AWS Solutions Architect: Associate Level

Cloud Compute with AWS

What You'll Learn

- Overview of EC2
- Amazon Machine Image
- Instance types available
- EBS and EFS
- EBS snapshots
- Instance pricing options
- Placement groups
- Elastic Load Balancing and Auto Scaling
- AWS Lambda, Elastic Beanstalk and ECS
- AWS Command Line Interface
- AWS recommended best practices for EC2
- Costs associated with EC2

Amazon EC2 Overview

Overview of Amazon EC2 concepts

Elastic Compute Cloud (EC2)

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud.

Elastic Web-Scale Computing

Benefits of using EC2:

- Elastic Web-Scale Computing
- Flexible Cloud Hosting Services
- AWS Integration
- Reliability and Security
- Low Cost

- EC2 increases or decreases your capacity in minutes.
- It launches thousands of server instances simultaneously.

Flexible Cloud Hosting Services

Benefits of using EC2:

- Elastic Web-Scale Computing
- Flexible Cloud Hosting Services
- AWS Integration
- Reliability and Security
- Low Cost

EC2 launches numerous Operating Systems, Instance Types, and Software in just minutes.

AWS Integration

Benefits of using EC2:

- Elastic Web-Scale Computing
- Flexible Cloud Hosting Services
- AWS Integration
- Reliability and Security
- Low Cost

EC2 is integrated with other AWS products, such as Amazon S3, Amazon RDS, and Amazon SQS, to provide a complete IT architecture solution.

Reliable and Secure

Benefits of using EC2:

- Elastic Web-Scale Computing
- Flexible Cloud Hosting Services
- AWS Integration
- Reliability and Security
- Low Cost

- AWS operates an SLA commitment of 99.95% availability.
- With Amazon VPC, you can easily create secure and robust networks to run your Amazon EC2 instances.

Low Cost

Benefits of using EC2:

- Elastic Web-Scale Computing
- Flexible Cloud Hosting Services
- AWS Integration
- Reliability and Security
- Low Cost

- AWS charges you by the hour and you only pay for what you use.
- Rates are lower than your existing on-premise infrastructure.

Amazon Machine Images (AMI)

Using Amazon Machine Images

Amazon Machine Image (AMI)

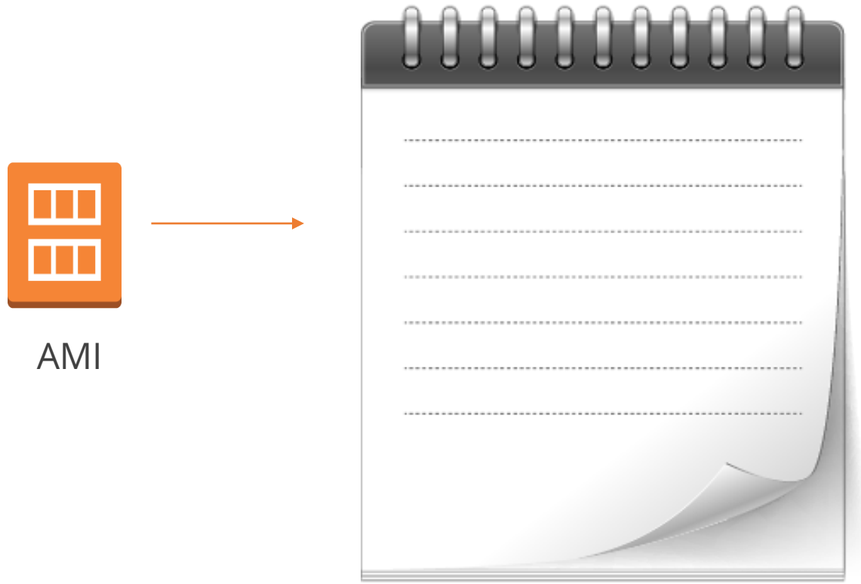
Amazon's definition of an AMI:

"An Amazon Machine Image (AMI) provides the information required to launch an instance. You specify an AMI when you launch an instance, and you can launch as many instances from the AMI as you need. You can also launch instances from as many different AMIs as you need."

Amazon Machine Image (AMI)

AMI is a virtual instance that includes:

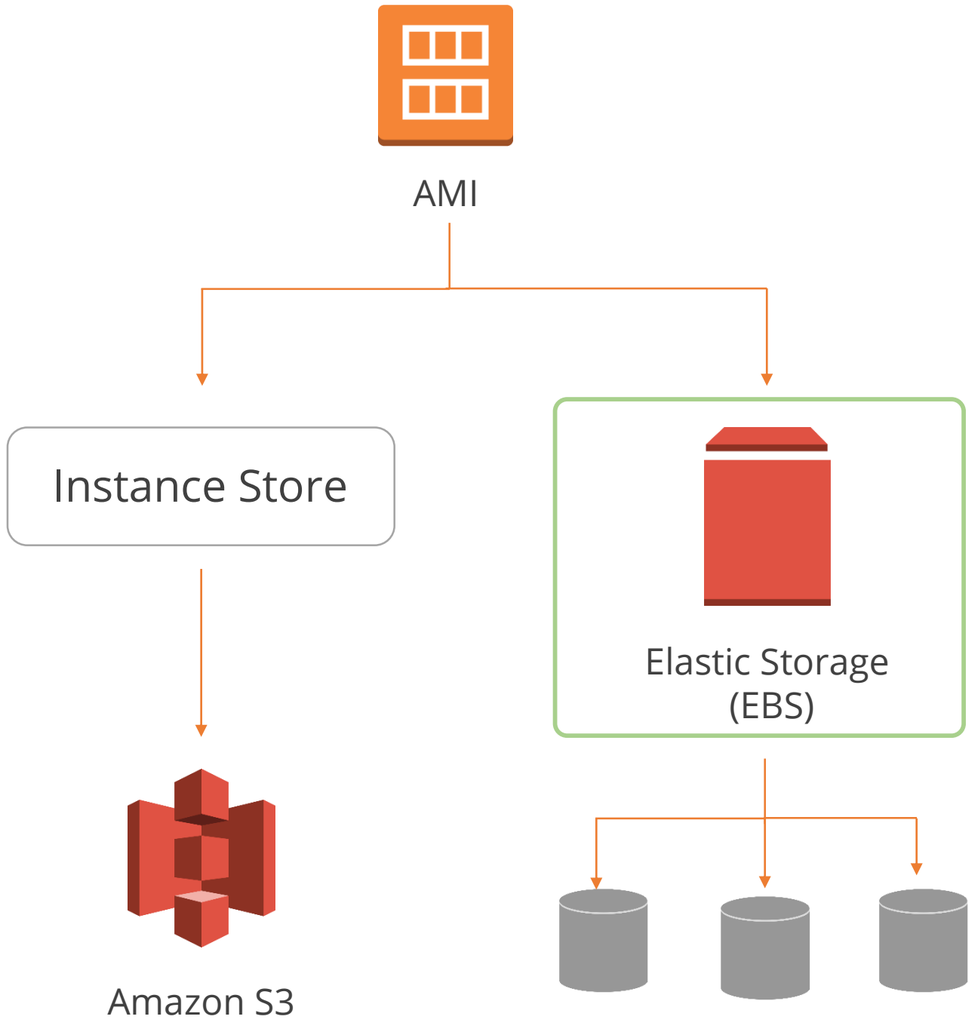
- A template for the root volume for the instance
- Launch permissions to control AMI launch instances
- A block device mapping that specifies volumes to attach to the instance



Root Device Storage

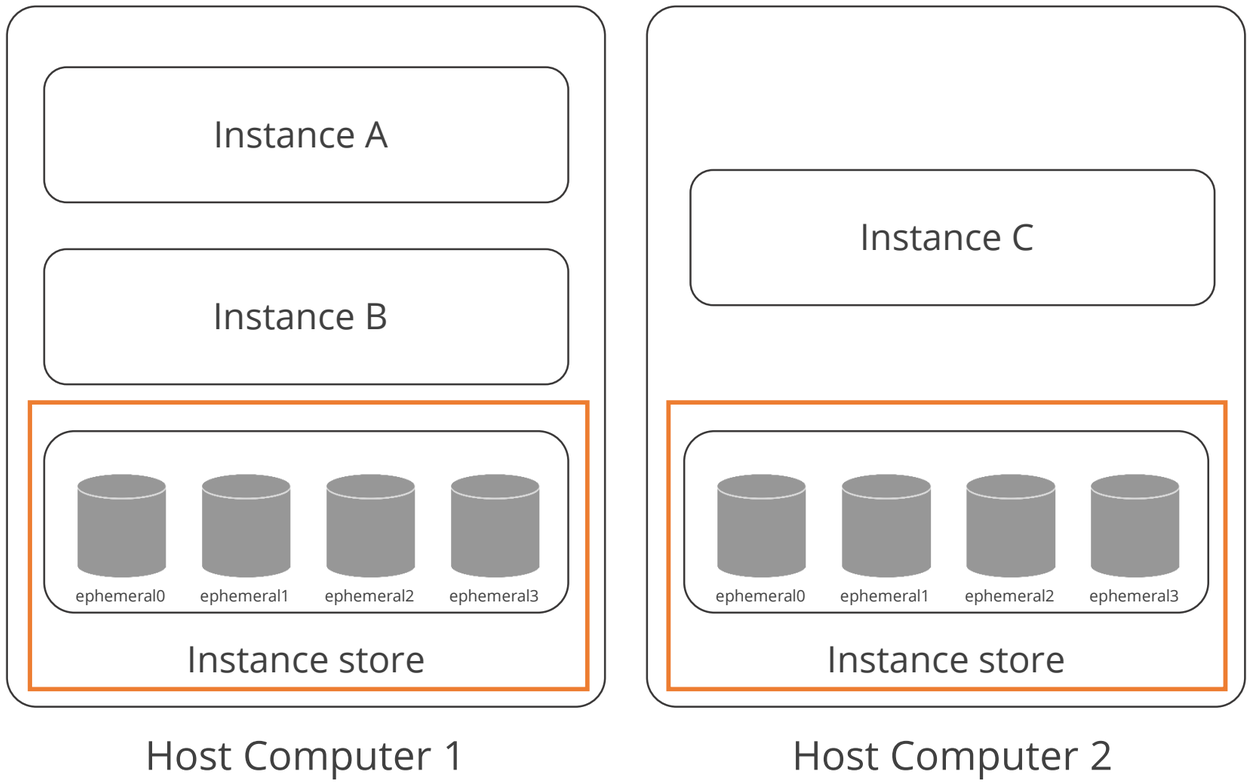
There are two types of root device storage for AMIs:

- Instance store
- Amazon EBS



Instance Store

Root device for the instance is an instance store volume created from a template stored in Amazon S3.



Amazon EBS

The Root device for the instance is an Amazon EBS volume created from an Amazon EBS snapshot.

Amazon EBS vs. Instance Store

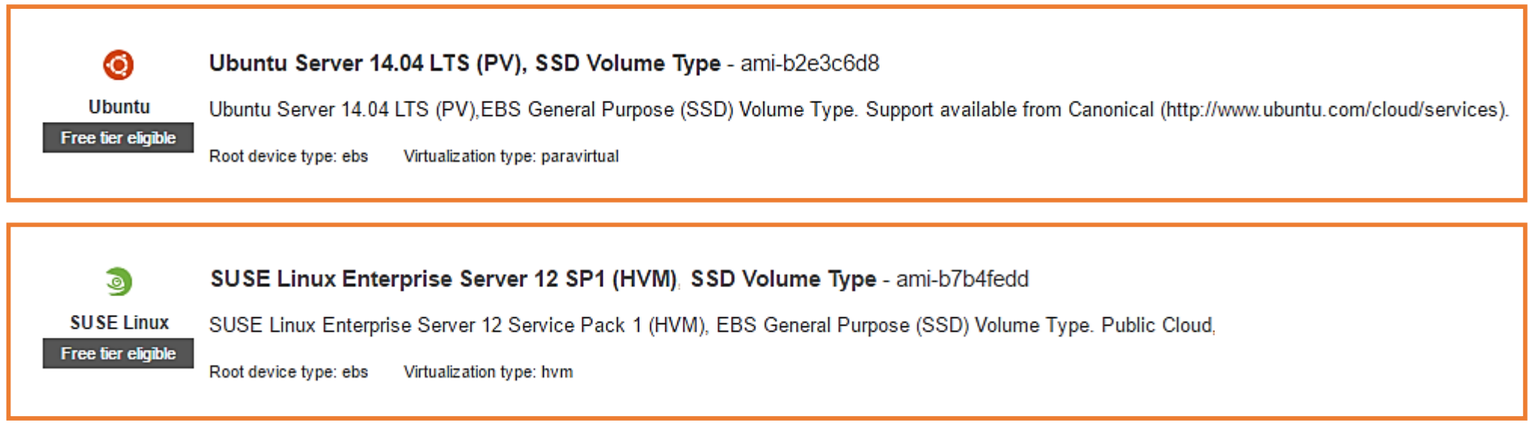
This table shows the different characteristics between the EBS-Backed and Amazon Instance Store-Backed volumes.

Characteristic	Amazon EBS-Backed	Amazon Instance Store-Backed
Boot time	Usually less than 1 minute	Usually less than 5 minutes
Size limit	16 TiB	10 GiB
Root device volume	Amazon EBS volume	Instance store volume
Data persistence	By default, the root volume is deleted when the instance terminates.* Data on any other Amazon EBS volumes persists after instance termination by default. Data on any instance store volumes persists only during the life of the instance.	Data on any instance store volumes persists only during the life of the instance. Data on any Amazon EBS volumes persists after instance termination by default.
Upgrading	The instance type, kernel, RAM disk, and user data can be changed while the instance is stopped.	Instance attributes are fixed for the life of an instance.
Charges	You're charged for instance usage, Amazon EBS volume usage, and storing your AMI as an Amazon EBS snapshot.	You're charged for instance usage and storing your AMI in Amazon S3.
AMI creation/bundling	Uses a single command/call	Requires installation and use of AMI tools
Stopped state	Can be placed in stopped state where instance is not running, but the root volume is persisted in Amazon EBS	Cannot be in stopped state; instances are running or terminated

HVM vs. PV

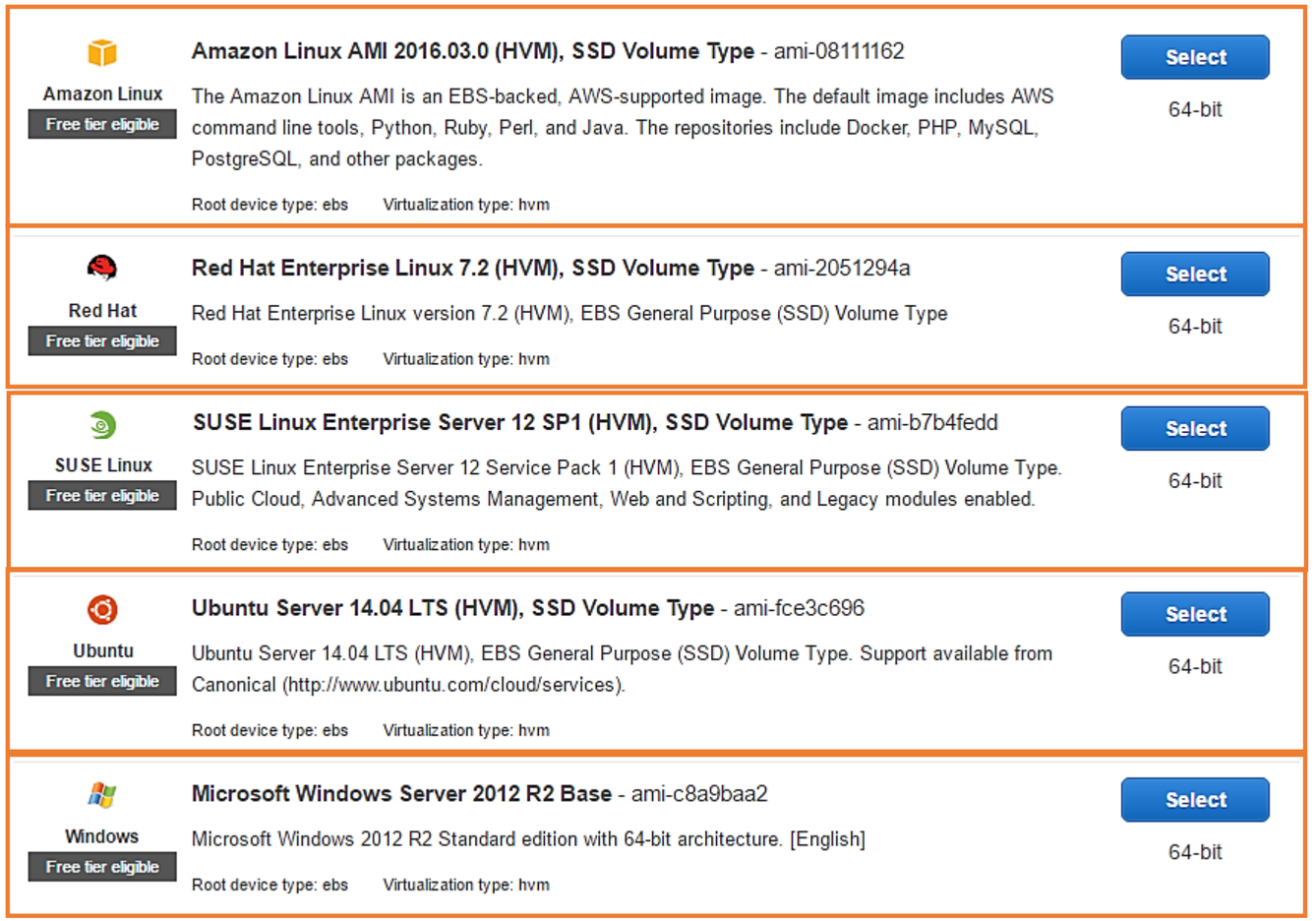
Linux Amazon Machine Images use one of the two types of virtualization:

- ParaVirtual (PV)
- Hardware Virtual Machine (HVM)



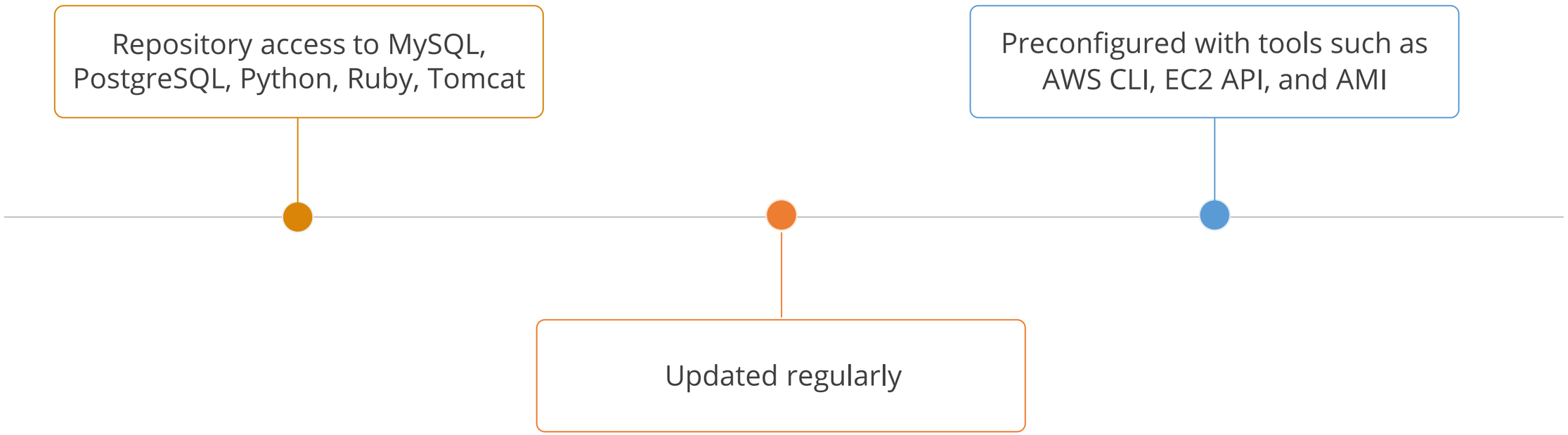
Choose an AMI

The first step of launching any new instance is selecting an AMI.



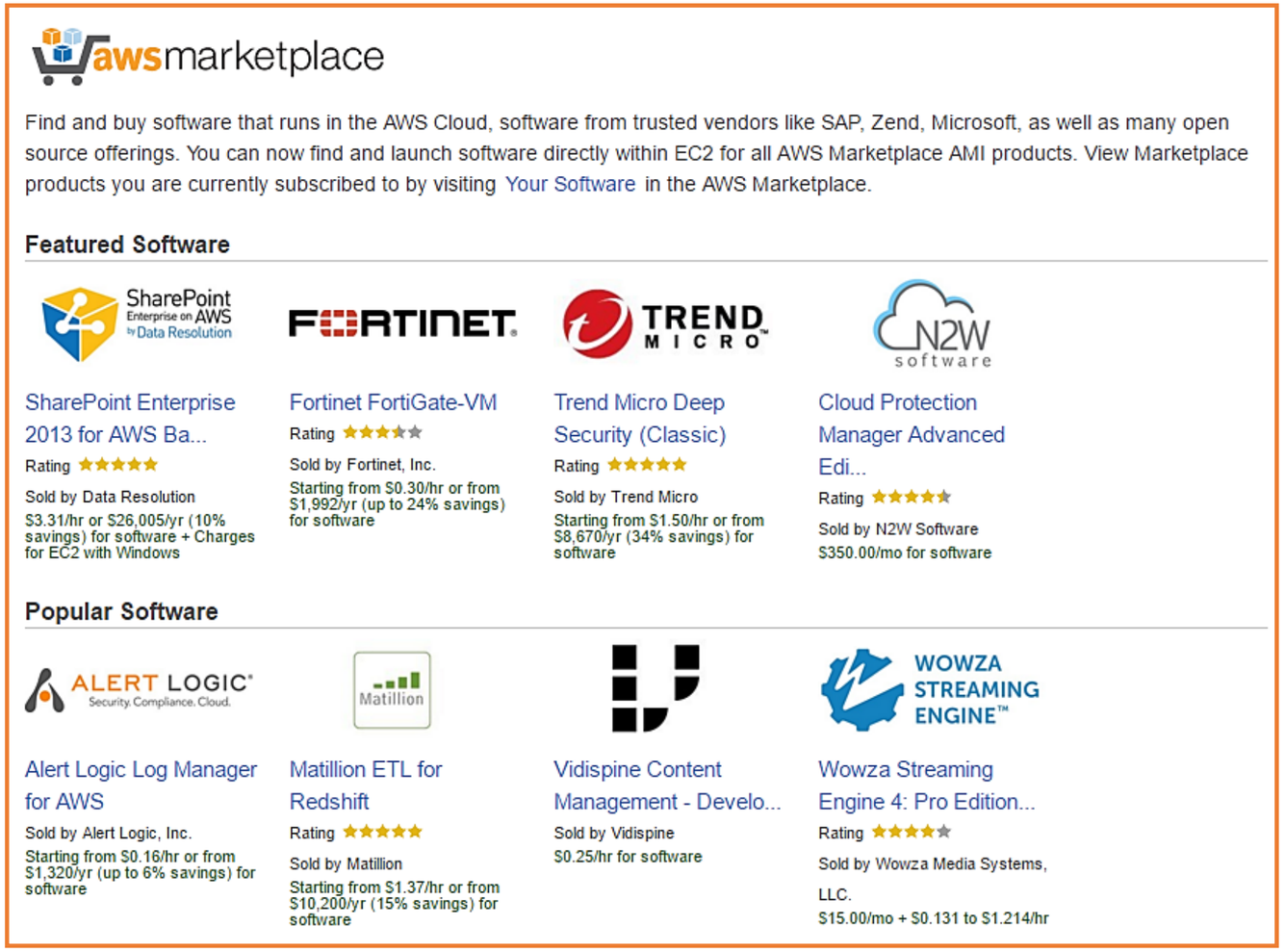
Amazon Linux

Amazon Linux AMI is a supported and maintained Linux image provided by AWS.



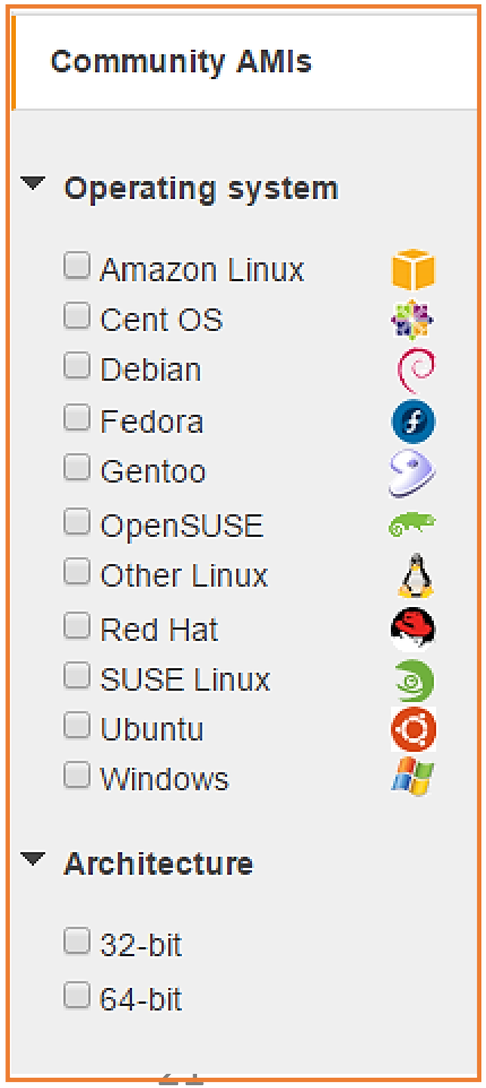
AWS Marketplace

The AWS Marketplace is an online store where you can buy software that runs on AWS from third-party vendors.



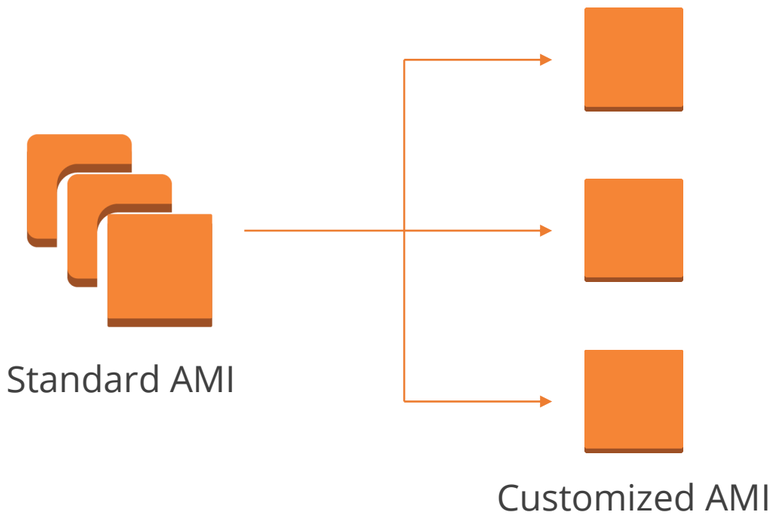
Community AMIs

Community AMI is a community resource where people and development teams can list and exchange software or projects under development.



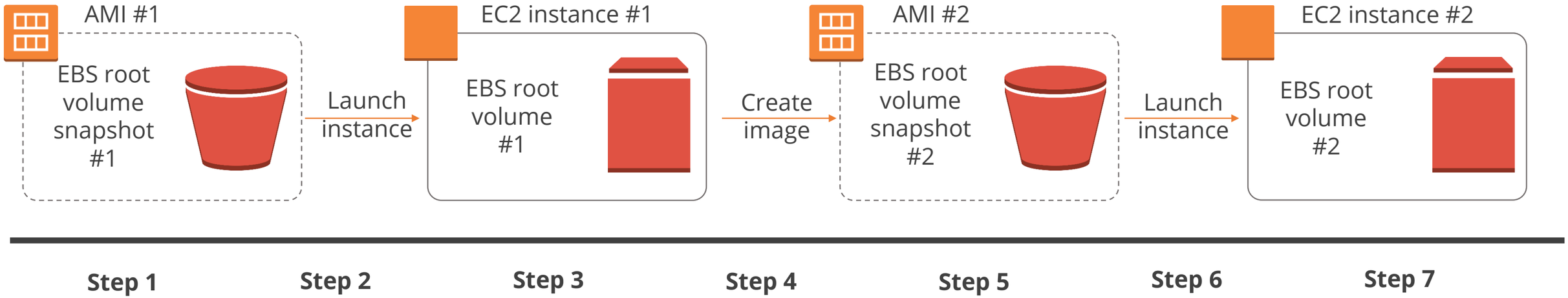
My AMIs

Customize the instance that you launch from a public AMI and then save that configuration as a custom AMI for your own use.



Creating AMIs

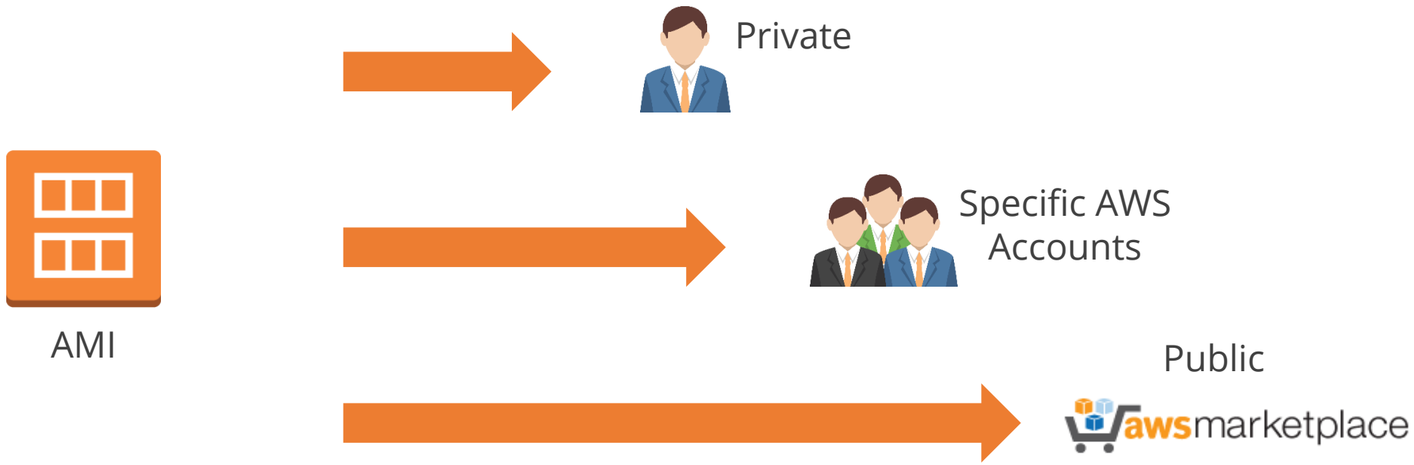
Use an existing AMI, launch an instance, customize it, create a new AMI from it, and finally launch an instance of your new AMI.



AMI Distribution

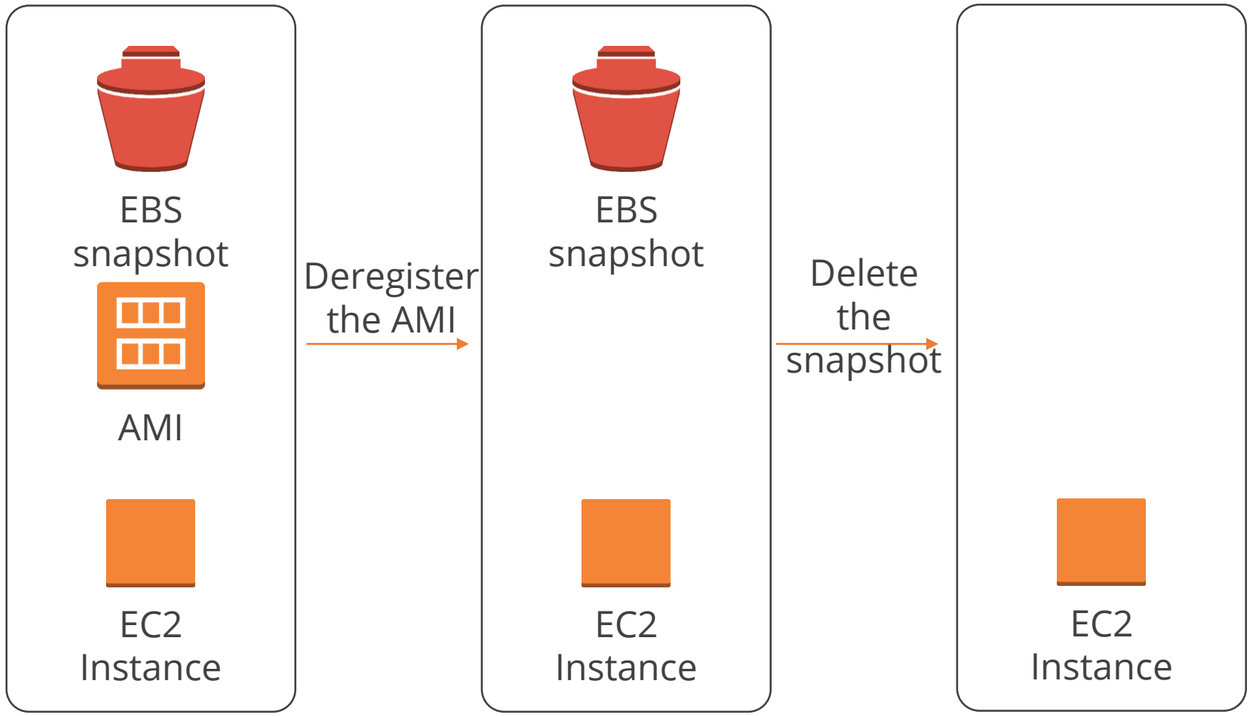
An AMI can be:

- Kept private
- Shared with a specified list of AWS accounts
- Made public



Deregistering AMIs

An AMI can be deregistered after its work is done. Once deregistered, it cannot launch new instances.

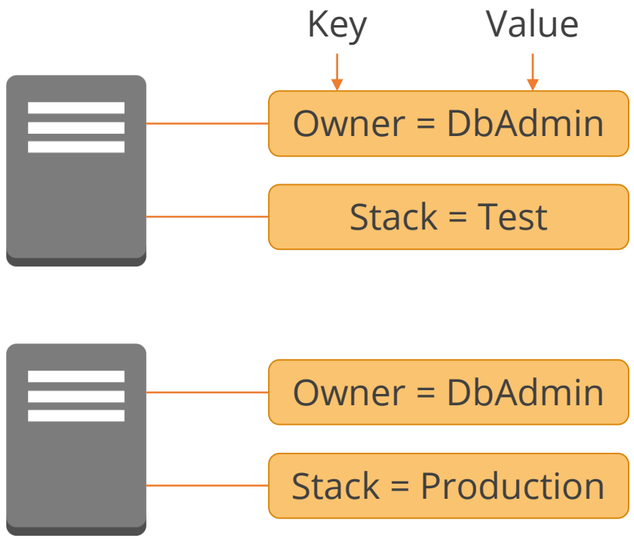


Your AMI, its snapshot, and an instance launched from the AMI

When you are finished with the instance, you can terminate it

Tag Instances

Tag instances to allow easy identification and management of AWS resources.



Demo 1: Launch and Connect to an EC2 Linux Instance

Demonstrate how to launch and connect to an EC2 Linux instance.

Demo 2: Launch and Connect to an EC2 Windows Instance

Demonstrate how to launch and connect to an EC2 Windows instance.

Demo 3: Create an AMI

Demonstrate how to create an AMI and launch a new server from it.

Knowledge Check

KNOWLEDGE CHECK	Which combination of root volume type and virtualization does AWS recommend?

a. HVM and Instance Store

b. HVM and EBS Volumes

c. PV and Instance Store

d. PV and EBS Volumes

KNOWLEDGE CHECK	Which combination of root volume type and virtualization does AWS recommend?

a. HVM and Instance Store

b. HVM and EBS Volumes

c. PV and Instance Store

d. PV and EBS Volumes

The correct answer is **b**.

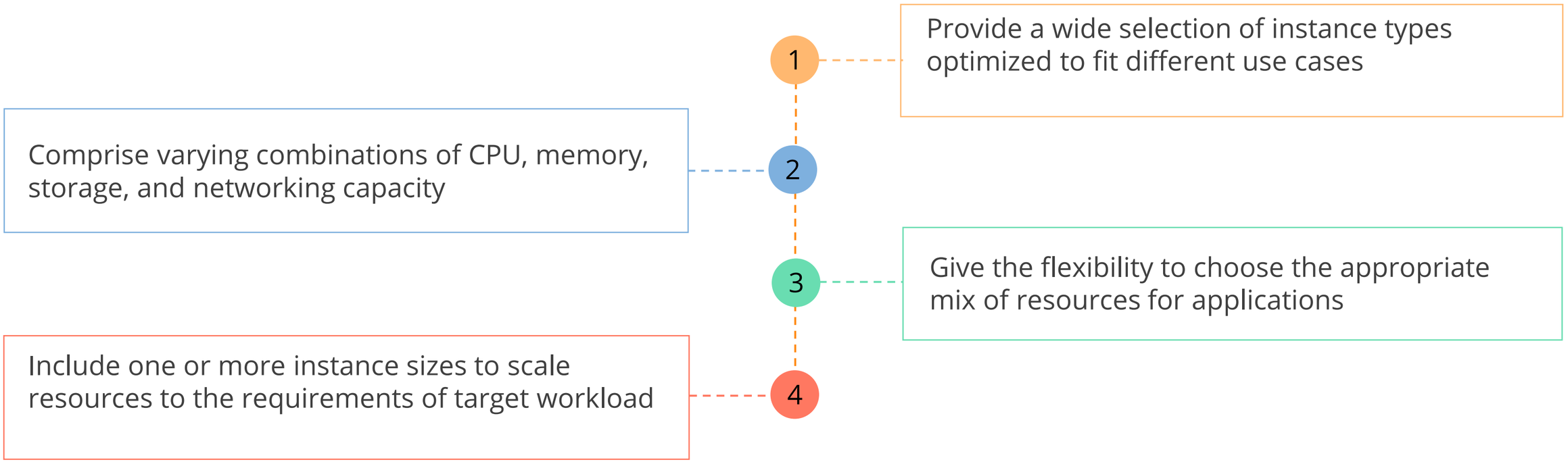
AWS recommends HVM and EBS Volumes.

EC2 Instance Types

Details of the available EC2 Instance Types

EC2 Instance Types Overview

EC2 Instance types:



EC2 Instance Types

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
T2	Lowest	Small/medium databases and web servers
M4	Low-Medium	Application servers
M5	Low-Medium	Application servers

EC2 Instance Types (contd.)

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
C4	Medium-High	CPU intensive databases, web servers, application servers, etc.
C5	Medium-High	CPU intensive databases, web servers, application servers, etc.

EC2 Instance Types (contd.)

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
R3	Medium-High	Memory-intensive databases, web servers, application servers
R4	Medium-High	Offer better price per GB of RAM than R3
X1	High	X1 instances are optimized for large-scale, enterprise-class, in-memory applications

EC2 Instance Types (contd.)

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
G2	Medium-High	Video encoding, Graphics, Machine Learning, and so on
P2	Medium-High	General-purpose GPU compute applications
F1	In preview as of Jan 2017	Customizable hardware acceleration with field programmable arrays (FPGAs)

EC2 Instance Types (contd.)

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
I2	Medium-Very High	NoSQL databases, Hadoop, Data Warehousing
H1	Medium-Very High	MapReduce, high throughput application
D2	Medium-Very High	File systems, Data Warehousing, Hadoop

EC2 Instance Types (contd.)

EC2 Instance types can be classified as:

- General Purpose
- Compute Optimized
- Memory Optimized
- Graphics Processing Unit (GPU)
- Storage Optimized
- EBS Optimized

FAMILY	Cost	Use
EBS Optimized	Low: additional cost to regular EC2 price	Applications that demand high IOPS and throughput

Demo 4: EC2 Instance Types

Demonstrate the EC2 instance types available for selection.

Knowledge Check

KNOWLEDGE CHECK	What instance type would you choose if you required high disk throughput?

a. General Purpose

b. G2

c. D2

d. R3

KNOWLEDGE CHECK	What instance type would you choose if you required high disk throughput?

a. General Purpose

b. G2

c. D2

d. R3

The correct answer is **c.**

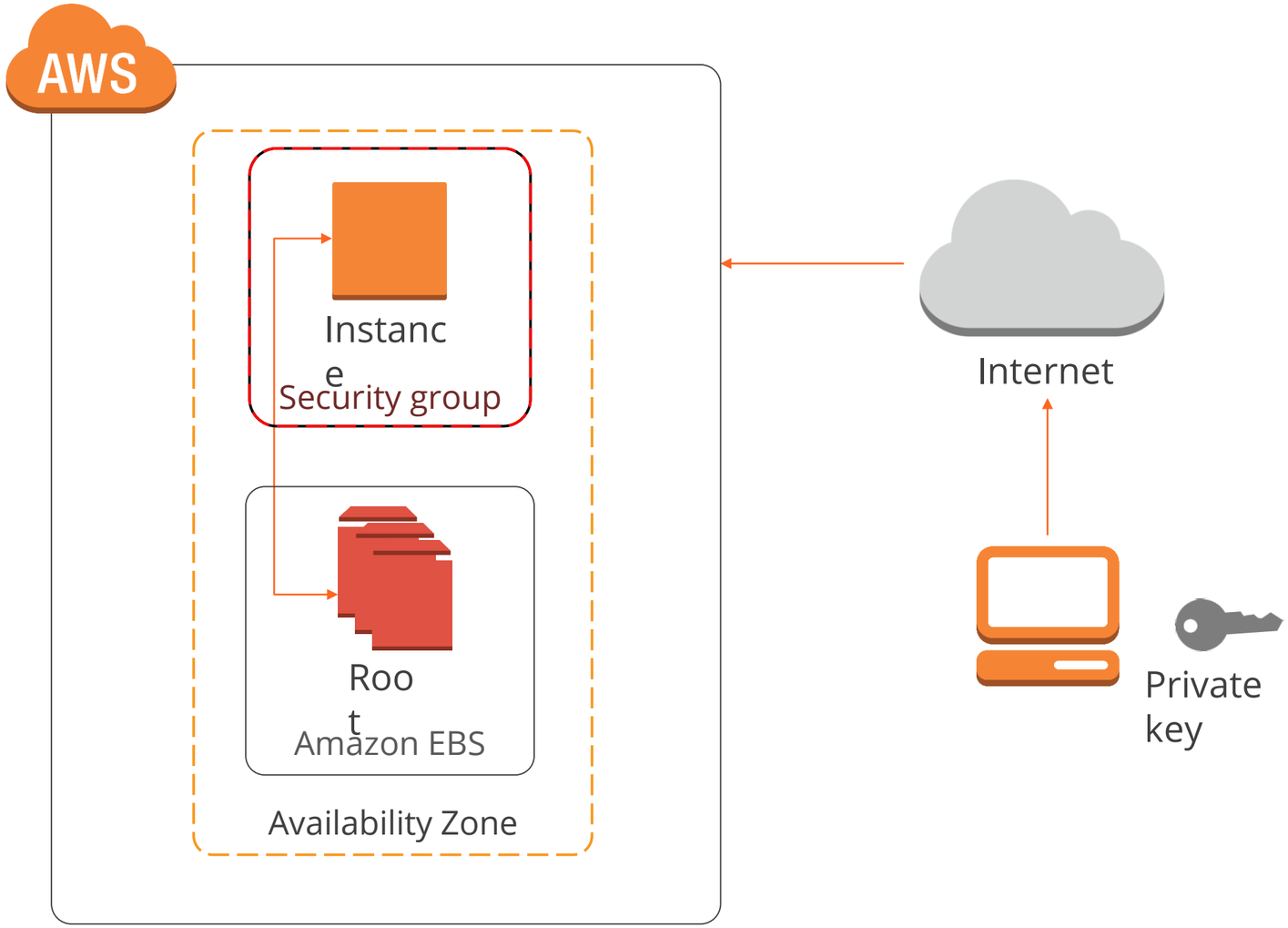
Dense Storage Instances are designed to deliver high disk throughput.

Amazon Elastic Block Store (EBS)

Details of EBS and its purpose

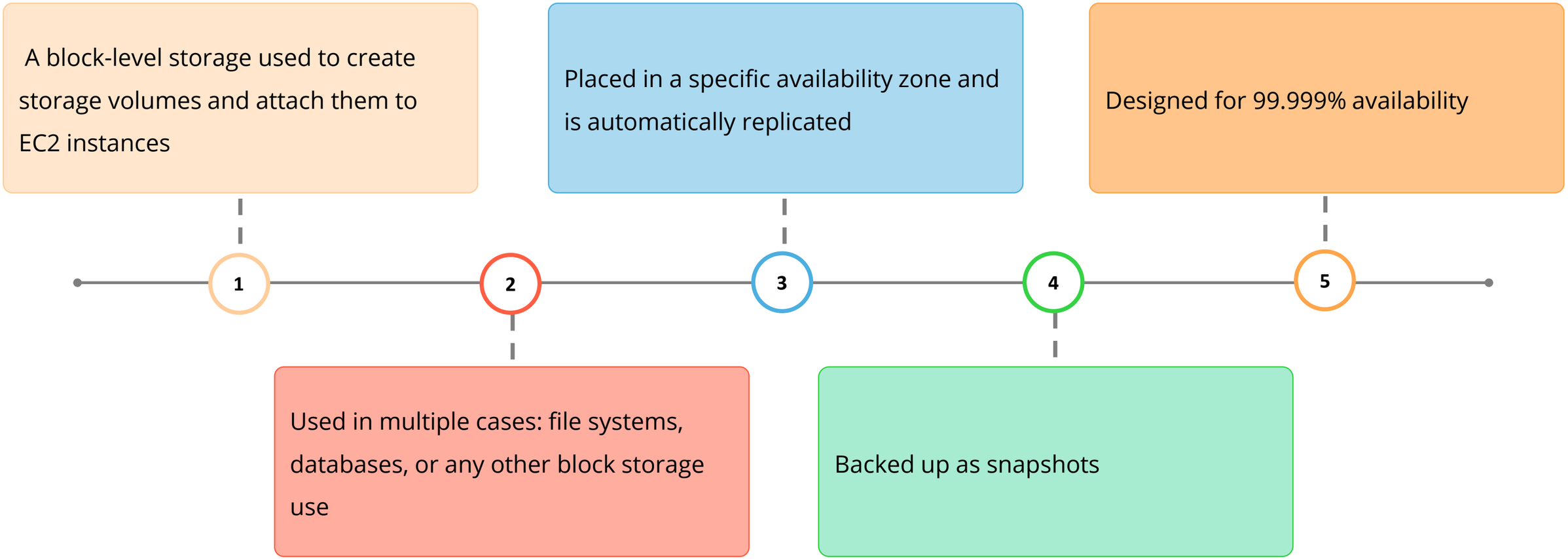
EBS Overview

Amazon Elastic Block Store (Amazon EBS) provides persistent block-level storage volumes for use with Amazon EC2 instances in the AWS Cloud.



EBS Overview (contd.)

Amazon EBS is:



Storage Categories

The two storage categories are:

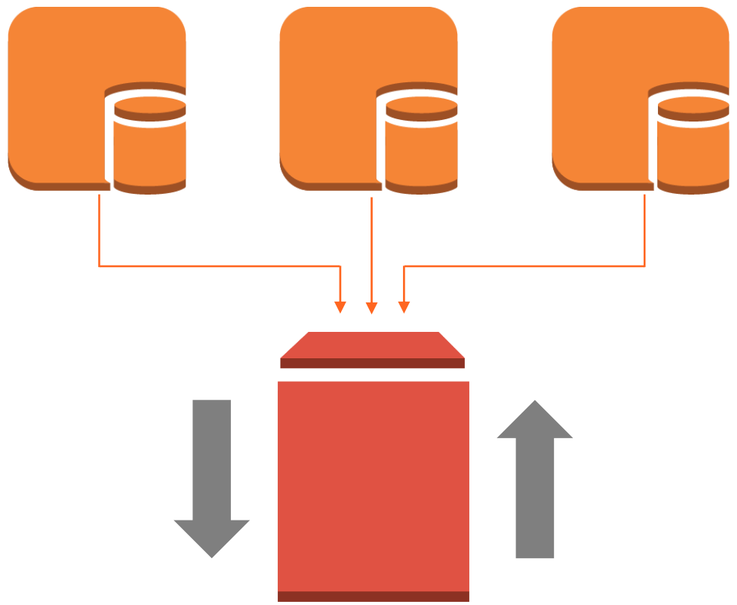
	SSD-backed		HDD-backed		
Type	Provisioned IOPS SSD (io1)	General Purpose SSD (gp2)	Throughput Optimized HDD (st1)	Cold HDD (sc1)	Magnetic
Purpose	I/O intensive NoSQL and relational databases	Boot volumes, low-latency interactive applications, dev, test	Big data, data warehouses, log processing	Colder data requiring fewer scans per day	Infrequent access/ low performance requirements
Volume Size	4 GB – 16 TB	1 GB – 16 TB	500 GB – 16 TB	500 GB – 16 TB	1 GB - 1 TB
Max IOPS/Volume	20,000 (16 KB I/O size)	10,000 (16 KB I/O size)	500 (1 MB I/O size)	250 (1 MB I/O size)	40-200
Max Throughput/ Volume	320 MB/s	160 MB/s	500 MB/s	250 MB/s	90 MB/s
Price	Medium	Low-Medium	Low-Medium	Low	Lowest
Dominant Performance Attribute	IOPS	IOPS	MB/s	MB/s	N/A

EBS Encryption

Amazon EBS encryption does not require you to build, maintain, and secure your own key management infrastructure.

Elastic File System (EFS)

It is a file storage service for Amazon Elastic Compute Cloud (Amazon EC2) instances.



Elastic File System (EFS) (contd.)

01 With EFS, you only need to pay for the storage used by your file system.

02 EFS supports Network File System Version 4 (NSFv4) protocol and can provide support to thousands of concurrent NFS requests.

03 With EFS, the data is stored across multiple AZs within a region.

EFS vs EBS

Feature	EFS	EBS
Storage Size	No Limitations	Max 16TiB
File Size Limitation	Max file size 47.9TiB	No limitation
Data Throughput	Default throughput of 3GB	Variable depending on disk type
Data Access	Can be accessed concurrently	Limited to single EC2 instance
Operating System	Windows not supported	All operating systems
AZ Failure	Can survive one AZ failure	Cannot withstand AZ failure without snapshots

Demo 5: Using EFS

Demonstrate how to use EFS with an Amazon Linux instance.

Demo 6: Attaching EBS Volumes

Demonstrate how to attach EBS volumes to EC2 instances.

Demo 7: EBS and RAID 0

Demonstrate how to use EBS to create RAID 0 volumes.

Demo 8: EBS Volume resize

Demonstrate how to extend an EBS volume

Knowledge Check

KNOWLEDGE CHECK	Select the correct EBS types available.

a. Fast SSD, Slow SSD, Fast HDD, Slow HDD, and Magnetic

b. Provisioned IOPS SSD, Reduced IOPS SSD, Throughput Optimized HDD, Throughput Reduced HDD, and Magnetic

c. Provisioned IOPS SSD, General Purpose SSD, Hot HDD, Cold HDD, and Magnetic

d. Provisioned IOPS SSD, General Purpose SSD, Throughput Optimized HDD, Cold HDD, and Magnetic

KNOWLEDGE CHECK

Select the correct EBS types available.

a. Fast SSD, Slow SSD, Fast HDD, Slow HDD, and Magnetic

b. Provisioned IOPS SSD, Reduced IOPS SSD, Throughput Optimized HDD, Throughput Reduced HDD, and Magnetic

c. Provisioned IOPS SSD, General Purpose SSD, Hot HDD, Cold HDD, and Magnetic

d. Provisioned IOPS SSD, General Purpose SSD, Throughput Optimized HDD, Cold HDD, and Magnetic

The correct answer is **d**.

Provisioned IOPS SSD, General Purpose SSD, Throughput Optimized HDD, Cold HDD, and Magnetic are the types of storage available.

EBS Snapshots

Details of EBS snapshots

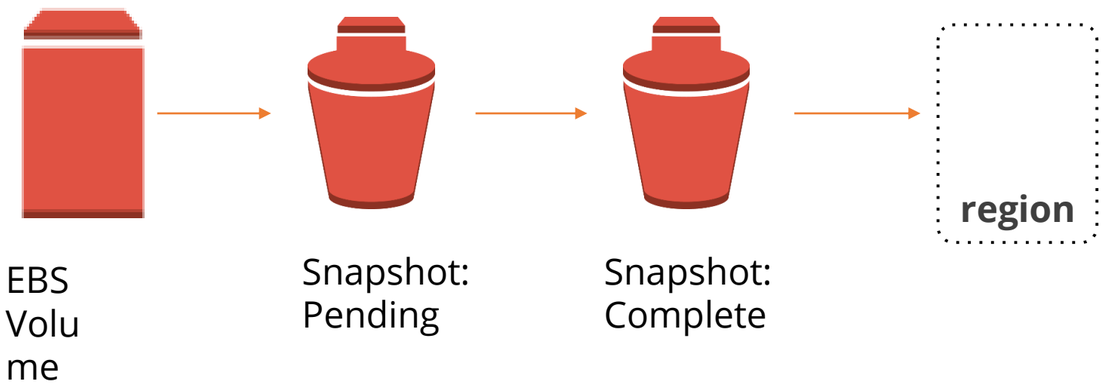
Features of EBS Snapshots

- Back up EBS volumes by taking point-in-time snapshots and storing them on Amazon S3.
- You can perform incremental backups, i.e., back up only the blocks on the device that have changed after the most recent snapshot are saved.
- When you delete a snapshot, only the data exclusive to that snapshot is removed.
- Active snapshots contain all of the information needed to restore your data (from the time the snapshot was taken) to a new EBS volume.
- If the EBS volume is encrypted, then the snapshot is also encrypted.
- Larger volumes can take up to 24 hours to copy to S3, but the snapshot is taken immediately.

EBS Snapshot Storage

With Amazon EBS, you can:

- Create point-in-time snapshots of volumes that are stored for you in Amazon Simple Storage Service (Amazon S3)
- Copy a snapshot from one AWS region to another or within the same region.
- Encrypt your data with Amazon S3 server-side encryption (256-bit Advanced Encryption Standard)



Demo 9: EBS Snapshots

Demonstrate how to take an EBS snapshot.

Knowledge Check

KNOWLEDGE CHECK	Which of the following statements is NOT true?

a. Snapshots are full backups.

b. When you delete a snapshot, only the data exclusive to that snapshot is removed.

c. Active snapshots contain all of the information needed to restore your data.

d. You can copy snapshots between regions.

KNOWLEDGE CHECK

Which of the following statements is NOT true?

a. Snapshots are full backups.

b. When you delete a snapshot, only the data exclusive to that snapshot is removed.

c. Active snapshots contain all of the information needed to restore your data.

d. You can copy snapshots between regions.

The correct answer is **a**.

Snapshots are incremental backups, which means that only the blocks on the device that have changed after your most recent snapshot are saved.

EC2 Instance Pricing

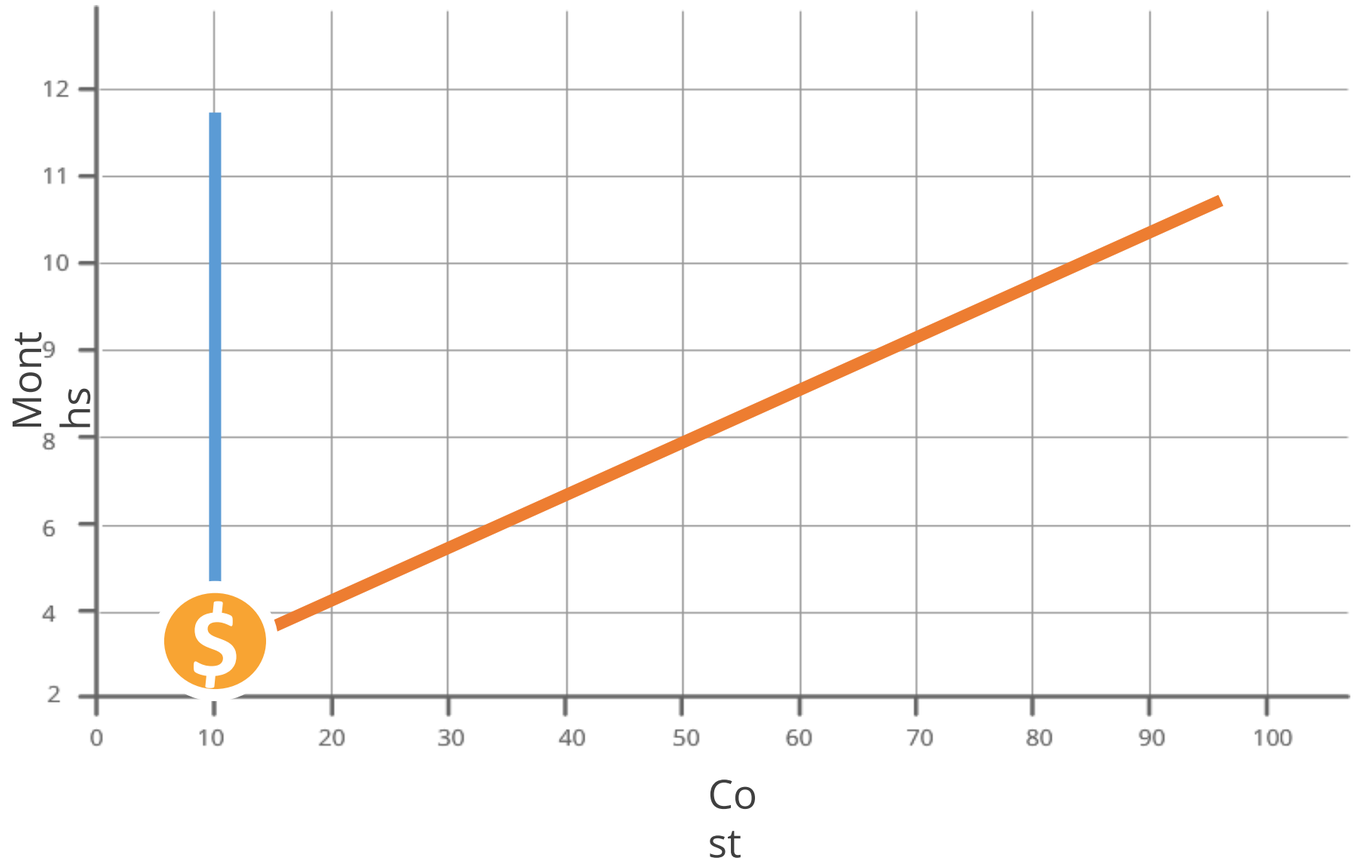
Details about the EC2 pricing models

Purchasing Options—On-demand

EC2 on-demand instance pricing enables you to pay only for what you use with no long-term commitments.

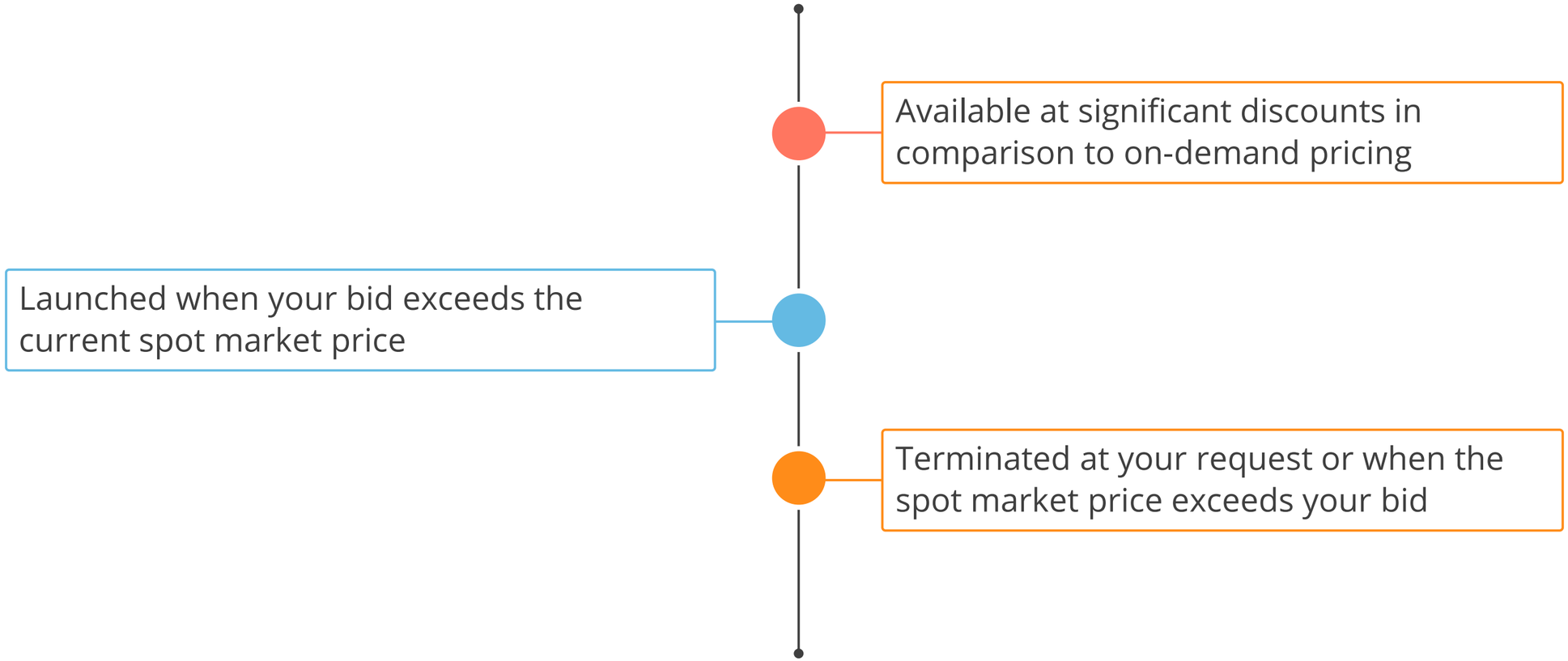
Purchasing Options—Reserved

Committing to a predefined period of between 12–36 months gets you significantly discounted hourly rates as compared to on-demand pricing.



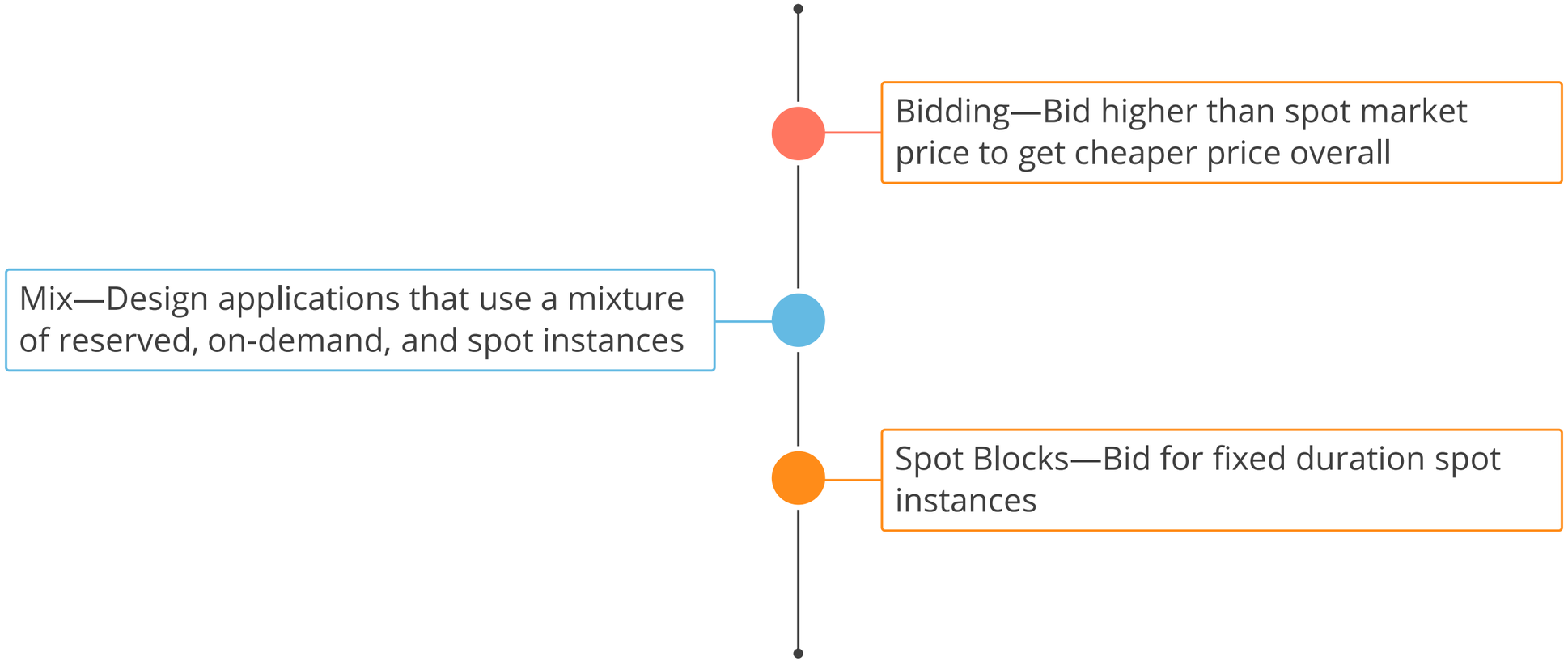
Purchasing Options—Spot

EC2 Spot Instances are ideal for workloads that have flexible start and end times as you are allowed to bid for spare EC2 computing capacity. Spot instances are:



Purchasing Options—Spot (contd.)

There are three different strategies available.



Purchasing Options—Dedicated

An Amazon EC2 Dedicated Host is a physical server with EC2 instance capacity fully dedicated to your use.

Demo 10: EC2 Spot Pricing

Demonstrate how to view EC2 Spot prices.

Knowledge Check

KNOWLEDGE CHECK	Which of the following are EC2 pricing models?

a. On-Request, Bid, Reserved, and Dedicated

b. On-Demand, Spot, Reserved, and Dedicated

c. On-Request, Auction, Reserved, and Constant

d. On-Demand, Bid, Reserved, and Constant

KNOWLEDGE CHECK	Which of the following are EC2 pricing models?

a. On-Request, Bid, Reserved, and Dedicated

b. On-Demand, Spot, Reserved, and Dedicated

c. On-Request, Auction, Reserved, and Constant

d. On-Demand, Bid, Reserved, and Constant

The correct answer is **b**.

On-Demand, Spot, Reserved, and Dedicated are the EC2 pricing models.

Placement Groups

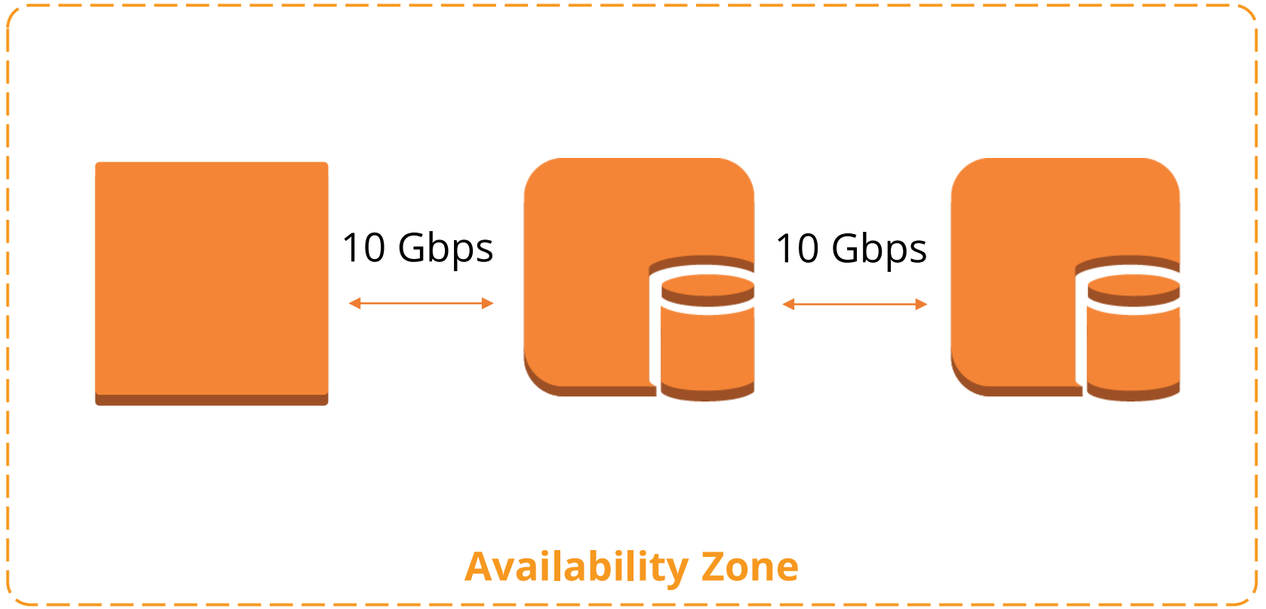
Details about the Placement Groups

Placement Groups

A placement group is a logical grouping of instances within a single Availability Zone.

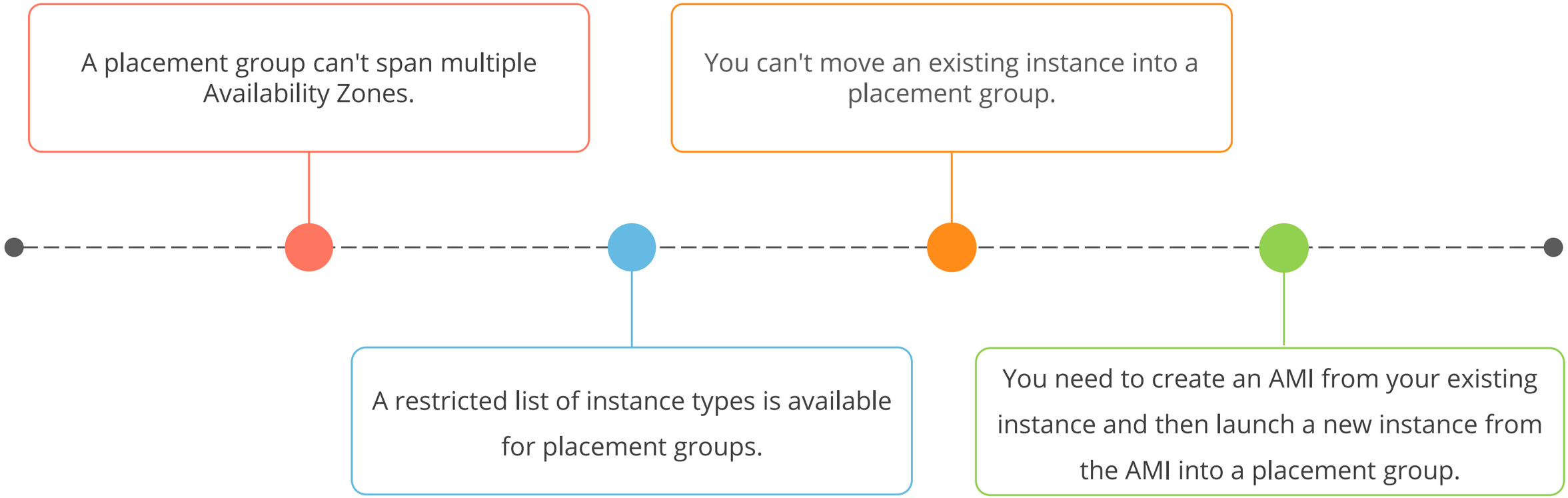
Placement Groups

Placement groups are perfect for applications that require low network latency, high network throughput, or both. They allow 10 Gigabits per second (Gbps) networks.



Placement Groups

Placement Groups restrictions:



Knowledge Check

KNOWLEDGE CHECK	Placement Groups are recommended for applications that benefit from:

a. low network latency, high network throughput, or both.

b. high network latency, high network throughput, or both.

c. low network latency, low network throughput, or both.

d. low network latency, zero network throughput, or both.

KNOWLEDGE CHECK	Placement Groups are recommended for applications that benefit from:

a. low network latency, high network throughput, or both.

b. high network latency, high network throughput, or both.

c. low network latency, low network throughput, or both.

d. low network latency, zero network throughput, or both.

The correct answer is **a**.

Placement Groups are recommended for applications that benefit from low network latency, high network throughput, or both.

Elastic Load Balancing (ELB)

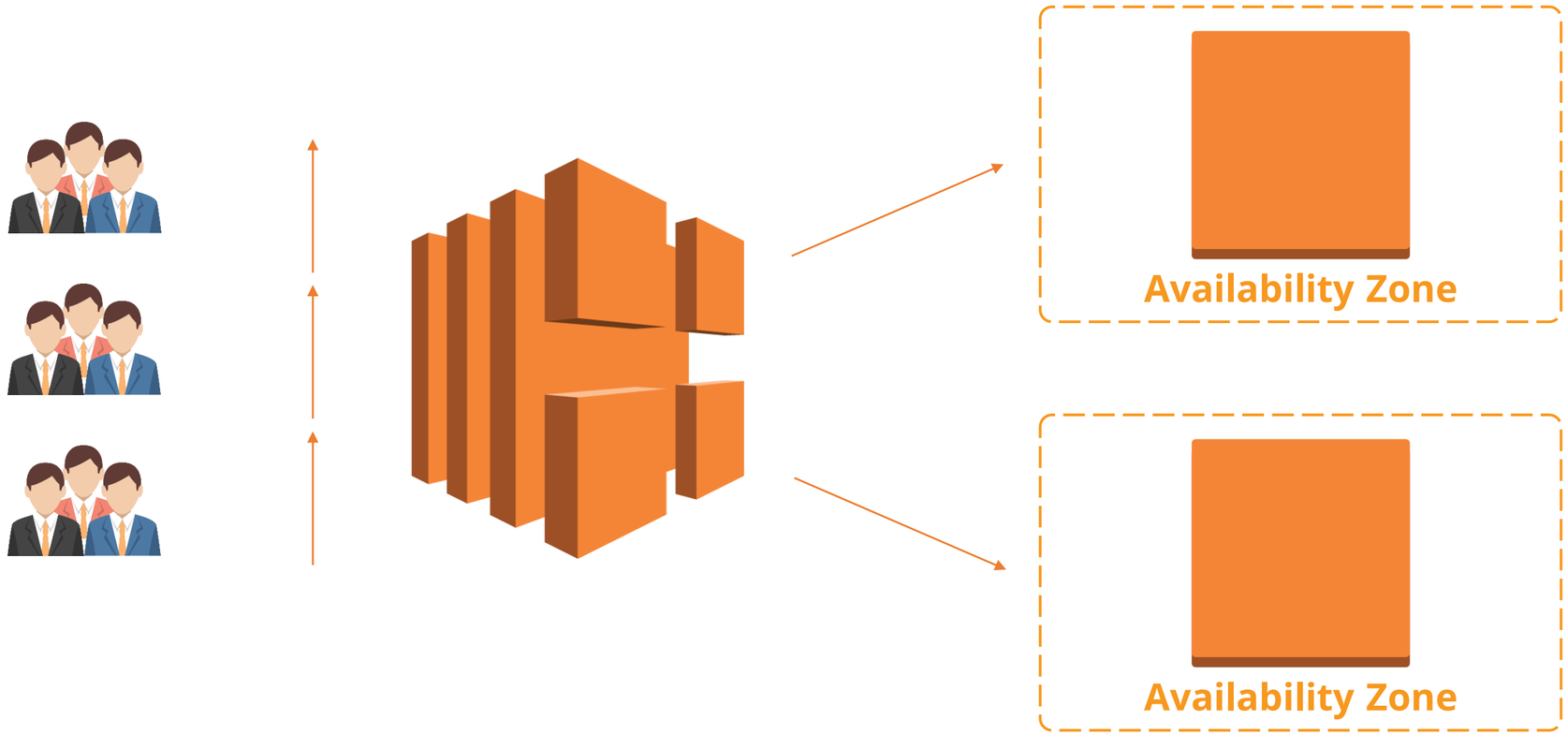
Details about Elastic Load Balancing

Elastic Load Balancing

ELB enables you to achieve increased levels of fault tolerance for your applications by seamlessly providing the required amount of load balancing capacity needed to distribute application traffic.

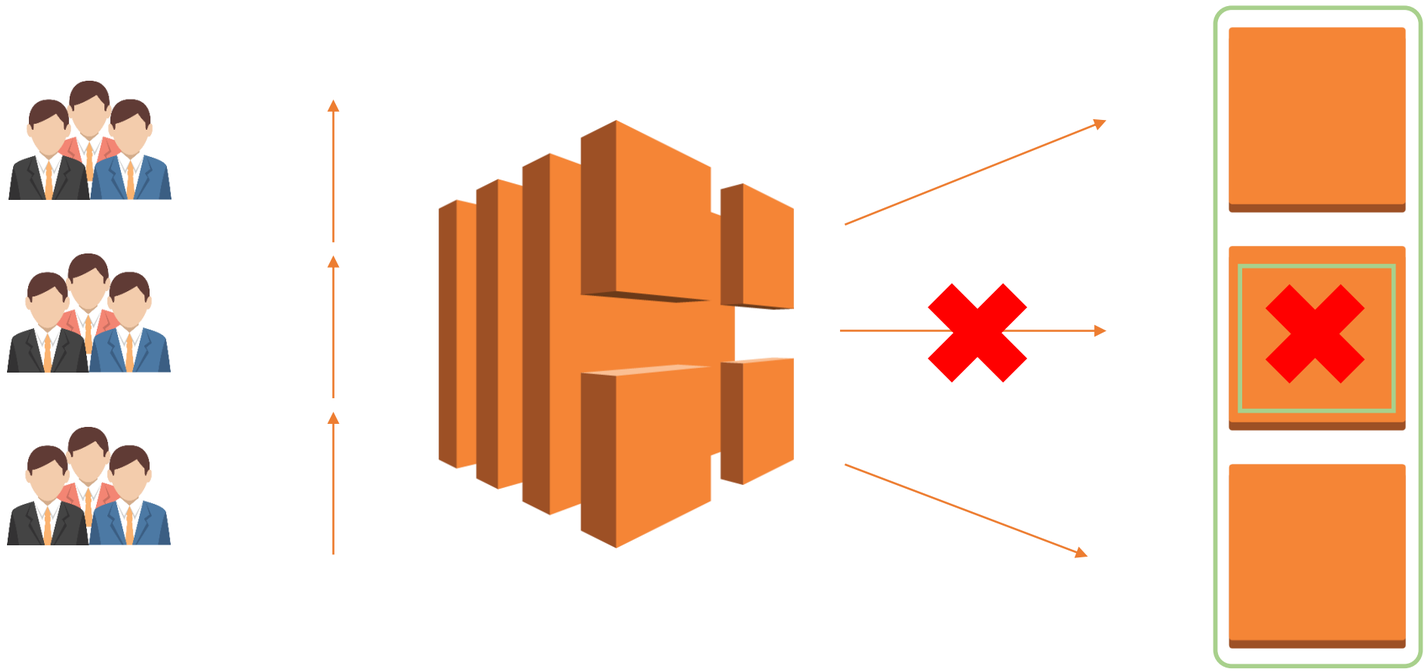
High Availability

ELB distributes incoming traffic across your Amazon EC2 instances in a single Availability Zone or multiple Availability Zones. ELB automatically scales its request handling capacity.



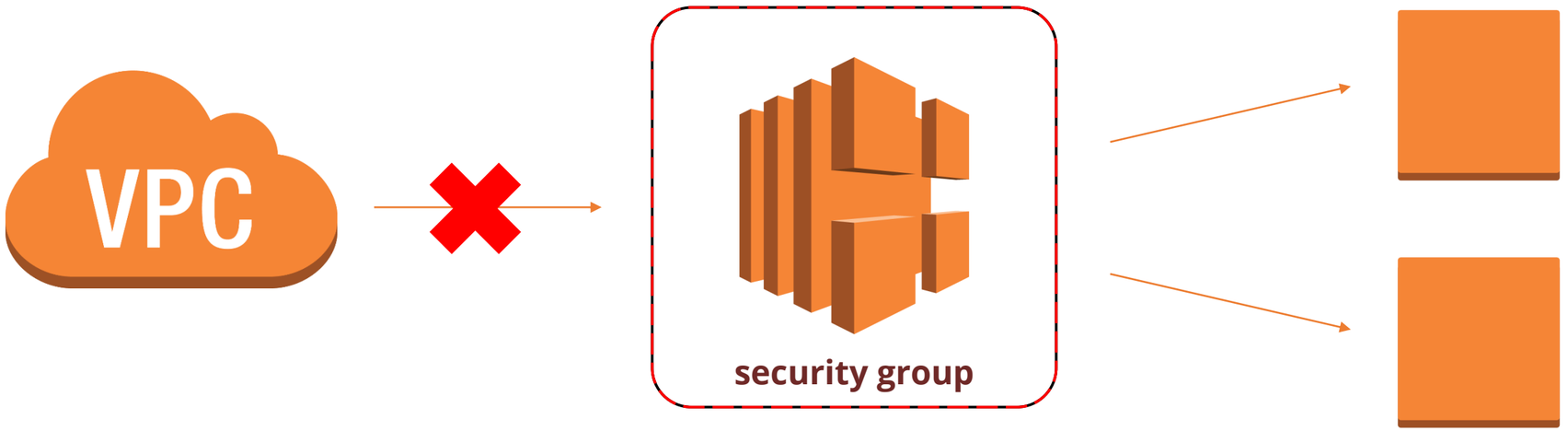
Health Checks

ELB can detect the health of Amazon EC2 instances. When it detects an unhealthy EC2 instance, it will spread load across the remaining instances and no longer route traffic to the unhealthy instance.



Security Features

ELB creates and manages security groups associated with it to provide additional networking and security options. You can also create a load balancer without public IP addresses to serve as an internal load balancer.

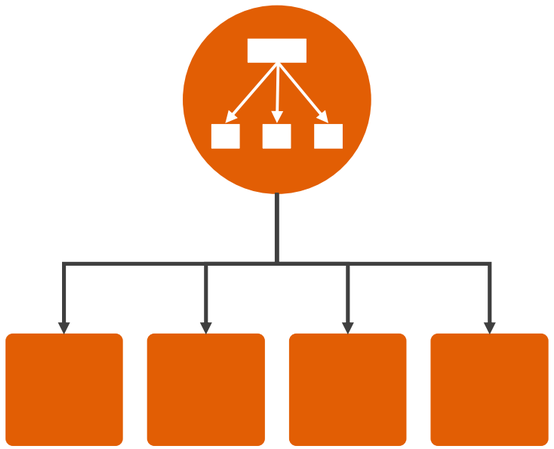


Sticky Sessions

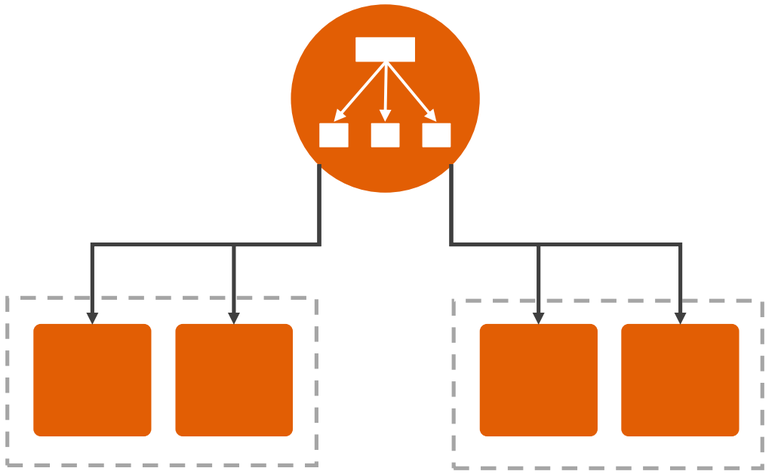
ELB supports the ability to stick user sessions to specific EC2 instances using cookies. Traffic will be routed to the same instances as the user continues to access your application.

Types of Load Balancer

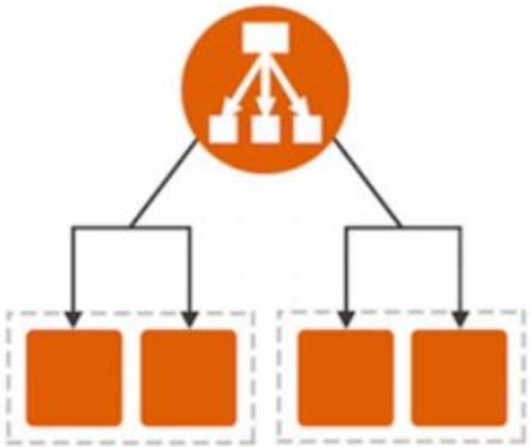
There are three types of load balancer:



Classic Load Balancer



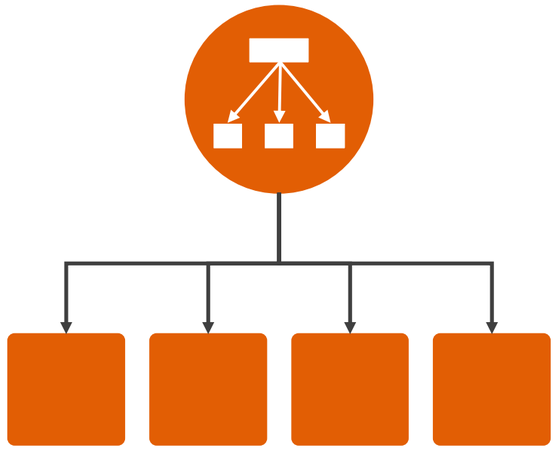
Application Load Balancer



Network Load Balancer

Classic Load Balancer

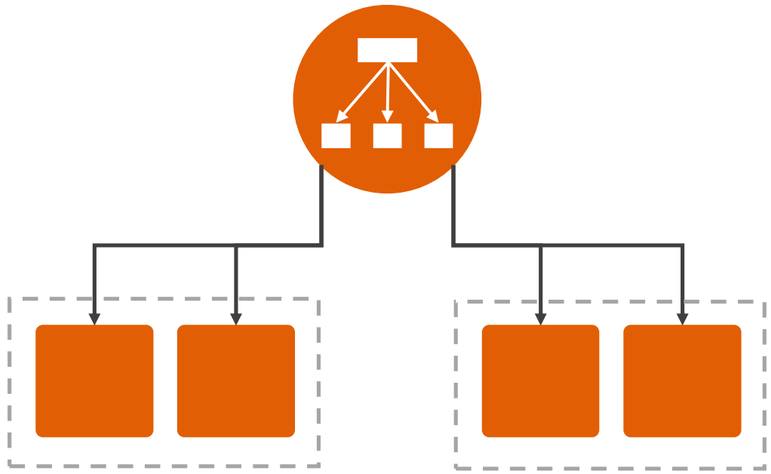
- The Classic load balancer is the original AWS load balancer.
- It operates at layer 4, which is the transport layer.



Classic Load Balancer

Application Load Balancer

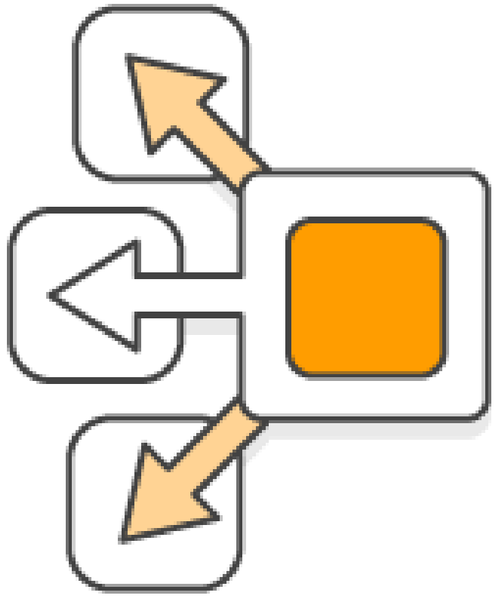
- The Application load balancer is preferred for HTTP/HTTPS application.
- It operates at layer 7, which is the application layer.
- It can route requests to one or more ports on each EC2 container instance.



Application Load Balancer

Network Load Balancer

- Network load balancer is preferred for TCP.
- It can handle millions of requests per second and provide static/elastic IP addresses.



Choosing the Right Load Balancer

Feature	Application	Network	Classic
Protocol	HTTP, HTTPS	TCP	TCP, SSL, HTTP, HTTPS
Platform	VPC	VPC	EC2-Classic, VPC
Load Balancing to multiple ports on the same instance	Yes	Yes	No
IP addresses as targets	Yes	Yes	No
Path/Host-based routing	Yes	No	No
Static/Elastic IP address	No	Yes	No

Demo 11: Elastic Load Balancing

Demonstrate how to configure Elastic Load Balancing.

Knowledge Check

KNOWLEDGE CHECK	Which of the following statements about ELB is NOT true?

a. You cannot distribute incoming traffic to instances to multiple Availability Zones.

b. Elastic Load Balancing automatically scales its request handling capacity in response to incoming application traffic.

c. Elastic Load Balancing can detect the health of Amazon EC2 instances.

d. Elastic Load Balancing supports the ability to stick user sessions to specific EC2 instances using cookies.

KNOWLEDGE CHECK

Which of the following statements about ELB is NOT true?

a. You cannot distribute incoming traffic to instances to multiple Availability Zones.

b. Elastic Load Balancing automatically scales its request handling capacity in response to incoming application traffic.

c. Elastic Load Balancing can detect the health of Amazon EC2 instances.

d. Elastic Load Balancing supports the ability to stick user sessions to specific EC2 instances using cookies.

The correct answer is **a**.

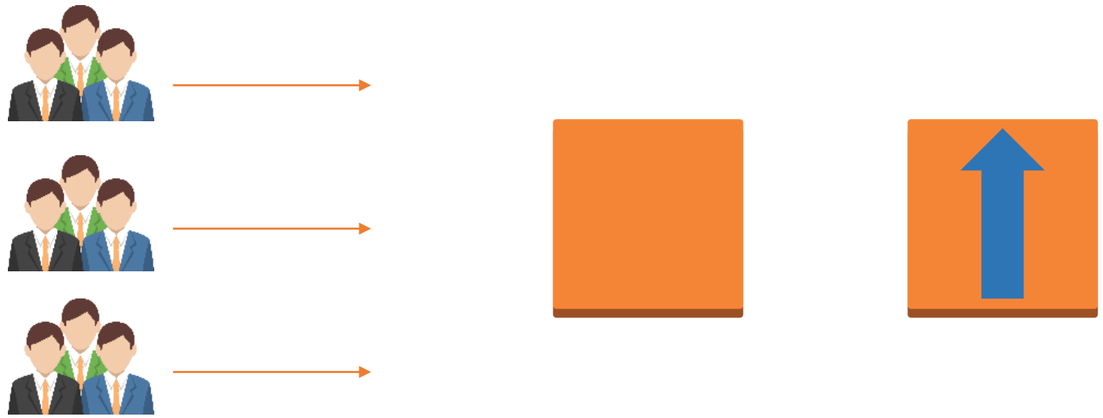
You can distribute incoming traffic to instances to single Availability Zones and multiple Availability Zones.

Auto Scaling

Details about Auto Scaling

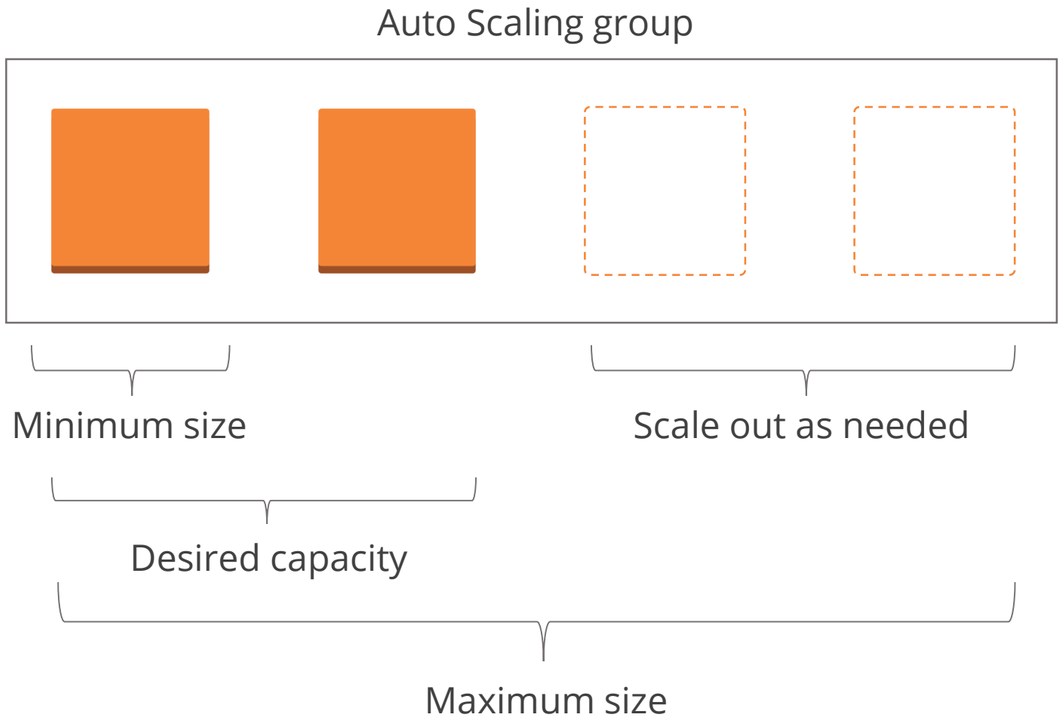
Auto Scaling

Auto Scaling ensures that you have the correct number of EC2 instances available to handle the load for your application.



Auto Scaling Groups

A collection of EC2 instances is called an Auto Scaling group. You can specify the minimum number of instances in each Auto Scaling group, and Auto Scaling ensures that your group never goes below this size.

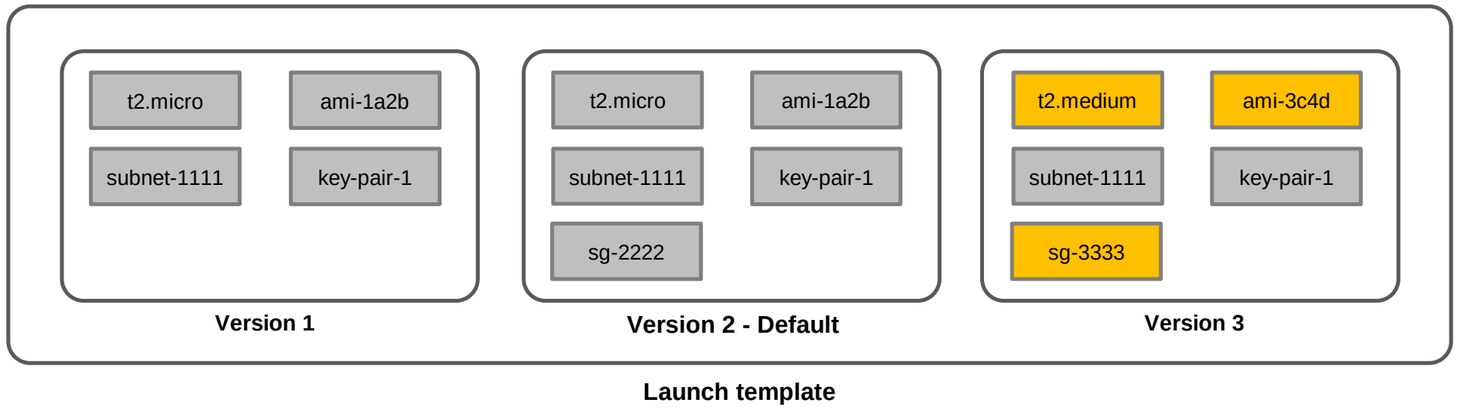


Auto Scaling Launch Configuration

A group uses a *launch configuration* as a template for its EC2 instances. In a launch configuration, specify information such as the AMI ID, instance type, key pair, security groups, and block device mapping for your instances.

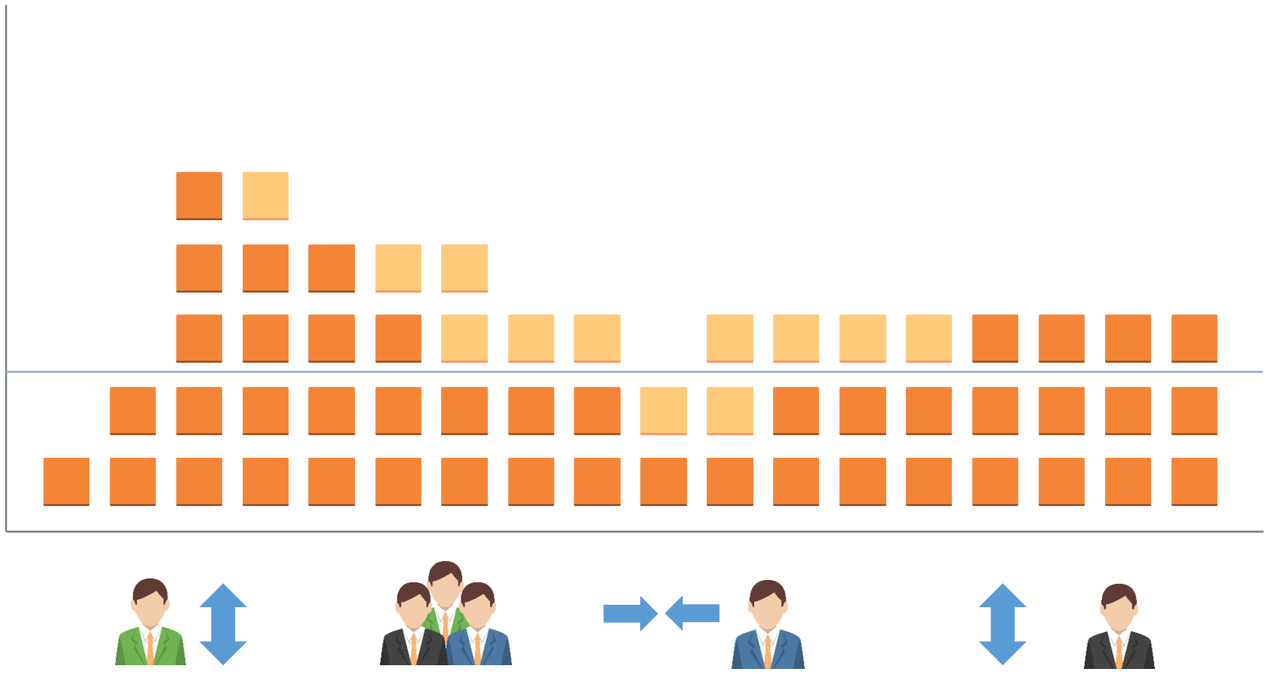
Launch Templates

Launch Templates enables a new way to templatize your launch requests by reducing the number of steps required to create an instance.



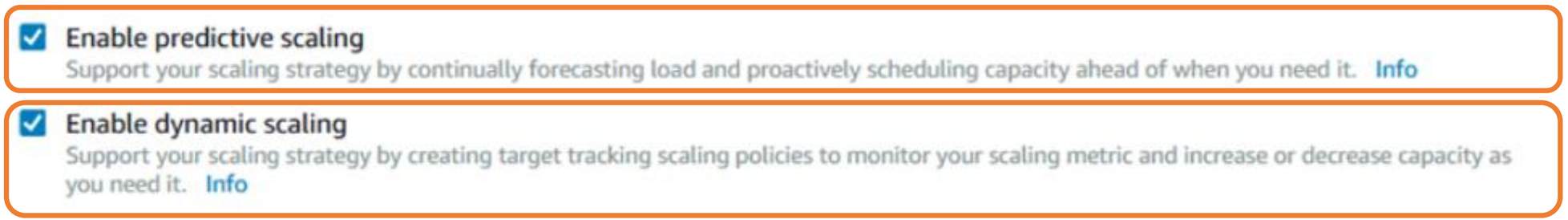
Auto Scaling Plans

A scaling plan tells Auto scaling when and how to scale.



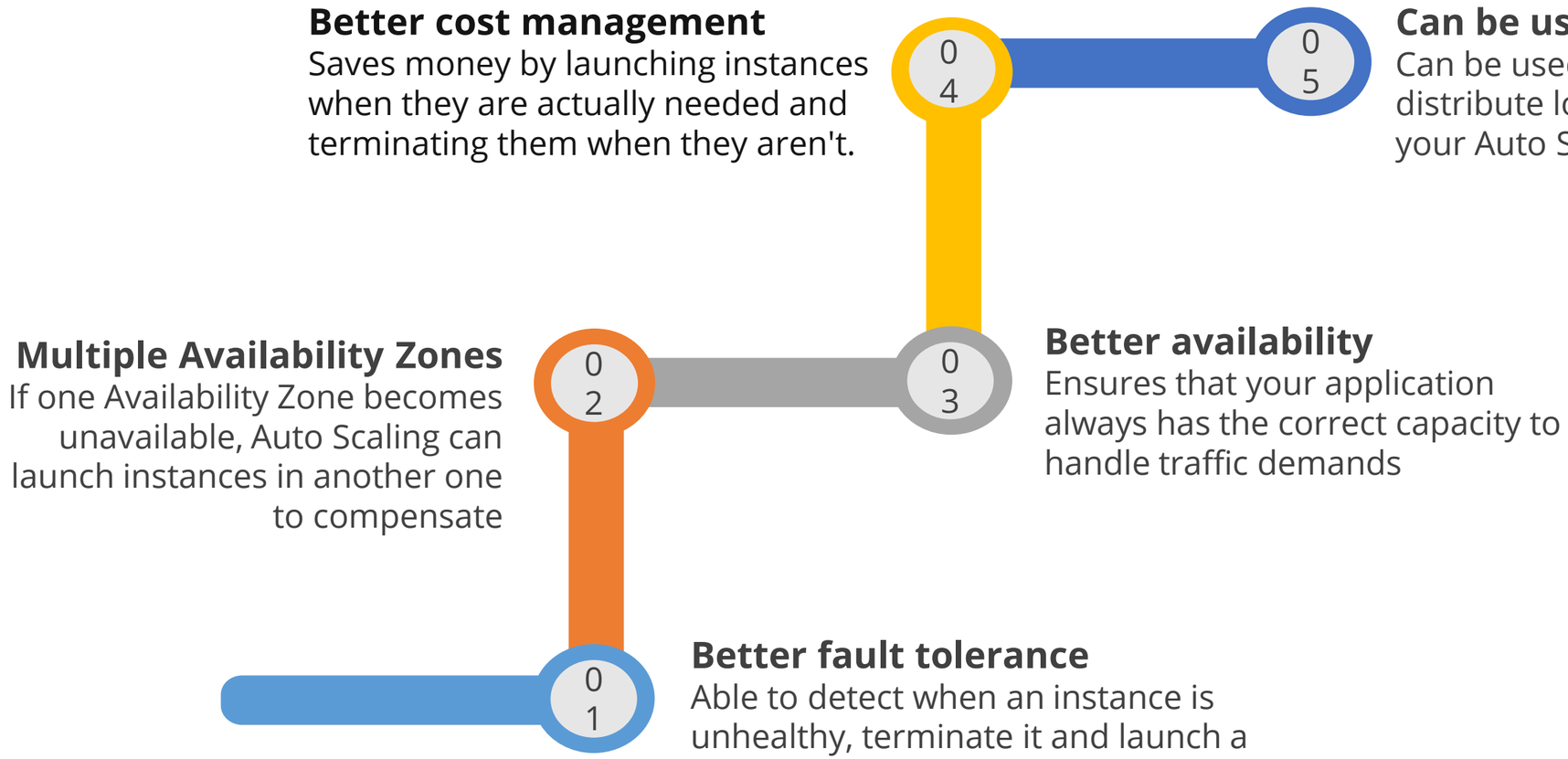
Auto Scaling Predictive Scaling

Scaling is enabled based on data collected from your actual EC2 usage and further informed by billions of data points drawn from our AWS observations.



Auto Scaling Benefits

The benefits of Auto Scaling are:



Demo 12: Auto Scaling

Demonstrate how to configure Auto Scaling.

Knowledge Check

KNOWLEDGE CHECK	Why would you use Auto Scaling?

a. To improve your storage costs

b. To increase IOPS

c. To decrease network latency

d. To ensure that you have the correct number of EC2 instances available to handle the load for your application

KNOWLEDGE CHECK

Why would you use Auto Scaling?

a. To improve your storage costs

b. To increase IOPS

c. To decrease network latency

d. To ensure that you have the correct number of EC2 instances available to handle the load for your application

The correct answer is **d**.

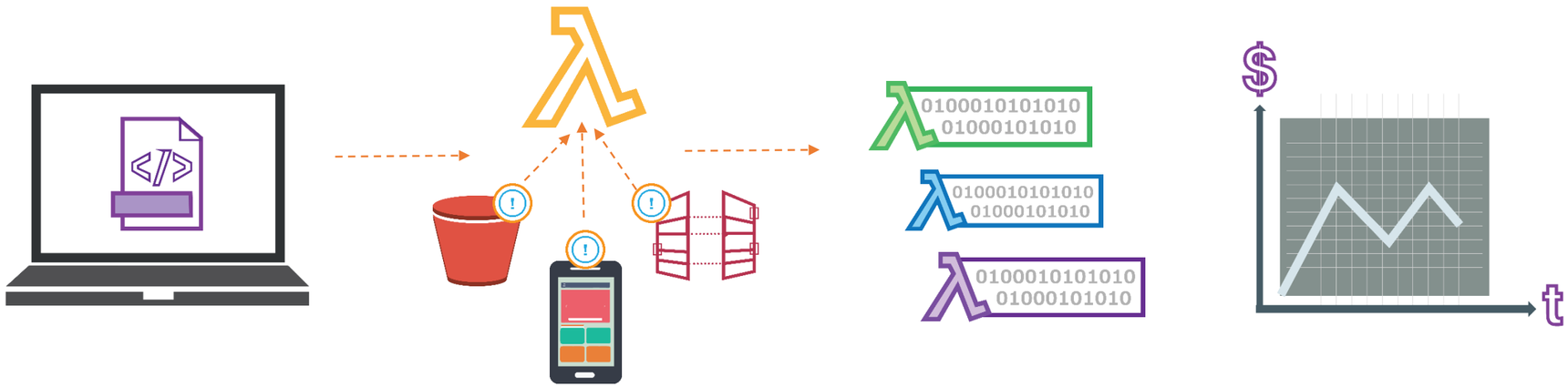
Auto Scaling ensures that you have the correct number of EC2 instances available to handle the load for your application using Auto Scaling groups, Launch Configuration, and Scaling Plans.

AWS Lambda

Details about AWS Lambda

AWS Lambda Overview

AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume; there is no charge when your code is not running.



Upload your code to AWS lambda

Set up your code to trigger from other AWS Services, HTTP endpoints, or in-app activity

Lambda runs your code only when triggered using only the compute resources needed

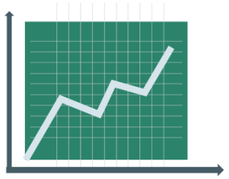
Pay just for the compute time you use

Benefits

The benefits of AWS Lambda:

- It automatically runs your code without requiring you to provision or manage servers. Just write the code and upload it to Lambda.
- It automatically scales your application by running code in response to each trigger. Your code runs in parallel and processes each trigger individually, scaling precisely with the size of the workload.
- You are charged for every 100ms your code executes and the number of times your code is triggered. You don't pay anything when your code isn't running.

No Servers to Manage



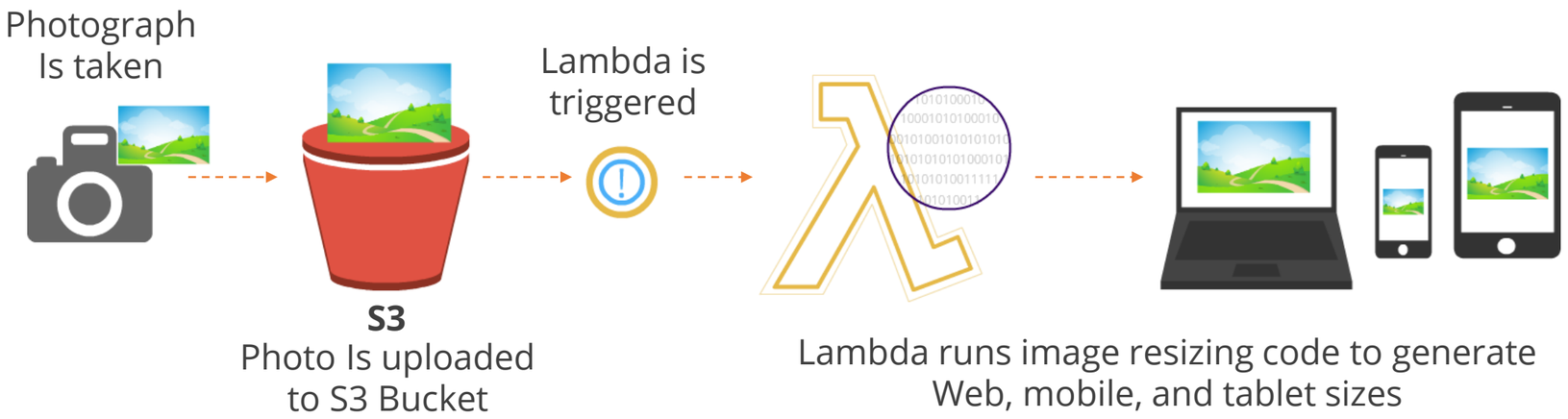
Continuous Scaling

Sub-second Metering

Case Study—The Seattle Times

The Seattle Times uses AWS Lambda to resize images for viewing on different devices such as desktop computers, tablets, and smartphones.

Example: Image Thumbnail Creation



Triggering Lambda Functions

Lambda can be triggered by multiple AWS services such as:

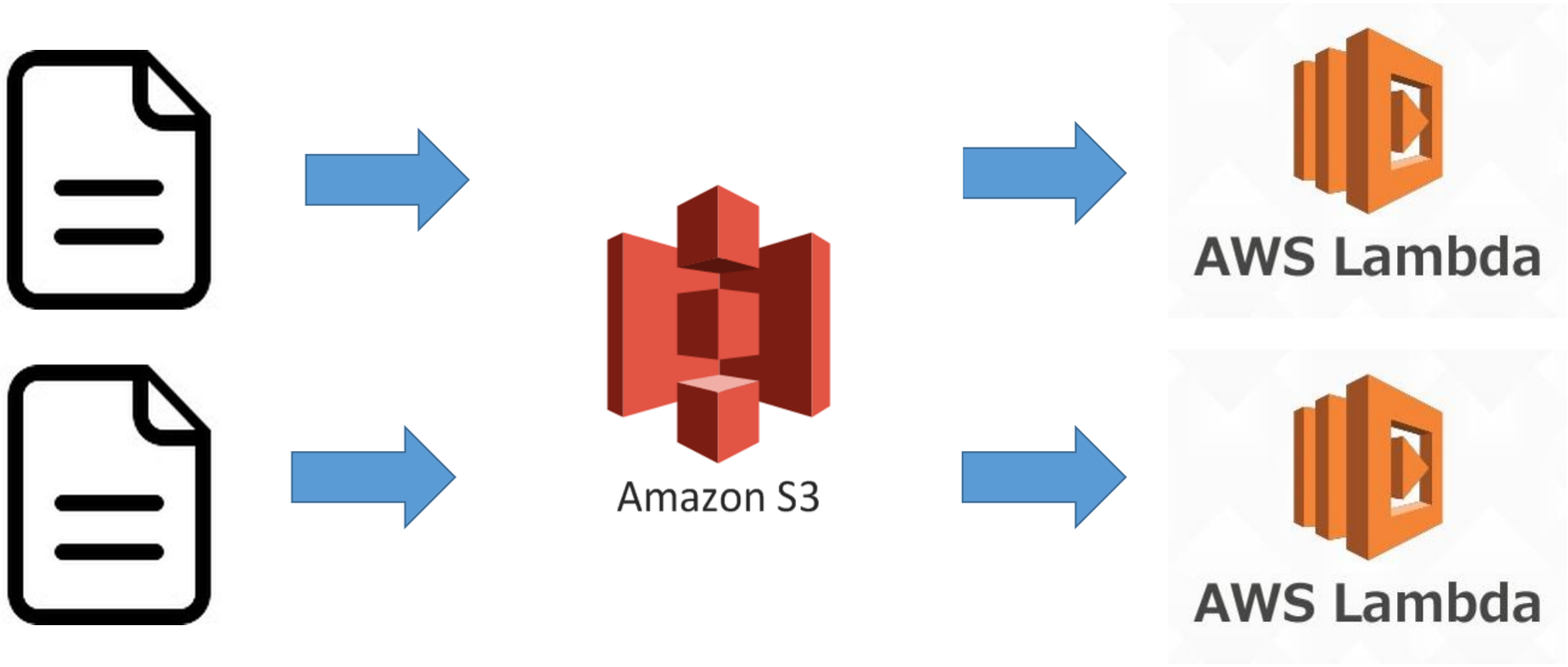
- API Gateway
- AWS IoT
- Alexa Skills Kit
- CloudFront
- DynamoDB
- Lambda
- S3
- SNS

Using Lambda: Example

"Alexa, play my music."

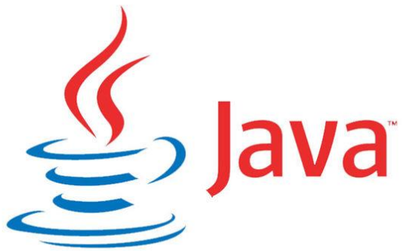
Lambda Executions

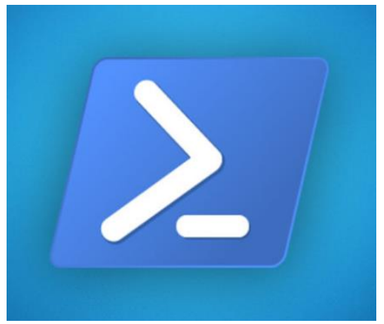
A Lambda function is executed once for each request.



Lambda Languages

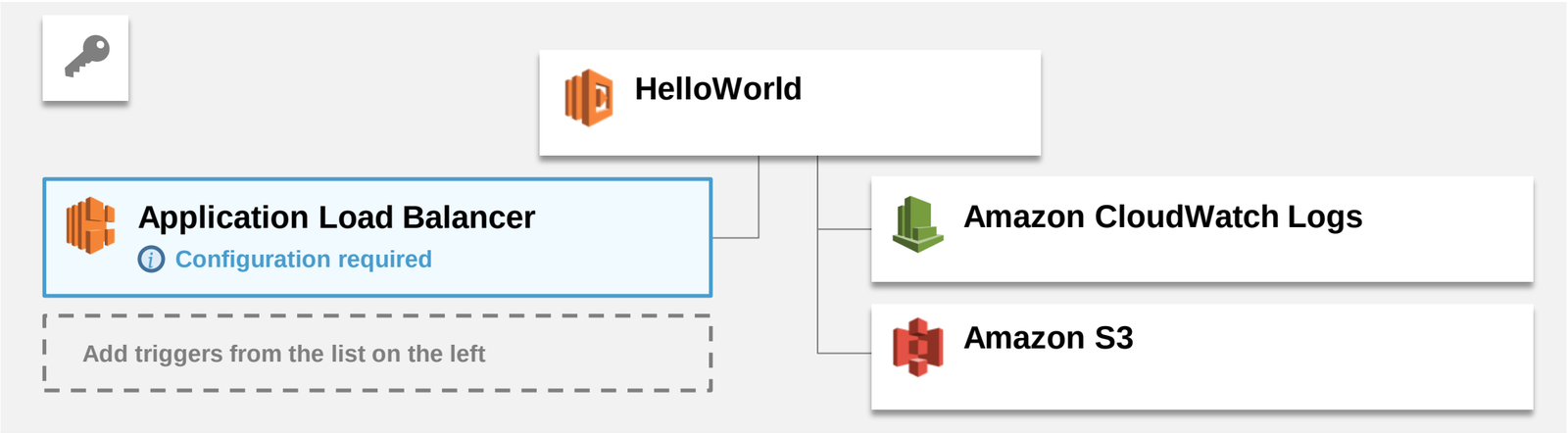
Lambda supports the following languages:





ALB for Lambda

Application Load Balancers (ALBs) now support AWS Lambda functions as targets.



Demo 13: AWS Lambda

Demonstrate how to use AWS Lambda

Knowledge Check

KNOWLEDGE CHECK

Which of the following is NOT a benefit of AWS Lambda?

a. No Servers to Manage

b. Continuous Scaling

c. Dedicated Hardware

d. Sub-second Metering

KNOWLEDGE CHECK

Which of the following is NOT a benefit of AWS Lambda?

a. No Servers to Manage

b. Continuous Scaling

c. Dedicated Hardware

d. Sub-second Metering

The correct answer is **c**.

AWS Lambda automatically runs your code without requiring you to provision or manage servers. It automatically scales your application by running code in response to each trigger, and you are charged for every 100ms your code executes and the number of times your code is triggered.

AWS Elastic Beanstalk

Details about AWS Elastic Beanstalk

AWS Elastic Beanstalk Overview

AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services.

Benefits of Elastic Beanstalk

Impossible to outgrow
Automatically scales application based on specific need using easily adjustable Auto Scaling settings

Fast and simple to deploy
Fastest and simplest way to deploy application on AWS

Developer productivity
Provisions and operates the infrastructure and manages the application stack

Complete resource control
Can choose the Amazon EC2 instance type that is optimal for your application

Knowledge Check

KNOWLEDGE CHECK

What is the primary purpose of Elastic Beanstalk?

a. Load balancing of EC2 instances

b. Deploying and scaling web applications and services

c. Automatic storage management

d. Running autonomous EC2 instances

KNOWLEDGE CHECK

What is the primary purpose of Elastic Beanstalk?

a. Load balancing of EC2 instances

b. Deploying and scaling web applications and services

c. Automatic storage management

d. Running autonomous EC2 instances

The correct answer is **b**.

AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services. You just have to upload your code. Elastic Beanstalk automatically handles the deployment, from capacity provisioning, load balancing, and auto-scaling to application health monitoring.

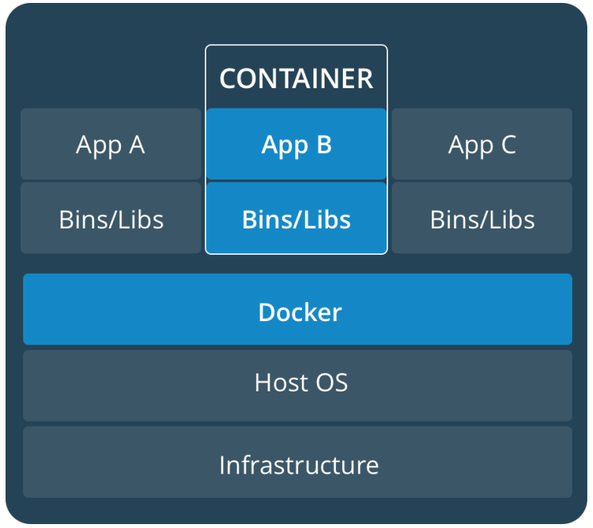
Amazon Elastic Container Service (ECS)

Meaning and Features of ECS

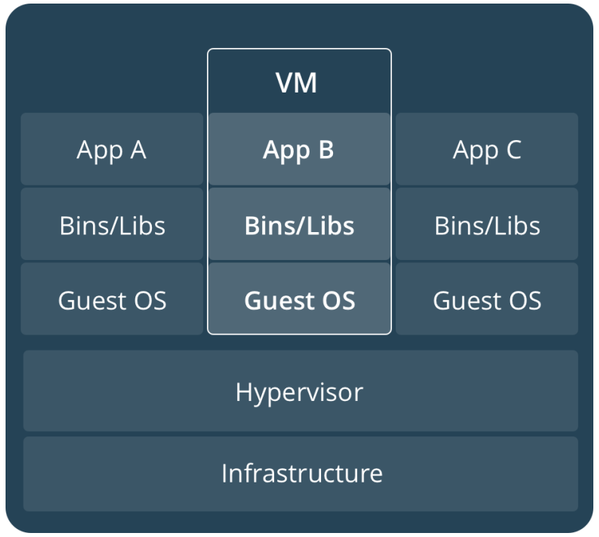
Containers Overview

A container is a lightweight, stand-alone, executable package of a piece of software that includes everything needed to run it: code, runtime, system tools, system libraries, settings.

Containers vs. Virtual Machines



- Containers remove the OS requirements and instead packages just code and dependencies together.
- Multiple containers can run on the same machine and share the OS kernel with other containers, and all the resources running as a machine
- Extremely portable
- Can start almost instantly
- 10MBs+ in size



- VMs turn one server into many servers
- Each VM includes a full copy of an operating system, one or more applications, all necessary binaries, and libraries
- Can be slow to boot up
- 10GBs+ in size

Docker Overview

Docker is an open-source container platform for automating the deployment of applications as portable, self-sufficient containers.

- Highly scalable
- Can run on Windows or Linux hosts
- Allows you to deploy into any environment knowing that your code will run
- Packages software into standardized units called containers, which include the application code, libraries, runtimes, config and dependencies

Docker Components

Docker Image
- A template with instructions to create a docker container.

Docker Container
- Created from a docker image. Holds everything that an application needs to run.

Union File Systems
- File systems that operate by creating layers.

DockerFile
- Used to build your own image. Stores instructions to run command, add a file, etc. Each instruction in a DockerFile creates a layer in the image.

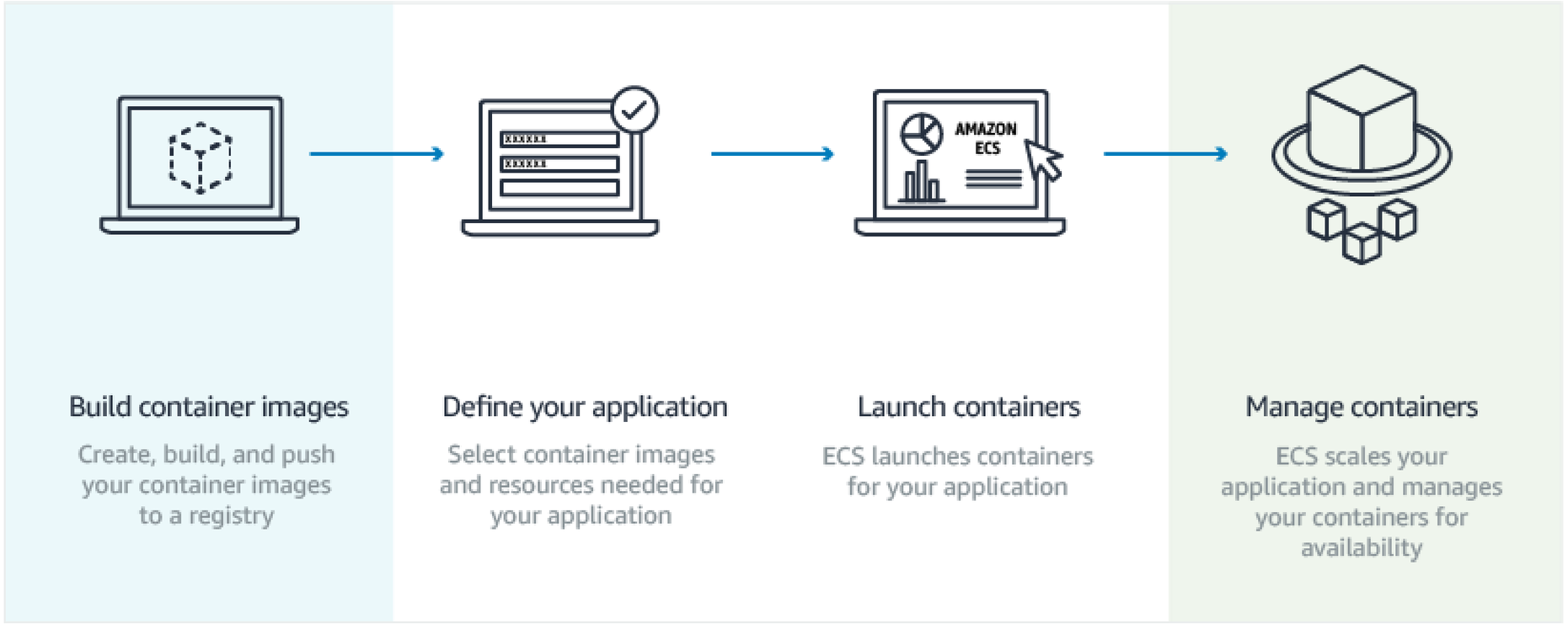
Docker Daemon/Engine
- Communicates with Docker client and manages Docker objects.

Docker Client
- Interface between you and Docker Engine.

Docker Registries
- Stores docker images. Can be public or private.

Amazon ECS

ECS is a container management service that lets you launch and stop container based applications.



Amazon ECS Components

Amazon EC2 Container Registry (Amazon ECR)

- A repository for your containers. Amazon’s version of DockerHub.

Task Definitions

- JSON text files that describe one or more containers that form your applications.

ECS clusters

- Logical grouping of container instances that you can place tasks on.

Amazon EKS

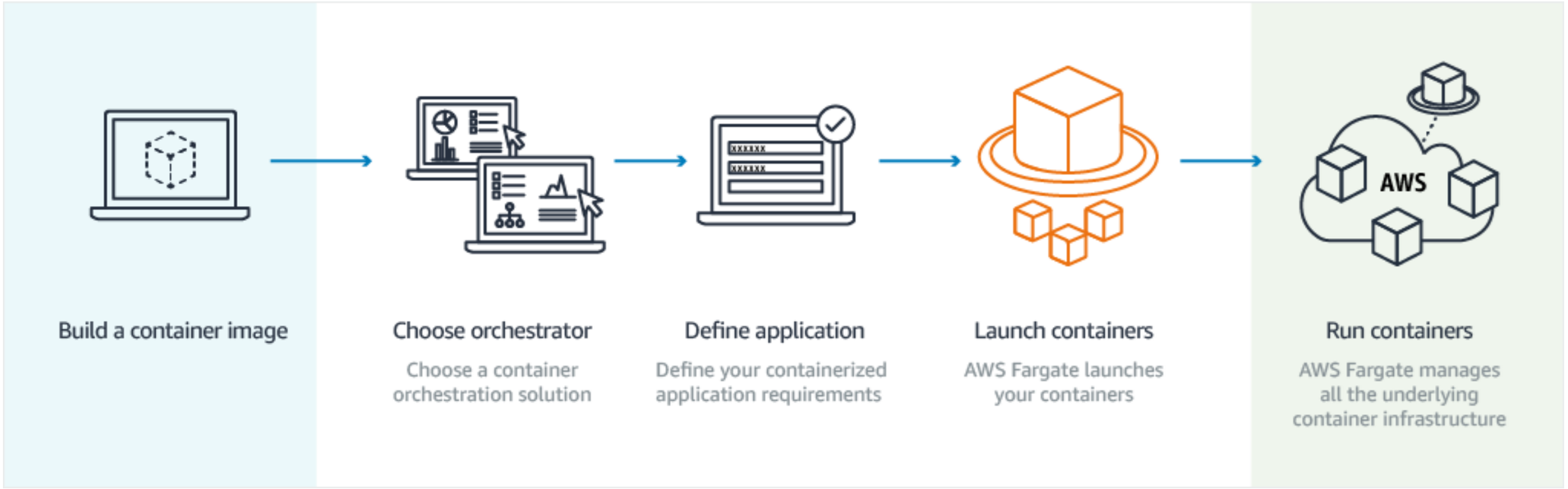
- Kubernetes is a docker orchestration tool that can be used to create a more manageable, resilient application infrastructure.
- It is mostly used for large, complex environments.
- Amazon EKS is a managed version of Kubernetes that simplifies deployment onto the AWS cloud.

kubernetes

Amazon
EKS

Amazon Fargate

AWS Fargate is a technology for Amazon ECS and EKS that allows you to run containers without having to manage servers or clusters.



Use the “Knowledge Check” slides in the next two screens to present Q&A between the lesson.

Knowledge Check

KNOWLEDGE CHECK	What does not need to be included in a container?

a. Application code

b. Libraries

c. Operating System

d. Config

KNOWLEDGE CHECK	What does not need to be included in a container?

a. Application code

b. Libraries

c. Operating System

d. Config

The correct answer is **c) Operating System**

A container does not have it's own kernel, which makes it much more lightweight and portable when compared to VMs.

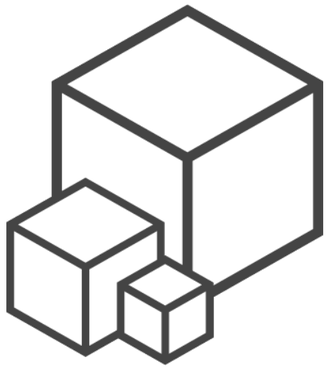
AWS Command Line Interface (CLI)

Details about AWS Command Line Interface

AWS CLI

Amazon's definition of an AWS CLI:

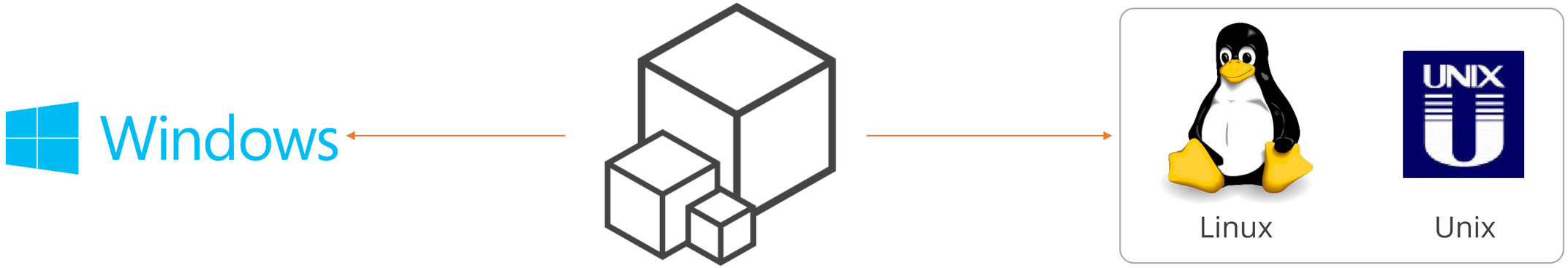
"The AWS Command Line Interface (CLI) is a unified tool to manage your AWS services. With just one tool to download and configure, you can control multiple AWS services from the command line and automate them through scripts."



AWS CLI

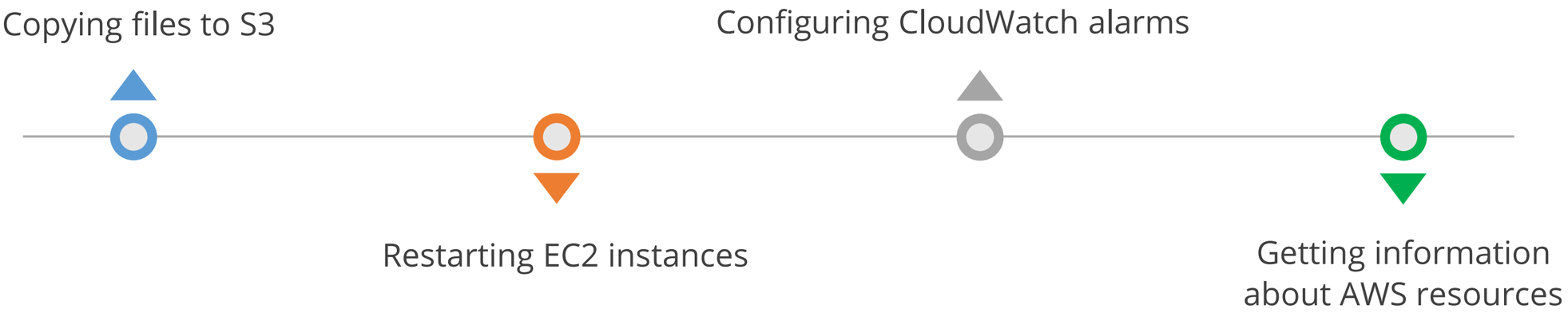
AWS CLI Installation

Amazon CLI can be installed on Windows using MSI or Linux/Unix with Pip/Bundled Installer. Amazon Linux AMI is preinstalled with AWS CLI.



AWS CLI Benefits

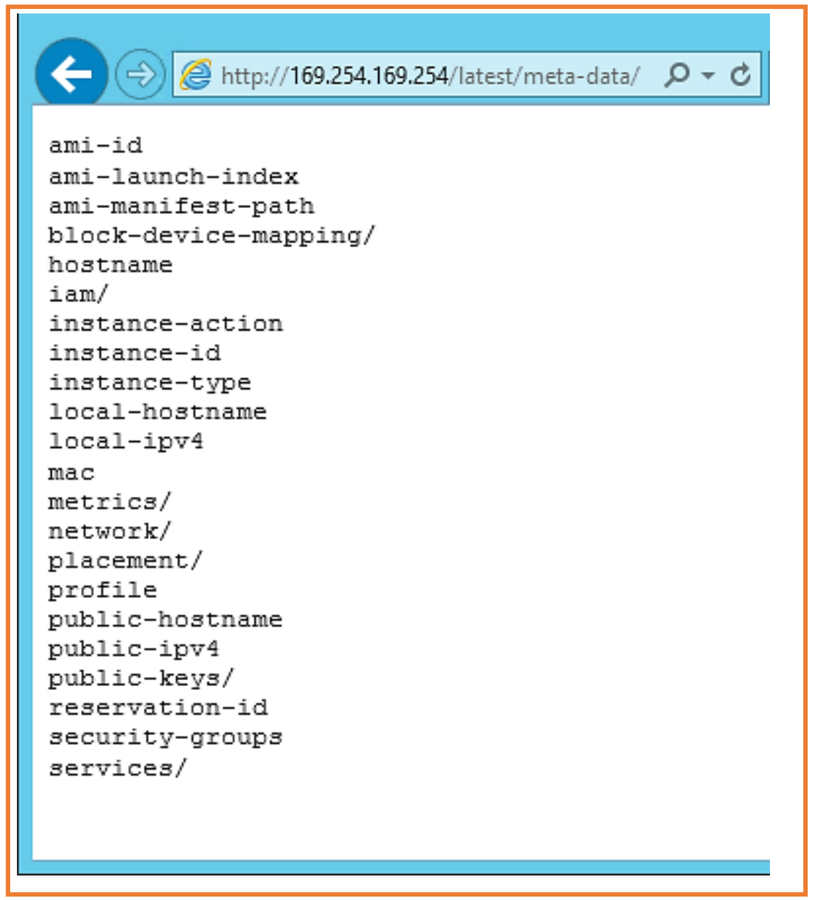
AWS CLI can be used to perform multiple tasks such as:



Alternative to AWS CLI

On your running instances, you can obtain instance metadata and user data using a specific URL.

- http://169.254.169.254/latest/meta-data/, Or
- http://169.254.169.254/latest/user-data



Demo 14: AWS CLI

Demonstrate how to use AWS CLI.

Knowledge Check

KNOWLEDGE CHECK

What is the key purpose of AWS CLI?

a. To manage multiple AWS resources from the command line

b. To completely replace the need to use the AWS Management Console

c. To lower your AWS resource costs

d. To improve your latency between AWS Regions

KNOWLEDGE CHECK

What is the key purpose of AWS CLI?

a. To manage multiple AWS resources from the command line

b. To completely replace the need to use the AWS Management Console

c. To lower your AWS resource costs

d. To improve your latency between AWS Regions

The correct answer is **a**.

AWS CLI allows you to manage multiple AWS resources, such as EC2, S3, etc., from the command line.

KNOWLEDGE CHECK	Which URL do you use to get metadata or user data from a running instance?

a. http://0.0.0.0/

b. http://169.254.169.254/

c. http://254.169.254.169/

d. http://10.0.0.0/

KNOWLEDGE CHECK

Which URL do you use to get metadata or user data from a running instance?

a. http://0.0.0.0/

b. http://169.254.169.254/

c. http://254.169.254.169/

d. http://10.0.0.0/

The correct answer is **b**.

You can use http://169.254.169.254/latest/meta-data/ or http://169.254.169.254/latest/user-data/.

AWS EC2 Best Practices

Details about AWS EC2 recommended best practices

AWS EC2 Best Practices

Security and Network Best Practices

- Security and Network
- Storage
- Resource Management
- Backup and Recovery

- Manage access to AWS resources and APIs using identity federation, IAM users, and IAM roles
- Implement the least permissive rules for your security group
- Regularly patch, update, and secure the Operating System and applications on your instance

AWS EC2 Best Practices (contd.)

Storage Best Practices

- Security and Network
- Storage
- Resource Management
- Backup and Recovery

- Understand the implications of the root device type for data persistence, backup, and recovery
- Ensure that the volume with your data persists after instance termination

AWS EC2 Best Practices (contd.)

Resource Management Best Practices

- Security and Network
- Storage
- Resource Management
- Backup and Recovery

- Use instance metadata and custom resource tags to track and identify your AWS resources
- View your current limits for Amazon EC2

AWS EC2 Best Practices (contd.)

Backup and Recovery Best Practices.

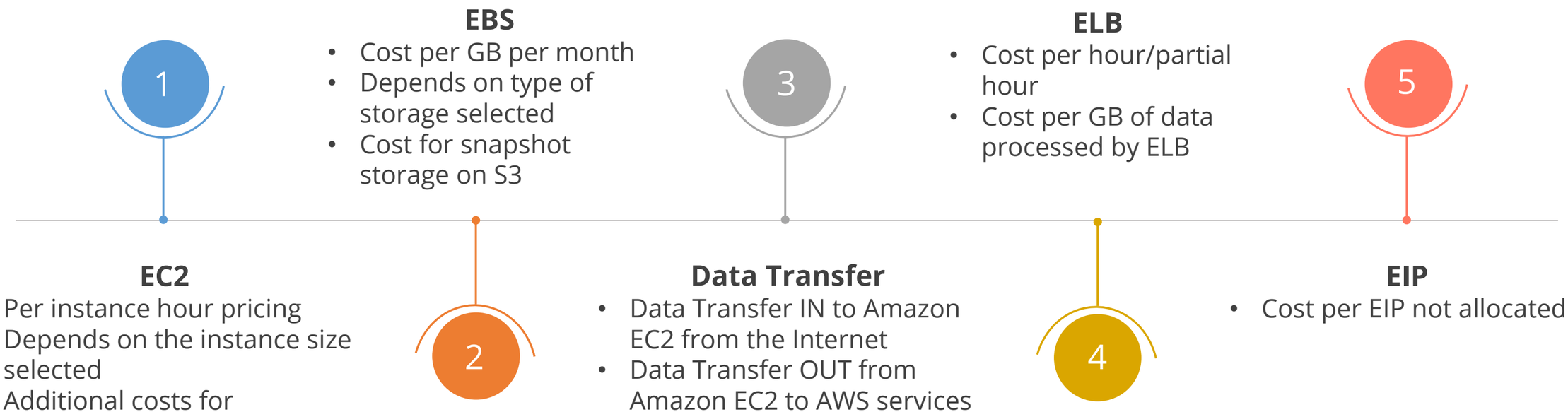
- Security and Network
- Storage
- Resource Management
- Backup and Recovery

- Regularly back up your instance using Amazon EBS snapshots or a backup tool
- Deploy critical components of your application across multiple Availability Zones and replicate your data appropriately
- Design your applications to handle dynamic IP addressing when your instance restarts
- Ensure you are prepared to handle failover

AWS EC2 Costs

Details about AWS EC2 costs

EC2 Costs



Practice Assignment: Configure ELB

Launch two webservers and configure ELB

Configure ELB

Your client needs to set up a webserver that offers load balancing in the

SIMPLILEARN_VPC.

ELB needs to launch into at least two subnets in different Availability Zones. So you will need to add a new public subnet to the SIMPLILEARN_VPC in a different Availability Zone to your existing public subnet. You will need to configure the custom route table so that the new public subnet has Internet access.

Then launch two Amazon Linux instances, one in each of your public subnets.

Set up a health_check.html file on each instance and configure ELB to serve both webservers.

BONUS: Rather than create two webservers, you can create one, configure it, create an AMI, and launch the second webserver from the newly created AMI.

Key Takeaways

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- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud.
- An AMI is a template of a virtual instance that includes a template, launch permissions, and a block device mapping.
- Root devices can either be ephemeral (instance store) or EBS. AWS recommends EBS.
- There are a variety of instance types to suit all requirements.
- The storage categories are SSD-backed and HDD-backed.
- You can back up your EBS volumes by taking point-in-time snapshots and storing them on Amazon S3. Amazon snapshots are incremental backups.
- EC2 on-demand instance pricing means you only pay for what you use with no long-term commitments.
- Placement groups are perfect for applications that require low network latency, high network throughput, or both.
- You can distribute incoming traffic across your Amazon EC2 instances in a single or multiple Availability Zones.
- Auto Scaling helps you ensure that you have the correct number of EC2 instances available to handle the load for your application.
- AWS Lambda lets you run code without provisioning or managing servers.
- AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services.
- The AWS Command Line Interface (CLI) is a unified tool to manage your AWS services. With just one tool to download and configure, you can control multiple AWS services from the command line and automate them through scripts.

Quiz

QUIZ 1	What happens when you deregister an AMI?

a. The AMI, Root Volume snapshot, and any instances launched from the AMI are deleted.

b. The AMI and any instances launched from the AMI are deleted.

c. The AMI and Root Volume snapshot are deleted.

d. Only the AMI is deleted.

QUIZ

1

What happens when you deregister an AMI?

a. The AMI, Root Volume snapshot, and any instances launched from the AMI are deleted.

b. The AMI and any instances launched from the AMI are deleted.

c. The AMI and Root Volume snapshot are deleted.

d. Only the AMI is deleted.

The correct answer is **d**

Explanations: Only the AMI is deleted; the snapshot of the root volume persists as do any instances launched from the AMI.

QUIZ 2	Which EC2 Family is suitable for CPU-intensive applications?

a. T2

b. C4

c. R3

d. I2

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a. T2

b. C4

c. R3

d. I2

The correct answer is **b**

Explanations: C4 (and C3) are compute-optimized instances that are best suited for CPU-intensive databases, web servers, application servers, etc.

QUIZ 3	Which EC2 Family is suitable for Memory-intensive applications?

a. M4

b. EBS Optimized

c. R3

d. G2

QUIZ

3

Which EC2 Family is suitable for Memory-intensive applications?

a. M4

b. EBS Optimized

c. R3

d. G2

The correct answer is **c**

Explanations: R3 instances are memory-optimized instances best suited for memory-intensive databases, web servers, application servers, etc.

QUIZ 4	EBS volumes are ____.

a. object-based storage

b. block-based storage

c. tape-based storage

d. USB-based storage

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a. object-based storage

b. block-based storage

c. tape-based storage

d. USB-based storage

The correct answer is **b**

Explanations: EBS is block-based storage.

QUIZ 5	Can you detach EBS volumes that are not the root volume without stopping the instance?

a. Yes

b. No

c. Only on certain instance types

d. Only on EBS optimized instances

QUIZ 5	Can you detach EBS volumes that are not the root volume without stopping the instance?

a. Yes

b. No

c. Only on certain instance types

d. Only on EBS optimized instances

The correct answer is **a**

Explanations: You can detach non-root volumes without stopping the instance, but it might take some time. Root volumes cannot be detached until an instance has been stopped.

This concludes “Amazon EC2.”

The next lesson is “Amazon S3.”