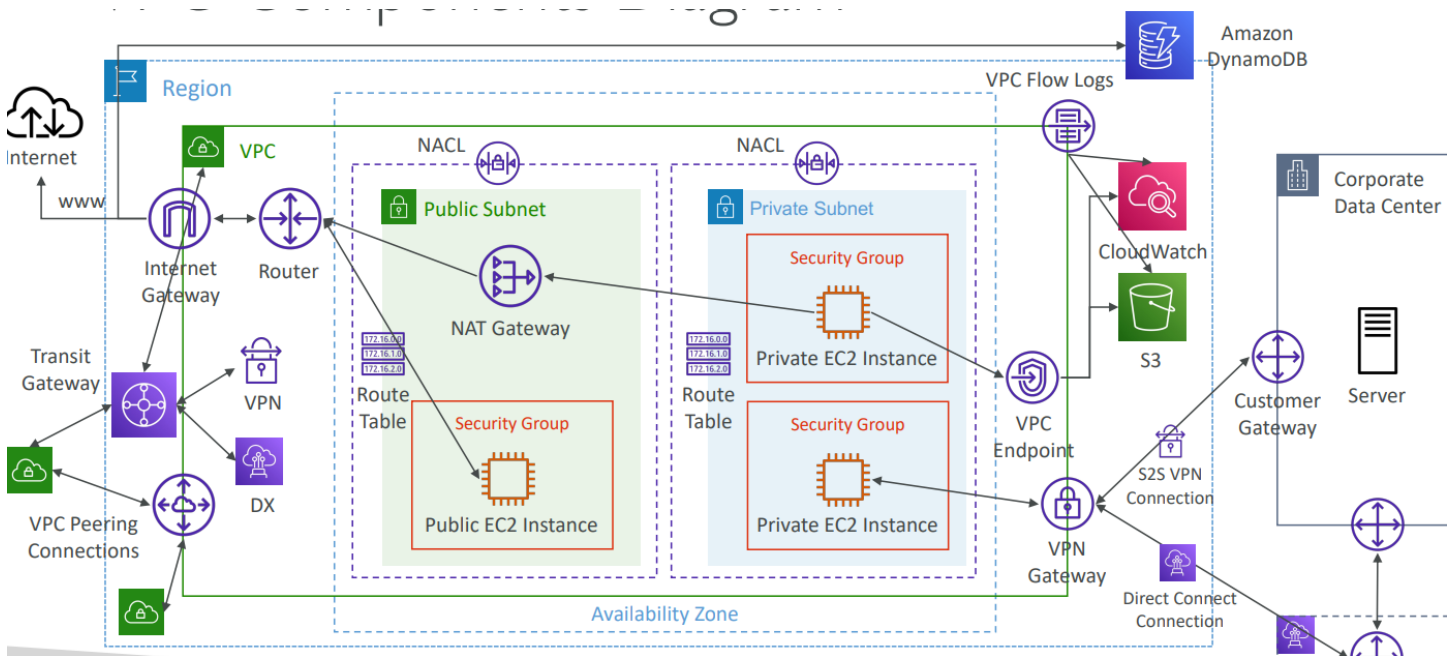


Creating an AWS VPC from Scratch (Enterprise Grade)

~Ritvik Kant



This is the final VPC which I will construct step by step

VPC

Stands for Virtual Private Cloud

In this guide, I'll create a custom VPC in AWS from scratch, including subnets, route tables, Internet connectivity, and essential components. This provides better control and security than using the default VPC.

This VPC **WILL BE** an Enterprise grade VPC with options and features which ensure

1. High Availability and scalability
2. Resilience
3. Security
4. High performance and traffic spiking workloads

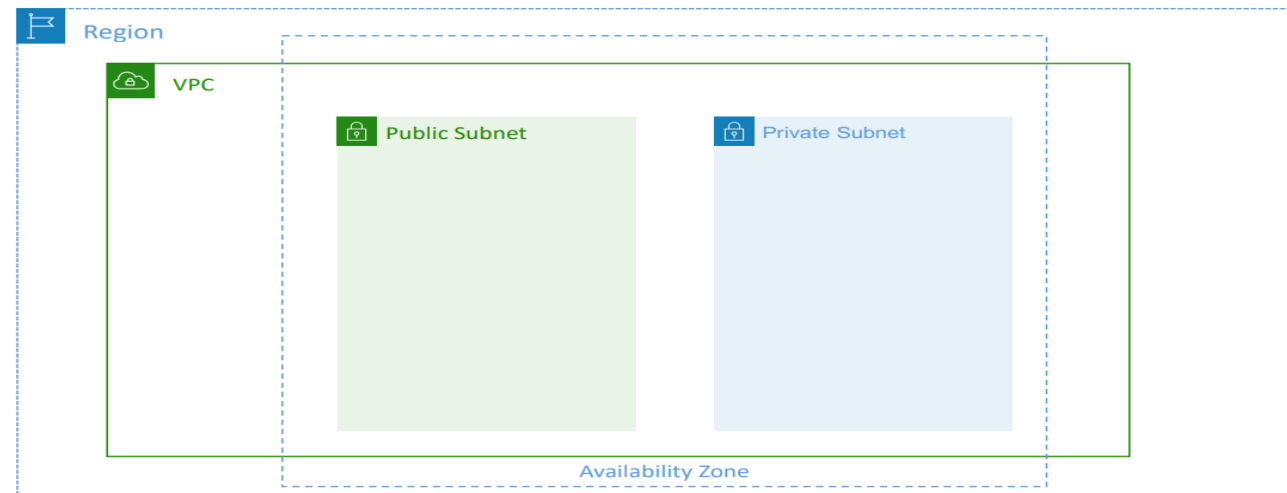
This is Ritvik and here is my take of a fault proof and an all rounder cost optimized and **ENTERPRISE GRADE VPC**
Let's make it from scratch

Step1. **Creating a VPC and establishing subnets in a region**

VPC as stated is a virtual private cloud in short like an independant society with residents not dependant on the outside for any resources

Imagine Subnets like the houses in the Neighbourhood Some our public like movie halls and parks

Rest are private like residential Homes



aws [Search] [Alt+S] Asia Pacific (Mumbai) FalconX

VPC > Subnets

VPC dashboard < EC2 Global View [?] Filter by VPC

Virtual private cloud

Your VPCs

Subnets

Route tables

Internet gateways

Egress-only internet gateways

DHCP option sets

Elastic IPs

Managed prefix lists

NAT gateways

Peering connections

Subnets (6) Info Last updated less than a minute ago [Actions] Create subnet

Find subnets by attribute or tag

Subnet ID	State	VPC	Block Public...	IPv4 CIDR	IPv6 CIDR
subnet-087e486d2b3fbce5d	Available	vpc-03d1f5a9b8e9c526e dem...	Off	10.0.1.0/24	-
subnet-0f9e0fa1c50402b5d	Available	vpc-02c0cb56c281c19c9 defa...	Off	172.31.0.0/20	-
subnet-096d3b467ce2bcbbf	Available	vpc-02c0cb56c281c19c9 defa...	Off	172.31.16.0/20	-
subnet-09d268e3052159647	Available	vpc-03d1f5a9b8e9c526e dem...	Off	10.0.0.0/24	-
subnet-07a84f294ce1eea07	Available	vpc-02c0cb56c281c19c9 defa...	Off	172.31.32.0/20	-
subnet-0c548e7b3005d8fe6	Available	vpc-03d1f5a9b8e9c526e dem...	Off	10.0.2.0/24	-

Select a subnet

VPC Show details

Your AWS virtual network

demo-vpc

Subnets (3)

Subnets within this VPC

ap-south-1a

A newBabySubnet

ap-south-1b

B babysubnet2

ap-south-1c

C newbabysubnet3

Step-2

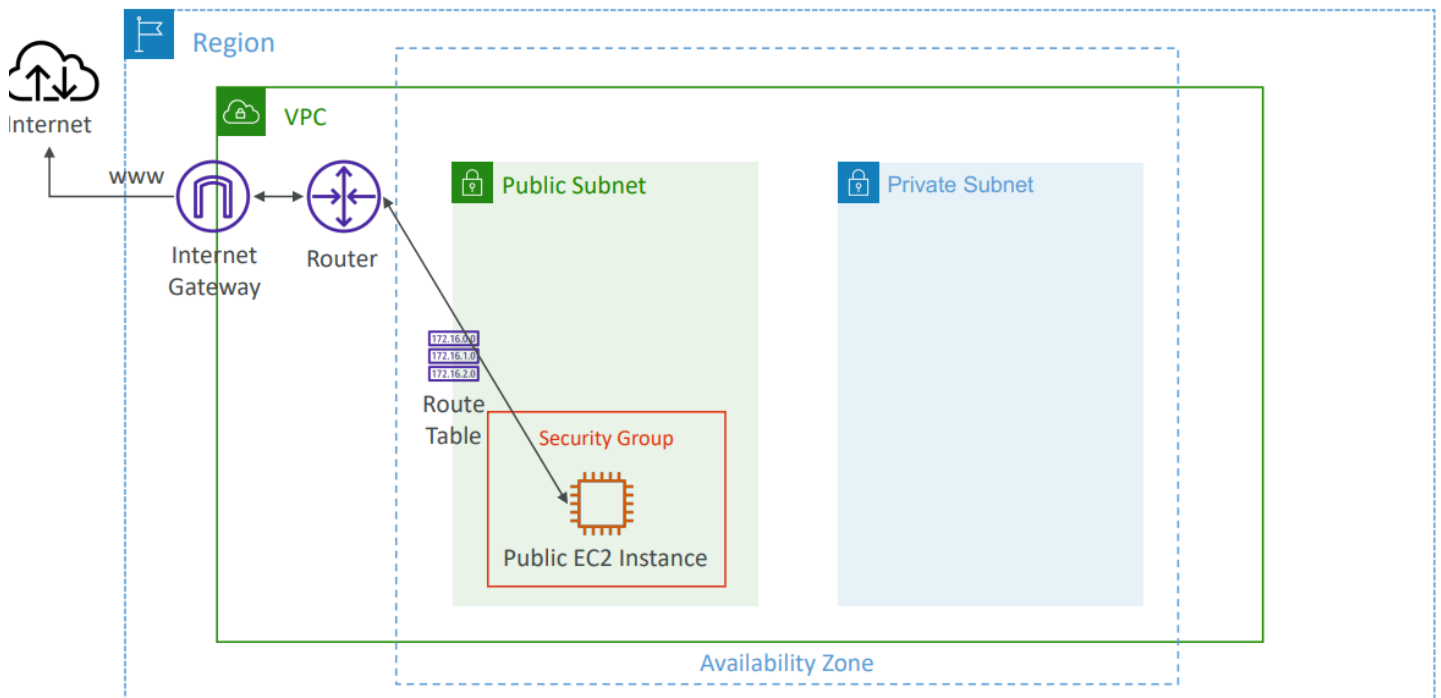
Internet GateWay

Now that the neighbourhood is created, we require a connection for import exports or in cloud terms Internet Access to the instances containing the app

I created an internet Gateway now the diagram is like this

Note:

- It scales horizontally and is highly available and redundant
- Must be created separately from a VPC
- One VPC can only be attached to one IGW and vice versa
- Internet Gateways on their own do not allow Internet access...
- Route tables must also be edited!



Below shows the attached Internet Gateway
and the route table records being attached to the Internet Gateway

PUBLIC SUBNET	PRIVATE SUBNET
Its personal Route table is created pointing the Internet Gateway	Its personal Route table is created either pointing to a Bastion Host or private networks only

aws

Search

[Alt+S]

Asia Pacific (Mumbai)

FalconX

VPC > Internet gateways > igw-Off212bc85a35b62e

igw-Off212bc85a35b62e / demoInternetGateway

Actions

VPC dashboard

EC2 Global View

Filter by VPC

Virtual private cloud

Your VPCs

Subnets

Route tables

Internet gateways

Egress-only internet

Details

Internet gateway ID

igw-Off212bc85a35b62e

State

Attached

VPC ID

vpc-03d1f5a9b8e9c526e | demo-vpc

Owner

254159011250

Tags

Search tags

Manage tags

Key

Value

Name

demoInternetGateway

Routes

Subnet associations

Edge associations

Route propagation

Tags

Routes (3)

Both

Edit routes

Filter routes

1

Destination

Target

Status

Propagated

0.0.0.0/0

igw-Off212bc85a35b62e

Active

No

10.0.0.0/16

local

Active

No

172.31.0.0/16

pcx-00ca29223482e24c7

Active

No

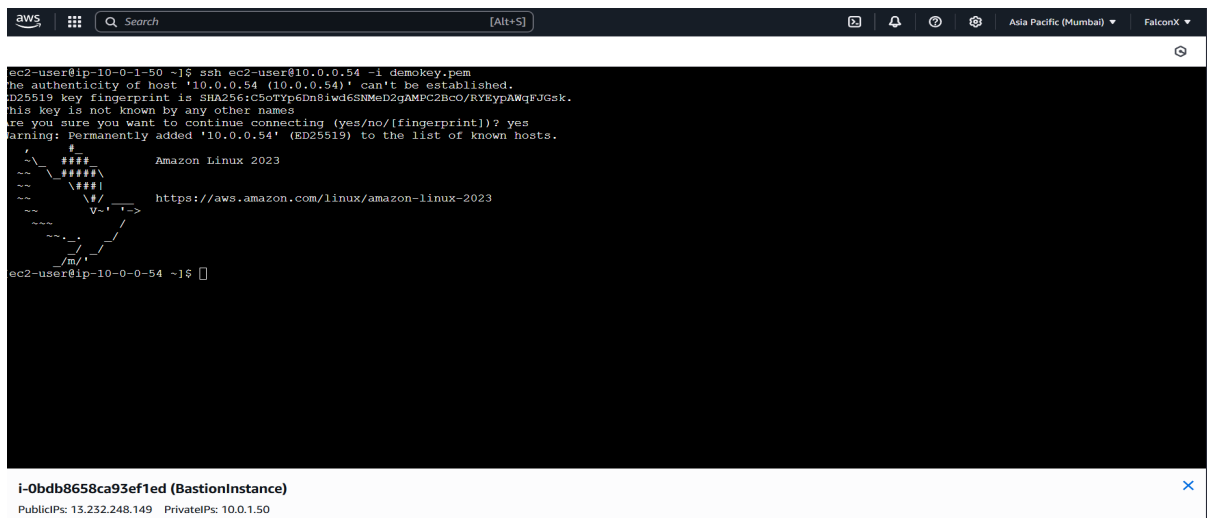
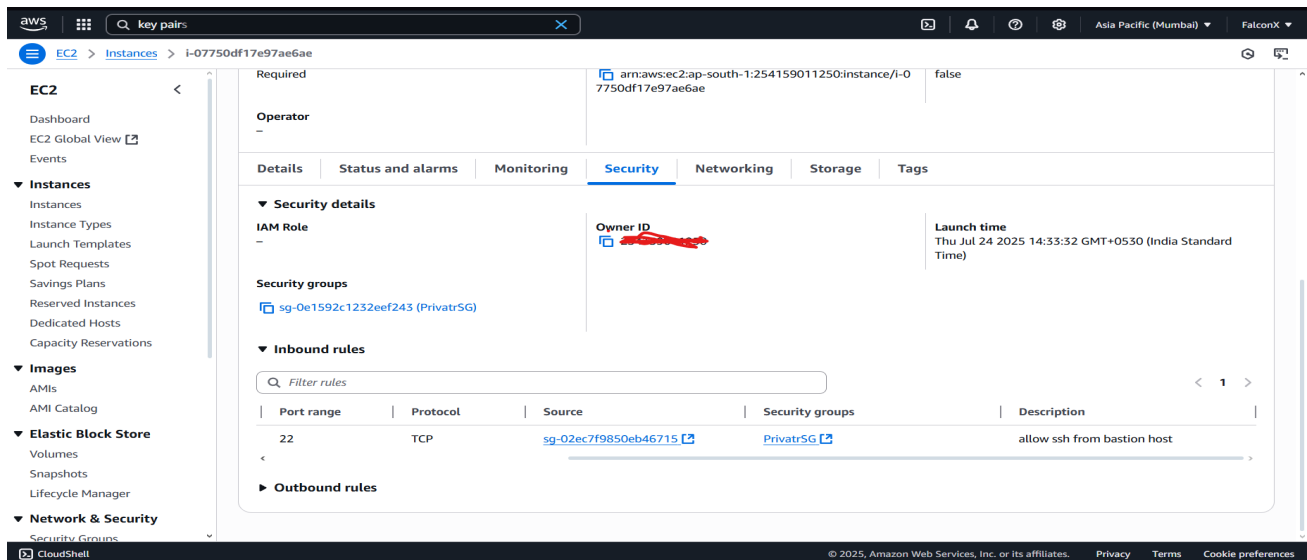
Now Ritvik You just talked About how public subnets are visible but Private subnets are not
So what if I want to access my instaces /App on the private instance for the public but I don t
want to show Them #Principle of OOPs-->Abstraction

Bastion Hosts (Step-2.5)

These are the types of instances which are hosted on public subnets have access and are visible to the public and can operate resources to the private subnet instances simply but doing SSH into those instances

Here I have

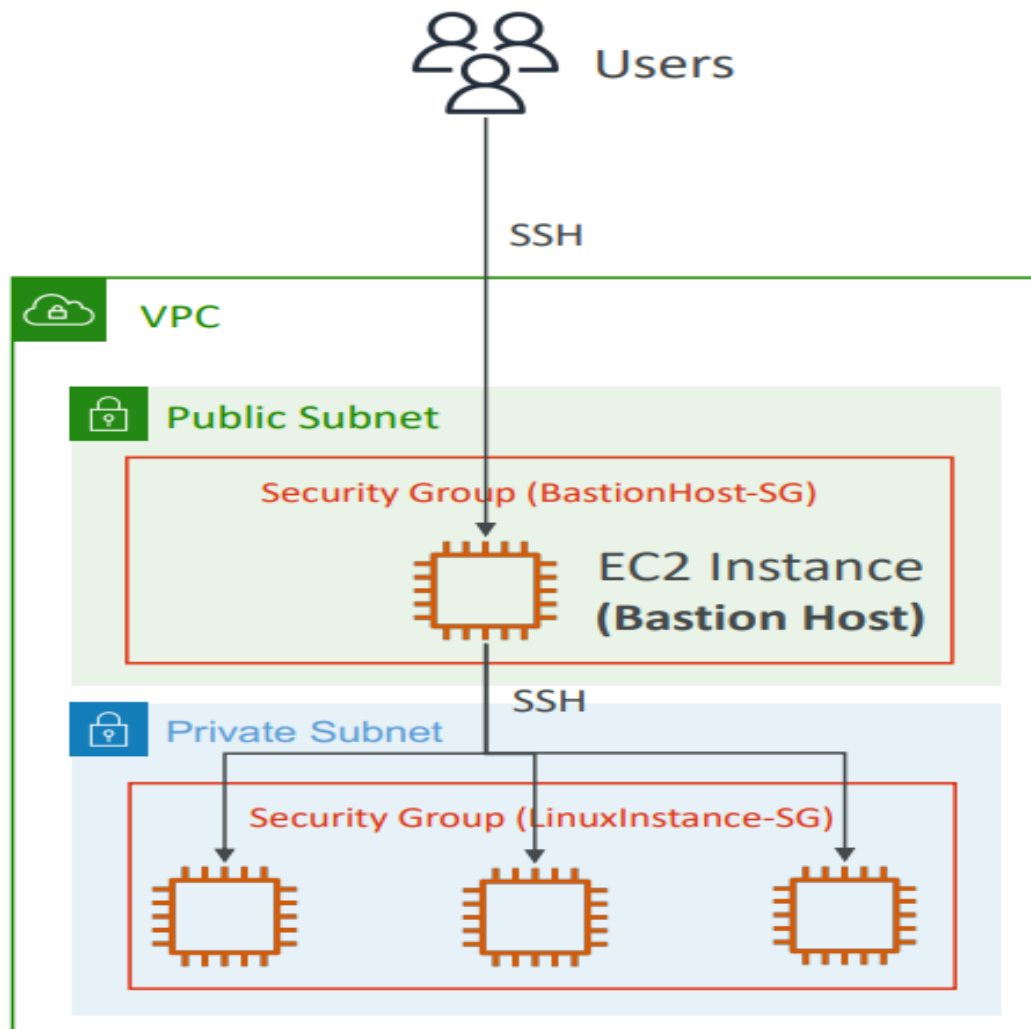
1. Created instance named bastion host in public subnet and one in private subnet
2. Modified the security group inbound rules of private instance to allow traffic on port 22 (SSH Port) to point **FROM THE SECURITY GROUP OF BASTION HOST**
3. **Now I ssh into the Bastion host**
4. From here I ssh into the private instance – make a .pem file, import it in the terminal itself and echo a “Hello” in Private instance
5. As soon as I curl cmd (For calling) it in the public instance it returns the desired output



ExpectedOutput

```
[ec2-user@ip-172-31-3-7 ~]$ curl 10.0.1.50  
hello  
[ec2-user@ip-172-31-3-7 ~]$
```

NOW THE Structure LOOK LIKE THIS



Step 3

Increasing level [#####-----]

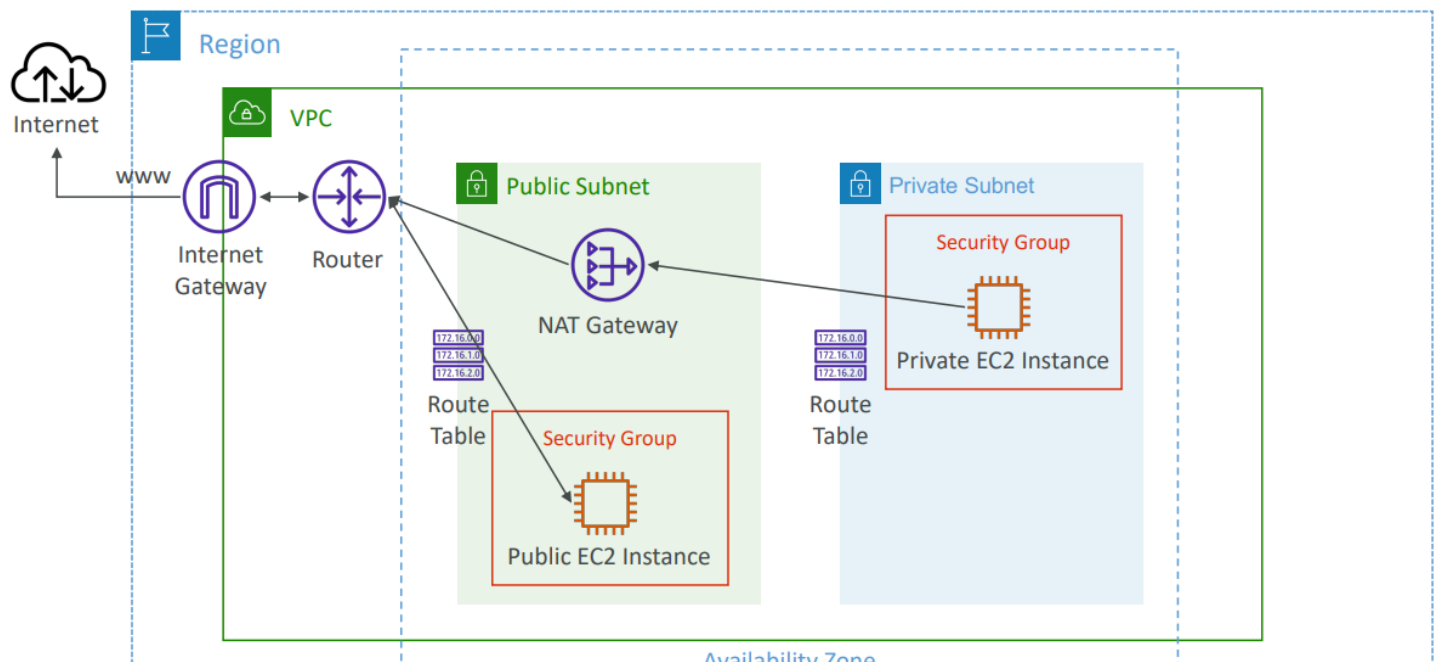
This method is great but not reliable for bigger workloads so

NAT GATEWAY

This thing ensures a stable internet connection both in and out be given to private subnets with a window for security checks ofc!

AWS-managed NAT, higher bandwidth, high availability, no administration

- NATGW is created in a specific Availability Zone, uses an Elastic IP
- Can't be used by EC2 instance in the same subnet (only from other subnets)
- Requires an IGW (Private Subnet => NATGW => IGW)
- 5 Gbps of bandwidth with automatic scaling up to 100 Gbps



Now Comes the Security Part to secure the infrastructure for

1. Malicious Traffic
2. Misguided Traffic

Step-4

NACL(s) /Security Groups

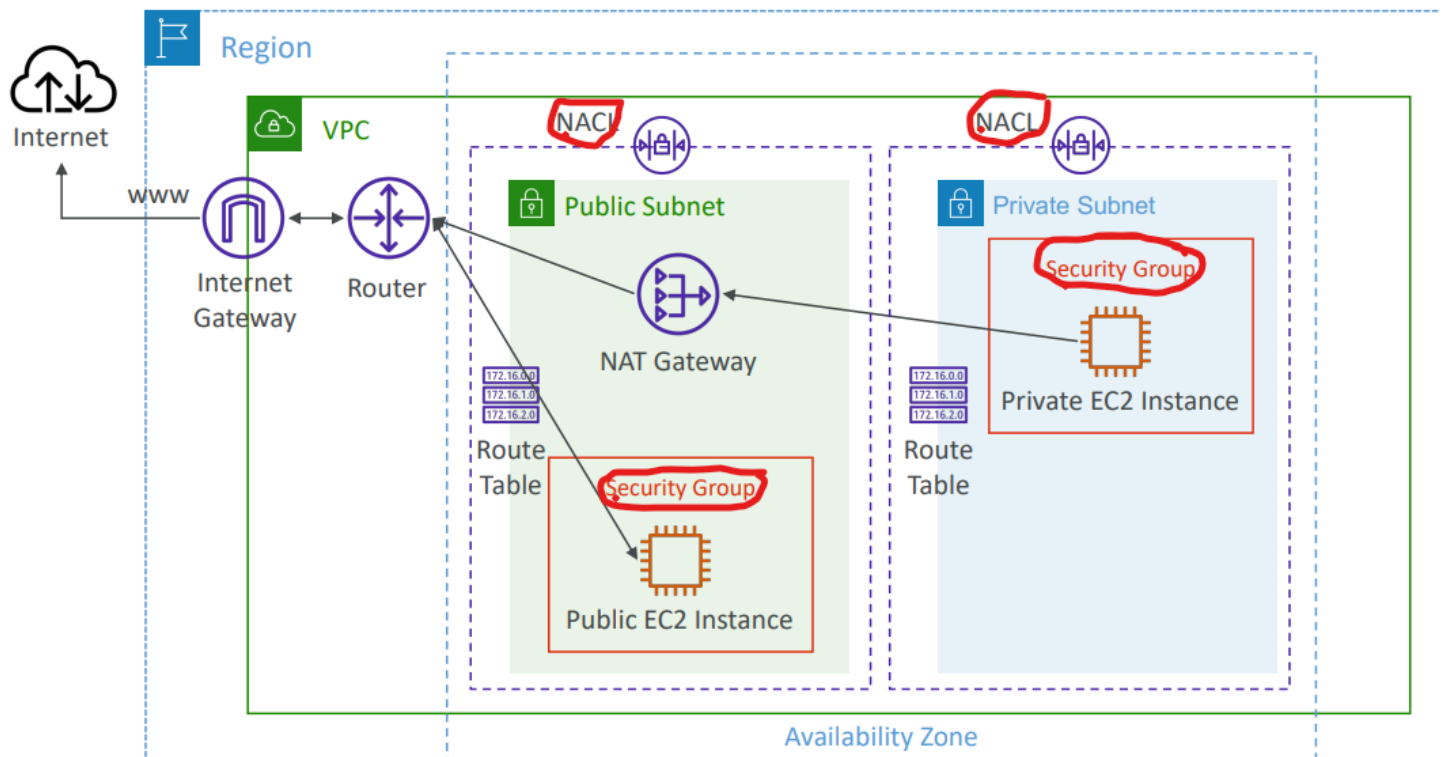
NACL(s) are Subnet Level completely stateless(Check both in and out traffic) and are based on Rules priority no.s

Security groups are instance level to further prevent the misguided traffic to reach its correct path and may not activate a wrong instance these are stateful(logical people if in then out and vice versa types) and have no priority no. System just declarations

There are many palces wehre I used NACLs to block certain CIDRs

And off those Which enter inside to guide through security groups

So here is our progress



NOTE:

EPHIMERAL PORTS- these are on spot usable ports used instead of defined ports for communication for added security

Now If the app is Enterprise grade and the infrastructure is also Enterprise grade
It can not rely on only 1 VPC

We have to have multiple VPC but that is not the point that is simple the point is

WE NEED SYNC and updated Information between all the VPCs for the companies

Also an Advantage of this will be to share info across VPC ,,,,next Feature

Step 4

VPC Peering

It simply means establishing a peering connection or simply a connection between VPCs **CROSS ACCOUNT & CROSS REGION**

Here I set up

1. TWO VPCs in different region
2. Accept the request of peering
3. **MOST IMP. ALWAYS** update it in the route tables which I will see in common once both VPCs are connected as shown

Accept VPC peering connection request ✕

Info

Are you sure you want to accept this VPC peering connection request? (pcx-00ca29223482e24c7 / my-pc-1)

Requester VPC

[vpc-03d1f5a9b8e9c526e](#) / [demo-vpc](#)

Accepter CIDRs

—

Requester owner ID

 254159011250(This account)

Accepter VPC

[vpc-02c0cb56c281c19c9](#) / [defaultVPC](#)

Requester Region

Mumbai (ap-south-1)

Accepter owner ID

 254159011250(This account)

Requester CIDRs

 10.0.0.0/16

Accepter Region

Mumbai (ap-south-1)

[Cancel](#)

[Accept request](#)

[VPC](#) > [Peering connections](#) > Create peering connection


[?](#) [↺](#) [🖨](#)

Select a local VPC to peer with

VPC ID (Requester)

[vpc-02c0cb56c281c19c9](#) (defaultVPC) ▼

VPC CIDRs for vpc-02c0cb56c281c19c9 (defaultVPC)

CIDR	Status	Status reason
172.31.0.0/16	 Associated	-

Select another VPC to peer with

Account

- ☒ My account
☐ Another account


Region

- ☒ This Region (ap-south-1)
☐ Another Region

VPC ID (Accepter)

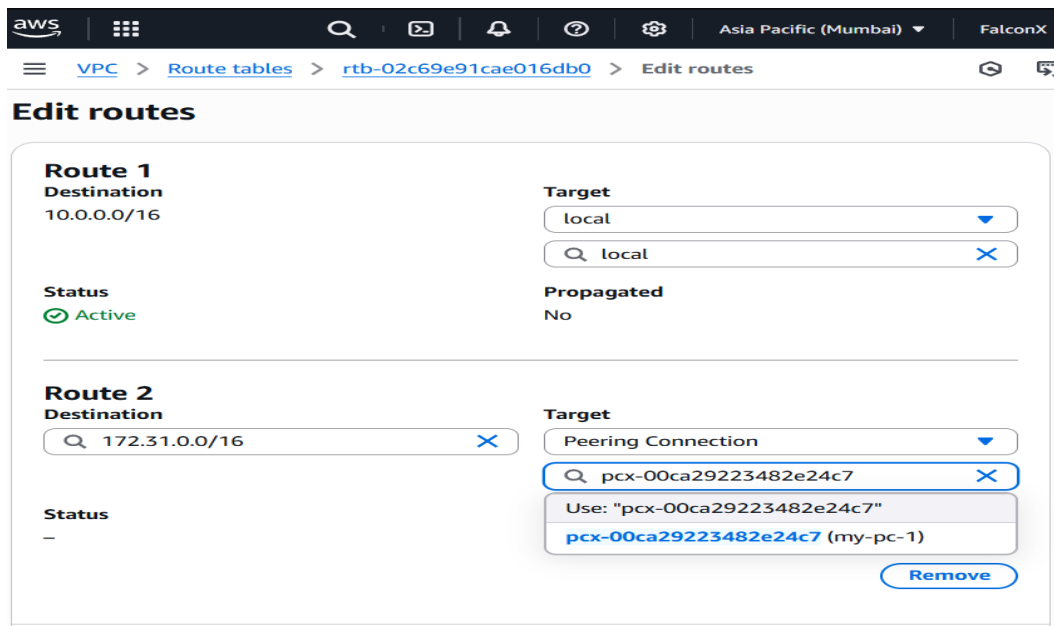
[vpc-02c0cb56c281c19c9](#) (defaultVPC) ▼

VPC CIDRs for vpc-02c0cb56c281c19c9 (defaultVPC)

CIDR	Status	Status reason
172.31.0.0/16	 Associated	-

Tags

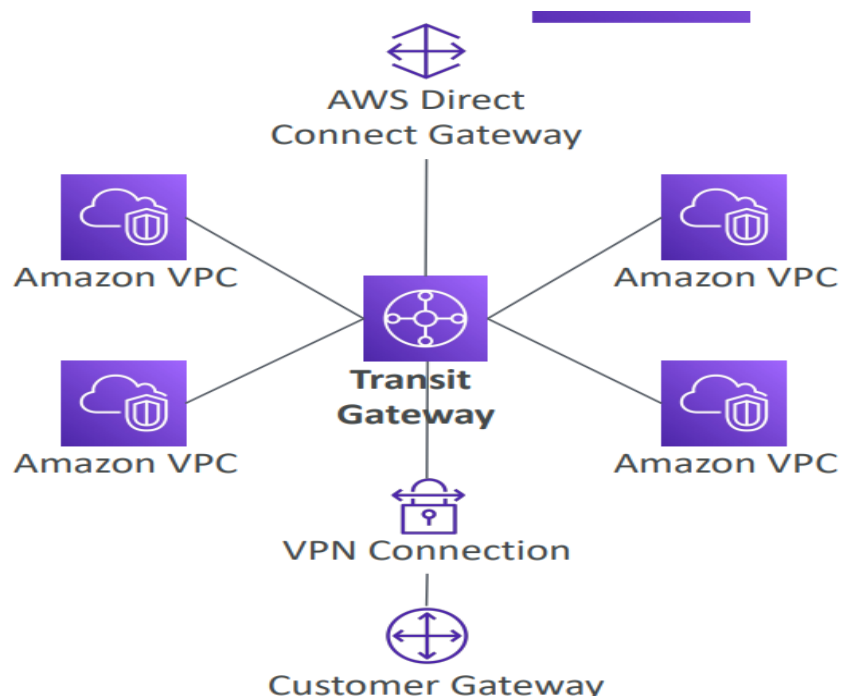
Changing the route Table



ADDITIONAL STEP FOR ENTERPRISE GRADE

Setup a Transit Gateway for incase of connecting multiple VPCs together using peerings

Reason: Network Topology becomes **complicated** and difficult to maintain



Some Cost Optimizing approaches....

Okay So Now the thing is I want my Private Instance to access AWS services or my private DATA Center

Why should i incurr such costs of setting up a NAT gateway then accessing those services through public

That's expensive and not even secure

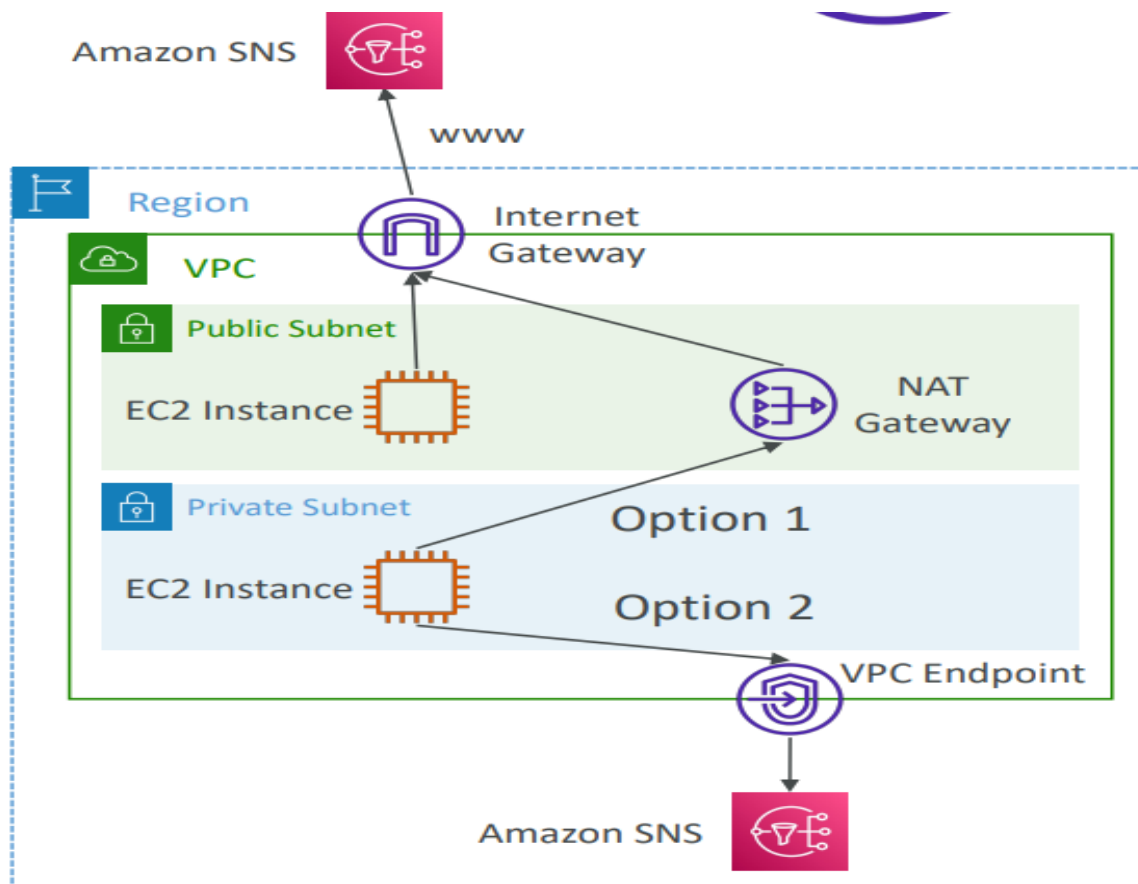
Hence

Step 5

VPC Endpoints

These are like metro connecting dots 🤔

VPC Endpoints (powered by AWS PrivateLink) allows you to connect to AWS services using a private network instead of using the public Internet



Now this is What I meant

These are also of two types one is a gateway endpoint supporting less services(FOR Small companies)

2. is Interface endpoints(Basically Endpoint premium subscription for Enterprises)

Finally.... So long but my VPC is all set !!!!

A final step remains.....

Imagine a city without police or fire Department

A school without rules and regulations

A college Without 75% criteria(Definitely mine 😊)

A VPC should also require to have a logging system to catch all the flow logs like how the traffic is flowing in and out and how is it behaving

STEP-Final

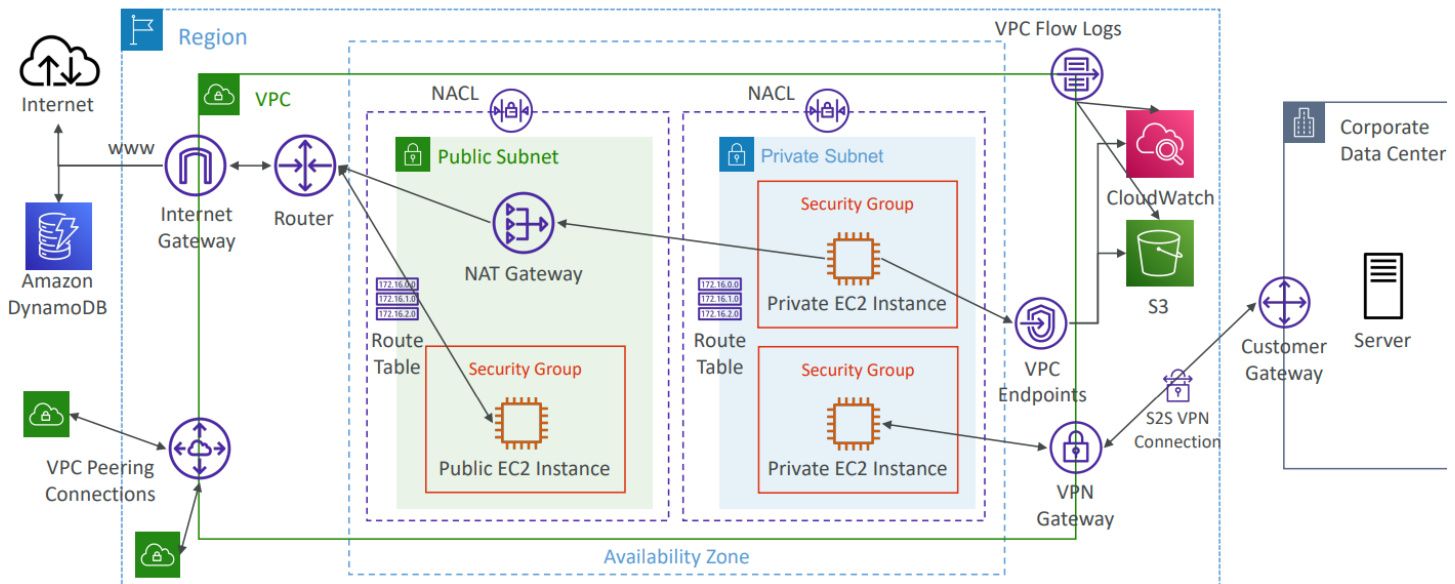
VPC FlowLogs

Flow logs data can go to S3, CloudWatch Logs, and Kinesis Data Firehose

Captures network information from AWS managed interfaces too: ELB, RDS, ElastiCache, Redshift, WorkSpaces, NATGW, Transit Gateway...

Some important things while viewing the log data from **log groups**

- srcaddr & dstaddr – help identify problematic IP
- srcport & dstport – help identify problematic ports
- Action – success or failure of the request due to Security Group / NACL
- Can be used for analytics on usage patterns, or malicious behavior
- Query VPC flow logs using Athena on S3 or CloudWatch Logs Insights



Some of the Parts like the direct connection to Corporate data centers will be covered later in the documentation

I am still writing it.. Figuring out how to document

IF YOU HAVE MADE THIS FAR  

If you liked my way of documenting things or would like to suggest changes feel free to message me and like the post

Hope you have understood my take of best practices in creating a vpc for an enterprise grade or a startup grade web app

SEE YOU SOON