🚀 DAY 3 — AWS FUNDAMENTALS + IAM + EC2 + HANDS-ON DEPLOYMENT

⭐ PART 1 — AWS Core Concepts (You Must Know These)

✔ 1. Region & Availability Zones (AZs)

- Region → geographical area (ap-south-1)
- AZs → multiple data centers inside a region
- High availability = deploy across multiple AZs

✔ 2. IAM (Identity & Access Management)

IAM manages identities:

- Users
- Groups
- Roles
- Policies

IAM is the MOST important AWS security concept.

✔ 3. EC2 (Elastic Compute Cloud)

Provides virtual machines for:

- Running applications
- Hosting backend services
- Hosting Docker containers
- CI/CD runners

✔ 4. Security Groups

Firewall for EC2 instances.

Rules:

- Inbound → who can reach the server
- Outbound → who server can reach

✔ 5. VPC (Virtual Private Cloud)

Private network inside AWS.

Subnets:

- Public subnet → accessible from internet
- Private subnet → no direct internet access

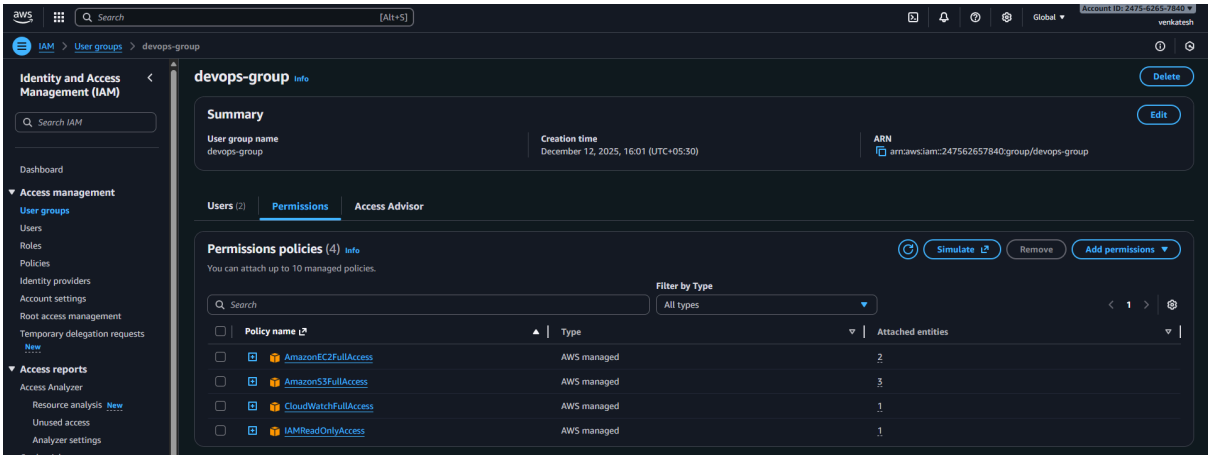
⭐ PART 2 — HANDS-ON: IAM USER + PERMISSIONS

🔥 Step 1: Create IAM Group

Go to AWS Console → IAM → User Groups

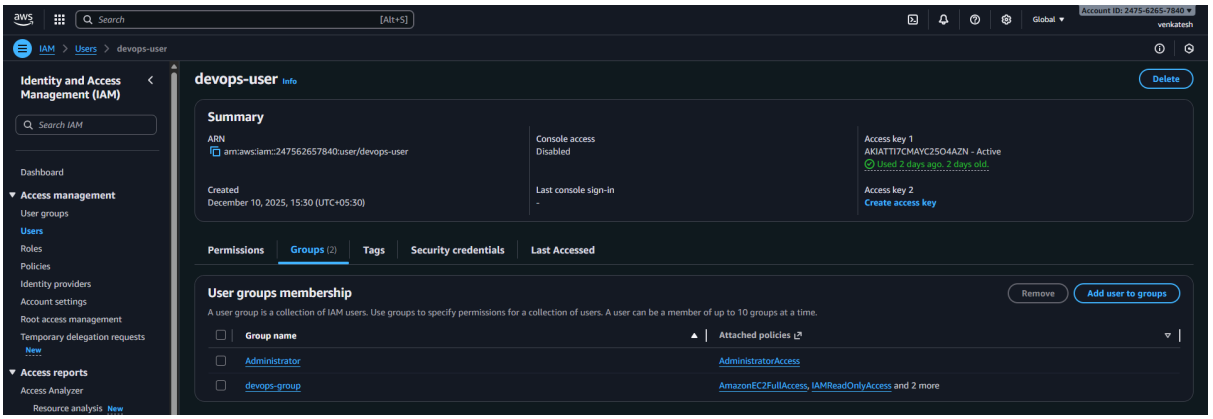
- Create User groups
  Example: devops-group

- Attach policies:
  - AmazonEC2FullAccess
  - AmazonS3FullAccess
  - IAMReadOnlyAccess
  - CloudWatchFullAccess



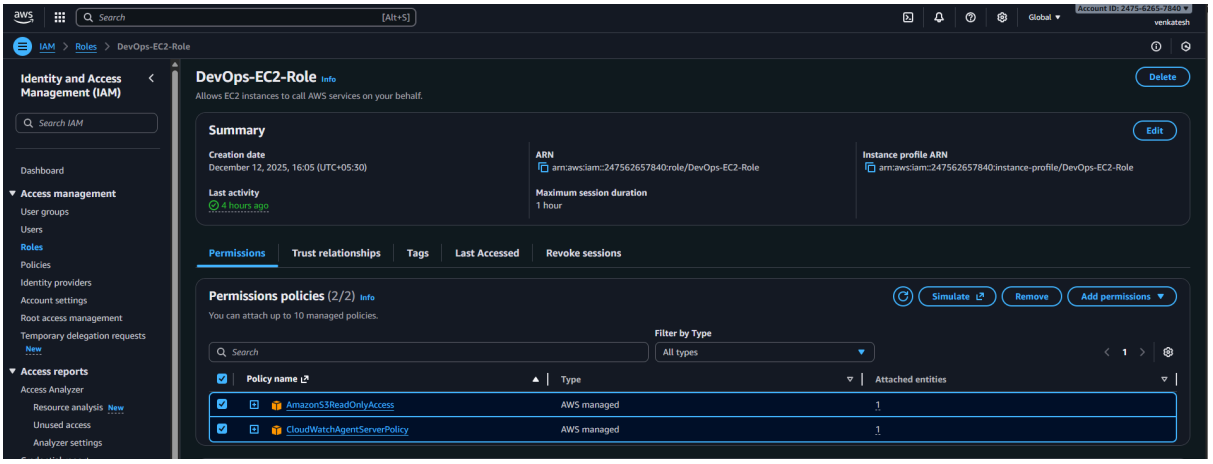
🔥 Step 2: Add your IAM user to this group

Go to: IAM → Users → your-user → Add to group



🔥 Step 3: Create a Role

- IAM → Roles → Create role
- Trusted entity → AWS Service
- Use case → EC2
- Attach policies:
  - AmazonS3ReadOnlyAccess
  - CloudWatchAgentServerPolicy
- Role Names:
  - **DevOps-EC2-Role**



This role is used by EC2 instances to access:

- S3
- CloudWatch

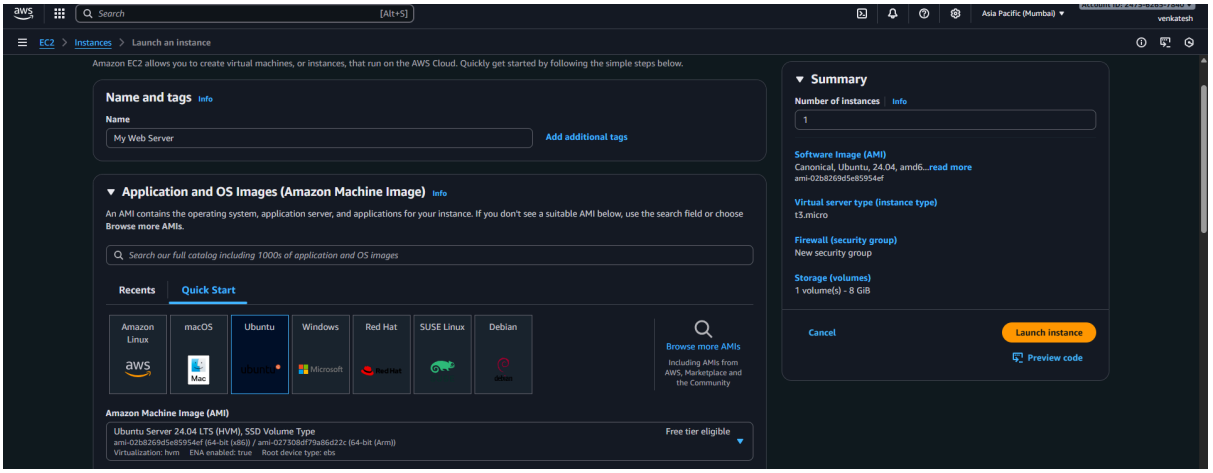
⭐ PART 3 — HANDS-ON: Launch an EC2 Instance (Step-by-Step)

🔥 Step 1: Go to EC2 Dashboard

- AWS Console → EC2 → Instances → Launch Instance

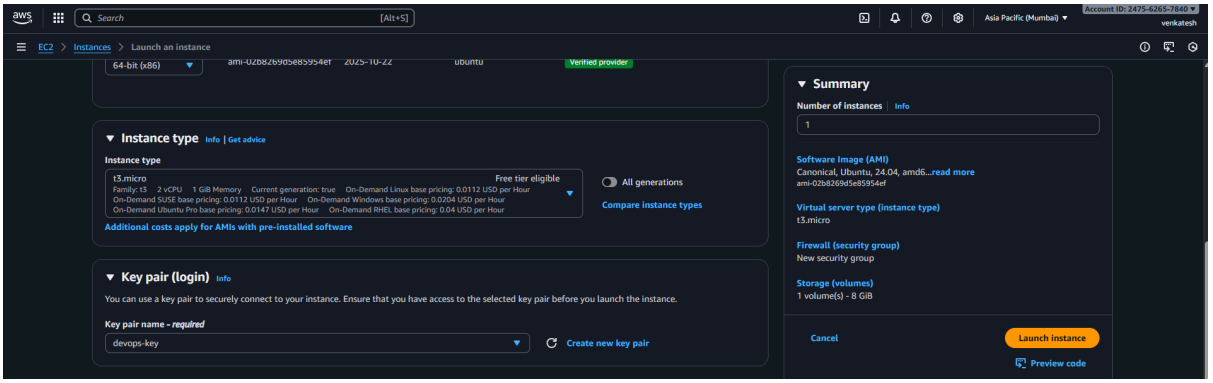
🔥 Step 2: Select AMI

- Choose: Ubuntu AMI



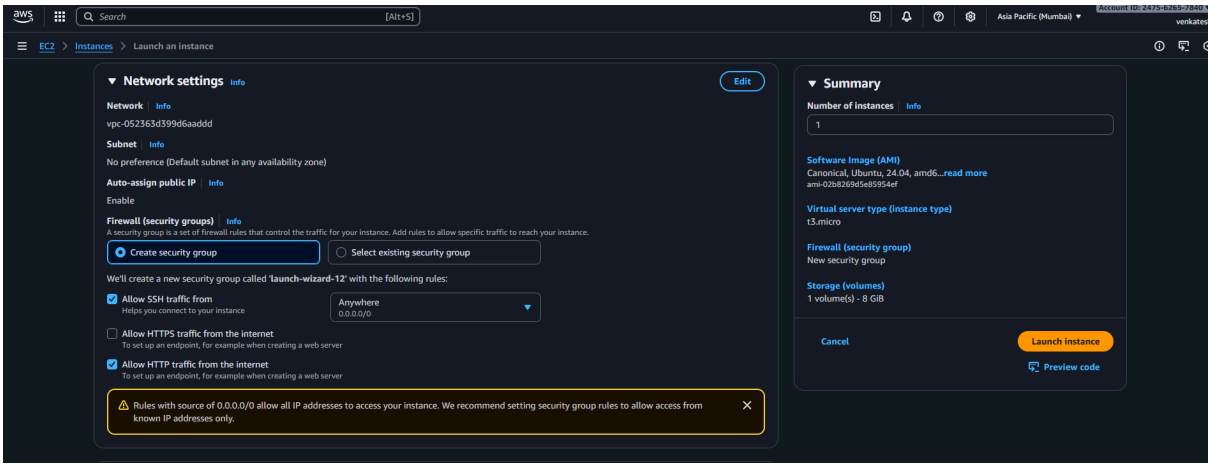
🔥 Step 3: Choose Instance Type and Key pair

- Choose: t3.micro (Free tier) and create new key pair (Store safely)



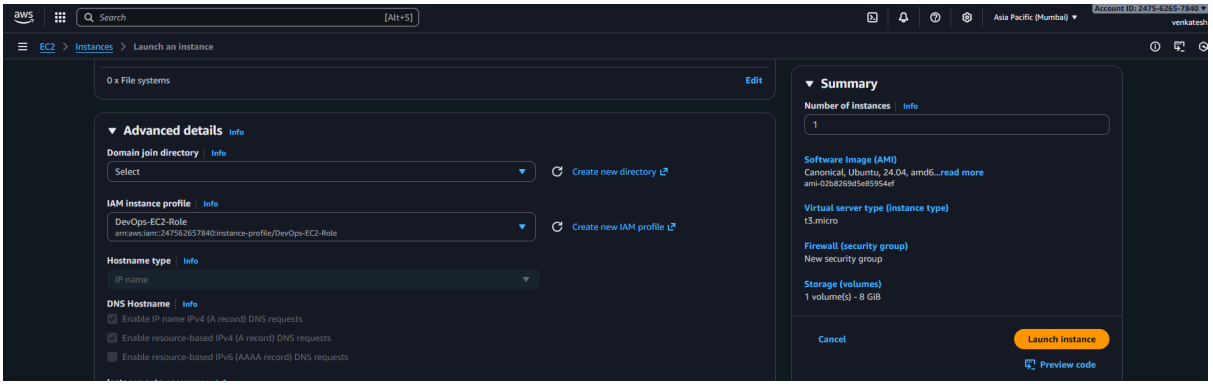
🔥 Step 4: Networking

- VPC: default
- Subnet: choose any AZ
- Auto-assign IP: ENABLED



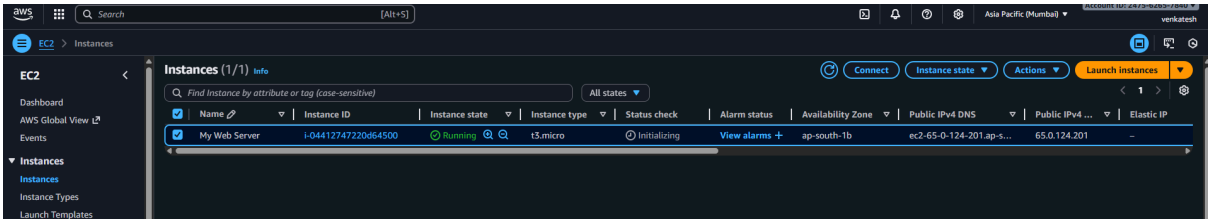
🔥 Step 5: Attach IAM Role

- Under "Advanced details" → IAM Instance Profile → Choose:



🔥 Step 6: Launch

- Launch Instance - Instance state -> Running



⭐ PART 4 — HANDS-ON: SSH INTO THE EC2 INSTANCE

- Open terminal:

  $ chmod 400 devops-key.pem #Key-pair permission change

```
ASUS@Venky MINGW64 /f/devops-learning-journey
$ chmod 400 ./devops-key.pem
```

- SSH command (replace with your IP):

  $ ssh -i devops-key.pem ubuntu@IP-Address

```
ASUS@Venky MINGW64 /f/devops-learning-journey
$ ssh -i ./devops-key.pem ubuntu@65.0.124.201
  System load:  0.0               Temperature:           -273.1 C
  Usage of /:   25.8% of 6.71GB   Processes:             111
  Memory usage: 23%               Users logged in:       0
  Swap usage:   0%                IPv4 address for ens5: 172.31.3.118

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-172-31-3-118:~$
```

⭐ PART 5 — Deploy a Live Web Application (Real DevOps Task)

- Inside EC2 Terminal:

  $ sudo apt update -y

  $ sudo apt install nginx -y

- Start Nginx:

  $ sudo systemctl enable nginx

  $ sudo systemctl start nginx

- Verify:

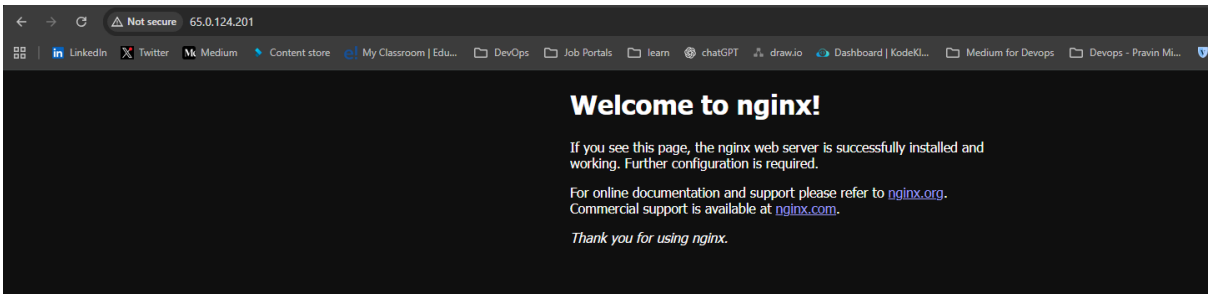
  $ sudo systemctl status nginx

```
ubuntu@ip-172-31-3-118:~$ sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
     Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset: enabled)
     Active: active (running) since Fri 2025-12-12 17:04:12 UTC; 13s ago
       Docs: man:nginx(8)
    Process: 1727 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_process on; (code=exited, status=>
    Process: 1729 ExecStart=/usr/sbin/nginx -g daemon on; master_process on; (code=exited, status=0/SUCCESS)
   Main PID: 1759 (nginx)
      Tasks: 3 (limit: 1008)
     Memory: 2.4M (peak: 5.3M)
        CPU: 26ms
     CGroup: /system.slice/nginx.service
             ├─1759 "nginx: master process /usr/sbin/nginx -g daemon on; master_process on;"
             ├─1761 "nginx: worker process"
             └─1762 "nginx: worker process"

Dec 12 17:04:12 ip-172-31-3-118 systemd[1]: Starting nginx.service - A high performance web server and a re>
Dec 12 17:04:12 ip-172-31-3-118 systemd[1]: Started nginx.service - A high performance web server and a rev>
ubuntu@ip-172-31-3-118:~$
```

- Now, Open browser -> Visit

  http://<your-ec2-public-ip>



⭐ PART 6 — Deploy Your Own HTML Page

- Inside EC2 Instance:

  $ echo "<h1>Hello from DevOps Day-3</h1>" | sudo tee /var/www/html/index.html

```
ubuntu@ip-172-31-3-118:~$ echo "<h1>Hello from DevOps Day-3</h1>" | sudo tee /var/www/html/index.html
<h1>Hello from DevOps Day-3</h1>
ubuntu@ip-172-31-3-118:~$
```

- Refresh browser → Should display:

Hello from DevOps Day-3

⭐ PART 7 — Enable CloudWatch Logs (Production Skill)

- Install CloudWatch agent:

  $ sudo apt install amazon-cloudwatch-agent -y

It will fail in Ubuntu no worries buddy — this is a **very common issue** on Ubuntu EC2 instances.

The package **amazon-cloudwatch-agent** is **NOT available in the default Ubuntu repositories**, so `apt install` will always fail.

- To fix this, you must **install the CloudWatch Agent using the official AWS package download link**, not `apt`.

⭐ STEP 1 — Download the CloudWatch Agent Package

$ wget https://s3.amazonaws.com/amazoncloudwatch-agent/ubuntu/amd64/latest/amazon-cloudwatch-agent.deb

```
ubuntu@ip-172-31-3-118:~$ wget https://s3.amazonaws.com/amazoncloudwatch-agent/ubuntu/amd64/latest/amazon-cl
oudwatch-agent.deb
--2025-12-12 17:12:57--  https://s3.amazonaws.com/amazoncloudwatch-agent/ubuntu/amd64/latest/amazon-cloudwat
ch-agent.deb
Resolving s3.amazonaws.com (s3.amazonaws.com)... 52.217.163.232, 16.15.180.204, 16.15.218.4, ...
Connecting to s3.amazonaws.com (s3.amazonaws.com)|52.217.163.232|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 66799118 (64M) [application/octet-stream]
Saving to: 'amazon-cloudwatch-agent.deb'

amazon-cloudwatch-agent.de 100%[=====================================>]  63.70M  15.4MB/s    in 5.4s

2025-12-12 17:13:03 (11.9 MB/s) - 'amazon-cloudwatch-agent.deb' saved [66799118/66799118]
```

⭐ STEP 2 — Install the Package

$ sudo dpkg -i -E ./amazon-cloudwatch-agent.deb

```
ubuntu@ip-172-31-3-118:~$ sudo dpkg -i -E ./amazon-cloudwatch-agent.deb
Selecting previously unselected package amazon-cloudwatch-agent.
(Reading database ... 71783 files and directories currently installed.)
Preparing to unpack ./amazon-cloudwatch-agent.deb ...
create group cwagent, result: 0
create user cwagent, result: 0
Unpacking amazon-cloudwatch-agent (1.300062.0b1304-1) ...
Setting up amazon-cloudwatch-agent (1.300062.0b1304-1) ...
ubuntu@ip-172-31-3-118:~$
```

⭐ STEP 3 — Verify Installation

$ sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-ctl -a status

```
ubuntu@ip-172-31-3-118:~$ sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-ctl -a status
{
  "status": "stopped",
  "starttime": "",
  "configstatus": "not configured",
  "version": "1.300062.0b1304"
}
ubuntu@ip-172-31-3-118:~$
```

⭐ STEP 4 — Start the CloudWatch Agent Using Default Config

- AWS provides a default config file.

$ sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-ctl \
-a fetch-config \
-m ec2 \
-c default \
-s

```
ubuntu@ip-172-31-3-118:~$ sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-ctl \
 -a fetch-config \
 -m ec2 \
 -c default \
 -s
****** processing amazon-cloudwatch-agent ******
Starting config-downloader, this will map back to a call to amazon-cloudwatch-agent
Executing /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent with arguments: [config-downloader -
ode ec2 -download-source default -output-dir /opt/aws/amazon-cloudwatch-agent/etc/amazon-cloudwatch-agent.d
-config /opt/aws/amazon-cloudwatch-agent/etc/common-config.toml -multi-config default]I! Trying to detect r
gion from ec2
D! [EC2] Found active network interface
I! imds retry client will retry 1 times
Start configuration validation...
2025/12/12 17:15:59 Reading json config file path: /opt/aws/amazon-cloudwatch-agent/etc/amazon-cloudwatch-a
ent.d/default.tmp ...
2025/12/12 17:15:59 I! Valid Json input schema.
2025/12/12 17:15:59 D! ec2tagger processor required because append_dimensions is set
2025/12/12 17:15:59 Configuration validation first phase succeeded
Starting config-translator, this will map back to a call to amazon-cloudwatch-agent
Executing /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent with arguments: [config-translator -
nput /opt/aws/amazon-cloudwatch-agent/etc/amazon-cloudwatch-agent.json -input-dir /opt/aws/amazon-cloudwatc
-agent/etc/amazon-cloudwatch-agent.d -output /opt/aws/amazon-cloudwatch-agent/etc/amazon-cloudwatch-agent.t
ml -mode ec2 -config /opt/aws/amazon-cloudwatch-agent/etc/common-config.toml -multi-config default]I! Tryin
 to detect region from ec2
D! [EC2] Found active network interface
```

⭐ STEP 5 — Check Service Status

$ sudo systemctl status amazon-cloudwatch-agent

```
ubuntu@ip-172-31-3-118:~$ sudo systemctl status amazon-cloudwatch-agent
● amazon-cloudwatch-agent.service - Amazon CloudWatch Agent
     Loaded: loaded (/etc/systemd/system/amazon-cloudwatch-agent.service; enabled; preset: enabled)
     Active: active (running) since Fri 2025-12-12 17:16:00 UTC; 1min 5s ago
   Main PID: 2065 (amazon-cloudwat)
      Tasks: 8 (limit: 1008)
     Memory: 25.9M (peak: 26.3M)
        CPU: 475ms
     CGroup: /system.slice/amazon-cloudwatch-agent.service
             └─2065 /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent -config /opt/aws/amazon-cl>

Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: D! [EC2] Found active network interface
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: I! imds retry client will retry 1 time>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: 2025/12/12 17:16:00 Reading json confi>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: /opt/aws/amazon-cloudwatch-agent/etc/a>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: 2025/12/12 17:16:00 Reading json confi>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: 2025/12/12 17:16:00 I! Valid Json inpu>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: I! Trying to detect region from ec2
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: 2025/12/12 17:16:00 D! ec2tagger proce>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2075]: 2025/12/12 17:16:00 Configuration vali>
Dec 12 17:16:00 ip-172-31-3-118 start-amazon-cloudwatch-agent[2065]: I! Detecting run_as_user...
ubuntu@ip-172-31-3-118:~$
```

⭐ STEP 6 — Now Check Cloudwatch log groups in AWS Console

- Go to the AWS Console:
  CloudWatch → Logs → Log groups

- You should see log groups like:
  - ✔ `/aws/amazon-cloudwatch-agent/instance-id`
  - ✔ `/aws/amazon-cloudwatch-agent/logs`
  - ✔ `/var/log/syslog` (if enabled)
  - ✔ `/var/log/nginx/access.log` (if configured later)