

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

*Practical-1 Infrastructure as a service using AWS*

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**Writeup:-**

- **Cloud Computing Architecture**

Cloud computing architecture refers to the components and subcomponents required for cloud computing. These components typically consist of a front end platform (fat client, thin client, mobile device), back end platforms (servers, storage), a cloud-based delivery, and a network (Internet, Intranet, Intercloud). Combined, these components make up cloud computing architecture. Cloud services are delivered through this architecture via three primary models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Each model represents a different part of the cloud computing stack: applications, runtime, data, middleware, O/S, virtualization, servers, storage, and networking.

- **IAAS**

Infrastructure as a Service (IaaS) is a cloud computing model where a third-party provider hosts and maintains core infrastructure, including hardware, software, servers, and storage on behalf of a customer. This typically includes the hosting of applications in a highly scalable environment, where customers can pay on a pay-per-use basis. Typically, IaaS services offer additional resources such as a virtual-machine disk image library, raw block storage, and load balancers. IaaS is a comprehensive solution that handles all the infrastructure, allowing businesses to focus on their core operations. It is an ideal solution for small businesses and startups that don't have the budget for hardware and IT staff. It's also a good option for larger organizations that want to be able to scale quickly.

Why IAAS??

**Flexibility** - IaaS provides highly scalable and flexible computing resources that can be provisioned and decommissioned on-demand based on workload needs. This is useful for spiky or unpredictable workloads.

**Lower costs** - With IaaS, organizations pay only for the infrastructure resources they use without having to purchase and maintain their own hardware. This eliminates capital expenditures and reduces costs.

- **AWS**

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 200 fully featured services from data centres globally. AWS provides a broad set of global cloud-based products including compute, storage, databases, analytics, networking, mobile, developer tools, management tools, IoT, security, and enterprise applications. These services are available on-demand and come with a pay-as-you-go pricing model.

AWS is known for its flexibility, security, cost-effectiveness, and innovation. It provides the opportunity to replace upfront capital infrastructure expenses with low variable costs that scale with your business. AWS is used by millions of customers—including startups, enterprises, and public sector organizations—to lower costs, become more agile, and innovate faster.

- **EC2**

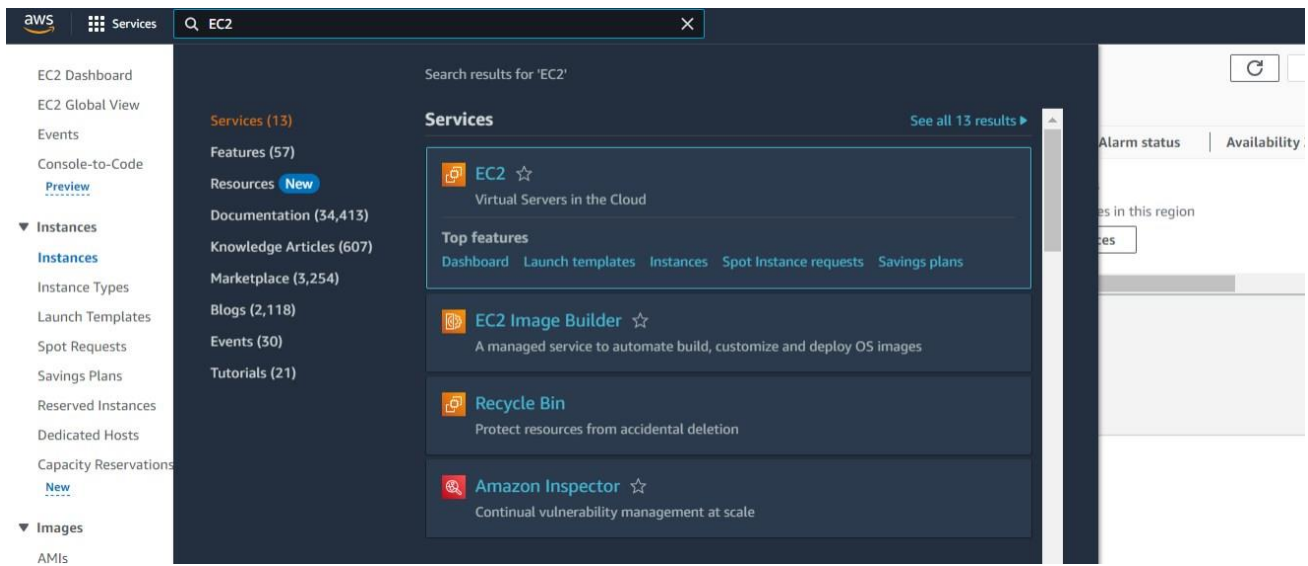
Amazon Elastic Compute Cloud (Amazon EC2) is a part of the AWS cloud platform that provides on-demand, scalable computing capacity. It allows users to launch as many or as few virtual servers as needed, manage storage, and configure security and networking. EC2 instances can be scaled up to handle compute-heavy tasks or scaled down when usage decreases.

EC2 supports the processing, storage, and transmission of credit card data by a merchant or service provider and has been validated as being compliant with Payment Card Industry (PCI) Data Security Standard (DSS). It offers various features like instances (virtual servers), Amazon Machine Images (AMIs), instance types, key pairs, instance store volumes, and Amazon EBS volumes.

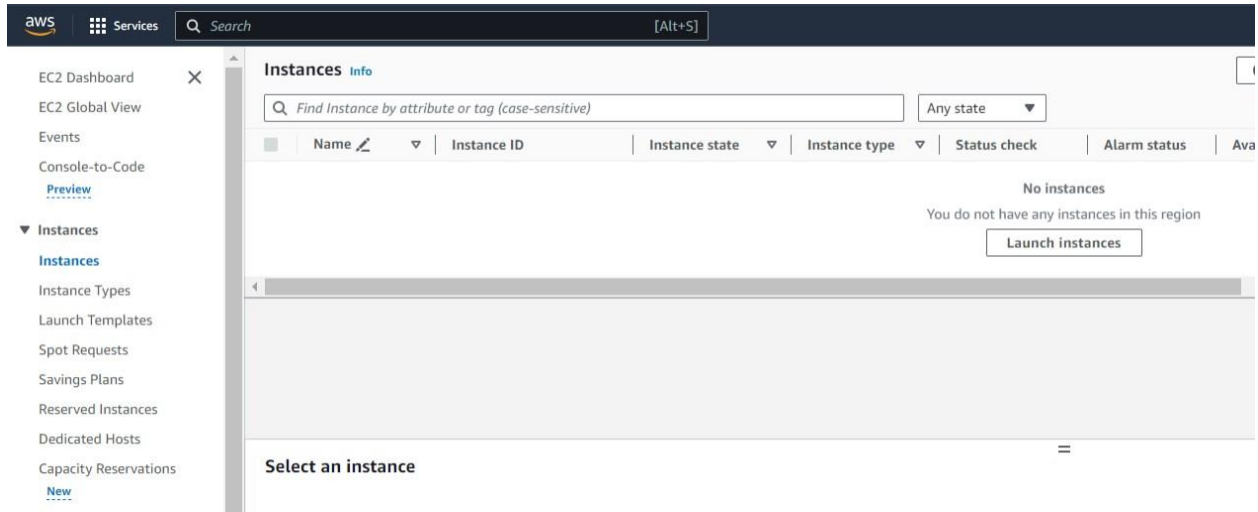
EC2 instances eliminate the up-front investment for hardware, and there is no need to maintain any rented hardware. It enables you to build and run applications faster. EC2 is secure, resizable, and scalable. These virtual machines are pre-configured with the operating systems and some of the required software. Instead of managing the infrastructure, AWS will do that so you can just launch and terminate the EC2 instance whenever you want. You can scale up and down the EC2 instance depending on the incoming traffic. The other advantage of AWS EC2 is that you need to pay only for how much you use it is like the pay-as-you-go model.

## **Implementing the windows machine using AWS EC2**

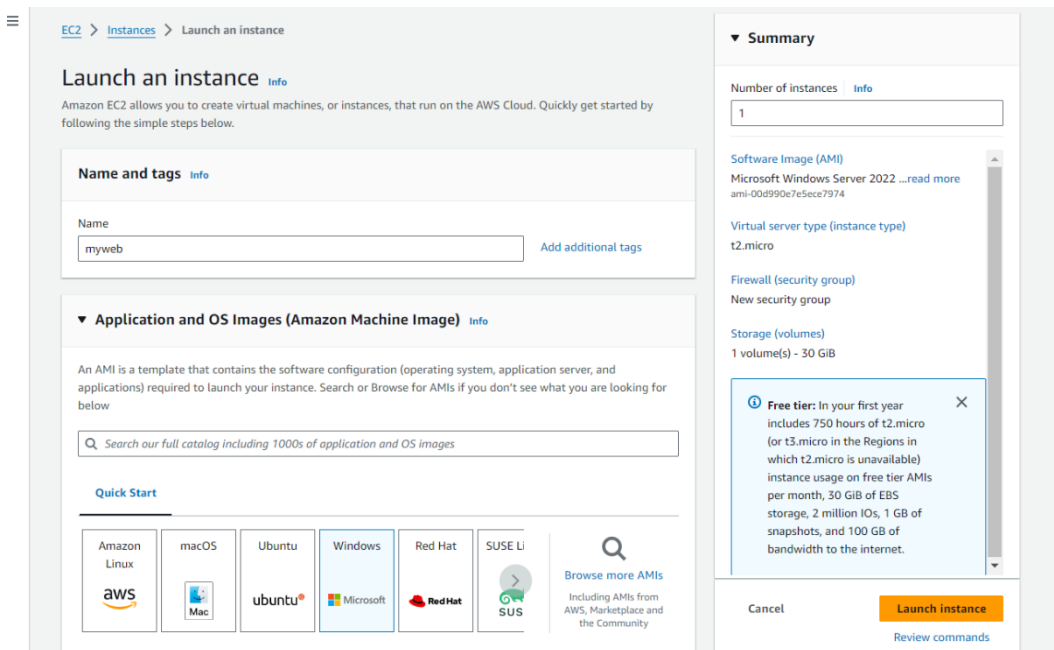
Step 1- Under AWS Dashboard select EC2



## Step 2- Select Instance under EC2 and click on launch Instance



## Step 3- Provide the name of the Instance and select Windows under Application and OS



Step 4- For key pair click on Create a new key pair and select perm and click on Create key pair

The 'Create key pair' dialog box is shown with the following details:

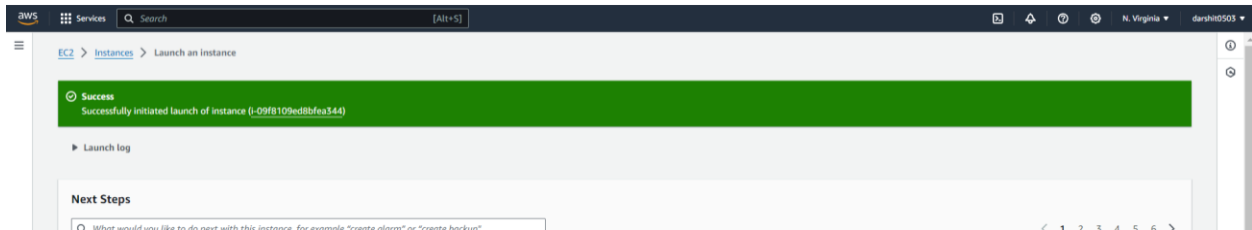
- Key pair name:** A text input field containing 'web'.
- Key pair type:** Two radio button options: 'RSA' (selected) and 'ED25519'.
- Private key file format:** Two radio button options: '.pem' (selected) and '.ppk'.
- Warning:** A yellow box with a warning icon stating: 'When prompted, store the private key in a secure and accessible location on your computer. You will need it later to connect to your instance. [Learn more](#)'.
- Buttons:** 'Cancel' and 'Create key pair'.

Step 5 – Launch the Instance Successfully

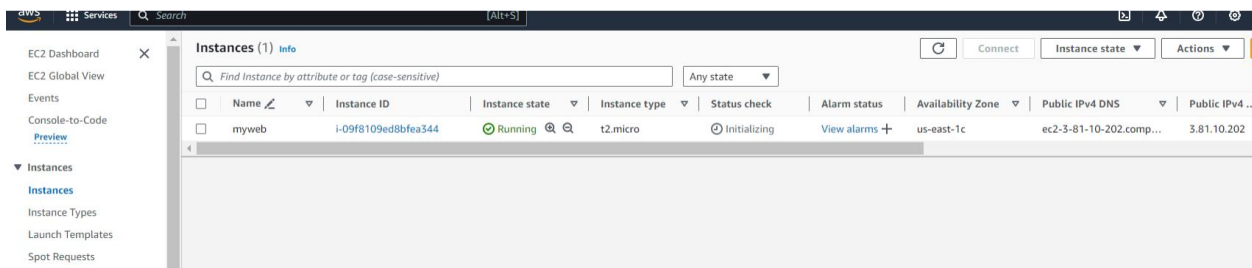
The 'Launch instance' wizard is shown with the following details:

- Allow HTTP traffic from the internet:** A checkbox that is unchecked, with a warning icon and text: 'Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.'
- Configure storage:** A section with a dropdown menu showing '1x 8 GiB gp3 Root volume (Not encrypted)'. Below it is a button 'Add new volume'.
- Free tier eligible customers:** A blue box with a warning icon stating: 'Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage'.
- Click refresh to view backup information:** A button with a refresh icon.
- 0 x File systems:** A section with an 'Edit' button.
- Advanced details:** A section with an 'Info' link.
- Software Image (AMI):** A dropdown menu showing 'Amazon Linux 2023 AMI 2023.3.2...read more'.
- Virtual server type (instance type):** A dropdown menu showing 't2.micro'.
- Firewall (security group):** A dropdown menu showing 'New security group'.
- Storage (volumes):** A section showing '1 volume(s) - 8 GiB'.
- Free tier:** A blue box with a warning icon 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, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth to the internet.'
- Buttons:** 'Cancel' and 'Launch instance'.
- Review commands:** A link below the 'Launch instance' button.

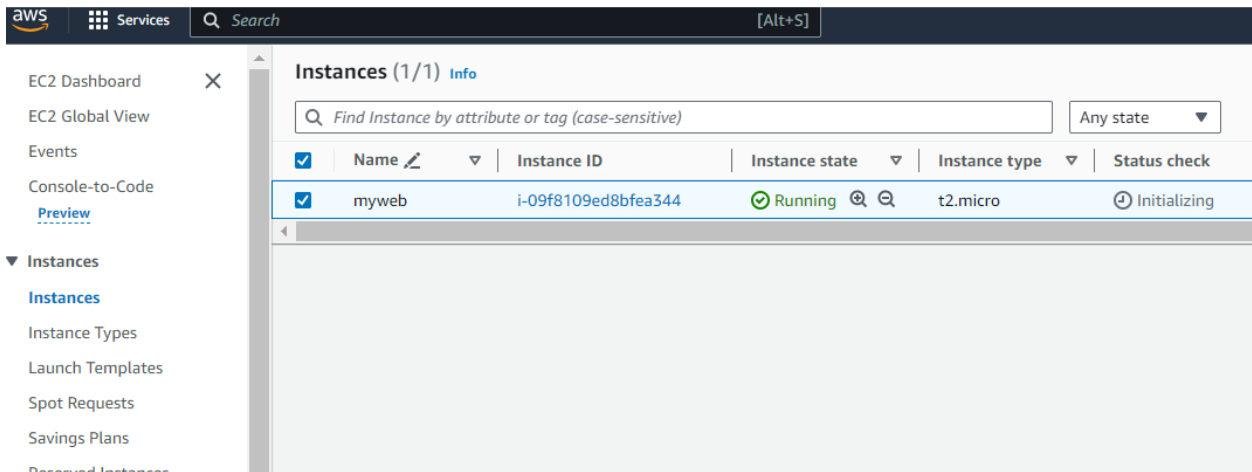
## Step 6- Instance Successfully Launched



## Step 7- Go to Instance, Refresh it and you see the launched instance



## Step 8- Select the Instance



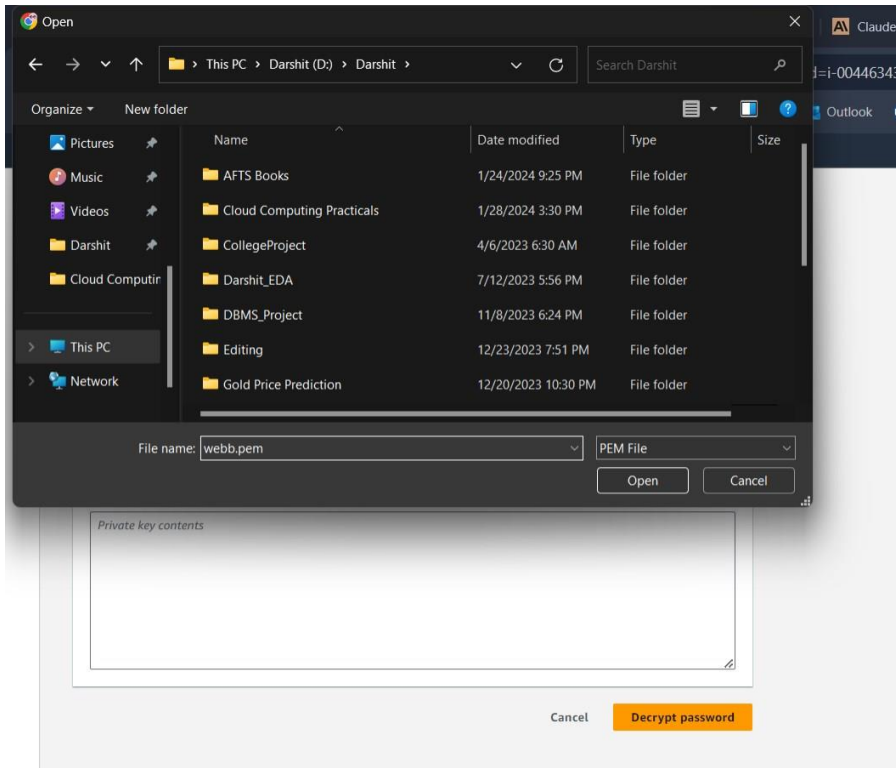
## Step 9- Click on Connect and select RDP Client

The screenshot shows the AWS Management Console interface. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and a keyboard shortcut '[Alt+S]'. Below the navigation bar, a breadcrumb trail reads 'EC2 > Instances > i-09f8109ed8bfea344 > Connect to instance'. The main heading is 'Connect to instance' with an 'Info' link. A sub-heading says 'Connect to your instance i-09f8109ed8bfea344 (myweb) using any of these options'. There are three tabs: 'Session Manager', 'RDP client' (which is selected), and 'EC2 serial console'. Under the 'RDP client' tab, the 'Instance ID' is 'i-09f8109ed8bfea344 (myweb)'. The 'Connection Type' section has two options: 'Connect using RDP client' (selected) and 'Connect using Fleet Manager'. The 'Connect using RDP client' option includes a description: 'Download a file to use with your RDP client and retrieve your password.' Below this, a message states: '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:'. There is a button 'Download remote desktop file'. Below that, it says 'When prompted, connect to your instance using the following details:'. The details are: 'Public DNS' is 'ec2-3-81-10-202.compute-1.amazonaws.com' and 'Username' is 'Administrator'. There is a 'Password' field and a 'Get password' link. A blue information box at the bottom says: 'If you've joined your instance to a directory, you can use your directory credentials to connect to your instance.'

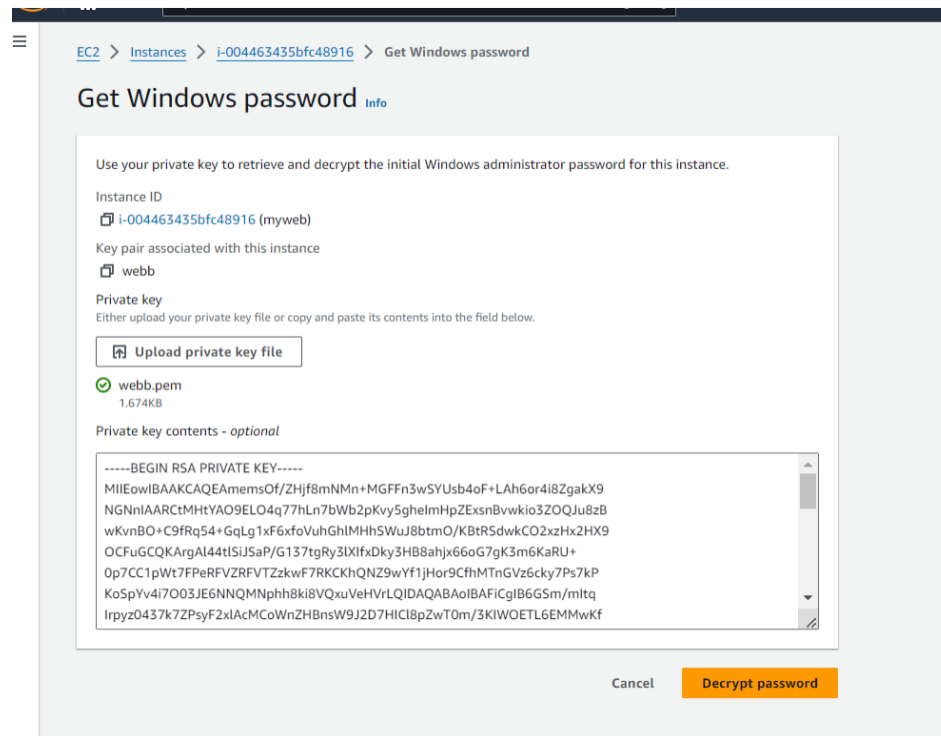
## Step 10- Click on GET PASSWORD

The screenshot shows the AWS Management Console interface. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and a keyboard shortcut '[Alt+S]'. Below the navigation bar, a breadcrumb trail reads 'EC2 > Instances > i-09f8109ed8bfea344 > Get Windows password'. The main heading is 'Get Windows password' with an 'Info' link. The text says 'Use your private key to retrieve and decrypt the initial Windows administrator password for this instance.' The 'Instance ID' is 'i-09f8109ed8bfea344 (myweb)'. The 'Key pair associated with this instance' is 'web'. The 'Private key' section says 'Either upload your private key file or copy and paste its contents into the field below.' There is a button 'Upload private key file'. Below that, it says 'Private key contents - optional'. There is a large text area for 'Private key contents'. At the bottom, there are two buttons: 'Cancel' and 'Decrypt password'.

## Step 11- Upload the key value File which got downloaded while creating a instance



## Step 12- Decrypt the Password





### Step 13- Save the password

xPmF7whmrQDULJETy?V)Ys\*WQ8.OJ9?s

Public DNS: ec2-18-209-106-160.compute-1.amazonaws.com

Username: Administrator

✓ Password copied

xPmF7whmrQDULJETy?V)Ys\*WQ8.OJ9?s

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

Cancel

### Step 14- Click on Download the Remote Desktop File .

Connect to your instance i-004463435bfc48916 (myweb) using any of these options

Session Manager | **RDP client** | EC2 serial console

Instance ID  
i-004463435bfc48916 (myweb)

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:

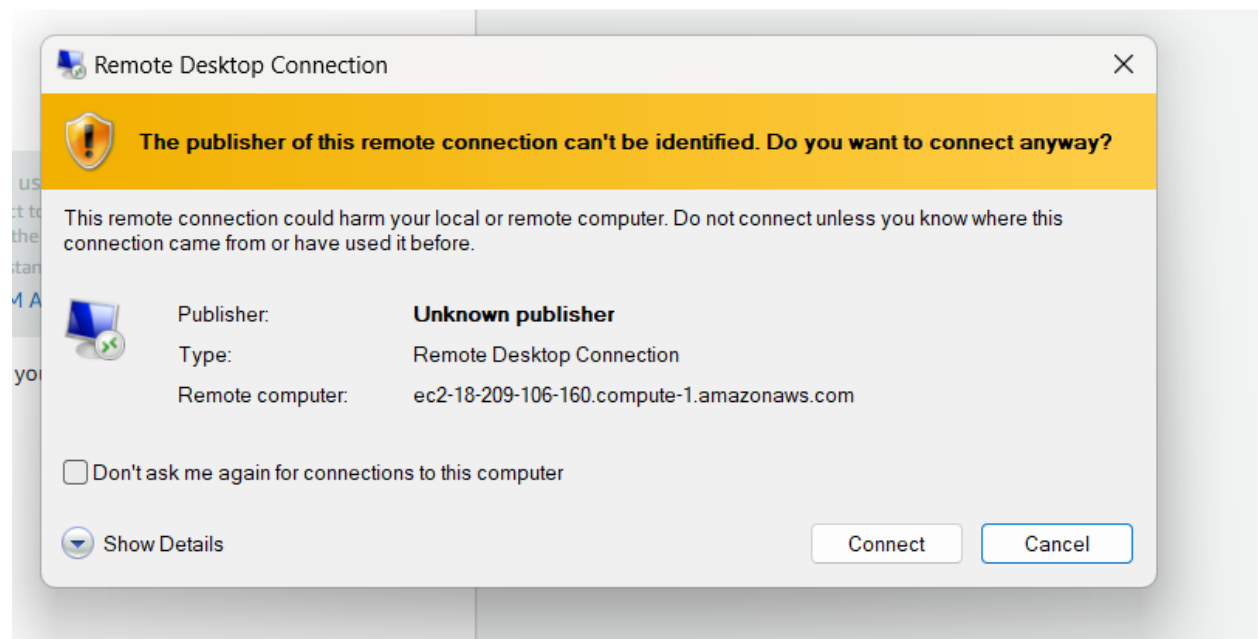
[Download remote desktop file](#)

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

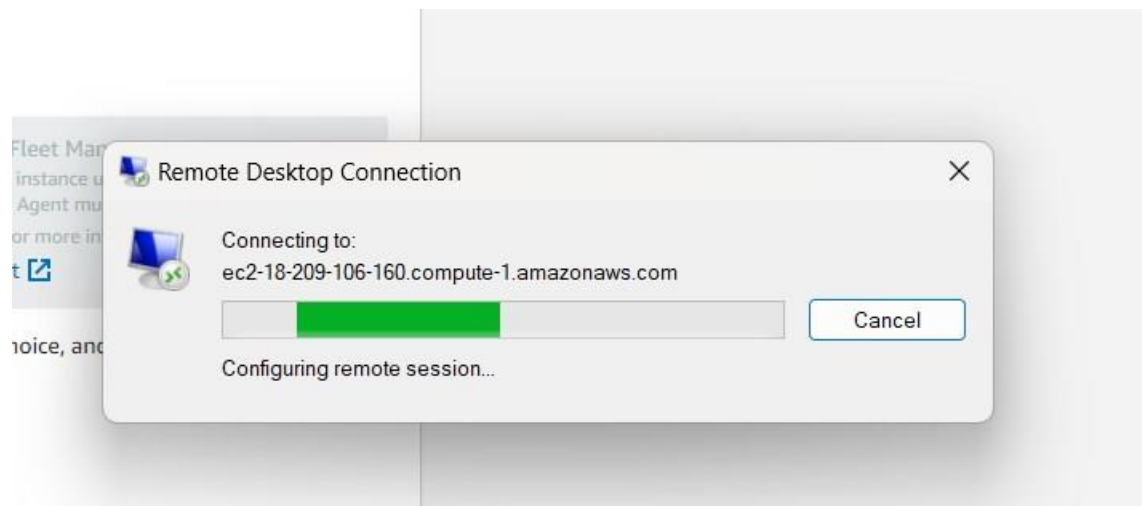
Public DNS: ec2-18-209-106-160.compute-1.amazonaws.com

Username: Administrator

#### Step 15- Open the RDP File



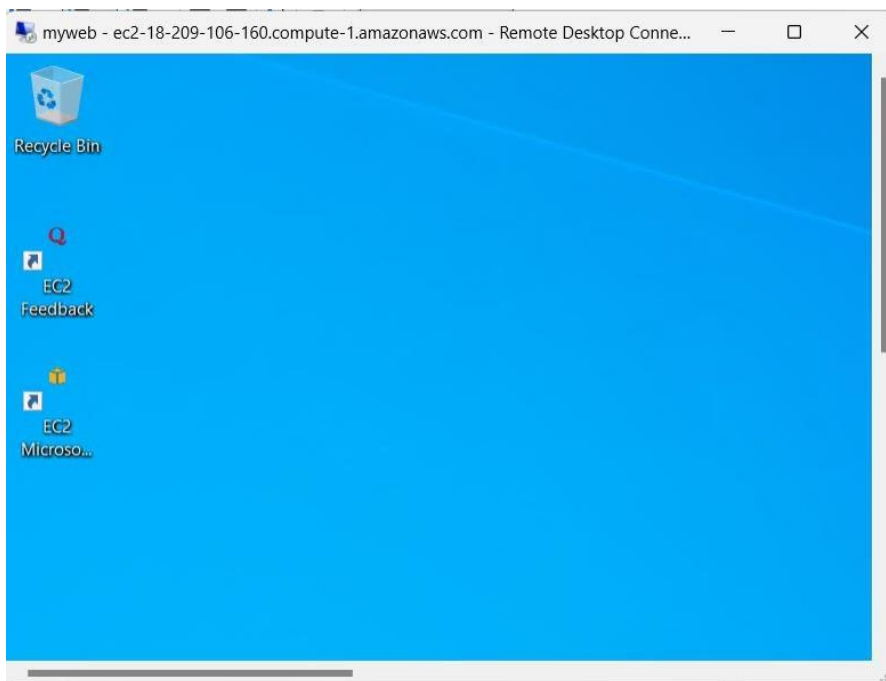
#### Step 16- Connect to the RDP



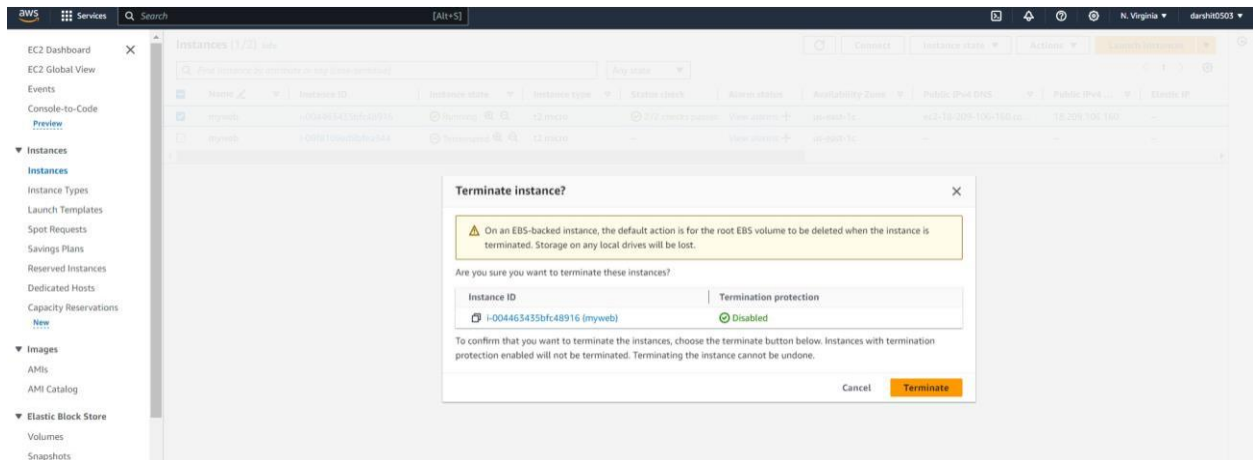
Step 17- Enter the password



Step 18- The Following Instance will popup

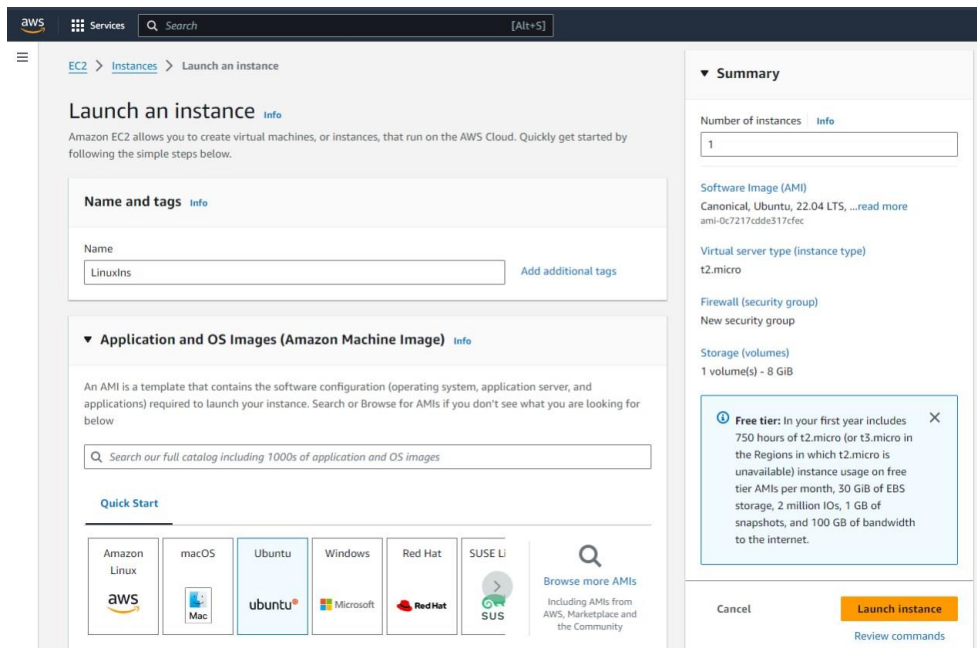


## Step 19- Close the RDP and Go to Instances and Terminate the Instance



## Implementing Ubuntu machine using AWS ec2 and execute the Linux commands.

## Step 20- Launch a New Instance for Linux and select Application and OS as Ubuntu



## Step 21- Create a key pair and select ppk under the following

**Create key pair**

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

linux

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

☒ .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

Step 22- Download Putty.exe from Google and select Alternative Binary Files (SSH and Talent Client Itself) and select 64 bit x 86

### Alternative binary files

The installer packages above will provide versions of all of these (except PuTTYtel and pterm), but you (Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

**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> )

**pscp.exe (an SCP client, i.e. command-line secure file copy)**

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

**psftp.exe (an SFTP client, i.e. general file transfer sessions much like FTP)**

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

**puttytel.exe (a Telnet-only client)**

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

## Step 22- Allow all the traffic under the Linux Instance and Launch it

**▼ Network settings** [Info](#)

Edit

Network [Info](#)

vpc-0baad39a26d377e03

Subnet [Info](#)

No preference (Default subnet in any availability zone)

Auto-assign public IP [Info](#)

Enable

Firewall (security groups) [Info](#)

A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

Create security group

Select existing security group

We'll create a new security group called 'launch-wizard-3' with the following rules:

☒ Allow SSH traffic from

Helps you connect to your instance

Anywhere  
0.0.0.0/0

☒ Allow HTTPS traffic from the internet

To set up an endpoint, for example when creating a web server

☒ Allow HTTP traffic from the internet

To set up an endpoint, for example when creating a web server

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

1

Software Image (AMI)

Canonical, Ubuntu, 22.04 LTS, ...[read more](#)  
ami-0c7217cdde317cfeec

Virtual server type (instance type)

t2.micro

Firewall (security group)

New security group

Storage (volumes)

1 volume(s) - 8 GiB

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

Cancel

Launch instance

[Review commands](#)

## Step 23- After the Instance is successfully Launched Select the particular Linux

aws Services Search [Alt+S]

EC2 Dashboard EC2 Global View Events Console-to-Code Preview

▼ Instances

Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances

Successfully terminated i-004463435bfc48916

Instances (1/3) [Info](#)

Find Instance by attribute or tag (case-sensitive) Any state

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	myweb	i-09fb109ed8bfea344	Terminated	t2.micro	-	<a href="#">View alarms</a>	us-east-1c
<input type="checkbox"/>	myweb	i-004463435bfc48916	Terminated	t2.micro	-	<a href="#">View alarms</a>	us-east-1c
<input checked="" type="checkbox"/>	Linuxlns	i-0b831c6b1de9b10fd	Running	t2.micro	Initializing	<a href="#">View alarms</a>	us-east-1c

## Step 24- Copy the Public IPV4 Address by selecting the Instance

aws Services Search [Alt+S]

EC2 Dashboard EC2 Global View Events Console-to-Code Preview

▼ Instances

Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances

EC2 > Instances > i-0b831c6b1de9b10fd

Instance summary for i-0b831c6b1de9b10fd (Linuxlns)

Updated less than a minute ago

Instance ID

i-0b831c6b1de9b10fd (Linuxlns)

IPv6 address

-

Hostname type

IP name: ip-172-31-40-196.ec2.internal

Answer private resource DNS name

Public IPv4 address copied

54.80.176.156 [open address](#)

Instance state

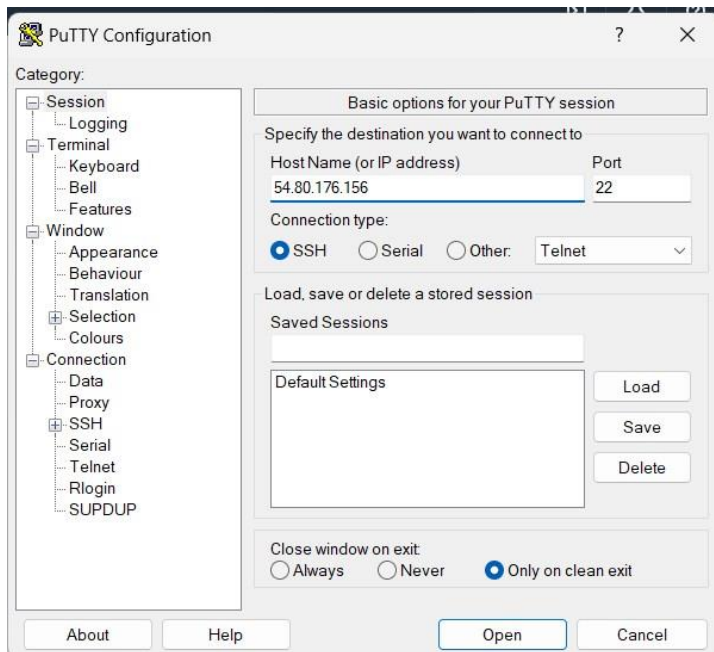
Running

Private IP DNS name (IPv4 only)

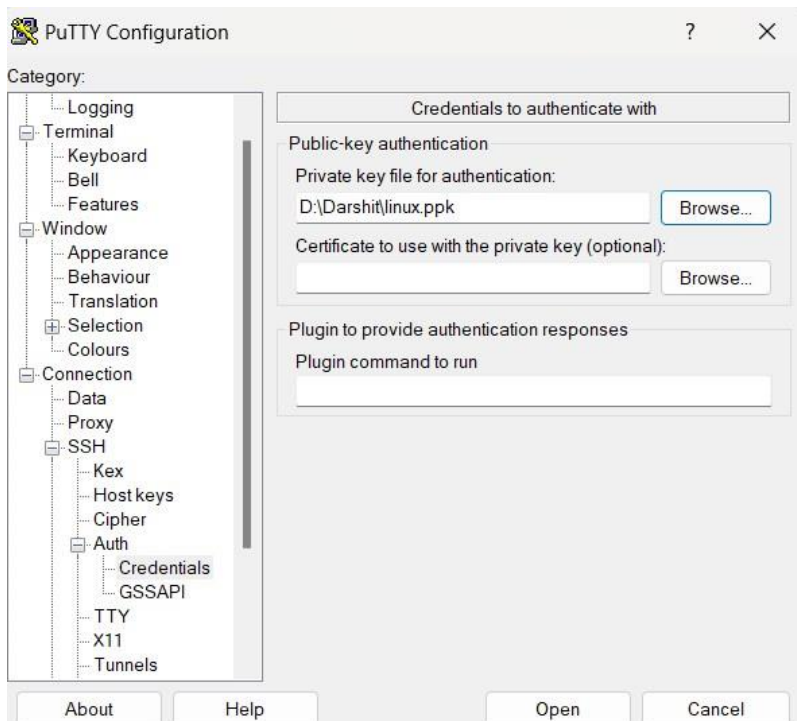
ip-172-31-40-196.ec2.internal

Instance type

## Step 25- Go to Putty and Paste the IP Address Copied



## Step 26- Under the Putty Select Category -> SSH -> Auth -> Credentials -> Browse and select ppk file





Step 27- Click on open and "ACCEPT" and the following popup will appear as Ubuntu Name

```
ubuntu@ip-172-31-40-196: ~  
login as: ubuntu  
Authenticating with public key "linux"  
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1017-aws x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
System information as of Sun Jan 28 11:02:56 UTC 2024  
  
System load:  0.24853515625      Processes:            100  
Usage of /:   20.6% of 7.57GB    Users logged in:     0  
Memory usage: 21%               IPv4 address for eth0: 172.31.40.196  
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.
```

Step 28- Run the Following Commands in Putty

```
ubuntu@ip-172-31-40-196: ~/tinan  
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-172-31-40-196:~$ mkdir tinan  
ubuntu@ip-172-31-40-196:~$ ls  
tinan  
ubuntu@ip-172-31-40-196:~$ cd tinan  
ubuntu@ip-172-31-40-196:~/tinan$ touch ubb.txt  
ubuntu@ip-172-31-40-196:~/tinan$ ls  
ubb.txt  
ubuntu@ip-172-31-40-196:~/tinan$ ubb.txt  
ubb.txt: command not found  
ubuntu@ip-172-31-40-196:~/tinan$ cat > ubb.txt  
Hello Darshit  
^Z  
[1]+  Stopped                  cat > ubb.txt  
ubuntu@ip-172-31-40-196:~/tinan$ cat ubb.txt  
Hello Darshit  
ubuntu@ip-172-31-40-196:~/tinan$
```



Step 29- Run the Following Python Code in Ubuntu

```
ubuntu@ip-172-31-40-196:~$ mkdir test
ubuntu@ip-172-31-40-196:~$ cd test
ubuntu@ip-172-31-40-196:~/test$ cat > hello.py
Hello World
^Z
[2]+  Stopped                  cat > hello.py
ubuntu@ip-172-31-40-196:~/test$ python3 hello.py
  File "/home/ubuntu/test/hello.py", line 1
    Hello World
    ^^^^^
SyntaxError: invalid syntax
ubuntu@ip-172-31-40-196:~/test$ cat > hello.py
print("Hello World")
^Z
[3]+  Stopped                  cat > hello.py
ubuntu@ip-172-31-40-196:~/test$ python3 hello.py
Hello World
ubuntu@ip-172-31-40-196:~/test$
```

Step 30- Terminate the Instance and Close Putty