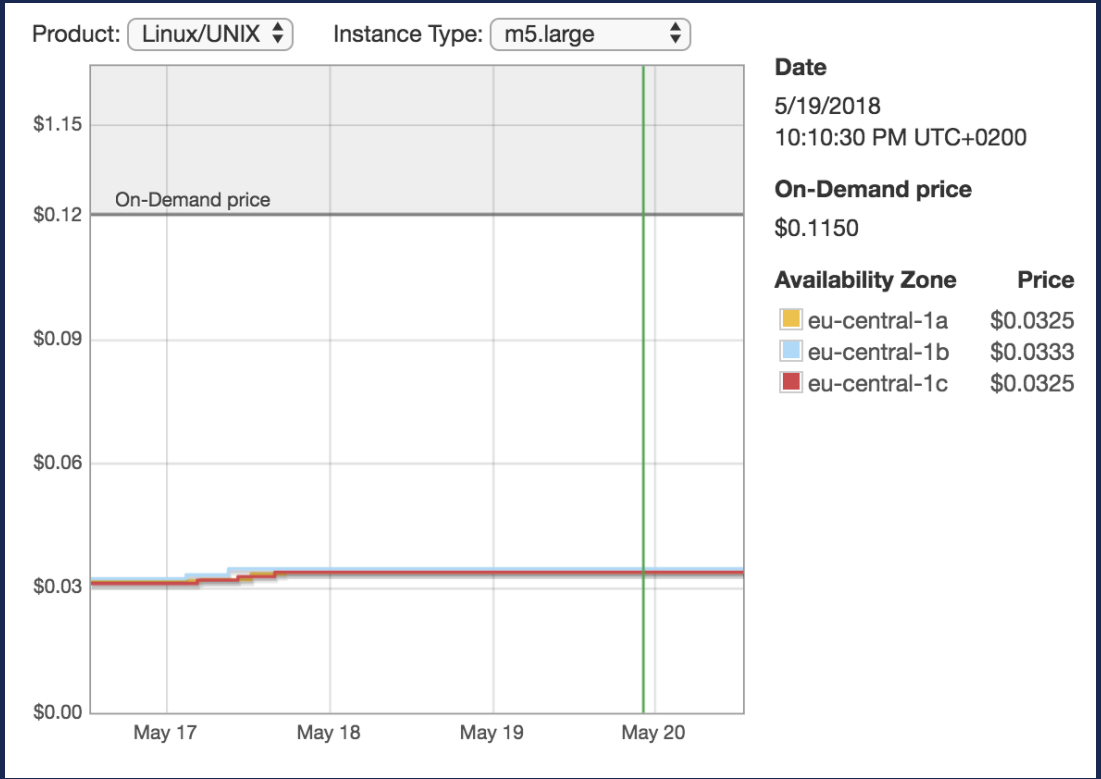
Use Spot Instances



Get your jobs done **faster** or **cheaper**.

AWS Batch retries jobs on instance terminations and selects from multiple instance types.

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Pricing

No additional charge for AWS Batch or Amazon ECS.

You only pay for the underlying resources that you consume!

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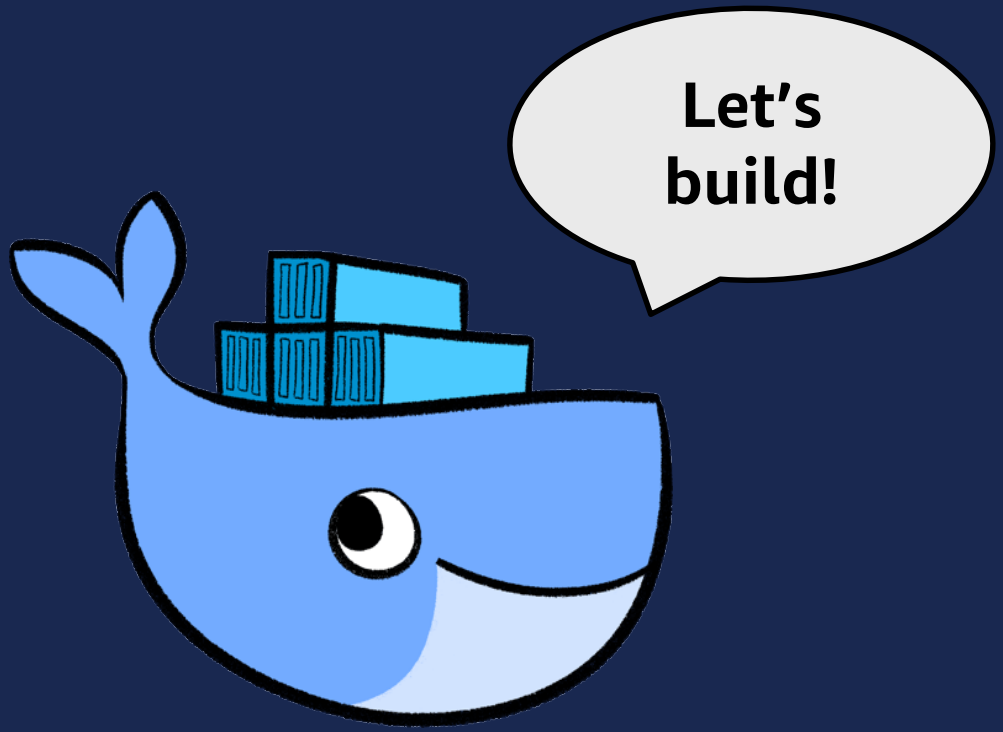

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Please complete the session survey in the summit mobile app.

Next session in this room:

14:00 - Kubernetes Running on AWS

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