AWS Technical Essentials

Lesson 4—Compute Services and Networking

simplilearn

WHAT YOU'LL LEARN

- Identify different compute and networking services of Amazon Web Services (AWS)
- Describe Amazon Virtual Private Cloud (Amazon VPC)
- Create an Amazon Elastic Compute Cloud (Amazon EC2) instance
- Use Amazon Elastic Block Storage (Amazon EBS)

Computing and Networking Services of AWS

AWS Computing and Networking Services

Amazon Web Services or AWS provides several computing and networking services to meet your application requirements.

AWS Computing services facilitate:

- Automatic scaling of an assortment of computing instances
- Dynamic distribution of network traffic

AWS Networking services facilitate:

- Setting up an isolated logical network

These help to privately connect with the AWS infrastructure

- Available
- Scalable
- Fault-tolerant DNS service

AWS Compute and Networking services facilitate:

- Setting up virtual servers, Internet access, and firewall
- Distributing and routing IP addresses
- Scaling infrastructure to fulfill rising demands

Eight Key Compute and Networking Services by AWS

01

Amazon Elastic Compute Cloud

Offers virtual servers or compute instances in the cloud

02

Auto Scaling

Automatically scales the group of virtual servers, and according to the in-demand changes

03

Elastic Load Balancing

Disseminates the network traffic across the group of virtual servers

04

Amazon Virtual Private Cloud

Offers an isolated virtual network for virtual servers

Eight Key Compute and Networking Services by AWS

05

Amazon Route 53

Directs the network traffic to resources, such as websites, virtual server, or a load balancer

06

Amazon EC2 Container Service

Offers Docker containers on a cluster of virtual servers from Amazon EC2

07

AWS Lambda

Executes the code from Amazon EC2 instances on virtual servers, as a response to a triggered event

08

AWS Direct Connect

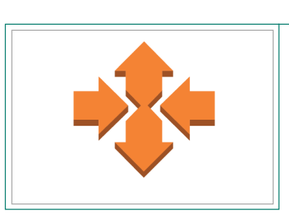
Establishes a dedicated connection from corporate premises, such as datacenter or office, to AWS

Six Key Concepts of Compute and Networking Services

Following are the key concepts of the Compute and Networking Services:

Instances and Amazon Machine Image

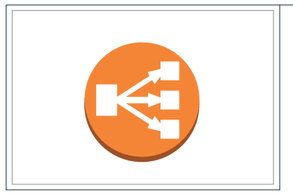
Security Groups



Auto Scaling groups

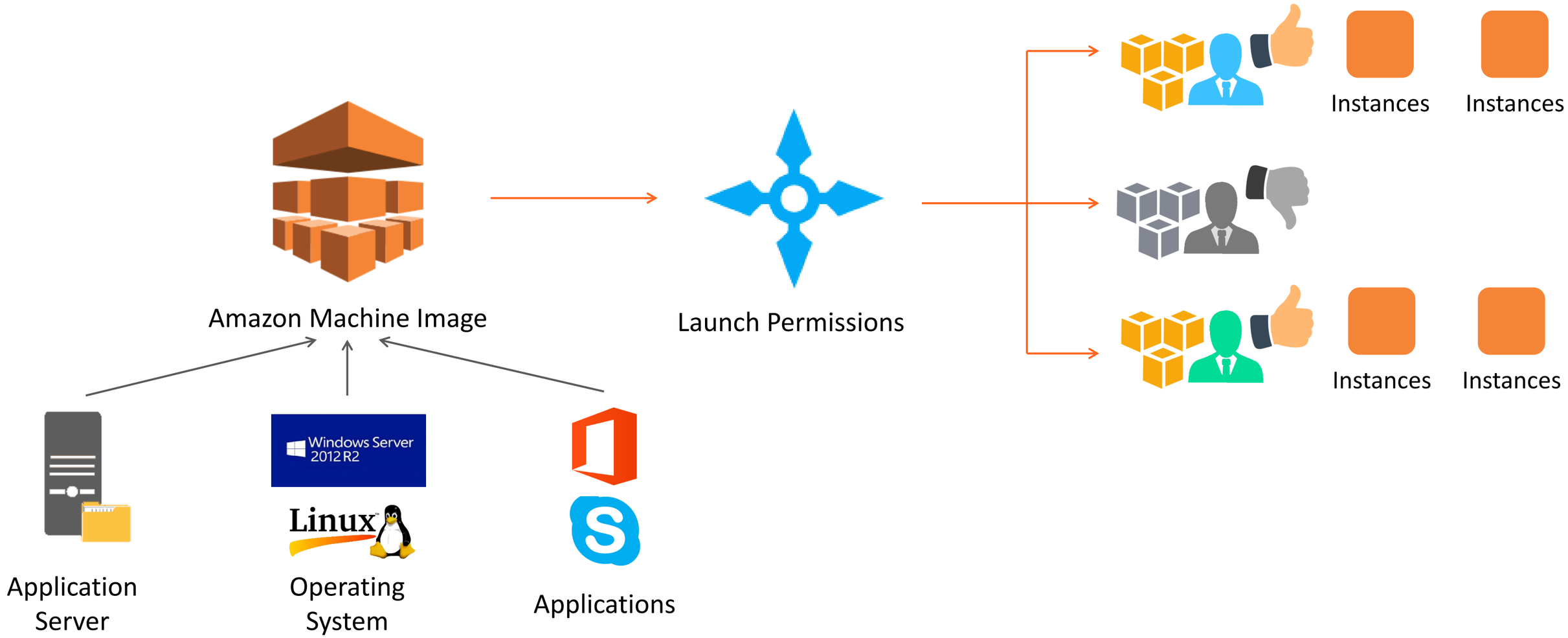
VPC and Subnets

Amazon Route 53 hosted zones



Load Balancer

Instances and Amazon Machine Image



An instance refers to a copy of AMI. This copy operates as a virtual server on a host computer in the AWS data centers.

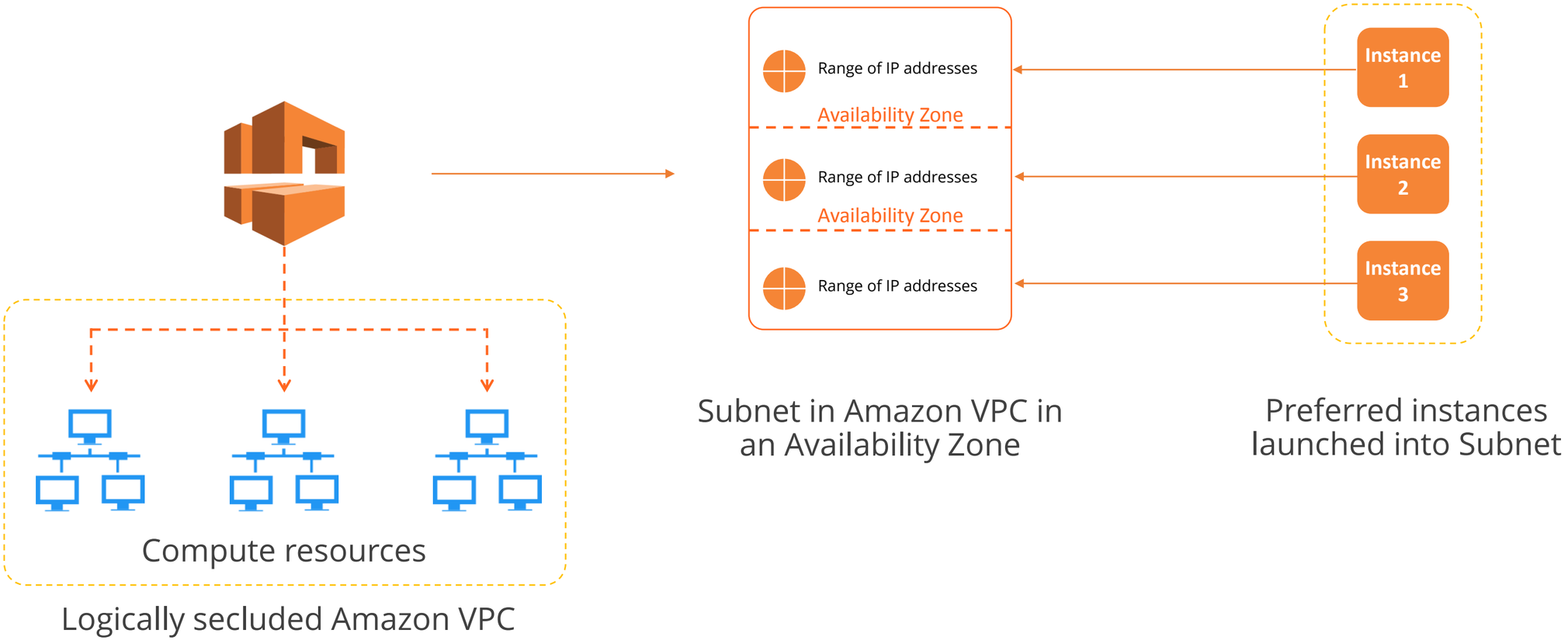
Steps to Open a New Instance

If an instance fails, you can open a new instance from the AMI.

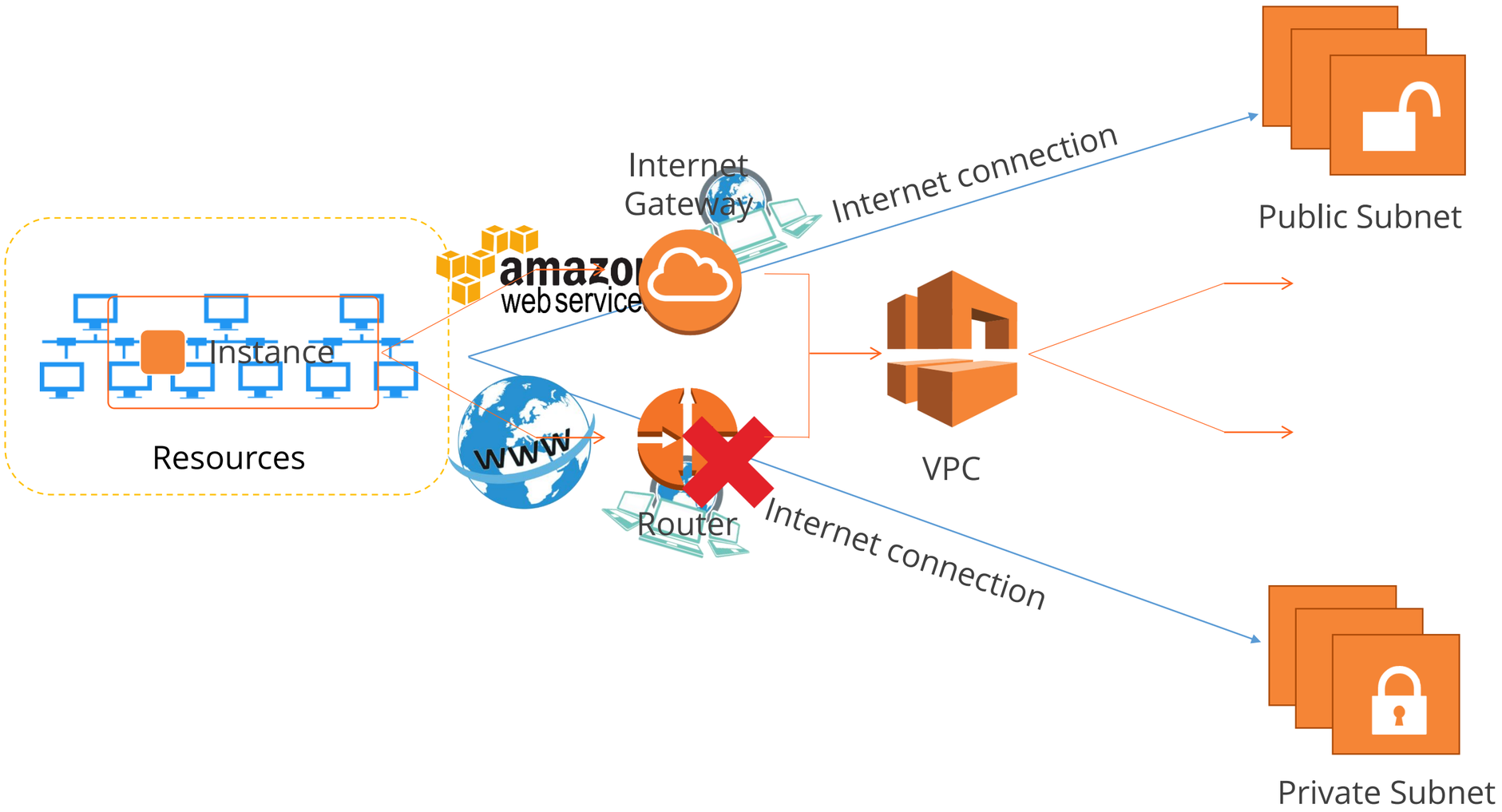
01	02	03	04
Choose an existing AMI	Log on to the instance	Configure additional settings to customize the instance	Save the customized configuration

Virtual Private Cloud (VPC) and Subnets

A Virtual Private Cloud or VPC refers to a virtual network for your AWS account.

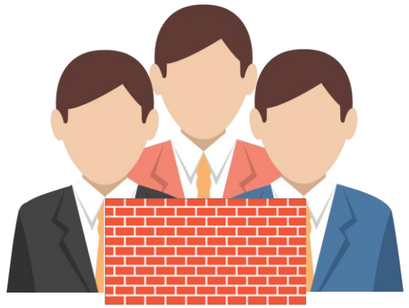


Public and Private Subnets



Security Groups

You can use security groups to guard the AWS resources in all subnets.



Controls:

- Incoming traffic
- Outgoing traffic

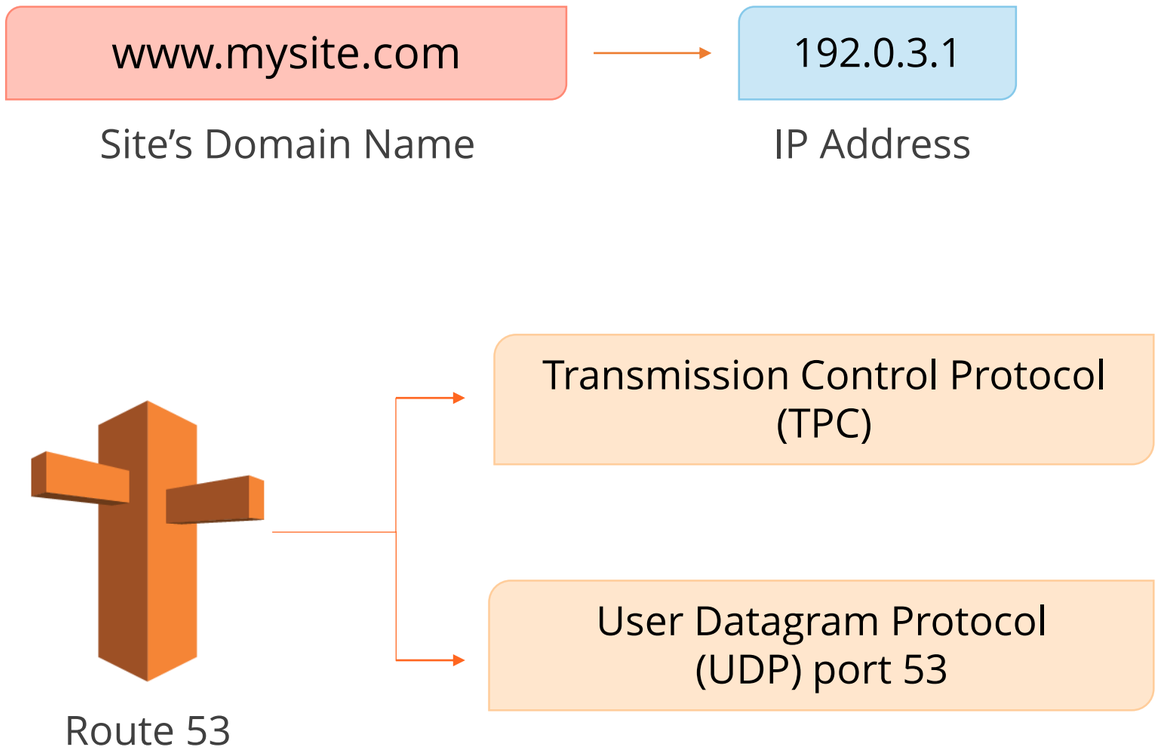
For an Amazon EC2 instance, security group functions like a virtual firewall

More than one security group can be created.

While creating a security group, rules to control inbound and outbound traffic can be specified

Amazon Route 53 and Hosted Zones

Amazon Route 53 is scalable, highly available, and a cost-effective medium to direct visitors to a website, virtual server, or a load balancer.



Amazon Route 53 and Hosted Zones

URLs should be easy to remember

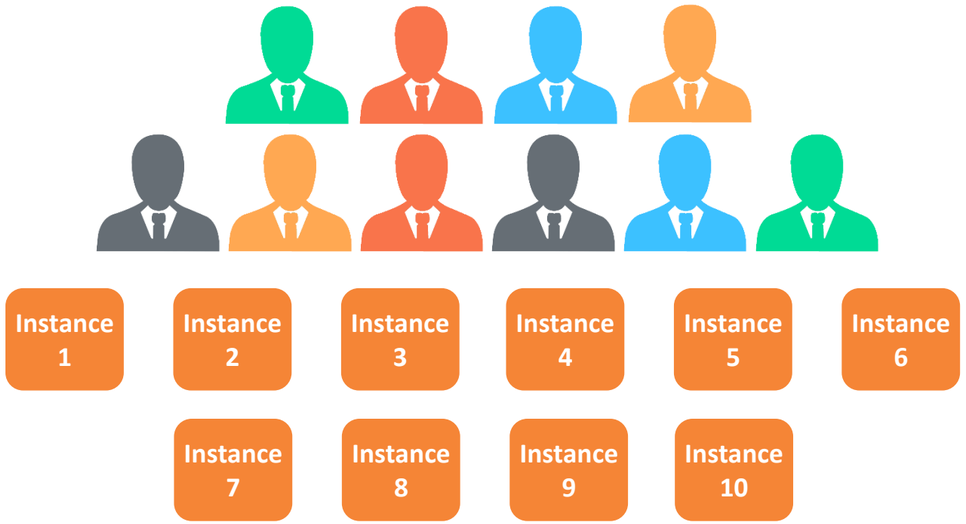
- Search for domain names and register a suitable one using Amazon Route 53
- Transfer an existing domain name to Amazon Route 53

Amazon Route 53 and Hosted Zones

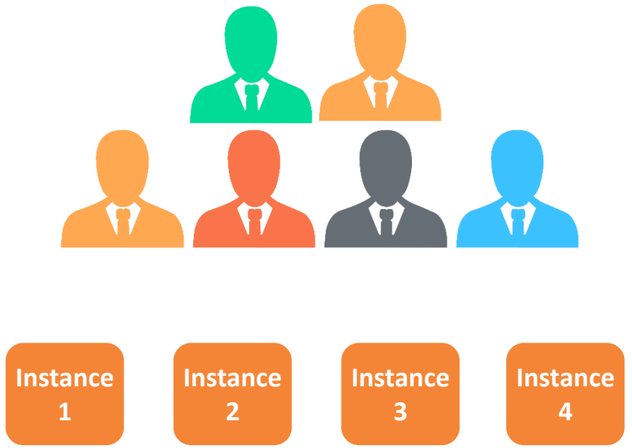
A hosted zone is similar to a DNS zone file, and contains its own configuration and metadata information. While creating a hosted zone, you get four name servers to ensure high availability.

Auto Scaling

Auto Scaling assists in retaining the application availability and automatically scaling the Amazon EC2 capacity based on specific conditions.



Increases the number of Amazon EC2 instances during peak time



Decreases the instance capacity during non-peak hours

Auto Scaling is suitable for applications with stable demand trends or that undergo hourly, daily, or weekly variations, in terms of usage.

Auto Scaling Groups

The collection of virtual servers or Amazon EC2 instances are known as Auto Scaling Groups, which can shrink or grow based on the demand.

If you set up scaling policies, Auto Scaling can open or terminate instances when the application demand increases or decreases.

Minimum two instances

Preferred capacity of three instances

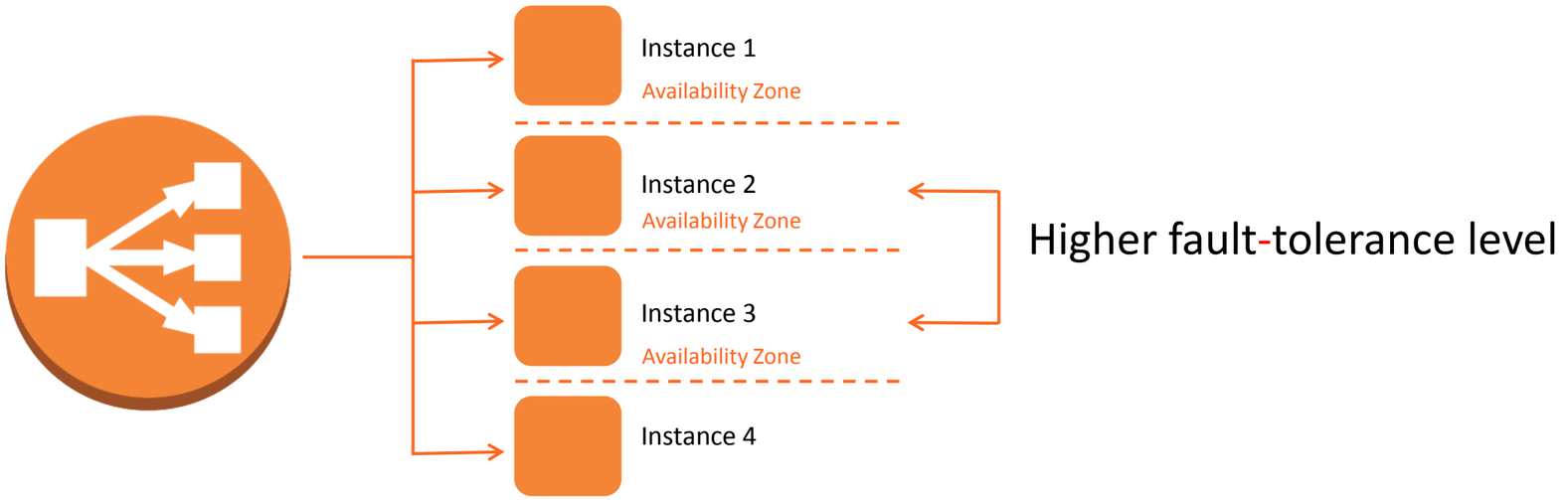
Maximum size of instances

With a scaling policy, it adjusts the number of instances in the range of two to six instances and according to your specified criteria.

Load Balancer/Elastic Load Balancing

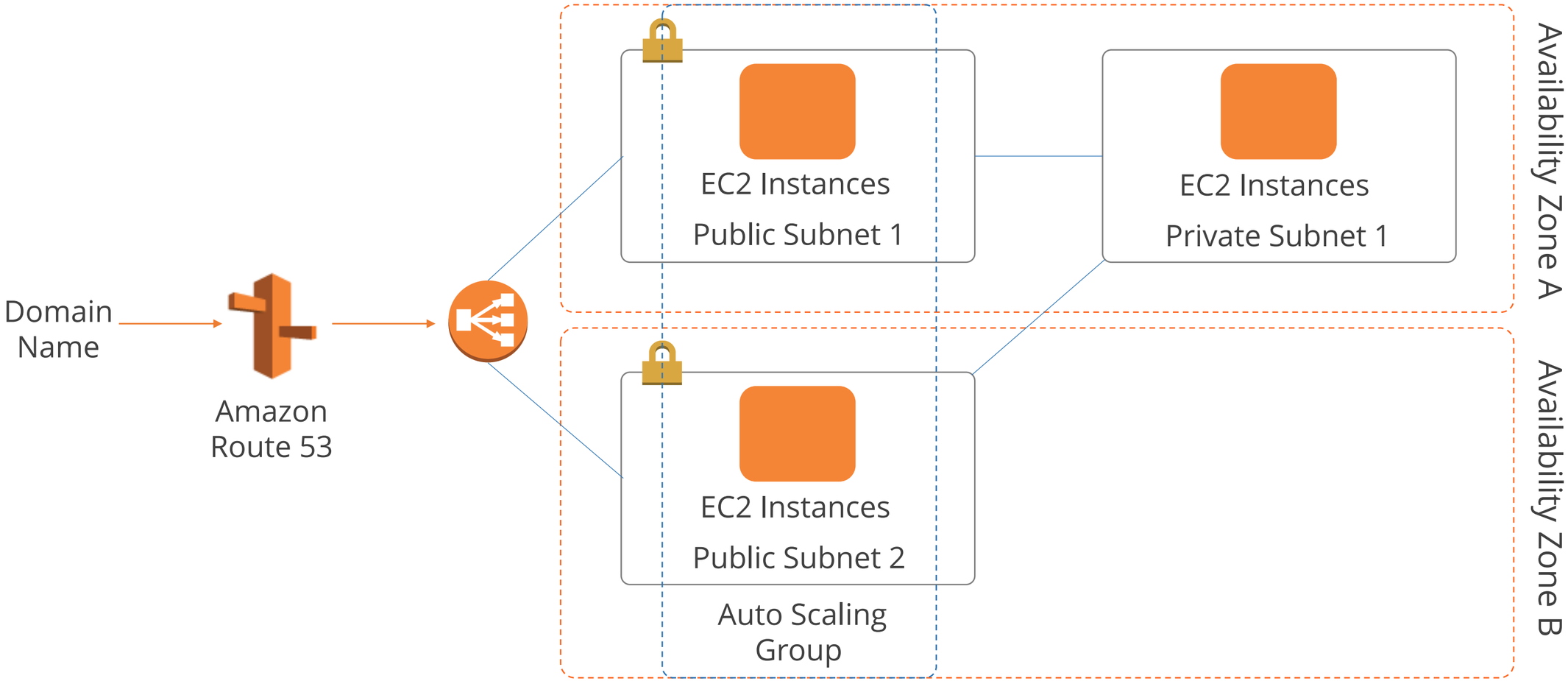
A Load Balancer is responsible for distributing the network traffic across several Amazon EC2 instances.

As you launch or terminate the instances, the Load Balancer automatically directs traffic to the running instances.



Load Balancer with instances
in several Availability Zones

Architecture of Compute and Networking Services



Depending on the load, when the Auto Scaling group terminates or launches the Amazon EC2 instances, the Load Balancer automatically makes the necessary adjustments.

Knowledge Check

KNOWLEDGE CHECK 1

What does networking services enable you to set up?

a. Open Logical Network

b. Distributed Logical Network

c. Isolated Logical Network

d. Closed Logical Network

KNOWLEDGE CHECK

What does networking services enable you to set up?

a. Open Logical Network

b. Distributed Logical Network

c. Isolated Logical Network

d. Closed Logical Network

The correct answer is **c.**

Explanation: The networking services enable you to set up an isolated logical network, and allow you to privately connect with the AWS infrastructure.

KNOWLEDGE CHECK 2

Which of the following are the key Compute and Networking services?

a. Amazon Virtual Private Cloud

b. Amazon Route 53

c. Amazon Machine Image

d. Amazon Instances

KNOWLEDGE CHECK

Which of the following are the key Compute and Networking services?

a. Amazon Virtual Private Cloud

b. Amazon Route 53

c. Amazon Machine Image

d. Amazon Instances

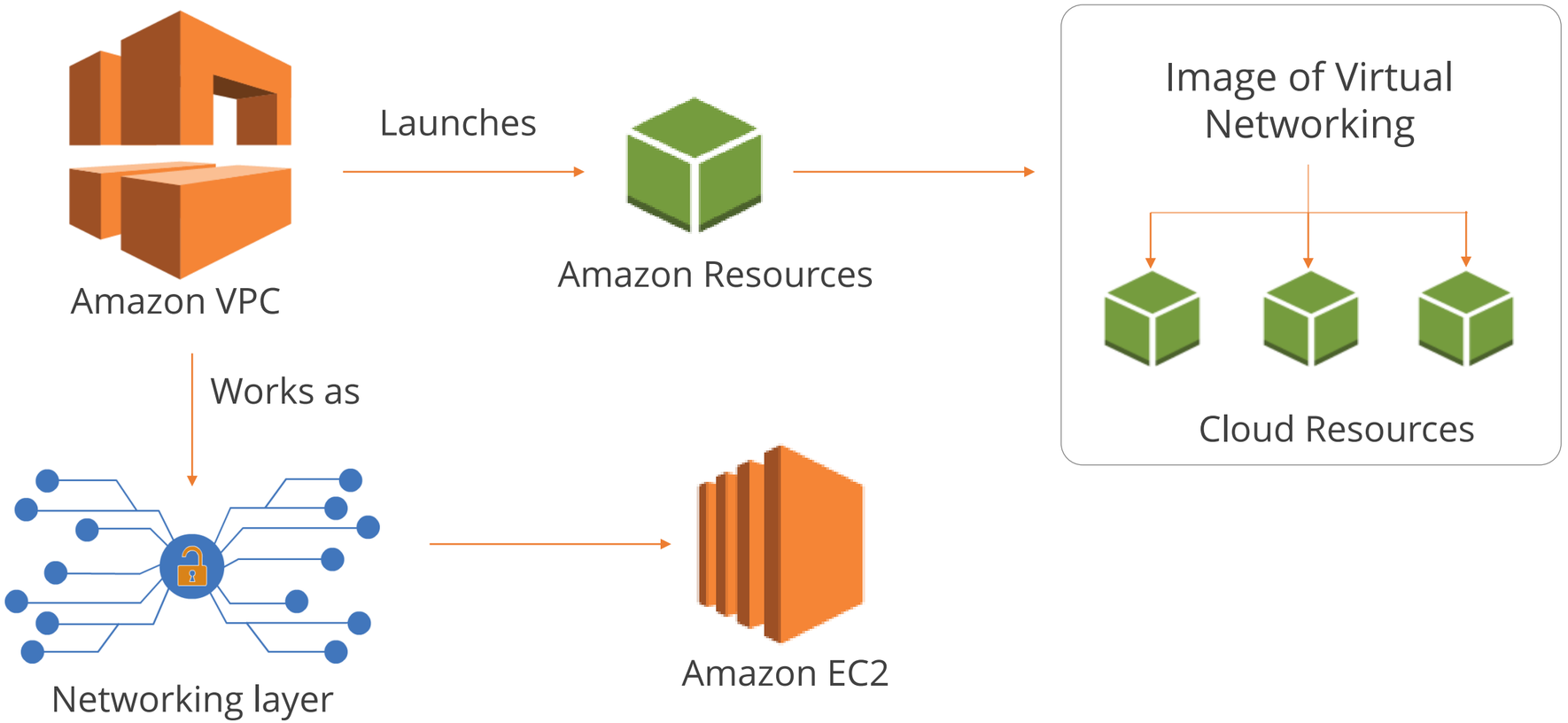
The correct answer is **a, b.**

Explanation: Amazon Virtual Private Cloud and Amazon Route 53 are the key Compute and Networking services.

Amazon Virtual Private Cloud

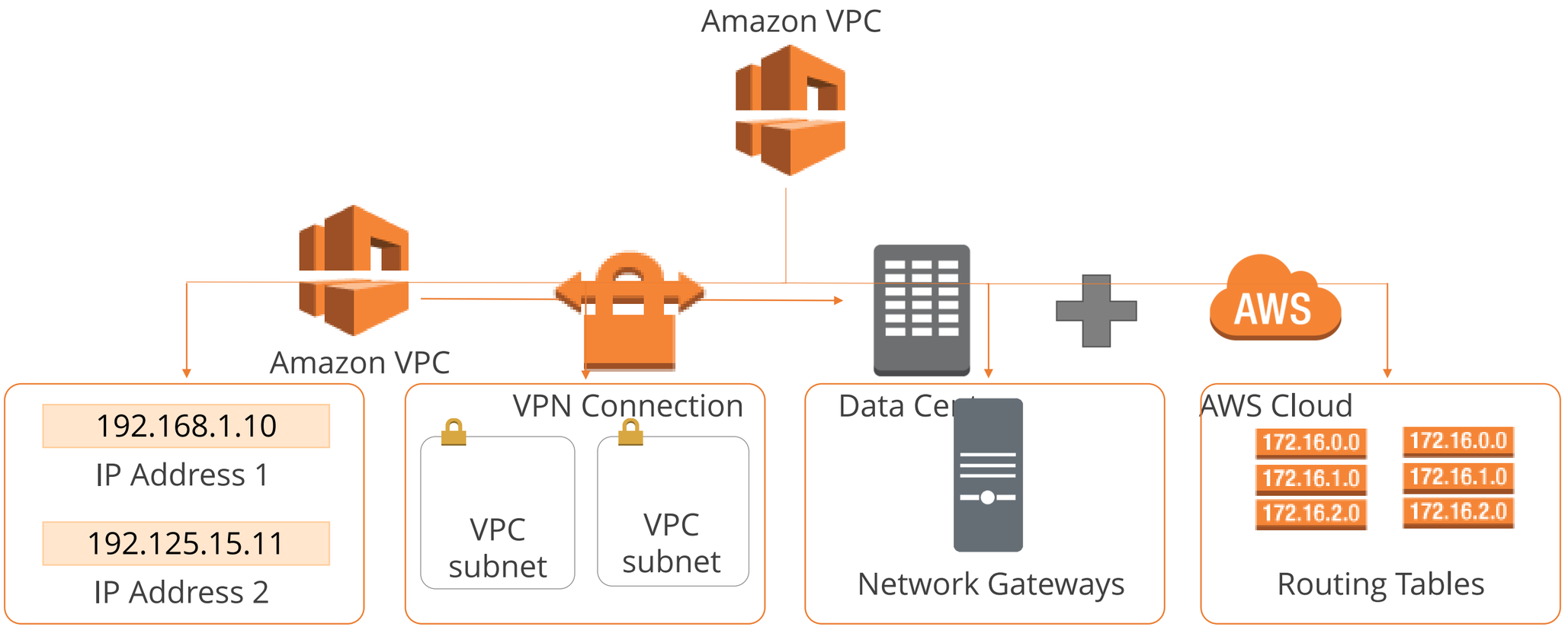
Overview of Amazon VPC

Amazon VPC allows launching AWS resources into the virtual network, which is a logically isolated area containing cloud resources.



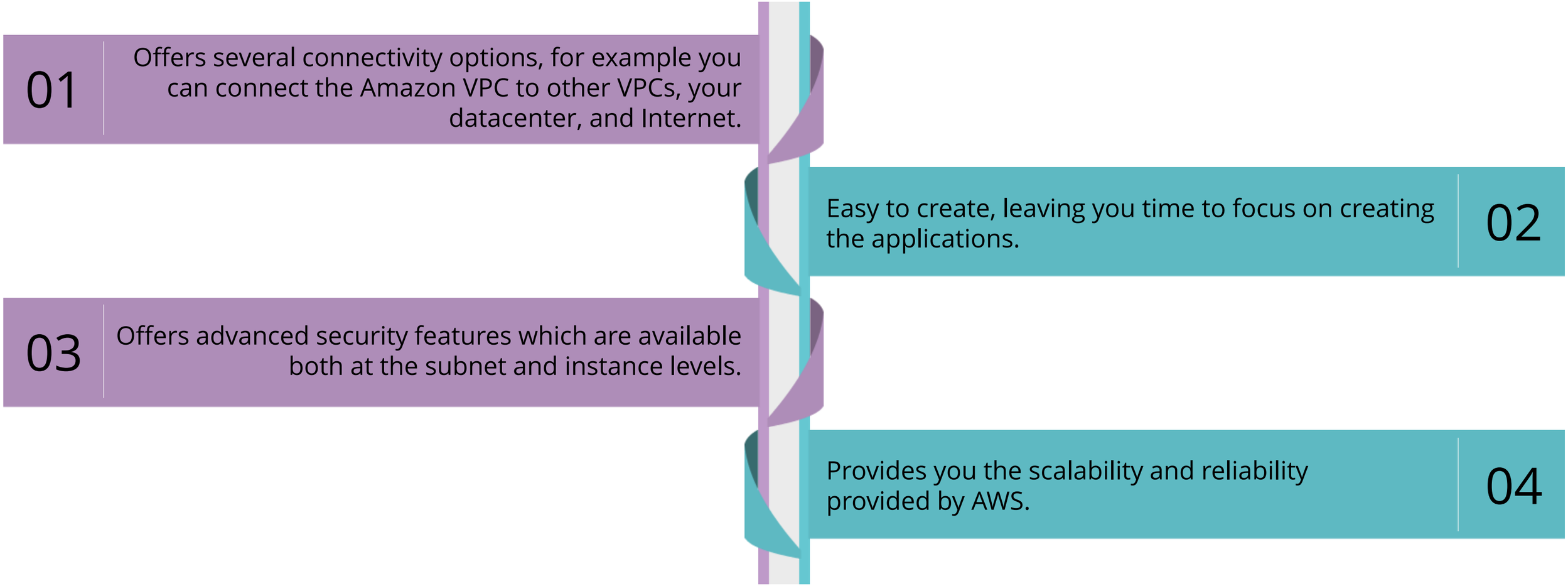
Amazon VPC service is similar to a traditional network but allows the use of the AWS infrastructure, and enjoy complete control over your virtual network.

Overview of Amazon VPC



With Amazon VPC, you can leverage several security layers by including Access Control Lists and different security groups.

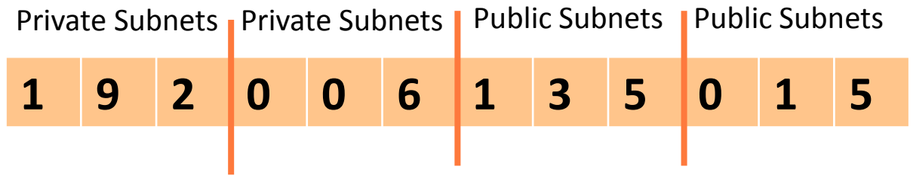
Benefits of Amazon VPC



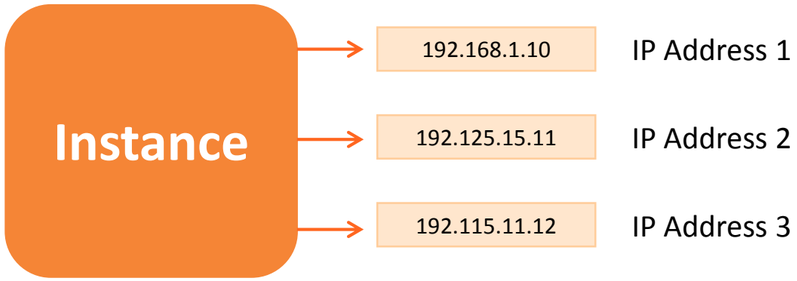
Benefits of Launching Instances into a VPC

By launching the instances into a VPC, you can:

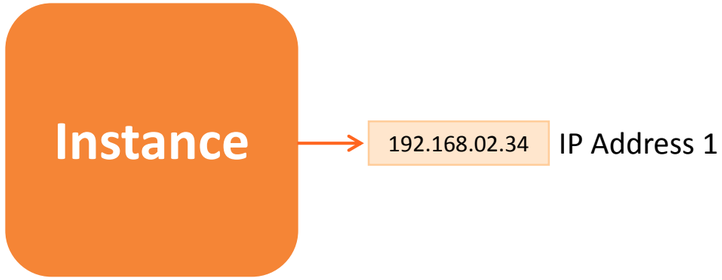
Run Instances on the hardware used by a single entity



Split the range of private IP addresses of VPC into one or more private or public subnets



Allocate multiple IP addresses to Instances



Allocate static private IP addresses to Instances

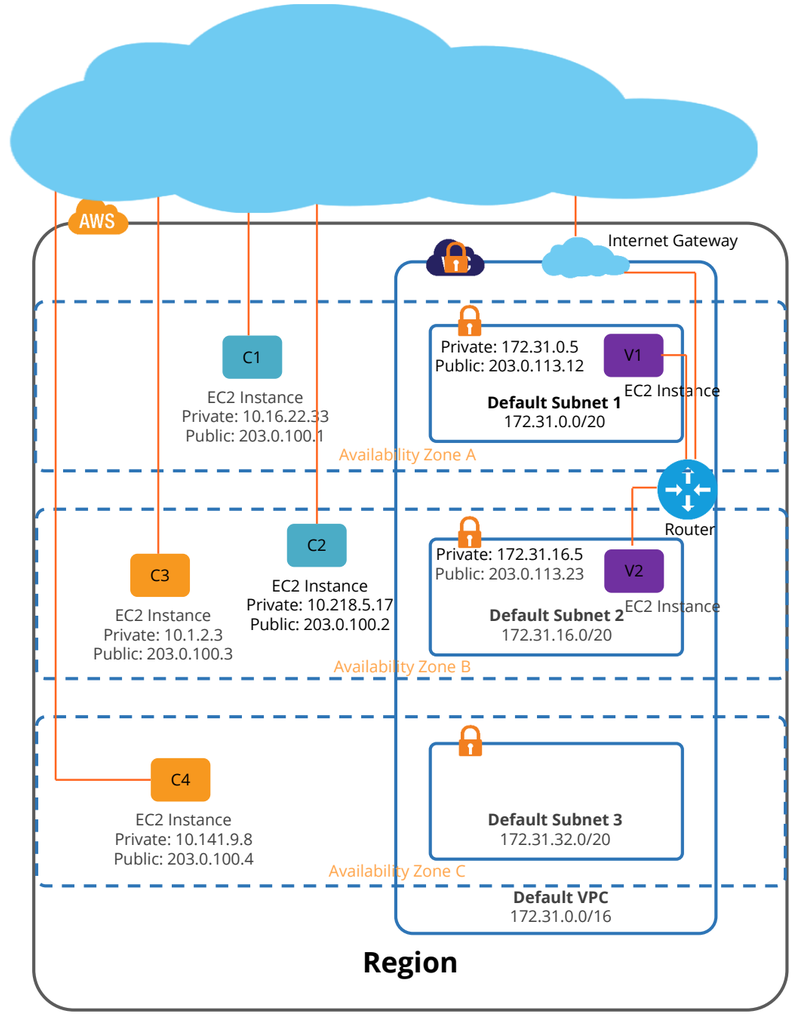
Default and Non-default VPCs

The default VPC contains a Subnet in each availability zone.

It is ready to use, offering advanced features of the EC2-VPC platform.

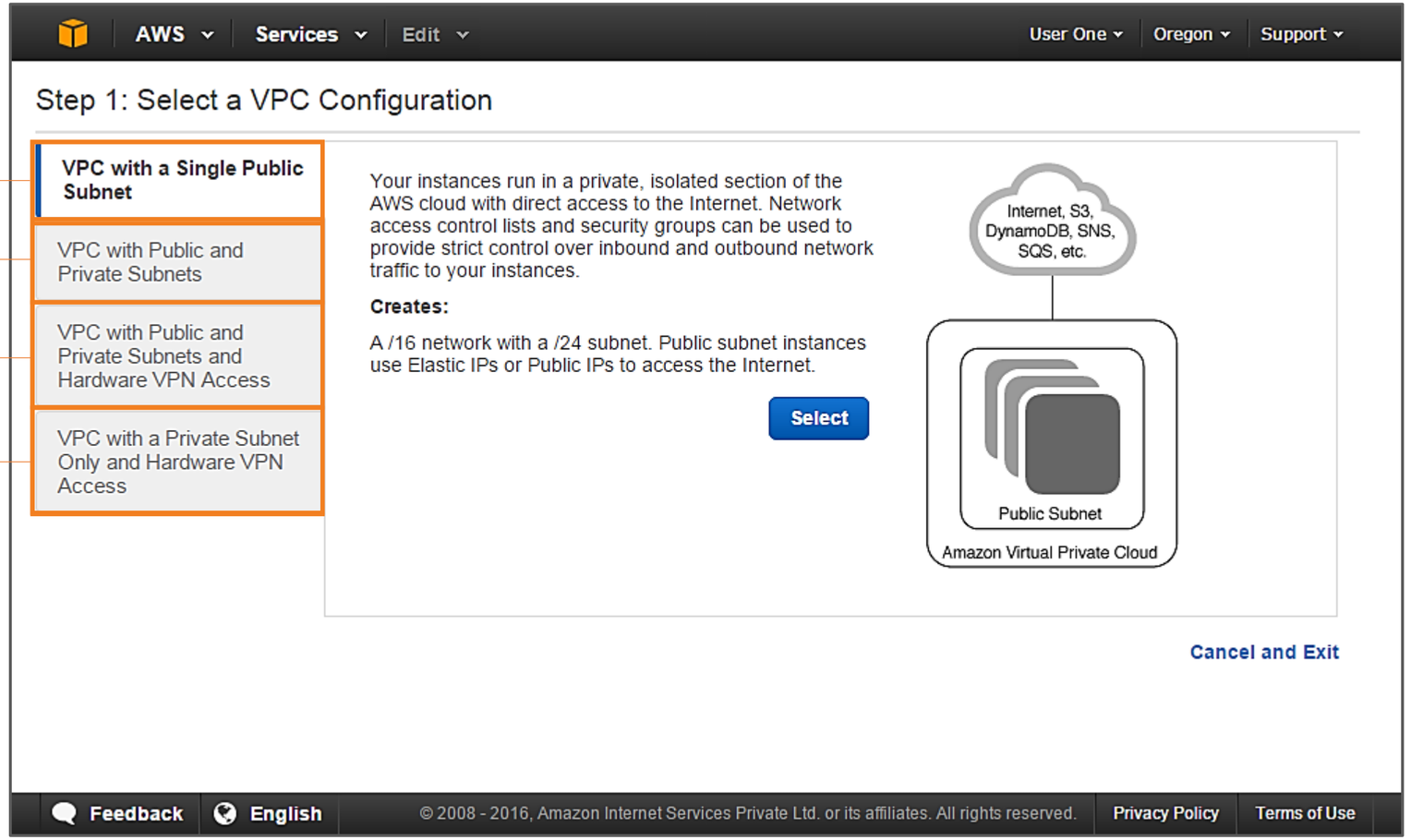
Even with an AWS account, you can create and configure a VPC as per your requirements.

Additional subnets in a default VPC and a non-default VPC are termed as Non-default Subnets.



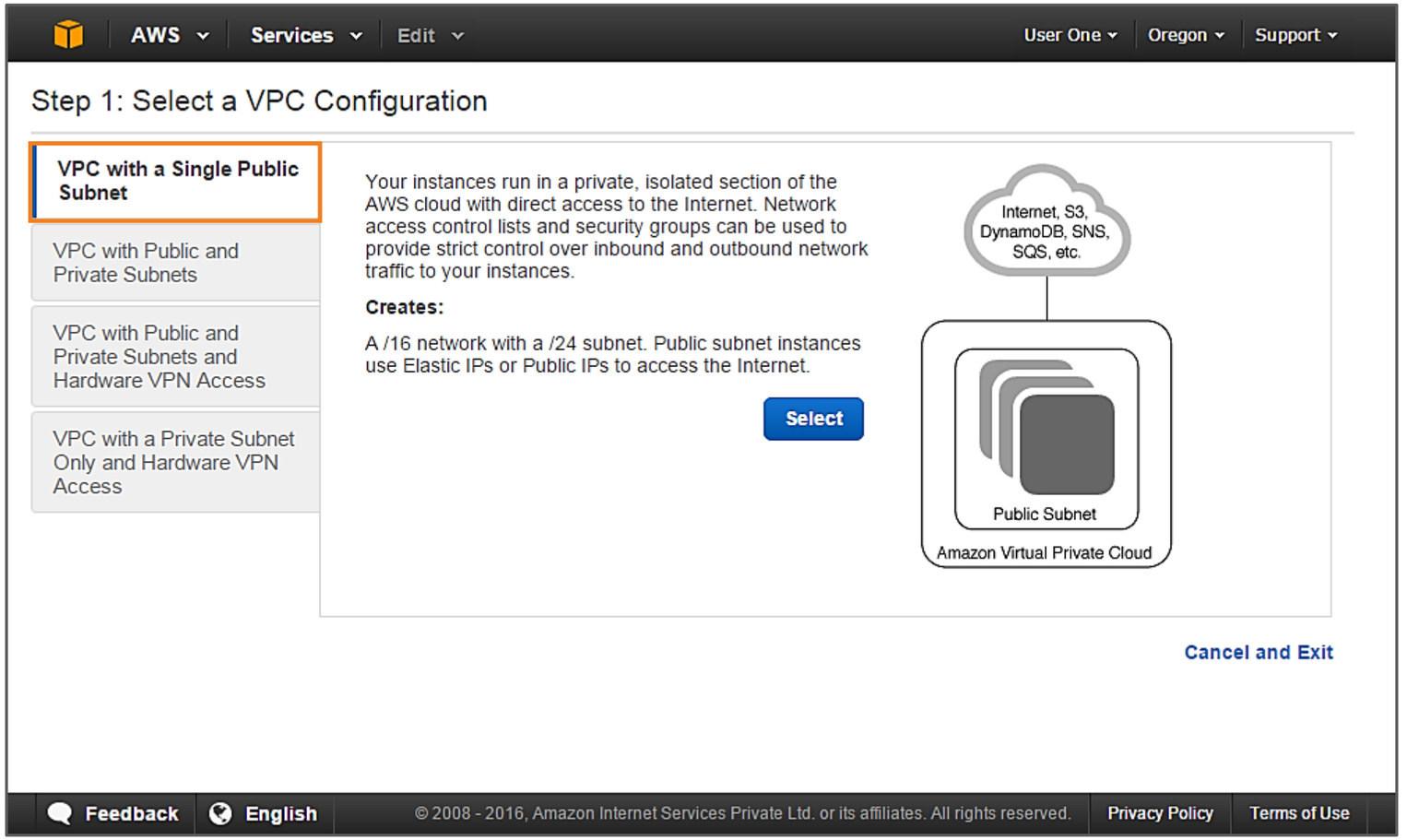
VPC Wizard Scenarios/VPC Use Cases

Select from the four scenarios – basic network topologies



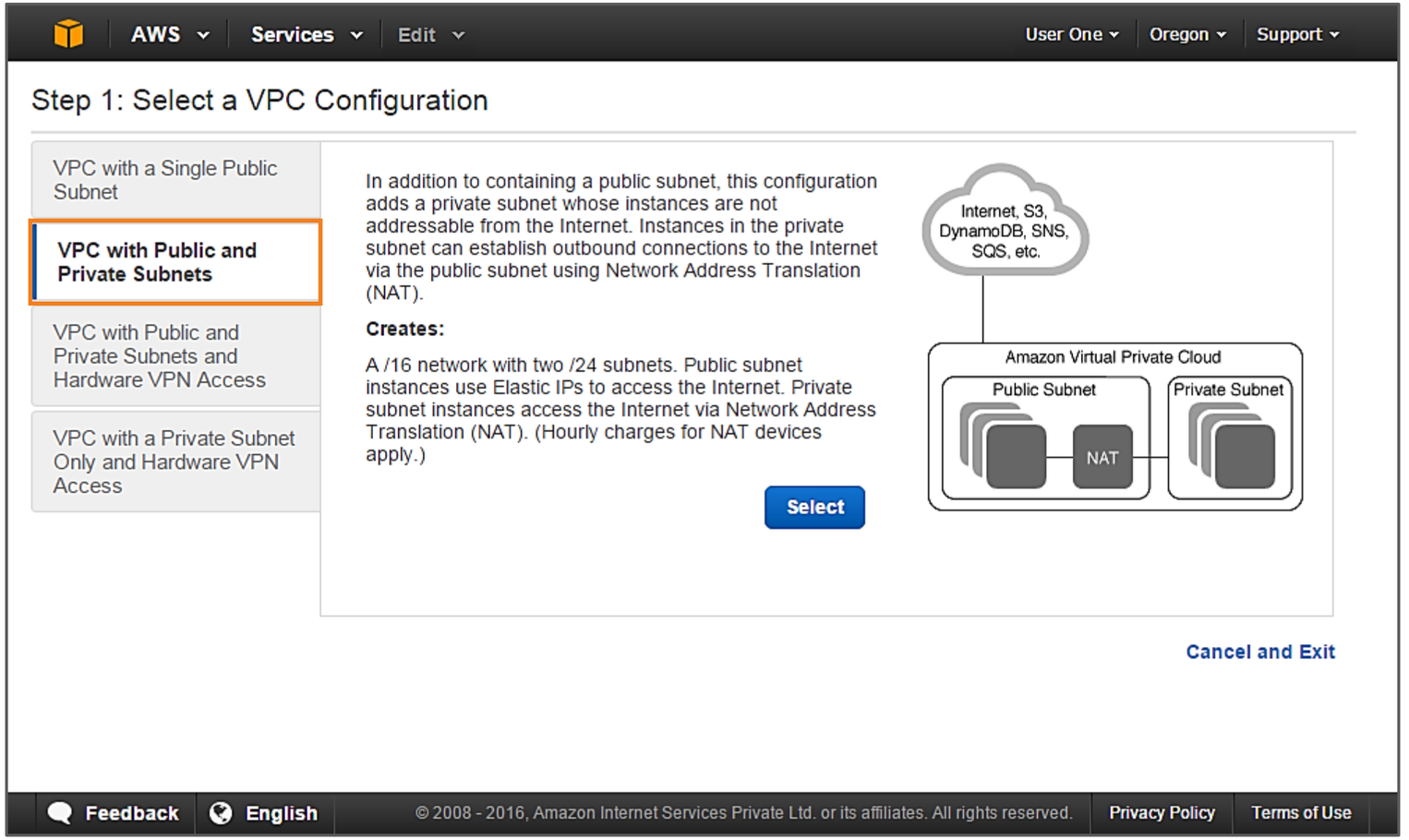
VPC with a Single Public Subnet

This allows running a single-tier Web application to be made publicly available, such as a simple Website or a blog.



VPC with Public and Private Subnets

This allows running a public Web application, and ensuring the private backend servers continue to run in another subnet.



VPC with Public and Private Subnets

The application servers and databases can be launched in the private subnets, and the web servers can be launched in the public subnets.

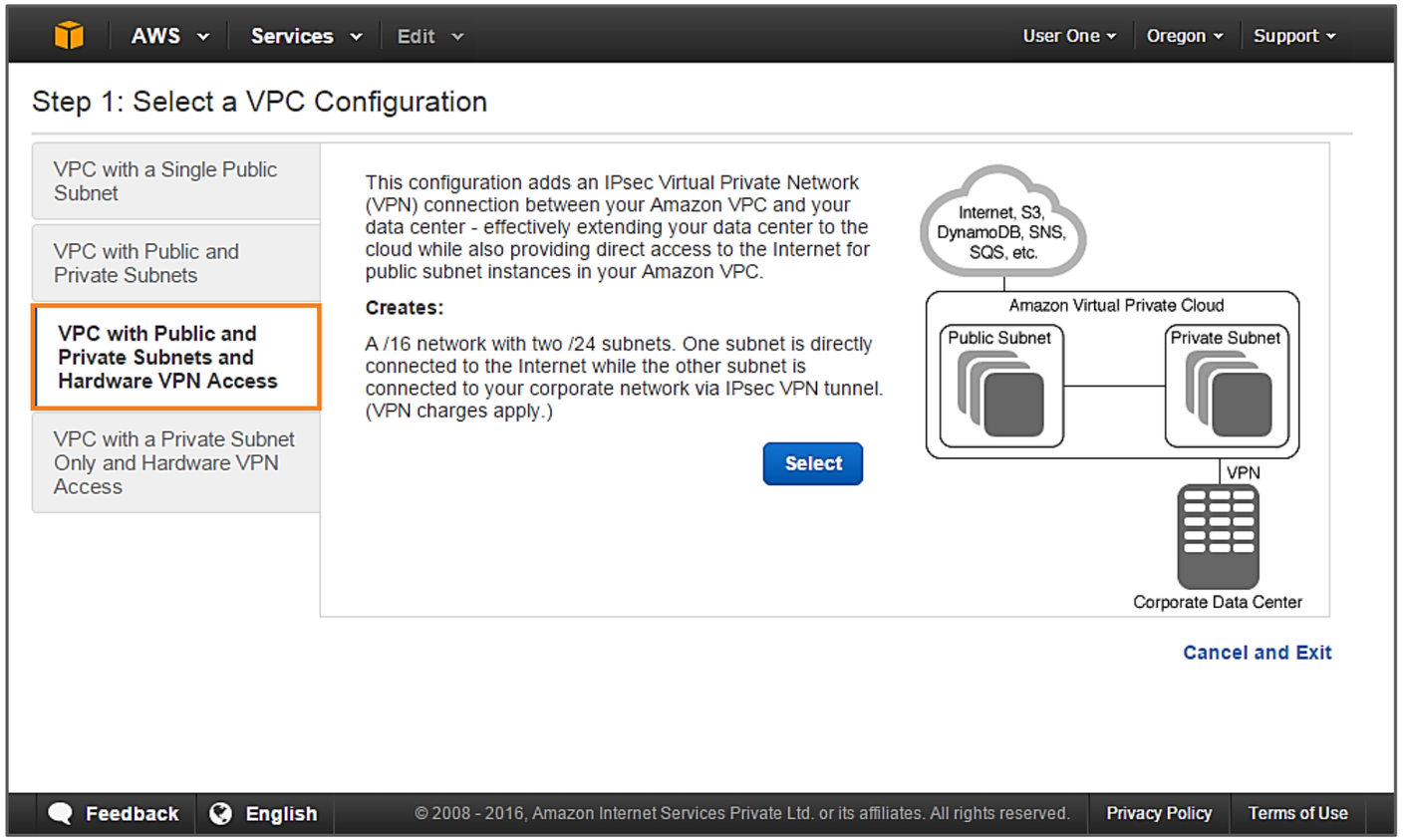
The application servers and databases access the Internet to download and install patches, when you set up a Network Address Translation.

The NAT Gateway lets Instances in a private subnet to connect to other AWS services, but does not allow the AWS services to connect with Instances in the private subnet.

VPC with Public and Private Subnets, and Hardware VPN Access

This allows accessing the World Wide Web directly from your VPC, and facilitates expanding your data center into the AWS cloud.

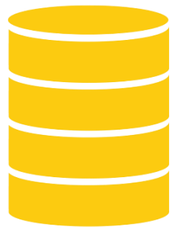
Consider this option for hosting scalable Web applications connected to your data center.



VPC with Public and Private Subnets, and Hardware VPN Access

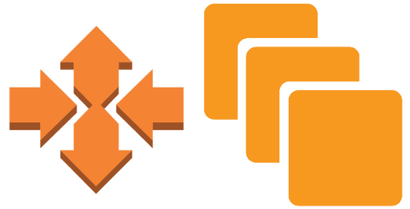
This topology allows creating a VPC, where instances such as Web servers in a subnet connect to the World Wide Web.

Application servers in other subnet



Communicate with Databases

Application servers and Web servers can take the benefits



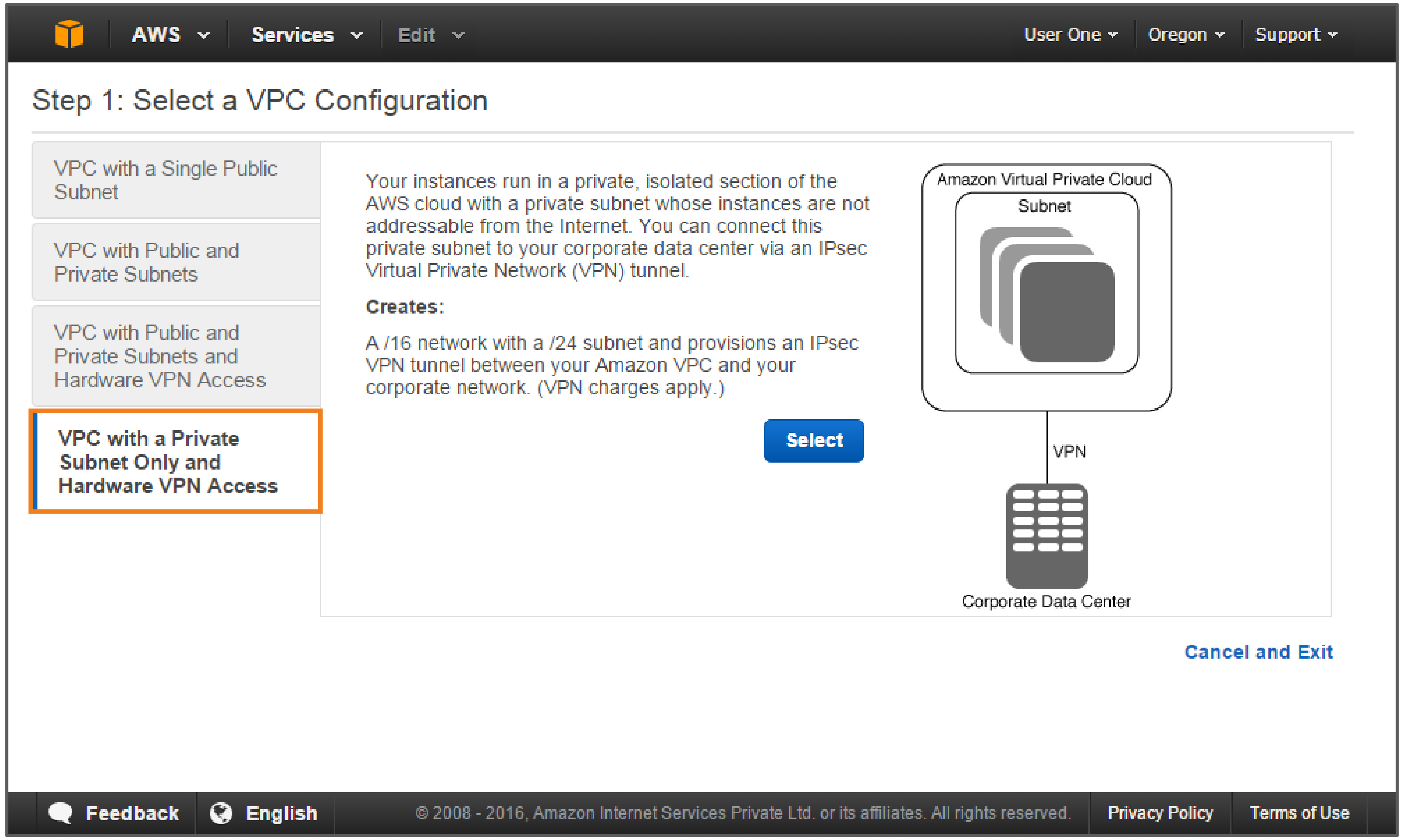
Auto Scaling and Amazon EC2 features

To secure all communications between the databases in your data center and application servers in the cloud, you can set up an Internet Protocol Security, or IPSec VPN connection between them.

VPC with a Private Subnet Only, and Hardware VPN Access

By hosting your VPC behind the firewall, you can effectively move the IT resources into the cloud, without modifying how the end users access the AWS VPC.

This allows leveraging the infrastructure of AWS without exposing your network to the World Wide Web, and facilitates expanding your data center into the AWS cloud.



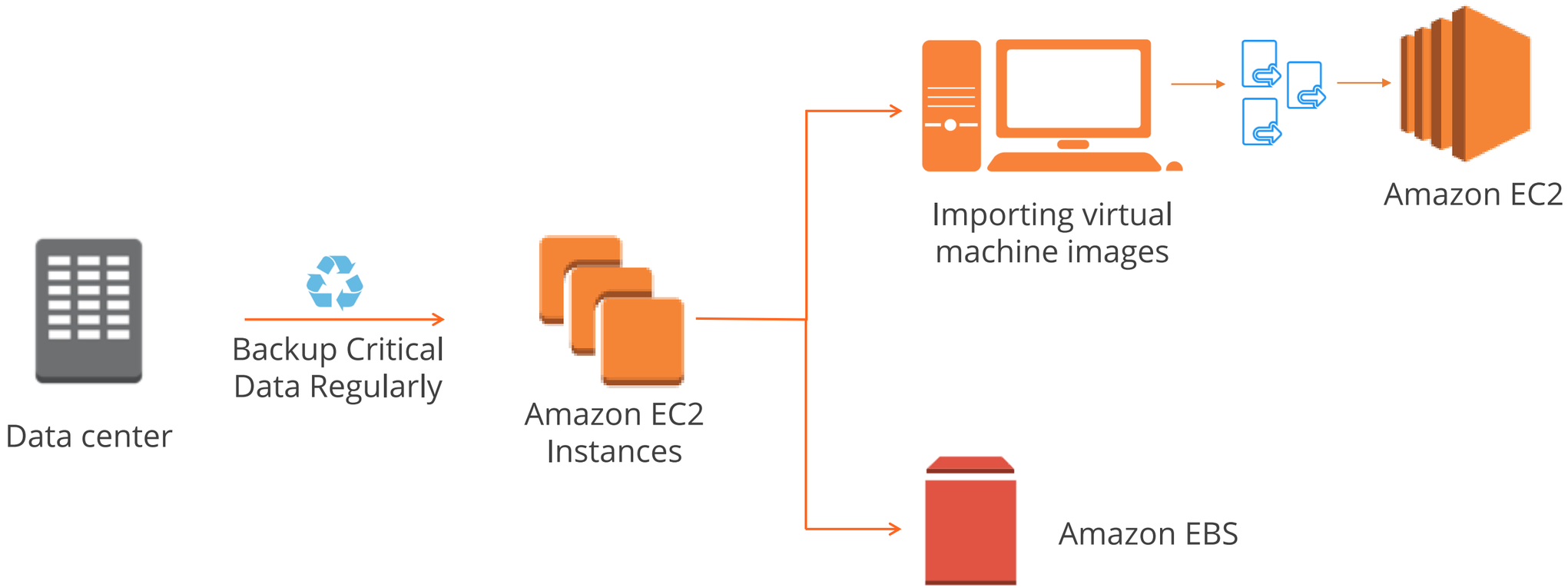
Demo 01—Creating or Accessing Amazon VPC

(Refer to the E-Learning course: Screen Number – 4.5)

Demonstrate how to create or access Amazon VPC.

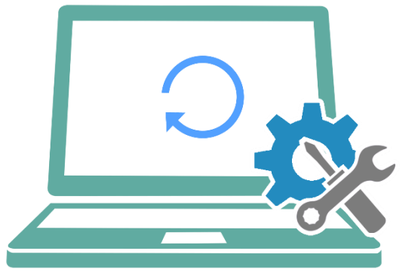
VPC for Disaster Recovery

Using Amazon VPC to recover from a disaster, you get all the facilities and advantages of a disaster recovery site at a fraction of the actual cost.

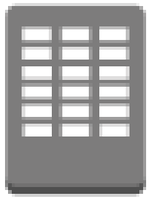


VPC for Disaster Recovery

Disaster in a
Data center



Launch replacement
compute capacity



Restore data to the Datacenter

Knowledge Check

KNOWLEDGE CHECK 1

Which of the following Amazon Web Services does not imply additional charges?

a. Amazon ELB

b. Amazon VPC

c. Amazon Route 53

d. Amazon Machine Image

KNOWLEDGE CHECK

Which of the following Amazon Web Services does not imply additional charges?

a. Amazon ELB

b. Amazon VPC

c. Amazon Route 53

d. Amazon Machine Image

The correct answer is **b.**

Explanation: There are no additional costs to use the Amazon VPC service.

KNOWLEDGE CHECK 2

Identify the VPC scenario that allows running a public Web application, and ensures the private backend servers continue to run in another Subnet.

a. VPC with a Single Private Subnet

b. VPC with Public and Private Subnets

c. VPC with Public and Private Hardware VPN Access

d. VPC with a Private Subnet Only

KNOWLEDGE CHECK

Identify the VPC scenario that allows running a public Web application, and ensures the private backend servers continue to run in another Subnet.

a. VPC with a Single Private Subnet

b. VPC with Public and Private Subnets

c. VPC with Public and Private Hardware VPN Access

d. VPC with a Private Subnet Only

The correct answer is **b.**

Explanation: The VPC with Public and Private Subnets allows running a public Web application, and ensures the private backend servers continue to run in another Subnet.

Amazon EC2 Instances

Amazon EC2 – in Detail

Amazon EC2 is a Web service that offers scalable computing capacity servers in the AWS data centers.

01	Eliminates the upfront payment for the hardware.
02	Facilitates faster development and deployment of software applications.
03	Introduces thousands of server instances in minutes.
04	Manages storage and configures networking and security parameters.
05	Scales capacity and tracks requirement changes
06	Ensures easy and scalable cloud computing.

Benefits of Amazon EC2

1. Elastic or Scalable Web-scale Computing

2. Full Control over Server Instances

3. Flexibility in using services for hosting in the cloud

4. Quick availability of instances

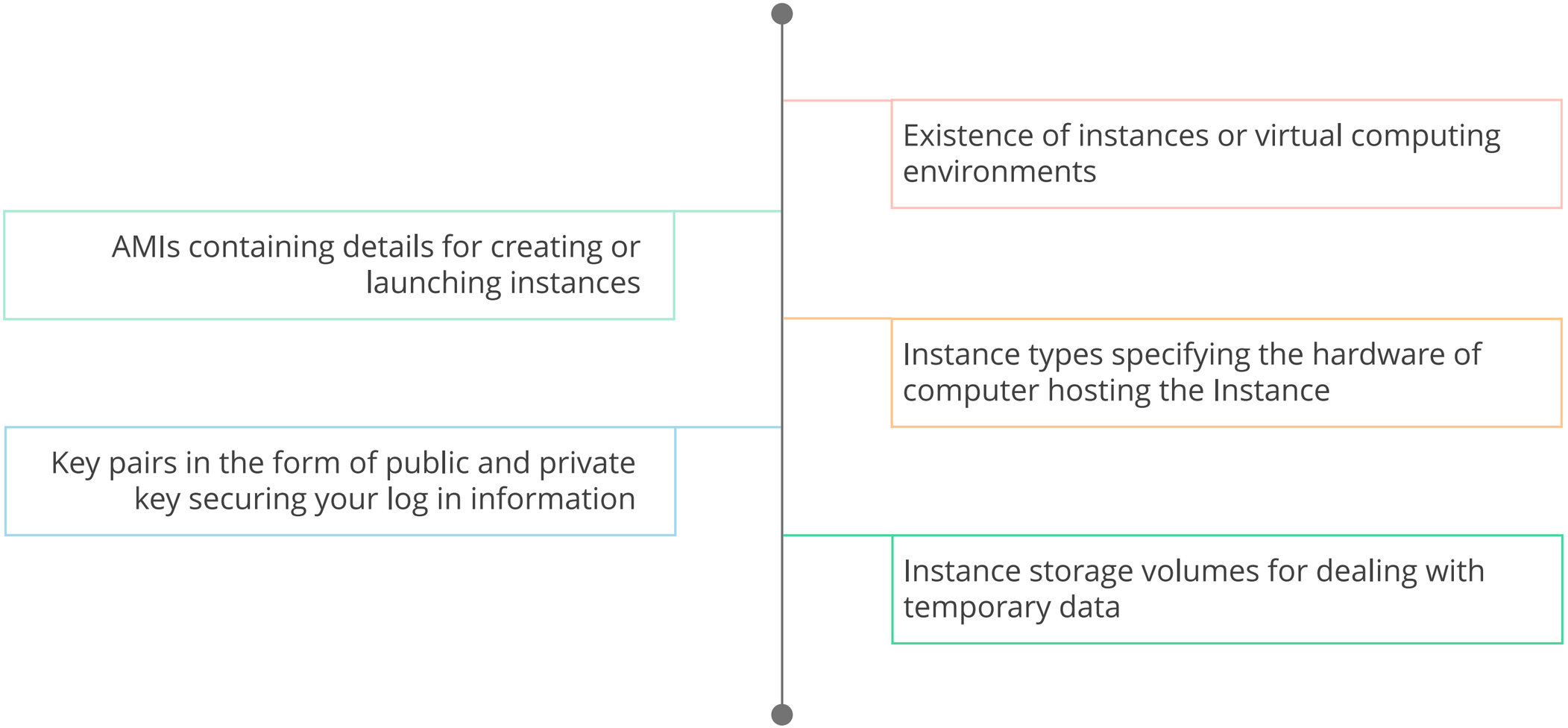
5. Security for your computing resources

6. Low rates for the used computing capacity

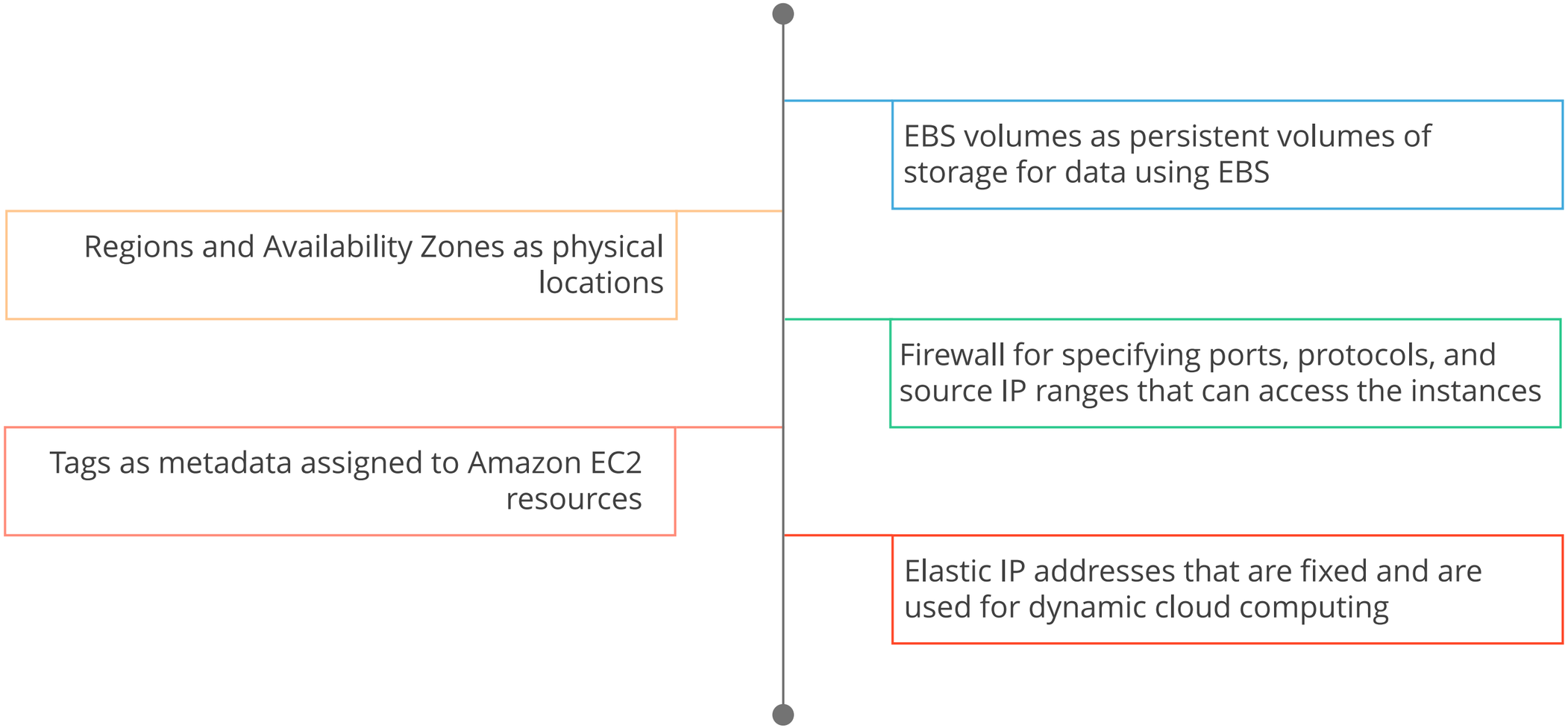
7. Ease of use

8. Compatibility of EC2 with other AWS services

Features of Amazon EC2



Features of Amazon EC2

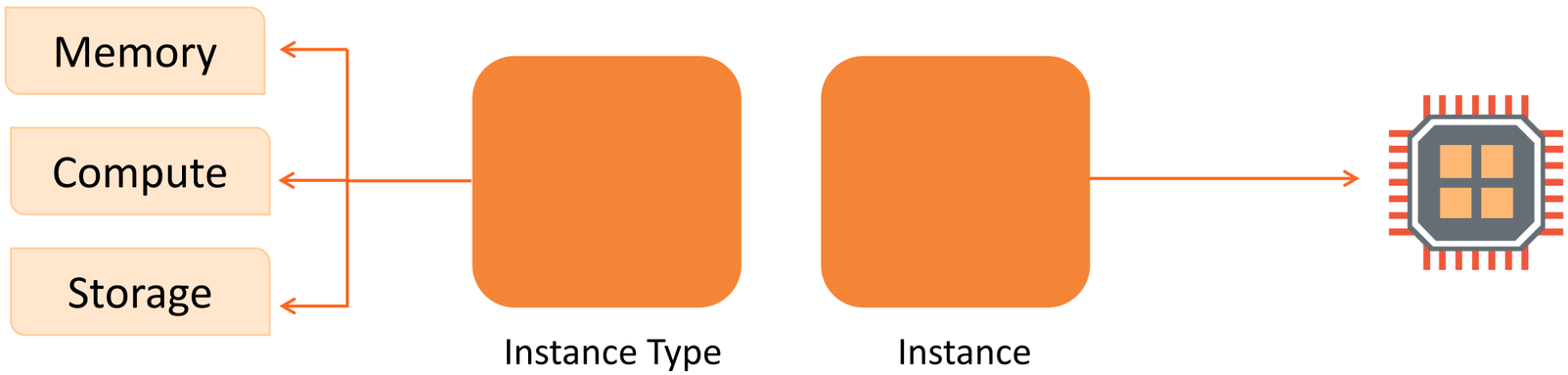


Overview of Instance Types

Amazon EC2 instance refers to a virtual server in the cloud.

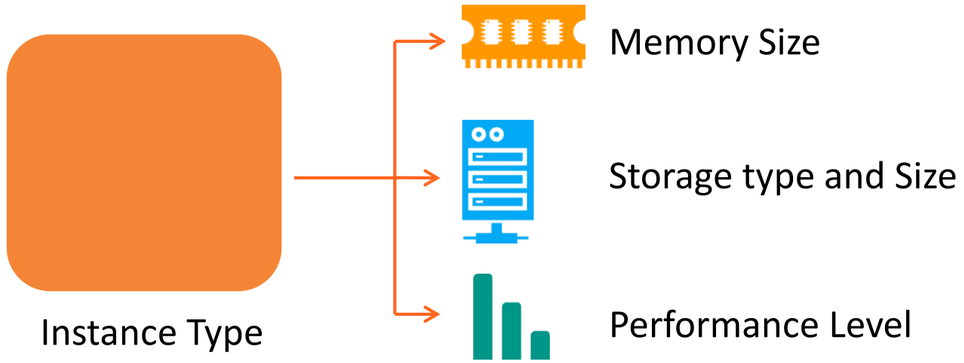
Configure the applications and operating system that need to run on instance

Launch an instance type determining the host computer hardware used for instance

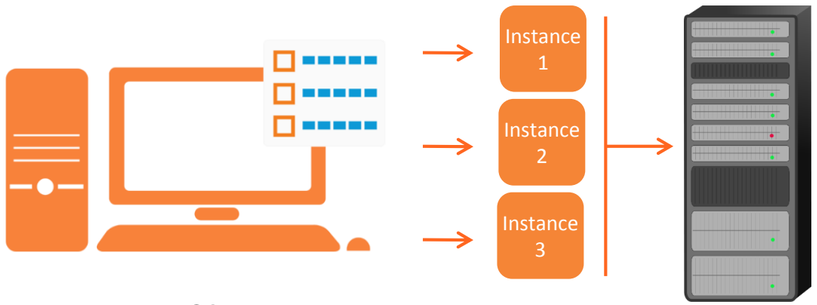


Overview of Instance Types

Each instance type comes with single or multiple sizes, enabling you to scale the resources.



Through instance types,
Amazon EC2 allots resources



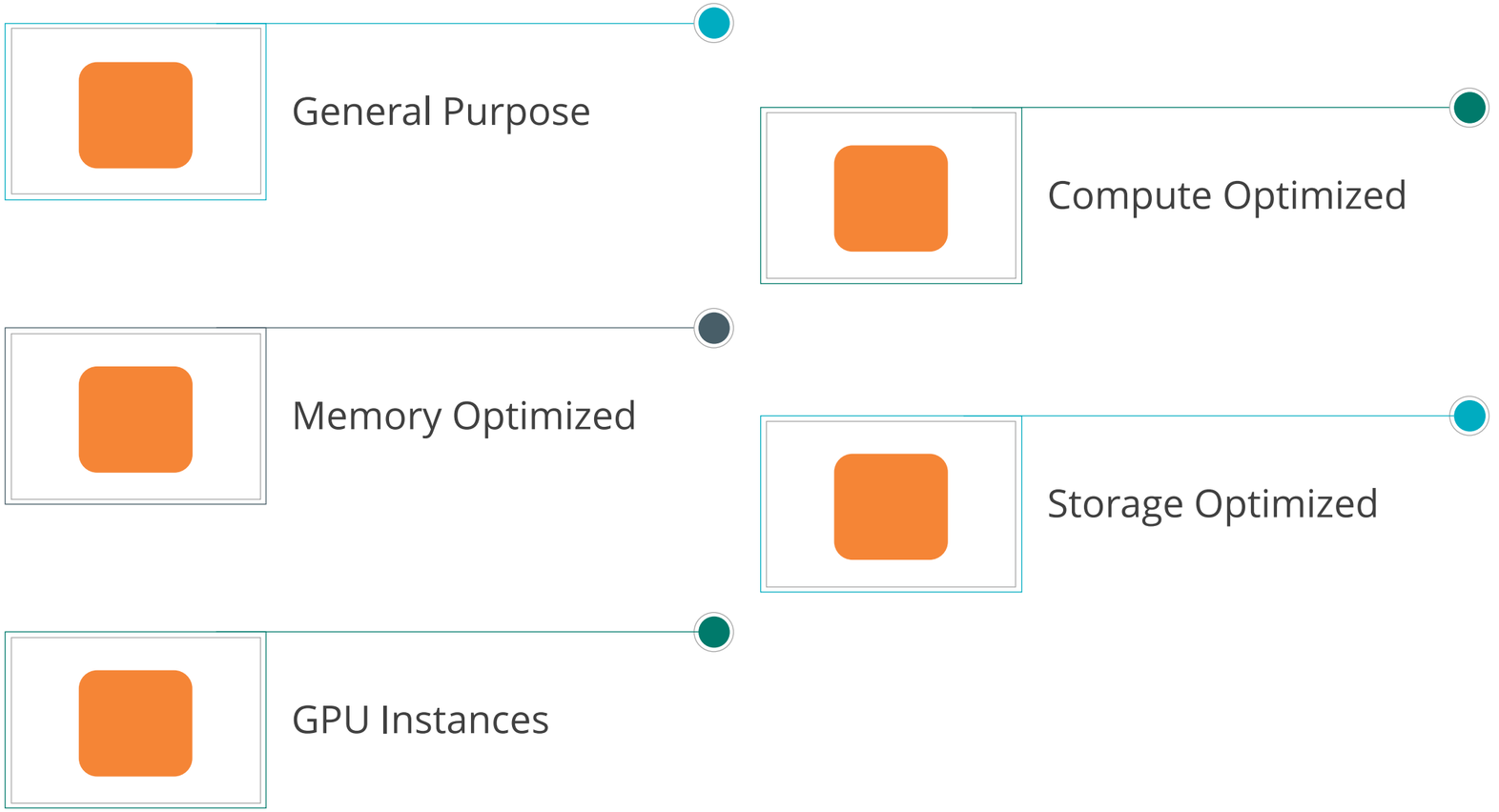
Other resources of host computer such are shared across instances

Disk Subsystem

In case a resource is not fully utilized, an instance gains a higher share of that resource.

Available Instance Types

Both current and previous generation instance types are split into five instance families, namely:



The previous generation types also have one more family called Micro Instance types, which are more expensive than a few general purpose instance types.

General Purpose Instance Types

T2 instance types ensure CPU performance at the predetermined baseline, but are capable of bursting above the baseline, for tackling the workload.

1

- t2.micro (eligible for Free Tier use)
- t2.small
- t2.medium
- t2.large

M3 instance types ensure a balance of compute, network, and memory resources.

2

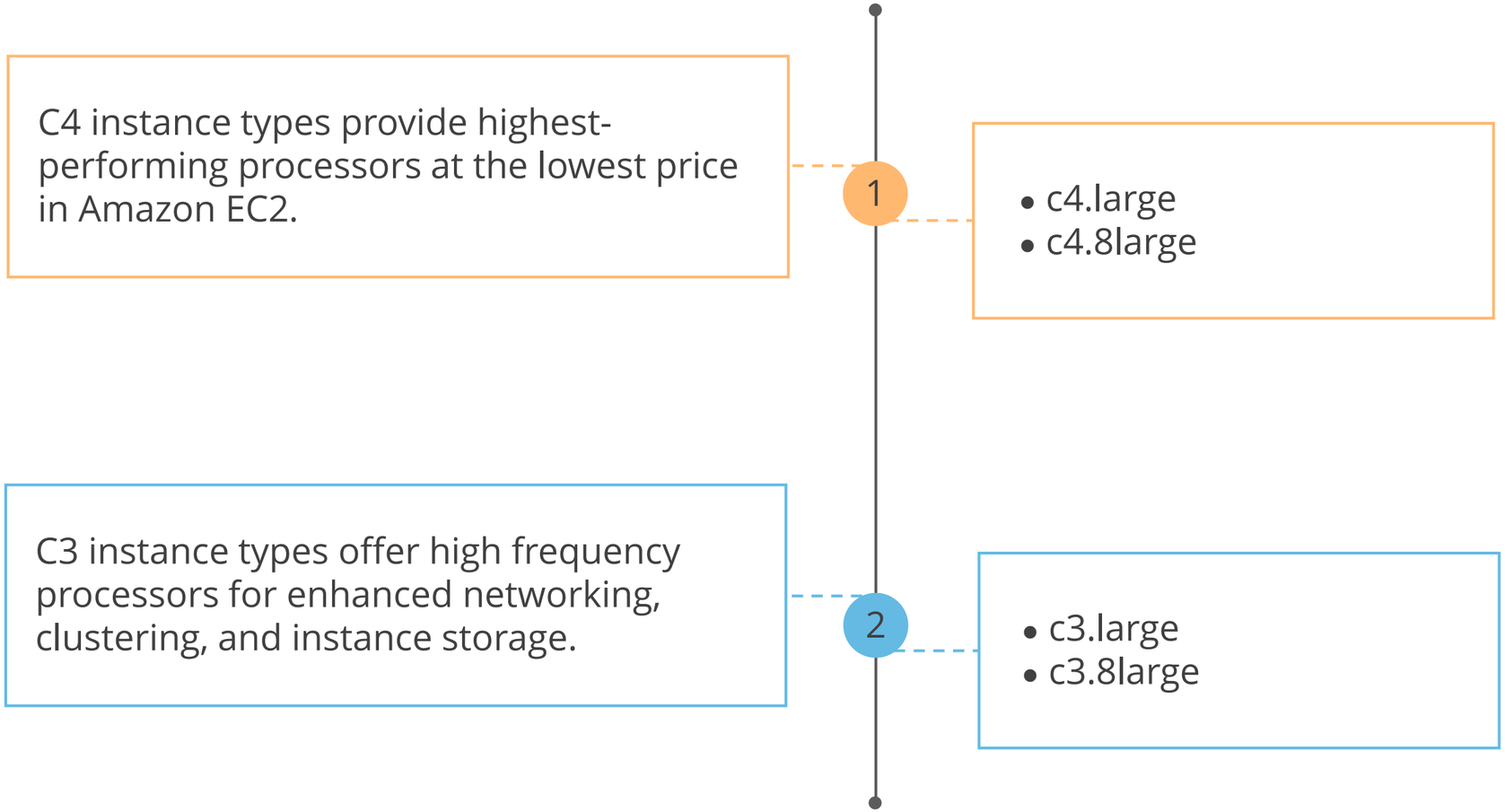
- m3.medium
- m3.xlarge
- m3.2xlarge

M4 instance types ensure a balance of memory, computer, and network resources. It can be used for mid-size databases, processing tasks that need more memory, and for cluster computing.

3

- m4.large
- m4.xlarge
- m4.10xlarge

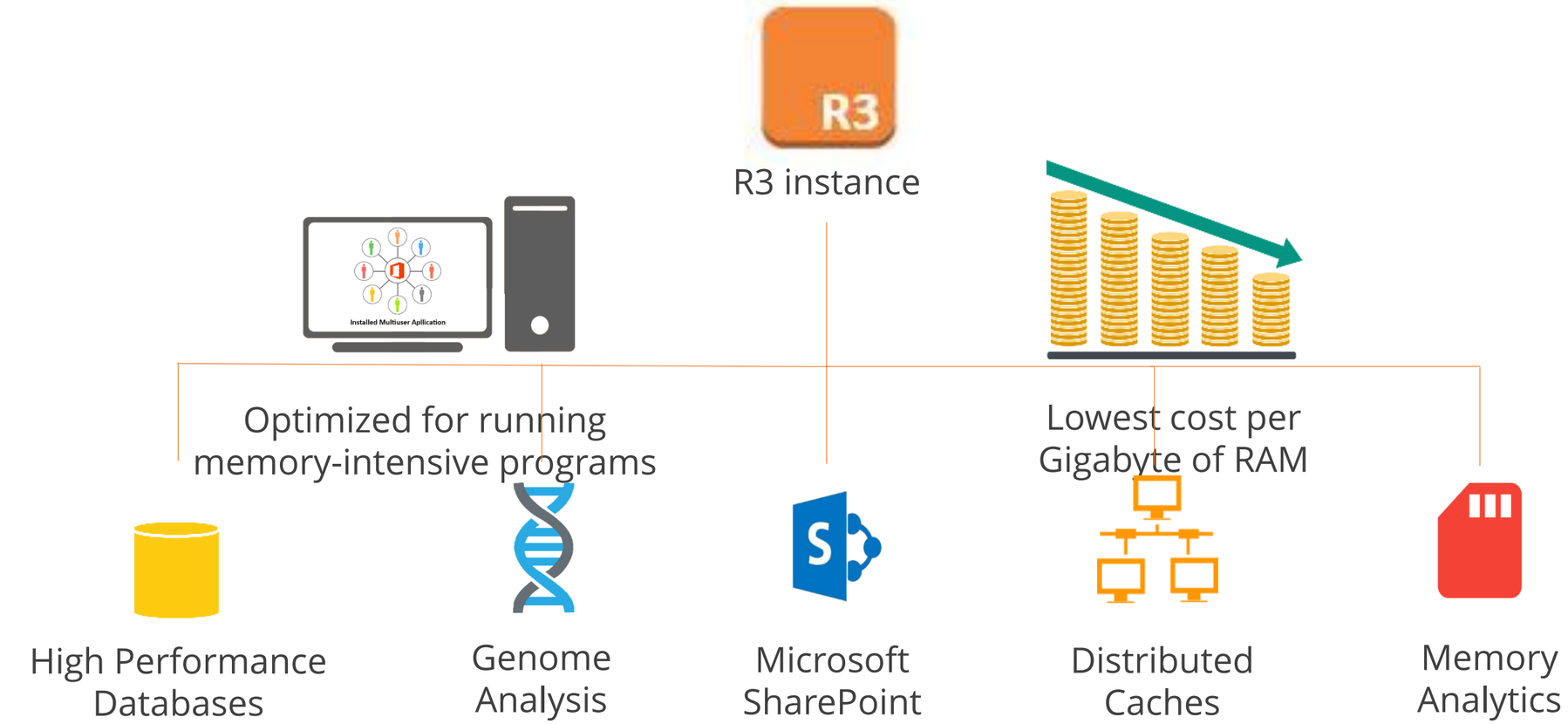
General Purpose Instance Types



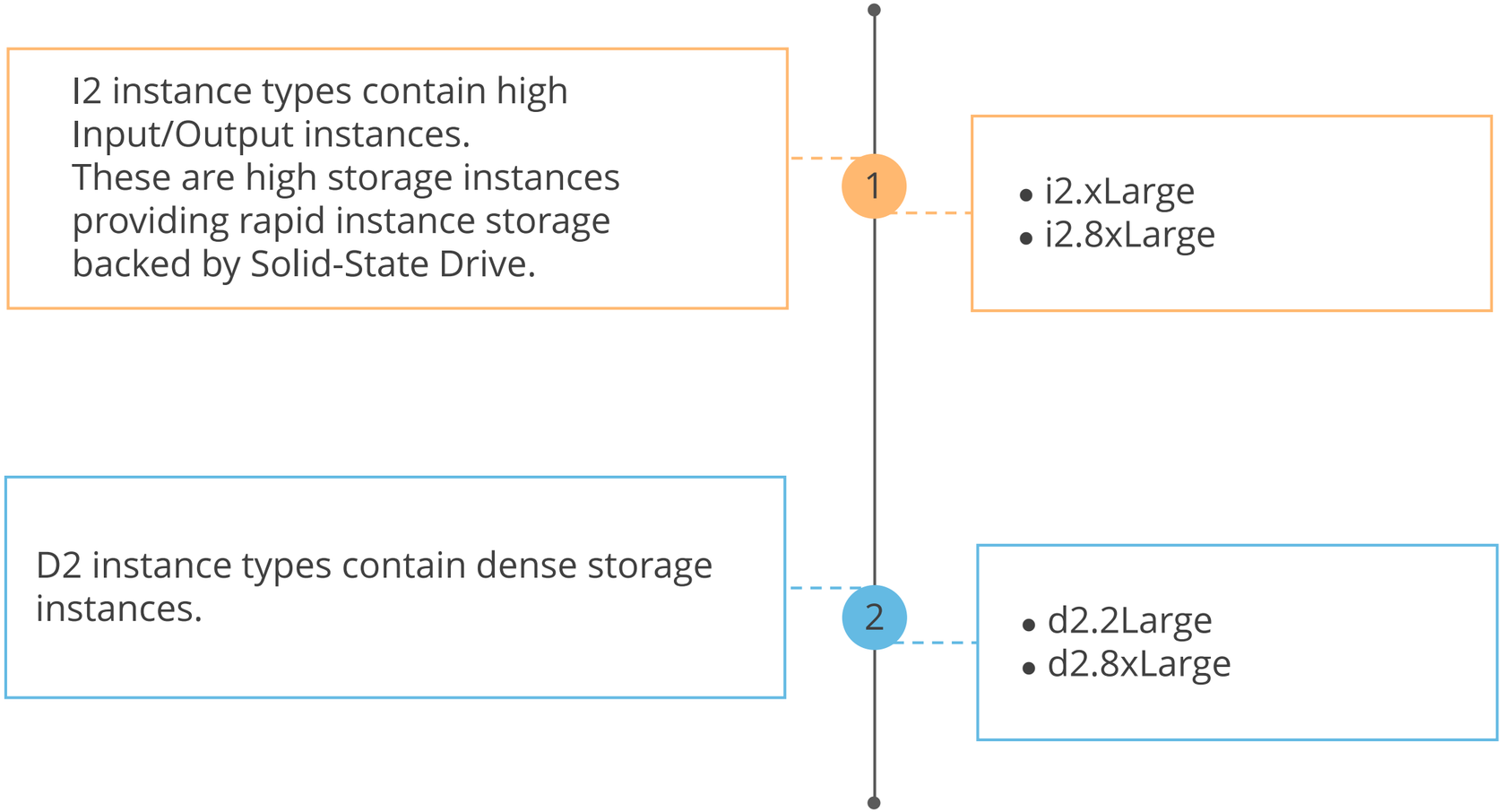
Memory Optimized Instance Types

The memory optimized family contains only R3 instances.

These instances are:



General Purpose Instance Types



Additional Instance Types

On-demand Instances	When you launch these instances, you pay by the hour.
Reserved Instances	You can purchase these at a considerable discount, and employ them for one month to three years.
Scheduled Instances	These are always available for one year, and as per the specific recurring schedule.
Spot Instances	These are unused instances on which you bid. You can launch them as long as they are available. Spot instances are affordable if you are flexible about the timings to run your applications.

Describing Instances

Amazon EC2 supports two platforms, namely EC2 Classic and EC2 VPC.

Classic Platform

Runs all instances in a flat network shared with other customers

VPC Platform

Runs all instances in a Virtual Private Cloud

AWS Account

Classic Platform

Network shared

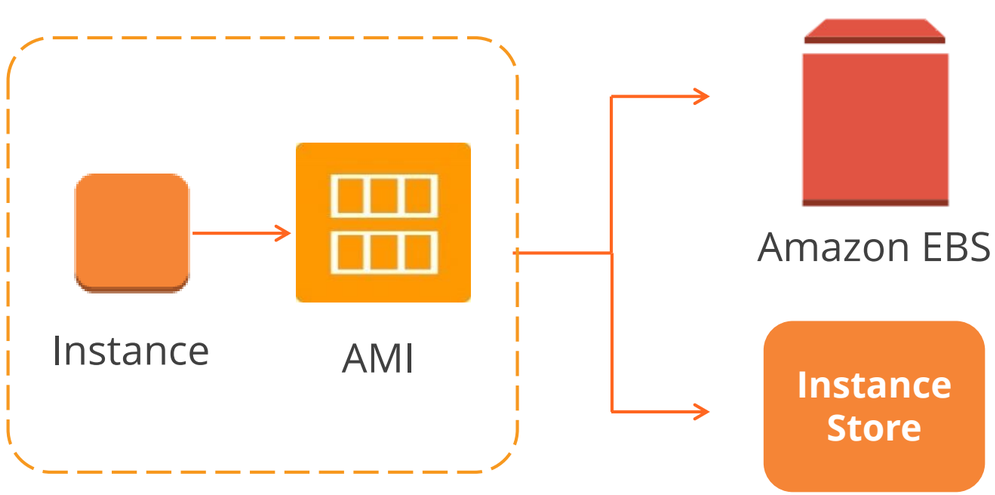
Virtual Private Cloud

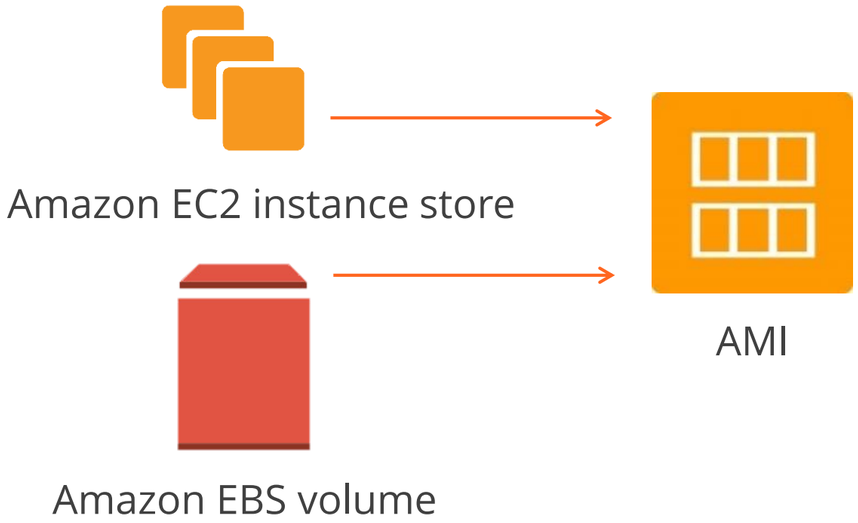
AWS Account

VPC Platform

Virtual Private Cloud

Describing Instances

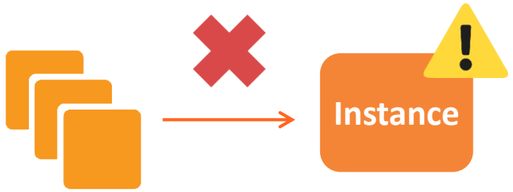




Describing Instances

When an instance fails or terminates:

Can restore an Instance backed by Amazon EBS



Cannot restore an instance backed by the instance store

Specify and configure the instance type, storage device settings, tags, and security groups

While launching the instance, you can secure it by stating a key pair comprising public and private keys. You would need the private key to connect to the instance.

Demo 02—Creating an Amazon EC2 Instance

(Refer to the E-Learning course: Screen Number – 4.9)

Demonstrate how to create an Amazon EC2 Instance.

Knowledge Check

KNOWLEDGE CHECK 1

Each Instance type comes with only a single size, enabling you to scale resources.

a. True

b. False

KNOWLEDGE CHECK 1	Each Instance type comes with only a single size, enabling you to scale resources.

a. True

b. False

The correct answer is **b.**

Explanation: Instances with different sizes enables you to scale resources. They comprise of CPU, memory, storage, and networking capacity, and allow you to choose the proper mix of resources for your applications.

KNOWLEDGE CHECK 2

R3 Instance is a type of _____ family.

a. Compute Optimized

b. General Purpose

c. Memory Optimized

d. Storage Optimized

KNOWLEDGE CHECK

R3 Instance is a type of _____ family.

a. Compute Optimized

b. General Purpose

c. Memory Optimized

d. Storage Optimized

The correct answer is **c.**

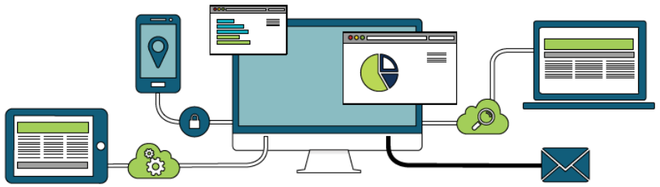
Explanation: The memory optimized family contains only R3 Instances. These are optimized for running memory-intensive programs.

Amazon EBS Volumes and Snapshots

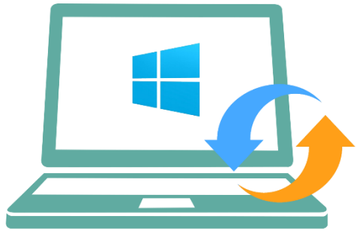
Overview of Amazon EBS Volumes

An Amazon EBS volume refers to a durable storage device attached to an Amazon EC2 instance in the same Availability Zone.

It acts as primary data storage that needs regular updates.



Data Availability



Data Backups

Benefits of EBS volume

Data Persistence

Data Security

Types of EBS Volumes

Amazon EBS offers different volume types based on price and performance. You can choose and customize as per your application requirements.

The General Purpose SSD Volumes offer affordable storage perfect for virtual desktops, development and testing, system boot volumes, and small to medium databases.

- Size ranges from 1 Gibibyte to 16 Tebibytes.
- Ensure low latency in milliseconds.
- Burst their ability up to 3,000 IOPS.
- Provide baseline performance of 10,000 IOPS.
- Features a throughput of up to 128 Mebibytes/sec for volume sizes, =< 170 Gibibytes.

Types of EBS Volumes

Amazon EBS offers different volume types based on price and performance. You can choose and customize as per your application requirements.

Provisioned IOPS SSD Volumes are best for I/O-intensive workloads, mainly those of large databases, for example, Oracle and MySQL, and other critical applications demanding constant I-OPS performance.

- Enables you to define the I-OPS rate and it delivers within 10% of the IOPS performance rate 99.9 percent of the time in a year.
- You can specify up to 20,000 IOPS/volume, with volume size ranging from 4-16 Tebibytes, while the throughput range is up to 320 Mebibytes/sec.

The Magnetic Volumes are perfect where the emphasis is on least possible storage cost, and workloads where data is accessed rarely.

- Deliver almost 100 I-OPS and are capable of bursting up to hundreds of IOPS.
- Size ranges from 1 Gibibyte to 1 Tebibyte.
- The maximum throughput of magnetic volumes is around 40 to 90 Mebibytes per second.

Demo 03—Creating an EBS volume using the Amazon EC2 console

(Refer to the E-Learning course: Screen Number – 4.12)

Demonstrate how to create an EBS volume using the Amazon EC2 console, and attaching it to an Instance.

Demo 04—Attaching an Amazon EBS Volume to an Instance

(Refer to the E-Learning course: Screen Number – 4.13)

Demonstrate how to attach an Amazon EBS Volume to an Instance

EBS Snapshots

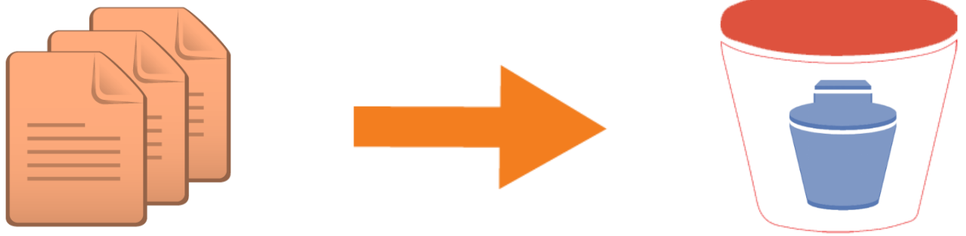
You can create EBS Snapshots or backups of any Amazon EBS volume, and copy the volume's data in Amazon S3.

In Amazon S3:

Data is stored redundantly in several AZs

No need to attach the EBS volume

While copying Snapshots to Amazon S3:

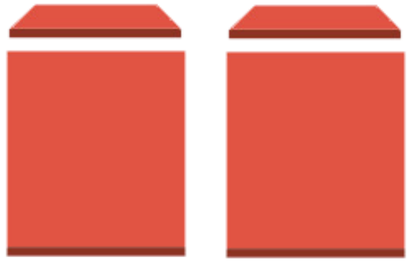


Only the modified data blocks are saved to Amazon S3

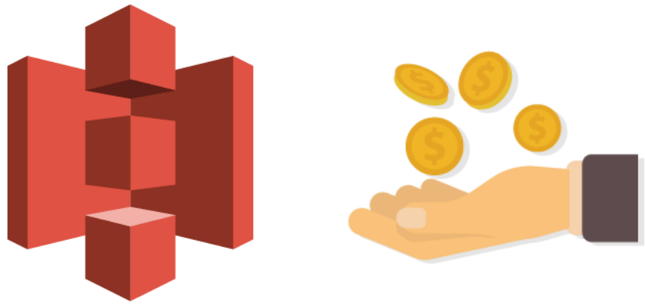
EBS Snapshots

Even though Snapshots are updated incrementally, they are deleted in a way such that only the most recent snapshot stays back for restoring the volume.

Snapshots are always restricted to the region where they are created.



Act as a baseline for creating several new volumes



Pay only for using Amazon S3

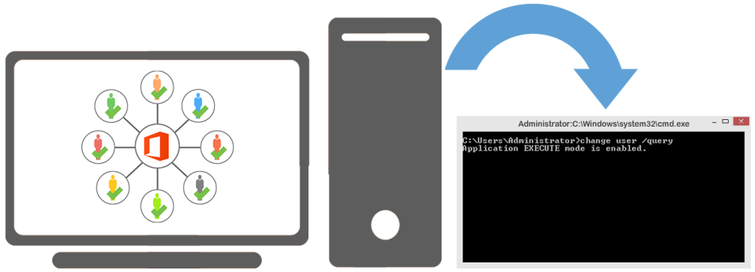
For a subsequent snapshot, you are charged only for additional data exceeding the original size of the volume.

EBS Snapshots

You can copy snapshots across regions with the status as ‘Completed’, and share the snapshots with the required AWS accounts.

At the time of issuing the Snapshot command:

Snapshots only include the data written to the attached volume



Exclude data cached by the operating system or an application

Snapshot of an associated volume that is in use

To create a snapshot for volumes acting as root devices, it is necessary to stop the instance prior to creating the snapshot.

Demo 05—Creating an EBS Snapshot

(Refer to the E-Learning course: Screen Number – 4.15)

Demonstrate how to create an EBS Snapshot.

Restoring Volumes from EBS Snapshots

Active snapshots have the desired information to restore your data to a new EBS volume.

Restore an EBS data volume from a Snapshot

- Snapshot ID
- Snapshot Access Permissions

New volumes load slowly

Need not wait for all data to get transferred to the volume

In case, you access a data not yet loaded, the volume loads it immediately before loading the rest of the data block. Restored data blocks on volume needs initialization which can consume time, however, it evens out over the lifespan of the volume.

Demo 06—Restoring an EBS Volume from a Snapshot

(Refer to the E-Learning course: Screen Number – 4.17)

Demonstrate how to restore an EBS Volume from a Snapshot.

Knowledge Check

KNOWLEDGE CHECK 1

Which of the following is the benefit offered by EBS volume?

a. Data Backup

b. Data Recovery

c. Data Storage

d. Data Availability

KNOWLEDGE CHECK

Which of the following is the benefit offered by EBS Volume?

a. Data Backup

b. Data Recovery

c. Data Storage

d. Data Availability

The correct answer is **a and d.**

Explanation: EBS volume offers four main benefits. The two among them are Data Backup and Data Availability.

KNOWLEDGE CHECK 2

What can be created with user access to the shared snapshots?

a. Instance Type

b. Amazon Machine Image

c. EBS Volume

d. Reserved Instance

KNOWLEDGE CHECK

What can be created with user access to the shared snapshots?

a. Instance Type

b. Amazon Machine Image

c. EBS Volume

d. Reserved Instance

The correct answer is **c.**

Explanation: Users with access to the shared snapshots can easily create EBS volumes, and this does not impact the snapshots.

Quiz

QUIZ

The collection of _____ are Auto Scaling groups.

a. General Purpose

b. EC2 Instance

c. GPU Instances

d. Compute Optimized

QUIZ

The collection of _____ are Auto Scaling groups.

a. General Purpose

b. EC2 Instance

c. GPU Instances

d. Compute Optimized

The correct answer is **b.**

Explanation: The collection of EC2 instances are Auto Scaling groups, which can shrink or grow based on the demand.

QUIZ 2

What does EBS volume refer?

a. Durable Storage device

b. Integrated Storage device

c. Cloud Storage device

d. Optimized Storage device

QUIZ 2

What does EBS volume refer?

a. Durable Storage device

b. Integrated Storage device

c. Cloud Storage device

d. Optimized Storage device

The correct answer is **a.**

Explanation: Amazon EBS volume refers to a durable storage device attachable to an EC2 instance in the same Availability Zone.

QUIZ 3	A _____ in Amazon VPC is a segment of the range of IP addresses.

a. VPC

b. GPU

c. Subnet

d. Route 53

QUIZ 3

A _____ in Amazon VPC is a segment of the range of IP addresses.

a. VPC

b. GPU

c. Subnet

d. Route 53

The correct answer is **c.**

Explanation: A Subnet in Amazon VPC is a segment of the range of IP addresses, and is a sub-division in an Availability Zone.

QUIZ 4

What can be used to guard AWS resources in all subnets?

a. Subnets

b. Security Group

c. Physical Security

d. Cloud Security

QUIZ 4

What can be used to guard AWS resources in all subnets?

a. Subnets

b. Security Group

c. Physical Security

d. Cloud Security

The correct answer is **b.**

Explanation: Security Groups can be used to guard AWS resources in all subnets.

QUIZ 5

Which of the following is easy to get started?

a. Amazon EC2

b. Amazon VPC

c. Amazon ELB

d. Amazon Route 53

QUIZ 5

Which of the following is easy to get started?

a. Amazon EC2

b. Amazon VPC

c. Amazon ELB

d. Amazon Route 53

The correct answer is **a.**

Explanation: One of the benefits of Amazon EC2 is its ease of use.

Key Takeaways

Key Takeaways

Computing and Networking services allow scaling of computing instances, distributing network traffic dynamically, and setting up a secluded logical network known as Virtual Private Cloud, or VPC.

AWS Computing services facilitate:

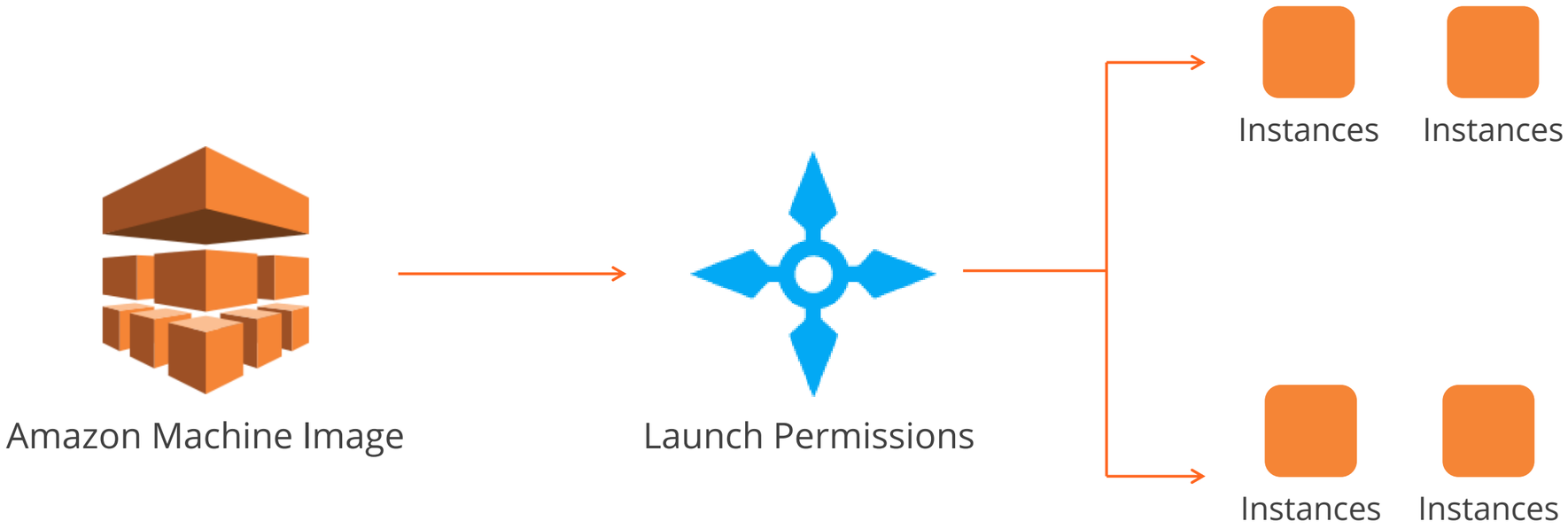
- Automatic scaling of an assortment of computing instances
- Dynamic distribution of network traffic

AWS Networking services facilitate:

- Setting up an isolated logical network

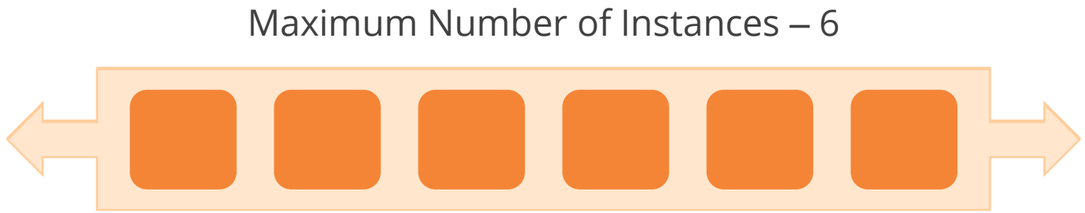
Key Takeaways

An Amazon Machine Image, or an AMI has all the details to launch an instance in Amazon EC2 or VPC.



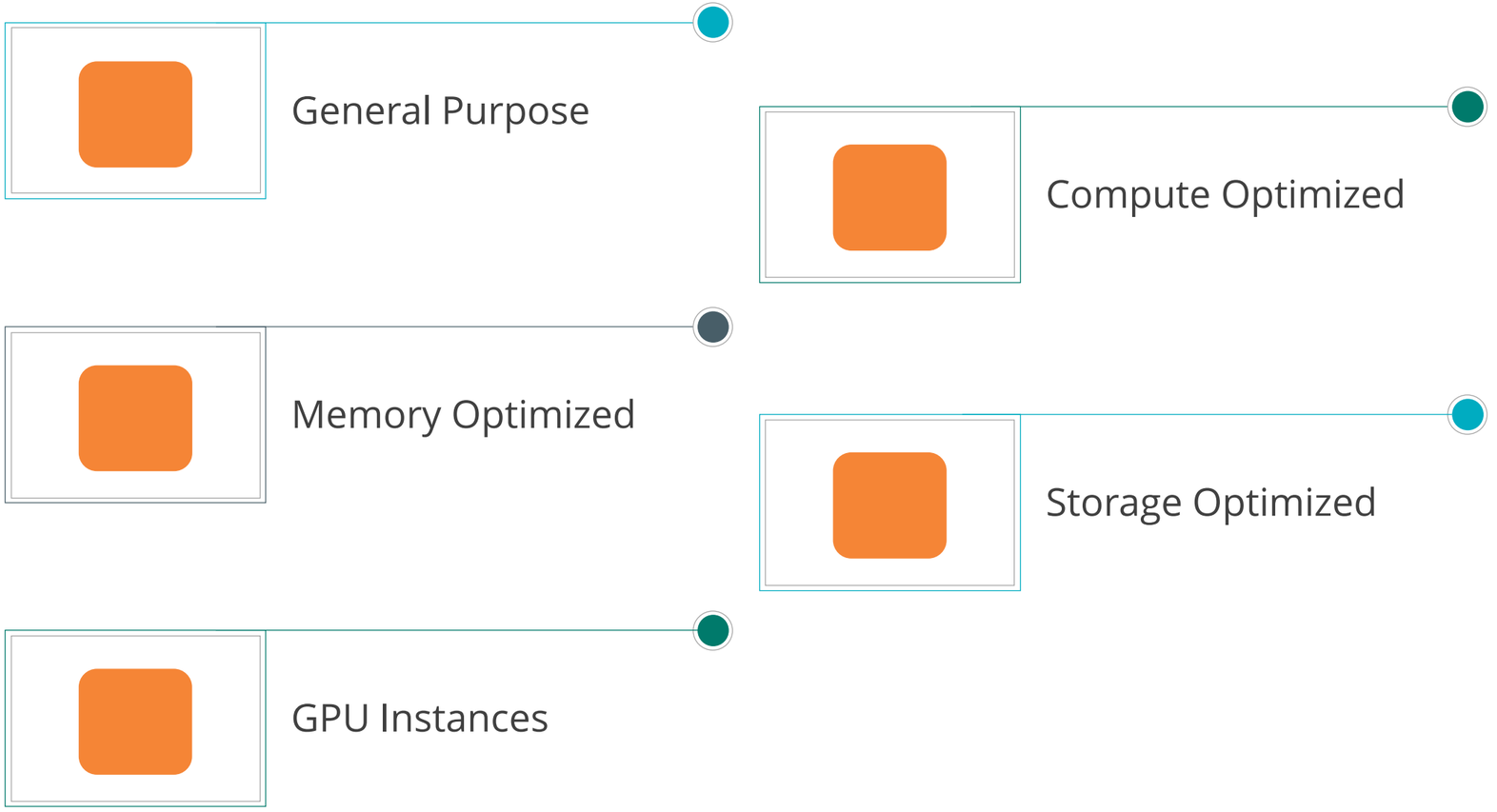
Key Takeaways

The collection of EC2 instances are called Auto Scaling groups, which can shrink or grow based on the demand.



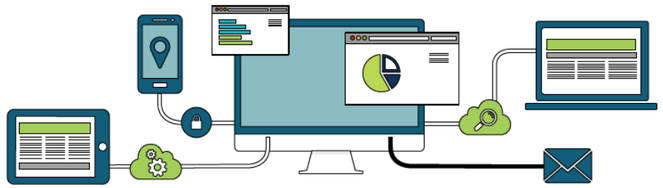
Key Takeaways

The current generation instance types are split into general purpose, compute optimized, memory optimized, storage optimized, and GPU instance.

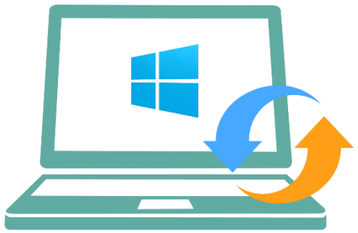


Key Takeaways

An Amazon EBS volume is a durable storage device attachable to an EC2 instance in the same Availability Zone.



Data Availability



Data Backups

Benefits of EBS volume

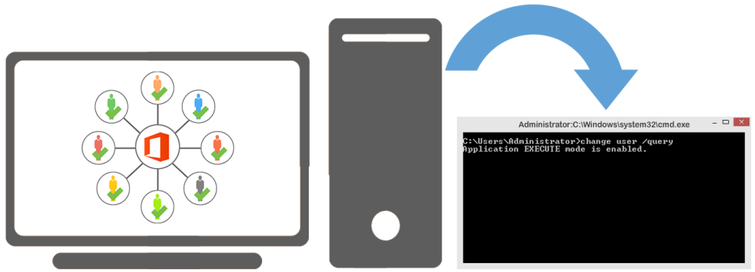
Data Persistence

Data Security

Key Takeaways

You can create snapshots or backups of any EBS volume, and make a copy of its data in Amazon S3.

Snapshots only include the data written to the attached volume



Exclude data cached by the operating system or an application

Key Takeaways

Computing and Networking services allow scaling of computing instances, distributing network traffic dynamically, and setting up a secluded logical network known as Virtual Private Cloud, or VPC.

An Amazon Machine Image, or an AMI has all the details to launch an instance in Amazon EC2 or VPC.

The collection of EC2 instances are called Auto Scaling groups, which can shrink or grow based on the demand.

The current generation instance types are split into general purpose, compute optimized, memory optimized, storage optimized, and GPU instance.

You can create snapshots or backups of any EBS volume, and make a copy of its data in Amazon S3.

This Concludes 'Compute Services and Networking.'

The Next Lesson is 'AWS Managed Services and Database.'