AWS Global (physical) Infrastructure:

AWS Regions:

- A grouping of ***AWS resources*** located in a specific geographical location.
- Designed to service AWS customers (or your users) that are located closest to a region.
- Regions are comprised of multiple ***Availability Zones***.

Image source:
https://aws.amazon.com/about-aws/global-infrastructure/

Quick Reference

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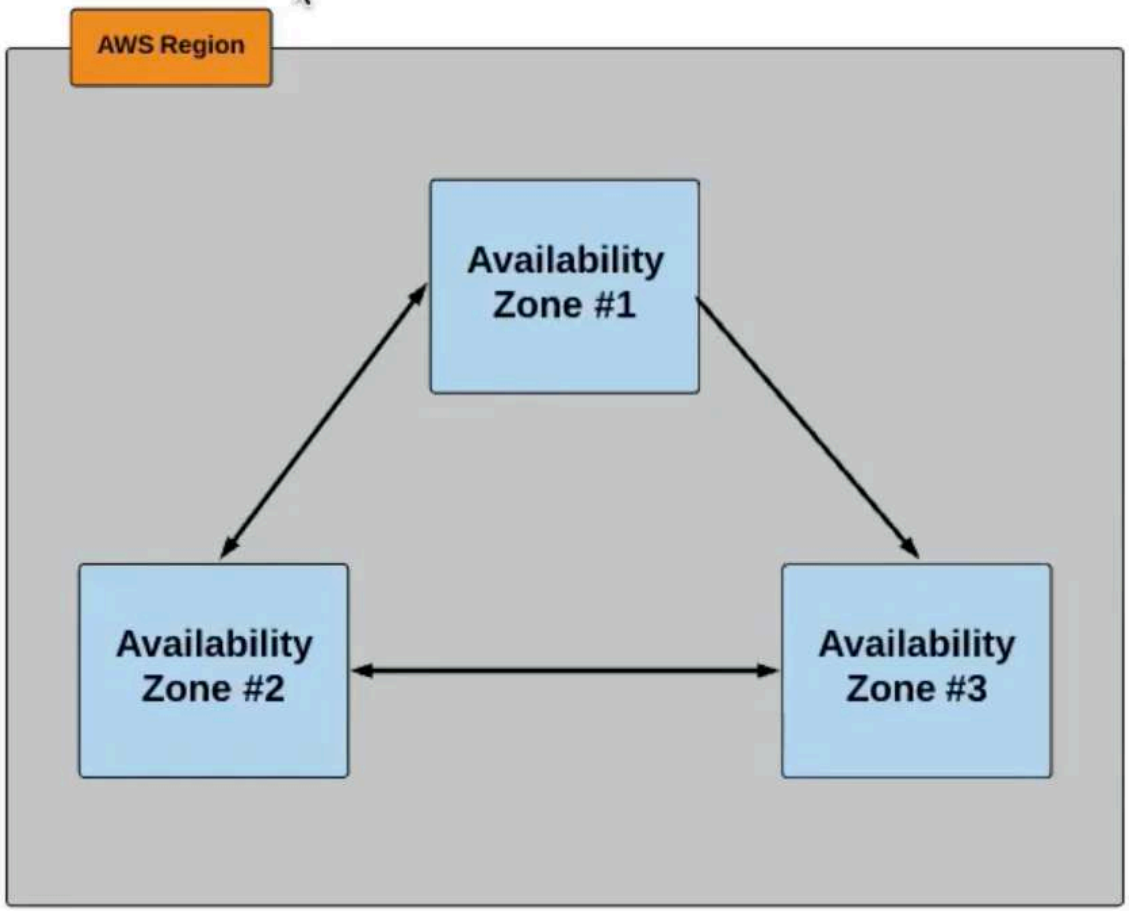
AWS Global (physical) Infrastructure:

AWS Availability Zones:

- Geographically isolated zones within a region that house AWS resources
- Availability Zones (AZs) are where seperate, physical ***AWS data centers*** are located.
- Multiple AZs in each Region provide redundancy for AWS resources in that region.



AWS Global (physical) Infrastructure:

AWS Data Centers:

- Where the physical hardware that runs AWS services is located.

Availability Zone

AWS Data Center:

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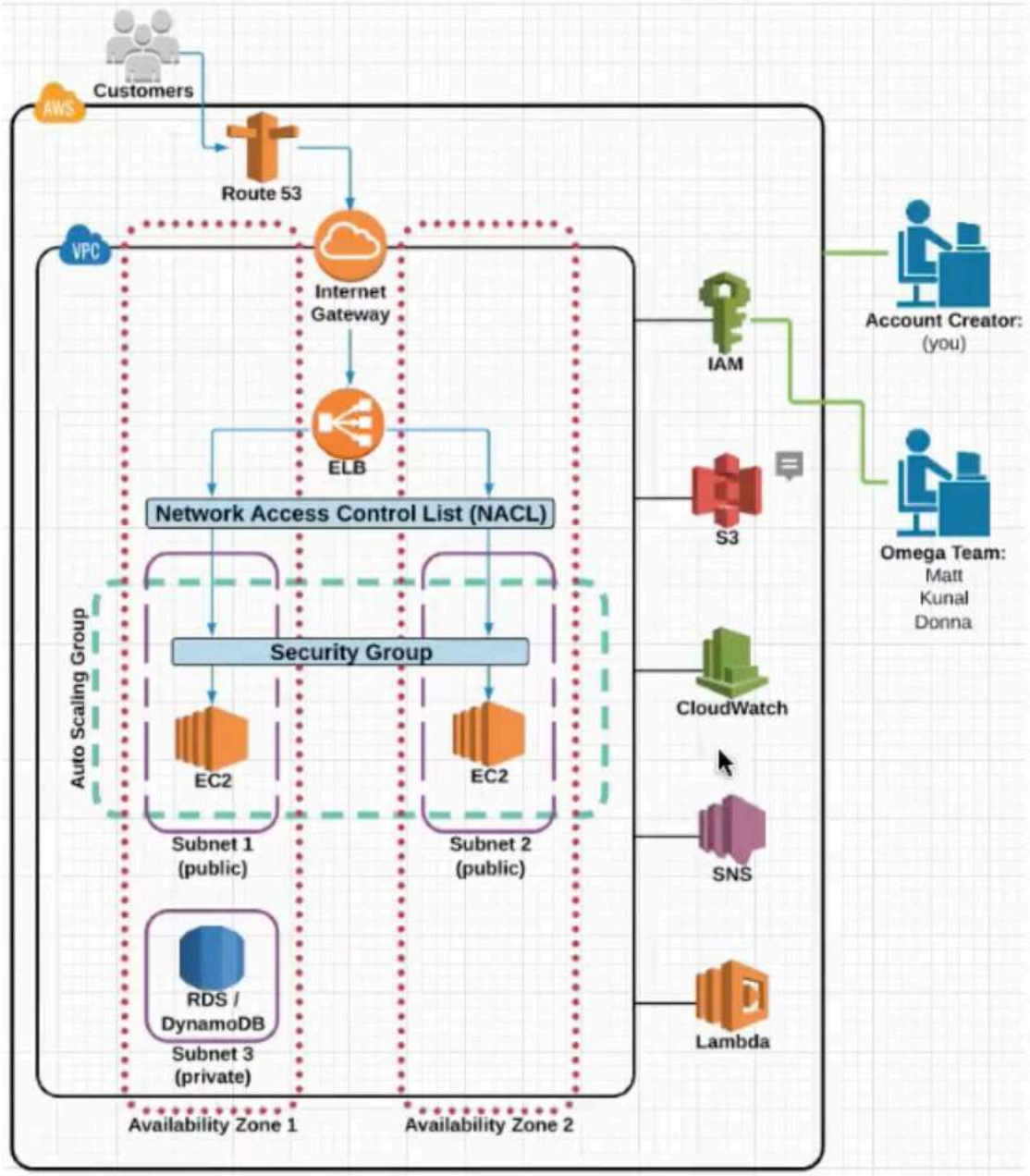
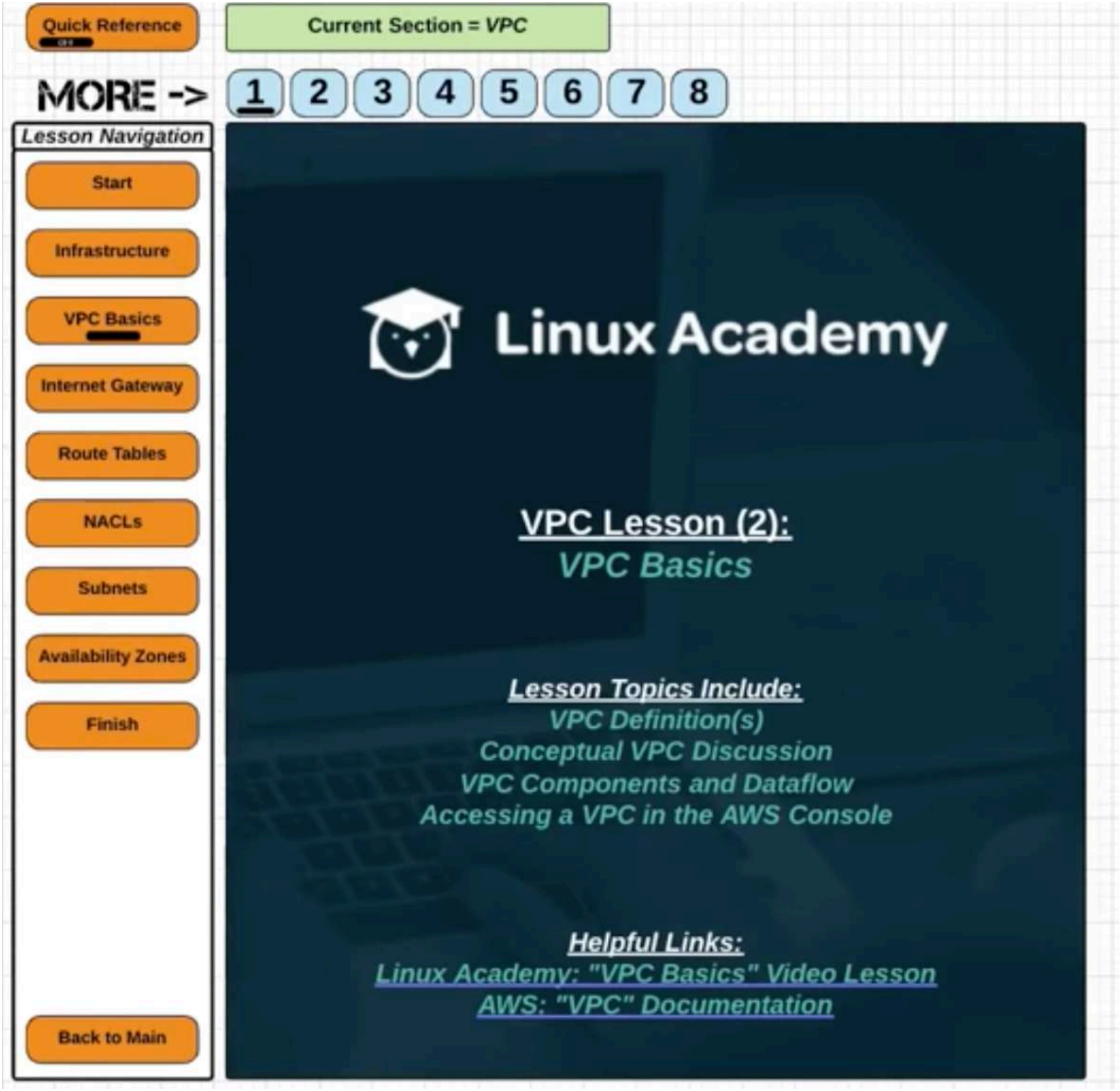
AWS Global (physical) Infrastructure:

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Linux Academy
VPC Lesson (2):
VPC Basics
Lesson Topics Include:
VPC Definition(s)
Conceptual VPC Discussion
VPC Components and Dataflow
Accessing a VPC in the AWS Console
Helpful Links:
Linux Academy: "VPC Basics" Video Lesson
AWS: "VPC" Documentation

VPC = **V**irtual **P**rivate **C**loud

What is a VPC?

Simplified Definition:
A private sub-section of AWS that you control, in which you can place AWS resources (such as EC2 instances and databases). You have FULL control over who has access to the AWS resources that you place inside your VPC.

AWS Definition:
"Amazon Virtual Private Cloud (Amazon VPC) lets you provision a ***logically isolated*** section of the Amazon Web Services (AWS) cloud where you can launch AWS resources in a ***virtual network*** that you define. ***You have complete control over your virtual networking environment***, including selection of your own IP address range, creation of ***subnets*** and configuration of ***route tables*** and ***network gateways***."

NOTE: When you create an AWS account, a "default" VPC is created for you.

AWS VPC

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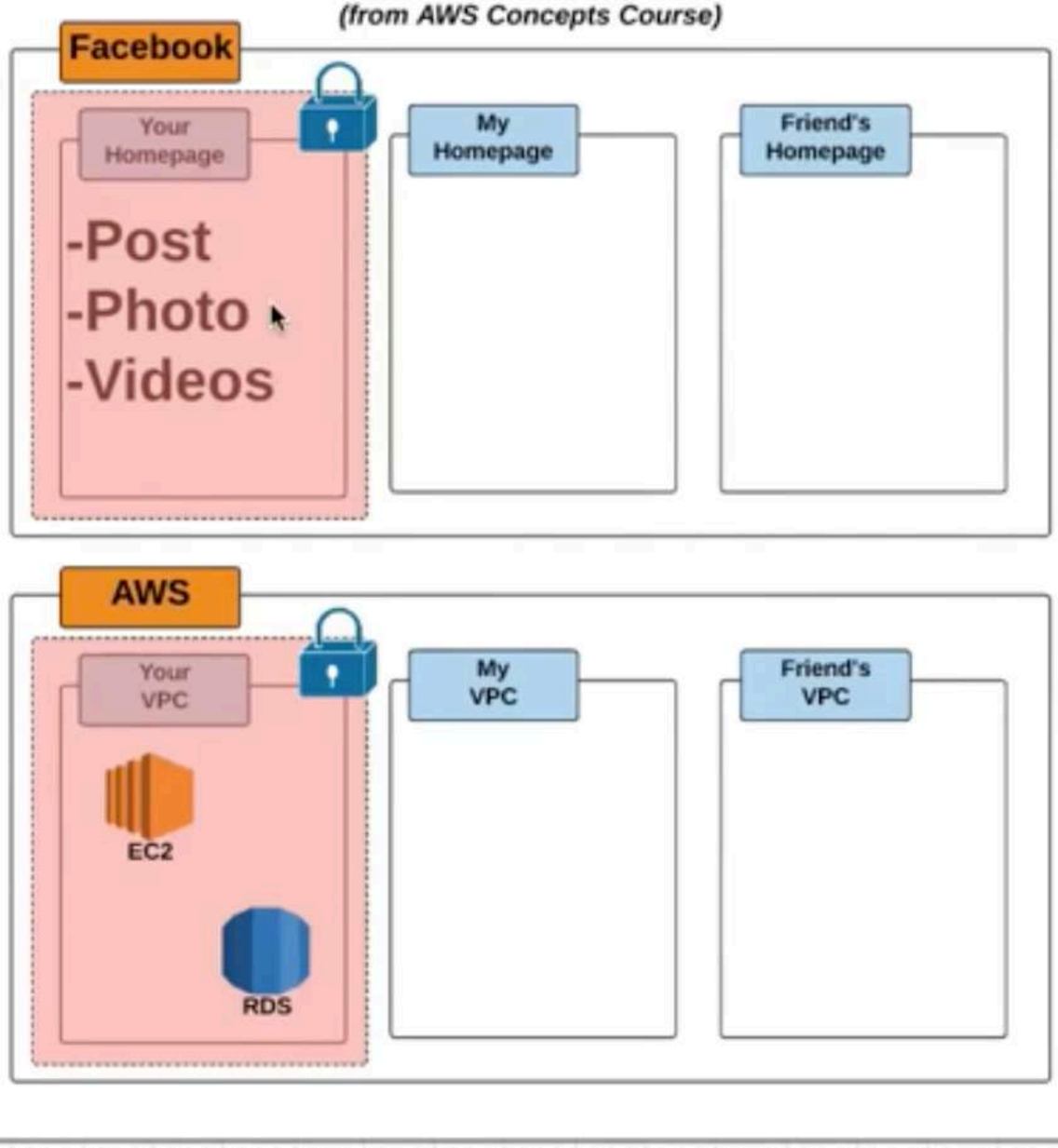
VPC Basics:

Facebook/VPC Analogy

(from AWS Concepts Course)



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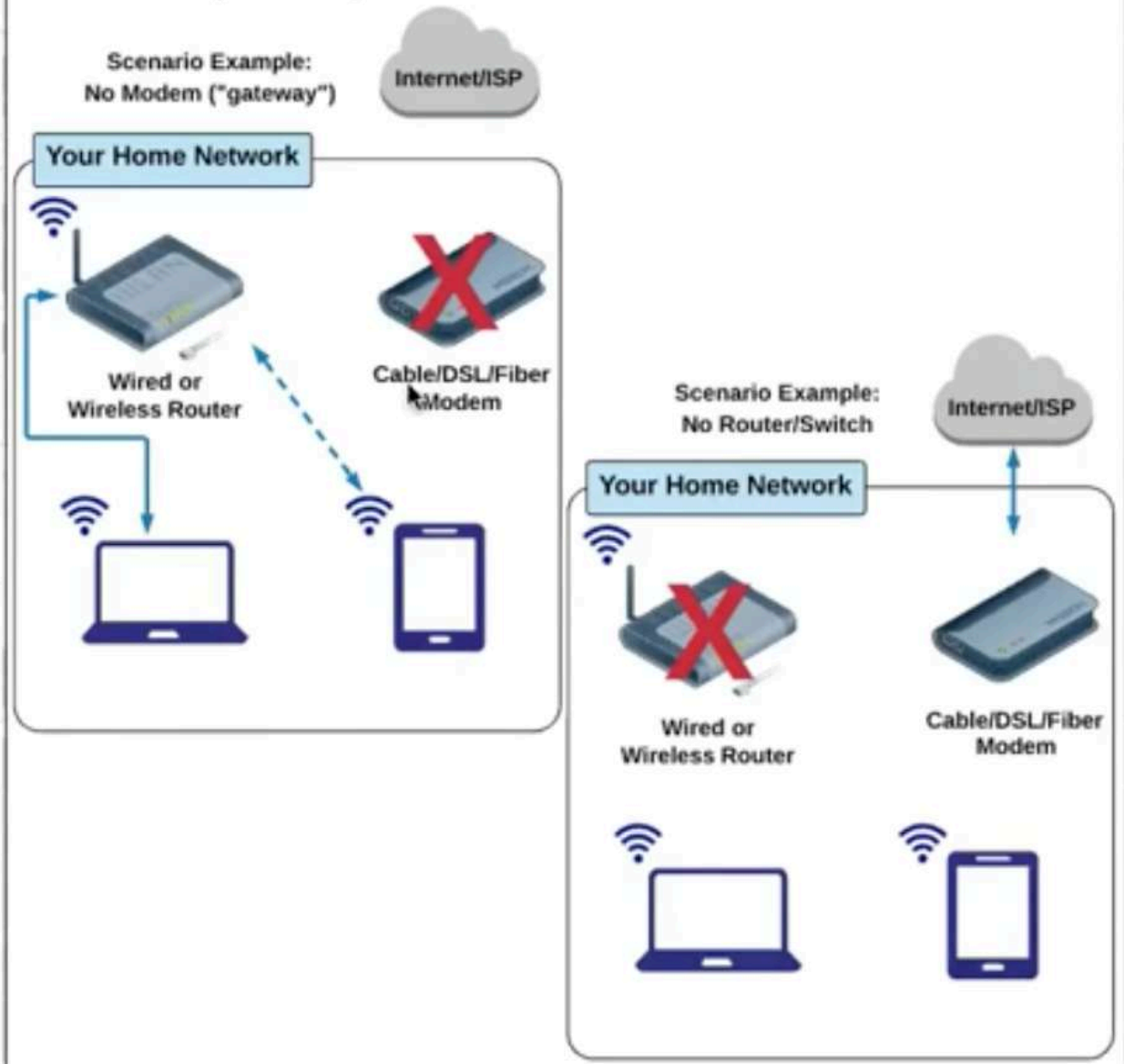
VPC Basics:

VPC - Conceptual Explanation:



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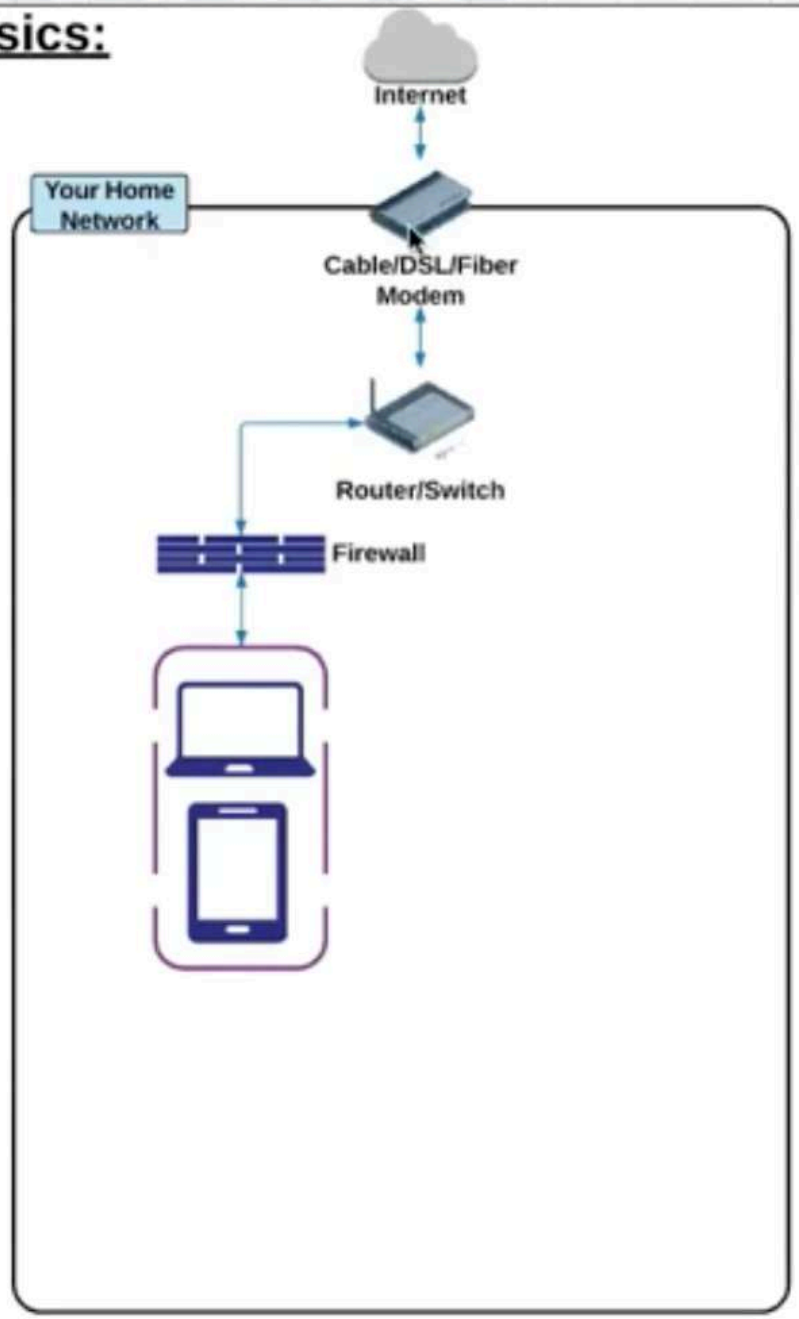
VPC Basics:



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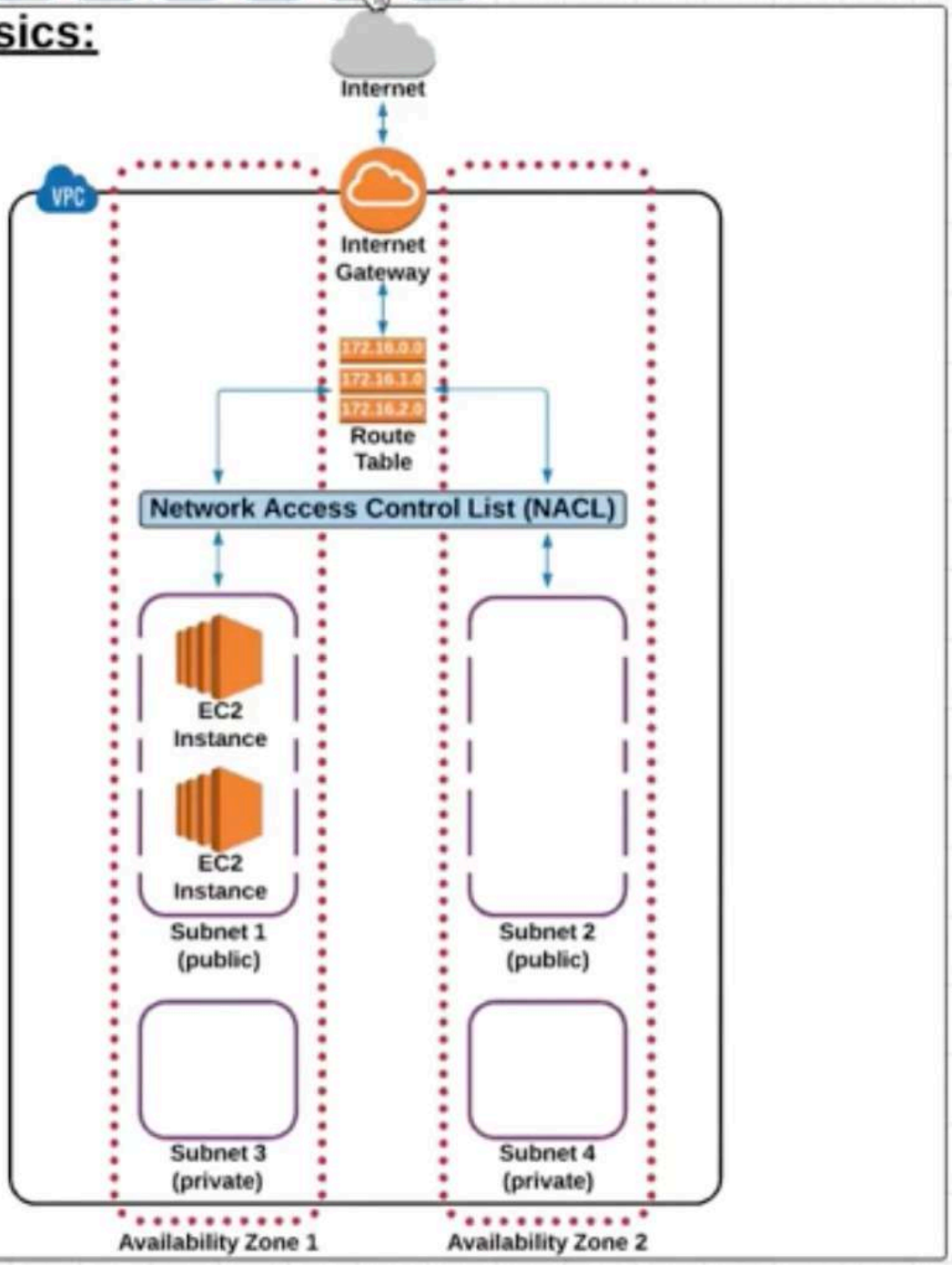
VPC Basics:



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"Amazon Virtual Private Cloud (Amazon VPC) lets you provision a ***logically isolated*** section of the Amazon Web Services (AWS) cloud where you can launch AWS resources in a ***virtual network*** that you define. ***You have complete control over your virtual networking environment***, including selection of your own IP address range, creation of ***subnets*** and configuration of ***route tables*** and ***network gateways***."

NOTE: When you create an AWS account, a "default" VPC is created for you. Including the standard components that are needed make it functional.
(1) Internet Gateway (IGW)
(2) A route table (with predefied routes to the default subnets)
(3) A Network Access Control List (with predefired rules for access)
(4) Subnets to provision AWS resources in (such as EC2 Instances)

AWS VPC

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Linux Academy

VPC Lesson (3):

Internet Gateways (IGW)

Lesson Topics Include:

IGW Definition(s)
Function of an IGW
Attaching & Detaching an IGW
Creating an IGW
Basic IGW Rules

Helpful Links:

Linux Academy: "Internet Gateways" Video Lesson
AWS: "Internet Gateways" Documentation

IGW = Internet Gateways

What is an IGW?

Simplified Definition:
A combination of hardware and software that provides your private network with a ***route*** to the world outside (meaning the Internet) of the VPC.

AWS Definition:
An Internet gateway is a horizontally scaled, ***redundant and highly available*** VPC component that ***allows communication between instances in your VPC and the Internet***. It therefore imposes no availability risks or bandwidth constraints on your network traffic.

NOTE: Your "default" VPC already has an IGW ***attached***.

Internet Gateway

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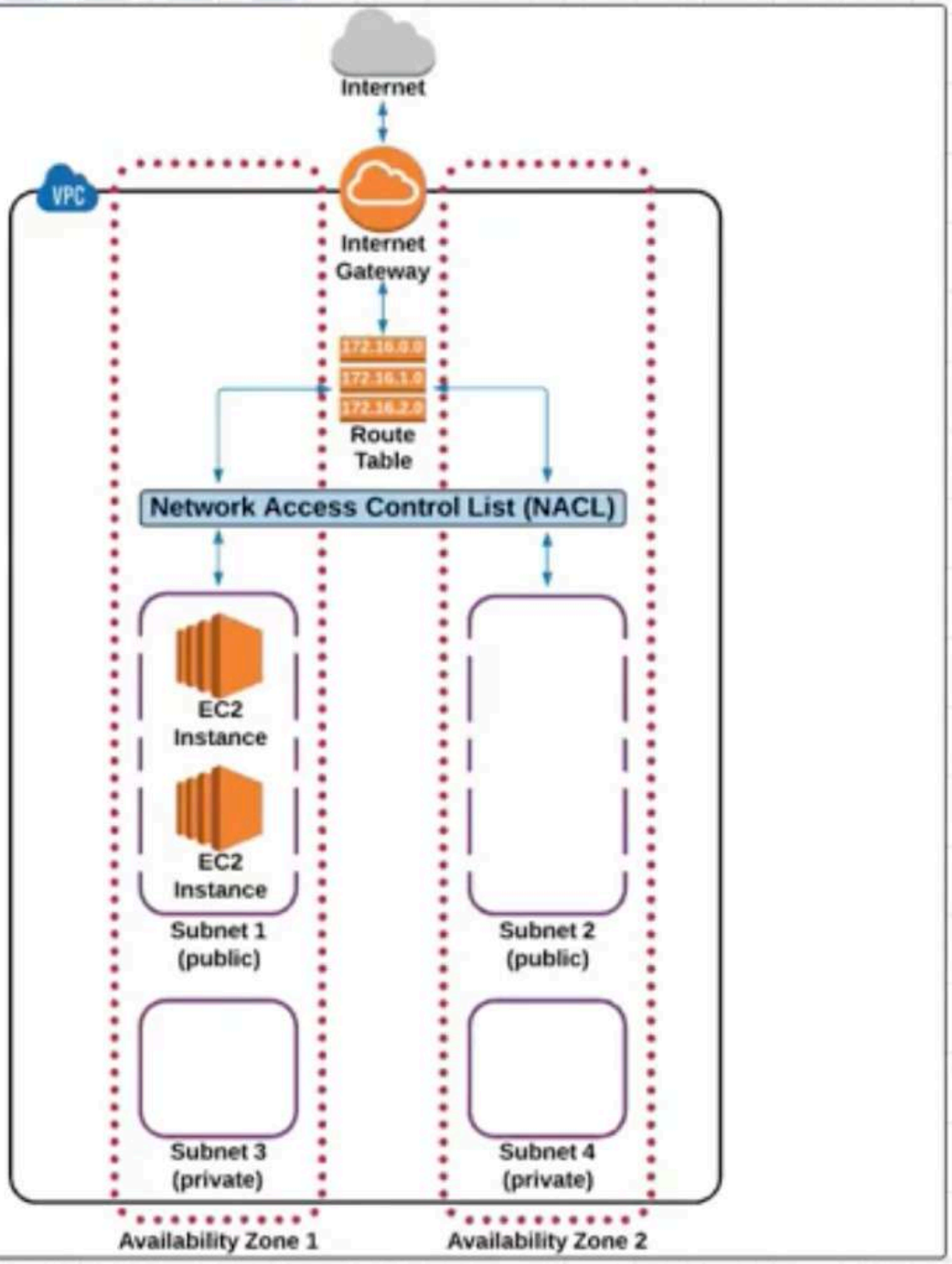
IGW:



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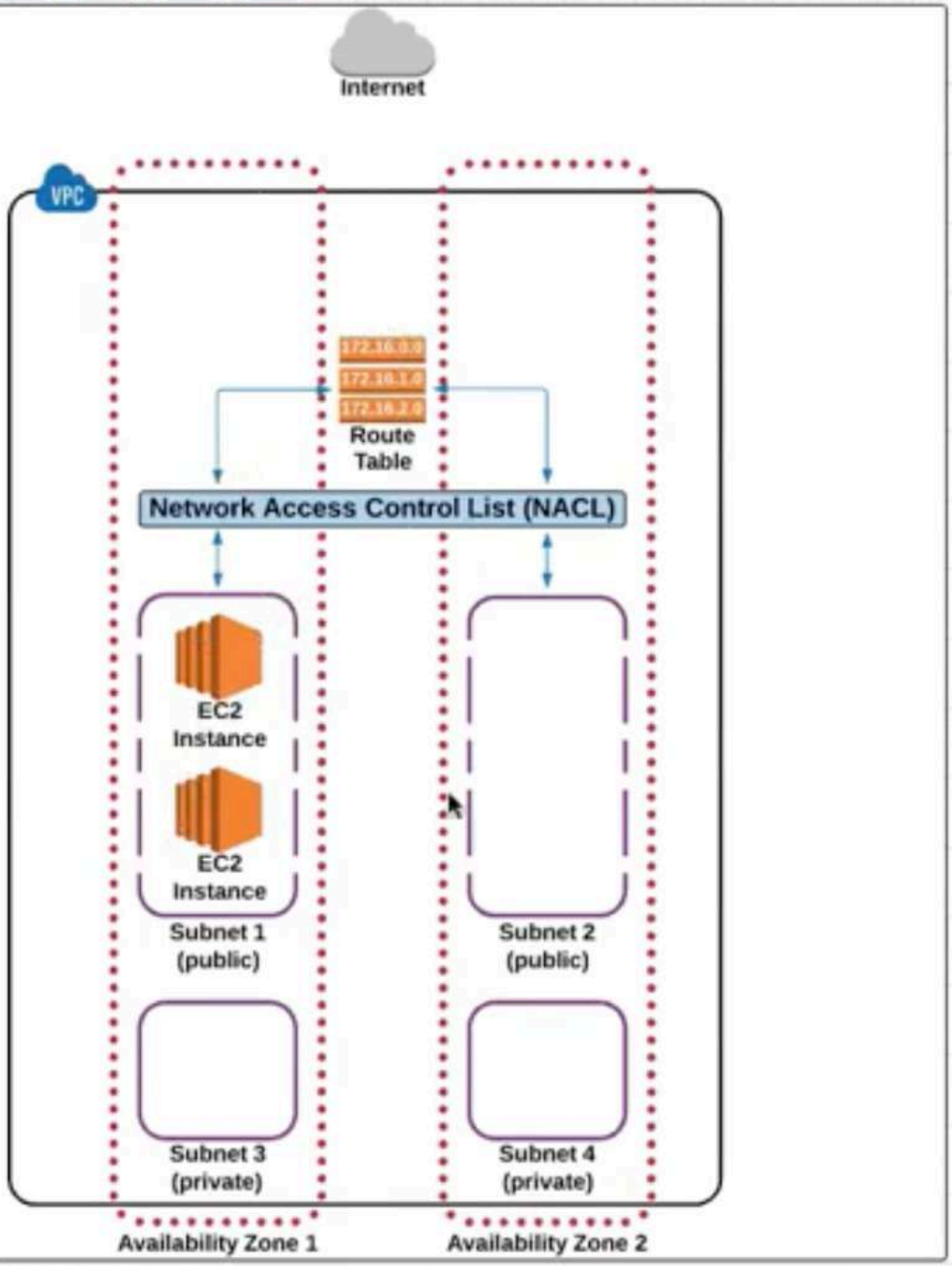
IGW:



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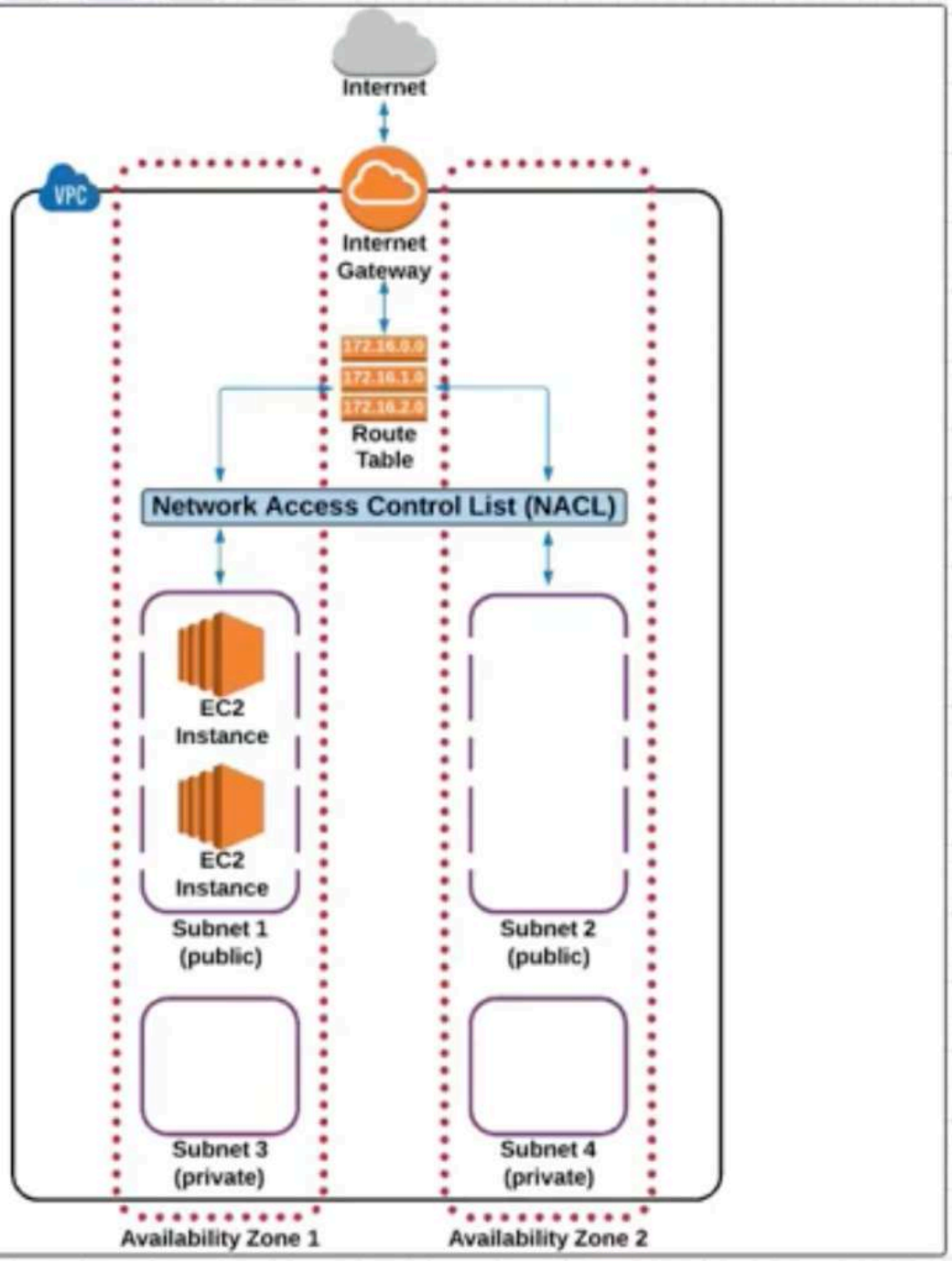
IGW:



IGW = Internet Gateways

What is an IGW?

Simplified Definition:
A combination of hardware and software that provides your private network with a ***route*** to the world outside (meaning the Internet) of the VPC.

AWS Definition:
An Internet gateway is a horizontally scaled, ***redundant and highly available*** VPC component that ***allows communication between instances in your VPC and the Internet***. It therefore imposes no availability risks or bandwidth constraints on your network traffic.

NOTE: Your "default" VPC already has an IGW ***attached***.

Route tables rules and details you need to know:
(1) Only 1 IGW can be attached to a VPC at a time
(2) An IGW cannot be detached from a VPC while there are active AWS resources in the VPC (such as an EC2 instance or RDS Database)

Internet Gateway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Linux Academy
VPC Lesson (4):
Route Tables (RTs)
Lesson Topics Include:
Route Table Definition(s)
Function of a Route Table
Creating and Deleting a Route Table
Setting Routes in the Route Table
Helpful Links:
Linux Academy: "Route Tables" Video Lesson
AWS: "Route Tables" Documentation

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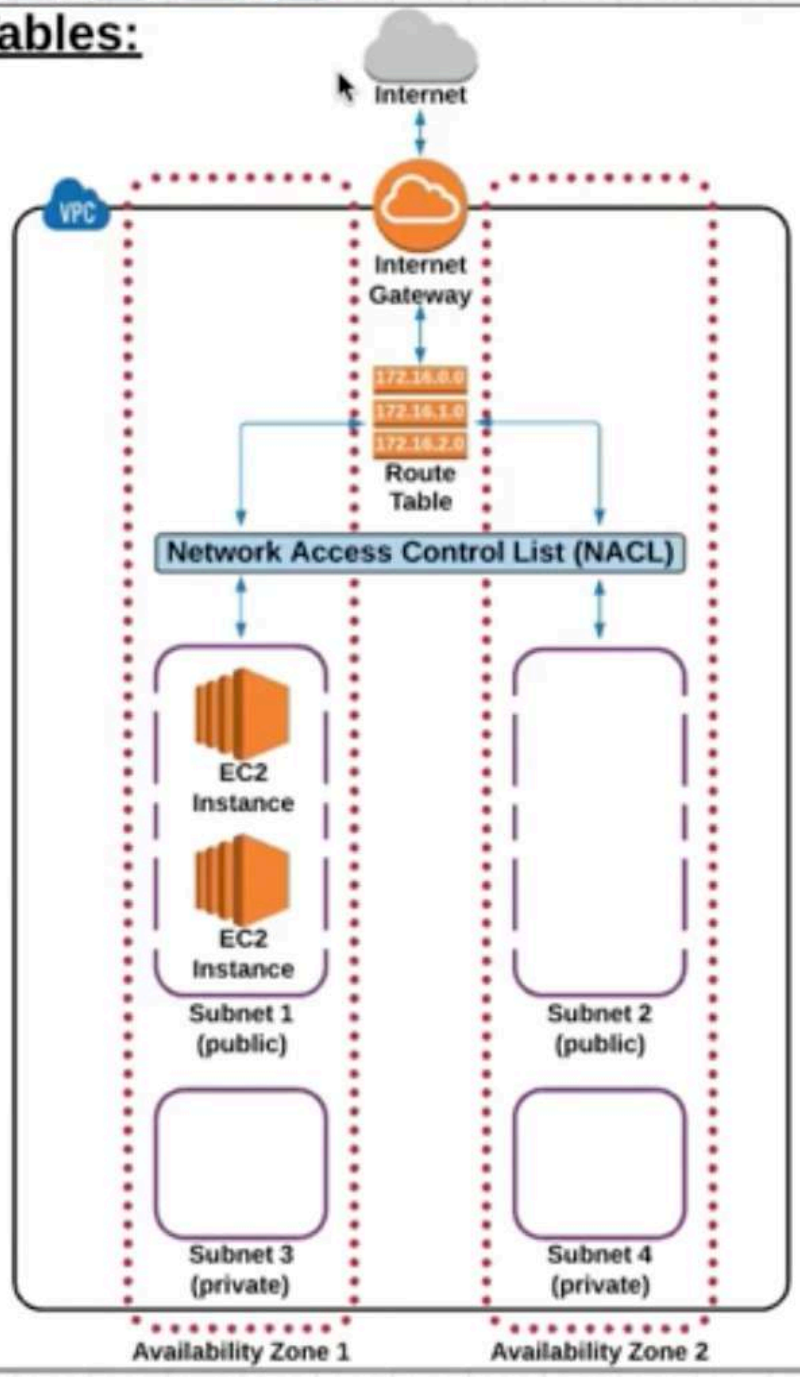
Route Tables:



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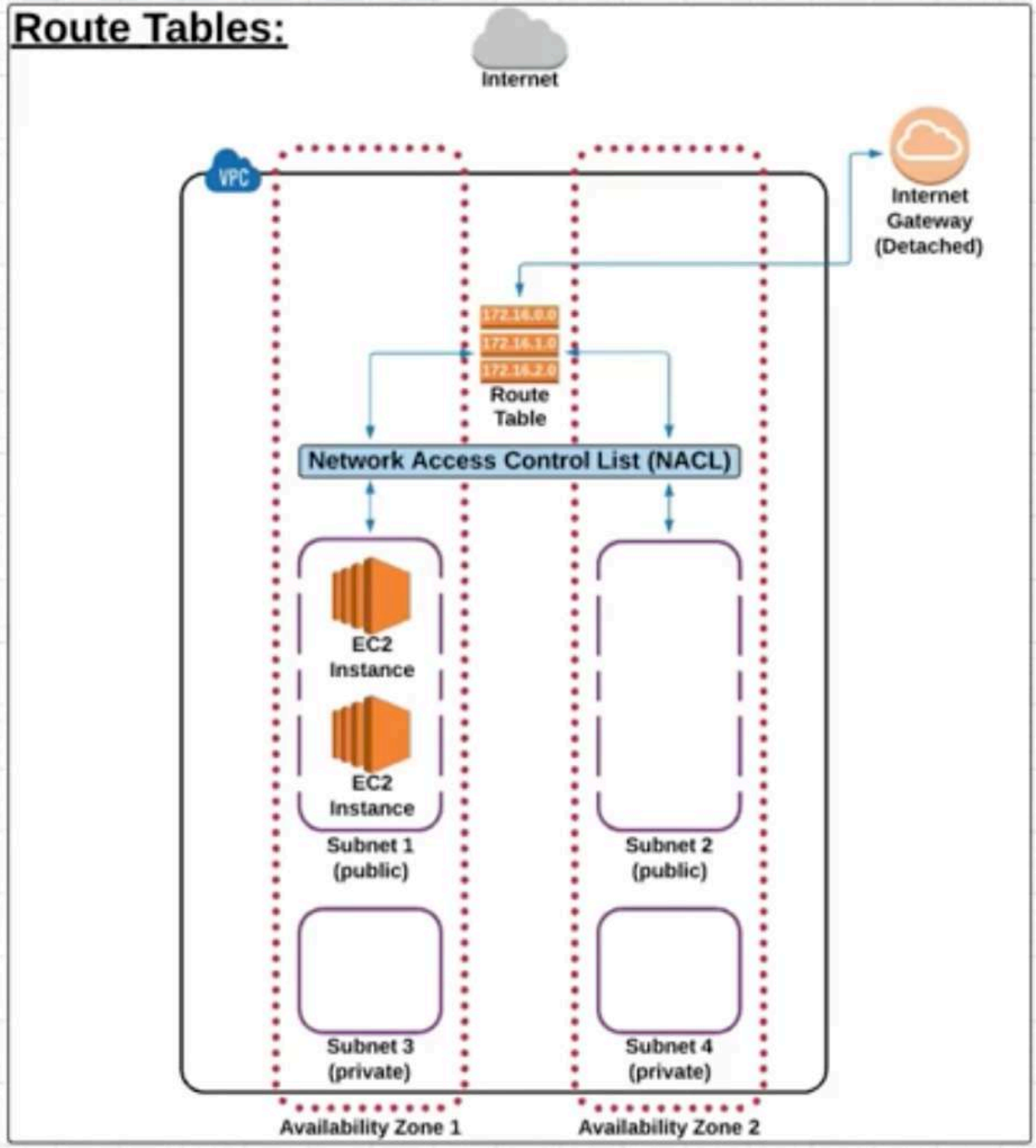
Route Tables:



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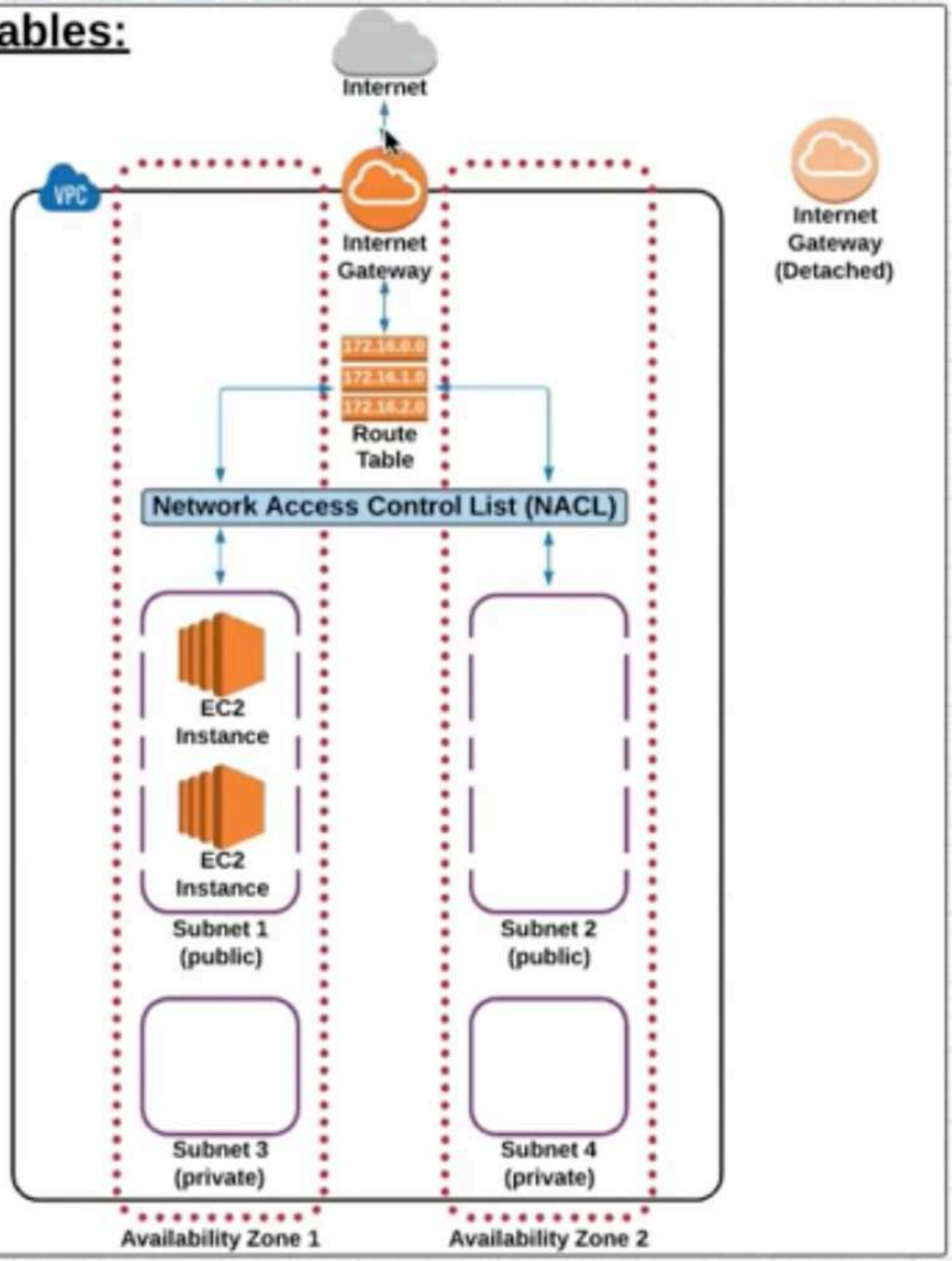
Route Tables:



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RTs = Route Tables

What is a Route Table?

Simplified Definition:
The AWS definition is simple enough, so let's jump right down to it!

AWS Definition:
"A route table contains a ***set of rules***, called ***routes***, that are used to ***determine where network traffic is directed***."

NOTE: Your "default" VPC already has a ***"main"*** route table.

Route table rules and details you need to know:
(1) Unlike an IGW, you can have multiple "active" route tables in a VPC
(2) You cannot delete a route table if it has ***"dependancies"*** (associated subnets)

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Linux Academy

VPC Lesson (4):

Network Access Control List (NACLs)

Lesson Topics Include:

NACLs Definition(s)
Function of a NACL
Creating a NACL
Managing NACL Rules

Helpful Links:

Linux Academy: "Network Access Control Lists" Video Lesson
AWS: "Network Access Control Lists" Documentation

NACLs = Network Access Control Lists

What is a NACL?

Simplified Definition:
The AWS definition is simple enough, so let's jump right down to it!

AWS Definition:
A network access control list (NACL) is an ***optional layer of security*** for your VPC that acts as a ***firewall*** for controlling traffic in and out of one or more ***subnets***.

NOTE: Your "default" VPC already has a NACL in place and assocaited with the default subnets.

Network Access Control List (NACL)

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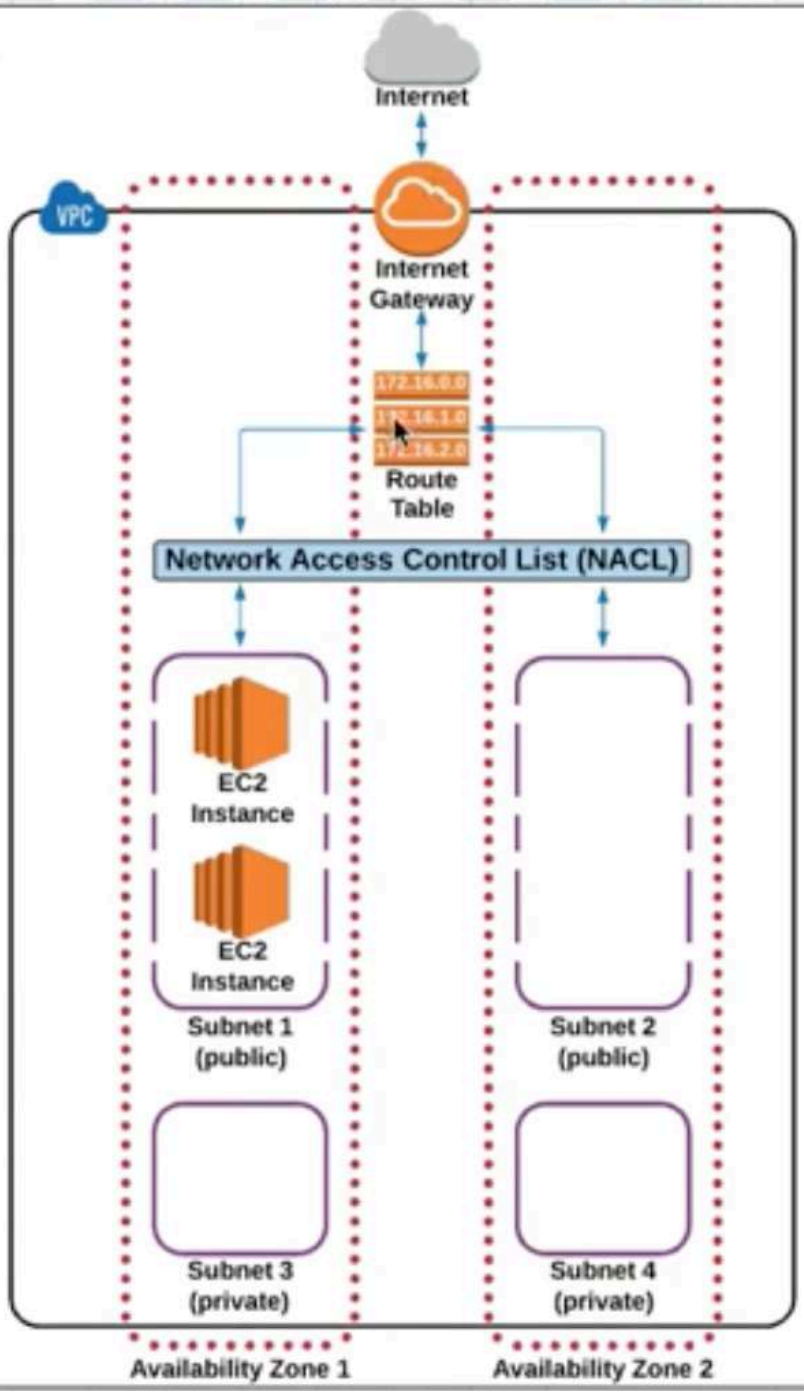
NACLs:



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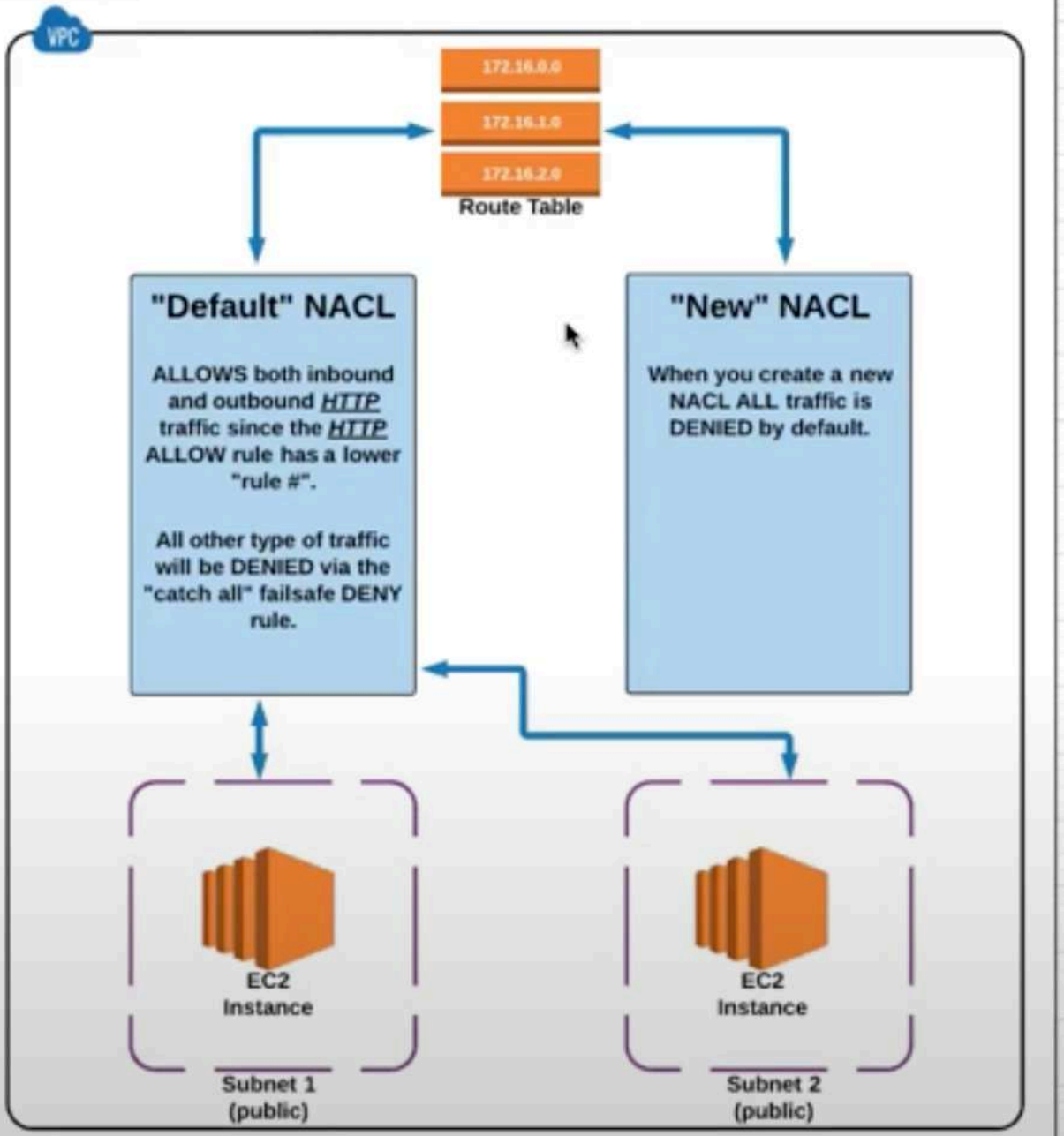
NACLs:



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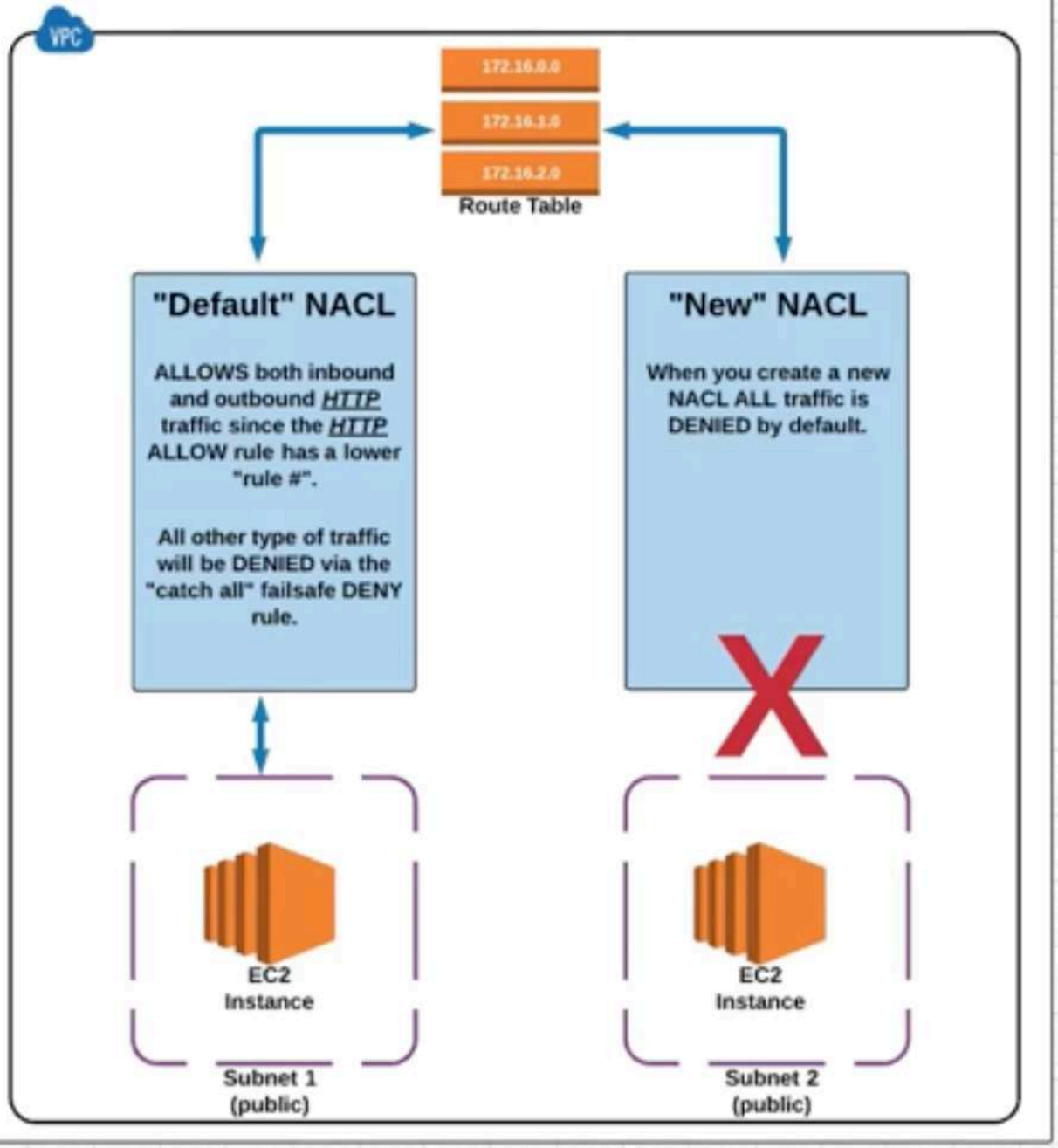

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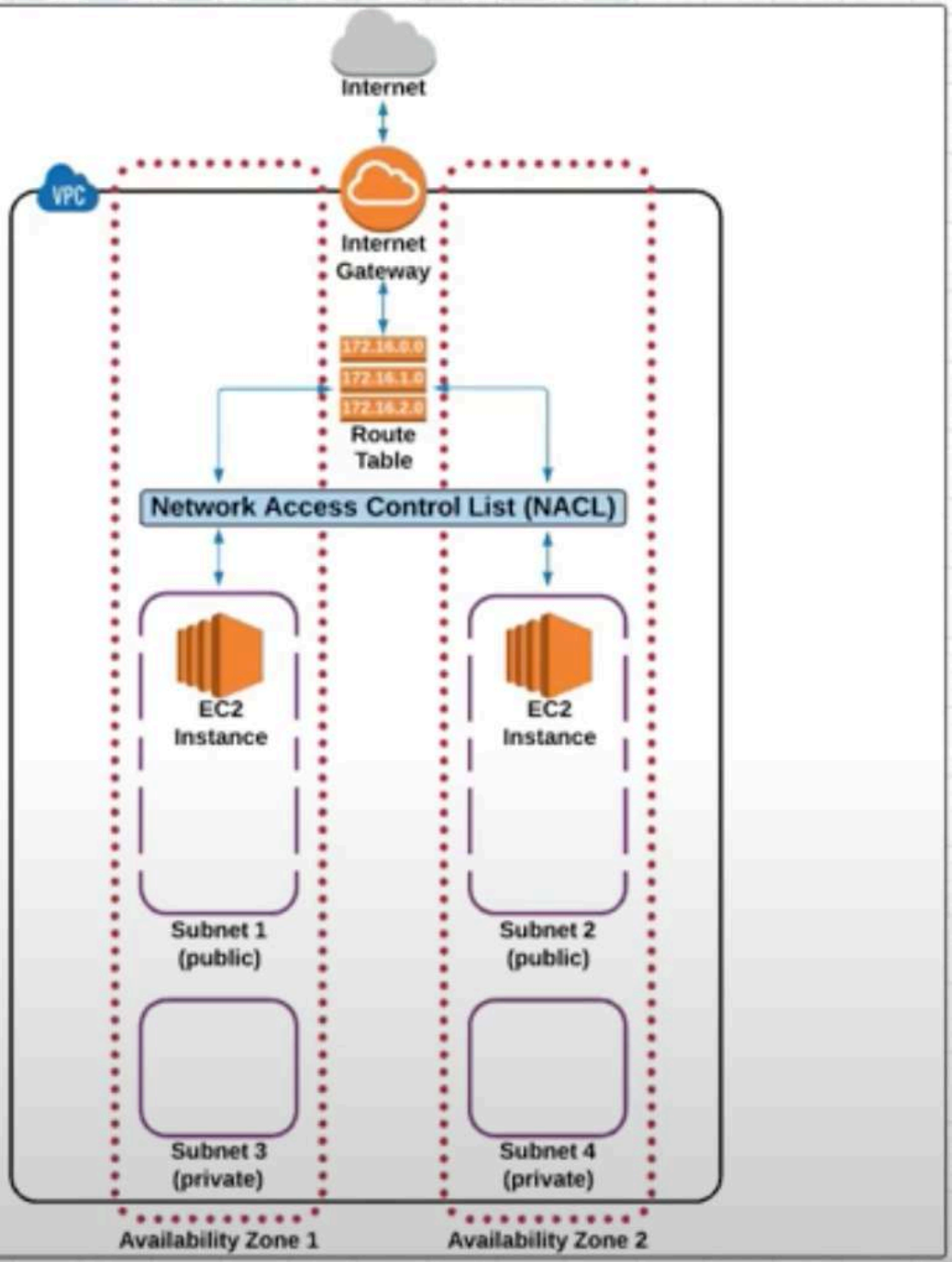


NACLs = Network Access Control Lists

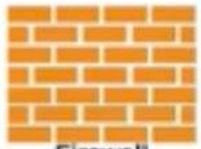
What is a NACL?

Simplified Definition:
The AWS definition is simple enough, so let's jump right down to it!

AWS Definition:
A network access control list (ACL) is an ***optional layer of security*** for your VPC that acts as a ***firewall*** for controlling traffic in and out of one or more ***subnets***.

NOTE: Your "default" VPC already has an NACL in place and associated with the default subnets.

NACL rules and details you need to know (recap):
(1) Rules are evaluated from lowest to highest based on "rule #"
(2) The first rule found that applies to the traffic type is immediatly applied, regardless of any rules that come after it (have a higher "rule #").
(3) The "default" NACL allows all traffic to the default subnets.
(4) Any new NACLs you create DENY all traffic by default.
(4) A subnet can only be associated with ONE NACL as a time.
(6) An NACL allows or denies traffic from entering a subnet. Once inside the subnet, other AWS resources (i.e. EC2 instances) may have an additional layer of security (security groups).



Network Access Control List (NACL)

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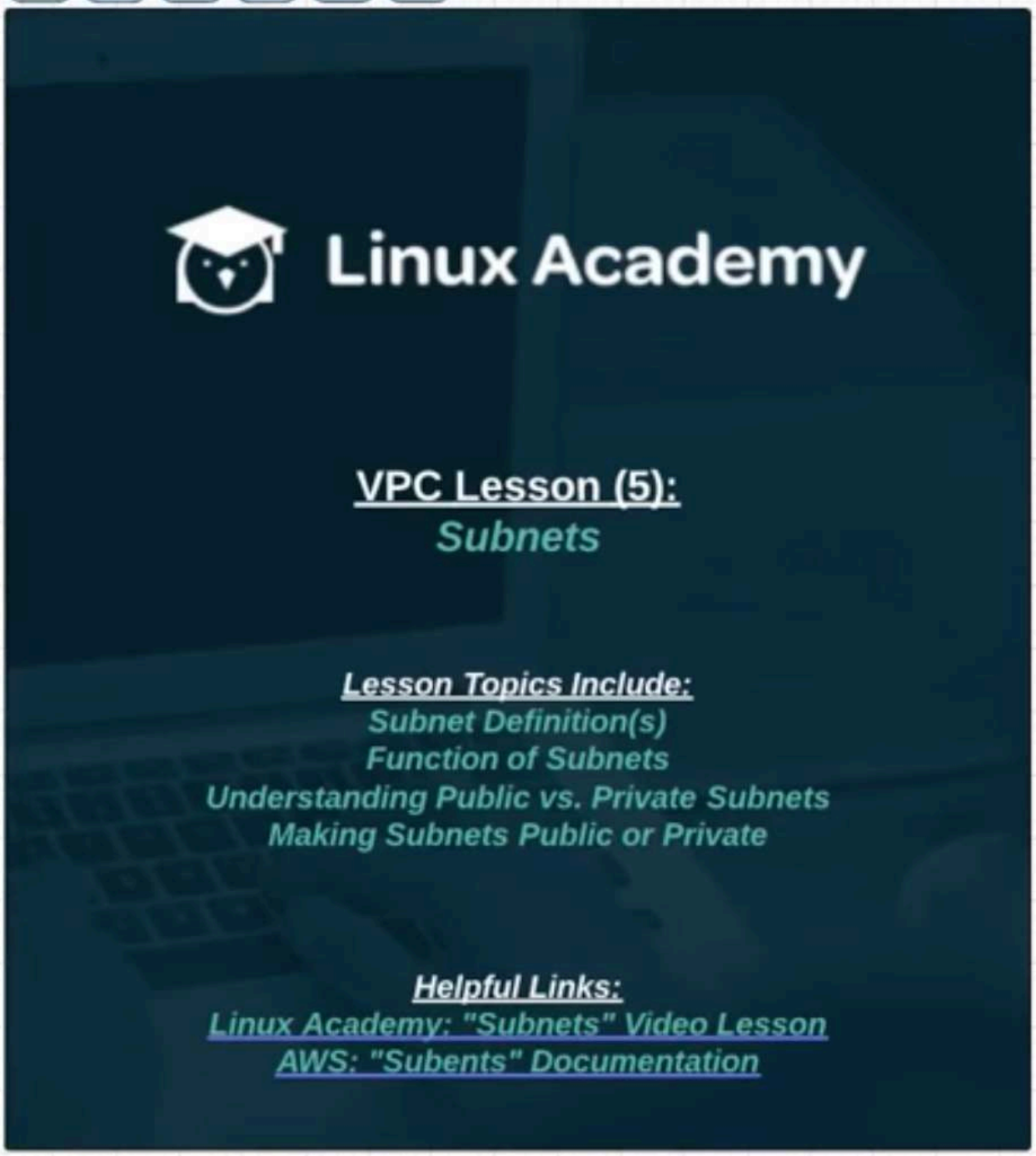

Subnets

What is a Subnet?

Simplified Definition:
A subnet, shorthand for subnetwork, is a sub-section of a network. Generally, a subnet includes all the computers in a specific location. Circling back to the "home network" anology we used in the VPC Baics lesson - if you think about your ISP being a network, then your home network can be considered a subnet of your ISP's network.

AWS Definition:
"When you create a VPC, it spans all of the Availability Zones in the region. After creating a VPC, ***you can add one or more subnets in each Availability Zone***. Each subnet ***must reside entirely*** within one Availability Zone and ***cannot span zones***."

NOTE: Your "default" VPC already has a subnets created by default.

Subnets

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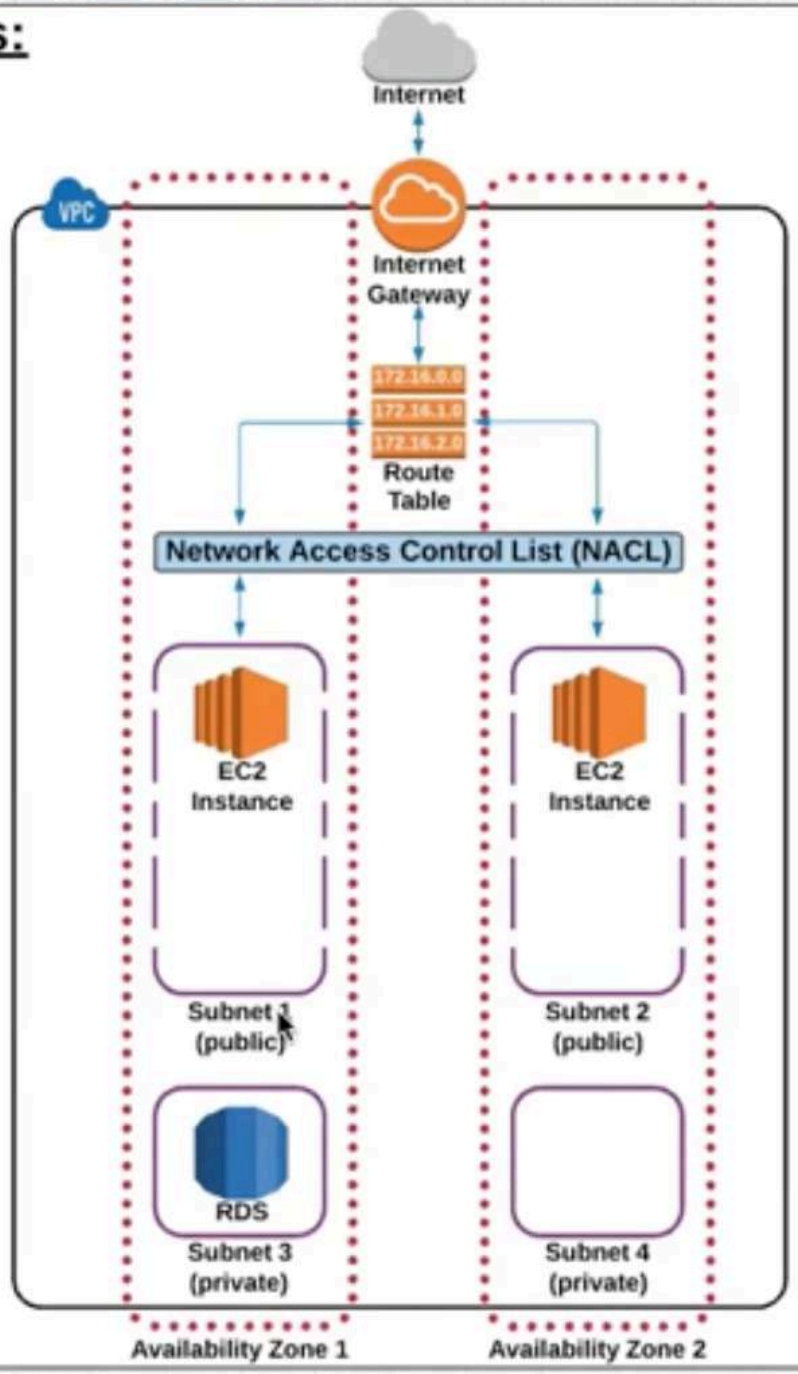
Subnets:



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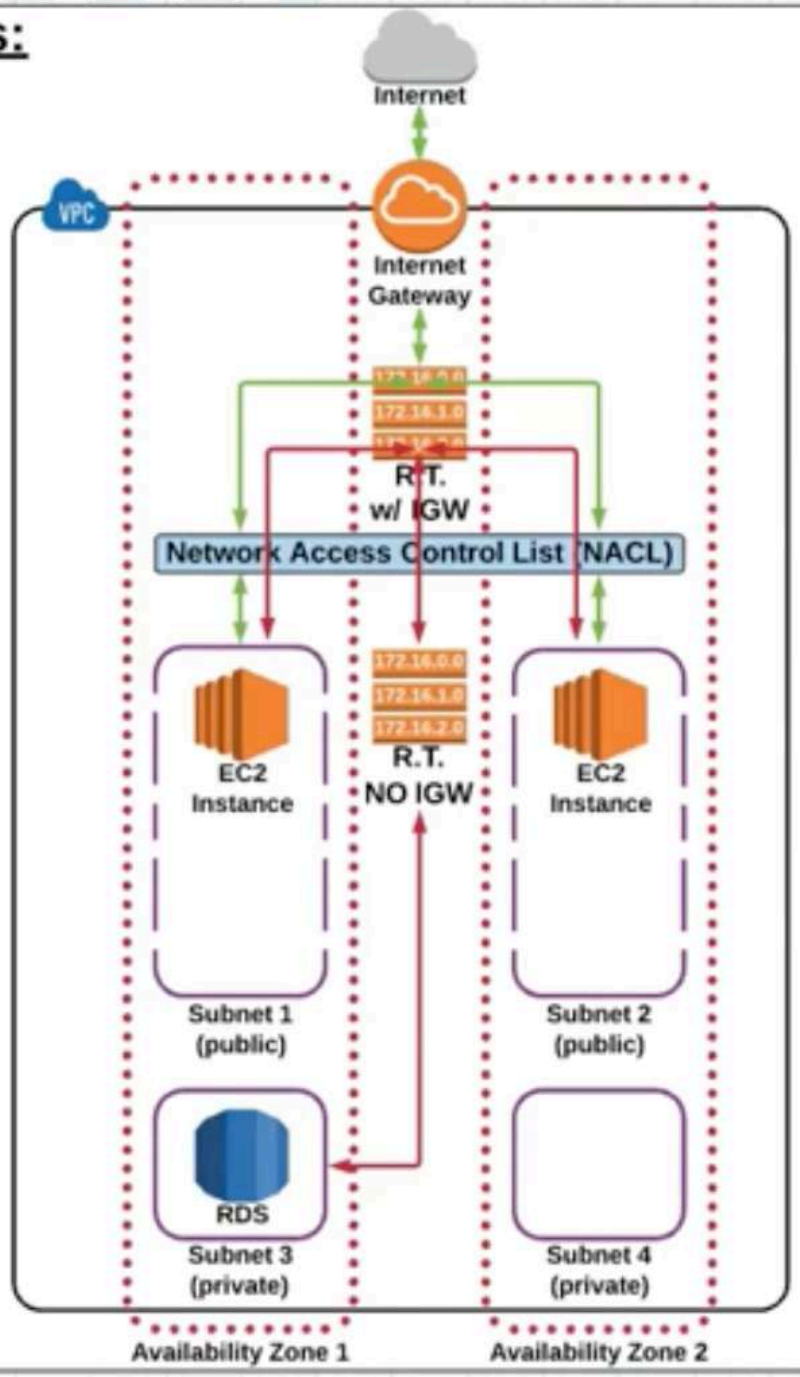
Subnets:



Subnets

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A subnet, short for subnetwork, is a sub-section of a network. Generally, a subnet includes all the computers in a specific location. Circling back to the "home network" anology we used in the VPC Basics lesson, if you think about your ISP being a network, then your home network can be considered a subnet of your ISP's network.

AWS Definition:
"When you create a VPC, it spans all of the Availability Zones in the region. After creating a VPC, ***you can add one or more subnets in each Availability Zone***. Each subnet ***must reside entirely*** within one Availability Zone and ***cannot span zones***."

NOTE: Your "default" VPC already has a subnet created by default.

Subnet rules and details you need to know:
(1) Subnets MUST be associated with a route table.
(2) A ***PUBLIC*** subnet ***HAS*** a route to the Internet.
(3) A ***PRIVATE*** subnet ***does NOT have*** a route to the Internet.
(4) A subnet is located in ONE specific Availability Zone.

Subnets

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Linux Academy

VPC Lesson (6):

Availability Zones (VPC Specific)

Lesson Topics Include:

How Availability Zones Work with a VPC
High Availability and Fault Toleranance
Project Omega Requirement Check (3)

Helpful Links:

Linux Academy: "Availability Zones (VPC Specific)" Video Lesson

Availability Zones

Availability Zones and VPCs:

Simplified Definition/Explaination:
Any AWS resource that you launch (like EC2/RDS) must be placed in a VPC subnet. Any given subnet must be located in an Availbility Zone. You can (and should) utilize multiple Availabilty Zones to create redundacy in your architecture. This is what allows for ***High Availabilty*** and ***Fault Toleratent*** systems.

AWS Definition/Explaination:
"When you create a ***VPC, it spans all of the Availability Zones in the region***. After creating a VPC, you can add ***one or more subnets in each Availability Zone***. Each subnet must reside entirely within one Availability Zone and cannot span zones.

Availability Zones are distinct locations that are engineered to be isolated from failures in other Availability Zones. By launching instances in separate Availability Zones, you can protect your applications from the failure of a single location."

NOTE: Your "default" VPC already has a subnet created by default.

Availability Zones

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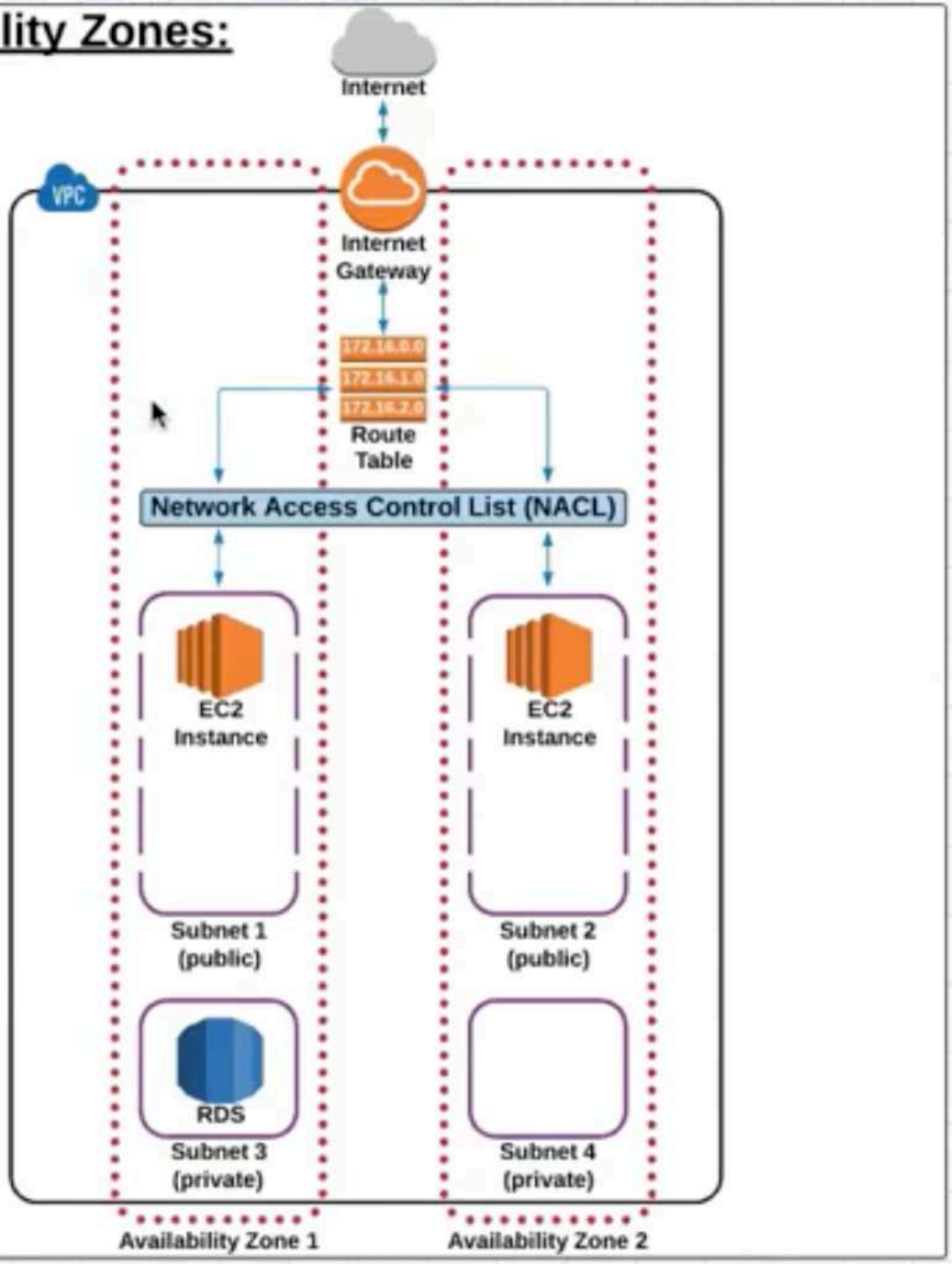
Availability Zones:



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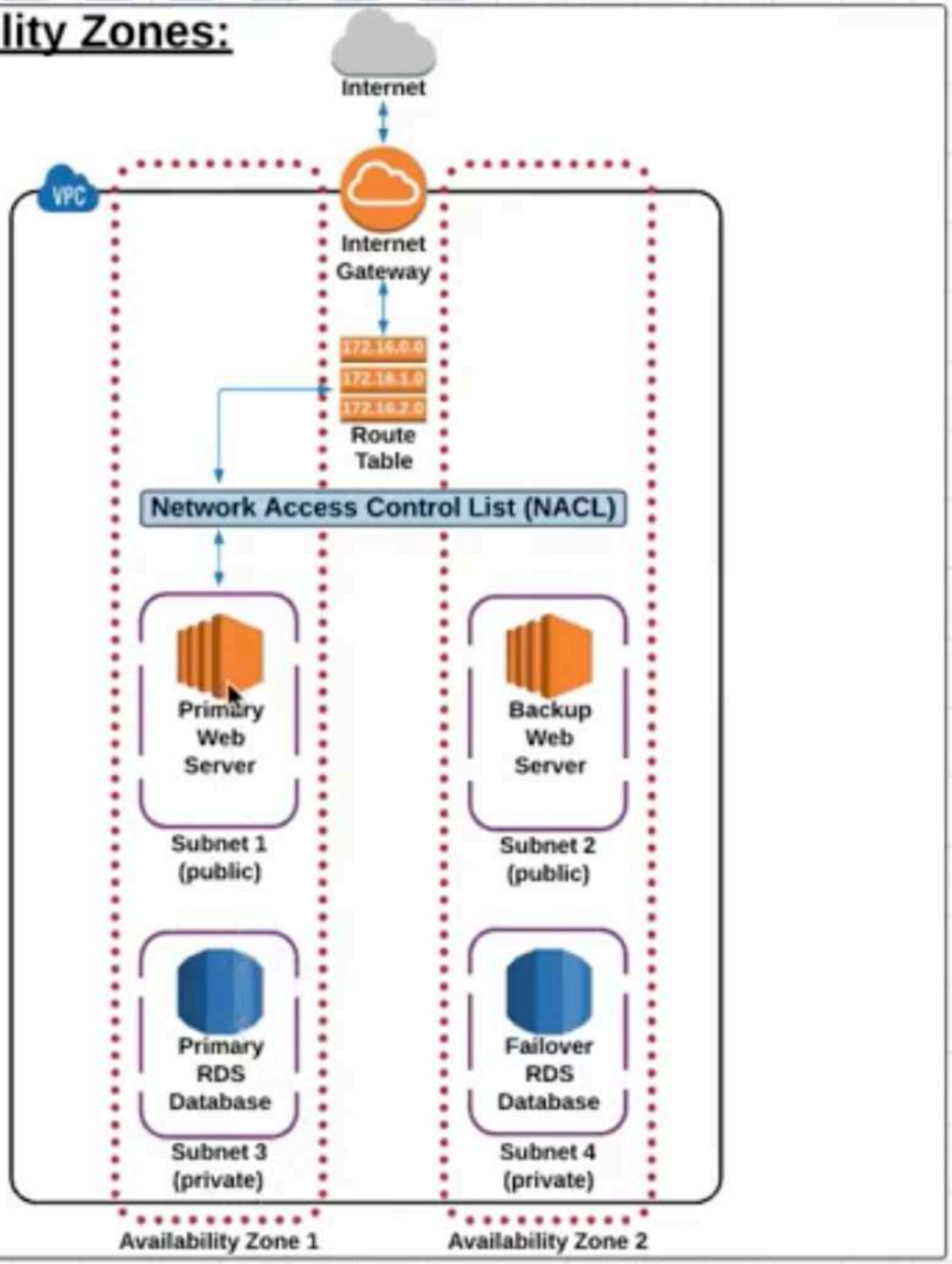
Availability Zones:



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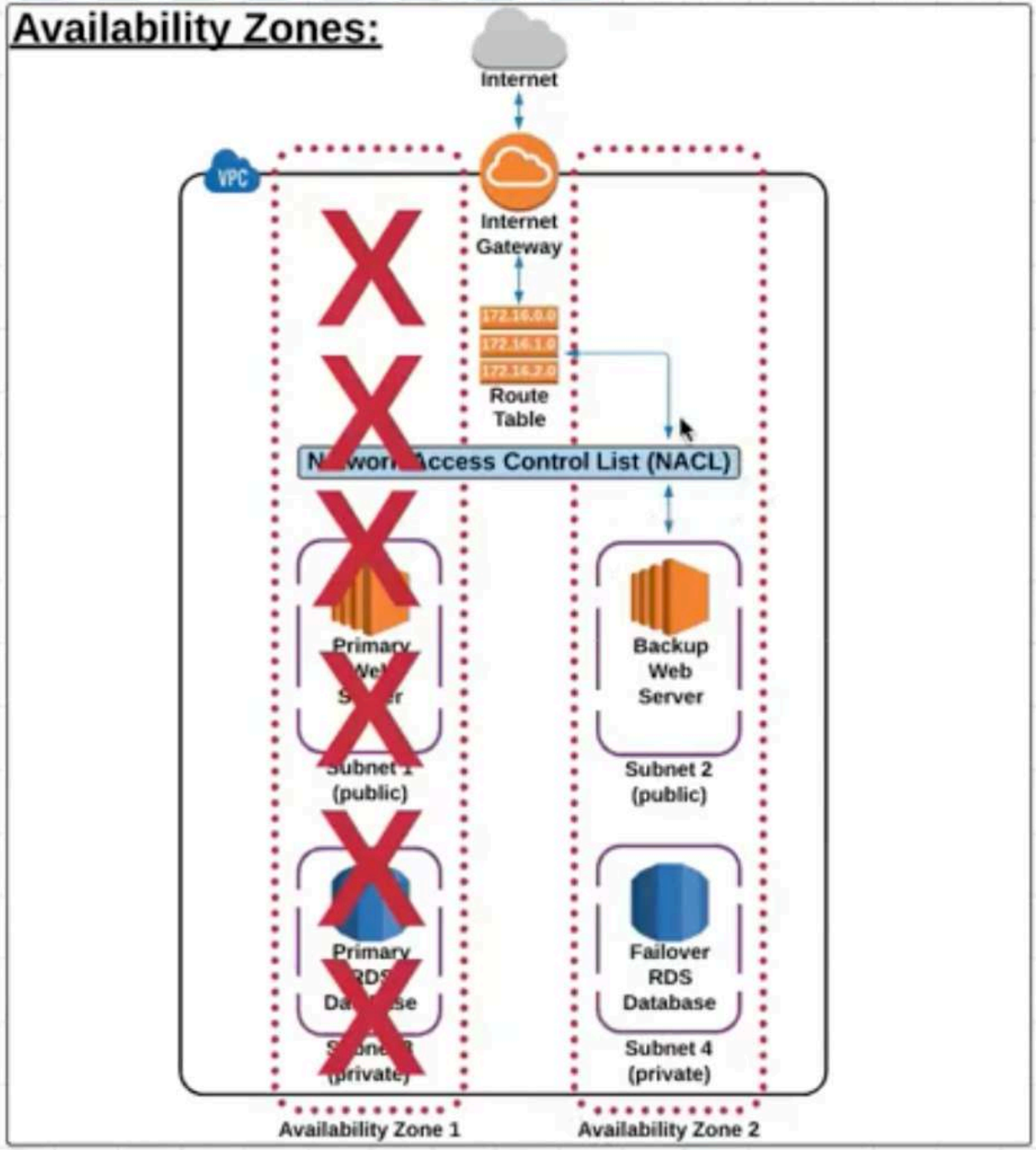
Availability Zones:



Availability Zones

High Availabilty:

Creating your architecture in such a way that your "system" is always availible (or has the least amount of downtime as possible).

What High Availabilty "sounds" like:
(1) "I can always access my data in the cloud"
(2) "My website never crashes and is always availaible to my customers"

Fault Tolerant:

The ability of your "system" to withstand failures in one (or more) of its components and still remain availabile.

What Fault Tolerant "sounds" like:
(1) "One of my web servers failed, but my backup server immediatly took over"
(2) "If someting in my system fails, it can repair itself."

Availability Zones

Availability Zones and VPCs:

Simplified Definition/Explaination:
Any AWS resource that you launch (like EC2/RDS) must be placed in a VPC subnet. Any given subnet must be located in an Availbility Zone. You can (and should) utilize multiple Availabilty Zones to create redundacy in your architecture. This is what allows for ***High Availabilty*** and ***Fault Toleratent*** systems.

AWS Definition/Explaination:
"When you create a ***VPC, it spans all of the Availability Zones in the region***. After creating a VPC, you can add ***one or more subnets in each Availability Zone***. Each subnet must reside entirely within one Availability Zone and cannot span zones.

Availability Zones are distinct locations that are engineered to be isolated from failures in other Availability Zones. By launching instances in separate Availability Zones, you can protect your applications from the failure of a single location."

NOTE: Your "default" VPC already has a Subnet created by default.

Availability Zones