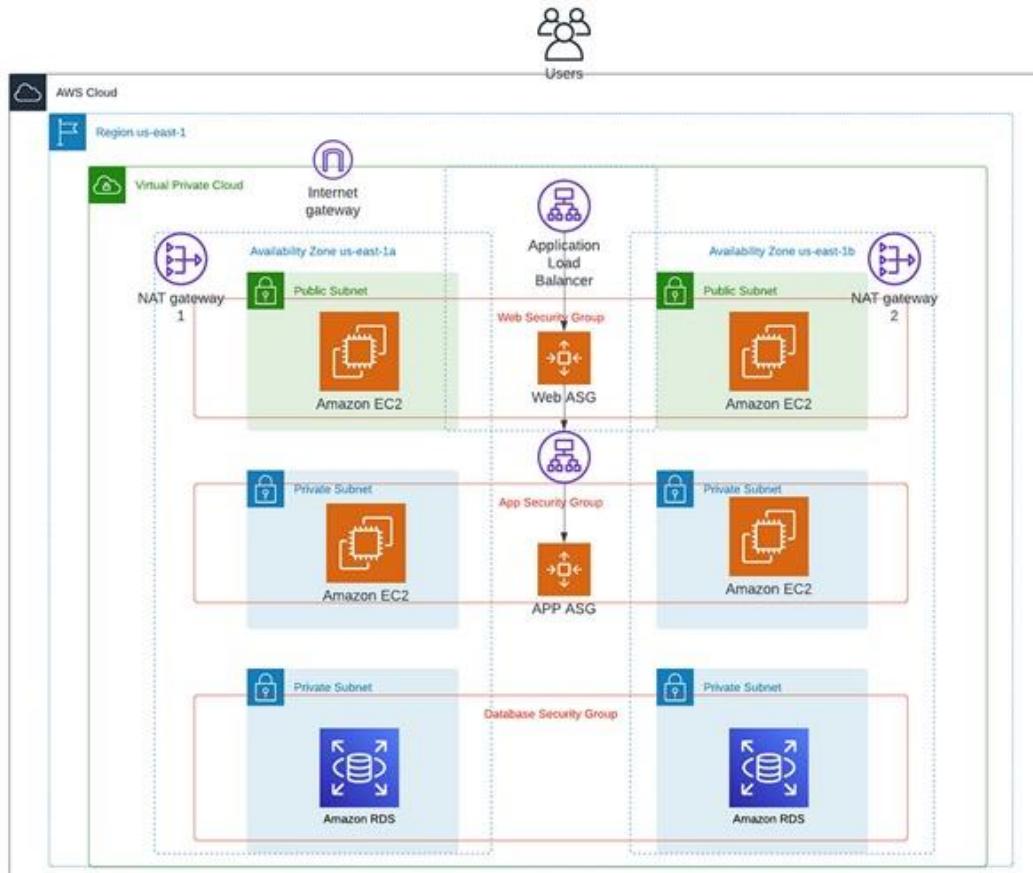


Creating a Highly Available 3-Tier Architecture for Web Applications in AWS

ARCHITECTURE :



AWS provides a wide range of resources for developing and managing cloud applications, which can be customized to construct highly dependable and resilient cloud infrastructures. Suppose you are tasked with developing a three-tier architecture that is readily available for your organization's new web application. This tutorial is extensive but comprehensive. You may want to bookmark this guide for future reference on creating web, application, and data tiers.

What is a 3-Tier Architecture?

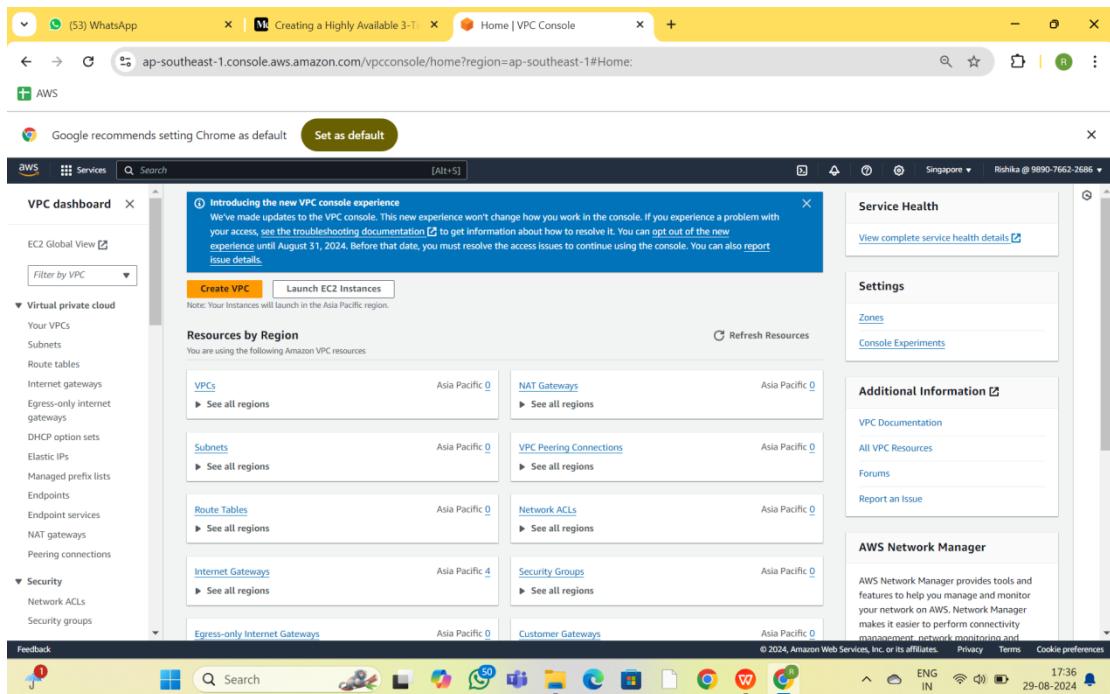
A three-tier architecture comprises three layers, namely the presentation tier, the application tier, and the data tier. The presentation tier serves as the front-end, hosting the user interface, such as the website that users or clients interact with. The application tier, commonly referred to as the back-end, processes the data. Finally, the data tier is responsible for data storage and management.

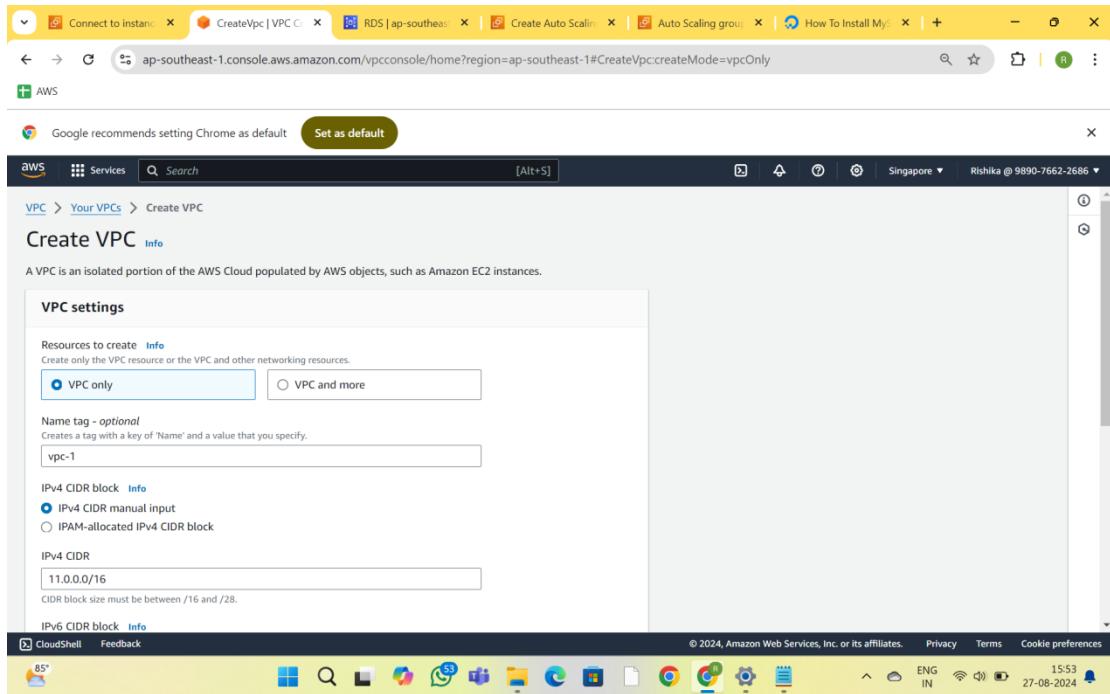
Benefits of a 3 Tier Architecture

1. Scalability: Each tier can scale independently, allowing organizations to optimize their resources and minimize costs.
2. Reliability: Each tier can be replicated across multiple servers, improving application availability and reliability.
3. Performance: By dividing the application into separate layers, 3-tier architecture reduces network traffic and enhances application performance.
4. Security: Each tier can have its own security group, allowing different organizations to implement customized security measures for each layer.

Creating a VPC ap- Southeast:

1. login to the AWS account & select VIRGINIA region & do search for VPC in the search box.
2. click on create VPC
3. select VPC only & give name & give IPv4 CIDR and then
4. click on create VPC.

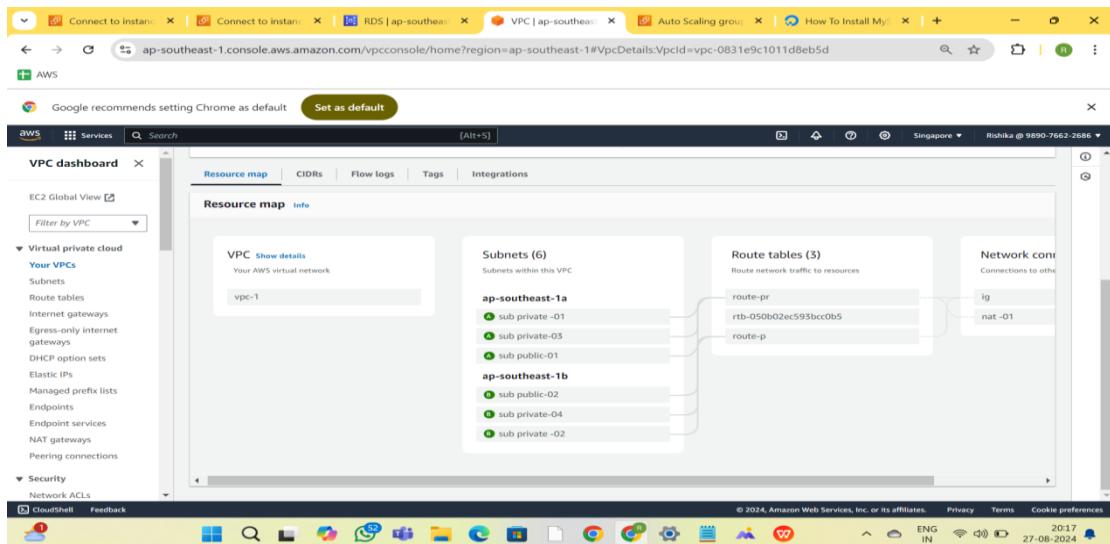




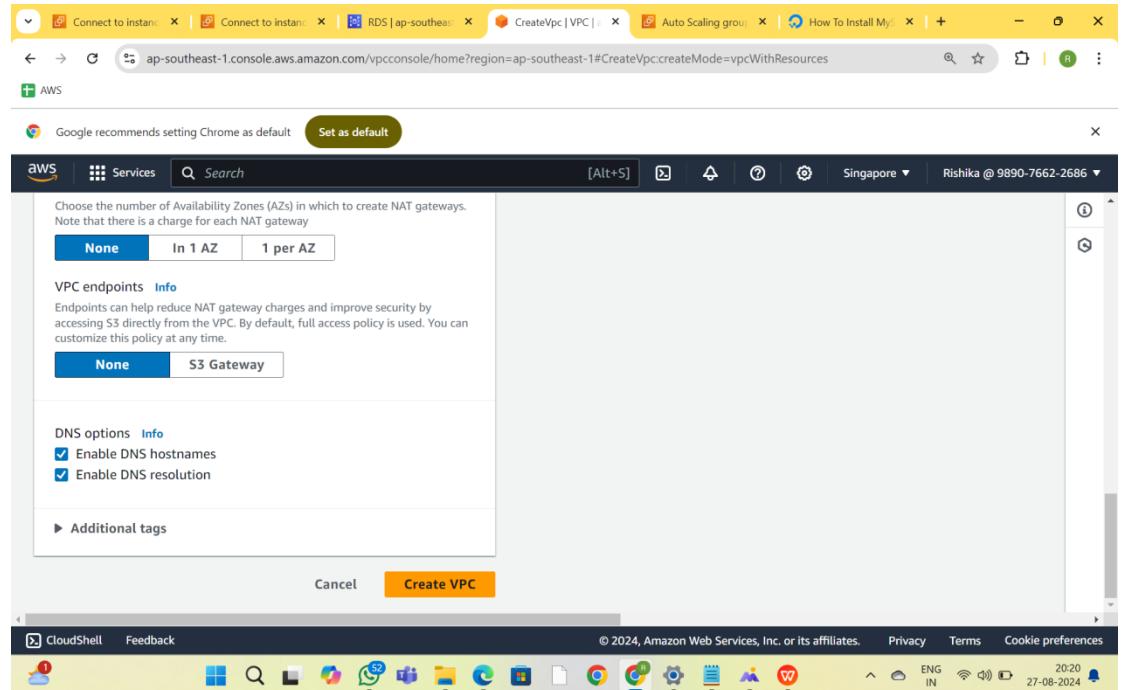
Before we create the VPC expand the customize AZ's and customize subnets CIDR blocks tabs.

- Click the “Create VPC” button.

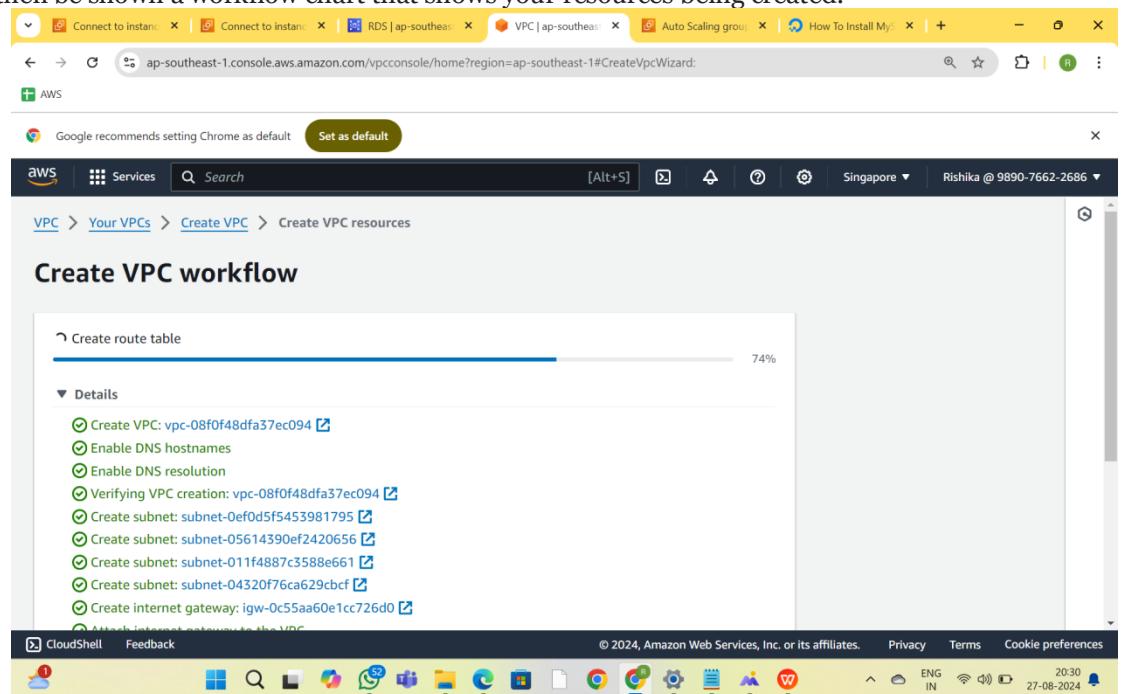
The diagram below highlights the route that your new VPC will take.



-Select VPC Button

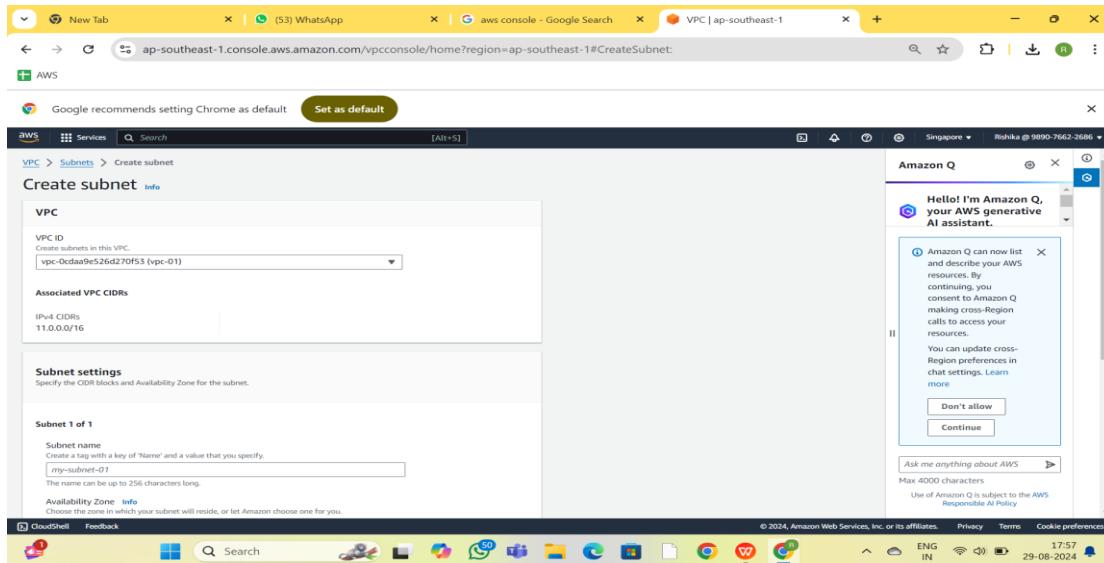
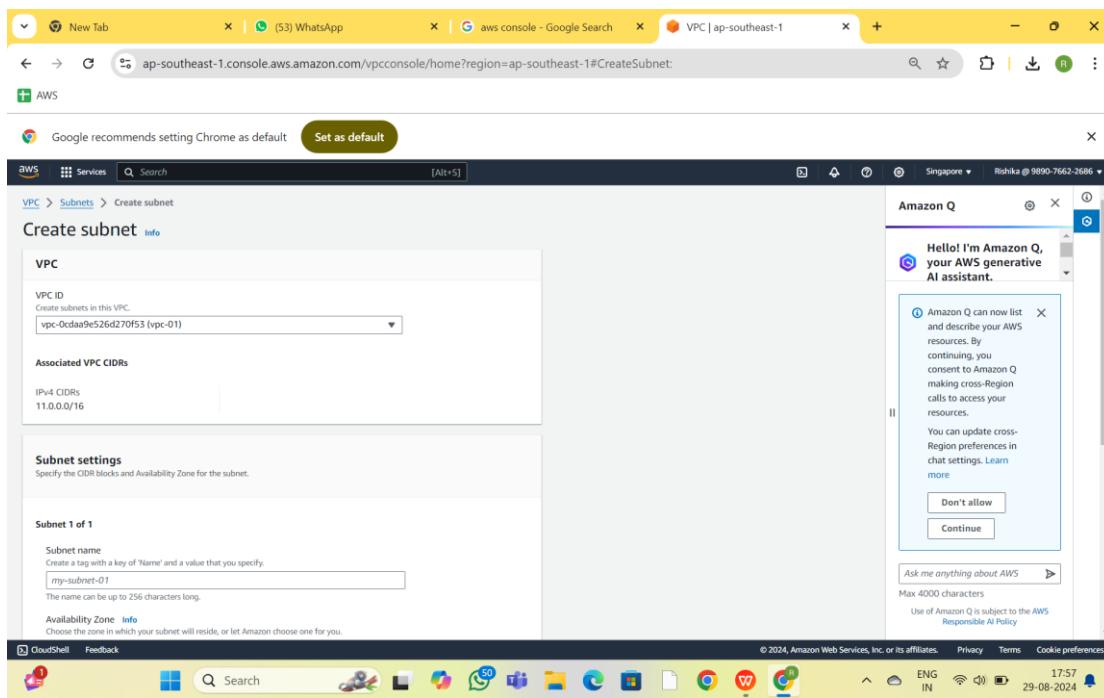


then be shown a workflow chart that shows your resources being created.



Create SUBNETS (2- Public & 4 - Private):

1. Click on SUBNETS & Click on create subnet & Choose VPC ID (Own not Default)
2. give subnet name & select availability zone (2a or 2b) & give IPv4 subnet CIDR BLOCK
3. click on create subnet.
4. like that create 6 subnets – 2 public subnets in 2a & 2b zone and 4 private subnets –
take 2 private subnets in 2a & remaining 2 private subnets in 2b zone. some snapshots of subnets are added below.



VPC dashboard

Subnets (1/6) Info

Name	Subnet ID	State	VPC
sub private -02	subnet-099e28b989b9e64b6	Available	vpc-0831e9
sub public-01	subnet-0fa5b01b8ac32af8	Available	vpc-0831e9
sub private-04	subnet-0d739db4c4789156de	Available	vpc-0831e9
sub private-03	subnet-0d3da9f37261965a9	Available	vpc-0831e9
sub private -01	subnet-0ec756e08a0c1278d	Available	vpc-0831e9
sub public-02	subnet-086330560441e590e	Available	vpc-0831e9

Actions ▾ **Create subnet**

Details Flow logs Route table Network ACL CIDR reservations Sharing Tags

Details

Subnet ID: subnet-0ec756e08a0c1278d Subnet ARN: arn:aws:ec2:ap-southeast-1:989076622686:subnet/subnet-0ec756e08a0c1278d State: Available IPv4 CIDR: 11.0.2.0/24 Available IPv4 addresses: IPv6 CIDR association ID: Availability Zone:

Create INTERNET GATEWAY:

- 1.click on internet gateway &create internet gateway.
2. after the creation of internet gateway ,click on actions and attach it to VPC

New Tab (53) What's App aws console - Google Search VPC | ap-southeast-1

Create internet gateway

Internet gateway settings

Name tag

Creates a tag with a key of 'Name' and a value that you specify.

ig

Tags - optional

A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

Key: Name Value: optional ig Remove Add new tag You can add up to 49 more tags.

Create internet gateway

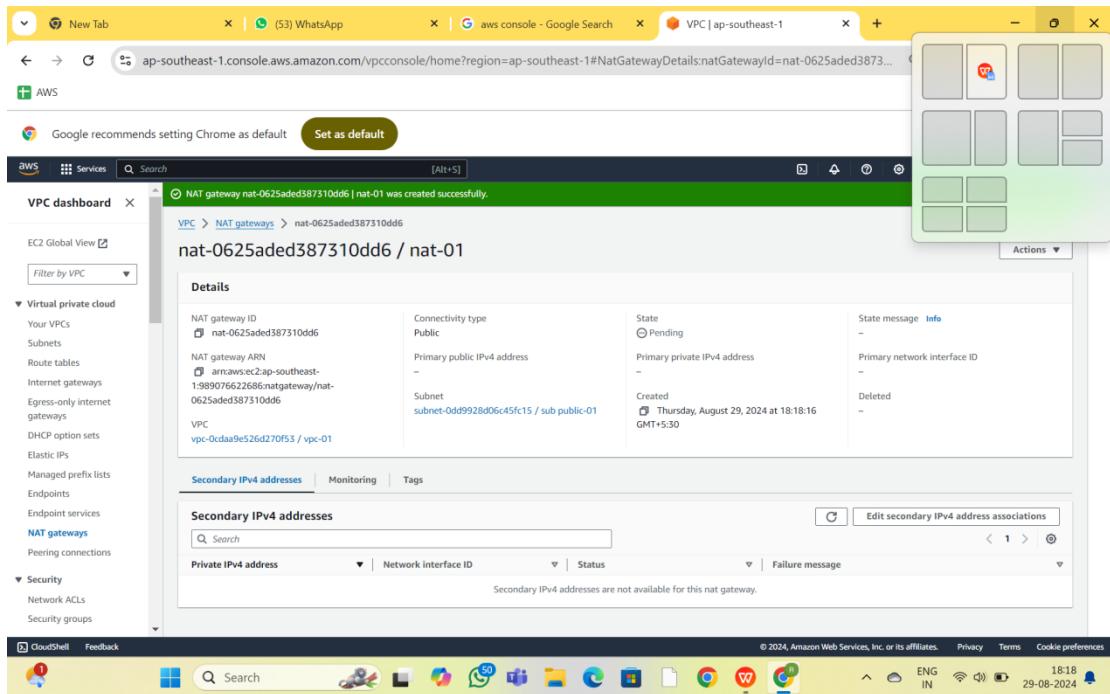
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The screenshot shows the AWS VPC dashboard. A green banner at the top indicates that an internet gateway has been created. The main table displays one item: 'igw-0ff8e195ed817a512 - ig'. The 'Details' tab is selected, showing the Internet gateway ID as 'igw-0ff8e195ed817a512', state as 'Detached', and owner as '989076622686'. A 'Tags' section shows a single tag named 'ig'. On the left sidebar, under 'Virtual private cloud', 'Internet gateways' is selected. The bottom status bar shows the date as 29-08-2024 and the time as 18:12.

Create NATGATEWAY:

- 1.click on Nat gateway & click on create.
- 2.select PRIVATE SUBNET & choose connec
- 3.Click on create NAT GATEWAY.

The screenshot shows the 'CreateNatGateway' wizard. Step 1: 'Elastic IP address 13.250.175.232 (elipalloc-016e88d798a75ebf3) allocated.' Step 2: 'Select a subnet in which to create the NAT gateway.' Subnet 'subnet-0dd9928d06c45fc15 (sub public-01)' is selected. Step 3: 'Select a connectivity type for the NAT gateway.' 'Public' is selected. Step 4: 'Assign an Elastic IP address to the NAT gateway.' 'elipalloc-016e88d798a75ebf3' is selected. Step 5: 'Additional settings' (Info). Step 6: 'Tags' (Info). A tag 'Name' with value 'nat-01' is added. Step 7: 'Create NAT gateway' button. The bottom status bar shows the date as 29-08-2024 and the time as 18:17.



>Create ROUTE TABLES:

- we have to create route tables – one is public & another is private, goto route table – click on create route- select VPC & create route table.
- 1.we have to create 2 route tables – one is public & another is private.
- 2.goto route table – click on create route- select VPC & create route table
- 3. click on route- actions-edit subnet associations-select public subnets-save associations
- 4. create another route table as PRIVATE.
- 5.Select VPC – do edit subnet associations-select 4 private subnets-save associations.
- 6.click on public route table – edit routes – add rules- a changes.
- 7. for private route table – attach internet gateway -save changes
- 8. Now go to the subnets - click on public subnet -01, click on ac – ENABLE Auto assign public IPv4 address,Do the same for remaining subnets also.

The screenshot shows the 'Create route table' page in the AWS VPC console. The URL is ap-southeast-1.console.aws.amazon.com/vpcconsole/home?region=ap-southeast-1#CreateRouteTable. The page title is 'VPC | ap-southeast-1'. The main content area is titled 'Create route table' with a 'Route table settings' section. It includes fields for 'Name - optional' (containing 'route-pr') and 'VPC' (containing 'vpc-0cdaa9e526d270f53 (vpc-01)'). Below these are 'Tags' and 'Route table settings' sections, both of which include a 'Key' field with 'Name' and a 'Value' field with 'route-pr'. A 'Create route table' button is at the bottom right.

This screenshot is identical to the one above, showing the 'Create route table' page in the AWS VPC console. The URL, title, and all form fields (Name: 'route-pr', VPC: 'vpc-0cdaa9e526d270f53 (vpc-01)', Tags: 'Name: route-pr, Value: route-pr') are the same. The 'Create route table' button is visible at the bottom.

VPC | ap-southeast-1

ap-southeast-1.console.aws.amazon.com/vpcconsole/home?region=ap-southeast-1#EditSubnetSettings:SubnetId=subnet-086330360441e590e

AWS Services Search [Alt+S]

Singapore Rishika @ 9890-7662-2686

Subnet ID: subnet-086330360441e590e Name: sub public-02

Auto-assign IP settings

Enable AWS to automatically assign a public IPv4 or IPv6 address to a new primary network interface for an instance in this subnet.

Enable auto-assign public IPv4 address

Enable auto-assign customer-owned IPv4 address

Resource-based name (RBN) settings

Specify the hostname type for EC2 instances in this subnet and optional RBN DNS query settings.

Enable resource name DNS A record on launch

Enable resource name DNS AAAA record on launch

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ENG IN 10:25 27-08-2024

Create SECURITY GROUPS:

1. we have to create TWO security groups.
2. Goto security groups - click on create security groups- select VPC – add INBOUND (SSH & HTTP) & OUTBOUND RULES (All traffic) – click on create security groups.

New Tab aws console - Google Search CreateSecurityGroup | EC2 | ap-...

EC2 > Security Groups > Create security group

Create security group

A security group acts as a virtual firewall for your instance to control inbound and outbound traffic. To create a new security group, complete the fields below.

Basic details

Security group name [Info](#) sg-01

Name cannot be edited after creation.

Description [Info](#) access

VPC [Info](#) vpc-0cd9aa9e526d270f5 (vpc-01)

Inbound rules [Info](#)

This security group has no inbound rules.

Add rule

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ENG IN 19:02 29-08-2024

The screenshot shows the AWS VPC Security Groups configuration page. At the top, it says "This security group has no inbound rules." Below that is a "Add rule" button. The "Outbound rules" section shows two rules:

Type	Protocol	Port range	Destination	Description - optional
SSH	TCP	22	Any... 0.0.0.0/0	
HTTP	TCP	80	Custom 0.0.0.0/8	

Below the rules, a note says: "⚠️ Rules with destination of 0.0.0.0/0 or ::/0 allow your instances to send traffic to any IPv4 or IPv6 address. We recommend setting security group rules to be more restrictive and to only allow traffic from specific sources." A "CloudShell" feedback icon is also present.

The screenshot shows the AWS EC2 Security Groups list. It displays three security groups:

Name	Security group ID	Security group name	VPC ID	Description
-	sg-005479c4703feb896	Sg-01	vpc-0cdaa9e526d270f53	access
-	sg-0d1596cc0fc99bc0	Sg-02	vpc-0cdaa9e526d270f53	access
-	sg-06ef2f3274d669eca	default	vpc-0cdaa9e526d270f53	default VPC security group

A "Create security group" button is visible at the top right of the list.

□ NOW LAUNCH TWO TEMPLATES (Public & Private):

☒ PUBLIC TEMPLATE:

1. Search EC2 – Click on LAUNCH TEMPLATES – Click on CREATE LAUNCH TEMPLATES.
2. Select AMI – UBUNTU & instance type – t2.micro(1GB- Free Tier).
3. Select KEY PAIR – a new or existing.
4. In Network Settings, I have created for the security-group-1(my-sg-01) is selected.

- Snapshots of Public Template are as below.

Screenshot of the AWS Cloud Console showing the EC2 Launch Templates page and the Create launch template wizard.

The top navigation bar shows tabs for "New Tab", "aws console - Google Search", and "Launch templates | EC2 | ap-southeast-1". The URL in the address bar is "ap-southeast-1.console.aws.amazon.com/ec2/home?region=ap-southeast-1#LaunchTemplates".

The left sidebar menu includes:

- Instances
- Launch Templates
- Spot Requests
- Savings Plans
- Reserved Instances
- Dedicated Hosts
- Capacity Reservations
- Images
- Elastic Block Store
- Network & Security
- Load Balancing
- Auto Scaling

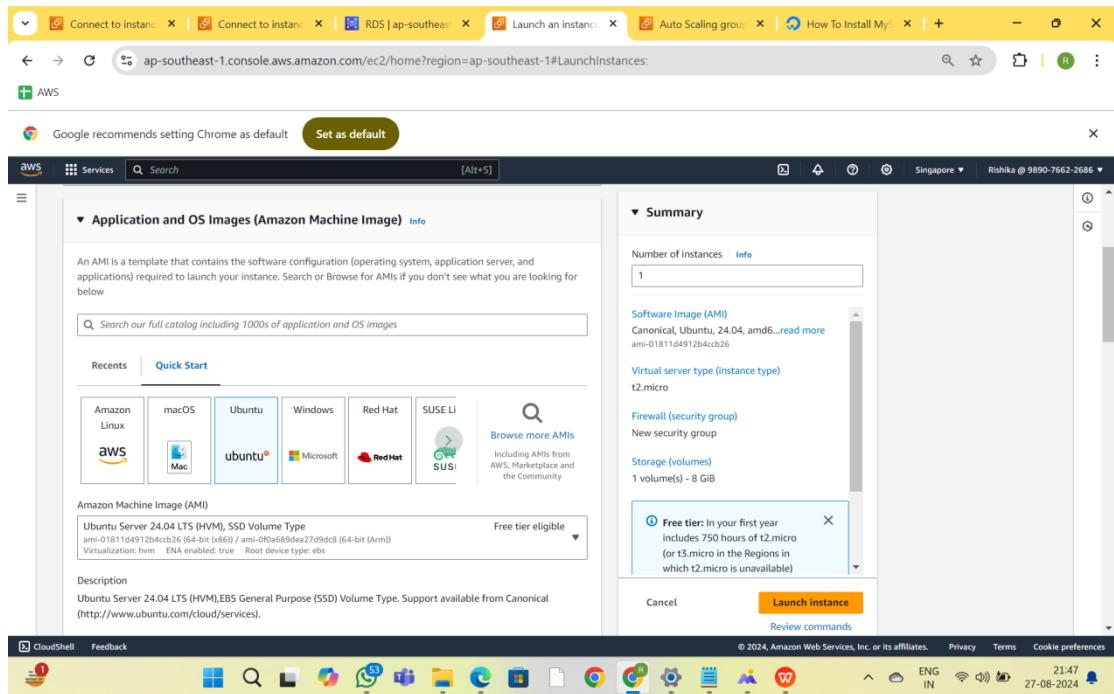
The main content area displays the "EC2 launch templates" page with the heading "Streamline, simplify and standardize instance launches". It highlights benefits like "Streamline provisioning" and "Simplify permissions". A call-to-action button "Create launch template" is visible.

The second screenshot shows the "Create launch template" wizard step. The title is "Create launch template". It asks for a "Launch template name and description" (set to "template-01") and a "Template version description" (set to "allow"). Under "Auto Scaling guidance", there is a checkbox "Select this if you intend to use this template with EC2 Auto Scaling" which is checked. Below the main form, there is a "Launch template contents" section.

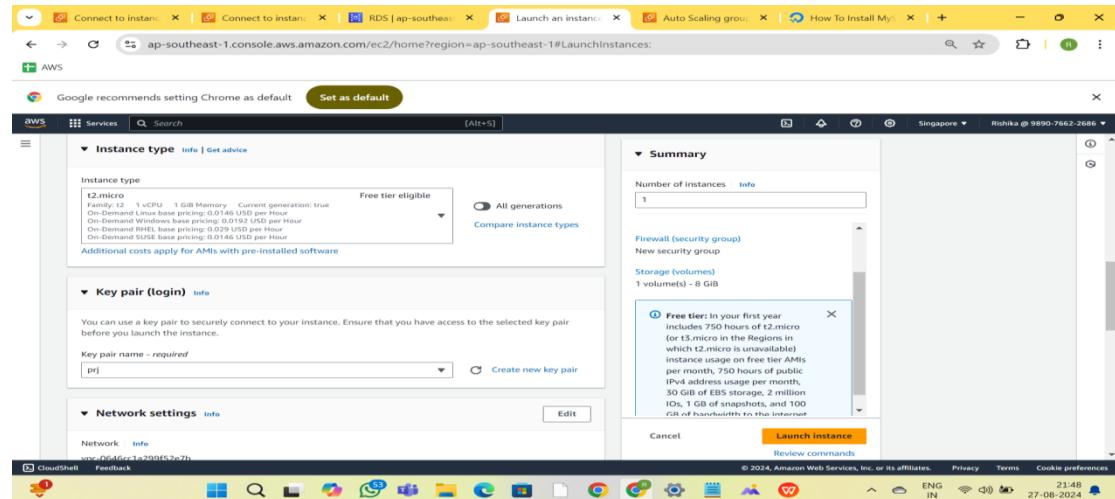
A modal window titled "Free tier" provides information about the free tier benefits:

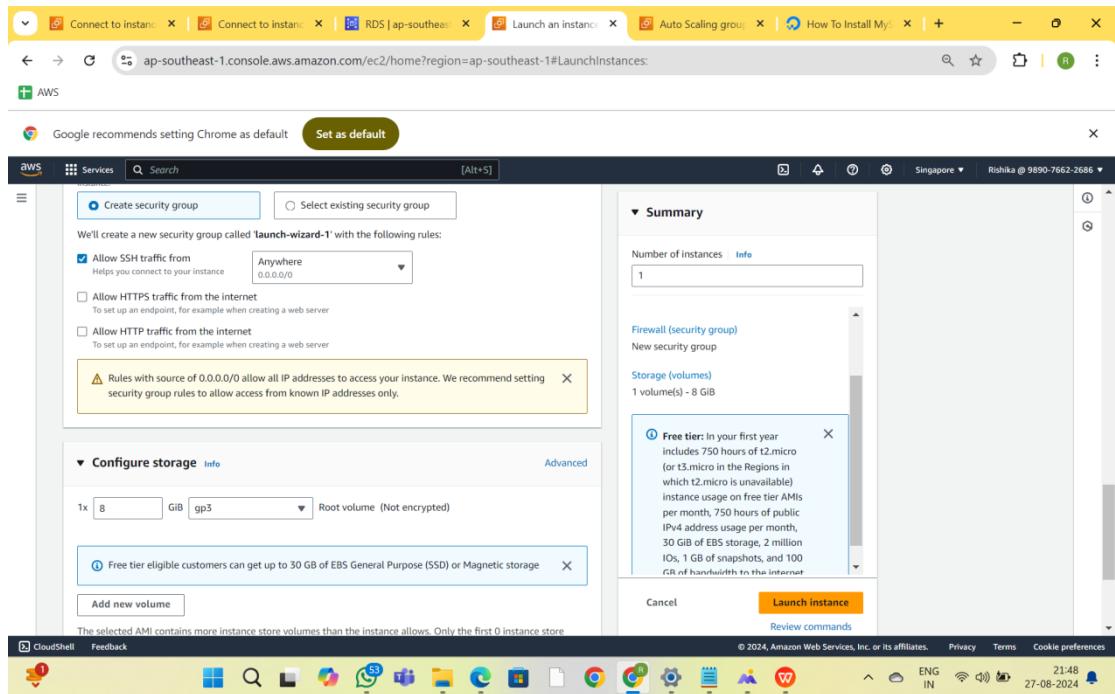
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 750 hours of public IPv4 address usage per month, 30 GiB of EBS storage, 2 million I/Os, 1 GB of snapshots, and 100 GB of bandwidth to the internet.

At the bottom right of the wizard, there are "Cancel" and "Create launch template" buttons.



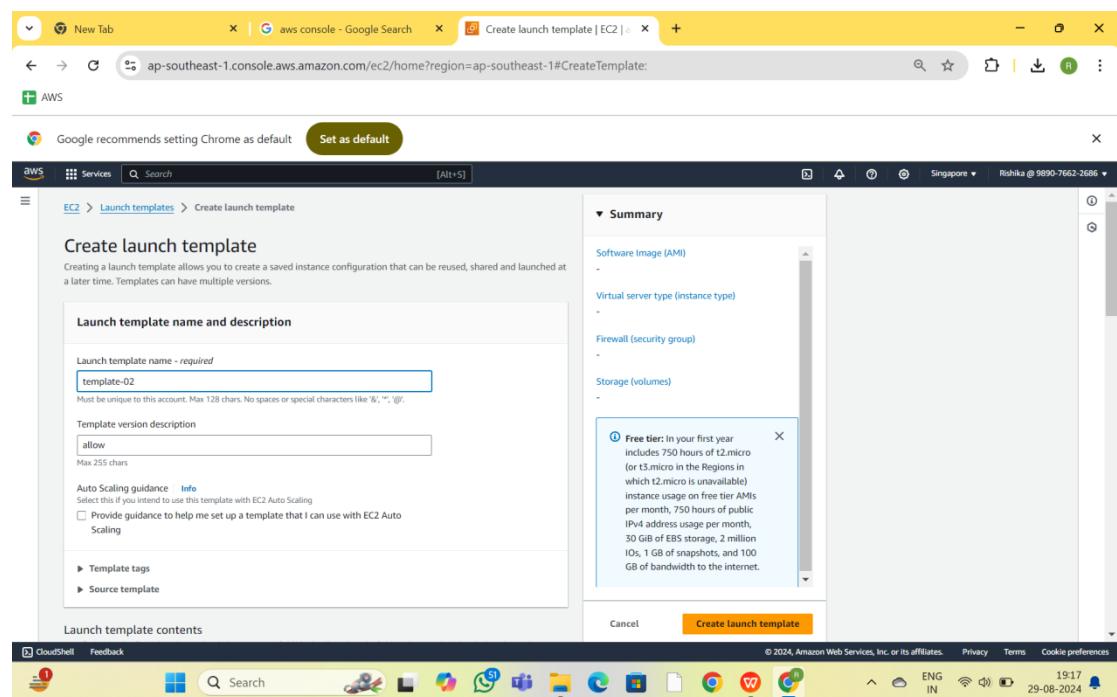
Select the key pair that you will use, and make sure to select your new VPC and the correct subnet. Auto-assign IP should be enabled.





Create PRIVATE TEMPLATE:

- 1.Create same as previous template, but at SECURITY GROUP select SECURITY GROUP -2 (my-sg-02).
- 2.Snapshots of PRIVATE TEMPLATE as attached.



The screenshot shows the AWS Cloud Console with the URL ap-southeast-1.console.aws.amazon.com/ec2/home?region=ap-southeast-1#LaunchInstances. The page is titled "Launch an instance" and displays the "Application and OS Images (Amazon Machine Image)" section. The user has selected the Canonical, Ubuntu 24.04 AMI. A tooltip for the "Free tier" is displayed, stating: "Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable)." The interface includes tabs for "Recent" and "Quick Start", and a search bar. The bottom navigation bar shows the date as 27-08-2024.

The screenshot shows the AWS Cloud Console with the URL ap-southeast-1.console.aws.amazon.com/ec2/home?region=ap-southeast-1#CreateTemplate. The page is titled "Create launch template" and displays the "Instance type" section. The user has selected the t2.micro instance type. A tooltip for the "Free tier" is displayed, stating: "Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 750 hours of public IPv4 address usage per month, 30 GiB of EBS storage, 2 million I/Os, 1 GB of snapshots, and 100". The interface includes tabs for "Currently in use" and "Advanced", and a search bar. The bottom navigation bar shows the date as 27-08-2024.

The screenshot shows the AWS EC2 Launch Templates page. The left sidebar includes options like Instances, Instance Types, Launch Templates, Images, Elastic Block Store, Network & Security, and Load Balancing. The main content area displays a table titled "Launch Templates (2) Info" with columns: Launch Template ID, Launch Template Name, Default Version, Latest Version, Create Time, and Created By. Two entries are listed:

Launch Template ID	Launch Template Name	Default Version	Latest Version	Create Time	Created By
lt-0575863956a272c27	template-01	1	1	2024-08-29T13:49:29.000Z	arn:aws:iam::989076622686:user/Rishika
lt-01c4dfdb406df10e1	template-02	1	1	2024-08-29T13:50:06.000Z	arn:aws:iam::989076622686:user/Rishika

A "Create launch template" button is located at the top right of the table. Below the table, a section titled "Select a launch template" is visible.

□ CREATE TWO AUTOSCALING GROUPS (Public & Private):

② PUBLIC ASG:

- 1.In EC2, go to autoscaling group – click on create autoscaling group.
- 2.give name to ASG – Select PUBLIC TEMPLATE (which is already created)
- 3.In network settings-choose VPC-choose 2 public subnets.
4. After that click on Next.
5. We have to attach Load balancer to ASG
- 6.Attach load balancer- choosing application load balancer-LB name should be same as ASG.
if you want to edit it you can edit the name.
- 7.select subnets – give PORT NO: 80 for HTTP – Select TARGET GROUP (new or existing).

Screenshot of the AWS CloudFormation console showing the "Create Auto Scaling group" wizard Step 3: Choose launch template or configuration.

Name
Auto Scaling group name:
Auto Scaling-01
Must be unique to this account in the current Region and no more than 255 characters.

Launch template
Choose a launch template that contains settings common to all EC2 instances that are launched by this Auto Scaling group. If you currently use launch configurations, you might consider migrating to launch templates.

Template-01

Description
Template-01
t2.micro

AMIs
ami-018116491204e026

Security groups
sg-0f8214a0c342975b

Key pair name
pk

Additional details
Storage (volume)
Date created: Tue Aug 27 2024 19:34:49 (IST +05:30 (India Standard Time))

Next

Screenshot of the AWS CloudFormation console showing the "Create Auto Scaling group" wizard Step 7: Review.

VPC
Choose the VPC that defines the virtual network for your Auto Scaling group.
vpc-0831e9c1011d8eb5d (vpc-1)
11.0.0.0/16

Create a VPC

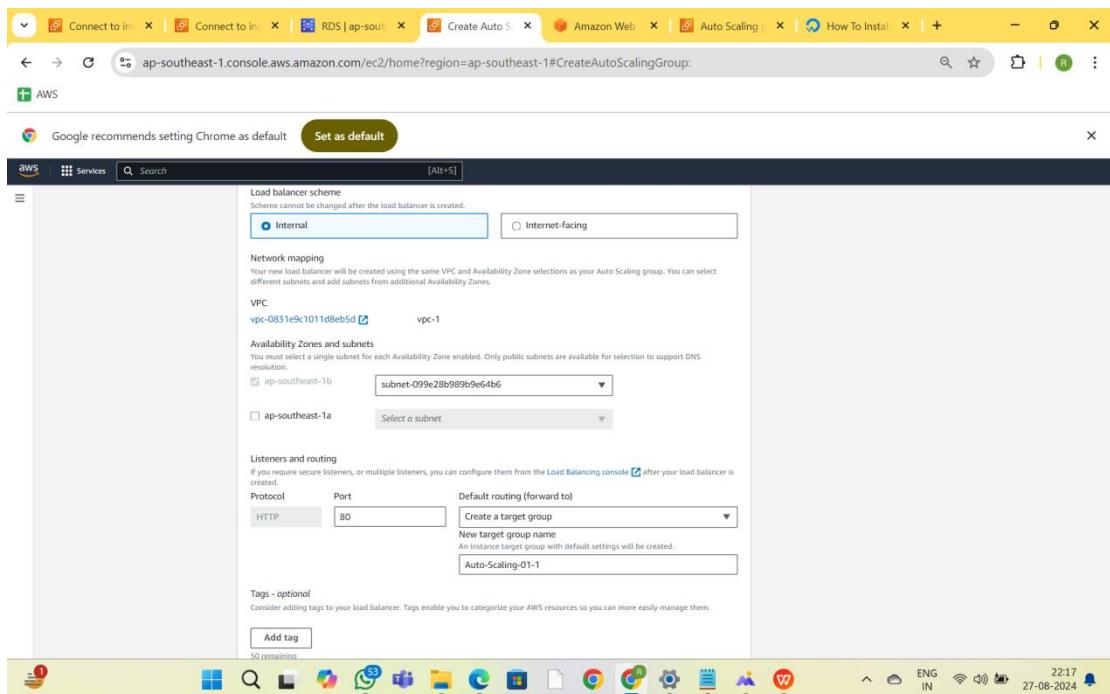
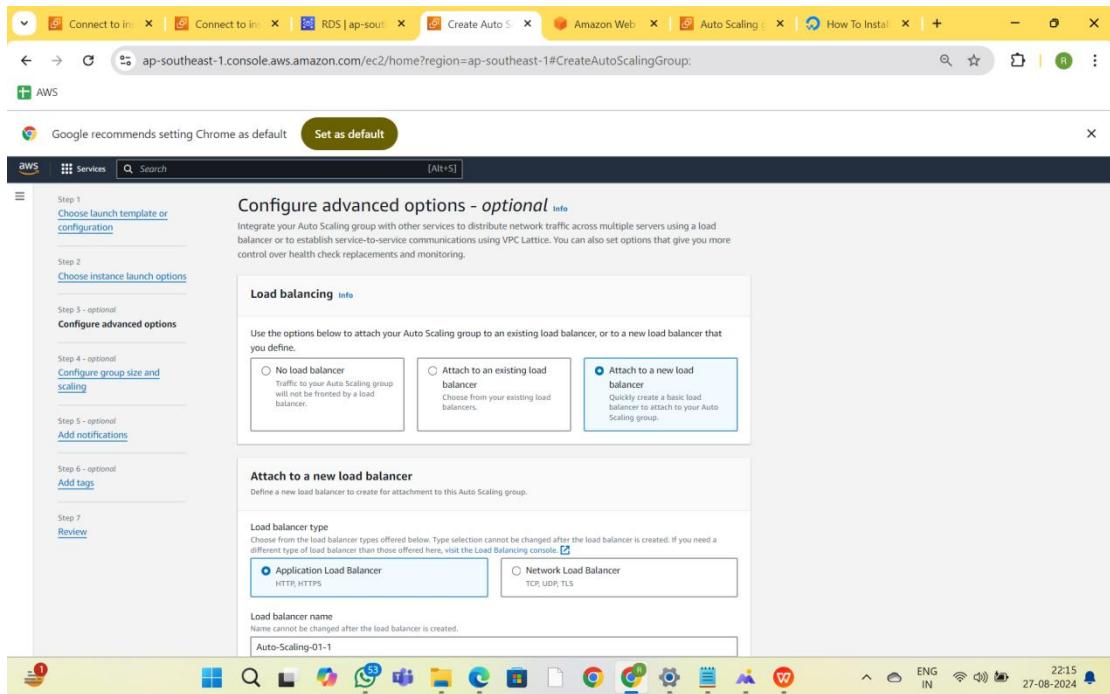
Availability Zones and subnets
Define which Availability Zones and subnets your Auto Scaling group can use in the chosen VPC.
Select Availability Zones and subnets

ap-southeast-1a | subnet-0f4a5b01b8ac32af8 (sub public-01)
11.0.0.0/24

ap-southeast-1b | subnet-086330360441e590e (sub public-02)
11.0.1.0/24

Create a subnet

Next



9. Select Group size

We want to set a minimum and maximum number of instances the ASG can provision:

Desired capacity: 2

Minimum capacity: 2

Maximum capacity: 5

10. After that, click on next-next-create auto scaling group.

communications between AWS services and helps you connect and manage your applications across compute services in AWS.

Select VPC Lattice service to attach

No VPC Lattice service
VPC Lattice will not manage your Auto Scaling group's network access and connectivity with other services.

Attach to VPC Lattice service
Incoming requests associated with specified VPC Lattice target groups will be routed to your Auto Scaling group.

Create new VPC Lattice service

Health checks

Health checks increase availability by replacing unhealthy instances. When you use multiple health checks, all are evaluated, and if at least one fails, instance replacement occurs.

EC2 health checks

Always enabled

Additional health check types - optional

Turn on Elastic Load Balancing health checks (Recommended)
Elastic Load Balancing monitors whether instances are available to handle requests. When it reports an unhealthy instance, EC2 Auto Scaling can replace it on its next periodic check.

Turn on VPC Lattice health checks
VPC Lattice can monitor whether instances are available to handle requests. If it considers a target as failed a health check, EC2 Auto Scaling replaces it on its next periodic check.

Turn on Amazon EBS health checks
EBS monitors whether an instance's root volume or attached volume stalls. When it reports an unhealthy volume, EC2 Auto Scaling can replace the instance on its next periodic health check.

Health check grace period [Info](#)
This time period delays the first health check until your instances finish initializing. It doesn't prevent an instance from terminating when placed into a non-running state.

50 [+/-](#) seconds

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](#)

Group size [Info](#)

Set the initial size of the Auto Scaling group. After creating the group, you can change its size to meet demand, either manually or by using automatic scaling.

Desired capacity type

Choose the unit of measurement for the desired capacity value. vCPUs and Memory(GiB) are only supported for mixed instances groups configured with a set of instance attributes.

Units (number of instances)

Desired capacity

Specify your group size.

4

Scaling [Info](#)

You can resize your Auto Scaling group manually or automatically to meet changes in demand.

Scaling limits

Set limits on how much your desired capacity can be increased or decreased.

Min desired capacity

1

Max desired capacity

5

Equal or less than desired capacity

Equal or greater than desired capacity

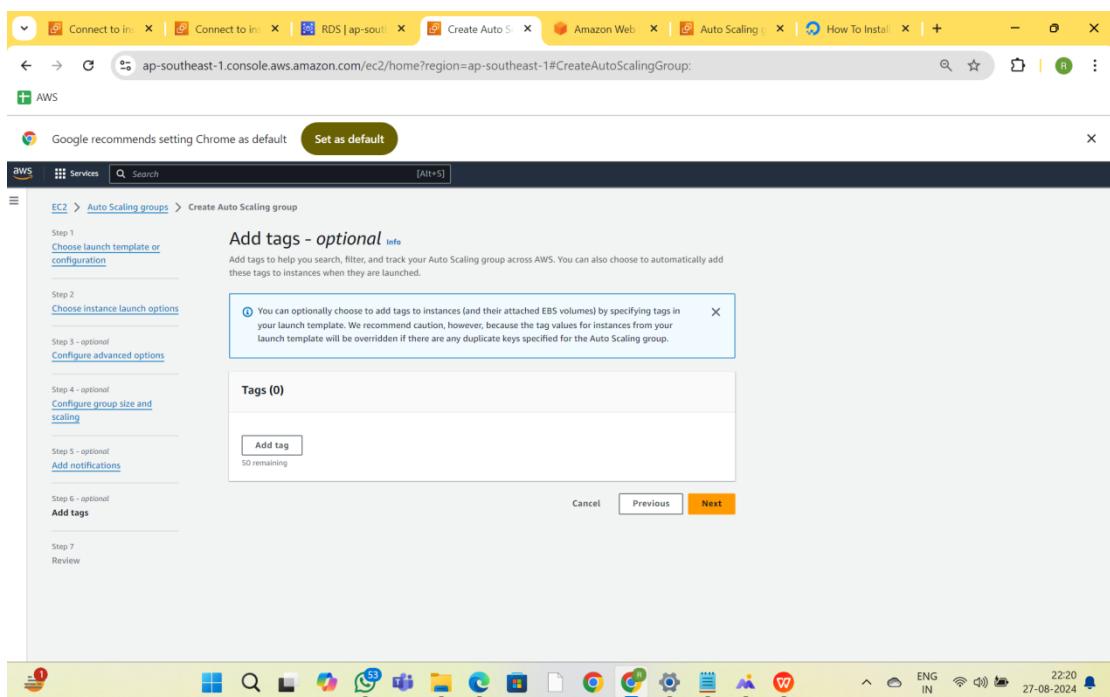
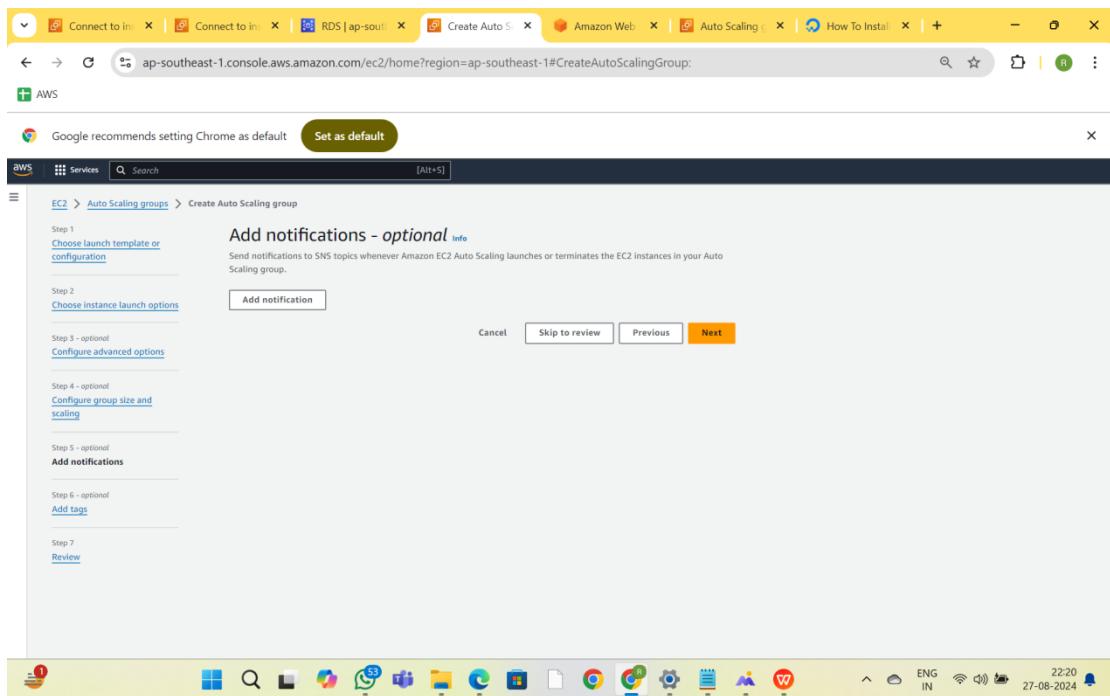
Automatic scaling - optional

Choose whether to use a target tracking policy [Info](#)

You can set up other metric-based scaling policies and scheduled scaling after creating your Auto Scaling group.

No scaling policies
Your Auto Scaling group will remain at its initial size and won't scale based on metrics.

Target tracking scaling policy
Choose a CloudWatch metric and target value and let the scaling group automatically adjust the group size to maintain the target value.



The screenshot shows the AWS CloudShell interface with the following details:

- Top Bar:** Connect to instance, Auto Scaling group, RDS | ap-southeast..., Create Auto Scal..., Auto Scaling group, How To Install My..., and several other tabs.
- Address Bar:** ap-southeast-1.console.aws.amazon.com/ec2/home?region=ap-southeast-1#AutoScalingGroups:
- Header:** AWS logo, Services, Search bar, [Alt+S] key, Singapore, and user Rishika @ 9890-7662-2686.
- Main Content:** "Auto Scaling groups (2) Info" table with the following data:

Name	Launch template/configuration	Instances	Status	Desired capacity	Min	Max
auto scaling-002	template-002 Version Default	2	-	2	2	5
auto scaling-01	template-01 Version Default	1	-	1	1	1

Below the table, it says "0 Auto Scaling groups selected".

CloudShell Footer: CloudShell, Feedback, 85°, various icons for file operations, and system status (ENG IN, 16:33, 27-08-2024).

After connecting to the UBUNTU ,

□- sudo -l -- to become a root user

❑ -apt update -y – to update packages

❑ -apt install apache2 – to install apache2

❑ -cd /var/www/html – path

❑ -ls – list.

❑ rm index.html – to remove index.html

❑ vi index.html – enter – press I –insert date --:x (to save) – enter

❑ systemctl status apache2 – to check the server status.

❑ Ping google.com – to check whether the server is ping or not.

```
JWS [ ] Services Q Search [Alt+5] Welcome to Ubuntu 24.04 LTS (GNU/Linux 4.9.0-1012-aws x86_64)

• Documentation: https://help.ubuntu.com
• Management: https://landscape.canonical.com
• Support: https://ubuntu.com/pro

System information as of Tue Aug 27 06:22:29 UTC 2024

System load: 0.00      Processes: 102
Usage of /: 22.7% of 4.71GB  Users logged in: 0
Memory usage: 20%        IPv6 addresses for enx0: 10.0.1.94
Swap usage: 0%          Swap usage: 0%

Expanded security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright*.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo command".
You must know the password for the "root" user.

shouttip:10-0-1-88:~# sudo -i
root@shouttip:10-0-1-88:~# apt update -y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu mobile InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu mobile-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu mobile-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu security InRelease [102 kB]
Get:5 http://security.ubuntu.com/ubuntu updates-security InRelease [102 kB]
Get:6 http://archive.ubuntu.com/ubuntu main Sources [15.0 MB]
Get:7 http://archive.ubuntu.com/ubuntu main Translation-en [1.00 MB]
Get:8 http://archive.ubuntu.com/ubuntu main Translation-en [1.00 MB]
```

```
aws Services Search [Alt+S] N. Virginia ush@0109-218

-- google.com ping statistics --
9 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.900/1.920/1.955/0.027 ms
root@ip-10-0-1-84:~# cd /var/www/html
root@ip-10-0-1-84:/var/www/html# ls
asp-1.pem index.html
root@ip-10-0-1-84:/var/www/html# rm index.html
root@ip-10-0-1-84:/var/www/html# vi asp-1.pem
root@ip-10-0-1-84:/var/www/html# systemctl restart apache2
root@ip-10-0-1-84:/var/www/html# chmod 400 "asp-1.pem"
root@ip-10-0-1-84:/var/www/html# ssh -i "asp-1.pem" ubuntu@10.0.5.175
Warning: Permanently added '10.0.5.175' (ED25519) to the list of known hosts.
ED25519 key fingerprint is SHA256:F/qyR0XzJxKRUdIdTicAr/AStj/juKeVqW4dfizVE.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.5.175' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1012-aws x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/pro

System information as of Tue Aug 27 09:28:54 UTC 2024

System load: 0.0 Processes: 105
Usage of /: 22.7% of 6.71GB Users logged in: 0
Memory usage: 20% IPV4 address for enx0: 10.0.5.175
```

```
aws Services Q Search [Alt+S]
E202519 key fingerprints is SHA256:/QyfDX+12wAK0dLdTicm/ABt;/juKewVQnWidfisVE.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.5.175' (E202519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.0.0-1012-aws x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/proposals

System information as of Tue Aug 27 03:28:54 UTC 2024
  System load: 0.0          Processes:           105
  Usage: 1.7% of 6.71GB   Users logged in: 0
  Memory usage: 204        IPv4 address for ensX0: 10.0.5.175
  Swap usage: 0%           IPv6 address for ensX0: fe80::500c:ff%ensX0

Expanded Security Maintenance for Applications is not enabled.
0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-10-0-5-175:~$
```

The screenshot shows a browser window with multiple tabs open, all related to AWS services. The main content area displays the Amazon RDS service page under the 'Databases' section. A prominent blue banner at the top introduces the 'Aurora I/O-Optimized' cluster storage configuration, stating it offers predictable pricing and up to 40% cost savings for I/O-intensive applications. Below this, a callout box suggests creating a Blue/Green Deployment to minimize downtime during upgrades. The main table lists 'Databases (0)' with columns for DB Identifier, Status, Role, Engine, Region & AZ, Size, Recommendations, and CPU. A note indicates 'No instances found'. The bottom of the page includes standard AWS footer links and a toolbar.

Screenshot of the AWS RDS Subnet Groups page showing a successful creation of a subnet group named "my_db".

The screenshot shows the AWS RDS Subnet Groups interface. A green success message at the top says "Successfully created my_db. View subnet group". Below it, a table lists the subnet group details:

Name	Description	Status	VPC
my_db	allow	Complete	vpc-0831e9c1011d8eb5d

The left sidebar shows the navigation menu for RDS, including Subnet groups under the Databases section.

Screenshot of the AWS RDS Databases page showing the creation of a new database named "database-1".

The screenshot shows the AWS RDS Databases interface. A blue notification bar at the top says "Your database might take a few minutes to launch. You can use settings from database-1 to simplify configuration of suggested database add-ons while we finish creating your DB for you." Below it, a modal window provides information about Aurora I/O-Optimized:

Introducing Aurora I/O-Optimized
Aurora's I/O-Optimized is a new cluster storage configuration that offers predictable pricing for all applications and improved price-performance, with up to 40% costs savings for I/O-intensive applications.

The main table lists the database details:

DB identifier	Status	Role	Engine	Region & AZ	Size	Recommendations
database-1	Creating	Instance	MySQL Community	ap-southeast-1a	db.t3.micro	

The left sidebar shows the navigation menu for RDS, including Databases under the Databases section.

```
root@ip-11-0-4-163:~  
root@ip-11-0-4-163:~# sudo systemctl start mysql.service  
mysql Ver 8.0.39-Ubuntu 0.24.04.2 for Linux on x86_64 ((Ubuntu))  
root@ip-11-0-4-163:~# mysql -h database-1.c7icccmazeq.ap-southeast-1.rds.amazonaws.com -u admin -p  
Enter password:  
Welcome to the MySQL monitor. Commands end with ; or \g.  
Your MySQL connection id is 26  
Server version: 8.0.35 Source distribution  
Copyright (c) 2000, 2024, Oracle and/or its affiliates.  
Oracle is a registered trademark of Oracle Corporation and/or its  
affiliates. Other names may be trademarks of their respective  
owners.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
mysql>
```