Kubernetes on AWS

Key Takeaways

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Container Services on AWS

Elastic Container Registry (ECR)

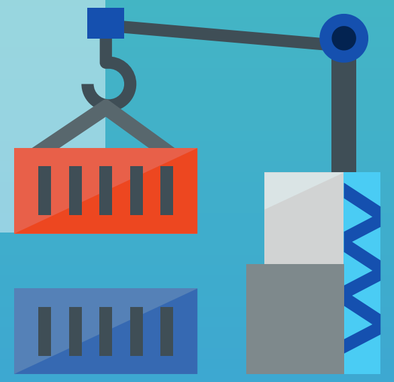
- Private Docker Repository

Elastic Kubernetes Service (EKS)

- Container Orchestration Service
- Managed Kubernetes Service

Elastic Container Service (ECS)

- Container Orchestration Service



Elastic Container Service

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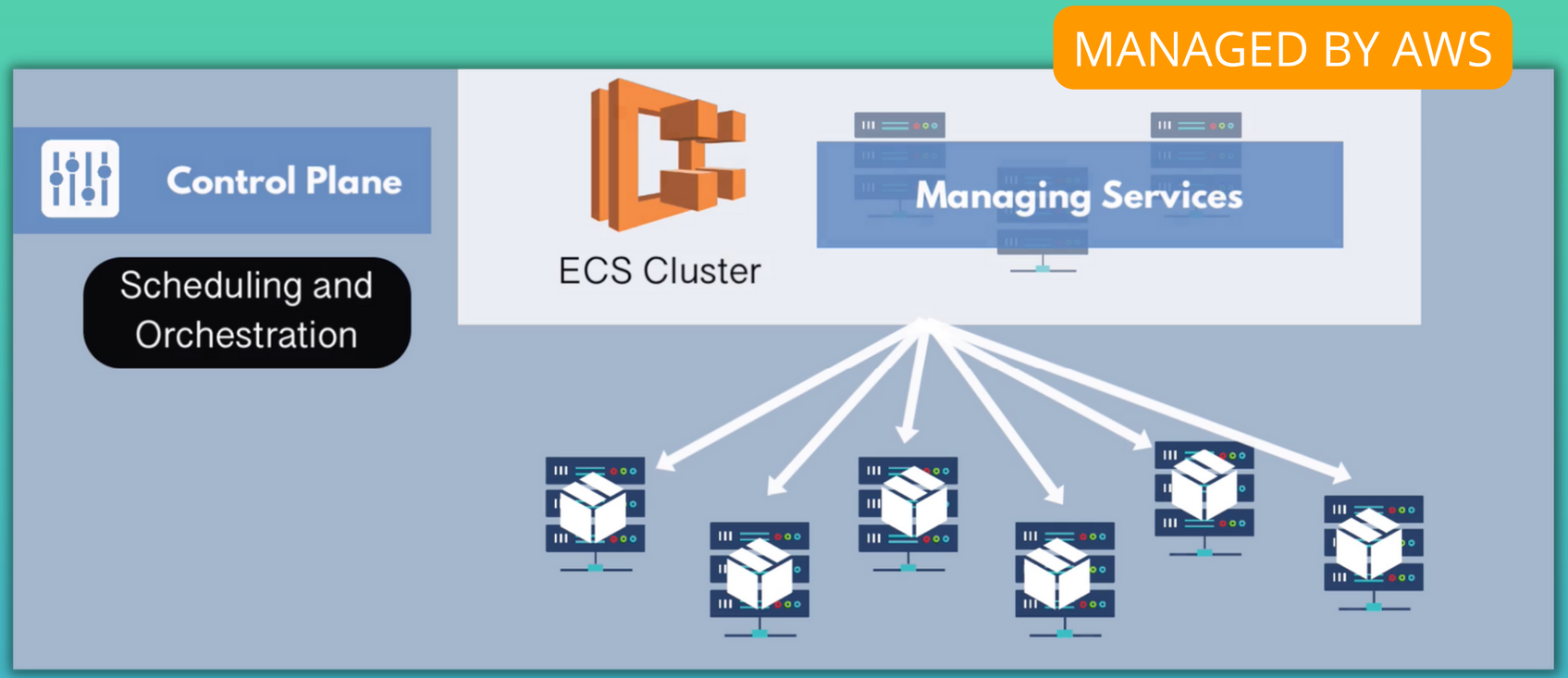
Different Container Orchestration Tools

Amazon's Elastic Container Service is one of several container orchestration tools

How does ECS work? - 1

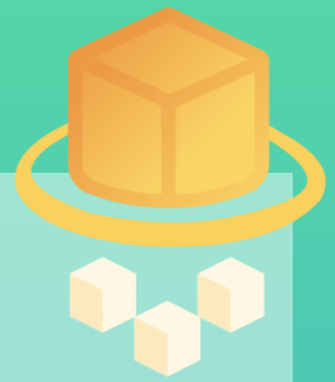
- **Control Plane**: managed by AWS
- Compute Fleet: **Hosted on EC2 instances**, connected and managed by ECS



EC2 instance needs to have:

1. Container Runtime
2. ECS Agent - for Control Plane communication

Using EC2 vs AWS Fargate



ECS hosted on EC2 Instances

- Containers managed by AWS
- **Full** access and **control** of your infrastructure
- You **still need to manage** and maintain the **virtual machine**
- Pay for **whole server**

ECS hosted on AWS Fargate

- **Serverless** way to launch containers

- Containers managed by AWS
- Infrastructure managed by AWS
- Provisions servers **on demand**
- Pay only for **what you use**
- Easily **scales up/down without fixed resources** defined beforehand

Elastic Kubernetes Service (EKS)

Amazon Elastic Kubernetes Service

Managed Container service to run and scale K8s applications

Difference of ECS and EKS

Amazon ECS

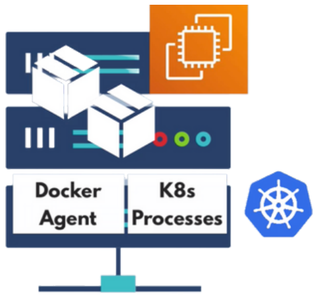
- Specific to AWS
- Migration difficult

- Less complex applications
- ECS control plane is free

- **Both:** Managing the Control Plane
- **Communication** between Control Plane and Compute Fleet:

ECS = via ECS Agent

EKS = via K8s Worker Processes



Amazon EKS

- You already use K8s (**same K8s API**)
- K8s is open-source
- Easier to migrate to another platform
- Large community (Helm charts etc.)

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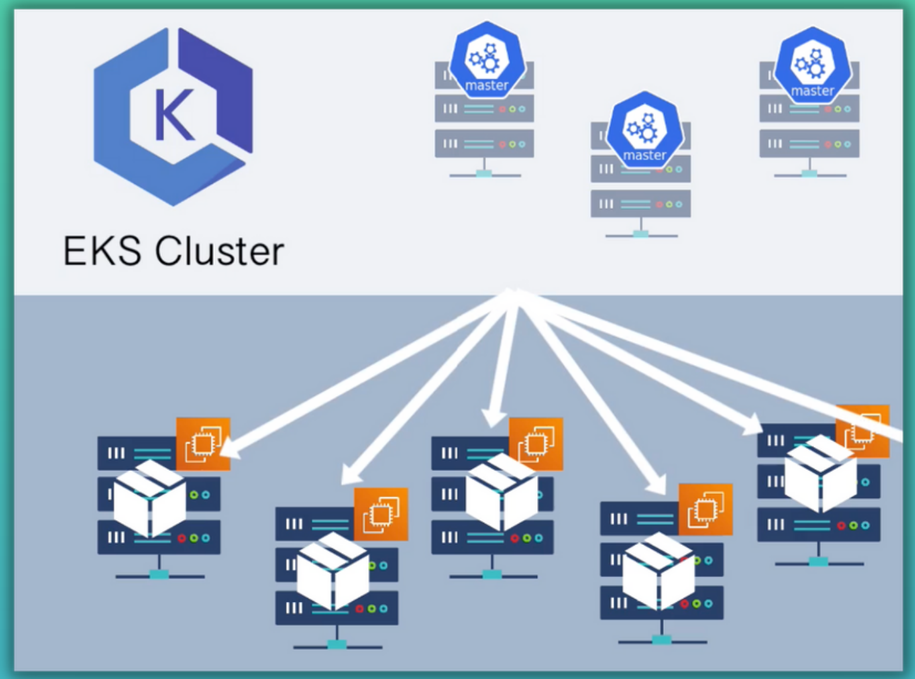
How EKS works - 1

- **Control Plane:** Scheduling and Orchestration
- **Worker Nodes**: Compute Fleet



- EKS deploys and manages K8s Control Plane Nodes
- K8s Control Plane services are already installed
- **High Availability**: Control Plane Nodes replicated across Availability Zones:

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How EKS works - 2

Different choices to host your Worker Nodes

EKS with **EC2 Instances**

self-managed

- You need to manage the infrastructure of Worker Nodes

EKS with **Nodegroup**

semi-managed

- Creates, deletes EC2 instances for you, but you need to configure it

EKS with **Fargate**

fully-managed

- Fully managed Worker Nodes

High-Level Steps to create an EKS cluster

1)

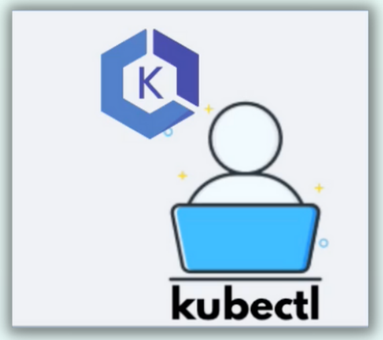
Provision an EKS cluster (**Control Plane Nodes**)

2)

Create Nodegroup of EC2 Instances (**Worker Nodes**)

3)

Connect Nodegroup to EKS cluster



4)

Deploy your containerized applications

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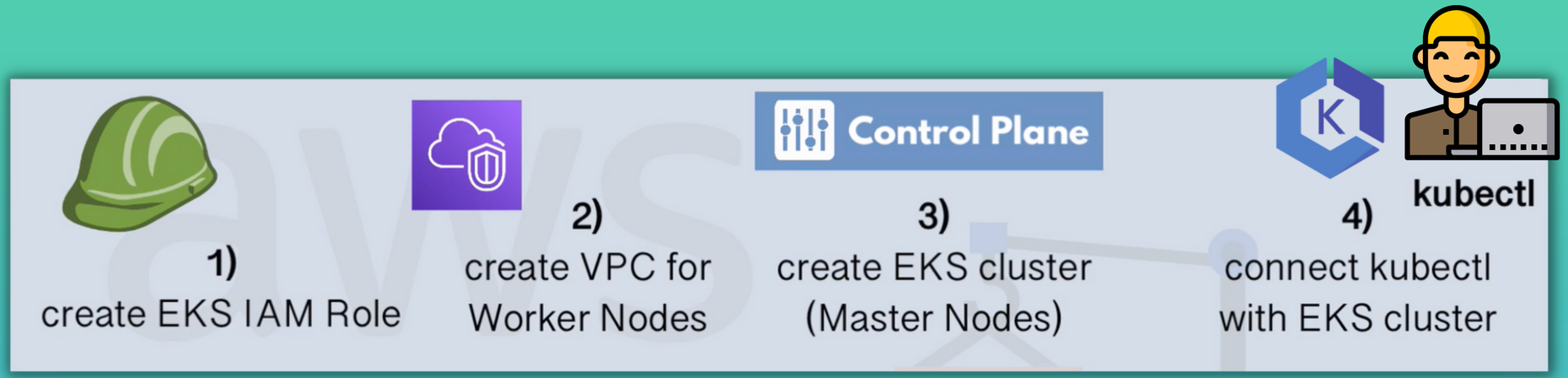
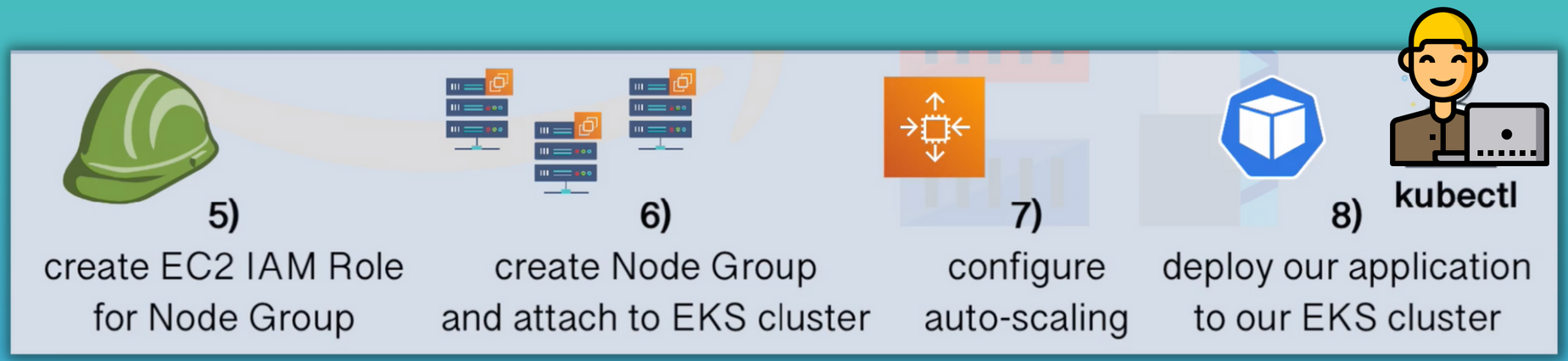
Detailed Steps to create an EKS cluster - 1



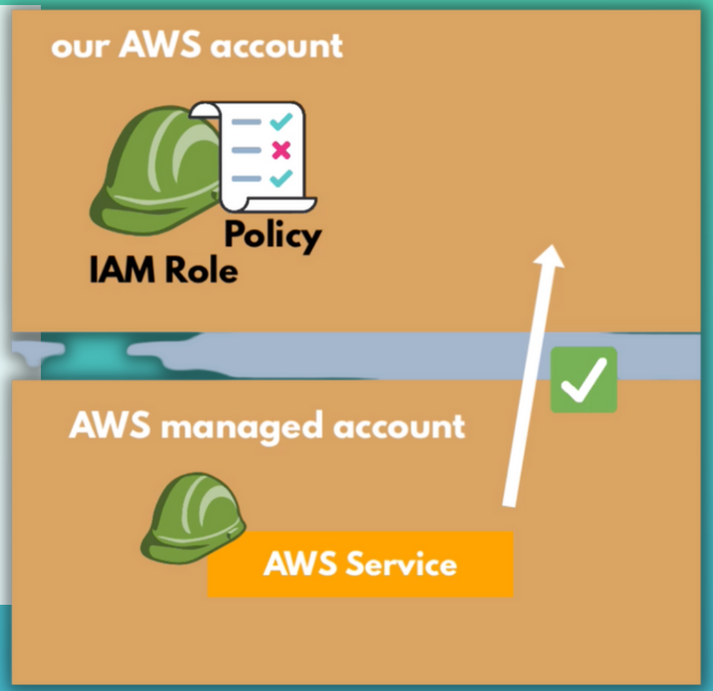


Detailed Steps to create an EKS cluster - 2

1) Create IAM Role for EKS cluster

1. Create IAM Role in AWS account
2. Assign Role to EKS cluster managed by AWS

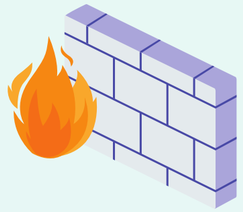
Why? To allow AWS to create and manage components on our behalf

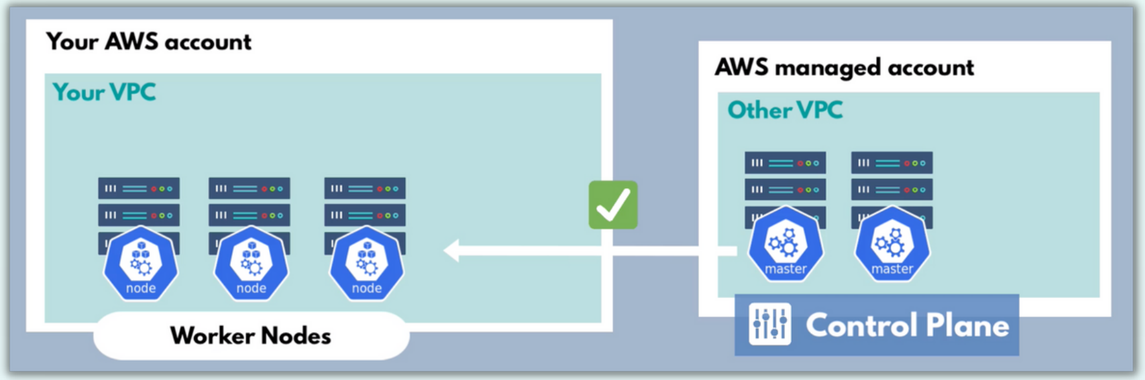


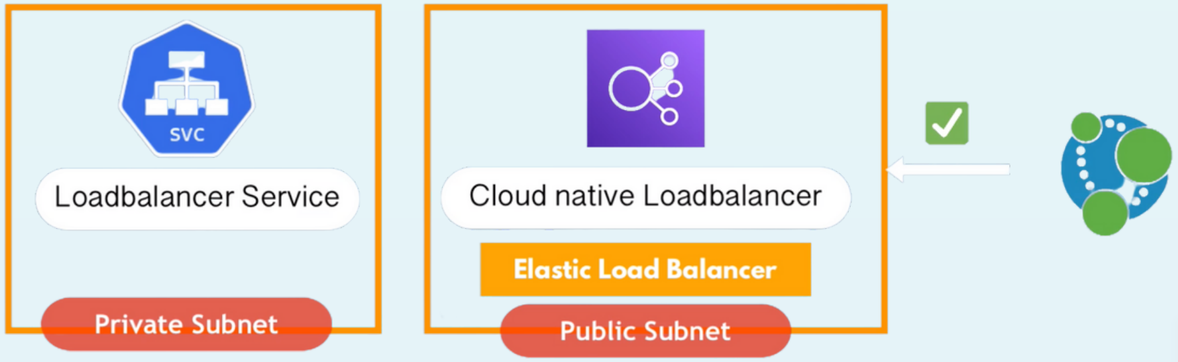
Detailed Steps to create an EKS cluster - 3

2) Create VPC for EKS Worker Node

- EKS cluster needs specific networking configuration
- Worker Nodes need specific Firewall configurations for Control Plane-Worker communication
- Best Practice Configure **public** and **private** subnet
- Through IAM Role you give K8s permission to change VPC configurations







Detailed Steps to create an EKS cluster - 4

3) Create EKS cluster

Options to create the cluster

Manually

- Difficult to replicate
- Or do multiple times

eksctl

- **Command Line Tool** for working with EKS clusters that automates many manual tasks
- Execute just 1 command
- Necessary resources get created and configured in the background
- Cluster will be created with default parameters
- But you can customize your cluster with CLI options

IaC

- Use Infrastructure as Code tool like Terraform

You will learn this in Terraform Module

Detailed Steps to create an EKS cluster - 5

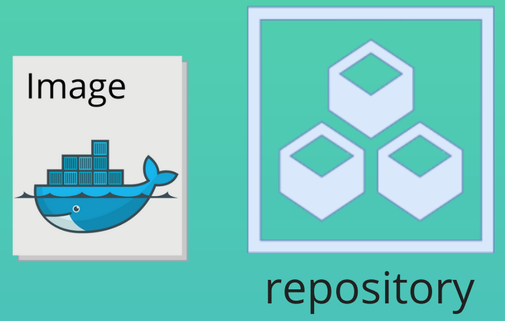
5) Create EC2 IAM Role for Node Group

- Kubelet is the **main worker process** - scheduling, managing Pods and **communicate with other AWS services**
- That's why Kubelet on Worker Node needs **permission**
- Create **Role for Node Group**

With Node Group all necessary worker processes (container runtime, kubelet, k-proxy) are installed

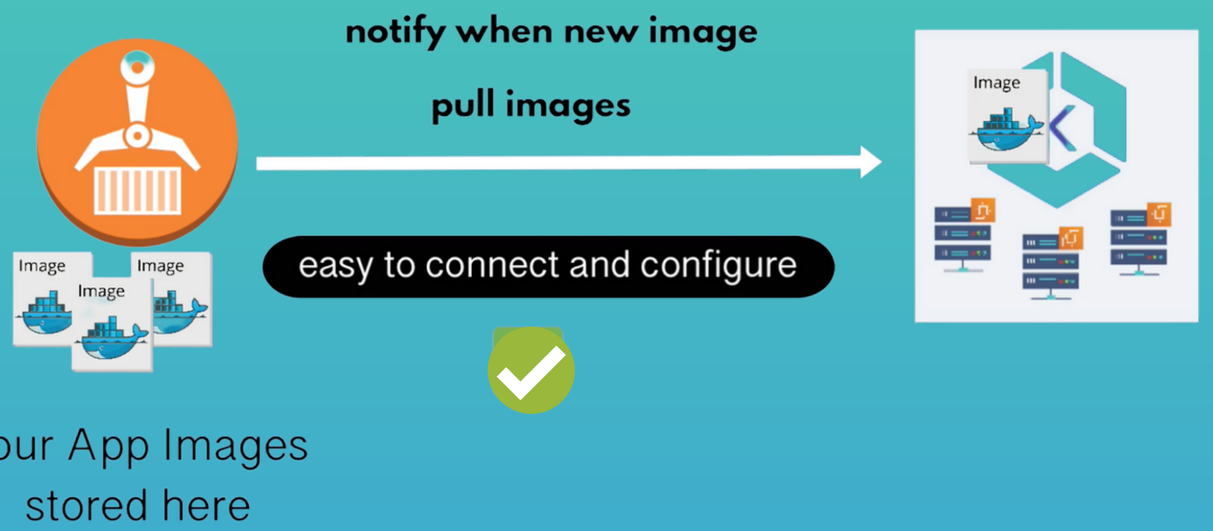
Elastic Container Registry (ECR) - 1

Repository for Container Images



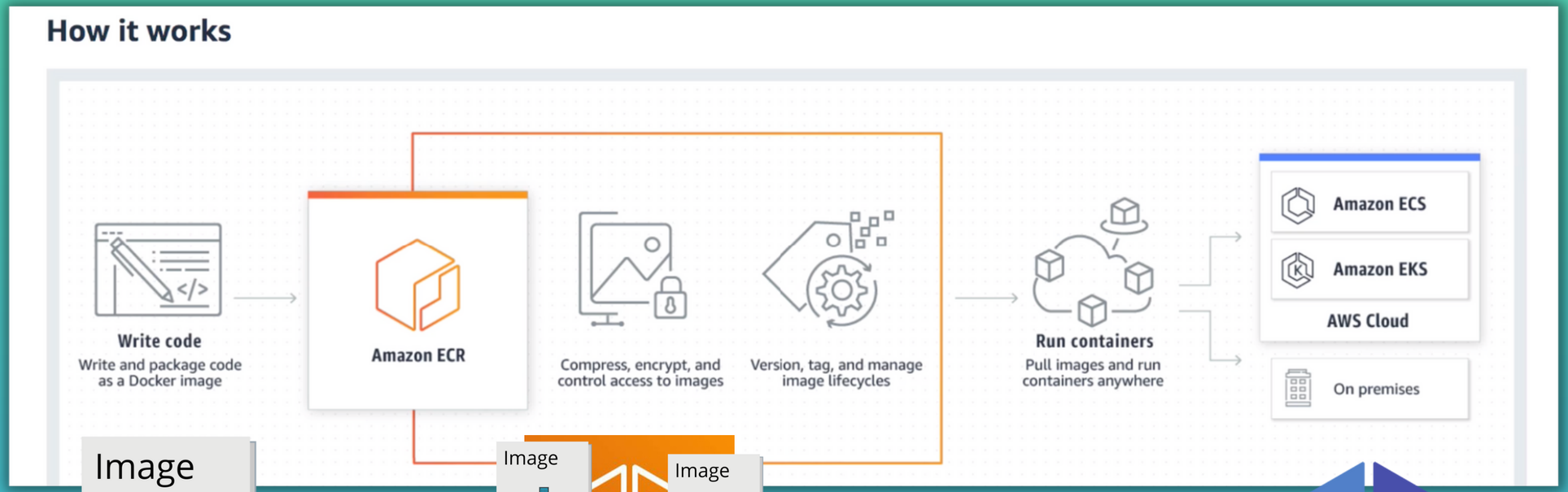
- Store, manage and deploy container images
- Amazon's alternative to:

- Integrates well with other AWS services

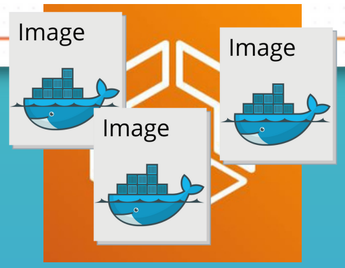


Elastic Container Registry (ECR) - 2

How it works:



your packaged application code



your private repository

pull into EKS cluster or ECS cluster

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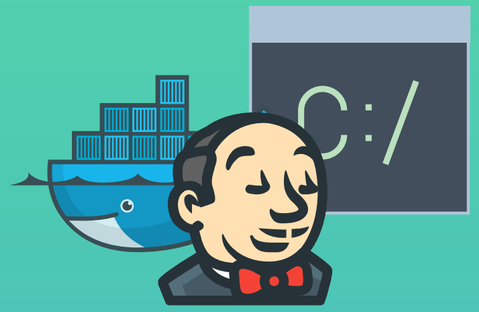
CD - Jenkins & EKS

Deploy to EKS cluster from Jenkins Pipeline



1. **Install kubectl** CLI inside Jenkins container
2. **Install aws-iam-authenticator** tool inside Jenkins container

3. **Create kubeconfig** file to connect to EKS cluster
   - contains all the necessary information for **authentication**:

=> authenticate with AWS

=> authenticate with K8s cluster

4. **Add AWS credentials** on Jenkins for AWS account authentication
5. **Adjust Jenkinsfile** to configure EKS cluster deployment

Best practice:

1) Create AWS IAM User for Jenkins
2) with limited permissions

Best Practices

- Create VPC with private and public subnet
- Security: Use AWS Key Management Service (KMS) keys to provide envelope encryption of Kubernetes secrets (https://aws.amazon.com/about-aws/whats-new/2020/03/amazon-eks-adds-envelope-encryption-for-secrets-with-aws-kms/)

Official AWS best practices for EKS:

- https://aws.github.io/aws-eks-best-practices/ - Each topic and recommendation is based on best practices implemented in production by AWS customers and validated by K8s specialists and the K8s engineering team at AWS.