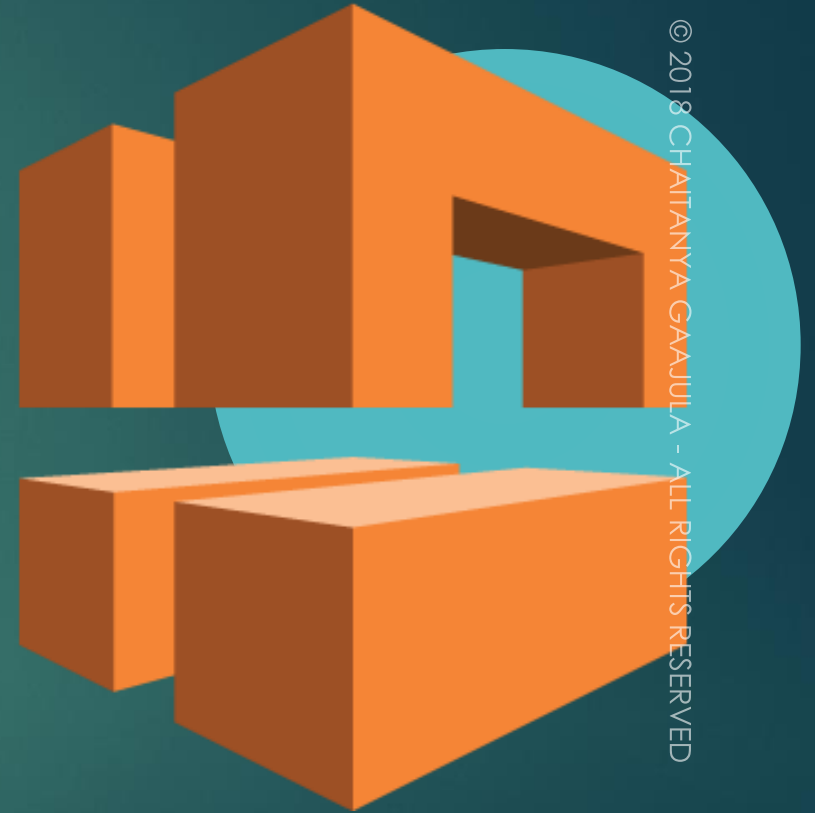


# Azure Virtual Network

# Agenda

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- ❖ What is Vnet
- ❖ VNET Features / Components / Types
- ❖ Public and Private Subnet
- ❖ VNET Security
- ❖ Security Groups and ACL Rules
- ❖ Flow Logs
- ❖ VNET Limitations
- ❖ VNET Peering
- ❖ Quiz
- ❖ Hands-On Lab



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# What is VNET

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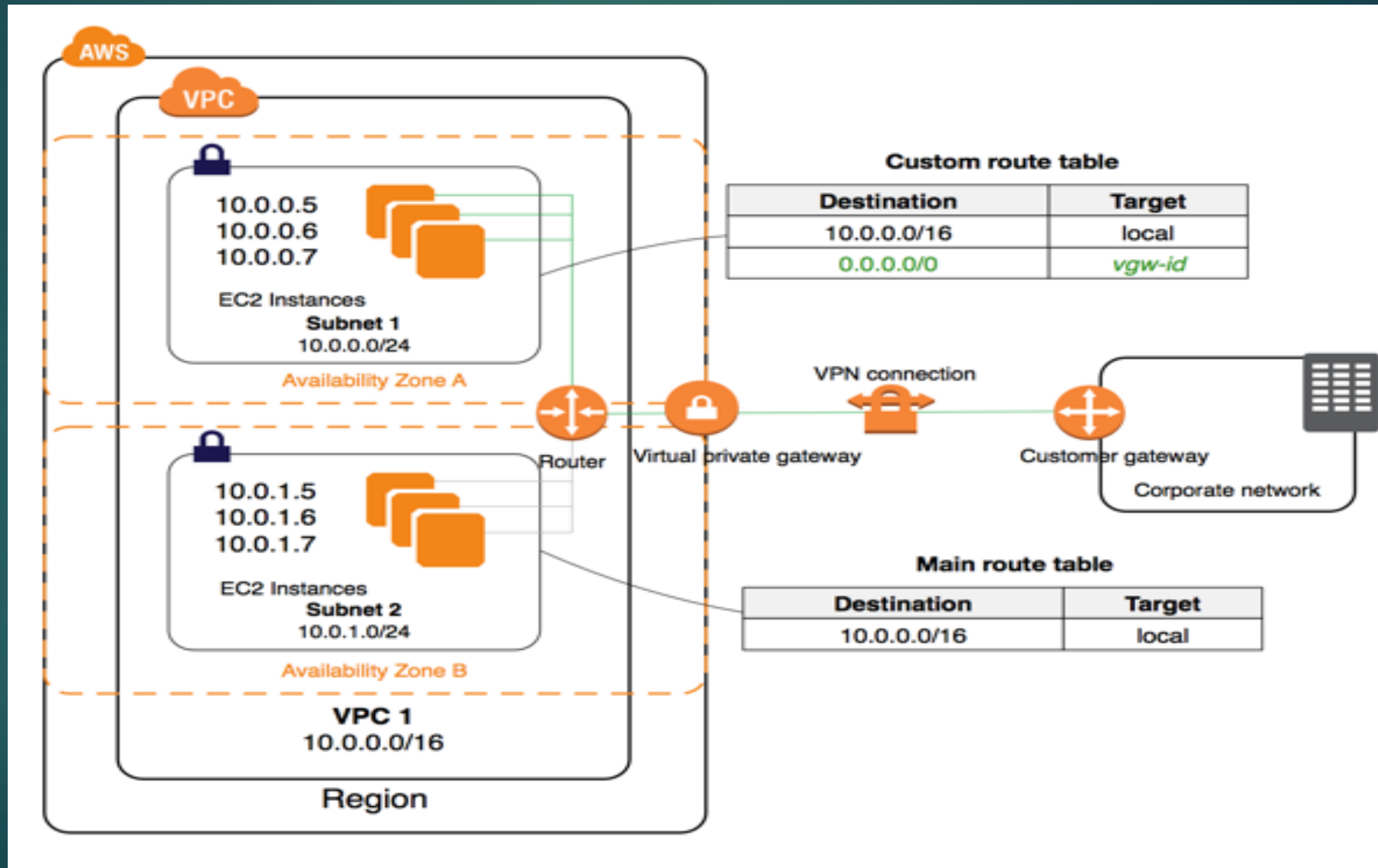
**Azure Virtual Network (VNet)** is the fundamental building block for your private network in Azure. VNet enables many types of Azure resources, such as Azure Virtual Machines (VM), to securely communicate with each other, the internet, and on-premises networks. VNet is similar to a traditional network that you'd operate in your own data center, but brings with it additional benefits of Azure's infrastructure such as scale, availability, and isolation.

## Why use an Azure Virtual network?

Azure virtual network enables Azure resources to securely communicate with each other, the internet, and on-premises networks. Key scenarios that you can accomplish with a virtual network include - communication of Azure resources with the internet, communication between Azure resources, communication with on-premises resources, filtering network traffic, routing network traffic, and integration with Azure services.

# Overview of VNET

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# VNET Features

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Attach one or more  
network interfaces to your  
instances

Assign static private IPv4  
addresses to your  
instances

Run your instances on  
single-tenant hardware

Assign multiple IP  
addresses to your  
instances

Access control lists (ACL)

Egress & Ingress filtering

# AWS VNET: Types

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**Default VNET**

**Non-Default VNET**

# Default Vs Non-Default VNET's

Characterisitics	Default VNET	Non-Default VNET
Public IP Address	Instance receives Public IP Address by default	Instance does not receive Public IP Address by default
Private IP Address	Instance receives a static IP private address from the range of default VNET	Instance receives a static IP private address from the range of VNET
DNS Hostnames	Are enabled by default	Are disabled by default
Accessing the internet	Instance can access the internet	Instances cannot access the internet
Internet Gateway	It is attached to the default VNET and the default subnet has a route to IGW	Depends on how it was created

# AWS VNET: Components

**Subnets**

**Route  
Tables**

**Internet  
Gateway**

**NAT  
Gateway**

**Security  
Groups**

**ACL's**

**VNET Peering**

**VPN**



# Route Tables

- ▶ A route table contains a set of rules, called routes, that are used to determine where network traffic is directed.
- ▶ Each subnet in your VNET must be associated with a route table
- ▶ The table controls the routing for the subnet.
- ▶ A subnet can only be associated with one route table at a time, but you can associate multiple subnets with the same route table.

**subnet-e48dcfbd (10.0.0.0/24) | Public subnet**

Summary **Route Table** Network ACL Flow Logs

[Edit](#)

Route Table: [rtb-8707c5e3](#)

Destination	Target
10.0.0.0/16	local
0.0.0.0/0	<a href="#">igw-b2f0a7d7</a>

# Internet Gateway

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An Internet gateway is a horizontally scaled, redundant, and highly available VNET component that allows communication between instances in your VNET and the Internet.

## Uses:

- ▶ Provides a target in your VNET route tables for Internet-routable traffic
- ▶ Performs network address translation (NAT) for instances that have been assigned public IPv4 addresses.
- ▶ An Internet gateway supports IPv4 and IPv6 traffic.

# Private, Public and Elastic IP address

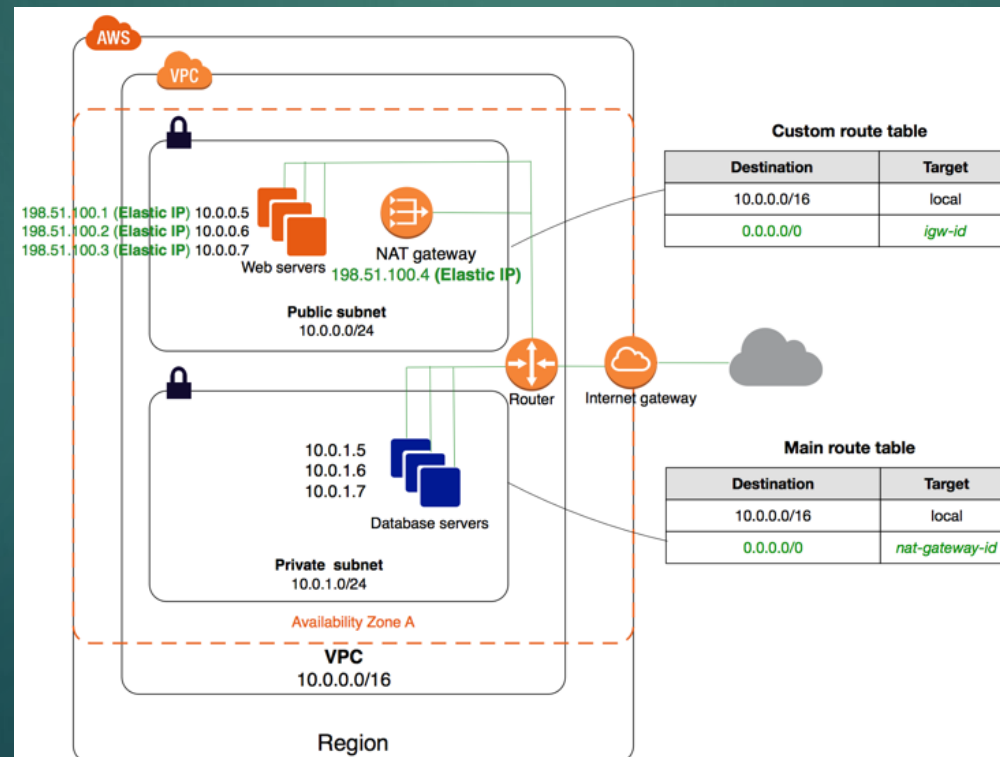
11

- ▶ A private IPv4 address is an IP address that's not reachable over the Internet. Private IPv4 addresses are used for communication between instances in the same network
- ▶ A public IP address is an IPv4 address that's reachable from the Internet. You can use public addresses for communication between your instances and the Internet.
- ▶ An Elastic IP address is a static public IPv4 address that could be allocate to AWS account. KIt could be associated to and from instances as required, and it's allocated to the account until you choose to release it

# NAT Device

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- ▶ NAT device helps to enable instances in a private subnet to connect to the Internet (for example, for software updates) or other AWS services, but prevent the Internet from initiating connections with the instances.
- ▶ A NAT device forwards traffic from the instances in the private subnet to the Internet or other AWS services, and then sends the response back to the instances.



# Nat Gateway and Nat Instances

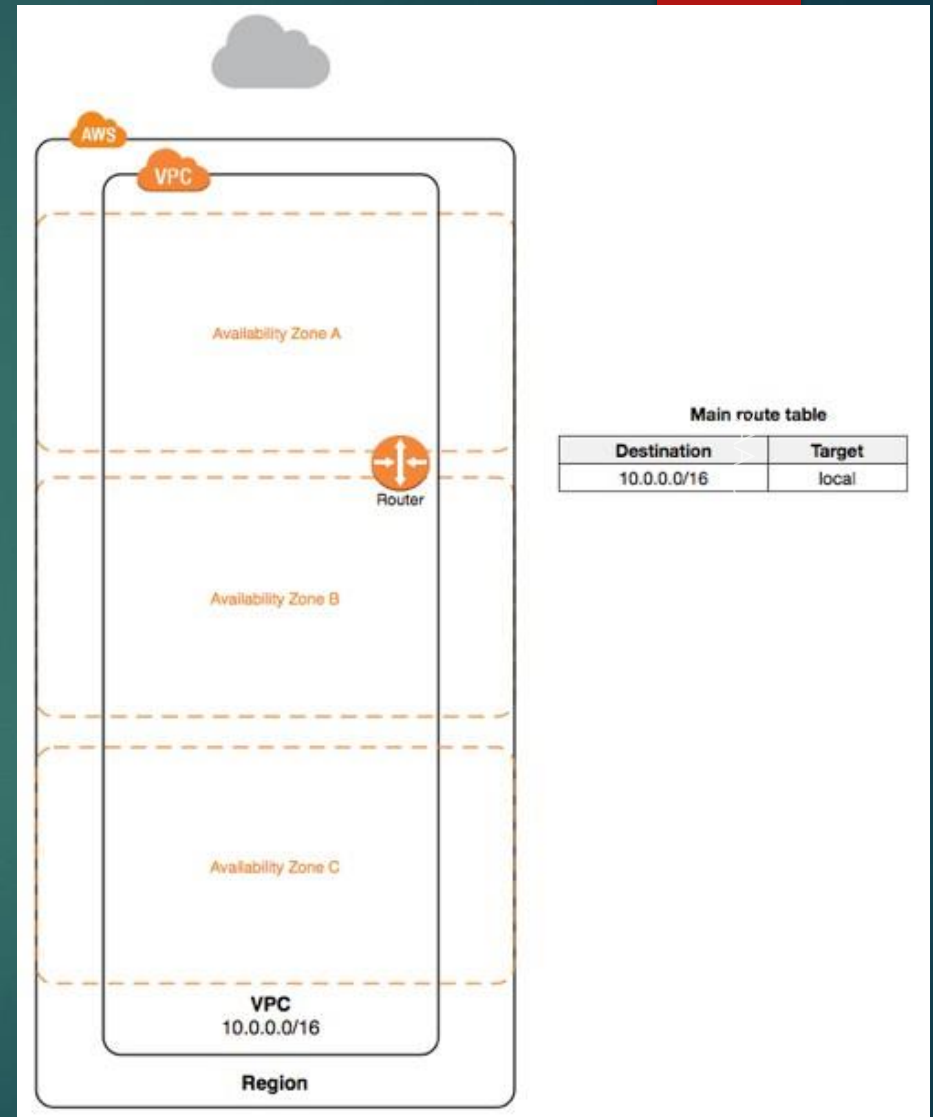
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Attribute	NAT gateway	NAT instance
Availability	Highly available. NAT gateways in each Availability Zone are implemented with redundancy. Create a NAT gateway in each Availability Zone to ensure zone-independent architecture.	Use a script to manage failover between instances.
Bandwidth	Supports bursts of up to 10Gbps.	Depends on the bandwidth of the instance type.
Maintenance	Managed by AWS.You do not need to perform any maintenance.	Managed by you, for example, by installing software updates or operating system patches on the instance.
Performance	Software is optimized for handling NAT traffic.	A generic Amazon Linux AMI that's configured to perform NAT.
Cost	Charged depending on the number of NAT gateways you use, duration of usage, and amount of data that you send through the NAT gateways.	Charged depending on the number of NAT instances that you use, duration of usage, and instance type and size.
Type and size	Uniform offering; you don't need to decide on the type or size.	Choose a suitable instance type and size, according to your predicted workload.

# AWS VNET: VNET and Subnet

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- ❑ Specify a range of IP addresses for the VNET in the form of a Classless Inter-Domain Routing (CIDR) block.
- ❑ Example, 10.0.0.0/16. This is the primary CIDR block for your VNET.
- ❑ Allowed block size is between a /16 netmask and /28 netmask.
- ❑ For subnet, specify the CIDR block for the subnet, which is a subset of the VNET CIDR block.
- ❑ Each subnet must reside entirely within one Availability Zone and cannot span zones.
- ❑ Use <http://www.subnet-calculator.com/cidr.php>





# Subnet Mask Classes

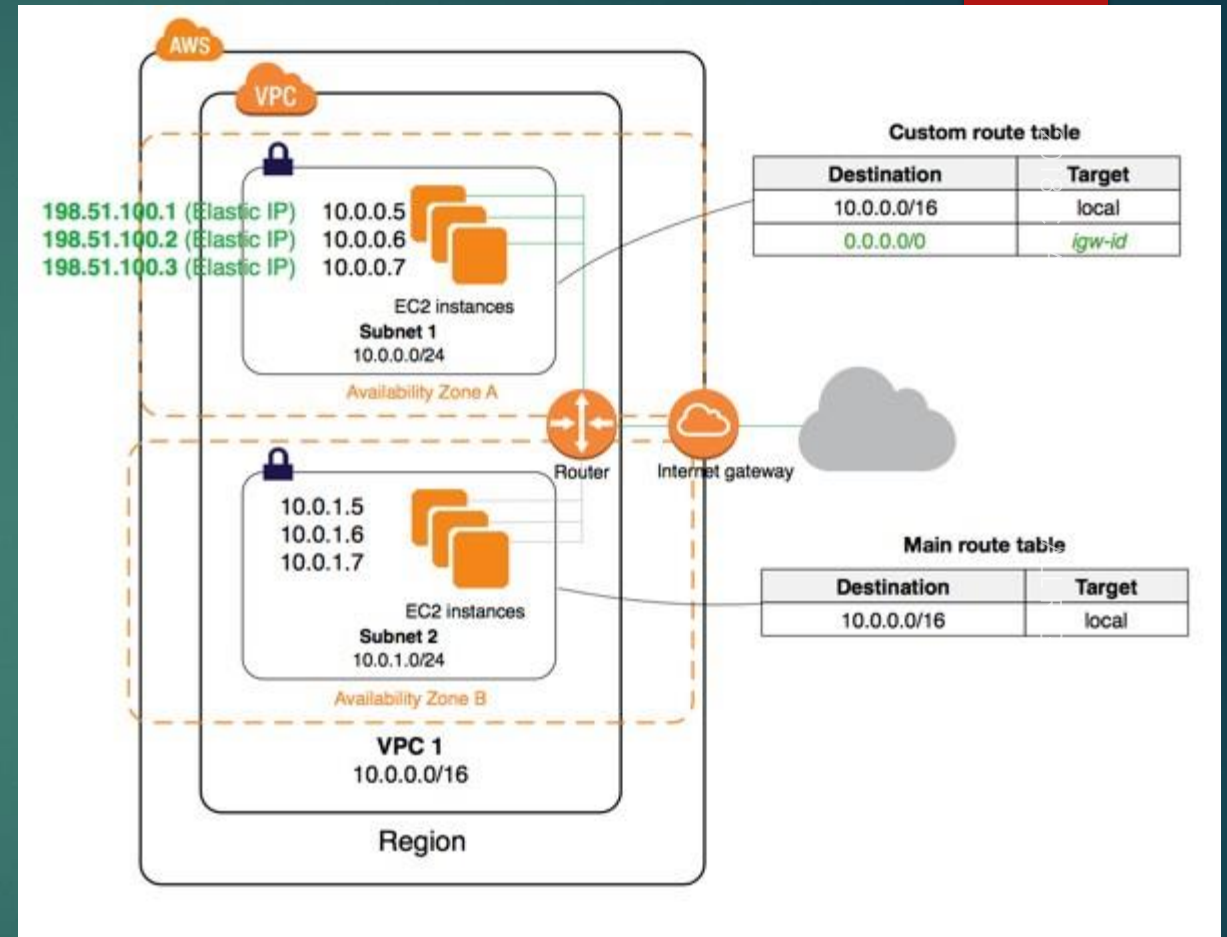
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Address Class	Value in First Octet	Classful Mask (dotted decimal)	Classful Mask (prefix notation)
<b>A</b>	1 - 126	255.0.0.0	/8
<b>B</b>	128 - 191	255.255.0.0	/16
<b>C</b>	192 - 223	255.255.255.0	/24
<b>D</b>	224 - 239	N/A	N/A
<b>E</b>	240 - 255	N/A	N/A

# AWS VNET: Public Subnet

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- ❑ A public subnet is a subnet that has access to the Internet through an Internet gateway.
- ❑ Each instance has a private address and public address.
- ❑ These instances can communicate with each other, and access the Internet.

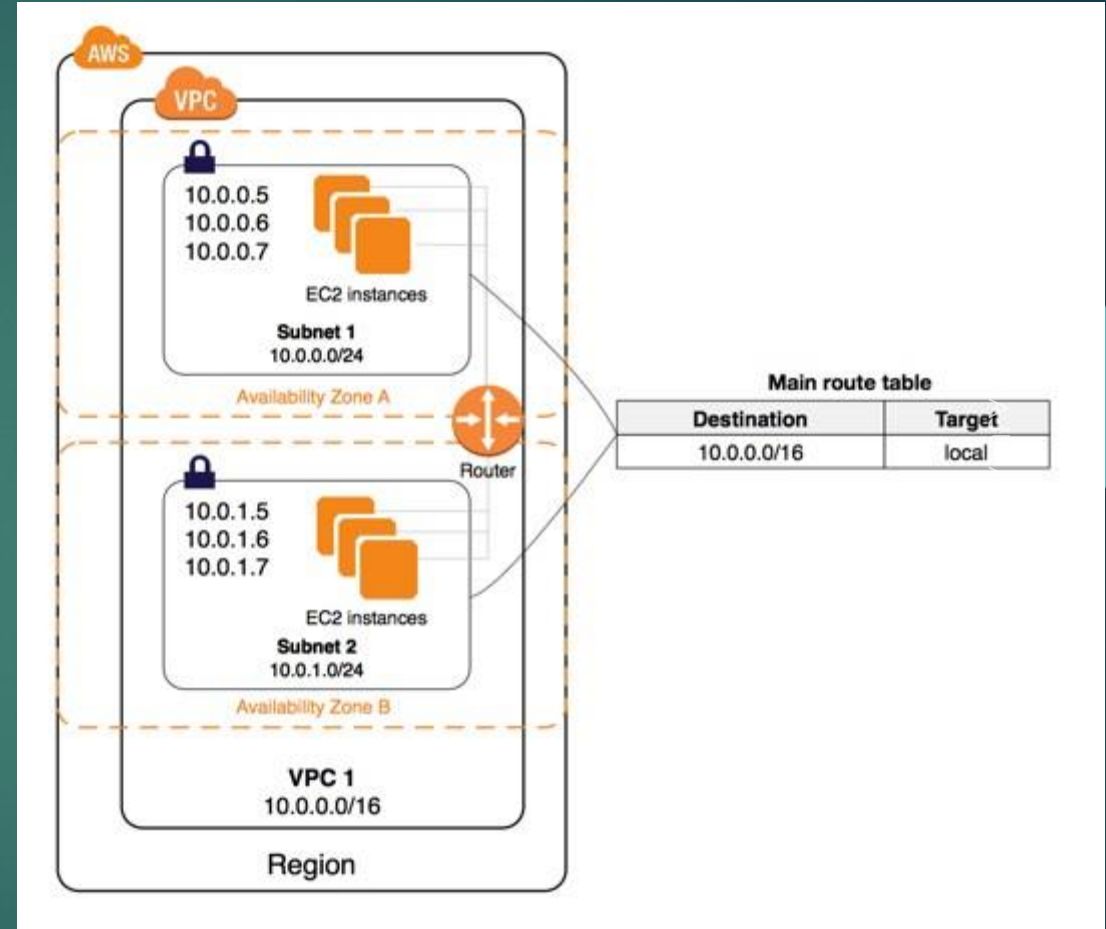




# AWS VNET: Private Subnet

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- ❑ If a subnet doesn't have a route to the internet gateway, the subnet is known as a private subnet.
- ❑ By default, each instance has a private address, but no public address.
- ❑ These instances can communicate with each other, but can't access the Internet.

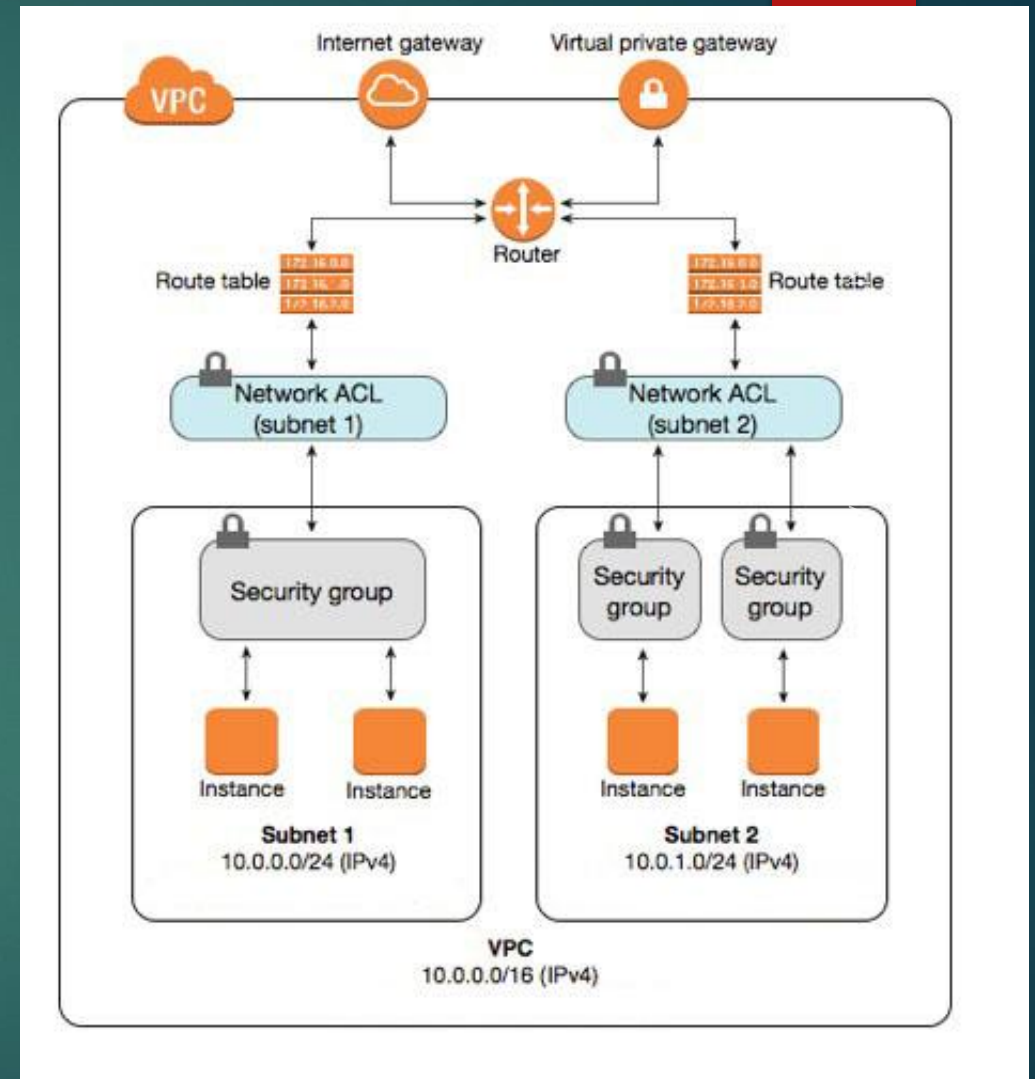


# AWS VNET: Security

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- ❑ VNET provides features to increase and monitor the security for your VNET:
  - **Security Groups**
  - **Network Access Control Lists (ACLs)**
  - **Flow Logs**

Security Group	Network ACL
Operates at the instance level (first layer of defense)	Operates at the subnet level (second layer of defense)
Supports allow rules only	Supports allow rules and deny rules
Is stateful	Is stateless
Evaluate all rules before deciding whether to allow traffic	Process rules in number order when deciding whether to allow traffic



# AWS VNET: ACL Rules

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Inbound ACL Rule						
Rule #	Type	Protocol	Port Range	Source	Allow/ Deny	Comments
100	HTTP	TCP	80	0.0.0.0/0	Allow	Allows inbound HTTP traffic from any IP address
110	HTTPS	TCP	443	0.0.0.0/0	Allow	Allows inbound HTTPS traffic from any IP address
120	RDP	TCP	3389	192.0.2.0/2	Allow	Allows inbound RDP traffic from IP address range
130	Custom TCP	TCP	32768-6553	0.0.0.0/0	Allow	Allows inbound return traffic from the Internet [ephemeral port]
*	All Traffic	All	All	0.0.0.0/0	Deny	Denies all inbound IP traffic not already handled by a preceding rule

Outbound ACL Rule						
Rule #	Type	Protocol	Port Range	Source	Allow/ Deny	Comments
100	HTTP	TCP	80	0.0.0.0/0	Allow	Allows outbound IP HTTP traffic from the subnet to the Internet
110	HTTPS	TCP	443	0.0.0.0/0	Allow	Allows outbound IP HTTPS traffic from the subnet to the Internet
120	Custom TCP	TCP	32768-6553	50.0.0.0/0	Allow	Allows outbound responses to clients on the Internet [ephemeral port]
*	All Traffic	All	All	0.0.0.0/0	Deny	Denies all outbound IP traffic not already handled by a preceding rule

# AWS VNET: Flow Logs

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- ❑ VNET Flow Logs enables you to capture information about the IP traffic going to and from network interfaces in your VNET.
- ❑ Flow log data is stored using Amazon CloudWatch Logs.
- ❑ After you've created a flow log, you can view and retrieve its data in Amazon CloudWatch Logs.
- ❑ You can create a flow log for:
  - VNET
  - Subnet
  - Network Interface
- ❑ Flow log format:
  - version account-id **interface-id** srcaddr dstaddr **srcport** **dstport** protocol packets bytes start end **action** log- status

# AWS VNET: Limitations

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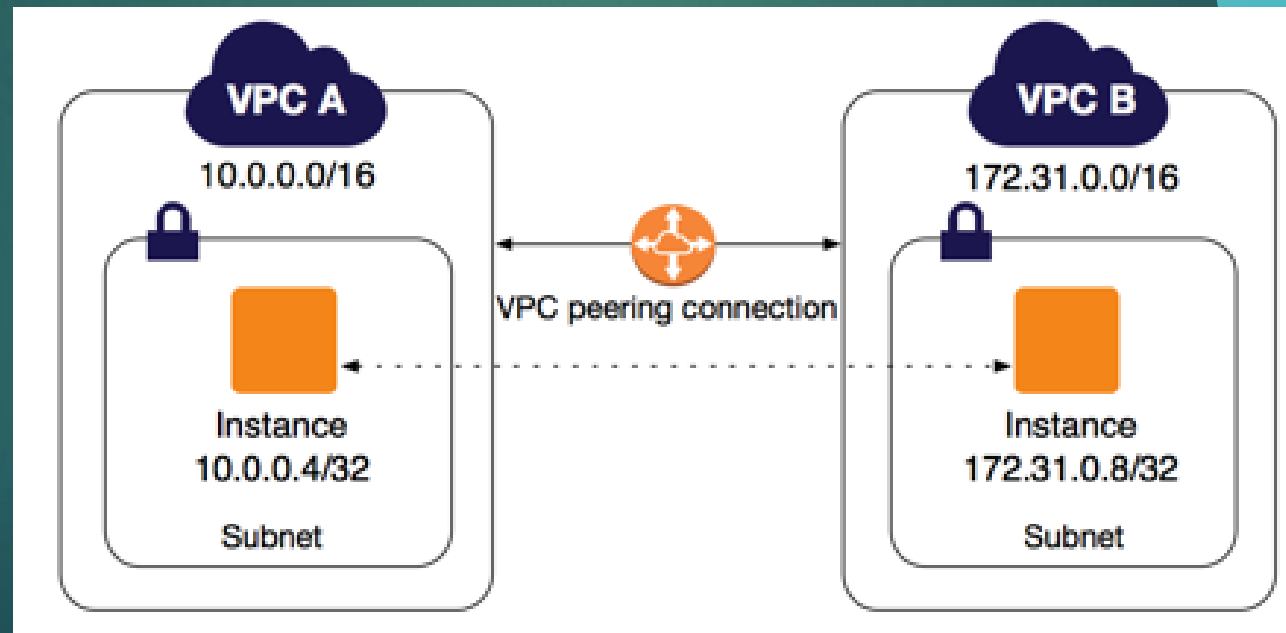
Resource	Default Limit
VNETs per region	5
Subnets per VNET	200
Internet gateways per region	5
NAT gateways per Availability Zone	5
Virtual private gateways per region	5
Network ACLs per VNET	200
Rules per network ACL	20
Route tables per VNET	200
Routes per route table	50
Active VNET peering connections per VNET	50
VPN connections per region	50

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# AWS VNET: Peering

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- ❑ VNET peering is a networking connection between two VNETs that enables you to route traffic between them.
- ❑ Instances in either VNET can communicate with each other as if they are within the same network.
- ❑ Create a VNET peering connection between own VNETs, or with a VNET in another AWS account.
- ❑ In both cases, the VNETs must be in the same region.

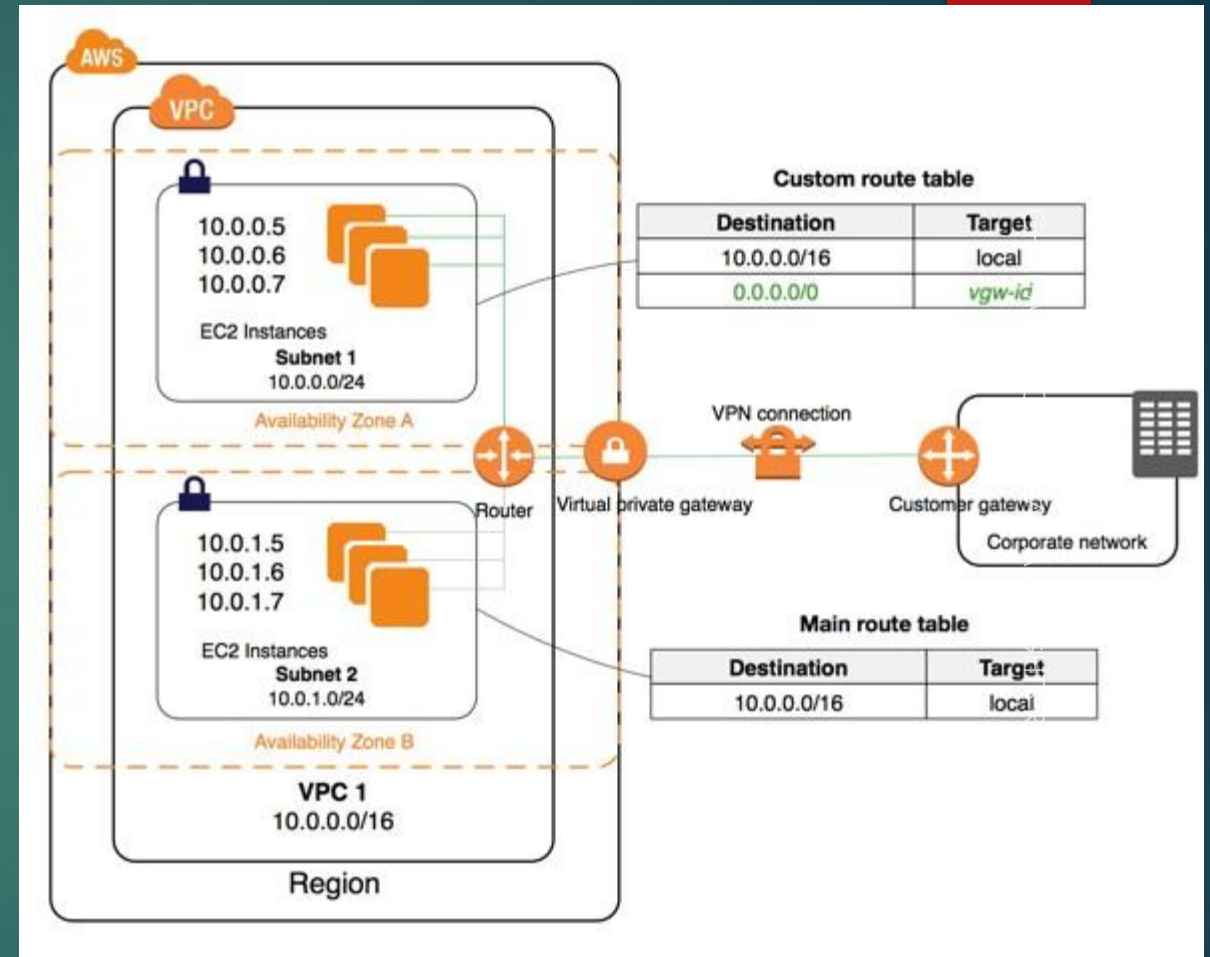




# AWS VNET: VPN

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- ❑ Connect VNET to corporate data center using VPN connection
- ❑ This makes the AWS cloud an extension of your data center.
- ❑ VPN connection consists of a virtual private gateway and a customer gateway.



# Hands-On Lab



# Hands-on Lab

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- ❑ Create a VNET using private address ranges CIDR block
- ❑ Create Public & Private subnet
- ❑ Manage Internet Gateway
- ❑ Manage Subnet settings
- ❑ Launch an Instance in Public & Private subnet
- ❑ Configure Web server in Public subnet
- ❑ Manage ACL
- ❑ Manage NAT Gateway

# Thank You