

CLOUD COMPUTING ARCHITECTURE LAB

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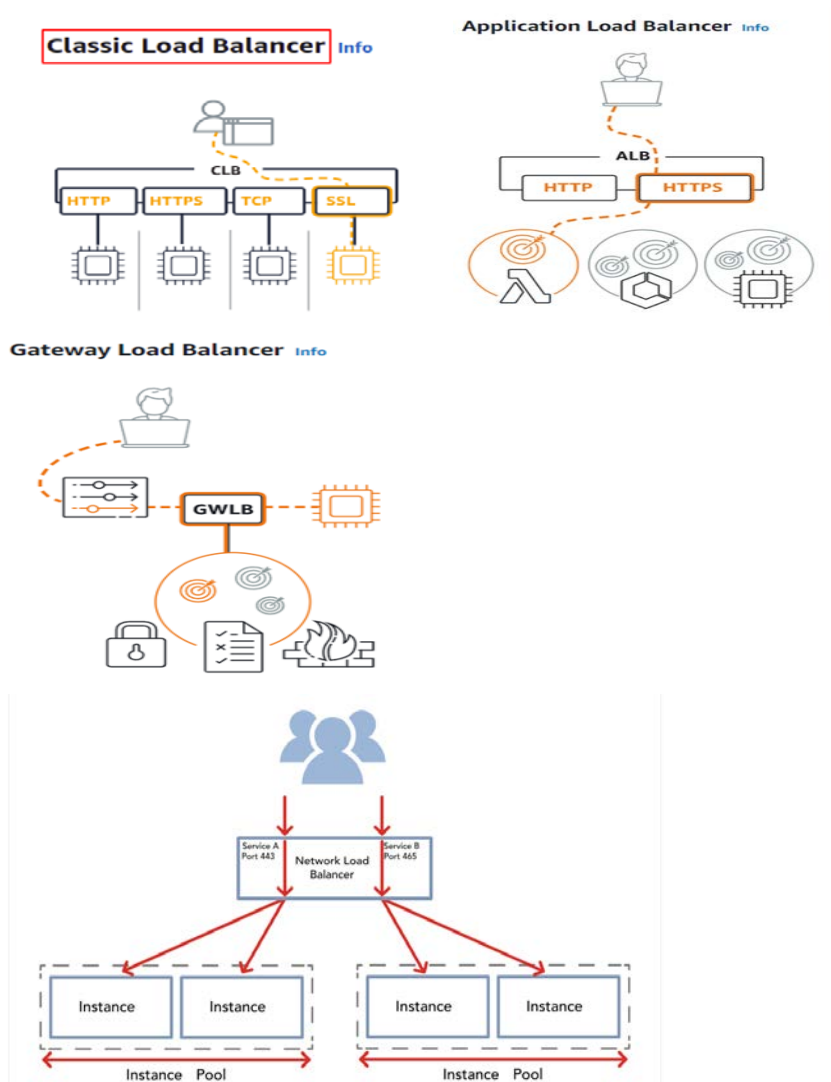
BATCH- 05

Experiment 4: Show how to use Application Load Balancer in AWS

Ques 1: Enumerate and differentiate different Load balancers in AWS?

<u>Application Load Balancer</u>	<u>Network Load Balancer</u>	<u>Gateway Load Balancer</u>	<u>Classic Load Balancer</u>
Operates on the 7 th layer of OSI Model	It operates on the 4 th Layer of OSI Model	It operates on layer 7 and 4 of OSI Model	It operates on layer 7 or layer 4 of OSI Model
Supports protocols like HTTP & HTTPS	Supports protocols like TCP,UDP,TLS	Supports IP	Supports TCP,HTTP, HTTPS,SSL/ TLS
Target type is IP, Instance ,Lambda	Target type is IP, Instance	Target type is IP	None
Provides backend server encryption	Provides backend server encryption	No backend server encryption	Provides backend server encryption
Supports networks eg VPC	Supports networks eg VPC	Supports networks eg VPC	Supports networks eg VPC,EC2-classic

Provides all IAM Permissions	Provides all IAM Permissions	Provides all IAM Permissions	Provides resource based IAM Permissions only
Supports websockets	Supports websockets	Supports websockets	Doesn't support websockets
Doesn't provide zonal isolation	Provides zonal isolation	Provides zonal isolation	Doesn't provide zonal isolation



Ques 2: Explain :

a). Load Balancer : A load balancer serves as the single point of contact for clients. The load balancer evenly distributes incoming application traffic across multiple targets, such as EC2 instances, in multiple Availability Zones. This increases the availability of your application. There are majorly 4 types of load balancer:-

- Application Load Balancer
- Network Load Balancer
- Gateway Load Balancer
- Classic Load Balancer

b) Target Groups : Target groups route requests to one or more registered targets, such as EC2 instances, using the protocol and port number that you specify. You can register a target with multiple target groups. You can configure health checks on a per target group basis. Health checks are performed on all targets registered to a target group that is specified in a listener rule for your load balancer.

When you create each listener rule, you specify a target group and conditions. When a rule condition is met, traffic is forwarded to the corresponding target group.

c) Rules : Each listener has a default rule, and you can optionally define additional rules. Each rule consists of a priority, one or more actions, and one or more conditions. You can add or edit rules at any time

☐ Default rule

When you create a listener, you define actions for the default rule. Default rules can't have conditions. If the conditions for none of a listener's rules are met, then the action for the default rule is performed

☐ Rule priority

Each rule has a priority. Rules are evaluated in priority order, from the lowest value to the highest value. The default rule is evaluated last. You can change the priority of a nondefault rule at any time. You cannot change the priority of the default rule

☐ Rule actions

Each rule action has a type, an order, and the information required to perform the action

- **authenticate-cognito**

[HTTPS listeners] Use Amazon Cognito to authenticate users.

- **authenticate-oidc**

[HTTPS listeners] Use an identity provider that is compliant with OpenID Connect (OIDC) to authenticate users.

- **fixed-response**

Return a custom HTTP response

- **forward**

Forward requests to the specified target groups.

- redirect

Redirect requests from one URL to another

☐ Rule conditions

Each rule condition has a type and configuration information.

When the conditions for a rule are met, then its actions are performed

d) Listeners : A listener is a process that checks for connection requests, using the protocol and port that you configure. The rules that you define for a listener determine how the load balancer routes requests to its registered targets. Listeners support HTTP, HTTPS protocols and ports.

e) Load scheduling algorithms :

Load balancing methods are also known as algorithms for load balancing or scheduling methods as they specify the manner in which a server load is shared across a server pool. There are various load balancing methods available, and each method uses a particular criterion to schedule an incoming traffic. Some of the common load balancing methods are as follows:

- Round robin -- In this method, an incoming request is routed to each available server in a sequential manner.

- Weighted round robin -- Here, a static weight is preassigned to each server and is used with the round robin method to route an incoming request.
- Least connection -- This method reduces the overload of a server by assigning an incoming request to a server with the lowest number of connections currently maintained.
- Weighted least connection -- In this method, a weight is added to a server depending on its capacity. This weight is used with the least connection method to determine the load allocated to each server.
- Least connection slow start time -- Here, a ramp-up time is specified for a server using least connection scheduling to ensure that the server is not overloaded on startup.
- Agent-based adaptive balancing -- This is an adaptive method that regularly checks a server irrespective of its weight to schedule the traffic in real time.
- Fixed weighted -- In this method, the weight of each server is preassigned and most of the requests are routed to the server with the highest priority. If the server with the highest priority fails, the server that has the second highest priority takes over the services.
- Weighted response -- Here, the response time from each server is used to calculate its weight.

- Source IP hash -- In this method, an IP hash is used to find the server that must attend to a request.

EXPERIMENT-

Step 1: - Create two EC2 instances with appropriate configuration and provide them with a custom script as :-

```
#!/bin/bash
sudo su
yum update -y
yum install -y httpd
systemctl start httpd.service
systemctl enable httpd.service
echo "<h1> At $(hostname -f) </h1>" >
```

/var/www/html/index.html

Launch an instance | EC2 Manag...

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

ServicesSearch[Alt+S]

N. Virginiavoclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

EC2 > Instances > Launch an instance

Launch an instanceInfo

Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tagsInfo

Name

Server1

Add additional tags

Application and OS Images (Amazon Machine Image)Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

RecentsQuick Start

Summary

Number of instancesInfo

1

Software Image (AMI)

-

Virtual server type (instance type)

t2.micro

Firewall (security group)

-

Storage (volumes)

-

Free tier: In your first year includes 750

CancelLaunch instance

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76°F Haze

Search

ENG US

11:57 AM 2/18/2023

Launch an instance | EC2 Manag...

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

ServicesSearch[Alt+S]

N. Virginiavoclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

Application and OS Images (Amazon Machine Image)Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

AMI from catalogRecentsQuick Start

Amazon Machine Image (AMI)

amzn2-ami-kernel-5.10-hvm-2.0.20230207.0-x86_64-gp2

ami-0dfcb1ef8550277af

Verified provider

Browse more AMIs

Including AMIs from AWS, Marketplace and the Community

Catalog	Published	Architecture	Virtualization type	Root device type	ENA Enabled
Quickstart AMIs	2023-02-09T12:19:48.000Z	x86_64	hvm	ebs	Yes

Summary

Number of instancesInfo

1

Software Image (AMI)

Amazon Linux 2 AMI (HVM) - Ker...[read more](#)

ami-0dfcb1ef8550277af

Virtual server type (instance type)

t2.micro

Firewall (security group)

New security group

Storage (volumes)

1 volume(s) - 8 GiB

Free tier: In your first year includes 750

CancelLaunch instance

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Search

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Launch an instance | EC2 Manag... X +

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

aws Services Search [Alt+S] N. Virginia voclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

Instance type Info

Instance type: t2.micro Family: t2 1 vCPU 1 GiB Memory Free tier eligible Compare instance types

Key pair (login) Info

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - required: ShubhiS Create new key pair

Network settings Info Edit

Network Info

Summary

Number of instances Info: 1

Software Image (AMI): Amazon Linux 2 AMI (HVM) - Ker...read more ami-0d6cb1ef8550277af

Virtual server type (instance type): t2.micro

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 8 GiB

Free tier: In your first year includes 750 X

Cancel Launch Instance

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Launch an instance | EC2 Manag... X +

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

aws Services Search [Alt+S] N. Virginia voclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

Inbound security groups rules

Security group rule 1 (TCP, 80, 0.0.0.0/0) Remove

Type Info: HTTP Protocol Info: TCP Port range Info: 80

Source type Info: Anywhere Source Info: Add CIDR, prefix list or security 0.0.0.0/0 X Description - optional Info: e.g. SSH for admin desktop

Security group rule 2 (TCP, 443, 0.0.0.0/0) Remove

Type Info: HTTPS Protocol Info: TCP Port range Info: 443

Source type Info: Anywhere Source Info: Add CIDR, prefix list or security 0.0.0.0/0 X Description - optional Info: e.g. SSH for admin desktop

Summary

Number of instances Info: 1

Software Image (AMI): Amazon Linux 2 AMI (HVM) - Ker...read more ami-0d6cb1ef8550277af

Virtual server type (instance type): t2.micro

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 8 GiB

Free tier: In your first year includes 750 X

Cancel Launch Instance

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76°F Haze Search ENG US 12:00 PM 2/18/2023

Launch an instance | EC2 Manag...

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

ServicesSearch[Alt+S]

N. Virginiavoclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

HTTPS

TCP

443

Source type Info

Source Info

Description - optional Info

Anywhere

Add CIDR, prefix list or security

e.g. SSH for admin desktop

0.0.0.0/0

Security group rule 3 (All, All, 0.0.0.0/0)

Remove

Type Info

Protocol Info

Port range Info

All traffic

All

All

Source type Info

Source Info

Description - optional Info

Anywhere

Add CIDR, prefix list or security

e.g. SSH for admin desktop

0.0.0.0/0

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Add security group rule

Summary

Number of instances Info

1

Software Image (AMI)

Amazon Linux 2 AMI (HVM) - Ker...read more

ami-0dfcb1ef8550277af

Virtual server type (instance type)

t2.micro

Firewall (security group)

New security group

Storage (volumes)

1 volume(s) - 8 GiB

Free tier: In your first year includes 750

Cancel

Launch Instance

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Search

ENG US

12:00 PM 2/18/2023

Launch an instance | EC2 Manag...

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LaunchInstances:

ServicesSearch[Alt+S]

N. Virginiavoclabs/user2203301=500094571@stu.upes.ac.in @ 7234-9287-6977

Metadata response hop limit Info

Select

Allow tags in metadata Info

Select

User data - optional Info

Enter user data in the field.

```
#!/bin/bash
sudo su
yum update -y
yum install -y httpd
systemctl start httpd.service
systemctl enable httpd.service
echo "<h1> At $(hostname -f) </h1>" > /var/www/html/index.html
```

☐ User data has already been base64 encoded

Advanced details

Purchasing option

Request a Spot Instance. If you do not request a Spot Instance, EC2 launches an On-Demand Instance by default. Spot Instances are unused EC2 instances that are available for less than the On-Demand price. Spot Instances can be interrupted, so use them for applications with flexible run times and for applications that can be interrupted.[Learn more](#)

Maximum price

The maximum price per instance hour that you're willing to pay. If you do not specify a value, your maximum price is the value specified in the launch template. If the launch template does not

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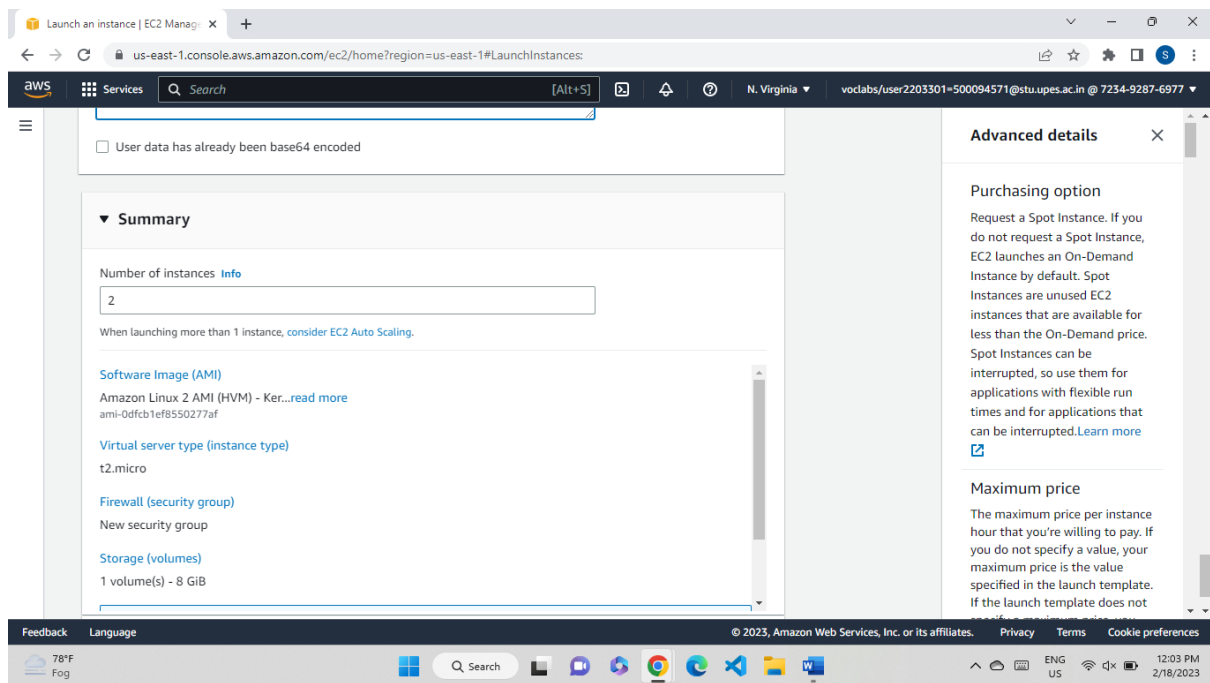
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78°F Fog

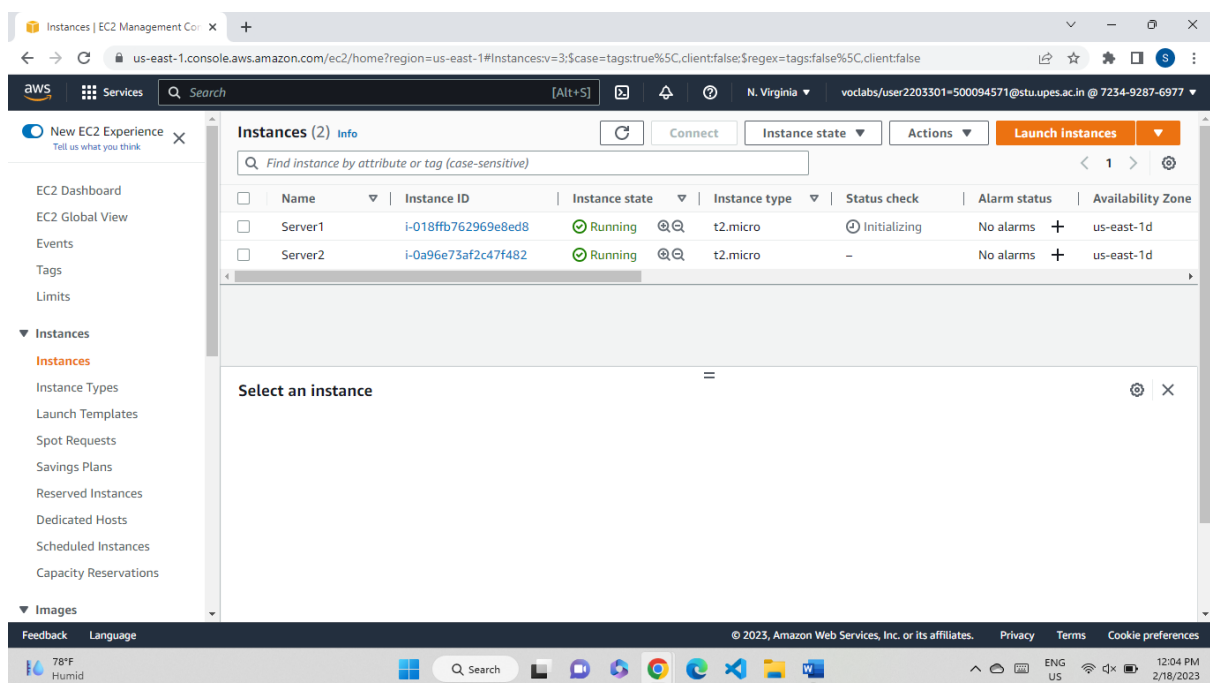
Search

ENG US

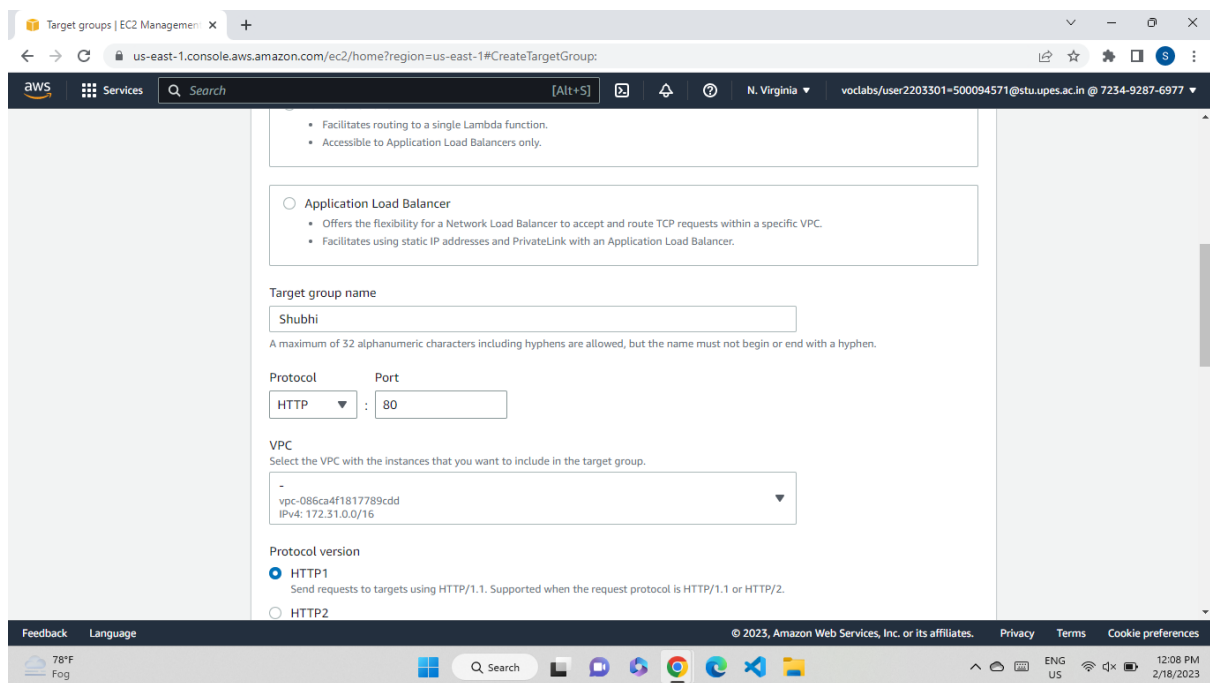
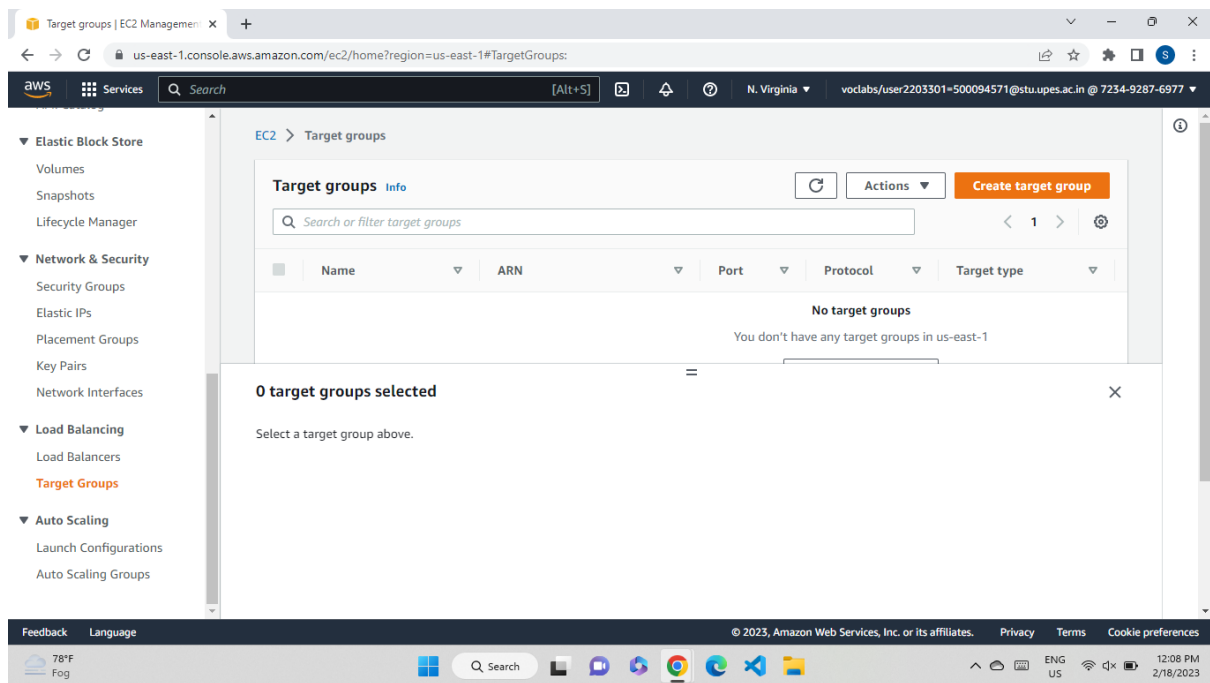
12:03 PM 2/18/2023



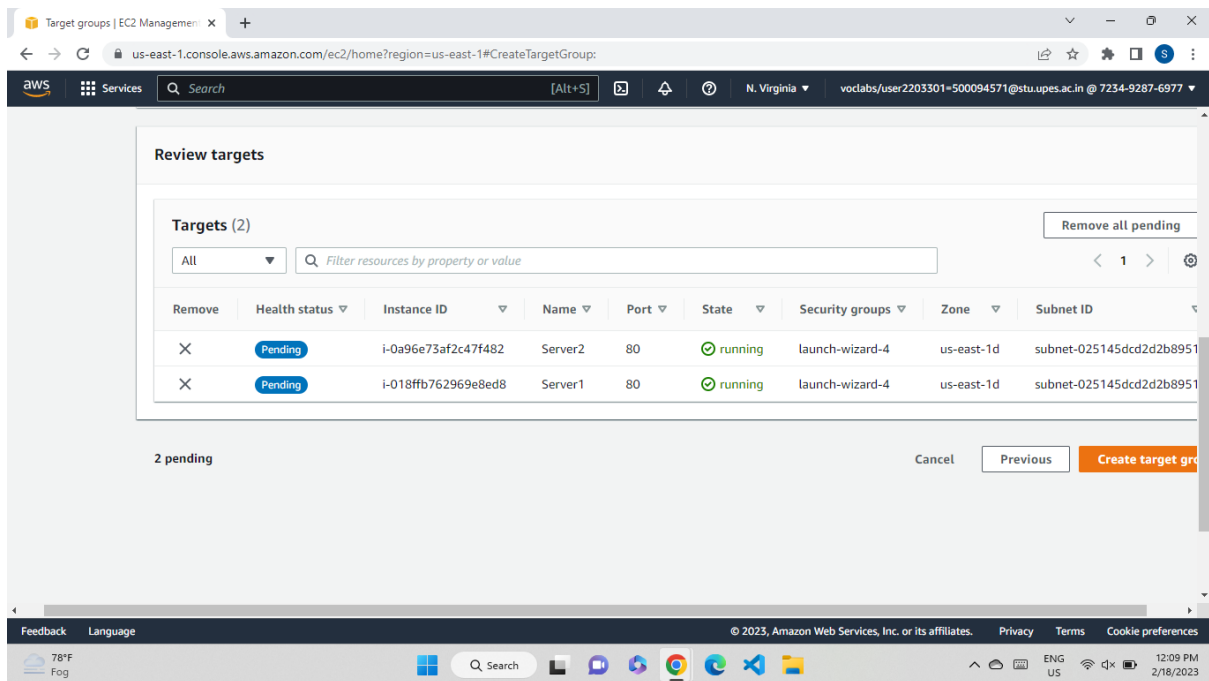
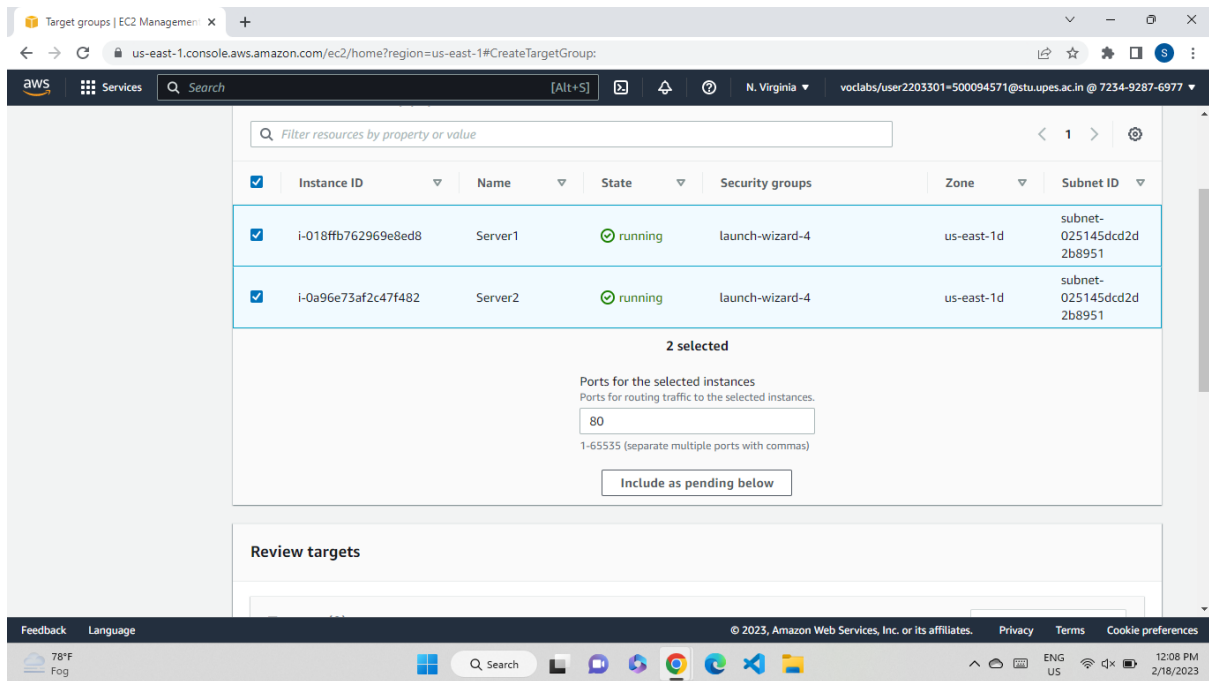
Step 2: Initialize and launch both the instances [Rename for convenience]



Step 3: Create a target group and add the two instances created

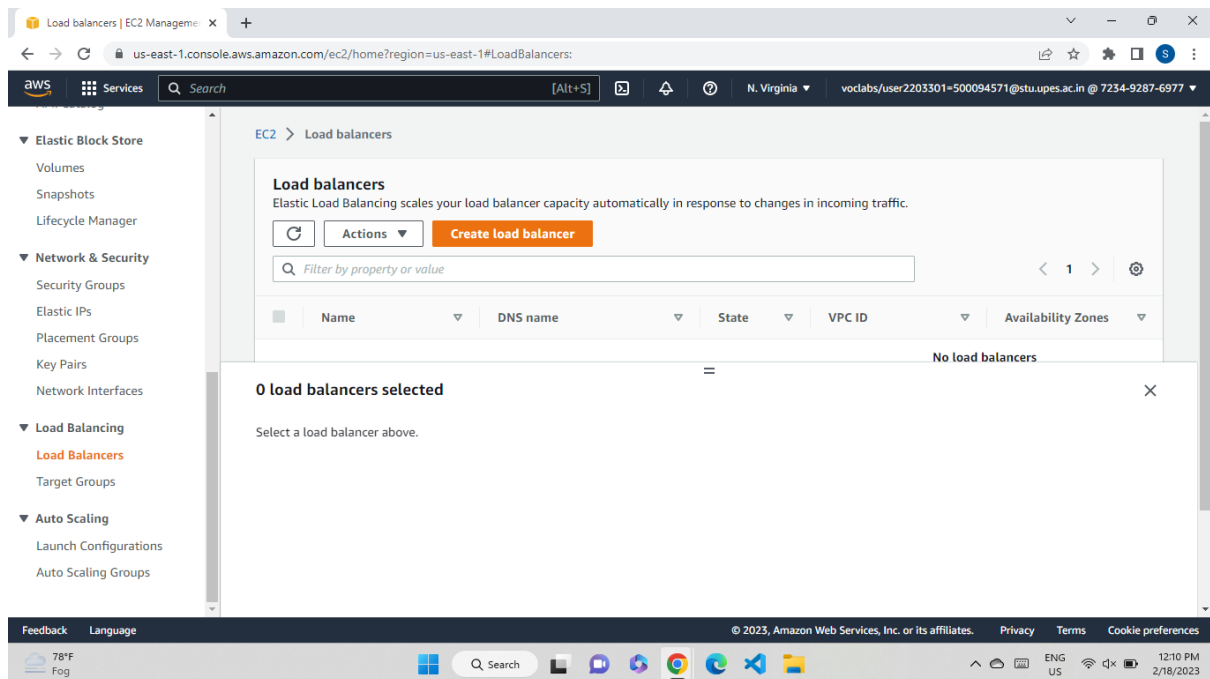


Step 4: After naming the target group click on next , in step-ii , include the instances into the group by clicking “Include as pending below”

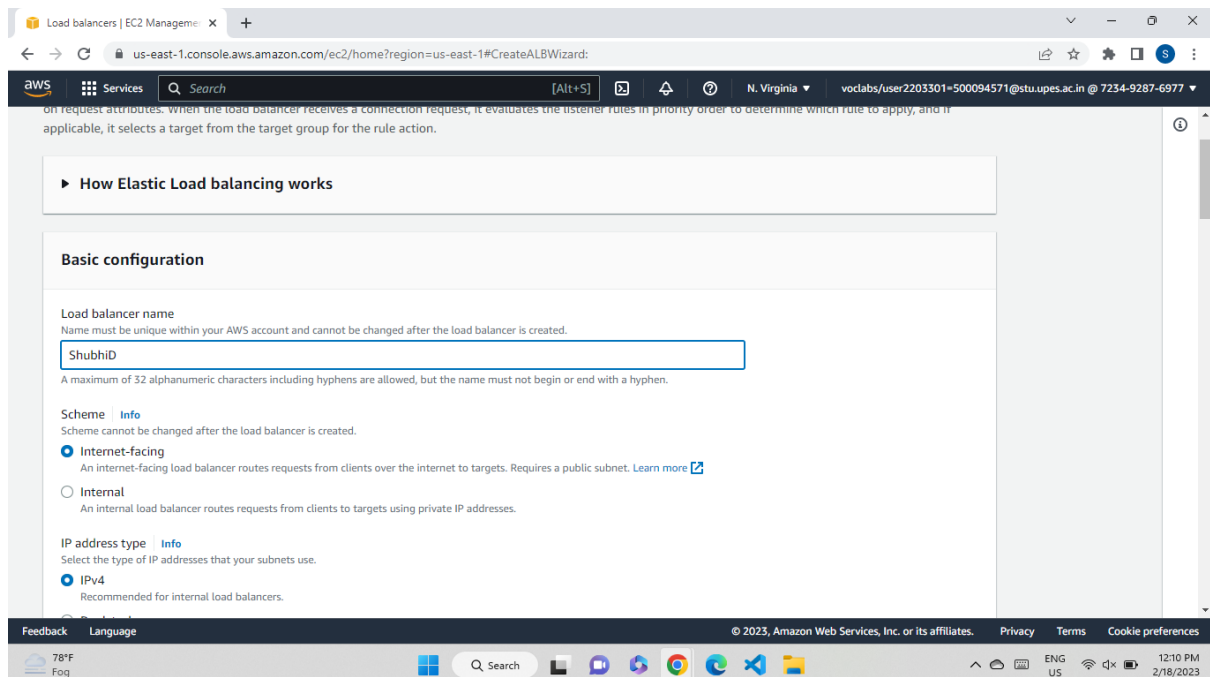


Step 5: Review the changes and click “create target group”

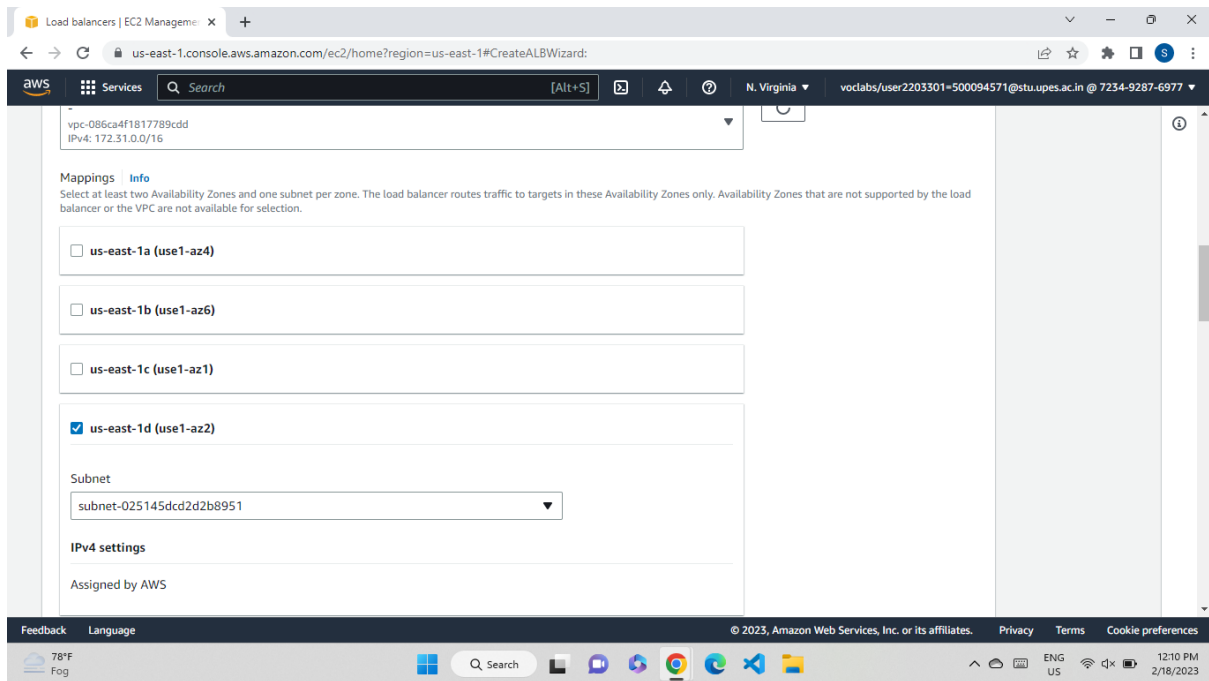
Step 6: Now go to load balancer and create an “Application load balancer”



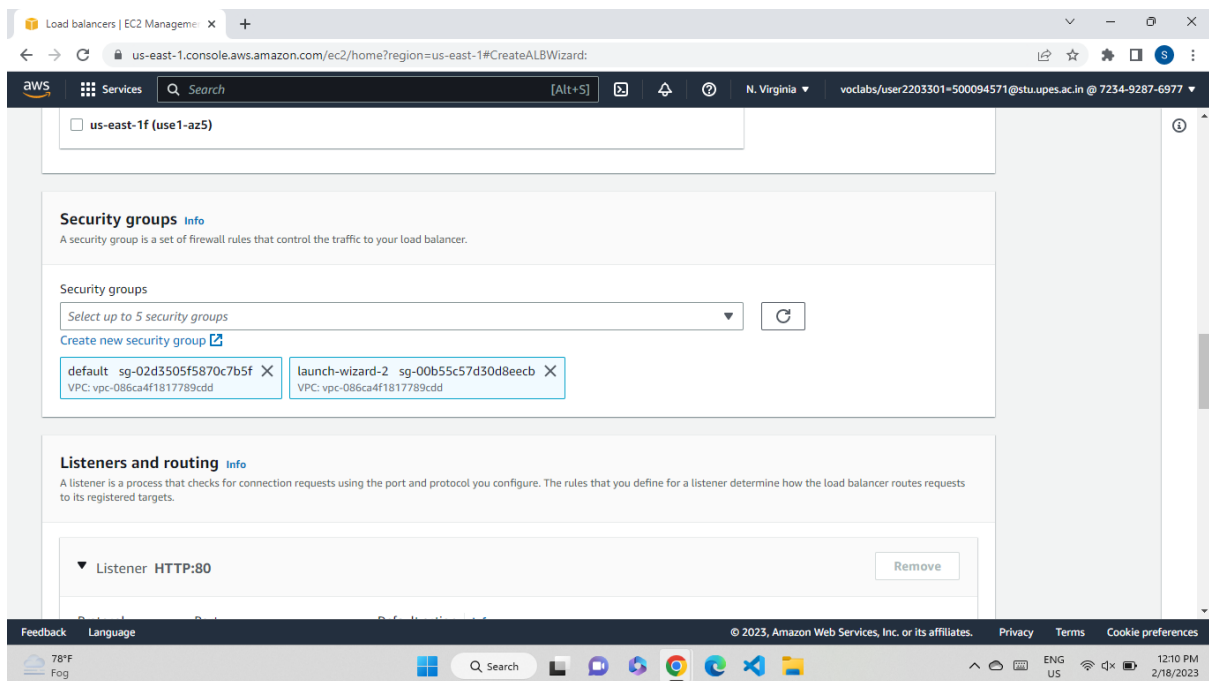
Step 7: Now we assign a name to the load balancer



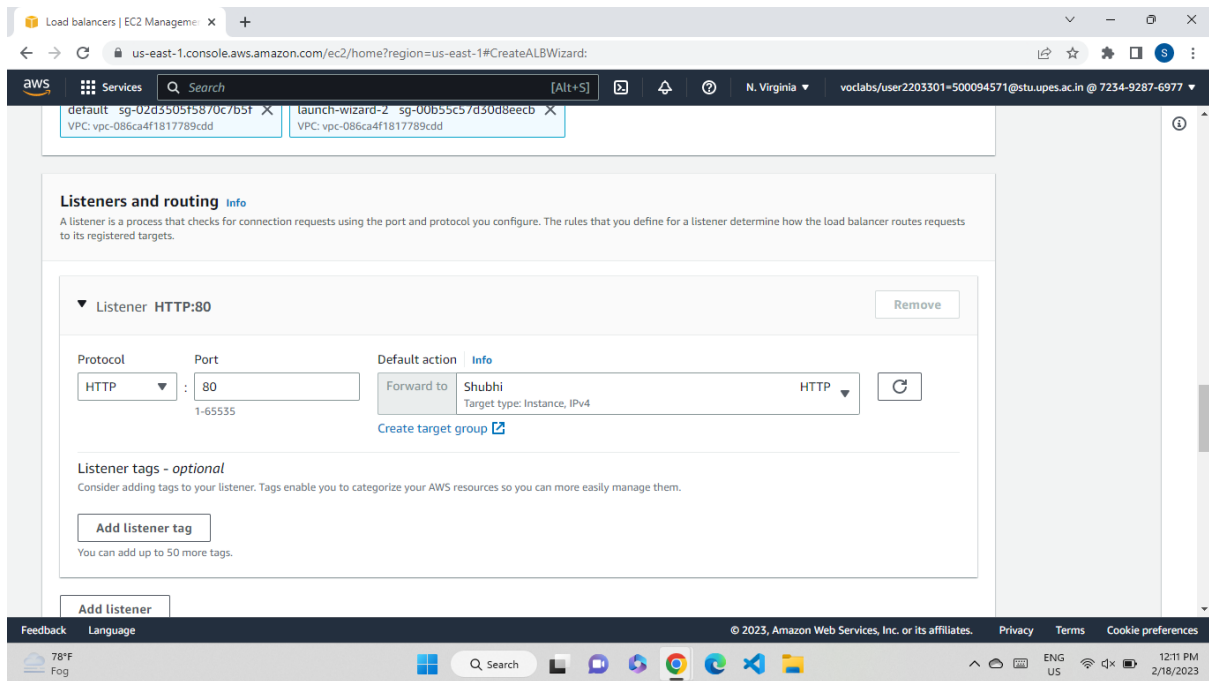
Step 8: In Network mapping , map at least two availability zones



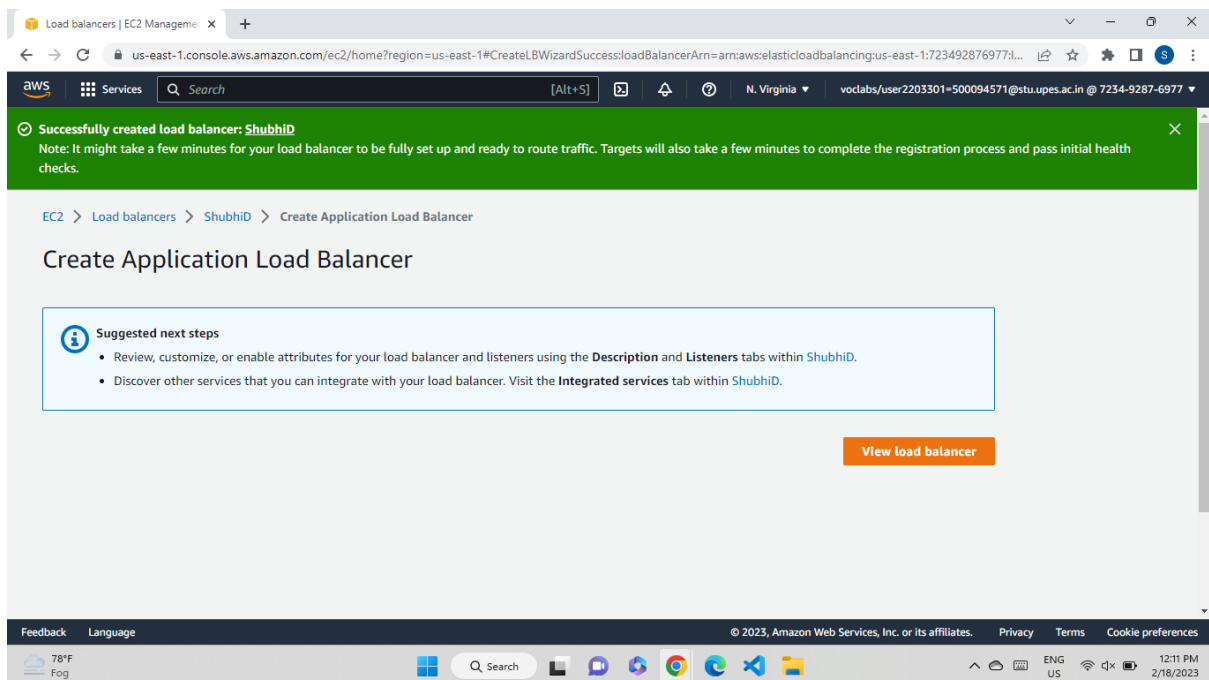
Step 9: Assign the security group assigned in step 1

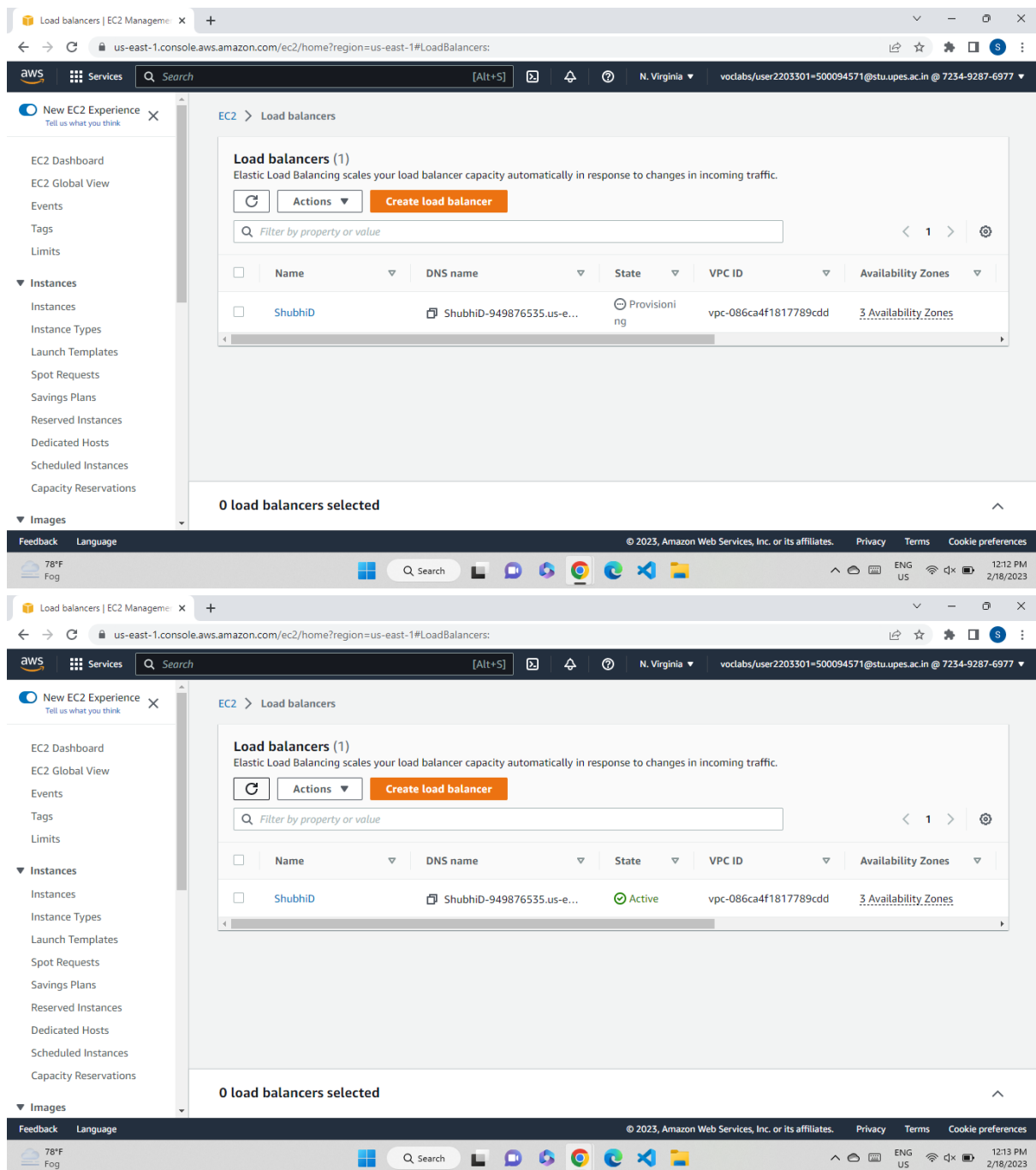


Step 10: In the listeners & routing column select the target group formed in step-5

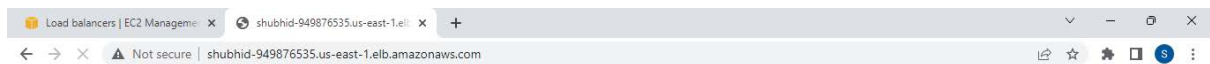
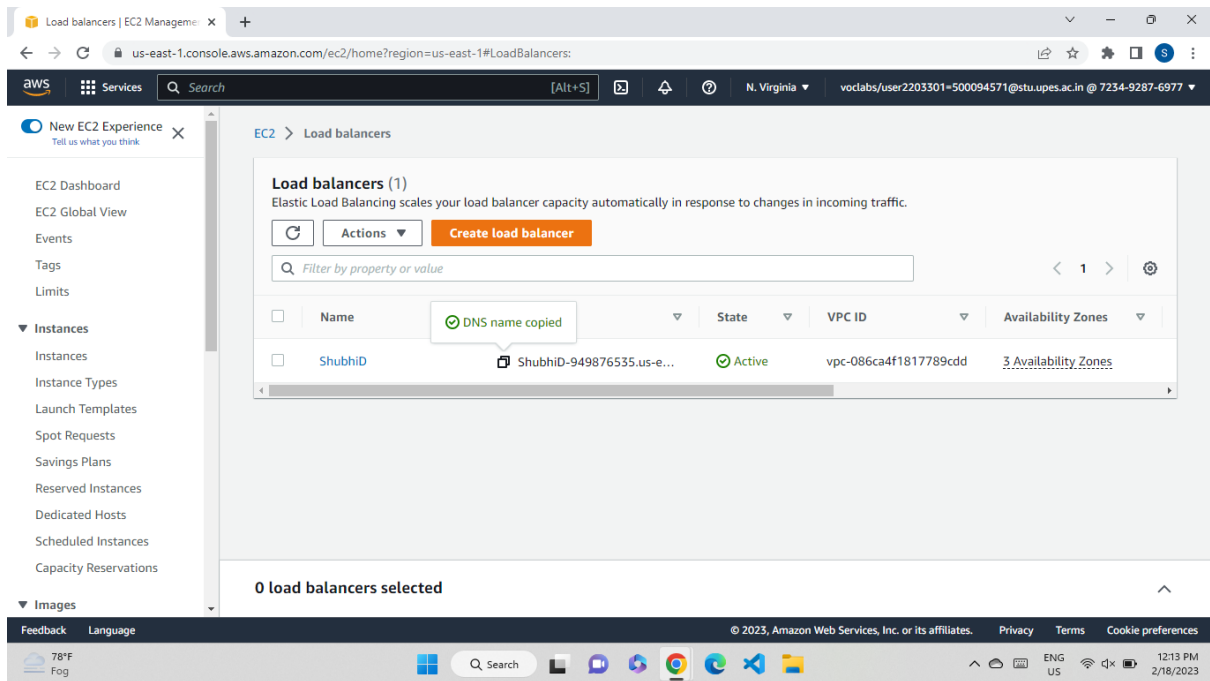


Step 11: Click on “create load balancer”





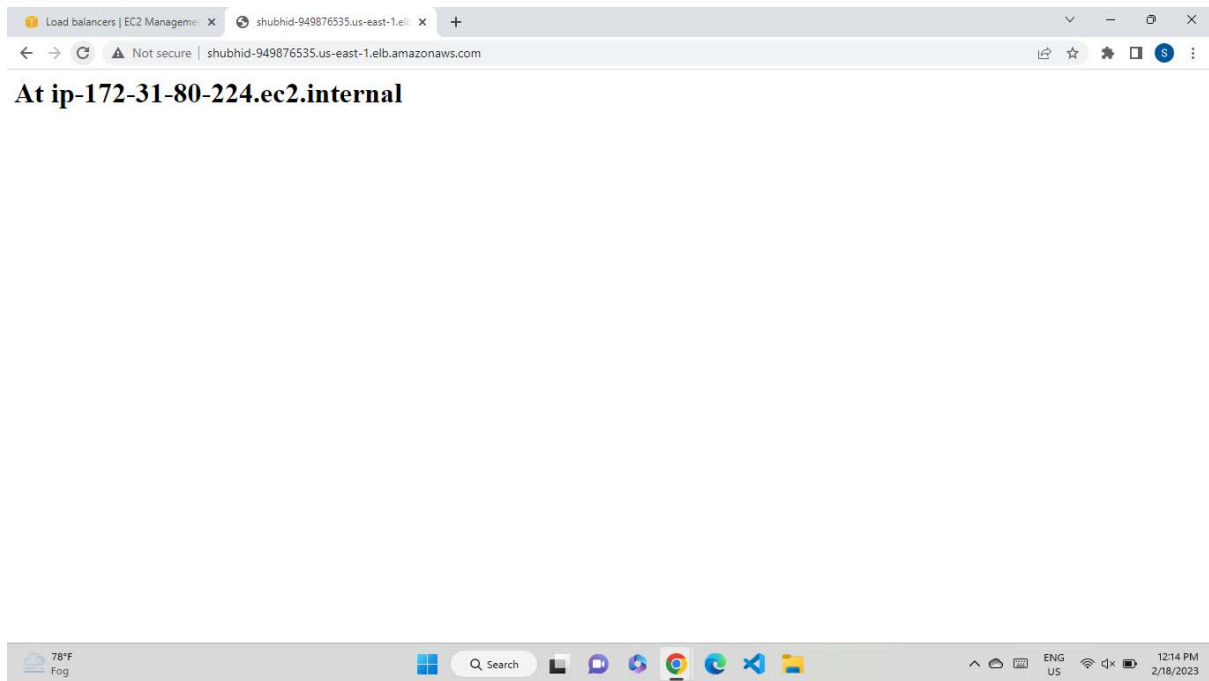
Step 12: Copy the DNS of the load-balancer and paste it in a browser



At ip-172-31-82-17.ec2.internal



[refresh the browser till you get the ip address of the 2nd server]



Step 13: Delete the loadbalancer, and corresponding target-group

Network Load-Balancer

Step 1: Create two ec2 instances(or reuse) with the custom script and assign a target group as done previously

EC2 > Target groups > Create target group

Step 1
Specify group details

Step 2
Register targets

Register targets

This is an optional step to create a target group. However, to ensure that your load balancer routes traffic to this target group you must register your targets.

Available instances (2/2)

Filter resources by property or value

<input checked="" type="checkbox"/>	Instance ID	Name	State	Security groups	Zone	Subnet ID
<input checked="" type="checkbox"/>	i-0fd03148ba49e6740	server1	running	launch-wizard-18	ap-northeast-1c	subnet-000dcca0438cb03
<input checked="" type="checkbox"/>	i-02f8ad31e8b293d22	server1	running	launch-wizard-18	ap-northeast-1c	subnet-000dcca0438cb03

2 selected

Ports for the selected instances
Ports for routing traffic to the selected instances.

80

1-65535 (separate multiple ports with commas)

Include as pending below

Review targets

Targets (2)

All Filter resources by property or value

Remove all pending

Remove	Health status	Instance ID	Name	Port	State	Security groups	Zone	Subnet ID
X	Pending	i-0fd03148ba49e6740	server1	80	running	launch-wizard-18	ap-northeast-1c	subnet-000dcca0438cb03
X	Pending	i-02f8ad31e8b293d22	server1	80	running	launch-wizard-18	ap-northeast-1c	subnet-000dcca0438cb03

2 pending

Cancel Previous **Create target group**

New EC2 Experience Tell us what you think

EC2 > Target groups

Successfully created target group: tgnetwork

Target groups (2) Info

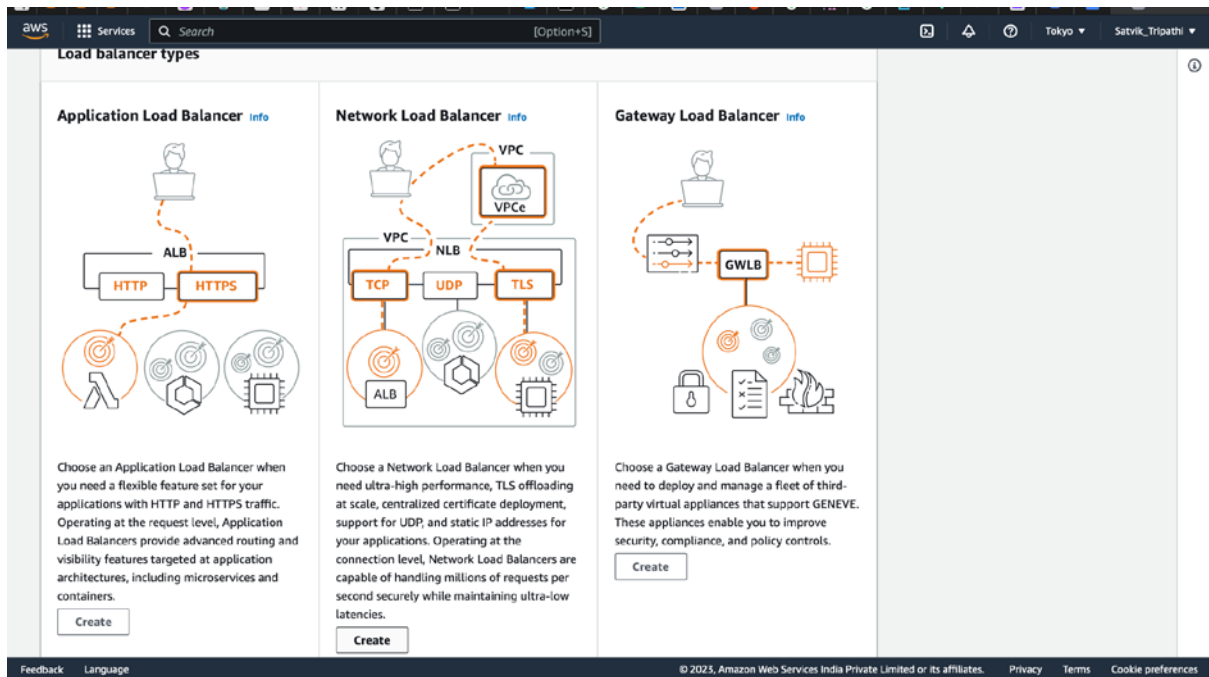
Search or filter target groups

<input type="checkbox"/>	Name	ARN	Port	Protocol	Target type	Load balance
<input type="checkbox"/>	tg	arn:aws:elasticloadbalancing...	80	HTTP	Instance	None asso
<input type="checkbox"/>	tgnetwork	arn:aws:elasticloadbalancing...	80	HTTP	Instance	None asso

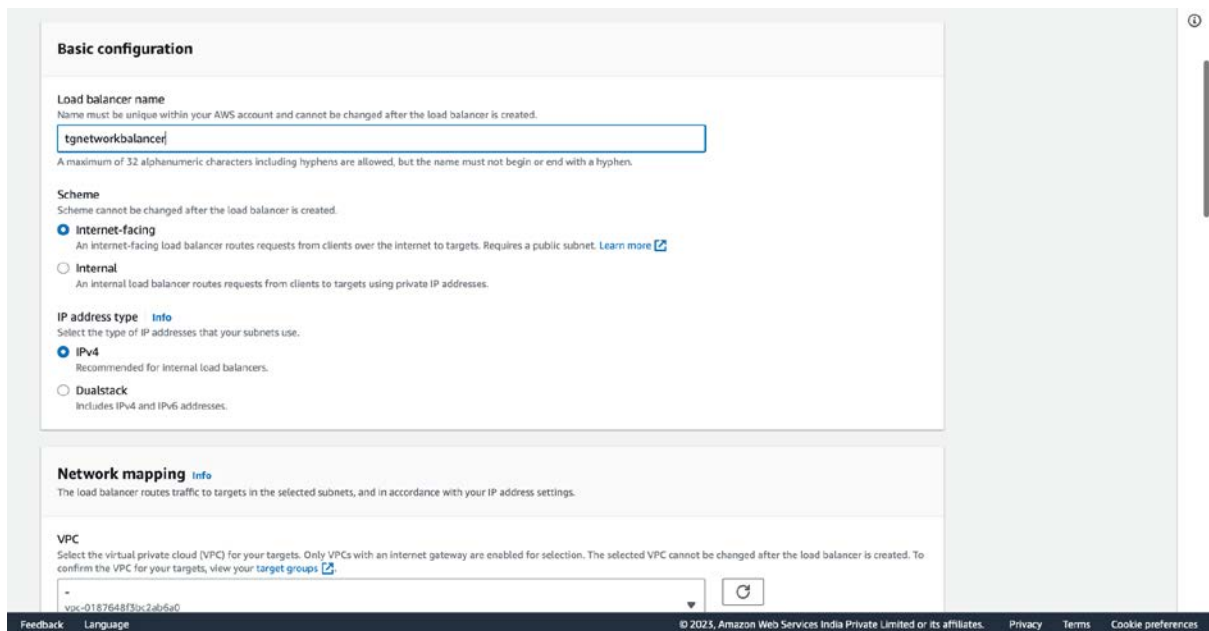
0 target groups selected

Select a target group above.

Step 2: Go to EC2-> Load balancers and click on “Network-loadbalancer”



Step 3: Assign a name and configuration to the loadbalancer



Step 4: In the mapping select at least two availability zones

Mappings

Select at least one Availability Zone and one subnet for each zone. We recommend selecting at least two Availability Zones. The load balancer will route traffic only to targets in the selected Availability Zones. Zones that are not supported by the load balancer or VPC cannot be selected. Subnets can be added, but not removed, once a load balancer is created.

☒ **ap-northeast-1a (apne1-az4)**

Subnet

IPv4 settings
IPv4 address

☒ **ap-northeast-1c (apne1-az1)**

Subnet

IPv4 settings
IPv4 address

☒ **ap-northeast-1d (apne1-az2)**

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Step 5: Select the target group created in step 1

Listeners and routing [Info](#)

A listener is a process that checks for connection requests using the port and protocol you configure. The rules that you define for a listener determine how the load balancer routes requests to its registered targets.

▼ Listener TCP:80

Protocol

Port

Default action [Info](#)
Forward to
Target type: Instance, IPv4
[Create target group](#)

Listener tags - optional
Consider adding tags to your listener. Tags enable you to categorize your AWS resources so you can more easily manage them.

You can add up to 50 more tags.

Step 6: Review the loadbalancer and click on “Create loadbalancer”

► **Tags - optional**
Consider adding tags to your load balancer. Tags enable you to categorize your AWS resources so you can more easily manage them. The 'Key' is required, but 'Value' is optional. For example, you can have Key = production-webservers, or Key = webserver, and Value = production.

Summary
Review and confirm your configurations. [Estimate cost](#)

Basic configuration Edit tgnetworkbalancer • Internet-facing • IPv4	Network mapping Edit VPC vpc-0187649f3bc2ab5a0 • ap-northeast-1a subnet-09a70c173bd0ccbc9a • ap-northeast-1c subnet-000dcca0438cb903 • ap-northeast-1d subnet-0ebd44a29c2b25259	Listeners and routing Edit • TCP:80 defaults to tgnetwork2	Tags Edit None
---	---	---	--

Attributes

ⓘ Certain default attributes will be applied to your load balancer. You can view and edit them after creating the load balancer.

Cancel **Create load balancer**

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Step 7: Go to the loadbalancer created and copy -paste the DNS in the browser

EC2 > Load balancers

Load balancers (1)
Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

Filter by property or value

	Name	DNS name	State	VPC ID	Availability Zones	Type	Date c
<input type="checkbox"/>	networklb	networklb-d743916478799...	Active	vpc-05525b34412abb13b	2 Availability Zones	network	Februa (UTC+)



Step 8 : Delete the loadbalancer and corresponding instances and target-groups

