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**CC PRACTICAL 1- Infrastructure As A Service(IAAS)**

**SVKM'S NMIM'S Nilkamal School of Mathematics, Applied Statistics & Analytics  
Master of Science (Data Science)**

Practical-1 Infrastructure as a service using AWS.

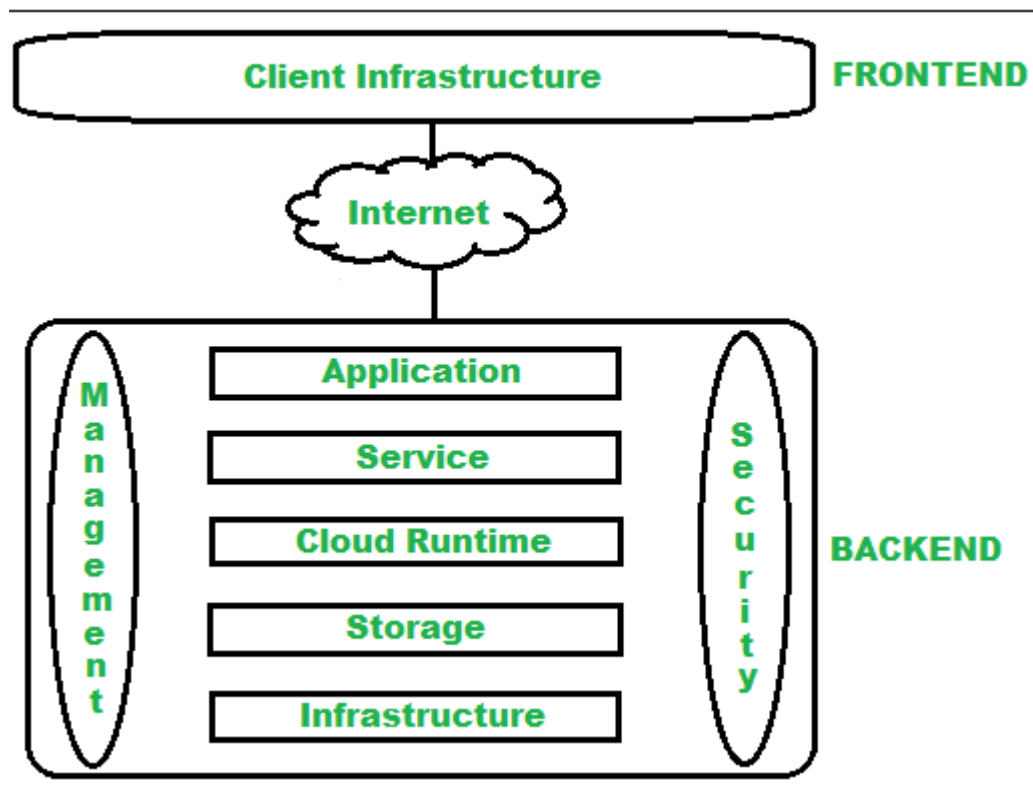
**Date:- 09/01/2024**

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**Writeup :-**

## **Q1. CLOUD COMPUTING ARCHITECTURE**

1. One of the most demanding technologies of the modern day is cloud computing, which is reshaping every corporation by offering virtualized services and resources on demand.
2. All sizes of organizations, from small to medium to large, use cloud computing services to store data and access it via the internet at any time, from any location.



*Fig:*

*ARCHITECTURE OF CLOUD COMPUTING*

3. Among the most crucial limitations that any cloud architecture should have are transparency, scalability, security, and intelligent monitoring.

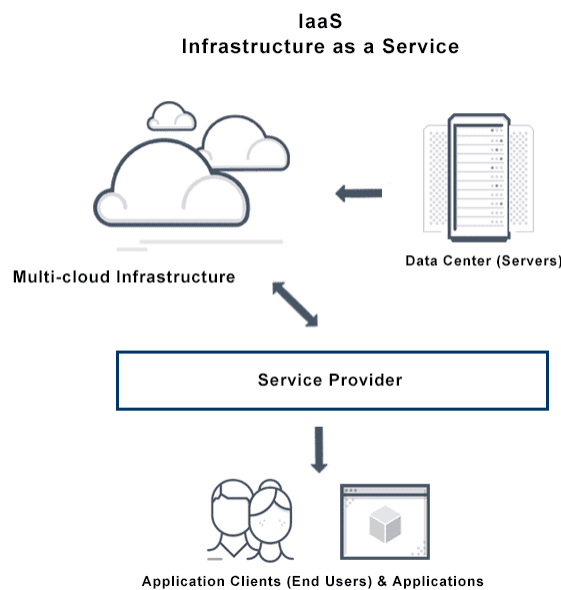
The architecture of cloud computing consists of two essential parts:

- Front End
- Back End

### COMPONENTS:

- 1) **Client Infrastructure:**
- 2) **Application**
- 3) **Service**
- 4) **Runtime Cloud**
- 5) **Storage**
- 6) **Infrastructure**
- 7) **Management**
- 8) **Security**
- 9) **Internet**

## Q2. IAAS



1. Hardware as a Service (HaaS) is another name for IaaS. It is a layer on the platform for cloud computing.
2. Conventional hosting services rented out IT infrastructure with pre-configured hardware for a certain amount of time. Regardless of the actual usage, the customer paid for the setup and labor
3. Maintaining IT infrastructure is no longer necessary for any firm thanks to the IaaS cloud computing platform layer.

IaaS is offered in three models: **public, private, and hybrid** cloud.

- ❖ The private cloud implies that the infrastructure resides at the customer-premise.
- ❖ In the case of public cloud, it is located at the cloud computing platform vendor's data center

- ❖ the hybrid cloud is a combination of the two in which the customer selects the best of both public cloud or private cloud.

IaaS provider provides the following services -

- 1) **Compute**
- 2) **Storage**
- 3) **Network**
- 4) **Load balancers**

### Q3. AWS

1. An affiliate of Amazon.com, Amazon Web Services (AWS), has spent billions of dollars on global IT resources.
2. Account users of AWS can access on-demand IT services at no upfront cost through a pay-as-you-go pricing model.
3. Businesses utilize AWS to lower the capital costs associated with constructing their own private IT infrastructure, which may be costly depending on the size and kind of the business.
4. AWS has a physical fiber network of its own that links to Edge locations, Availability zones, and regions. Businesses save tons of money since AWS handles all maintenance costs as well.
5. Security of the cloud is the responsibility of AWS but Security in the cloud is the Customer's Responsibility. The Performance efficiency in the cloud has four main areas:-
  - ❖ Selection
  - ❖ Review
  - ❖ Monitoring
  - ❖ Tradeoff

### Q4. AWS services



Cloud computing, or web services, is the term for the IT services that Amazon Web Services (AWS) started providing to the general public in 2006.

Important Cloud Services provided by AWS

### 1. Compute

- 1) **Amazon EC2:** Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud.
- 2) **AWS Lambda:** You can run code without worrying about managing servers with AWS Lambda, an event-driven, serverless computing service.
- 3) **AWS Elastic Beanstalk:** A platform called Beanstalk is plug-and-play, enabling the use of many programming languages and environments.

### 2. Networking

- 1) **Amazon VPC:** Your cloud-based network environment is called an Amazon VPC.
- 2) **Amazon Route 53:** A cloud-based DNS web service that is both highly available and scalable.

### 3. Storage

- 1) **Simple Storage Service (Amazon S3):** Amazon S3 allows users to store and retrieve any volume of data from any location on the internet.
- 2) **Amazon Glacier:** An incredibly affordable, long-lasting, and safe storage solution for long-term backup and data preservation.

### 4. Databases

- 1) **Relational database service (Amazon RDS):** This cloud-based solution simplifies the setup, management, and scalability of relational databases and also manages time-consuming database management operations
- 2) **Non-Relational Database:** Amazon DynamoDB is a quick and adaptable NoSQL database solution for any purpose, regardless of size that supports both document and key-value data models

## Q5. EC2

1. Web hosting by Amazon The safe, scalable, and resizable EC2 web service is offered by the AWS cloud.
2. Amazon will handle infrastructure management in place of you, allowing you to start and stop an EC2 instance anytime you choose.
3. Depending on the amount of incoming traffic, you may scale up or down the EC2 instance.

### USE CASES OF AMAZON EC2 (ELASTIC COMPUTE CLOUD)

1. **Application Deployment**
2. **Application Scaling**
3. **Deploying The ML Models**
4. **Hybrid Cloud Environment**

### **AWS EC2 Instance Types**

Different Amazon EC2 instance types are designed for certain activities.

The AWS EC2 Instance Types are as follows:

- General Purpose Instances
- Compute Optimized Instances
- Memory-Optimized Instances
- Storage Optimized Instances
- Accelerated Computing Instances

Features of AWS EC2 (Elastic Compute Cloud)

- 1) AWS EC2 Functionality  
AWS EC2 Operating Systems
- 2) AWS EC2 Software
- 3) AWS EC2 Scalability and Reliability

### **OBJECTIVES TO BE IMPLEMENTED IN PRACTICALS:**

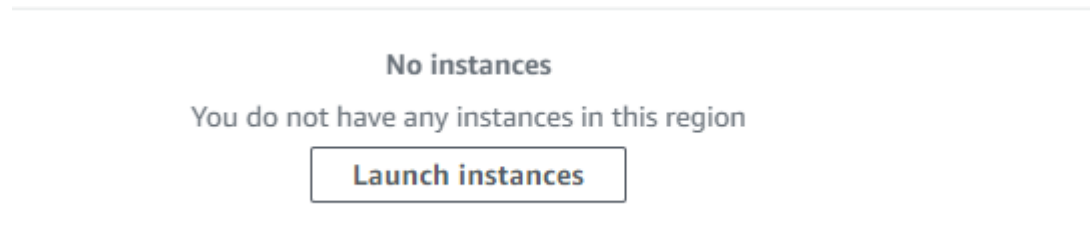
1. **Implement the windows machine using AWS ec2.**
2. **Implement Ubuntu machine using AWS ec2 and execute the Linux commands.**
  - **Disk information in human readable format**
  - **Create a folder with your name**
  - **Create a file with your cityname and add your address in it**
  - **Display the created file**
  - **Copy the contents of the created file in other file and print it**
  - **Install firefox/python 3**

### **PRAC1: IAAS with EC2**

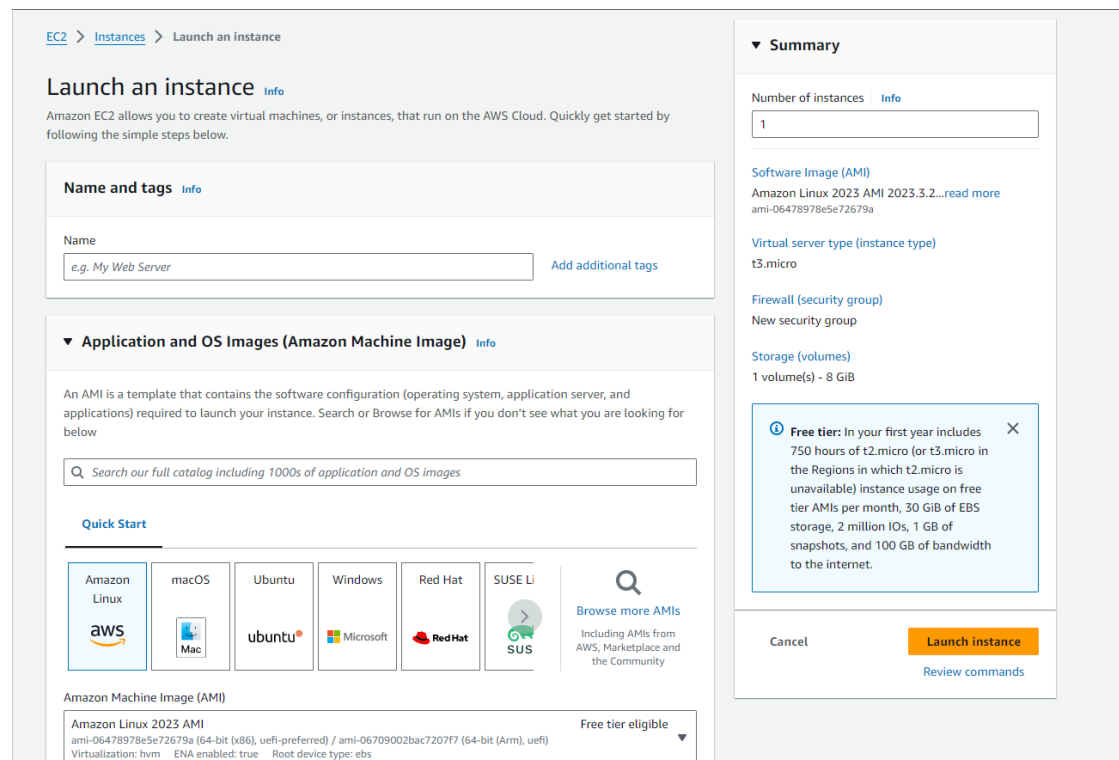
- Protocol
- IP
- Key
- Linux
- Putty

### **STEPS SCREENSHOTS:**

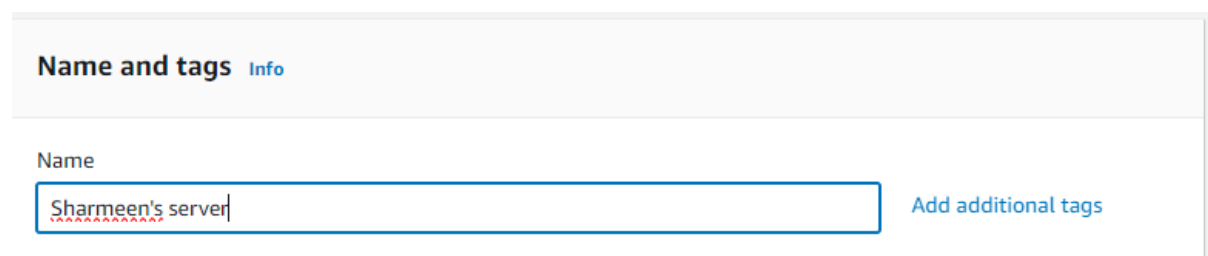
## FOR Q1




Click on EC2->Instances->launch an instance





Give a name to server





## Quick Start


Amazon Linux  



macOS  


Ubuntu  


Windows  


Red Hat  


SUSE Linux  


  
[Browse more AMIs](#)  
Including AMIs from AWS, Marketplace and the Community

## Create a key pair

### ▼ 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*

Select



[Create new key pair](#)

For Windows instances, you use a key pair to decrypt the administrator password. You then use the decrypted password to connect to your instance.

Create key pair

×

Key pair name

Key pairs allow you to connect to your instance securely.

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

☒ RSA  
RSA encrypted private and public key pair

☐ ED25519  
ED25519 encrypted private and public key pair (Not supported for Windows instances)

Private key file format

☒ .pem  
For use with OpenSSH

☐ .ppk  
For use with PuTTY

⚠ When prompted, store the private key in a secure and accessible location on your computer. You will need it later to connect to your instance. [Learn more](#)

Cancel

Create key pair

Create key pair

×

Key pair name

Key pairs allow you to connect to your instance securely.

Sharmeen's key pair

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

☒ RSA  
RSA encrypted private and public key pair

☐ ED25519  
ED25519 encrypted private and public key pair (Not supported for Windows instances)

Private key file format

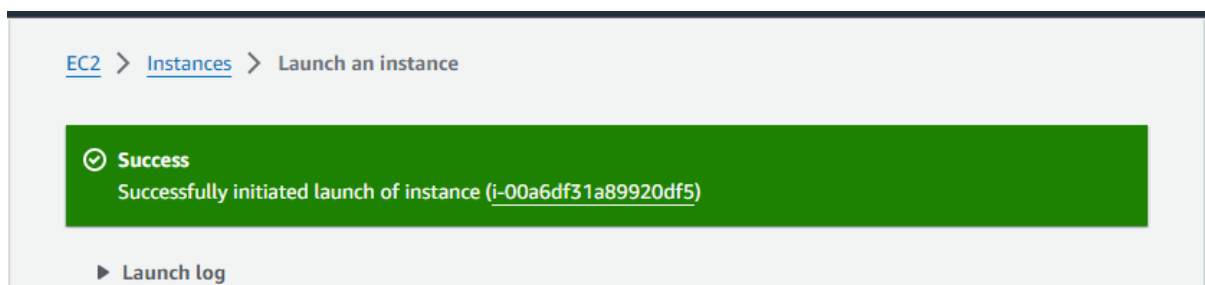
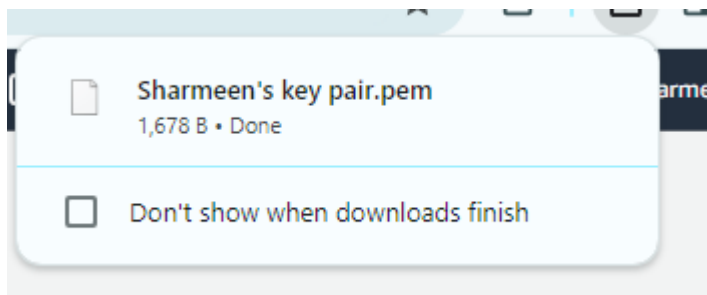
☒ .pem  
For use with OpenSSH

☐ .ppk  
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⚠ When prompted, store the private key in a secure and accessible location on your computer. You will need it later to connect to your instance. [Learn more](#)

Cancel

Create key pair



Go to instances again after completing above steps->will show status as running



**Instances (1/1)** [Info](#)

**Launch instances**

Find Instance by attribute or tag (case-sensitive)

< 1 >

| <input checked="" type="checkbox"/> | Name             | Instance ID         | Instance state | Instance type |
|-------------------------------------|------------------|---------------------|----------------|---------------|
| <input checked="" type="checkbox"/> | Sharmeen's se... | i-00a6df31a89920df5 | Running        | t3.micro      |

Click and select -> connect above button

**Connect to instance** [Info](#)

Connect to your instance i-00a6df31a89920df5 (Sharmeen's server) using any of these options

[Session Manager](#) | **[RDP client](#)** | [EC2 serial console](#)

Instance ID  
 i-00a6df31a89920df5 (Sharmeen's server)

Connection Type

☒ **Connect using RDP client**  
 Download a file to use with your RDP client and retrieve your password.

☐ **Connect using Fleet Manager**  
 To connect to the instance using Fleet Manager Remote Desktop, the SSM Agent must be installed and running on the instance. For more information, see [Working with SSM Agent](#) .

You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

**Download remote desktop file**

When prompted, connect to your instance using the following details:

|  |                           |
|--|---------------------------|
| Public DNS<br>ec2-13-51-194-123.eu-north-1.compute.amazonaws.com | Username<br>Administrator |
|--|---------------------------|

Password    [Get password](#)

If you've joined your instance to a directory, you can use your directory credentials to connect to your instance.

Copy the password that comes down

|   |                           |
|---|---------------------------|
| Public DNS<br>ec2-13-51-194-123.eu-north-1.compute.amazonaws.com<br>Password copied<br>hT;Jl0Rwmx2ZQ=0YLjWyJXhE9wxAdvFo | Username<br>Administrator |
|---|---------------------------|

Open the downloaded remote desktop pem file

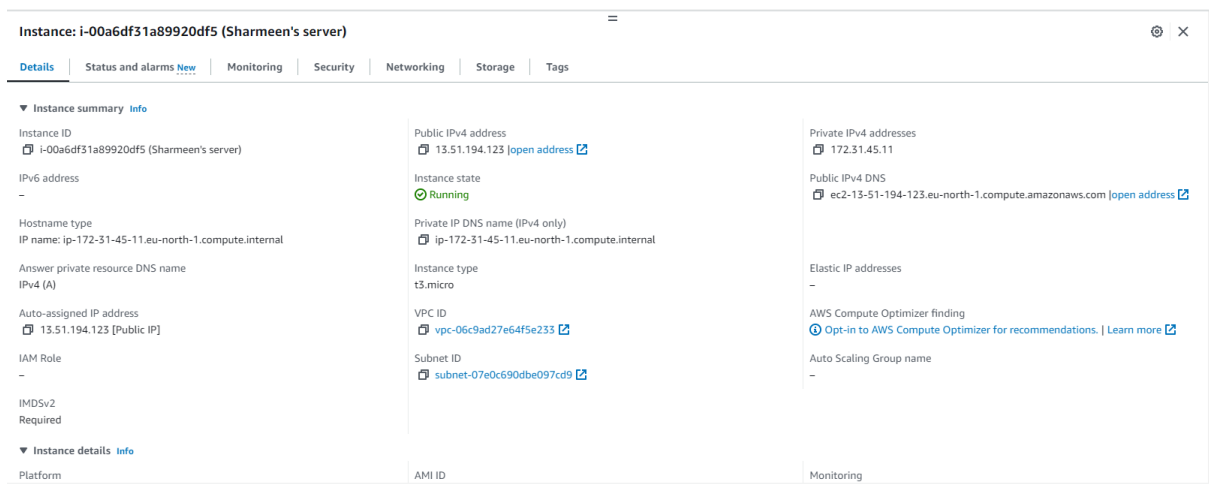


Click on yes-> a new desktop opens with is IAAS(your infrastructure as a service

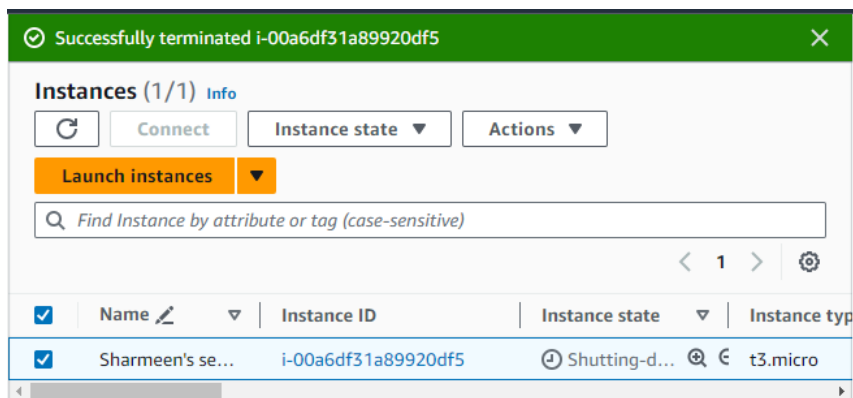
Below is the information visible on dektop

```
Hostname : EC2AMAZ-CUNMQSN
Instance ID : i-00a6df31a89920df5
Private IP Address : 172.31.45.11
Public IP Address : 13.51.194.123
Instance Size : t3.micro
Availability Zone : eu-north-1b
Architecture : AMD64
Total Memory : 1024
Network : Up to 5 Gigabit
```

You can download python to code as PAAS(Platform as a service)



After finishing task, terminate the instance



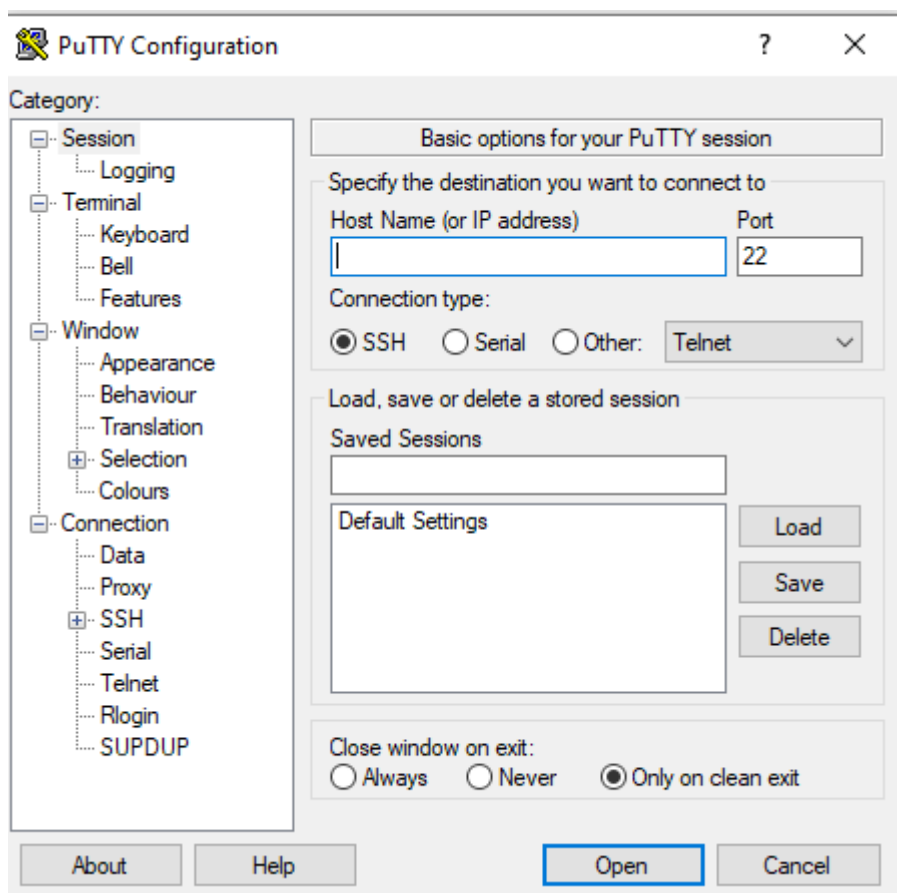
**FOR THE 2<sup>nd</sup> question's demonstration,**

1. Install putty from web

**putty.exe (the SSH and Telnet client itself)**

|             |                           |                             |
|-------------|---------------------------|-----------------------------|
| 64-bit x86: | <a href="#">putty.exe</a> | <a href="#">(signature)</a> |
| 64-bit Arm: | <a href="#">putty.exe</a> | <a href="#">(signature)</a> |
| 32-bit x86: | <a href="#">putty.exe</a> | <a href="#">(signature)</a> |

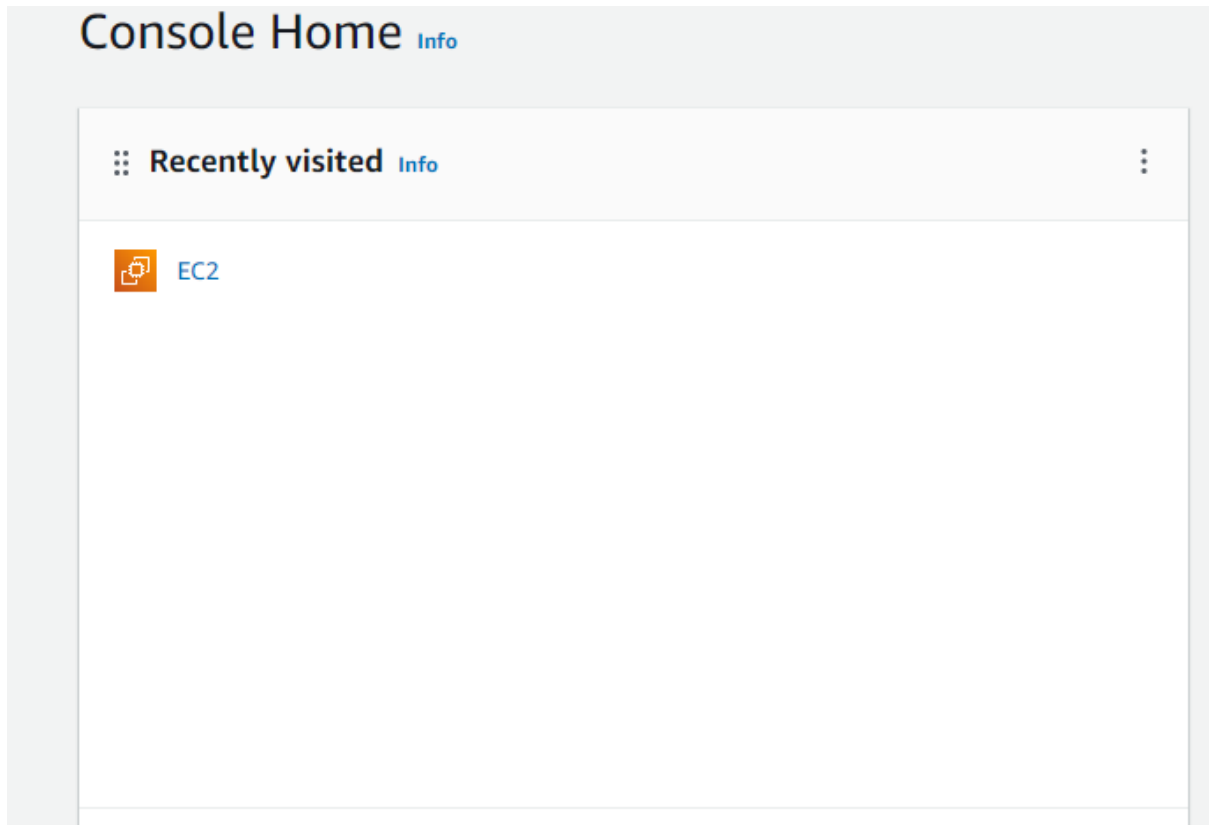
2. Will Get a dialog box like this



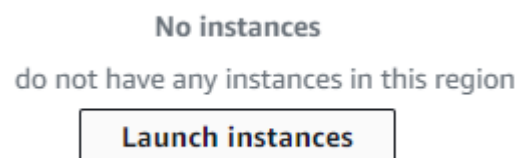
**We need to know 3 things for this:**

- IP address
- Authentication key
- Username

Go to instances-> EC2



Click launch instance



Will get a window like this as shown below

In that give a name to your instance, and select Ubuntu from the available AMI's

## 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

[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

#### Quick Start

|   |  |   |  |  |   |   |
|---|--|---|--|--|---|---|
| <br>Amazon Linux | <br>macOS | <br>Ubuntu | <br>Windows | <br>Red Hat | <br>SUSE Linux | <br><a href="#">Browse more AMIs</a><br>Including AMIs from AWS, Marketplace and the Community |
|---|--|---|--|--|---|---|

Amazon Machine Image (AMI)

Go down to key pairs->click create new key pair

### ▼ 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*

[↻ Create new key pair](#)

Dialog box will be this way below as shown->give key pair a name-> select .ppk extension for use with putty

Number of instances Info

### Create key pair ×

**Key pair name**  
Key pairs allow you to connect to your instance securely.

Ubuntu\_Key

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

**Key pair type**



☒ **RSA**  
RSA encrypted private and public key pair

☐ **ED25519**  
ED25519 encrypted private and public key pair

**Private key file format**

☐ **.pem**  
For use with OpenSSH

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 When prompted, store the private key in a secure and accessible location on your computer. **You will need it later to connect to your instance.** [Learn more](#) 

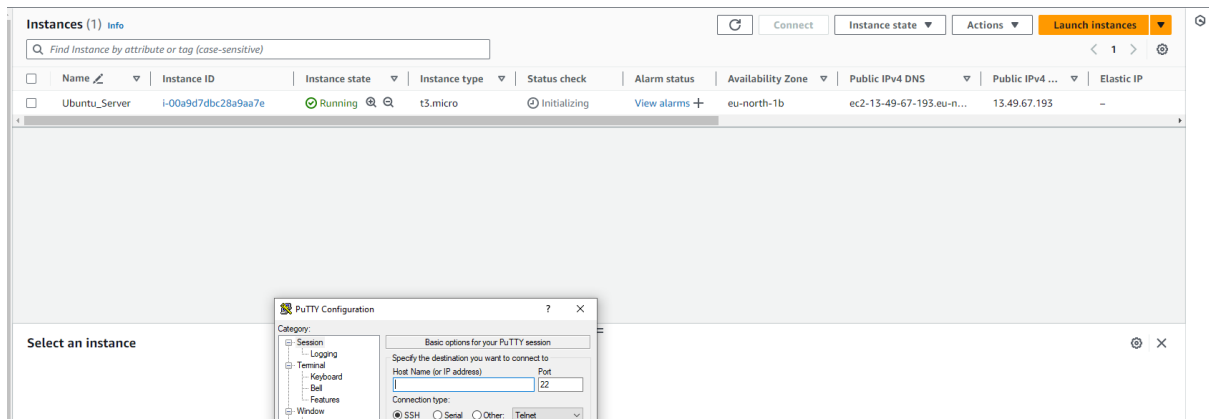
Cancel Create key pair

Go to network settings->select create security group below->tick on all checkboxes seen below that

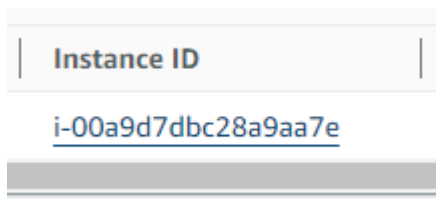
Click on launch instance

In that your instance ID name and its status will be displayed as shown below

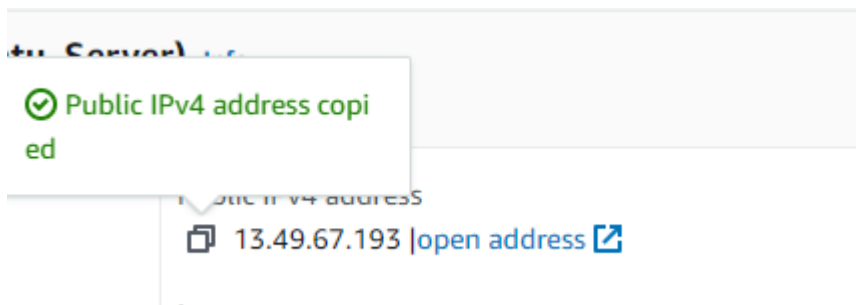


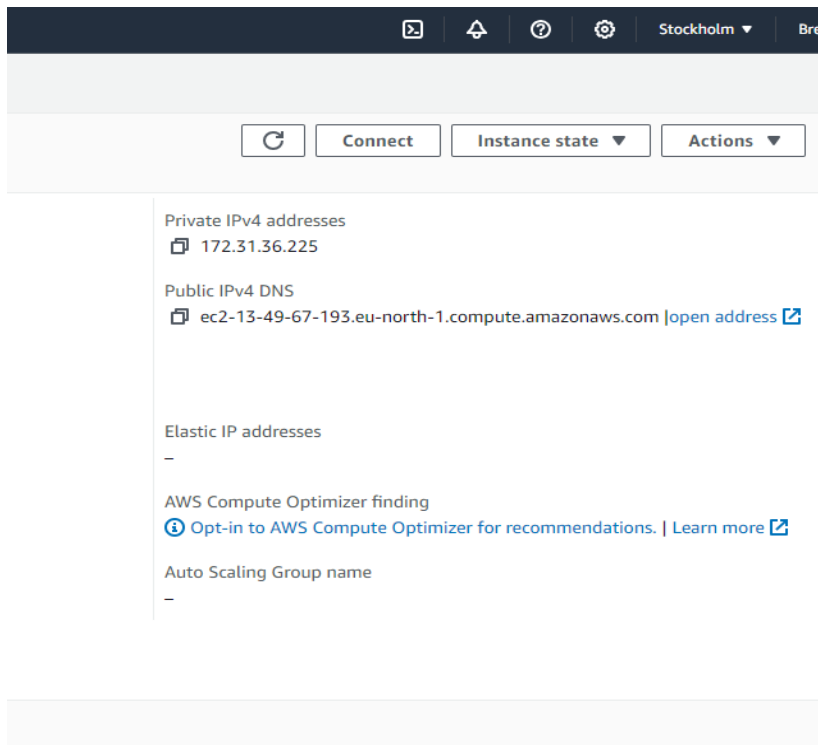


Click on the ID

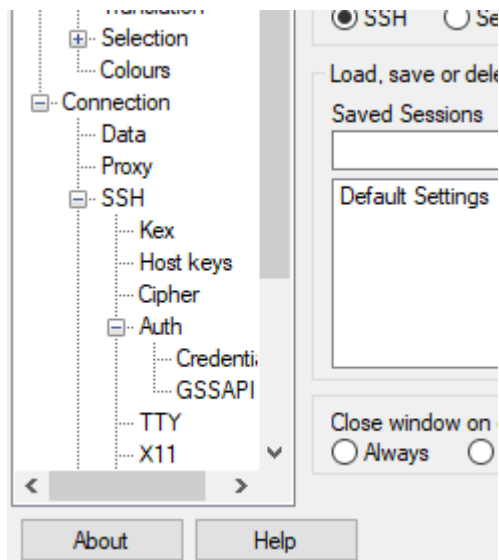


After that a new page opens with several addresses related to your server->in that copy your public IPv4 address

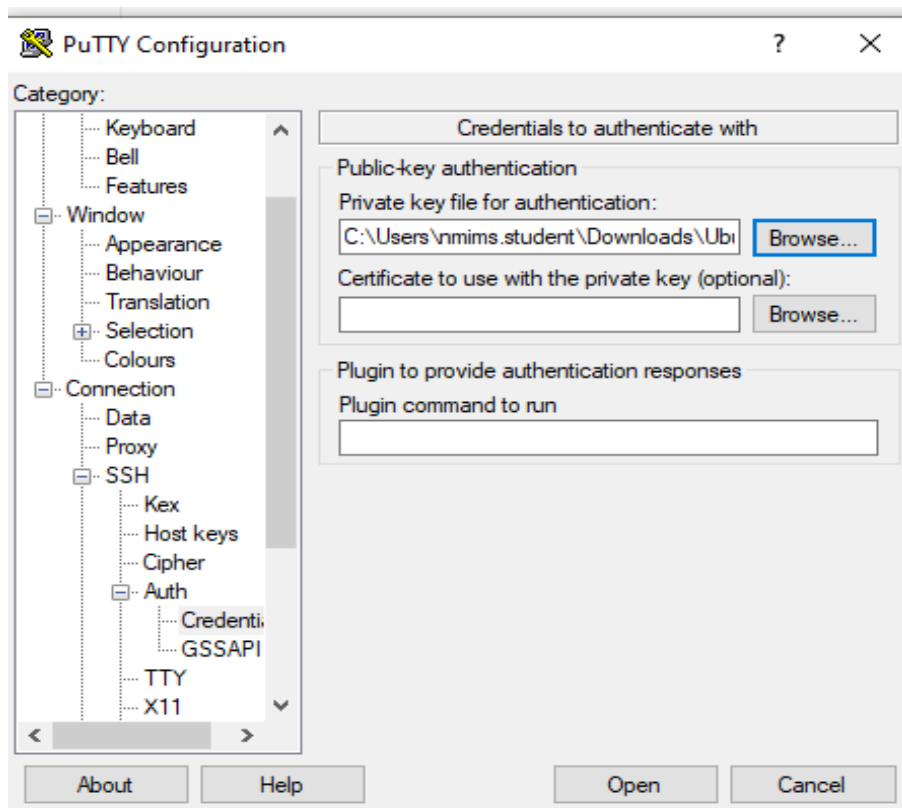




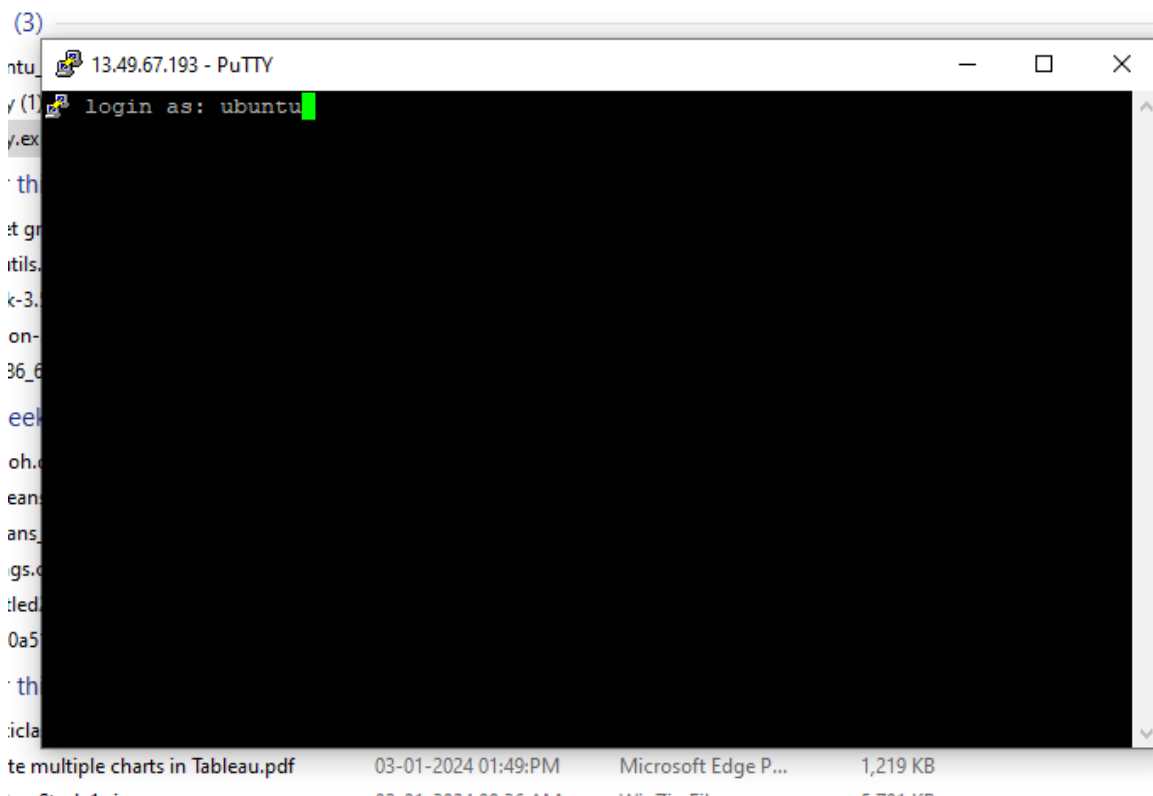
After that ->go to the previous dialog box of your putty configuration->select SSH option in the leftmost panel downside->in that select Auth->and select Credentials as shown below



In credentials->browse your private key file from device and select and put it there



After that click on open-> after that a new desktop will open with your selected ubuntu interface->in that put your login as **ubuntu**



It will authenticate and then allow you to use the interface

Type the commands

- **Ls**-for listing
- **Mkdir** -to make a directory
- **cd**-to change directory
- **touch**-to create empty files and modify file timestamps
- **cat**-reads each file parameter in sequence and writes to standard output
- **sudo apt-get install**-to install any software(eg.python)

```
ubuntu@ip-172-31-34-170: ~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ip-172-31-34-170:~$ ls  
ubuntu@ip-172-31-34-170:~$ ls -l  
ubuntu@ip-172-31-34-170:~$ mkdir sharmeen  
ubuntu@ip-172-31-34-170:~$ ls  
sharmeen  
ubuntu@ip-172-31-34-170:~$ cd msc  
-bash: cd: msc: No such file or directory  
ubuntu@ip-172-31-34-170:~$ cd sharmeen  
ubuntu@ip-172-31-34-170:~/sharmeen$ cloud.txt  
cloud.txt: command not found  
ubuntu@ip-172-31-34-170:~/sharmeen$ touch cloud.txt  
ubuntu@ip-172-31-34-170:~/sharmeen$ ls  
cloud.txt  
ubuntu@ip-172-31-34-170:~/sharmeen$ cat > cloud.txt  
this is my linux ami  
ubuntu@ip-172-31-34-170:~/sharmeen$ cat cloud.txt  
this is my linux ami  
ubuntu@ip-172-31-34-170:~/sharmeen$ cd  
ubuntu@ip-172-31-34-170:~$ ls -df  
.  
ubuntu@ip-172-31-34-170:~$ ls  
sharmeen  
ubuntu@ip-172-31-34-170:~$ sudo apt-get install python3.6  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
Note, selecting 'libpython3.6-stdlib' for regex 'python3.6'  
Note, selecting 'python3.6-2to3' for regex 'python3.6'  
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.  
ubuntu@ip-172-31-34-170:~$ python --version  
Command 'python' not found, did you mean:
```

```
>>> print('hello world')  
hello world  
>>> print('machine learning')  
machine learning  
>>> python helloworld.py  
File "<stdin>", line 1  
python helloworld.py  
^^^^^^^^^^  
SyntaxError: invalid syntax  
>>>  
ubuntu@ip-172-31-34-170:~$ sudo snap install firefox  
firefox 121.0.1-1 from Mozilla✓ installed  
ubuntu@ip-172-31-34-170:~$ ls  
sharmeen  
ubuntu@ip-172-31-34-170:~$ firefox  
Error: no DISPLAY environment variable specified  
ubuntu@ip-172-31-34-170:~$ open firefox  
Command 'open' not found, but can be installed with:  
sudo apt install xdg-utils # version 1.1.3-4.1ubuntu3~22.04.1, or  
sudo apt install mailcap # version 3.70+nmu1ubuntu1  
ubuntu@ip-172-31-34-170:~$
```