

```
1 Ethernet adapter Local Area Connection:
2
3 Connection-specific DNS Suffix . : domain.name
4 Link-local IPv6 Address . . . . . : fe80::c0b9:fe99:3526:d465%15
5 IPv4 Address. . . . . : 192.168.1.3
6 Subnet Mask . . . . . : 255.255.255.0
7 Default Gateway . . . . . : fe80::ed2:b5ff:fe6f:113c%15
8                               192.168.1.1
9
10
11 IPv4 = (Network Id + host Id)
12 Subnet Mask:
13
14
15 192.168.1.3
16 255.255.255.0
```

10.10.20.40
255.255.0.0

10.10 (Network Id)
20.40 (Host Id)

Network packet can be send from one machine to other machine if they have same network id(private network)
Router(route table) send the packet to outside network(default gateway)
Packet with in network we don't need anything

$255.255.255.0 = 8 \text{ bits} = 255 - 2 = 253$

1 is network id

2 is broadcast

For example

10.10.20.40

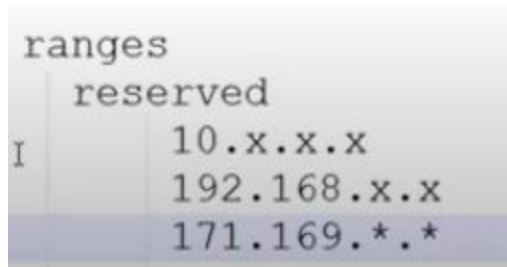
10.10 (network id = 1)

20.40 (host id = 0) = $2^{16} - 2$ (physical network calculation)

So ipv4 (total bit 32 bit) = (network id + host id)

(software define network) Virtual network calculation $2^{16} - 5$

Public IP- anyone with internet reach to your network(dynamic ip)



ranges	
	reserved
I	10.x.x.x
	192.168.x.x
	171.169.*.*

Private IP-

reserved ip so its costly(static ip)

CIDR-classless inter domain routing

$255.255.255.0 = 253$

$255.255.0.0 = 65534$

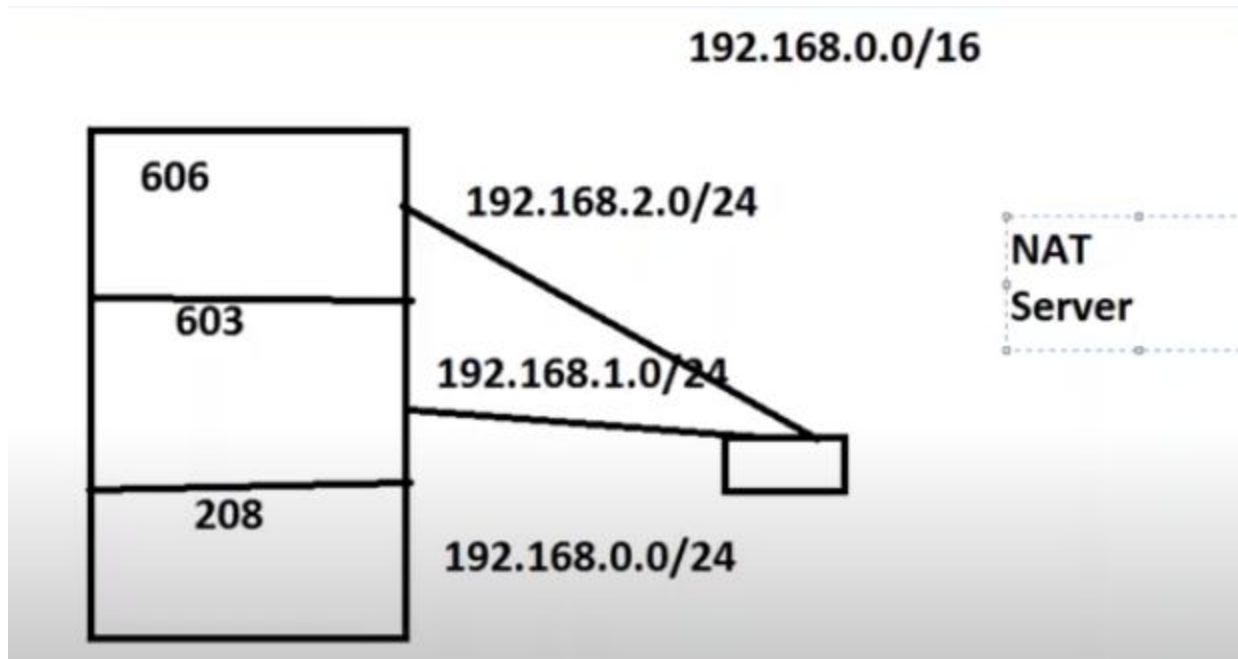
$11111111.11111111.11111111.00000000 = 255.255.255.0 = 254$

$11111111.11111111.11111110.00000000 = 510 \text{ } 10.10.10.0/23$

$11111111.11111111.1111100.00000000 = 1022$

$10.10.10.0/22$

$10.10.10.0/24$



Router or routable use to send packet outside network

Nat server go in one direction only(nat server send packet to google.com and google.com will again response packet to nat server then nat convert it and send router we can get response

```

C:\Windows\system32\cmd.exe
C:\Users\qualitythought>tracert google.com
Tracing route to google.com [172.217.163.174]
over a maximum of 30 hops:
  0  <1 ms  <1 ms  <1 ms  192.168.1.1
  1  27 ms  29 ms  27 ms  202.56.197.21
  2  47 ms  48 ms  64 ms  182.79.243.201
  3  41 ms  41 ms  40 ms  72.14.211.198
  4  42 ms  41 ms  41 ms  74.125.242.129
  5  49 ms  52 ms  49 ms  209.85.248.181
  6  48 ms  48 ms  48 ms  naa05s05-in-f14.1e100.net [172.217.163.174]
Trace complete.
C:\Users\qualitythought>

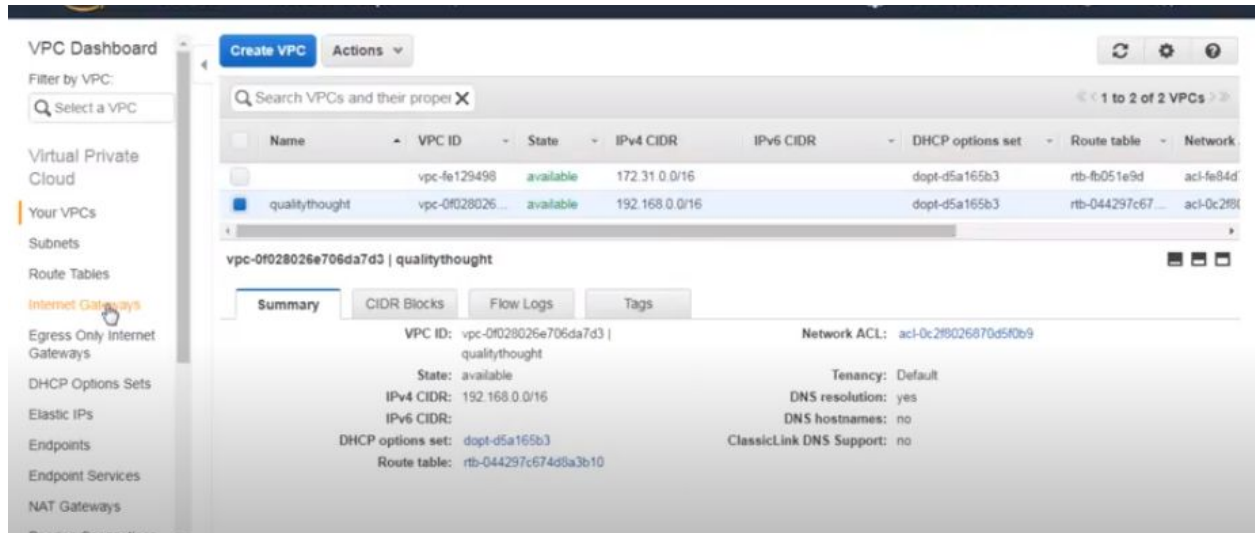
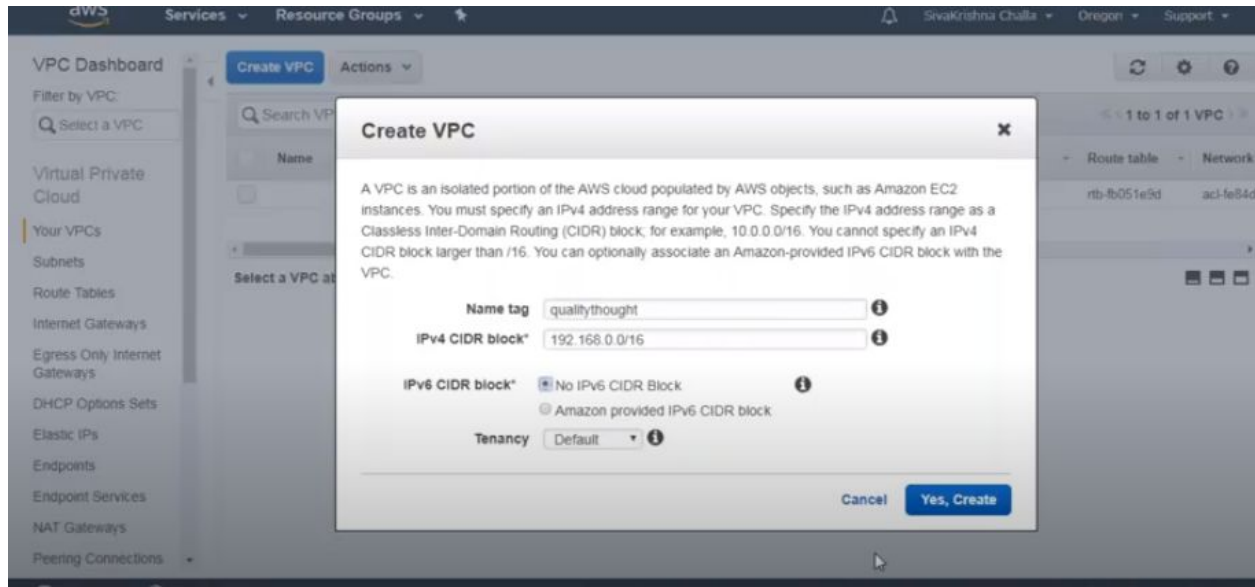
```

Packet travel trace windows and for linux we can use command traceroute

<https://www.qualitythought.in/wp-content/uploads/2017/02/NetworkingBasics.pdf>

<https://www.qualitythought.in/wp-content/uploads/2017/02/VPC-Introduction.pdf>

VPC



VPC Dashboard

Filter by VPC:

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Endpoints

Endpoint Services

NAT Gateways

Peering Connections

Create internet gateway Actions

Filter by tags and attributes or search by keyword

1 to 2 of 2

Name	Name	ID	State	VPC
igw-e3a4c684		igw-e3a4c684	attached	vpc-fe129498
qt-ig	qt-ig	igw-0a7026b79d1...	detached	-

Internet gateway: igw-e3a4c684

Description Tags

ID igw-e3a4c684 Attached VPC ID vpc-fe129498

State attached

aws Services Resource Groups

SivaKrishna Challa Oregon Support

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1 to 2 of 2

Name	Name	ID	State	VPC
igw-e3a4c684		igw-e3a4c684	attached	vpc-fe129498
qt-ig	qt-ig	igw-0a7026b79d1...	detached	-

Internet gateway: igw-0a7026b79d15740b2

Description Tags

ID igw-0a7026b79d15740b2 Attached VPC ID -

State detached

Internet gateways > Attach to VPC

Attach to VPC

Attach an internet gateway to a VPC to enable communication with the Internet. Specify the VPC you would like to attach below.

VPC*

AWS Command Line Interface command

* Required

Cancel Attach

Create internet gateway

Actions

Filter by tags and attributes or search by keyword

	Name	Name	ID	State	VPC
			igw-e3a4c884	attached	vpc-fe129498
	qt-ig	qt-ig	igw-0a7026b79d1...	attached	vpc-0f028026e70...

Create VPC

Actions

Search VPCs and their proper

1 to 2 of 2 VPCs

	Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP options set	Route table	Ne
		vpc-fe129498	available	172.31.0.0/16		dopt-d5a165b3	rtb-fb051e9d	acl
	qualitythought	vpc-0f028026...	available	192.168.0.0/16		dopt-d5a165b3	rtb-044297c67...	acl

vpc-0f028026e706da7d3 | qualitythought

Summary

CIDR Blocks

Flow Logs

Tags

VPC ID: vpc-0f028026e706da7d3 | qualitythought

State: available

IPv4 CIDR: 192.168.0.0/16

IPv6 CIDR:

DHCP options set: dopt-d5a165b3

Route table: rtb-044297c674d8a3b10

Network ACL: acl-0c2f8026870d5f0b9

Tenancy: Default

DNS resolution: yes

DNS hostnames: no

ClassicLink DNS Support: no

Services

Resource Groups

SivaKrishna Challa

Oregon

Support

VPC Dashboard

Filter by VPC: Select a VPC

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Create Route Table

Delete Route Table

Set As Main Table

Search Route Tables and their

1 to 2 of 2 Route Tables

	Name	Route Table ID	Explicitly Associat-	Main	VPC
		rtb-fb051e9d	0 Subnets	Yes	vpc-fe129498
		rtb-044297c674d8a...	0 Subnets	Yes	vpc-0f028026e706da7d3 qualitytho...

rtb-044297c674d8a3b10

Summary

Routes

Subnet Associations

Route Propagation

Tags

Route Table ID: rtb-044297c674d8a3b10

Explicitly Associated With: 0 Subnets

Main: yes

VPC: vpc-0f028026e706da7d3 | qualitytho

By default when we create vpc amazon create route table

VPC Dashboard

Filter by VPC:

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Create Route Table Delete Route Table Set As Main Table

Search Route Tables and their Subnets

1 to 1 of 1 Route Table

Name	Route Table ID	Explicitly Associated Subnets	Main	VPC
	rtb-086fe5594030e53b3	0 Subnets	Yes	vpc-0e055d2ee1b7b998f Qt-VPC

rtb-086fe5594030e53b3

Summary Routes Subnet Associations Route Propagation Tags

Edit Save Successful

View: All rules

Destination	Target	Status	Propagated
192.168.0.0/16	local	Active	No
0.0.0.0/0	igw-01e467d16b1dcaa31	Active	No

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Add edit route table 0.0.0.0 to internet gateway

Create Subnet 1

Create subnet

Specify your subnet's IP address block in CIDR format, for example, 10.0.0.0/24. IPv4 block sizes must be between a /16 netmask and /28 netmask, and can be the same size as your VPC. An IPv6 CIDR block must be a /64 CIDR block.

Name tag

VPC*

VPC CIDRs

CIDR	Status	Status Reason
192.168.0.0/16	associated	

Availability Zone

IPv4 CIDR block*

* Required

Cancel Create

Subnet 2

[Subnets](#) > Create subnet

Create subnet

Specify your subnet's IP address block in CIDR format, for example, 10.0.0.0/24. IPv4 block sizes must be between a /16 netmask and /28 netmask, and can be the same size as your VPC. An IPv6 CIDR block must be a /64 CIDR block.

Name tag:

VPC*:

VPC CIDRs	CIDR	Status	Status Reason
	192.168.0.0/16	associated	

Availability Zone:

IPv4 CIDR block*:

Subnet 3

[Subnets](#) > Create subnet

Create subnet

Specify your subnet's IP address block in CIDR format, for example, 10.0.0.0/24. IPv4 block sizes must be between a /16 netmask and /28 netmask, and can be the same size as your VPC. An IPv6 CIDR block must be a /64 CIDR block.

Name tag:

VPC*:

VPC CIDRs	CIDR	Status	Status Reason
	192.168.0.0/16	associated	

Availability Zone:

IPv4 CIDR block*:

If main is yes in route table(no association) then all subnet connect to default route table
 Now launch ec2 instance (select vpc and subnet 208 as per example and Enable auto assign public ip address)

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances: [Launch into Auto Scaling Group](#)

Purchasing option: ☐ Request Spot instances

Network: [Create new VPC](#)

Subnet: [Create new subnet](#)
 251 IP Addresses available

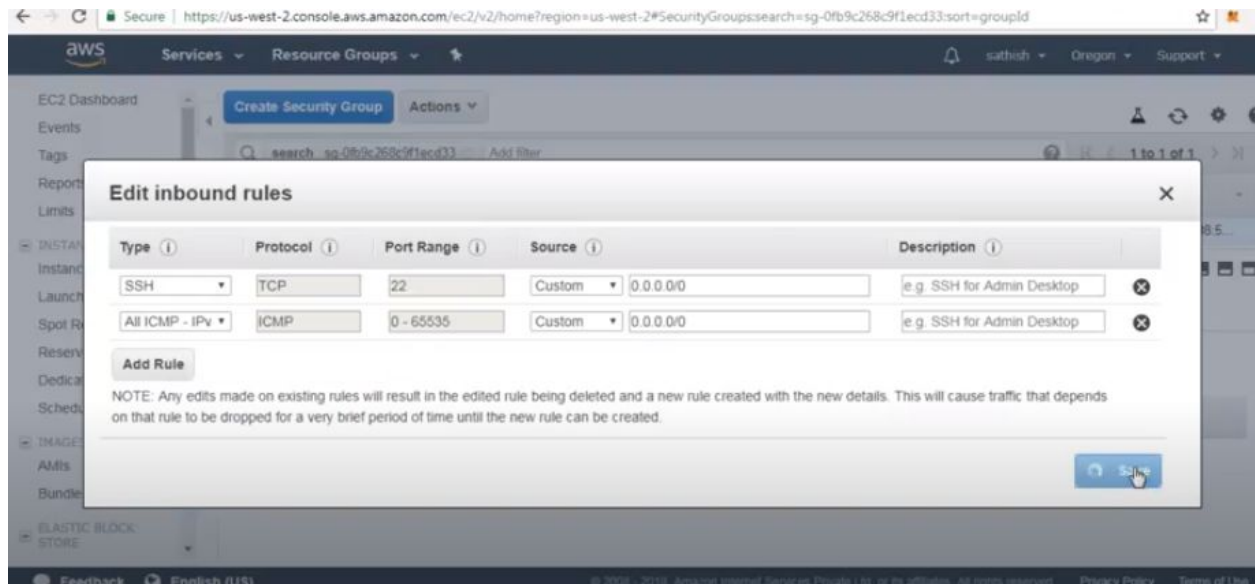
Auto-assign Public IP:

Placement group: ☐ Add instance to placement group

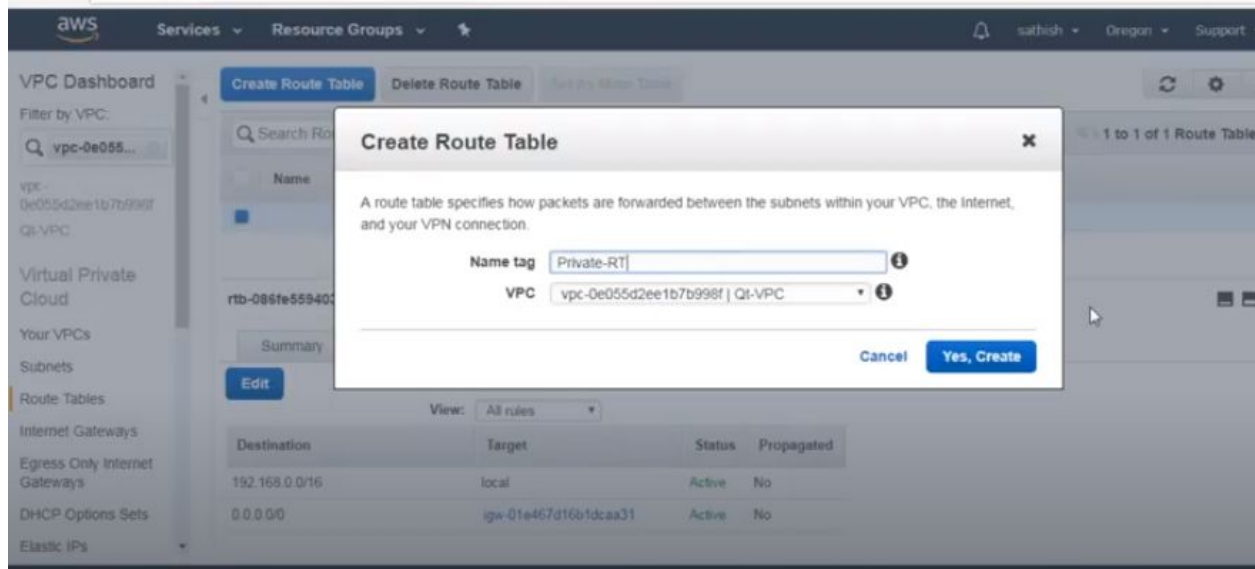
IAM role: [Create new IAM role](#)

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Add Storage](#)

Icmp security group use for allow ping from outside



Private route Table (main is No)



Edit private subnet route table association

[Subnets](#) > Edit route table association

Edit route table association

Subnet ID: subnet-04ff741e915883e59

Route Table ID*:

Destination	Target
192.168.0.0/16	local

* Required Cancel

Same as do for another private subnet

Now launch ec2 for both private subnet

1. Choose AMI 2. Choose Instance Type 3. Configure Instance **4. Add Storage** 5. Add Tags 6. Configure Security Group 7. Review

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances [Launch into Auto Scaling Group](#)

Purchasing option ☐ Request Spot instances

Network [Create new VPC](#)

Subnet [Create new subnet](#)
251 IP Addresses available

Auto-assign Public IP

Placement group ☐ Add instance to placement group

IAM role

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Add Storage](#)

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So to login private subnet ec2 machine we need to be inside public subnet ec2 machine and try to connect so now login public subnet ec2 machine
And test with ping ip of ec2 of private subnet machine
To transfer pem key file command



Identify the above subnet id so it's easy to find out public subnet
Also remember for nat gateway we need to have static ip(in amazon its called elastic ip)

[NAT Gateways](#) > Create NAT Gateway

Create NAT Gateway

Create a NAT gateway and assign it an Elastic IP address. [Learn more.](#)

Subnet*  

Elastic IP Allocation ID*   [Create New EIP](#)

New EIP (52.41.108.203) creation successful.

* Required

[Cancel](#) [Create a NAT Gateway](#)

Now in route table private route edit and add 0.0.0.0/0 with nat gateway

NAT Gateways > Create NAT Gateway

Create NAT Gateway

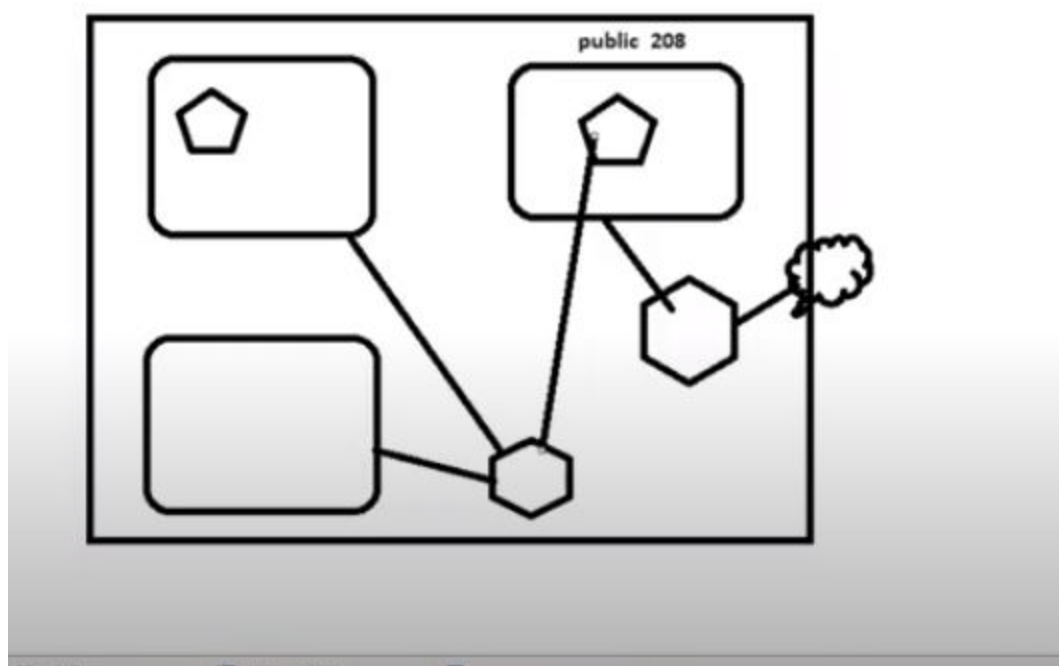
Create a NAT gateway and assign it an Elastic IP address. [Learn more](#)

Subnet* subnet-06d69e3e36d0931c2 ⌵ ⓘ

Elastic IP Allocation ID* eipalloc-00e59e5e369066fc0 ⌵ ⓘ Create New EIP

New EIP (52.41.108.203) creation successful.

* Required Cancel Create a NAT Gateway

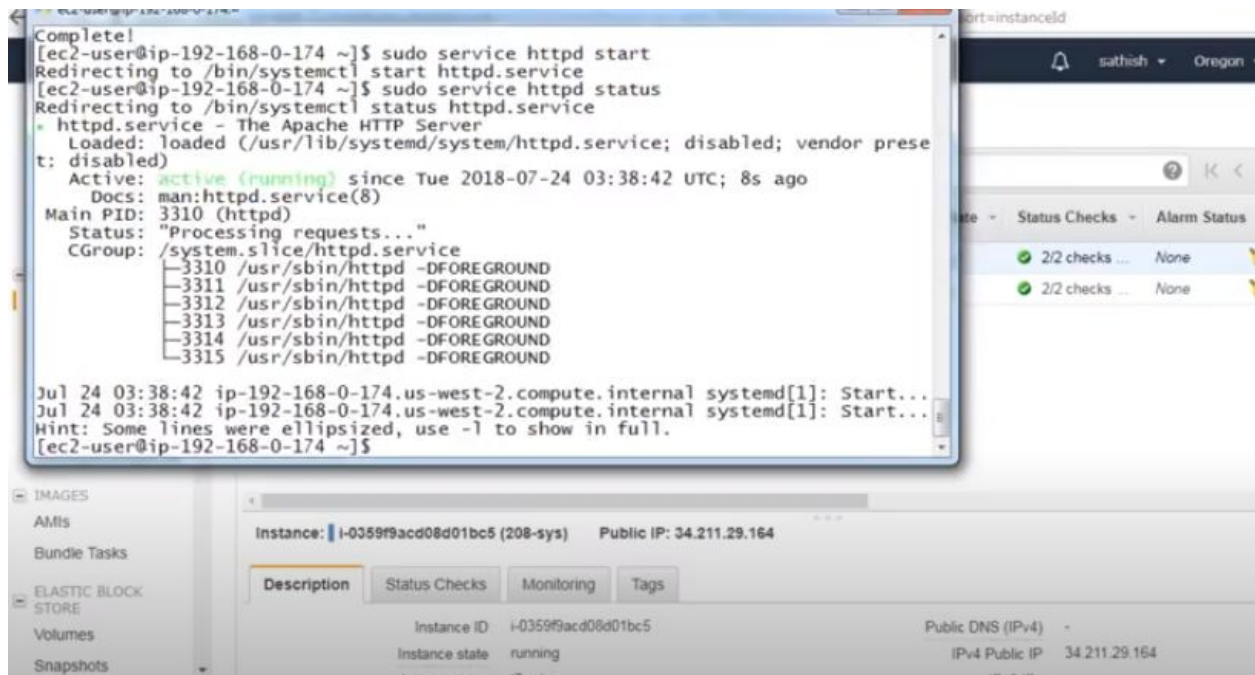


Vpc diagram

Nat is managed by amazon so there is no down time and Elastic ip is chargeable if you are not using.because we are block particular ip.

Proxy server: proxy server will use if packet need it will transfer or else it will block packet

Now let us install apache in public ec2



Security group:

Everything is closed in ec2 machine ,inbound incoming traffic and outbound is traffic out goingt

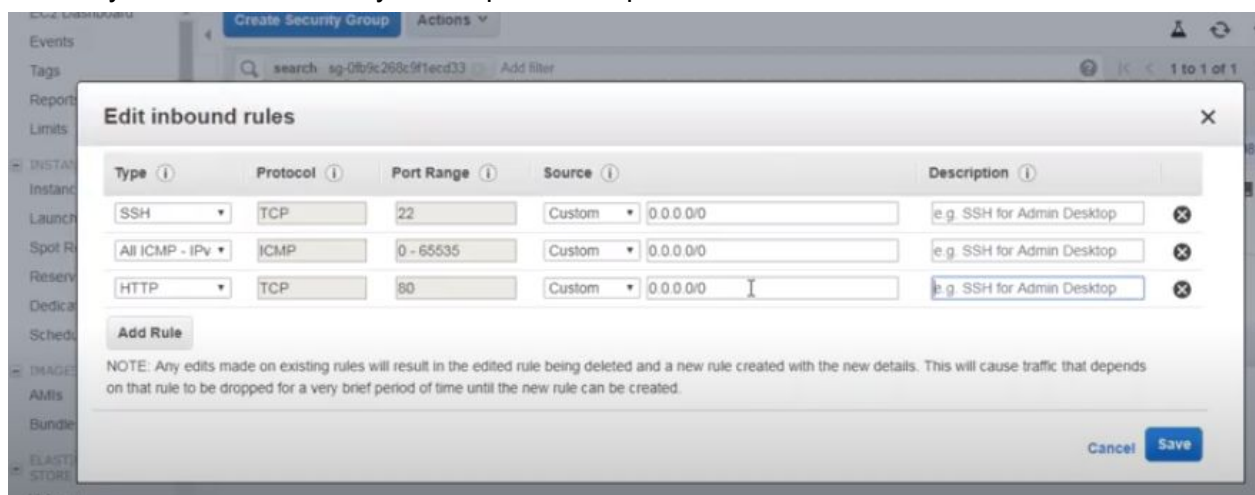
What ever you see it open remaining all port closed

Restriction are generally on network id not on host id

35.35.35.35/0 no network id or we can write like 0.0.0.0/0

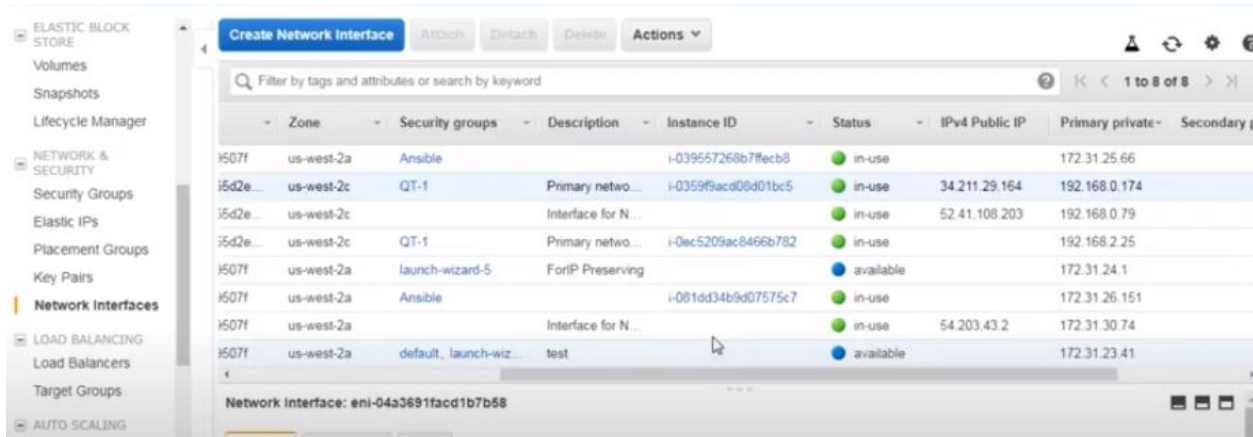
35.35.35.35/32 means complete network id only one ip address

35.35.x.y/16 means allow any of the ip from the pool



Network interface which is create when security group created

S



Zone	Security groups	Description	Instance ID	Status	IPv4 Public IP	Primary private	Secondary private
i507f	us-west-2a	Ansible	i-039557268b7#ecb8	in-use		172.31.25.66	
i5d2e...	us-west-2c	QT-1	Primary netwo...	in-use	34.211.29.164	192.168.0.174	
i5d2e...	us-west-2c		Interface for N...	in-use	52.41.108.203	192.168.0.79	
i5d2e...	us-west-2c	QT-1	Primary netwo...	in-use		192.168.2.25	
i507f	us-west-2a	launch-wizard-5	ForIP Preserving	available		172.31.24.1	
i507f	us-west-2a	Ansible	i-081dd34b9d07575c7	in-use		172.31.26.151	
i507f	us-west-2a		Interface for N...	in-use	54.203.43.2	172.31.30.74	
i507f	us-west-2a	default, launch-wiz...	test	available		172.31.23.41	

Network interface: eni-04a3691facd1b7b58

You can create flow logs on your resources to capture IP traffic flow information for the network interfaces for your resources

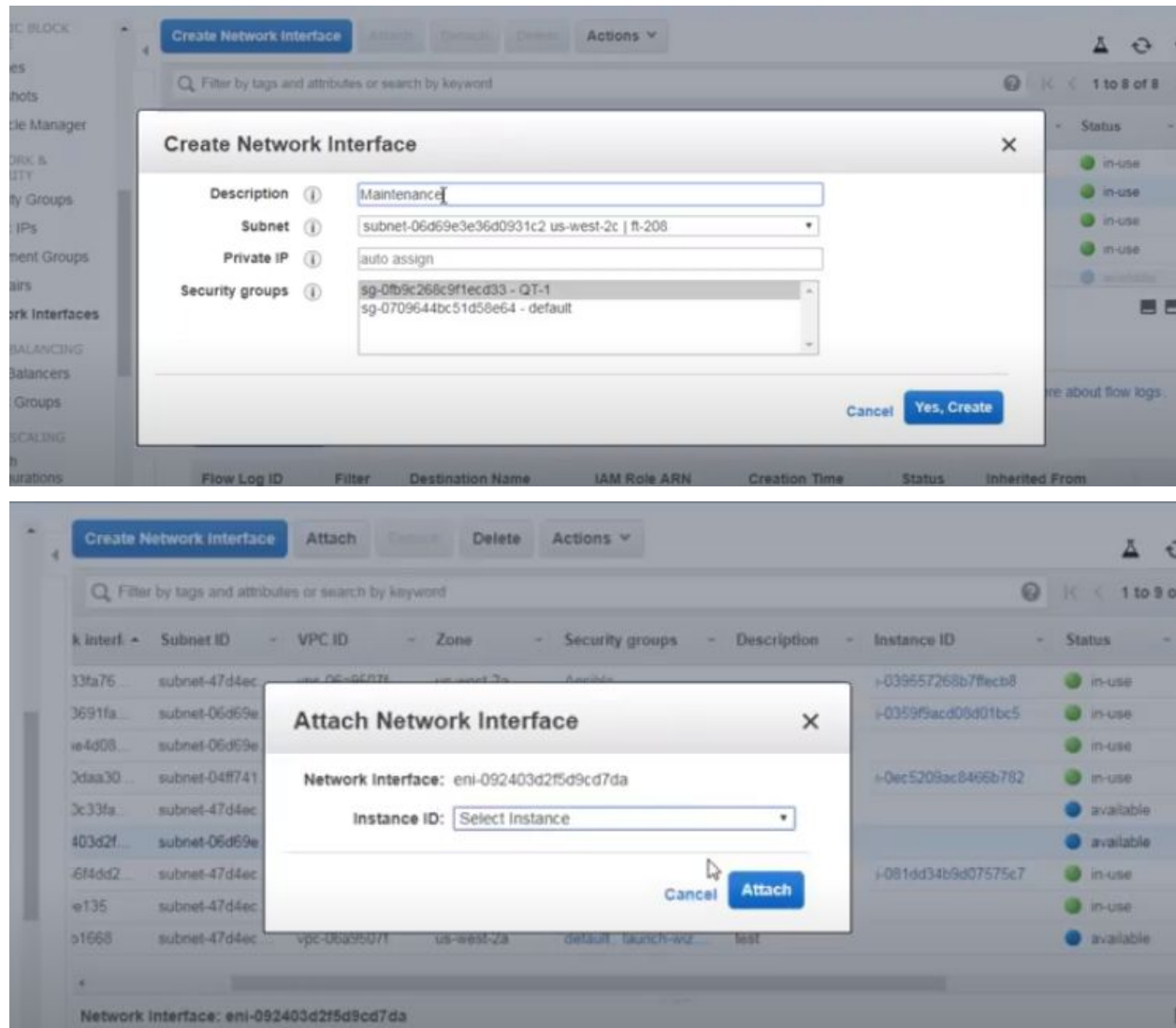
We can create flow logs in the network interface.

Your system can have multiple network interfaces and multiple ip.

We can not change the security group but we can change the rules and we can only kill the security group.

So for high availability of servers we can disassociate network interfaces and associate with other systems so there will be less down time.

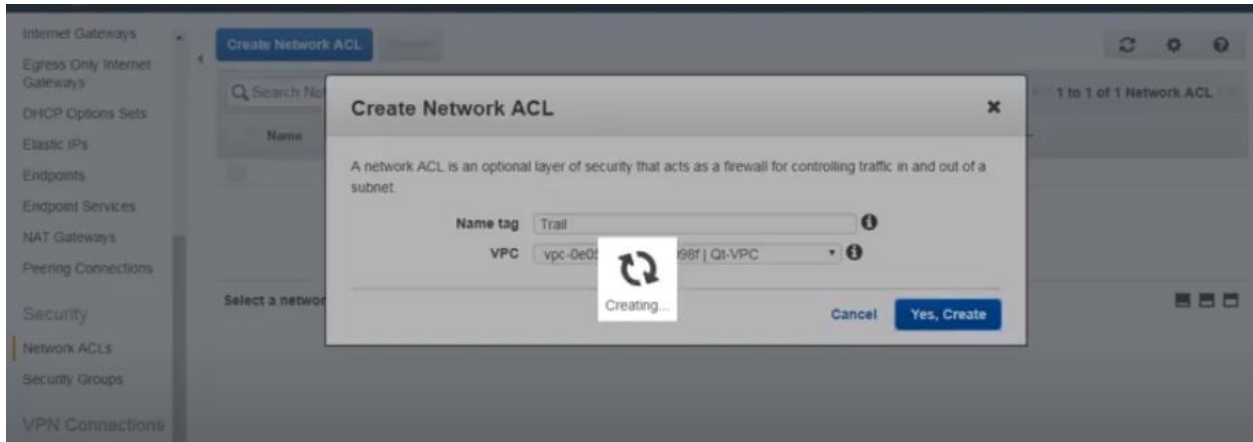
We can create a network interface and you should know what is your vpc and availability zone.



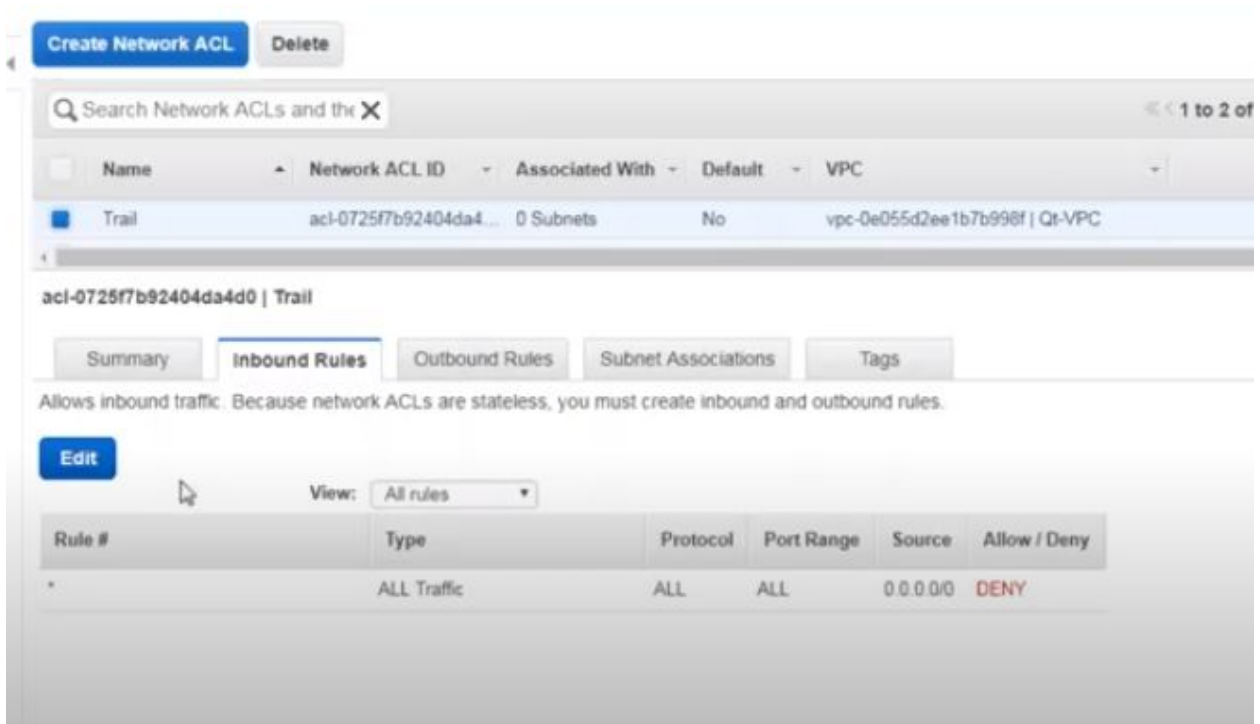
Security group(stateful) we are giving to the network interface so we can secure our ec2 instance so we can deny service attacks for unnecessary traffic .in sg we need only inbound setup.

NACL(stateless) network access control list which operate security in subnet level
So the 1st layer network interface for which we have a security group,here we write rules to only allow.

The 2nd layer is the subnet for which we use NACL,here we write rules for both allow and deny.,for nacl we need to setup both inbound and outbound



Rule will have priority based on number, lower the number higher the priority



We can restrict traffic from particular ip which is unwanted for denial of service attack

Create Network ACLDelete

Search Network ACLs and the X1 to 2 of 2

Name	Network ACL ID	Associated With	Default	VPC
Trail	acl-0725f7b92404da4...	0 Subnets	No	vpc-0e055d2ee1b7b998f Qt-VPC

aci-0725f7b92404da4d0 | Trail

SummaryInbound RulesOutbound RulesSubnet AssociationsTags

Allows inbound traffic. Because network ACLs are stateless, you must create inbound and outbound rules.

Edit

View: All rules

Rule #	Type	Protocol	Port Range	Source	Allow / Deny
105	ALL Traffic	ALL	ALL	192.168.0.0/16	ALLOW
110	ALL Traffic	ALL	ALL	35.25.0.0/16	DENY
120	SSH (22)	TCP (6)	22	0.0.0.0/0	ALLOW
*	ALL Traffic	ALL	ALL	0.0.0.0/0	DENY

Create Network ACLDelete

Search Network ACLs and the X1 to 2 of 2

Name	Network ACL ID	Associated With	Default	VPC
Trail	acl-0725f7b92404da4...	0 Subnets	No	vpc-0e055d2ee1b7b998f Qt-VPC

aci-0725f7b92404da4d0 | Trail

SummaryInbound RulesOutbound RulesSubnet AssociationsTags

Allows outbound traffic. Because network ACLs are stateless, you must create inbound and outbound rules.

EditSave Successful

View: All rules

Rule #	Type	Protocol	Port Range	Destination	Allow / Deny
100	ALL Traffic	ALL	ALL	0.0.0.0/0	ALLOW
*	ALL Traffic	ALL	ALL	0.0.0.0/0	DENY

Create Network ACL Delete

Search Network ACLs and the X

Name	Network ACL ID	Associated With	Default	VPC
Trail	aci-0725f7b92404da4...	0 Subnets	No	vpc-0e055d2ee1b7b998f Qt-VPC

aci-0725f7b92404da4d0 | Trail

Summary Inbound Rules Outbound Rules Subnet Associations Tags

Cancel Save

Associate	Subnet	IPv4 CIDR	IPv6 CIDR	Current Network ACL
<input checked="" type="checkbox"/>	subnet-06d69e3e36d0931c2 ft-208	192.168.0.0/24	-	aci-06817dfa3181f586d
<input type="checkbox"/>	subnet-015407ce46930bcac ft-603	192.168.1.0/24	-	aci-06817dfa3181f586d
<input type="checkbox"/>	subnet-04f741e915883e59 ft-606	192.168.2.0/24	-	aci-06817dfa3181f586d

Subnet association

Create Network ACL Delete

Search Network ACLs and the X

<< 1 to 2 of 2 Network ACLs

Name	Network ACL ID	Associated With	Default	VPC
Trail	aci-0725f7b92404da4...	1 Subnet	No	vpc-0e055d2ee1b7b998f Qt-VPC
	aci-06817dfa3181f586d	2 Subnets	Yes	vpc-0e055d2ee1b7b998f Qt-VPC

Allows inbound traffic. Because network ACLs are stateless, you must create inbound and outbound rules.

Cancel Save

View: All rules

Rule #	Type	Protocol	Port Range	Source	Allow / Deny	Remove
105	ALL Traffic	ALL	ALL	192.168.0.0/16	ALLOW	
110	ALL Traffic	ALL	ALL	35.25.0.0/16	DENY	
120	SSH (22)	TCP (6)	22	0.0.0.0/0	ALLOW	
130	HTTP (80)	TCP (6)	80	0.0.0.0/0	ALLOW	

Add another rule

Default nacl is allow all both inbound and outbound(*)

Default security group is allow 22 port allow everything apart from that other block

100	All Traffic	10.10.0.0/16	Allow
110	All Traffic	0.0.0.0/0	Deny

here allow only 10. Network

other all blocked