PROJECT : 3-TIER ARCHITECTURE

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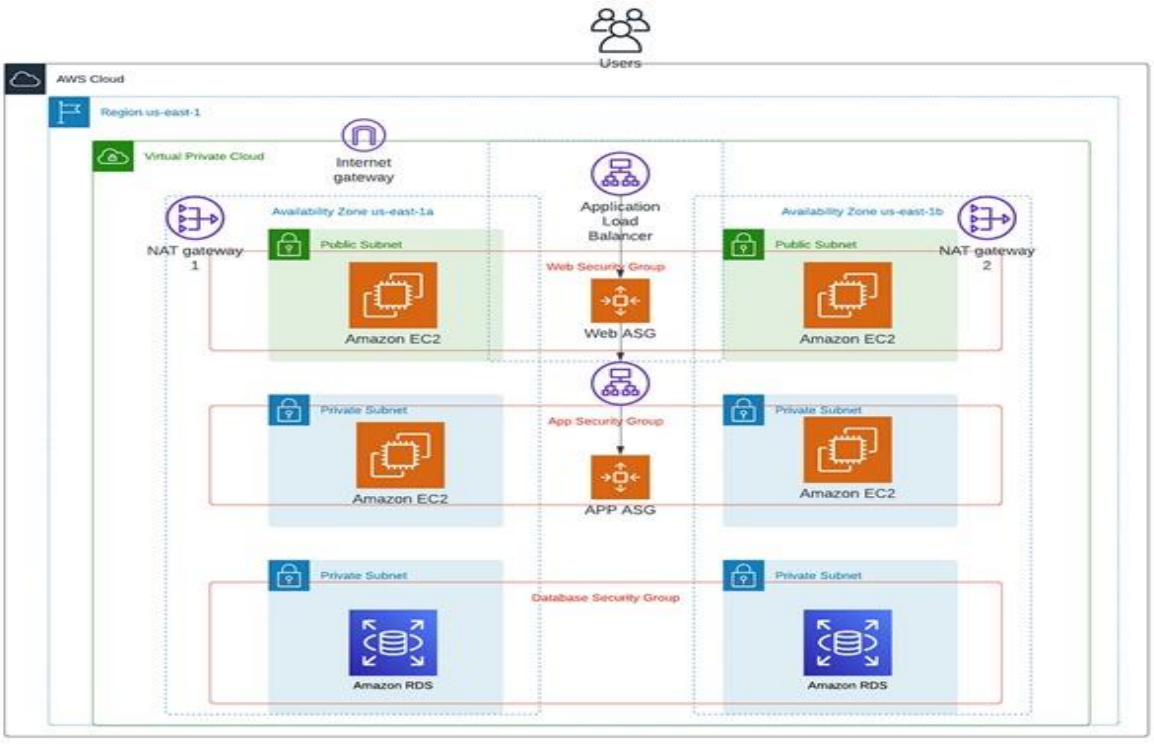
BATCH – 125 (10 a.m)

OVERVIEW: A 3-tier architecture is an architecture that divides application into 3 different layers web/presentation layer, application layer and database layer.

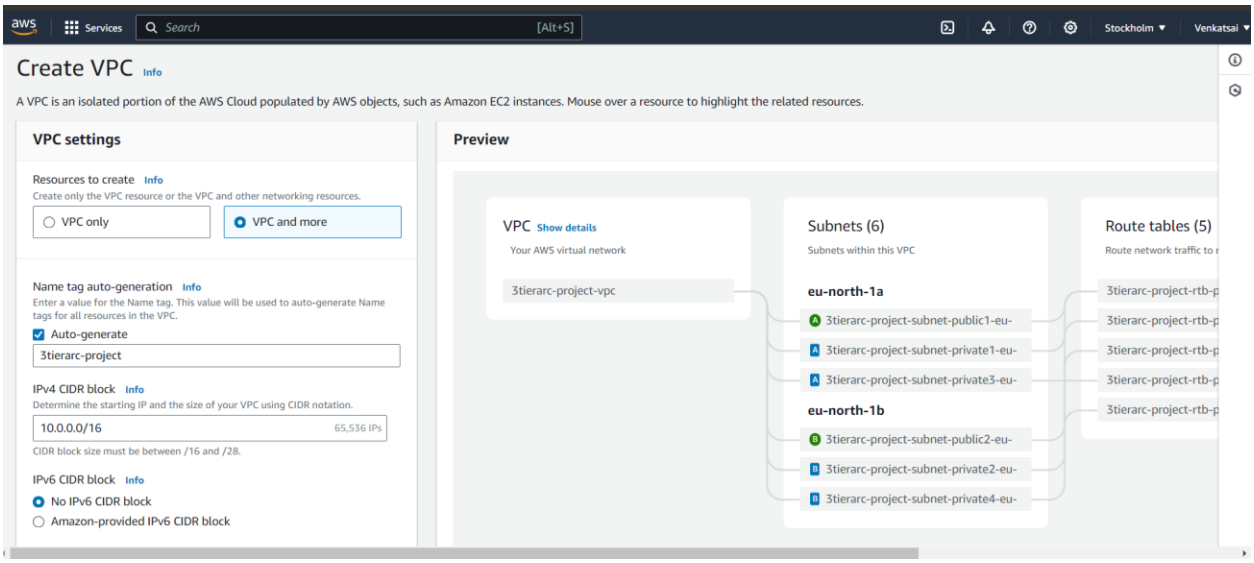
The below image shows the structure of the architecture:

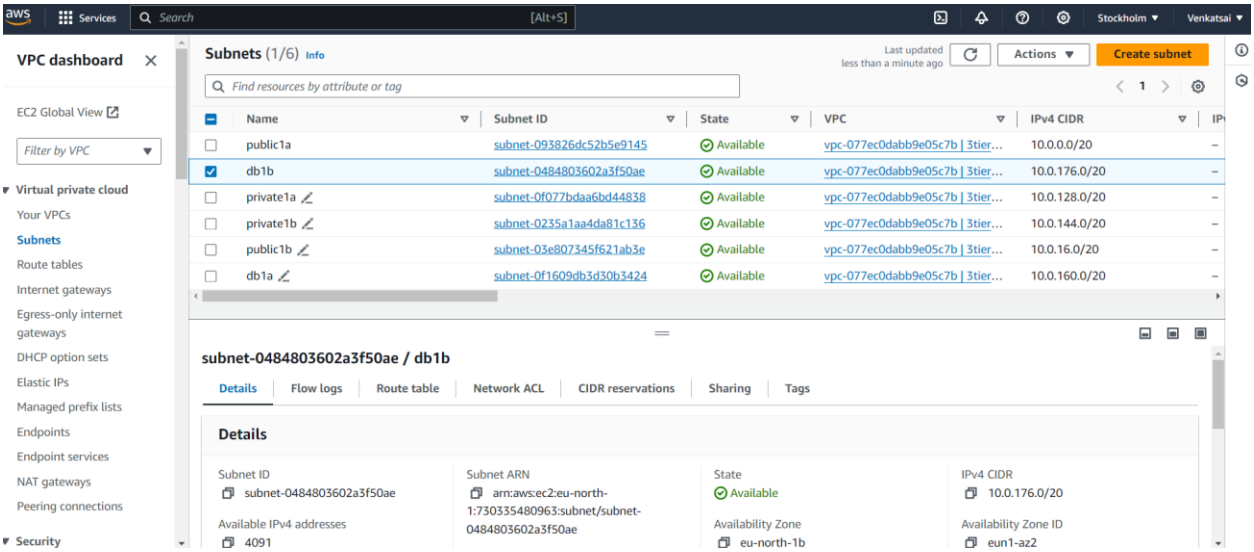


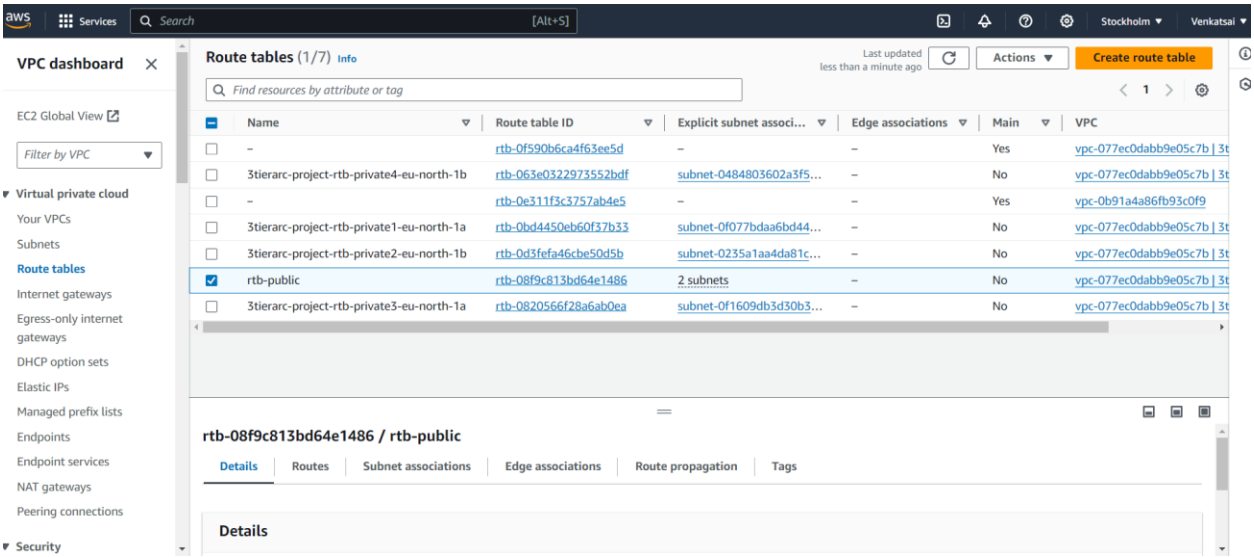
This architecture involves various cloud services like VPC, auto scaling, load balancers, RDS etc.

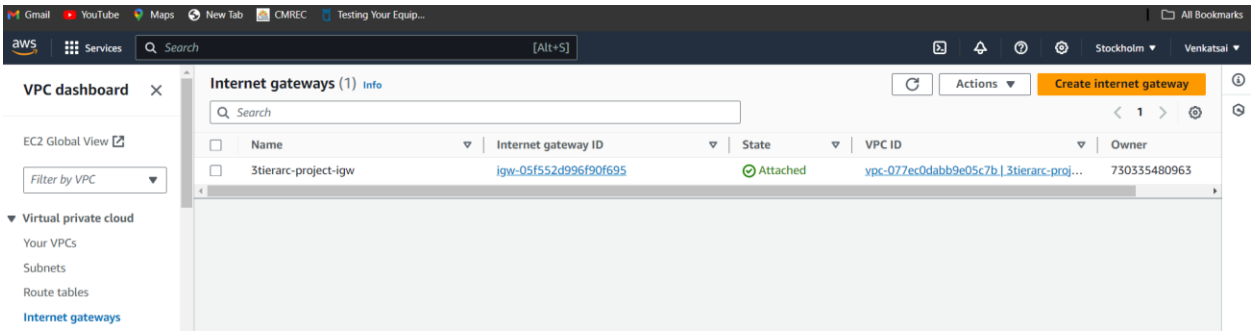
<u>This can be achieved by following steps:</u>

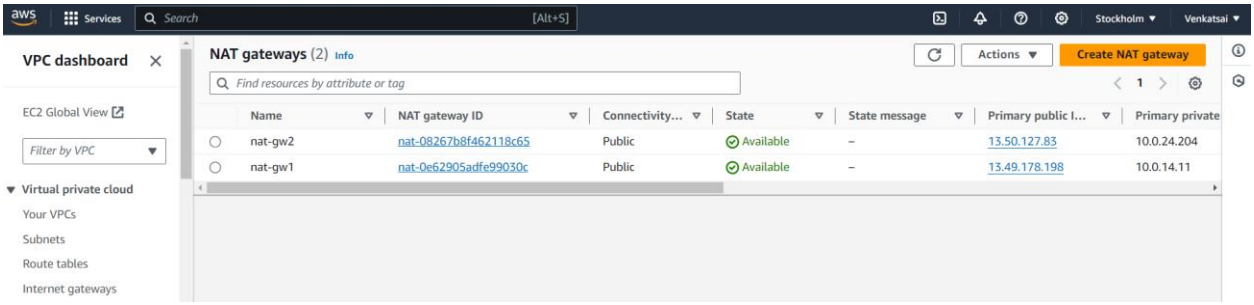
STEP 1: Create a VPC with the option VPC and more, this creates subnets, route tables, internet gateway, nat gateways automatically for 2 availability zones.


Create VPC Info
A VPC is an isolated portion of the AWS Cloud populated by AWS objects, such as Amazon EC2 instances. Mouse over a resource to highlight the related resources.
VPC settings
Resources to create Info
Create only the VPC resource or the VPC and other networking resources.
VPC only
VPC and more
Name tag auto-generation Info
Enter a value for the Name tag. This value will be used to auto-generate Name tags for all resources in the VPC.
Auto-generate
3tierarc-project
IPv4 CIDR block Info
Determine the starting IP and the size of your VPC using CIDR notation.
10.0.0.0/16
65,536 IPs
CIDR block size must be between /16 and /28.
IPv6 CIDR block Info
No IPv6 CIDR block
Amazon-provided IPv6 CIDR block
Preview
VPC Show details
Your AWS virtual network
3tierarc-project-vpc
Subnets (6)
Subnets within this VPC
eu-north-1a
3tierarc-project-subnet-public1-eu-
3tierarc-project-subnet-private1-eu-
3tierarc-project-subnet-private3-eu-
eu-north-1b
3tierarc-project-subnet-public2-eu-
3tierarc-project-subnet-private2-eu-
3tierarc-project-subnet-private4-eu-
Route tables (5)
3tierarc-project-rtb-p
3tierarc-project-rtb-p
3tierarc-project-rtb-p
3tierarc-project-rtb-p
3tierarc-project-rtb-p

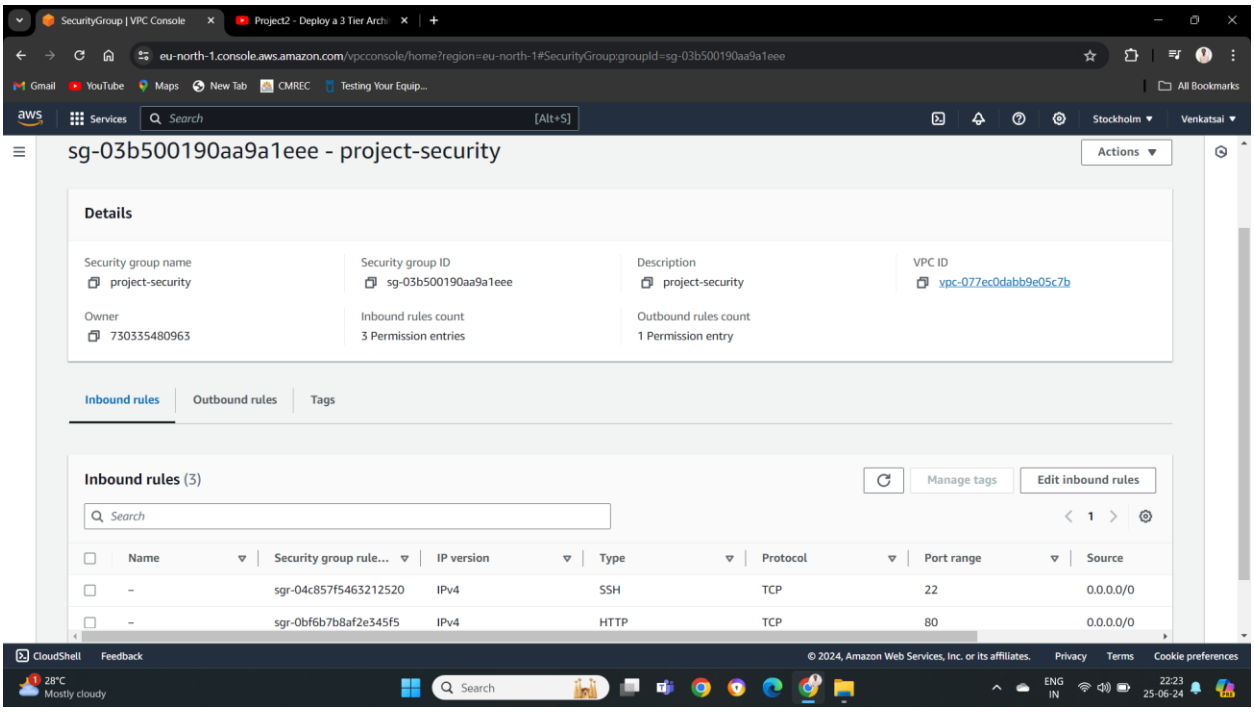

VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
DHCP option sets
Elastic IPs
Managed prefix lists
Endpoints
Endpoint services
NAT gateways
Peering connections
Security
Subnets (1/6) Info
Last updated less than a minute ago
Actions
Create subnet
Find resources by attribute or tag
Name
Subnet ID
State
VPC
IPv4 CIDR
public1a subnet-093826dc52b5e9145 Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.0.0/20
db1b subnet-0484803602a3f50ae Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.176.0/20
private1a subnet-0f077bdaa6bd44838 Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.128.0/20
private1b subnet-0235a1aa4da81c136 Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.144.0/20
public1b subnet-03e807345f621ab3e Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.16.0/20
db1a subnet-0f1609db3d30b3424 Available vpc-077ec0dabb9e05c7b | 3tier... 10.0.160.0/20
subnet-0484803602a3f50ae / db1b
Details
Flow logs
Route table
Network ACL
CIDR reservations
Sharing
Tags
Details
Subnet ID
subnet-0484803602a3f50ae
Subnet ARN
arn:aws:ec2:eu-north-1:730335480963:subnet/subnet-0484803602a3f50ae
State
Available
IPv4 CIDR
10.0.176.0/20
Available IPv4 addresses
4091
Availability Zone
eu-north-1b
Availability Zone ID
eun1-az2


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
Endpoints
Endpoint services
NAT gateways
Peering connections
Security
Route tables (1/7) Info
Last updated less than a minute ago
Actions
Create route table
Find resources by attribute or tag
Name
Route table ID
Explicit subnet associ...
Edge associations
Main
VPC
– rtb-0f590b6ca4f63ee5d – – Yes vpc-077ec0dabb9e05c7b | 3t
3tierarc-project-rtb-private4-eu-north-1b rtb-063e0322973552bdf subnet-0484803602a3f5... – No vpc-077ec0dabb9e05c7b | 3t
– rtb-0e311f3c3757ab4e5 – – Yes vpc-0b91a4a86fb93c0f9
3tierarc-project-rtb-private1-eu-north-1a rtb-0bd4450eb60f37b33 subnet-0f077bdaa6bd44... – No vpc-077ec0dabb9e05c7b | 3t
3tierarc-project-rtb-private2-eu-north-1b rtb-0d3fefa46cbe50d5b subnet-0235a1aa4da81c... – No vpc-077ec0dabb9e05c7b | 3t
rtb-public rtb-08f9c813bd64e1486 2 subnets – No vpc-077ec0dabb9e05c7b | 3t
3tierarc-project-rtb-private3-eu-north-1a rtb-0820566f28a6ab0ea subnet-0f1609db3d30b3... – No vpc-077ec0dabb9e05c7b | 3t
rtb-08f9c813bd64e1486 / rtb-public
Details
Routes
Subnet associations
Edge associations
Route propagation
Tags
Details

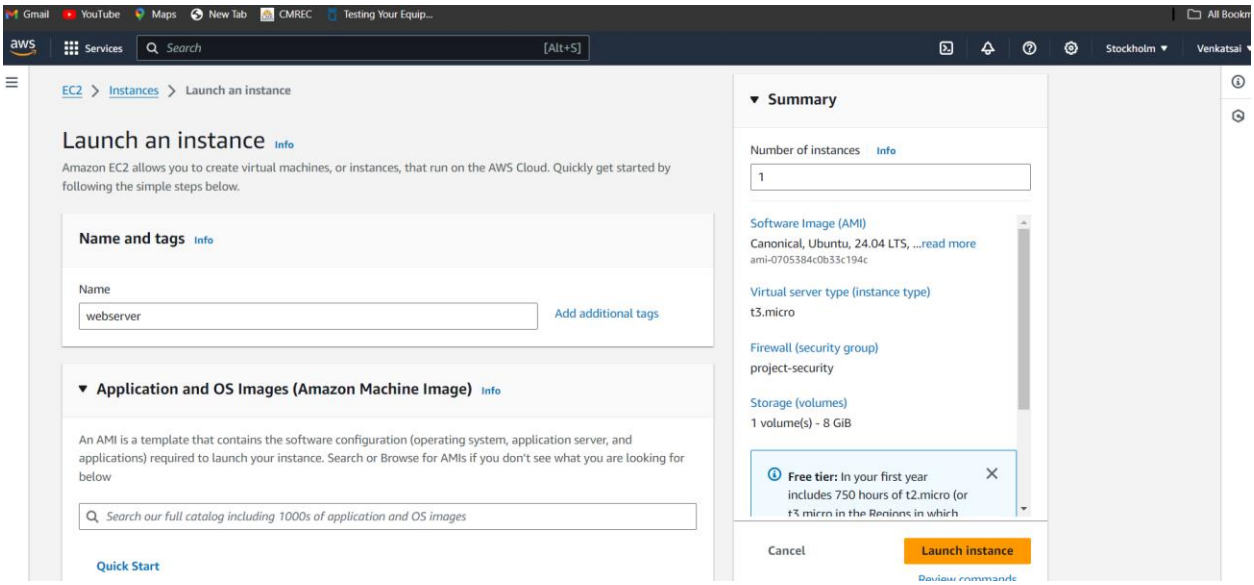


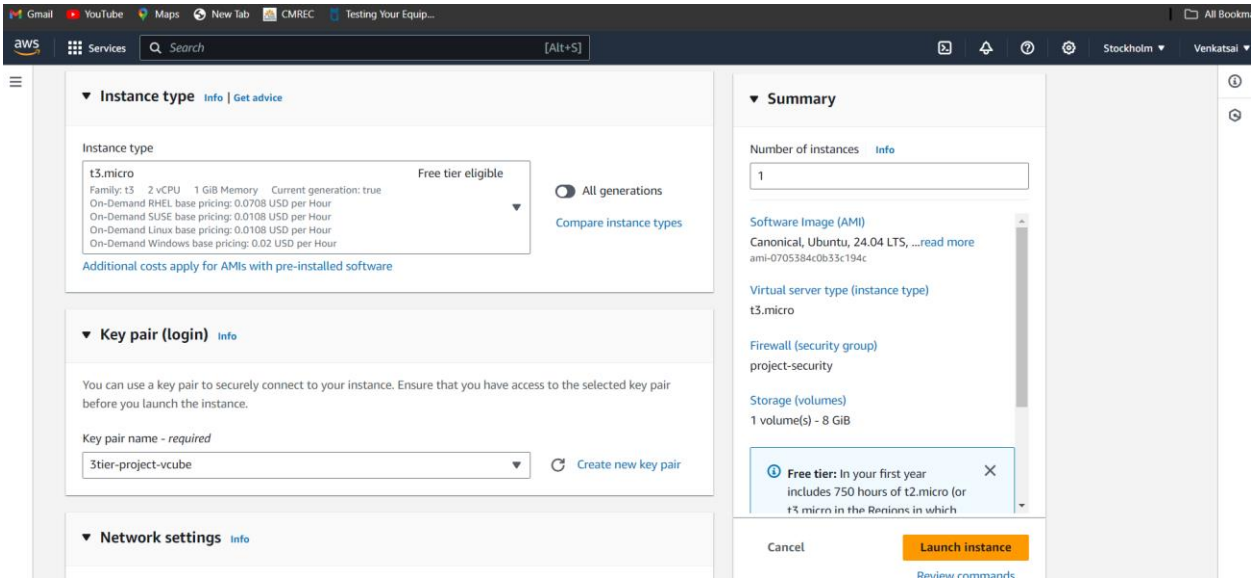


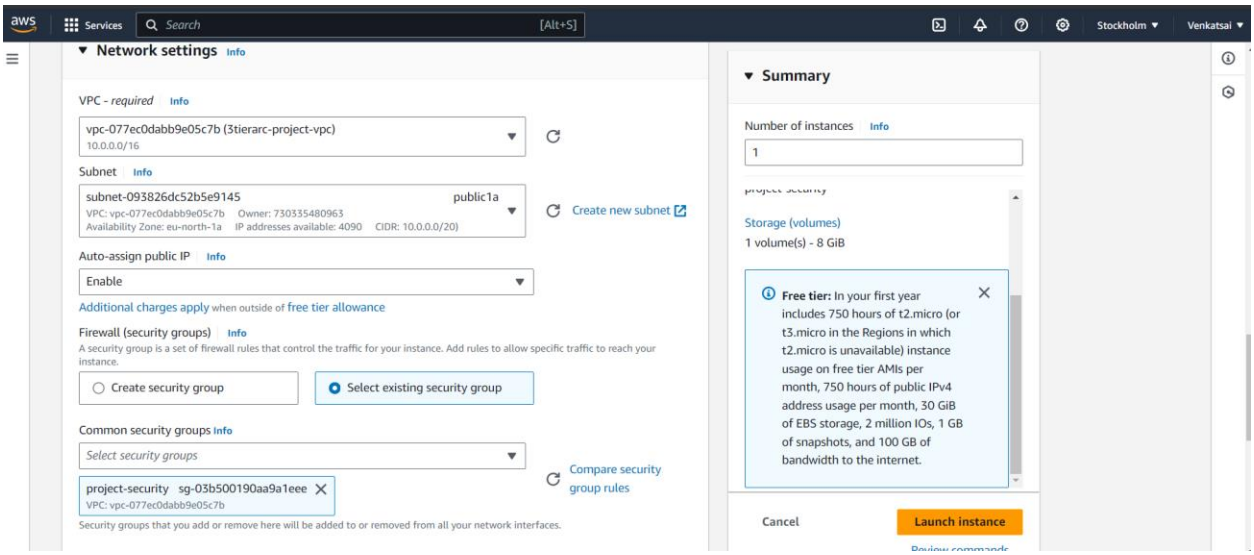
STEP 2: Create a security group named project security this controls the traffic depending on some protocols/rules. Add some inbound rules like SSH, HTTP and mysql/aurora.



STEP 3: Create an instance for the web tier through which we can connect. And select the network settings to the VPC we created earlier and also select the public subnet.

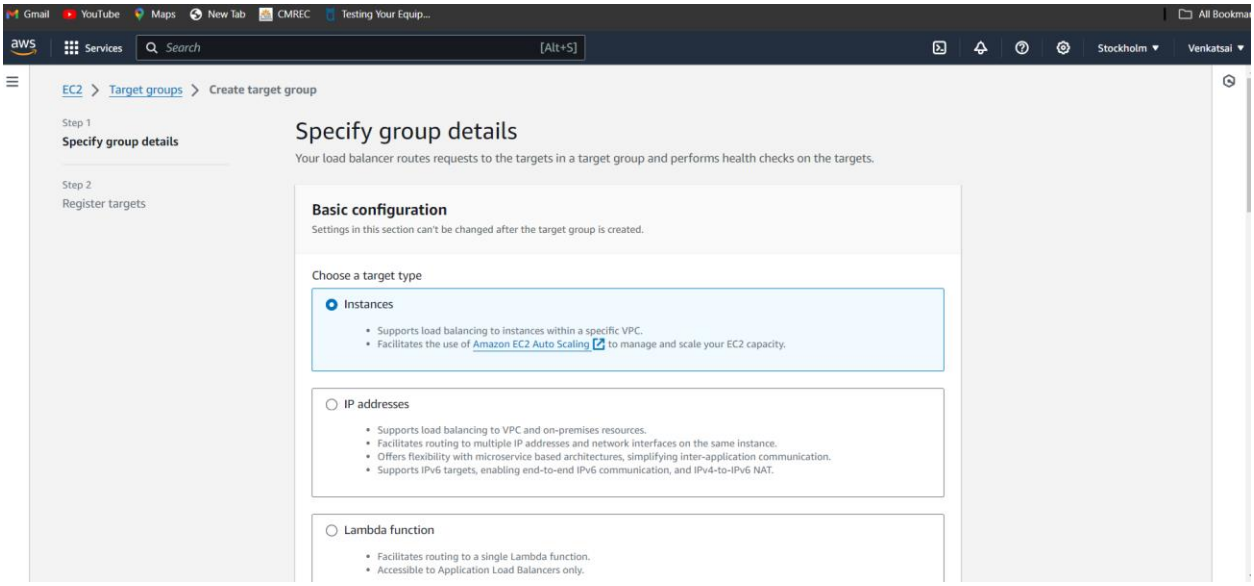

Gmail
YouTube
Maps
New Tab
CMREC
Testing Your Equip...
All Bookm
aws
Services
Search
[Alt+S]
Stockholm
Venkatsai
EC2 > Instances > Launch an instance
Launch an instance Info
Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.
Name and tags Info
Name
webserver
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
Quick Start
Summary
Number of instances Info
1
Software Image (AMI)
Canonical, Ubuntu, 24.04 LTS, ...read more
ami-0705384c0b33c194c
Virtual server type (instance type)
t3.micro
Firewall (security group)
project-security
Storage (volumes)
1 volume(s) - 8 GiB
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which
Cancel
Launch instance
Review commands

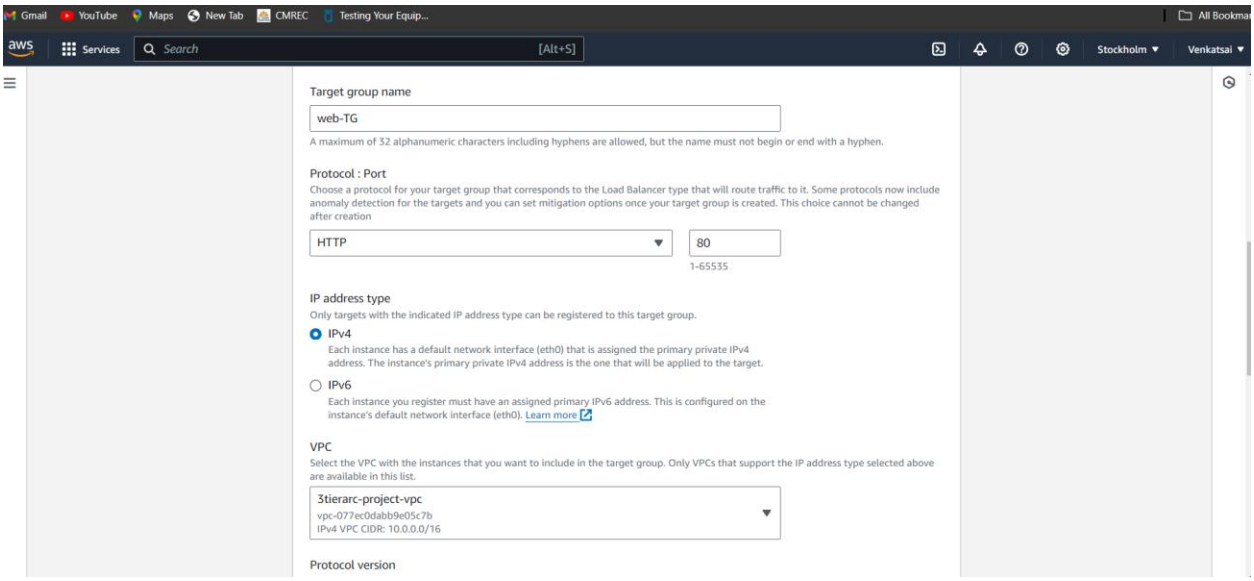

Gmail
YouTube
Maps
New Tab
CMREC
Testing Your Equip...
All Bookm
aws
Services
Search
[Alt+S]
Stockholm
Venkatsai
Instance type Info | Get advice
Instance type
t3.micro
Free tier eligible
Family: t3 2 vCPU 1 GiB Memory Current generation: true
On-Demand RHEL base pricing: 0.0708 USD per Hour
On-Demand SUSE base pricing: 0.0108 USD per Hour
On-Demand Linux base pricing: 0.0108 USD per Hour
On-Demand Windows base pricing: 0.02 USD per Hour
All generations
Compare instance types
Additional costs apply for AMIs with pre-installed software
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
3tier-project-vcube
Create new key pair
Network settings Info
Summary
Number of instances Info
1
Software Image (AMI)
Canonical, Ubuntu, 24.04 LTS, ...read more
ami-0705384c0b33c194c
Virtual server type (instance type)
t3.micro
Firewall (security group)
project-security
Storage (volumes)
1 volume(s) - 8 GiB
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which
Cancel
Launch instance
Review commands



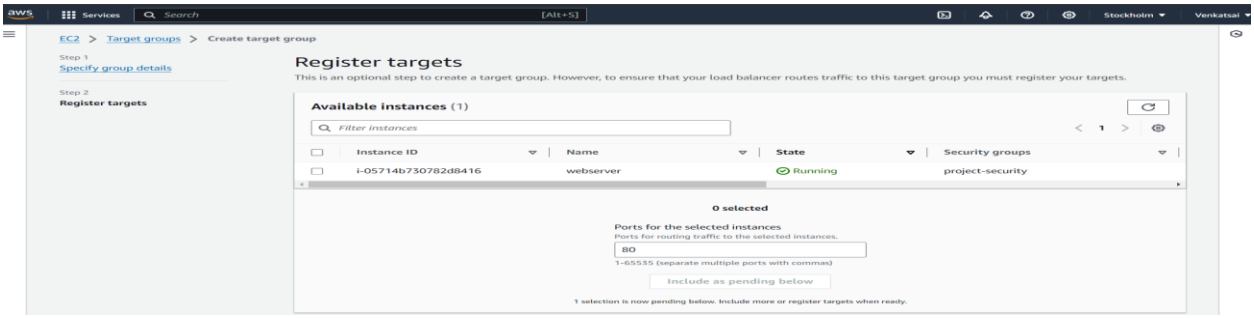
Now click on launch instance, the instance is created.

STEP 4: Now create a target group to target instance and connect to the load balancers to distribute the traffic.



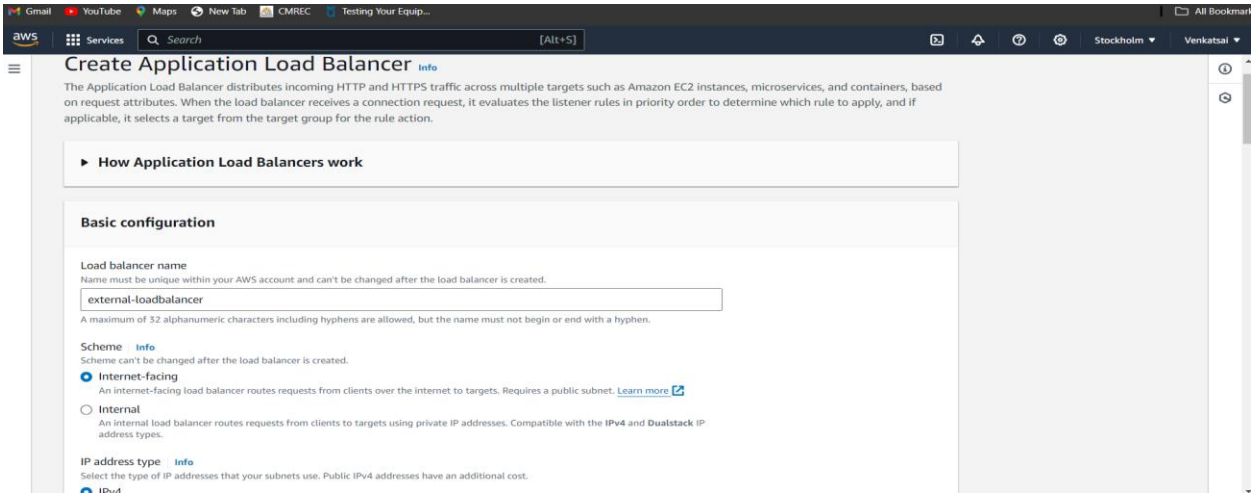


Select the target instances.

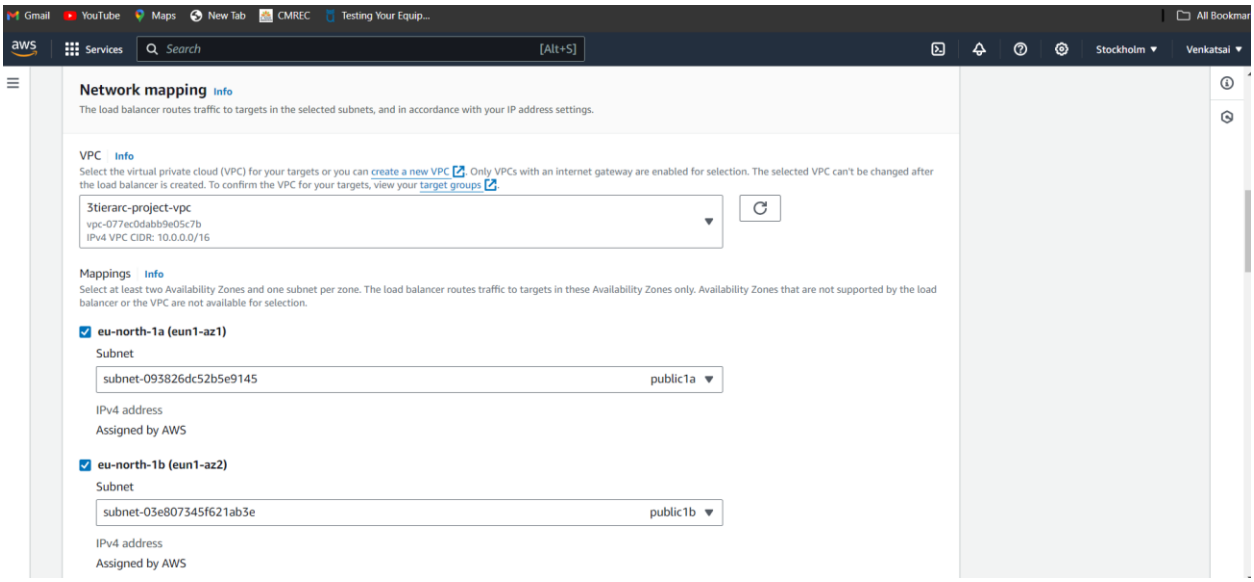


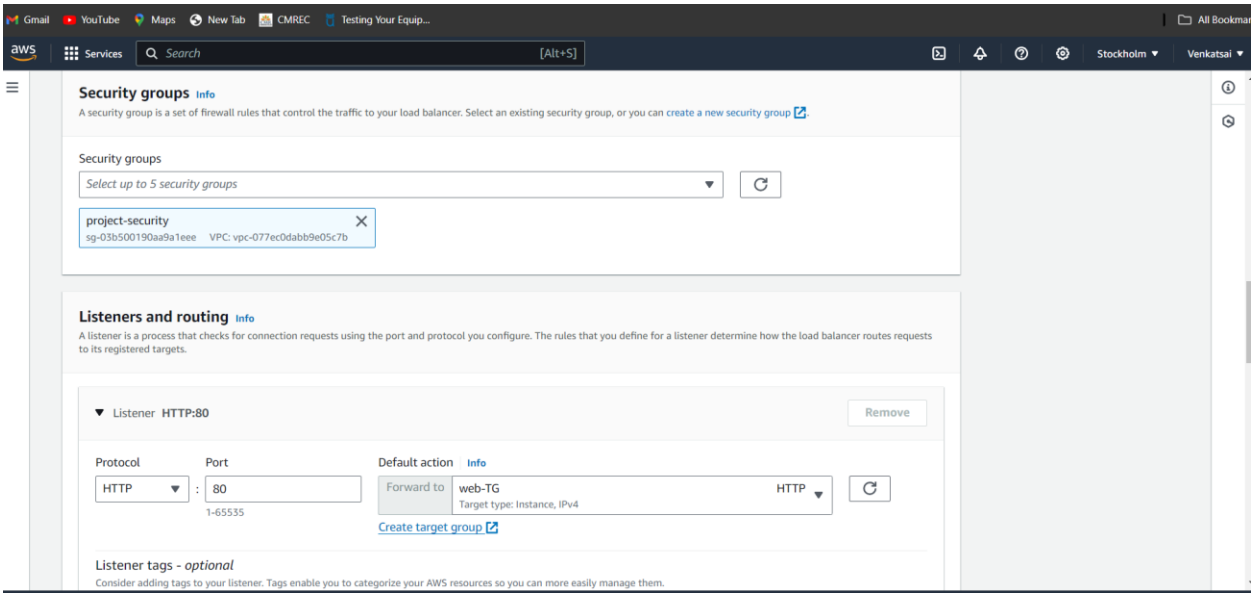
Now click create target group.

STEP 5: Now create an external load balancer which is used to distribute traffic equally to instances.



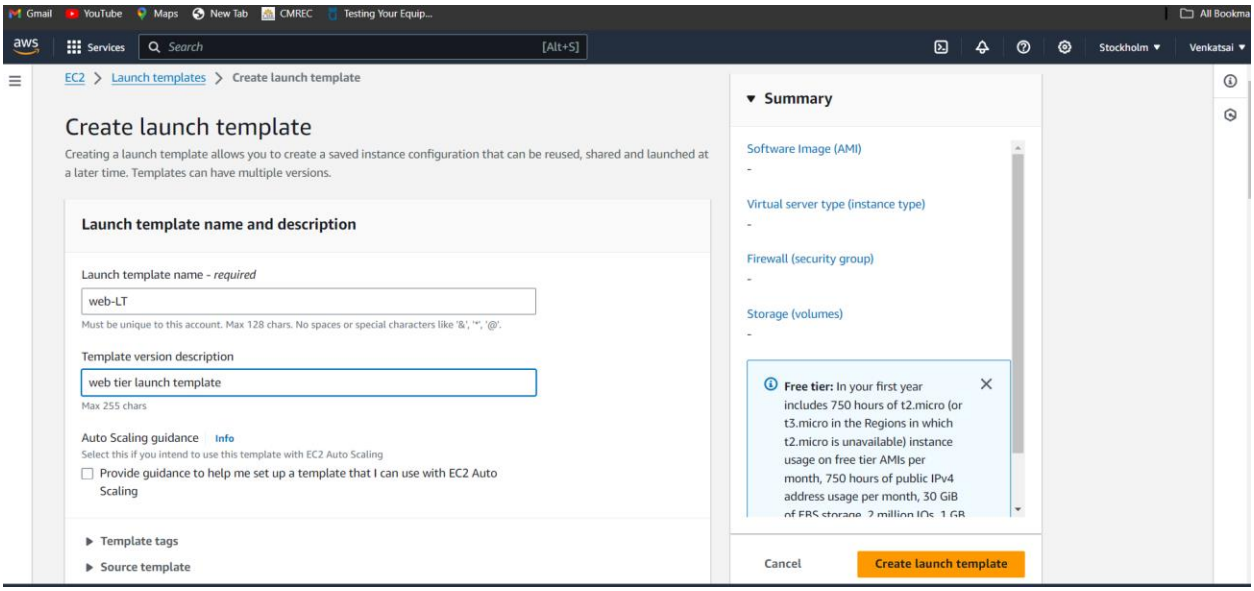
Select the subnets you need to distribute the traffic

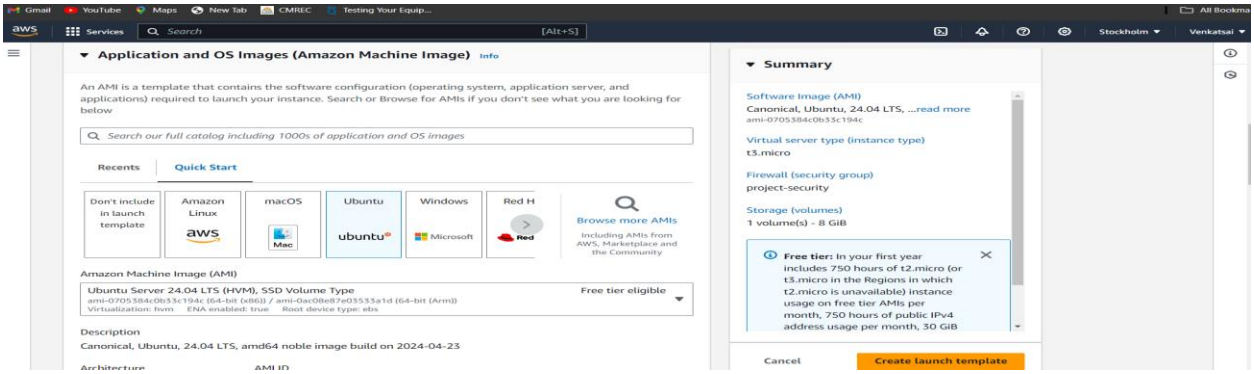


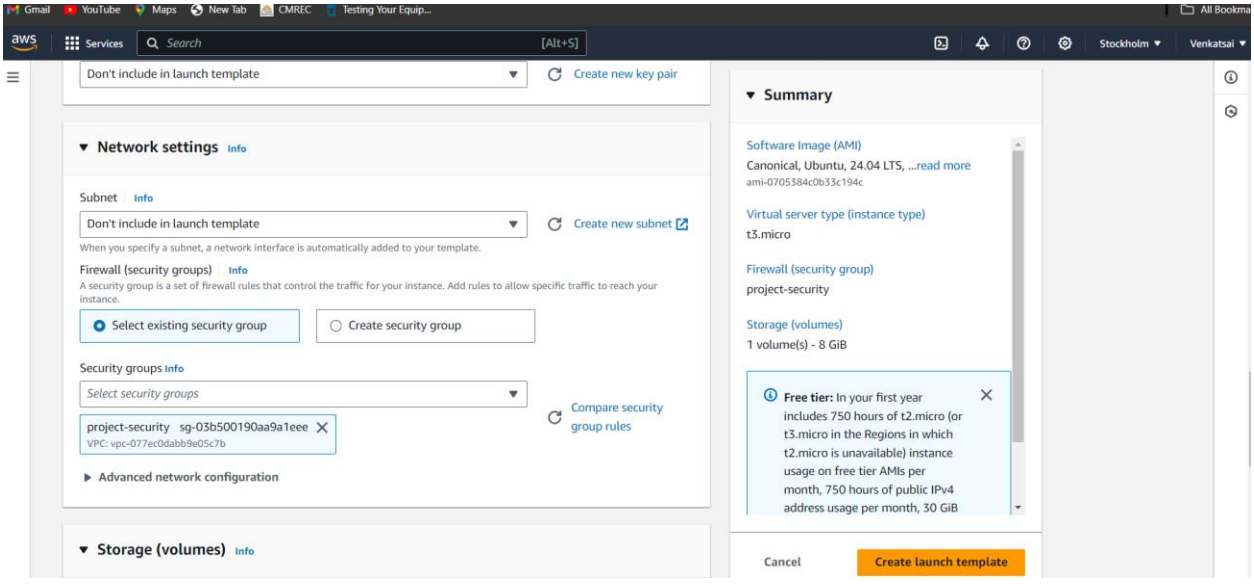


Click on create load balancer and the application load balancer is created.

STEP 6: Create a launch template for the web-tier instance.

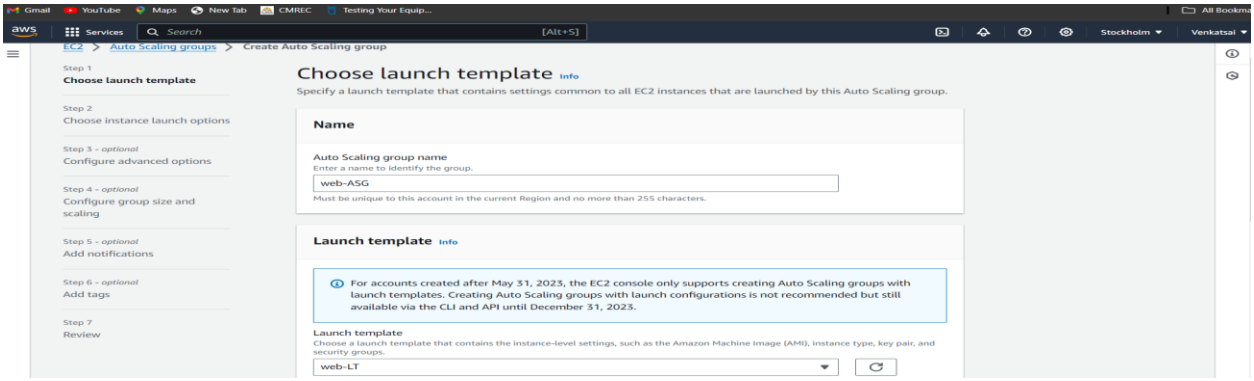




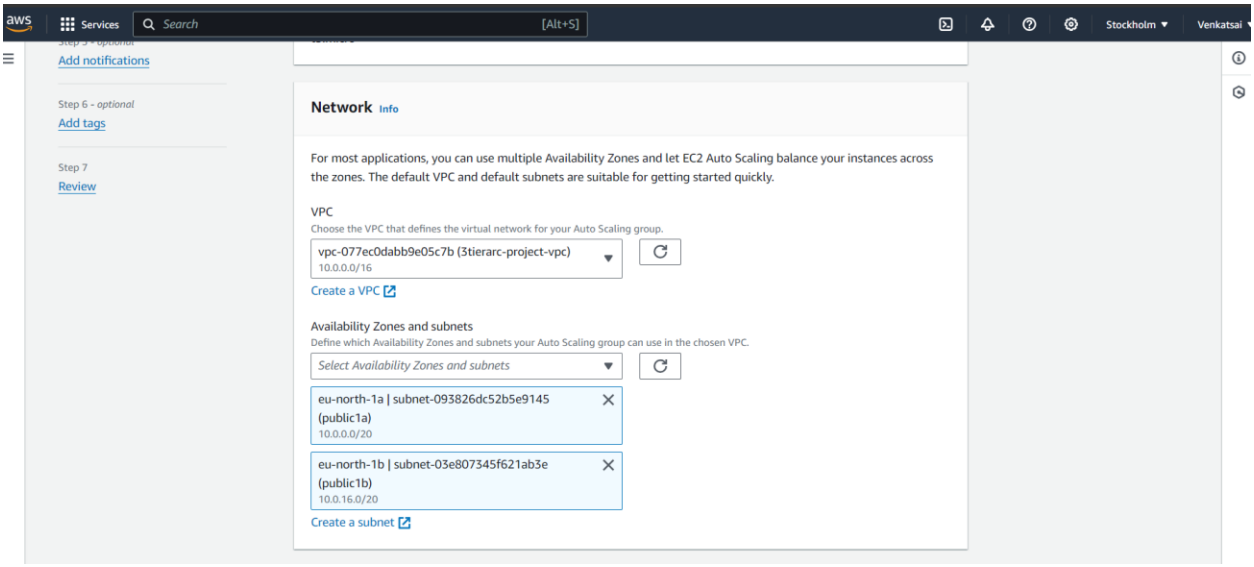


Click on create launch template.

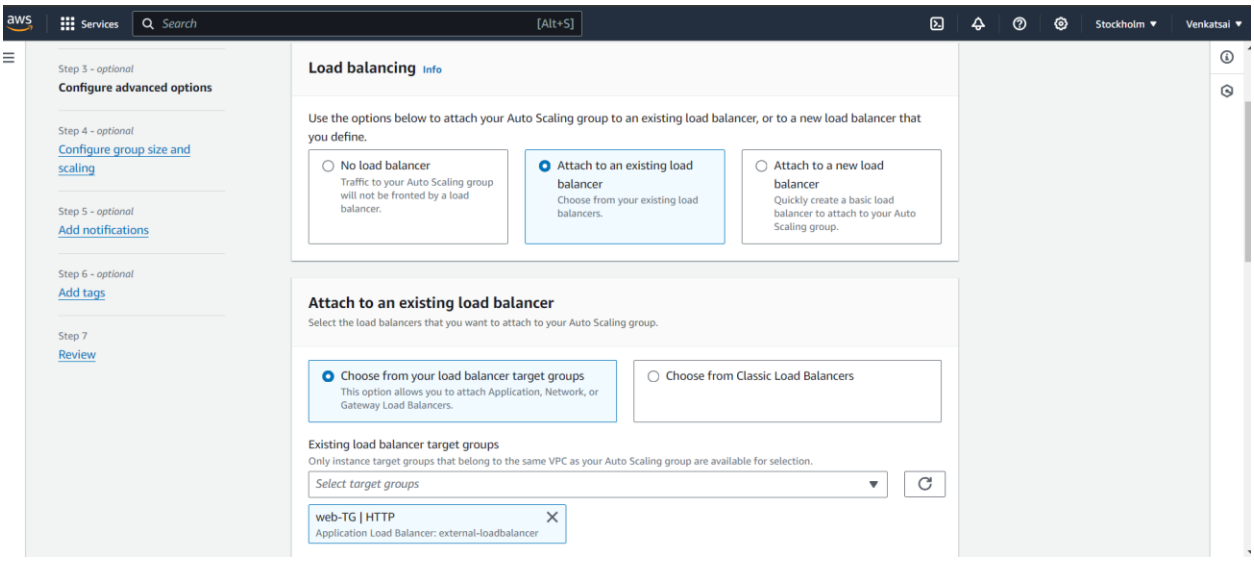
STEP 7: Now we have to create an auto-scaling group which is used to maintain the traffic in the servers without crashing the servers. This increases or decreases the no.of servers depending on the usage of the cpu percentage of the server.



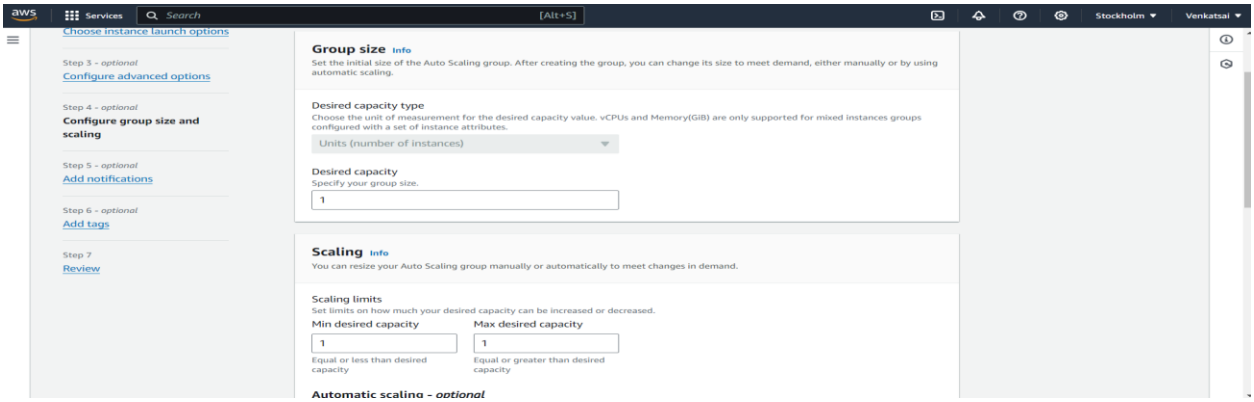
Now select the vpc created and the two public subnets in the subnets options



Attach the target group created for the web tier and the external loadbalancer.

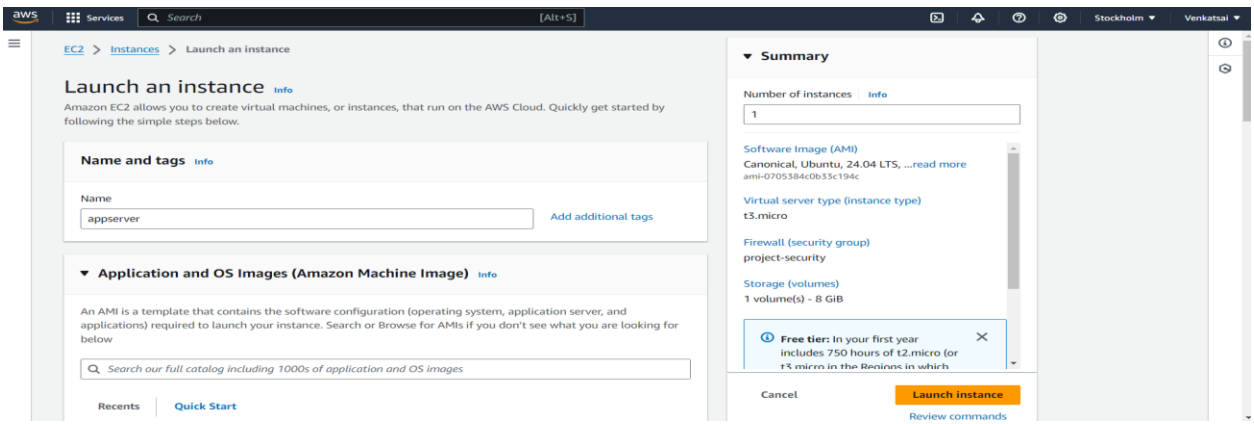


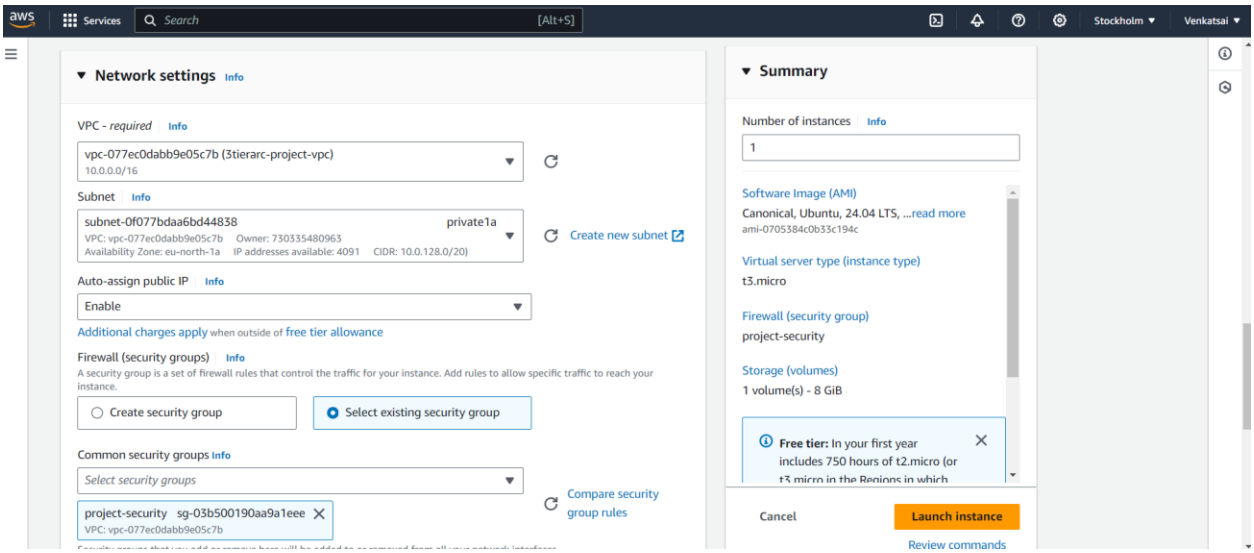
Now select the no.of desired capacity, min capacity and maximum capacity for the instances



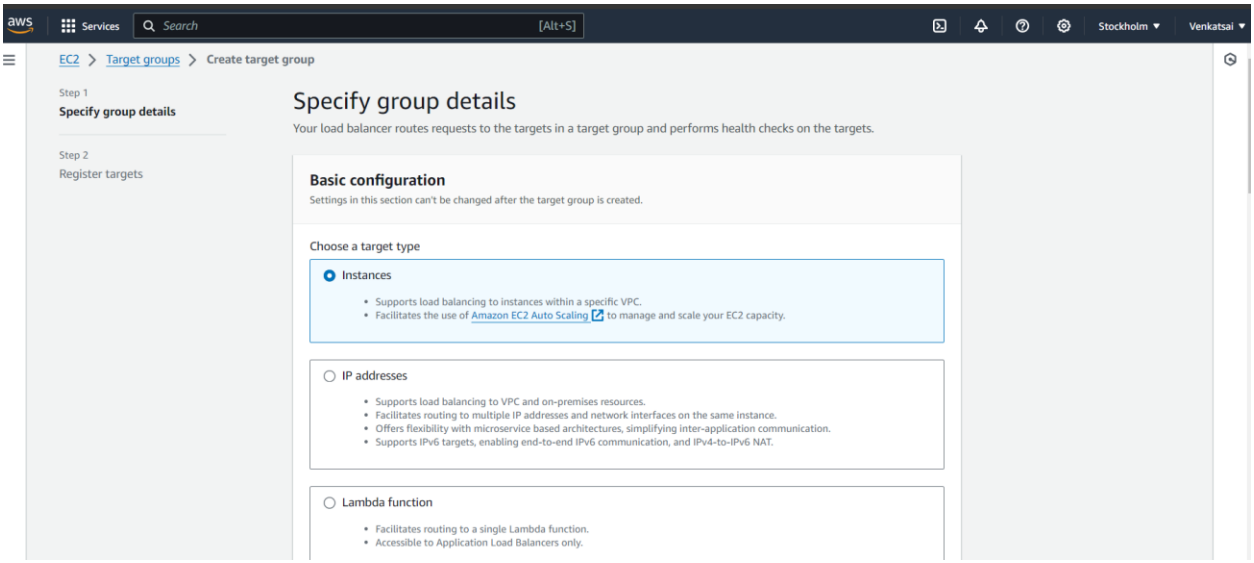
Now click on create autoscaling group.

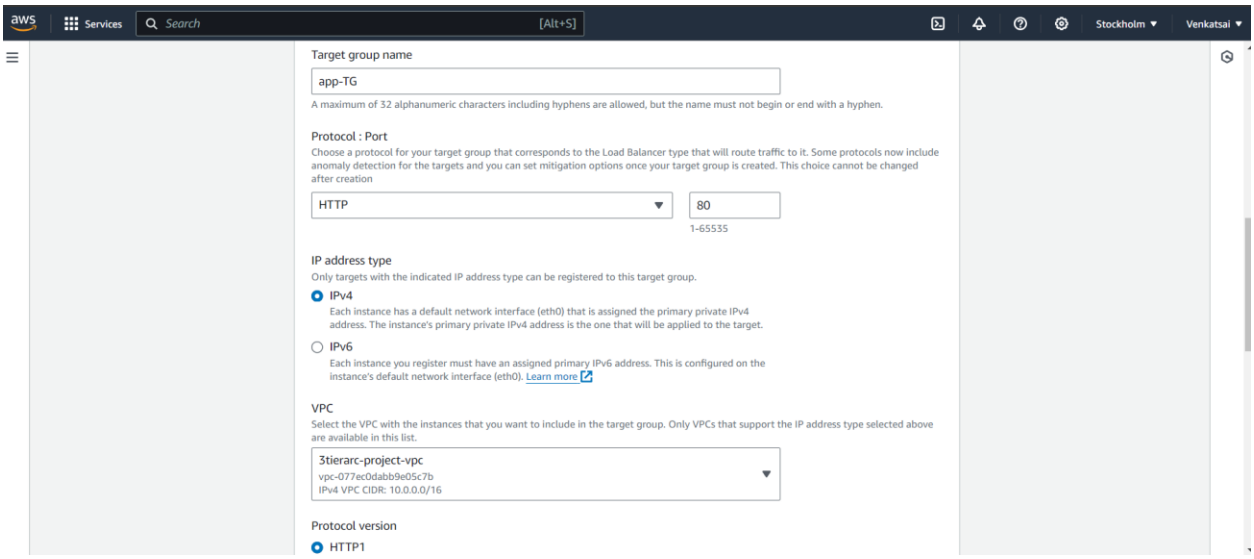
STEP 8: Create an instance for the app tier through which we can connect. And select the network settings to the VPC we created earlier and also select the private subnet.

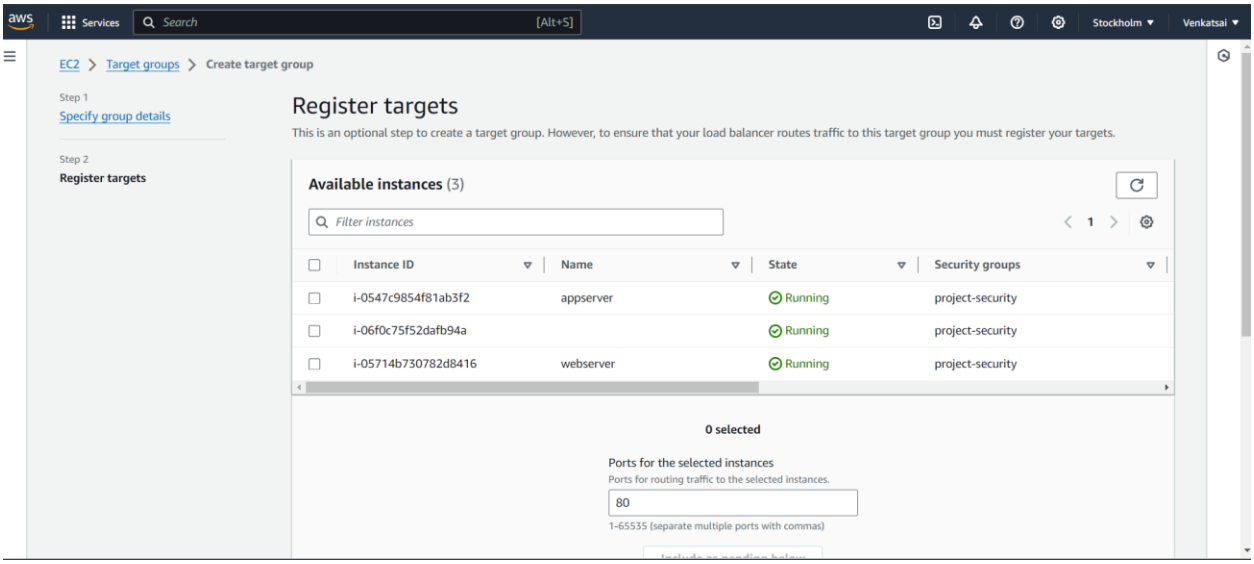




STEP 9: Now create a target group to target instance and connect to the load balancers to distribute the traffic.

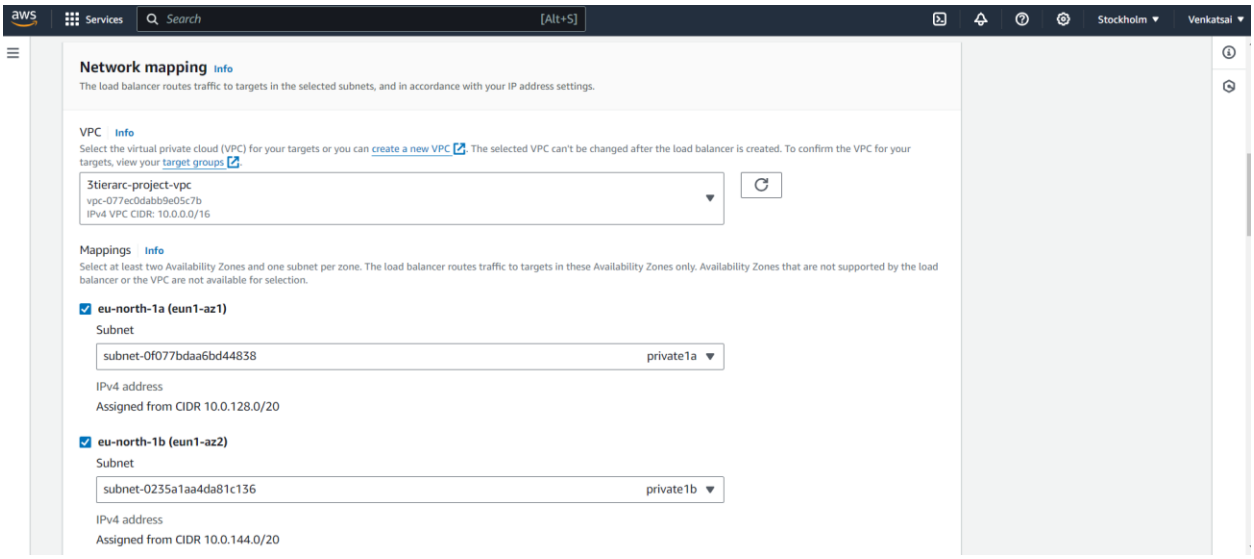




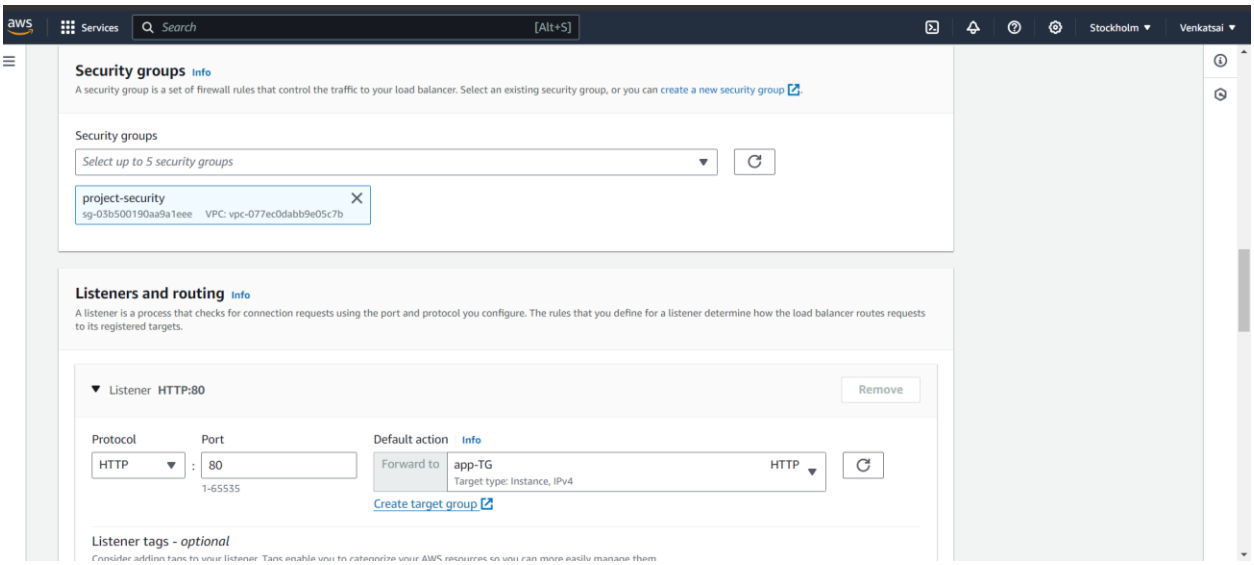


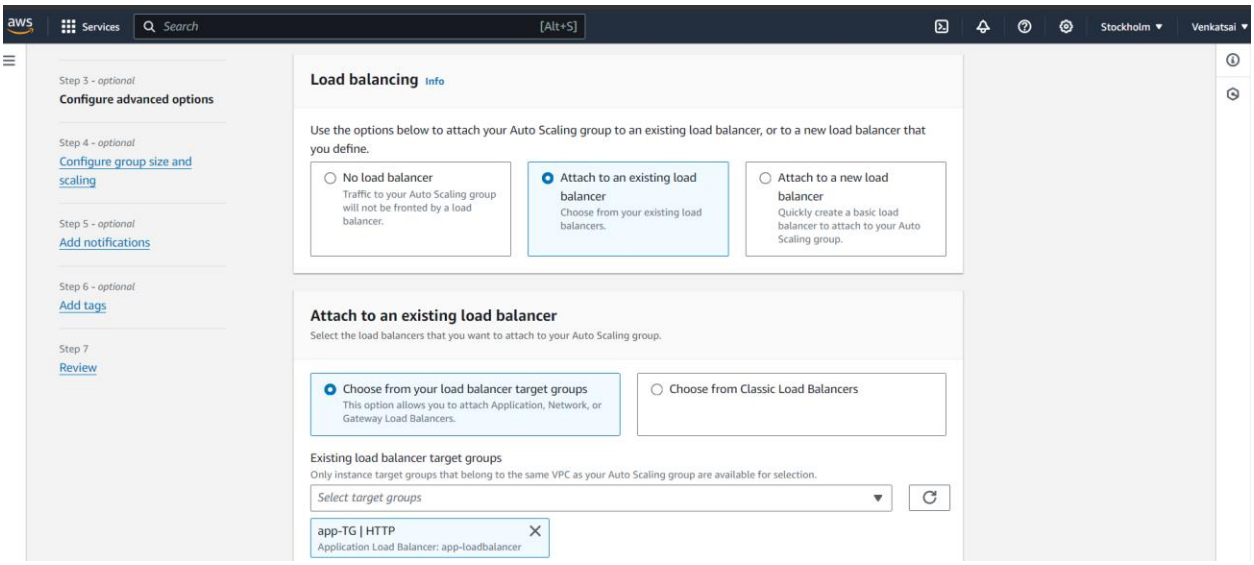
Here check the instance created for the app-tier.

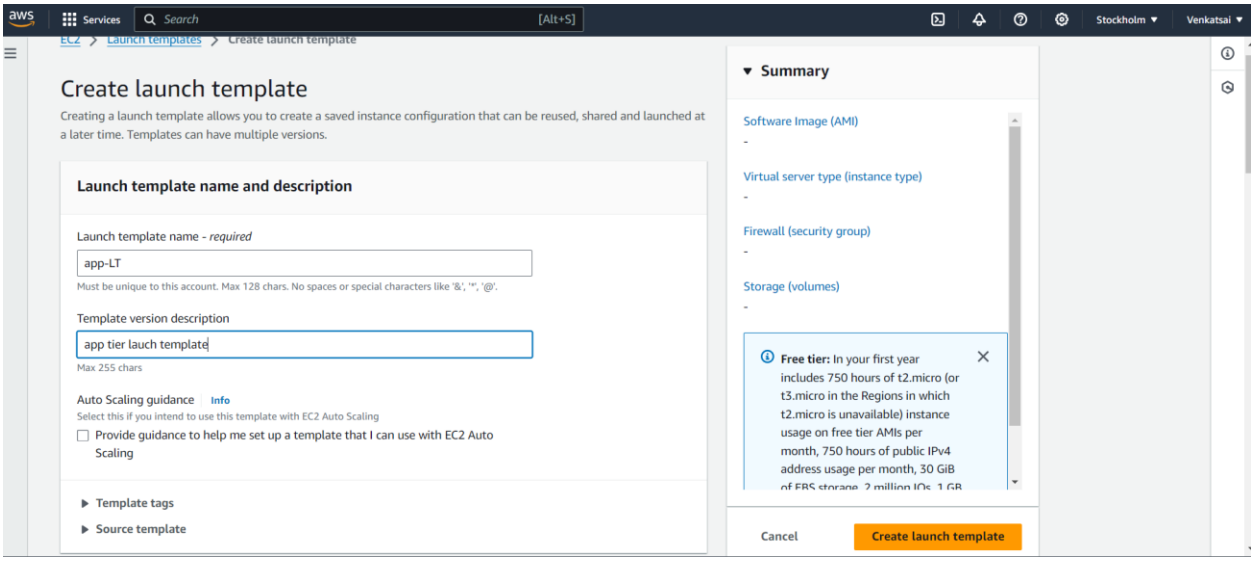
In the network mapping select the vpc and and the two private subnets from 2 regions 2a and 2b.



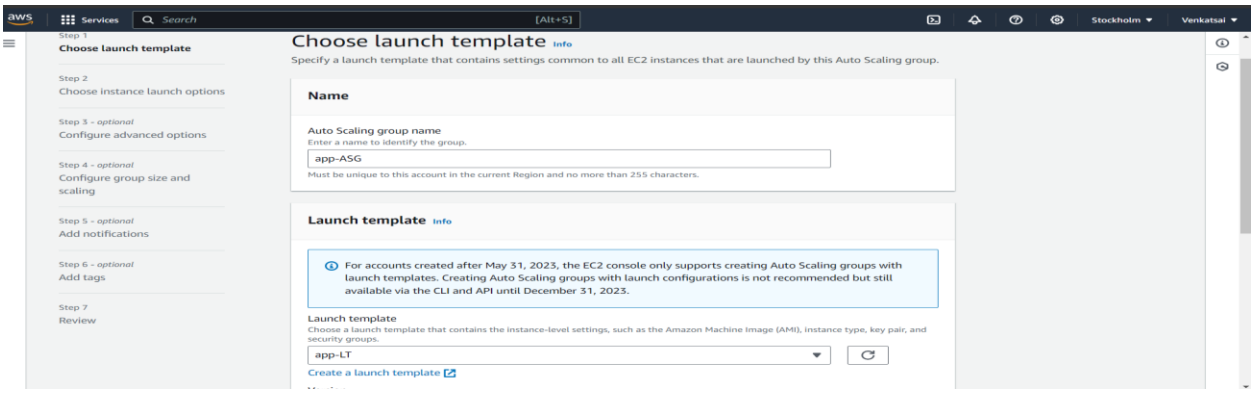
Select the security group and target group created for this project and app tier respectively.

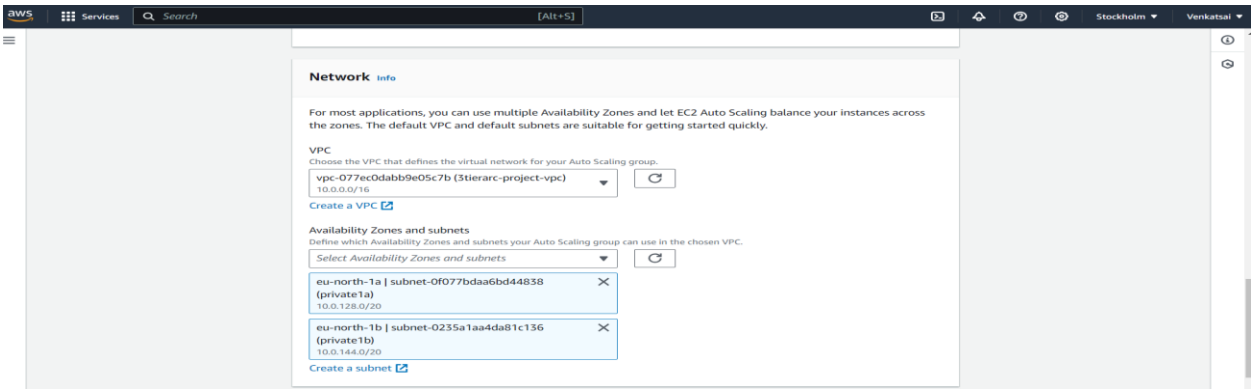


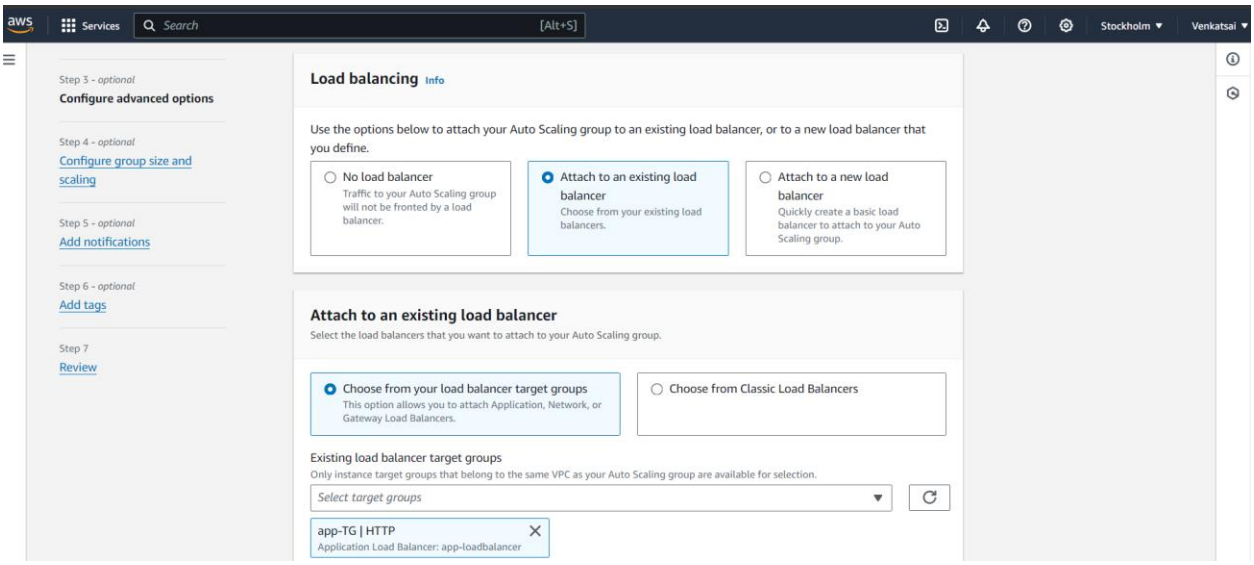


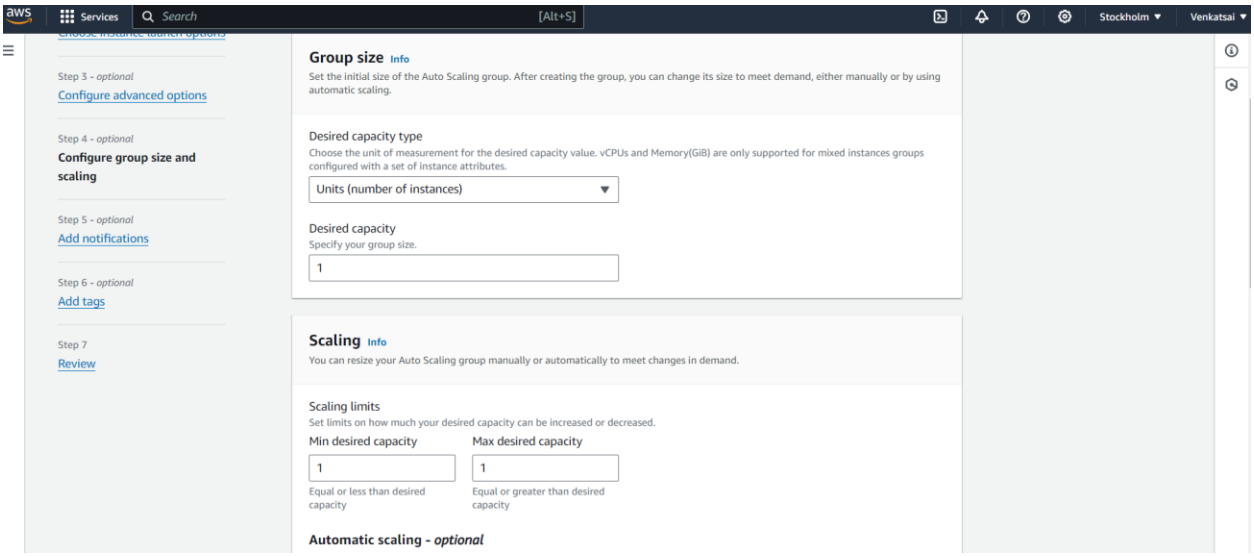


STEP 10: Now we have to create an auto-scaling group which is used to maintain the traffic in the servers without crashing the servers. This increases or decreases the no.of servers depending on the usage of the cpu percentage of the server.


aws
Services
Search
[Alt+S]
Stockholm
Venkatsai
Step 1
Choose launch template
Step 2
Choose instance launch options
Step 3 - optional
Configure advanced options
Step 4 - optional
Configure group size and scaling
Step 5 - optional
Add notifications
Step 6 - optional
Add tags
Step 7
Review
Choose launch template Info
Specify a launch template that contains settings common to all EC2 instances that are launched by this Auto Scaling group.
Name
Auto Scaling group name
Enter a name to identify the group.
app-ASG
Must be unique to this account in the current Region and no more than 255 characters.
Launch template Info
For accounts created after May 31, 2023, the EC2 console only supports creating Auto Scaling groups with launch templates. Creating Auto Scaling groups with launch configurations is not recommended but still available via the CLI and API until December 31, 2023.
Launch template
Choose a launch template that contains the instance-level settings, such as the Amazon Machine Image (AMI), instance type, key pair, and security groups.
app-LT
Create a launch template

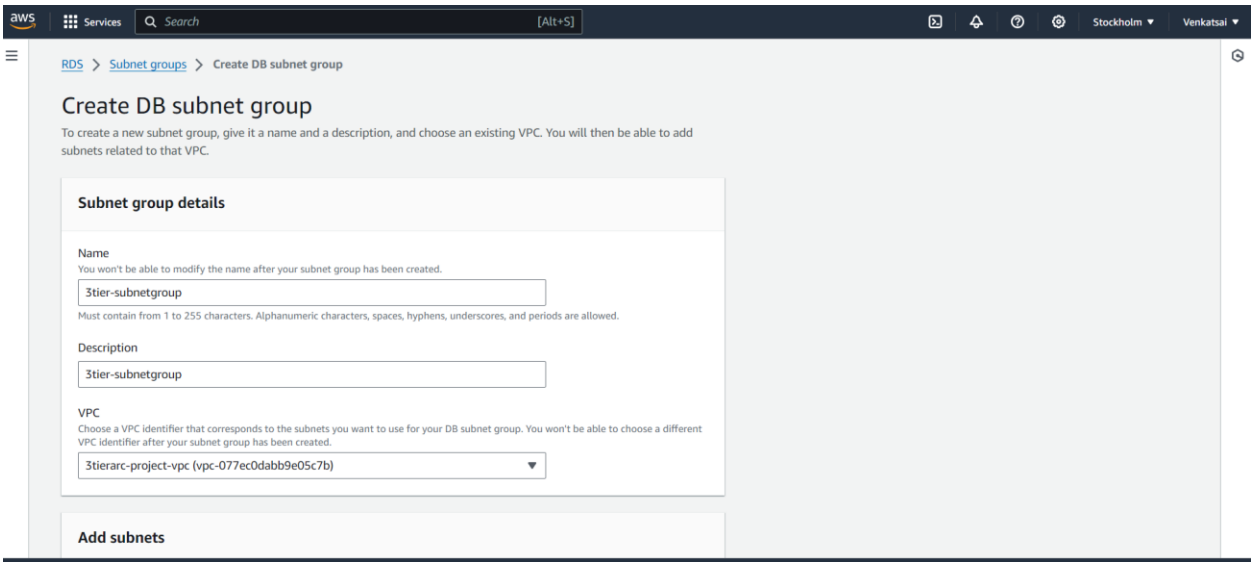

aws
Services
Search
[Alt+S]
Stockholm
Venkatsai
Network Info
For most applications, you can use multiple Availability Zones and let EC2 Auto Scaling balance your instances across the zones. The default VPC and default subnets are suitable for getting started quickly.
VPC
Choose the VPC that defines the virtual network for your Auto Scaling group.
vpc-077ec0dabb9e05c7b (3tierarc-project-vpc)
10.0.0.0/16
Create a VPC
Availability Zones and subnets
Define which Availability Zones and subnets your Auto Scaling group can use in the chosen VPC.
Select Availability Zones and subnets
eu-north-1a | subnet-0f077bdaa6bd44838 (private1a)
10.0.128.0/20
eu-north-1b | subnet-0235a1aa4da81c136 (private1b)
10.0.144.0/20
Create a subnet

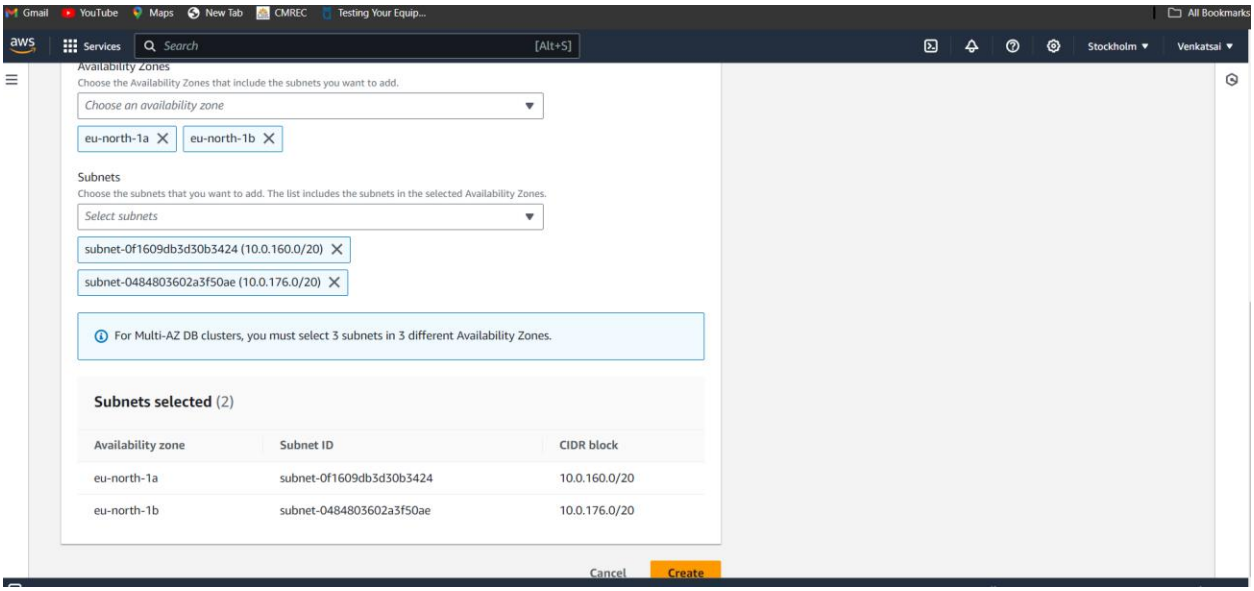

aws
Services
Search
[Alt+S]
Stockholm
Venkatsai
Step 3 - optional
Configure advanced options
Step 4 - optional
Configure group size and scaling
Step 5 - optional
Add notifications
Step 6 - optional
Add tags
Step 7
Review
Load balancing Info
Use the options below to attach your Auto Scaling group to an existing load balancer, or to a new load balancer that you define.
No load balancer
Traffic to your Auto Scaling group will not be fronted by a load balancer.
Attach to an existing load balancer
Choose from your existing load balancers.
Attach to a new load balancer
Quickly create a basic load balancer to attach to your Auto Scaling group.
Attach to an existing load balancer
Select the load balancers that you want to attach to your Auto Scaling group.
Choose from your load balancer target groups
This option allows you to attach Application, Network, or Gateway Load Balancers.
Choose from Classic Load Balancers
Existing load balancer target groups
Only instance target groups that belong to the same VPC as your Auto Scaling group are available for selection.
Select target groups
app-TG | HTTP
Application Load Balancer: app-loadbalancer



Now click create auto scaling group and the group is created.

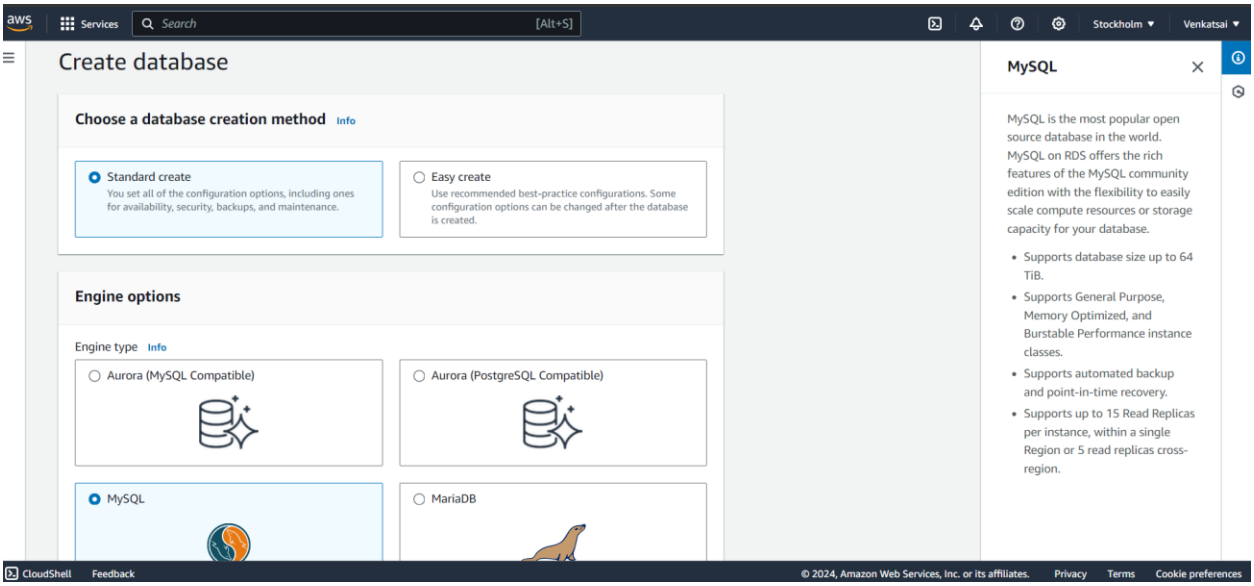
STEP 11: Now go to RDS services and create a subnet group and add the database subnets.

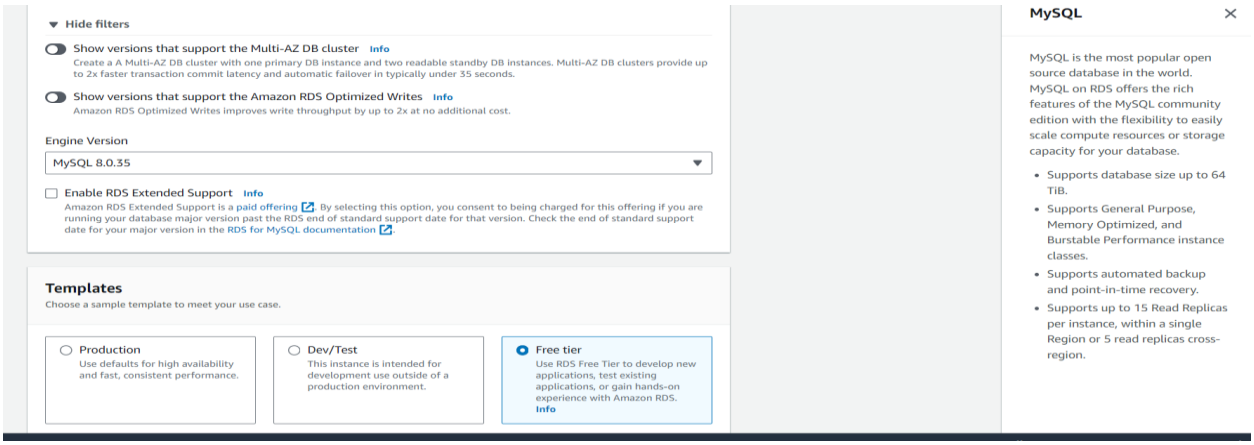


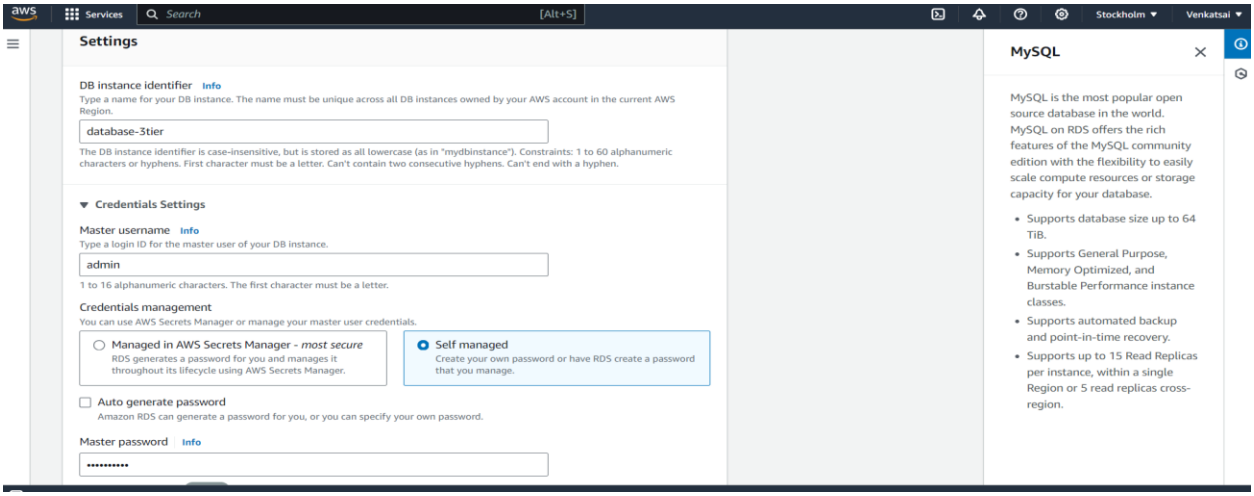


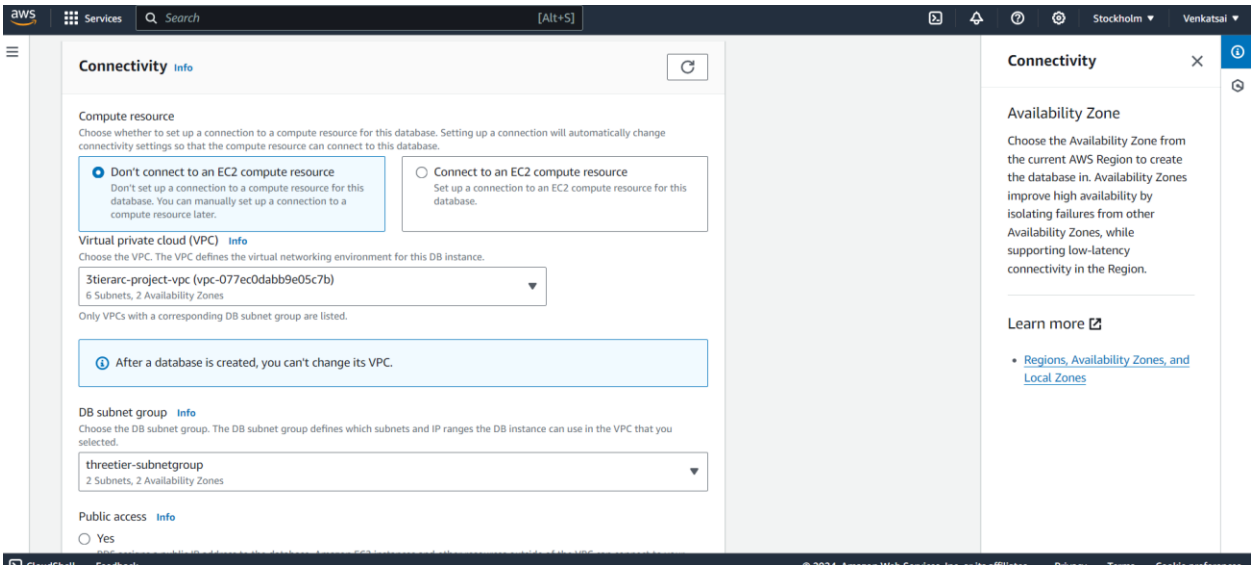
click on create.

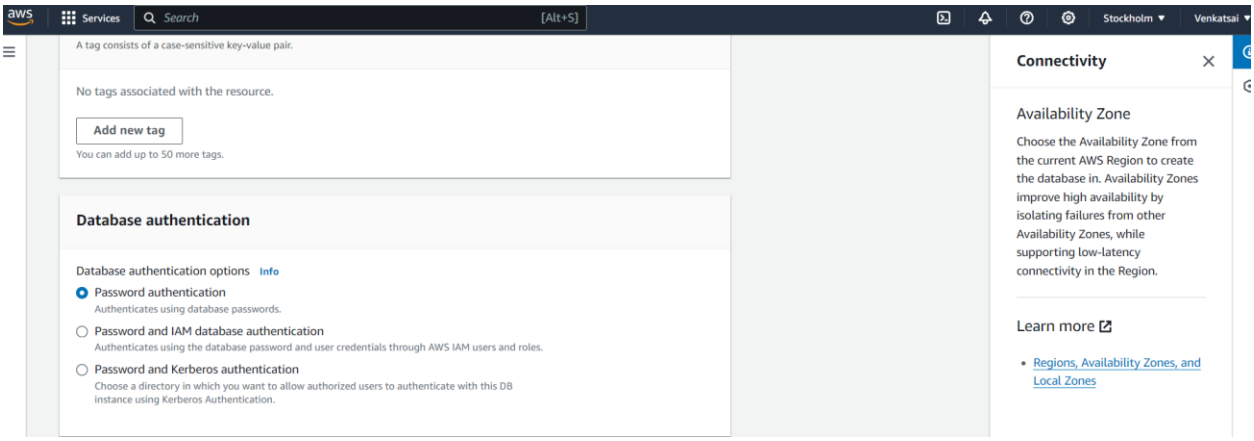
STEP 12: Now create a database and add the subnet group in the data base.




Hide filters
Show versions that support the Multi-AZ DB cluster Info
Create a A Multi-AZ DB cluster with one primary DB instance and two readable standby DB instances. Multi-AZ DB clusters provide up to 2x faster transaction commit latency and automatic failover in typically under 35 seconds.
Show versions that support the Amazon RDS Optimized Writes Info
Amazon RDS Optimized Writes improves write throughput by up to 2x at no additional cost.
Engine Version
MySQL 8.0.35
Enable RDS Extended Support Info
Amazon RDS Extended Support is a paid offering. By selecting this option, you consent to being charged for this offering if you are running your database major version past the RDS end of standard support date for that version. Check the end of standard support date for your major version in the RDS for MySQL documentation.
Templates
Choose a sample template to meet your use case.
Production
Use defaults for high availability and fast, consistent performance.
Dev/Test
This instance is intended for development use outside of a production environment.
Free tier
Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS.
Info
MySQL
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Supports database size up to 64 TiB.
Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
Supports automated backup and point-in-time recovery.
Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.


Services
Search
[Alt+S]
Stockholm
Venkatsai
Settings
DB instance identifier Info
Type a name for your DB instance. The name must be unique across all DB instances owned by your AWS account in the current AWS Region.
database-3tier
The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.
Credentials Settings
Master username Info
Type a login ID for the master user of your DB instance.
admin
1 to 16 alphanumeric characters. The first character must be a letter.
Credentials management
You can use AWS Secrets Manager or manage your master user credentials.
Managed in AWS Secrets Manager - most secure
RDS generates a password for you and manages it throughout its lifecycle using AWS Secrets Manager.
Self managed
Create your own password or have RDS create a password that you manage.
Auto generate password
Amazon RDS can generate a password for you, or you can specify your own password.
Master password Info
MySQL
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Supports database size up to 64 TiB.
Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
Supports automated backup and point-in-time recovery.
Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.


Services
Search
[Alt+S]
Stockholm
Venkatsai
Connectivity Info
Compute resource
Choose whether to set up a connection to a compute resource for this database. Setting up a connection will automatically change connectivity settings so that the compute resource can connect to this database.
Don't connect to an EC2 compute resource
Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.
Connect to an EC2 compute resource
Set up a connection to an EC2 compute resource for this database.
Virtual private cloud (VPC) Info
Choose the VPC. The VPC defines the virtual networking environment for this DB instance.
3tierarc-project-vpc (vpc-077ec0dabb9e05c7b)
6 Subnets, 2 Availability Zones
Only VPCs with a corresponding DB subnet group are listed.
After a database is created, you can't change its VPC.
DB subnet group Info
Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB instance can use in the VPC that you selected.
threetier-subnetgroup
2 Subnets, 2 Availability Zones
Public access Info
Yes
Connectivity
Availability Zone
Choose the Availability Zone from the current AWS Region to create the database in. Availability Zones improve high availability by isolating failures from other Availability Zones, while supporting low-latency connectivity in the Region.
Learn more
Regions, Availability Zones, and Local Zones



Now click on create database below.

STEP 13: CONNECTING DATABASE TO EC2 INSTANCE

- **Now go to the web server created in the ec2 instances.**
- **Connect the instance with ssh key in the git.**
- **Type sudo –i to become the root user.**
- **Install the my sql server using the command - sudo apt install mysql-server**

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
root@ip-10-0-7-222:~# sudo systemctl start mysql.service
root@ip-10-0-7-222:~# mysql -h database-3tier.cfkk2smc6j8d.eu-north-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 27
Server version: 8.0.35 Source distribution

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.00 sec)

mysql>
```

THE DATABSES AVAILABLE ARE SHOWN IN THE INSTANCE.