

Experiment No. 02

Title: Creating Linux/Windows Virtual Machine
Instance using AWS (IaaS)

Aim:

- 1) To create a Windows Virtual Machine (VM) instance in AWS using RDP (Remote Desktop Protocol).
 - 2) To create a Linux Virtual Machine (VM) instance in AWS and connect with PuTTY.
-

Resources needed: AWS (Amazon Web Services), PuTTY

Theory:**What is a virtual machine?**

In its simplest form, a virtual machine, or VM, is a digitized version of a physical computer. Virtual machines can run programs and operating systems, store data, connect to networks, and do other computing functions. However, a VM uses entirely virtual resources instead of physical components. VMs enable businesses to create isolated environments on host hardware that behave like separate machines.

A VM is a virtualized environment of a physical computer. It can perform almost all of the same functions, including running applications and operating systems.

How do virtual machines work?

Virtual machines use virtualization technology to create virtual hardware—or a virtual version of a computer on a physical machine. The physical machine on which the VMs run is called the host, and the VMs running on the host are called guests. Each guest VM runs on an isolated partition on the host, completely separated from other guests. You can host multiple VMs on a single host machine, often a server, running on a software layer known as the hypervisor. The hypervisor abstracts the host machine's physical resources, such as compute, memory, or storage, into a pool that can be provisioned and dynamically allocated to guest VMs as needed, providing more flexibility and increasing overall efficiency.

IaaS (Infrastructure as a Service): AWS EC2 (Elastic Compute Cloud) is a cloud-based IaaS offering that provides scalable compute resources. It allows users to create and manage virtual machines (VMs), known as EC2 instances, with various configurations based on performance and resource needs.

Amazon EC2 (Elastic Compute Cloud): EC2 instances are virtual servers in AWS, where users can run applications, store data, and access computing resources as needed. EC2 instances can be configured with different operating systems, including various versions of Windows.

Windows AMI (Amazon Machine Image): AWS provides pre-configured machine images

for different operating systems, including Windows. A Windows-based AMI will be used to create the VM instance.

RDP (Remote Desktop Protocol): RDP is a protocol used to remotely access Windows-based computers. It allows users to control the desktop of the instance as if they were physically present, making it ideal for managing Windows servers and applications.

Linux AMI: Just like for Windows, AWS provides pre-configured Amazon Machine Images (AMIs) for Linux-based operating systems, such as Ubuntu, CentOS, and Amazon Linux. The Linux VM will be based on one of these AMIs.

SSH (Secure Shell): SSH is a cryptographic network protocol used to securely connect to a remote machine (Linux in this case) through the command line. PuTTY is used on Windows systems to establish this SSH connection.

Procedure:

- 1. Launch and connect to a Window instance and execute a simple program.**
 - 2. Launch and connect to a Linux instance and execute a simple program.**
-

Procedure for Windows VM (using RDP):

- 1) Launch EC2 Instance for Windows:**
 - a) Log in to the AWS Management Console.
 - b) Navigate to EC2 and click on Launch Instance.
 - c) Choose a Windows AMI (e.g., Windows Server 2019 or 2022).
 - d) Select the instance type based on your requirements (e.g., t3.micro for light workloads).
 - e) In the Key Pair section, select or create a new key pair. Make sure to download the .pem file, which will be used to get the administrator password.
 - 2) Configure Networking and Security:**
 - a) Set up a Security Group to allow inbound RDP traffic:
 - b) Open port 3389 (default for RDP) and allow access from your IP address for security reasons.
 - c) Ensure that the VPC and subnet settings are correct for internet access.
 - 3) Download the RDP File:**
 - a) After the instance is created, go to the Instances dashboard.
 - b) Select your instance and click Connect.
 - c) Under RDP Client, download the RDP file.
 - d) Use the Administrator Password (retrieved from the .pem file) to log in to the Windows instance using RDP.
 - 4) Connect via RDP:**
 - a) Open Remote Desktop Connection on your local machine.
 - b) Enter the Elastic IP or Public IP of the Windows instance.
 - c) Use the administrator password to log in.
-

Procedure for Linux VM (Using PuTTY):

1) Launch EC2 Instance for Linux:

- a) Log in to the AWS Management Console.
- b) Navigate to EC2 and click on Launch Instance.
- c) Choose a Linux AMI (e.g., Ubuntu, Amazon Linux, or CentOS).
- d) Select the instance type (e.g., t3.micro).
- e) In the Key Pair section, choose an existing key pair or create a new one. Download the .ppk file directly from AWS (you can skip conversion if the .ppk file is downloaded).

2) Configure Networking and Security:

- a) Set up a Security Group to allow inbound SSH traffic on port 22 from your IP address.

3) Access the Instance via PuTTY:

- a) Open PuTTY on your local machine.
- b) Enter the Elastic IP or Public IP of your Linux instance in the Host Name field.
- c) Under Connection > SSH > Auth, browse and select the .ppk file that you downloaded.
- d) Click Open to initiate the SSH connection.

4) Login to the Instance:

- a) When prompted, log in using the default username for your Linux AMI (e.g., ubuntu for Ubuntu, ec2-user for Amazon Linux).
 - b) You will now have SSH access to your Linux instance.
-

Results: (Attach the snapshots of execution)

Windows Virtual Machine (VM) instance in AWS

The screenshot shows the AWS Console Home page. On the left, under 'Recently visited', there are links for EC2, VPC, and Amazon Managed Blockchain. On the right, the 'Applications' section is displayed with a message 'Access denied' highlighted in red. A 'Create application' button is also visible.

The screenshot shows the AWS EC2 Dashboard for the Europe (Stockholm) Region. The left sidebar includes sections for Instances, Images, Elastic Block Store, Network & Security, and Load Balancing. The main area displays resource counts (Instances running: 1, Auto Scaling Groups: 0, Capacity Reservations: 0, etc.) and various monitoring and configuration tools like Launch instance, Instance alarms, and Scheduled events.

The screenshot shows the 'Launch an instance' wizard. It starts with a summary of the instance details: Name (GROUP-ABCD), Software Image (AMI) (Microsoft Windows Server 2022), Virtual server type (instance type) (t2.micro), Firewall (security group) (New security group), and Storage (volumes) (1 volume(s) - 30 GiB). The 'Launch instance' button is at the bottom right.

Screenshot of the AWS EC2 Launch Instance wizard step 3: Select an existing key pair or create a key pair.

Key pair name - required

For Windows instances, you use a key pair to decrypt the administrator password. You must select a key pair when launching a Windows instance.

Network settings

- Network: vpc-0daacb5bb1e54bb9
- Subnet: No preference (Default subnet in any availability zone)
- Auto-assign public IP: Enabled
- Firewall (security groups): Create security group (selected)
- Allow RDP traffic from anywhere
- Allow HTTPS traffic from the internet
- Allow HTTP traffic from the internet
- Rules with source of 0.0.0.0/0 allow all IP addresses to access your known IP addresses only.

Configure storage

- Root volume: 3000 GiB (Amazon EBS)

Select an existing key pair or create a key pair

We noticed that you didn't select a key pair. If you want to be able to connect to your instance it is recommended that you create one or select an existing one.

Existing key pair Create new key pair

Proceed without key pair

Key pair name

Key pairs allow you to connect to your instance securely.

ABCD

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 pk 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](#)

Summary

Number of instances: 1

Software Image (AMI): Microsoft Windows Server 2025...read more

Virtual server type (instance type): t3.micro

Firewall (security group): New security group

Storage (volumes): volume(s) - 30 GiB

Free tier: In your first year of opening an AWS account, you get 750 hours per month of t2.micro instance usage (or t3.micro where t2.micro isn't available) when used with free tier AMIs, 750 hours per month of public IPv4 address usage, 30 GiB of EBS storage, 2 million I/Os, 1 GB of snapshots, and 100 GB of bandwidth to the internet.

Cancel Launch instance Preview code

Screenshot of the AWS EC2 Launch Instance wizard step 4: Success.

Success
Successfully initiated launch of instance i-000835116acbcd41c

Launch log

Next Steps

Q: What would you like to do next with this instance, for example "create alarm" or "create backup"

Create billing and free tier usage alerts

To manage costs and avoid surprise bills, set up email notifications for billing and free tier usage thresholds.

[Create billing alerts](#)

Connect to your instance

Once your instance is running, log into it from your local computer.

[Connect to instance](#) [Learn more](#)

Connect an RDS database

Configure the connection between an EC2 instance and a database to allow traffic flow between them.

[Connect an RDS database](#) [Create a new RDS database](#) [Learn more](#)

Create EBS snapshot policy

Create a policy that automates the creation, retention, and deletion of EBS snapshots.

[Create EBS snapshot policy](#)

Manage detailed monitoring

Enable or disable detailed monitoring for the instance. If you enable detailed monitoring, the Amazon EC2 console displays monitoring graphs with a 1-minute period.

[Manage detailed monitoring](#)

Create Load Balancer

Create a application, network gateway or classic Elastic Load Balancer.

[Create Load Balancer](#)

Get instance screenshot

Capture a screenshot from the instance and view it as an image. This is useful for troubleshooting an unreachable instance.

[Get instance screenshot](#)

Get system log

View the instance's system log to troubleshoot issues.

[Get system log](#)

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Screenshot of the AWS EC2 Instances page.

EC2

- Dashboard
- EC2 Global View
- Events
- Instances**
- Instances
- Instance Types
- Launch Templates
- Spot Requests
- Savings Plans
- Reserved Instances
- Dedicated Hosts
- Capacity Reservations
- Images**
- AMIs
- AMI Catalog
- Elastic Block Store**
- Volumes
- Snapshots
- Lifecycle Manager
- Network & Security**
- Security Groups
- Elastic IPs
- Placement Groups
- Key Pairs
- Network Interfaces
- Load Balancing**

Instances (3) Info

IPV4 ...	Elastic IP	IPv6 IPs	Monitoring	Security group name	Key name	Last updated	Launch time	Platform...	Managed	Operator
0.220.244	-	-	disabled	launch-wizard-20	ABCD	less than a minute ago	2025/03/12 15:26 GMT+5:30	Windows	false	-
.18.211	-	-	disabled	launch-wizard-19	B1		2025/03/12 15:24 GMT+5:30	Linux/UNIX	false	-
.185.238	-	-	disabled	launch-wizard-18	Group-B1		2025/03/12 15:15 GMT+5:30	Linux/UNIX	false	-

Select an instance

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Instance summary for i-000835116acbcd41c (GROUP-ABCD)

- Public IPv4 address:** 16.170.220.244 [open address]
- Instance state:** Running
- Private IP4 addresses:** 172.31.27.95
- Public IPv4 DNS:** ec2-16-170-220-244.eu-north-1.compute.amazonaws.com [open address]
- Elastic IP addresses:** -
- AWS Compute Optimizer finding:** It is taking a bit longer than usual to fetch your data
- Auto Scaling Group name:** Managed

Details | Status and alarms | Monitoring | Security | Networking | Storage | Tags

Instance details

AMI ID: ami-0e06e610ffe146fe	Monitoring: disabled	Platform details: Windows
AMI name: Windows_Server-2025-English-Full-Base-2025.02.13	Allowed image: -	Termination protection: Disabled
Launch time: -		

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](#)

Get Windows password

Use your private key to retrieve and decrypt the initial Windows administrator password for this instance.

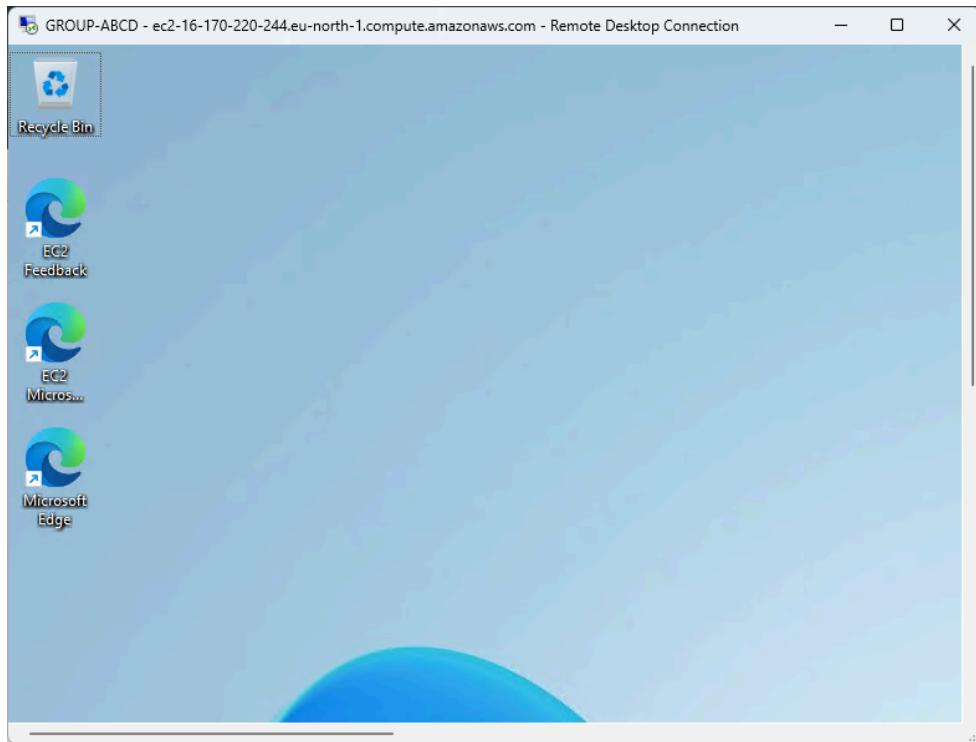
Instance ID: i-000835116acbcd41c (GROUP-ABCD)

Key pair associated with this instance: ABCD

Private key: Either upload your private key file or copy and paste its contents into the field below.

Private key contents - optional:

```
-----BEGIN RSA PRIVATE KEY-----
MIIEABAAQCAQEAyAUP2PzPdGr7FLz7h9FKzEL5Rq7o+XOz1s5w4B4hgJlsFQdC
O0+fk+oF7hpjhGd3+Tdfy+ZWhfNSD1nTJBj0Kfm+38KzVzZ305NhTMpAPrmP
H2Wp1o+o233XWm7TrxR8pm6focFB0n1XFJKx2yZjfcig6iAX1h;gKPhngsdKO
vSFuS10xfhbm1Fdaf2mpf5qu+QNK80IDBCrJbaZv9l6nVCN/29AwXKY2r
HKjV2jplIDAdCstVCMu/xUB5blcfZxt0oQJUqJUqyR6gUAHsIE0Ng/qzc0wy
gsxwZURux1Jv+JHTkMPh+DyAm3iuFdHO1EtvQlTAQABAoiBAFB+H052nMMcu/JF
du8kq28QErmSpfipHIEb1GKFnlGJLuld/lvCW5e/enq59WNsf0tHoKcIfhjSqVi
-----END RSA PRIVATE KEY-----
```



Linux Virtual Machine (VM) instance in AWS

The screenshot shows the AWS CloudFormation console interface for launching a new instance.

Launch an instance

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

Name: Group-B1

Application and OS Images (Amazon Machine Image)

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

Summary

Number of instances: 1

Software Image (AMI): Amazon Linux 2023 AMI 2023.3.2...read more
ami-0d63de463e6604d0a

Virtual server type (instance type): t2.micro

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 8 GiB

Cancel Launch instance Review commands

Quick Start

Amazon Machine Image (AMI)

Amazon Linux 2023 AMI
ami-0d63de463e6604d0a (64-bit (x86), uefi-preferred) / ami-007766fc294fad510 (64-bit (Arm), uefi)
Virtualization: hvm ENA enabled: true Root device type: ebs

Free tier eligible

Description

Amazon Linux 2023 AMI 2023.3.20240131.0 x86_64 HVM kernel-6.1

Architecture: 64-bit (x86) Boot mode: uefi-preferred AMI ID: ami-0d63de463e6604d0a Verified provider

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Create key pair

X

Key pair name

Key pairs allow you to connect to your instance securely.

Group-B1

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

The screenshot shows the 'Create key pair' step of the AWS EC2 Launch Instance wizard. The key pair 'Group-B1' is selected. A note at the bottom of the form says: '⚠️ 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'. The 'Create key pair' button is highlighted in orange.

Success
Successfully initiated launch of instance i-093c52702577729f6

Next Steps

What would you like to do next with this instance, for example "create alarm" or "create backup".

- Create billing and free tier usage alerts**
- Connect to your instance**
- Connect an RDS database**
- Create EBS snapshot policy**
- Manage detailed monitoring**
- Create Load Balancer**
- Create AWS budget**
- Manage CloudWatch alarms**
- Disaster recovery for your instances**
- Monitor for suspicious runtime activities**
- Get instance screenshot**
- Get system log**

The screenshot shows the AWS EC2 Instances page. A new instance named 'Group-B1' is listed with the ID i-093c52702577729f6. The instance is currently running. Its Public IPv4 address is 16.16.185.238. The page also displays other details such as the instance type (t3.micro), status check (initializing), and network information (VPC ID, Subnet ID, Instance ARN).

Instances (1/1) Info

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 IP	Elastic IP
Group-B1	i-093c52702577729f6	Running	t3.micro	Initializing		eu-north-1a	ec2-16-16-185-238.eu...	16.16.185.238	-

i-093c52702577729f6 (Group-B1)

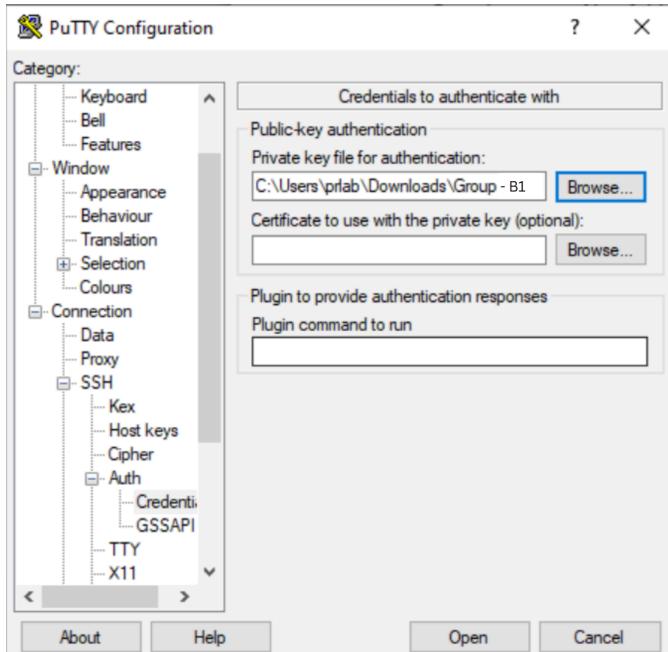
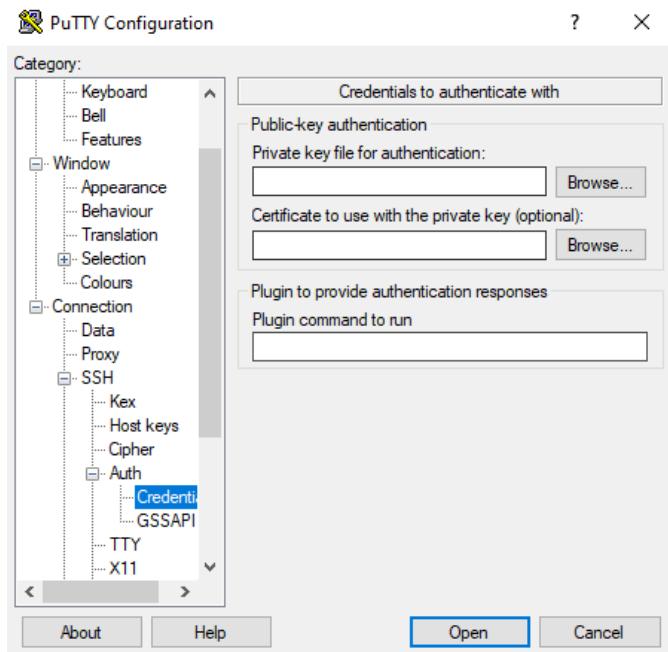
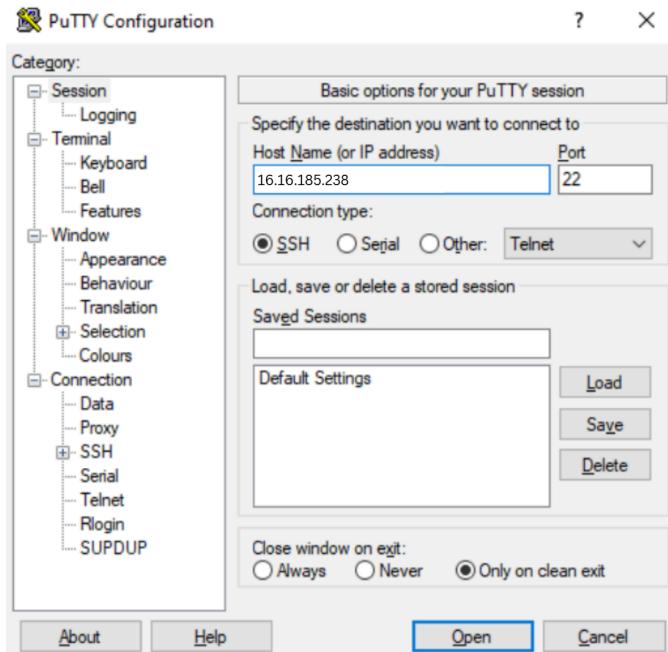
Details

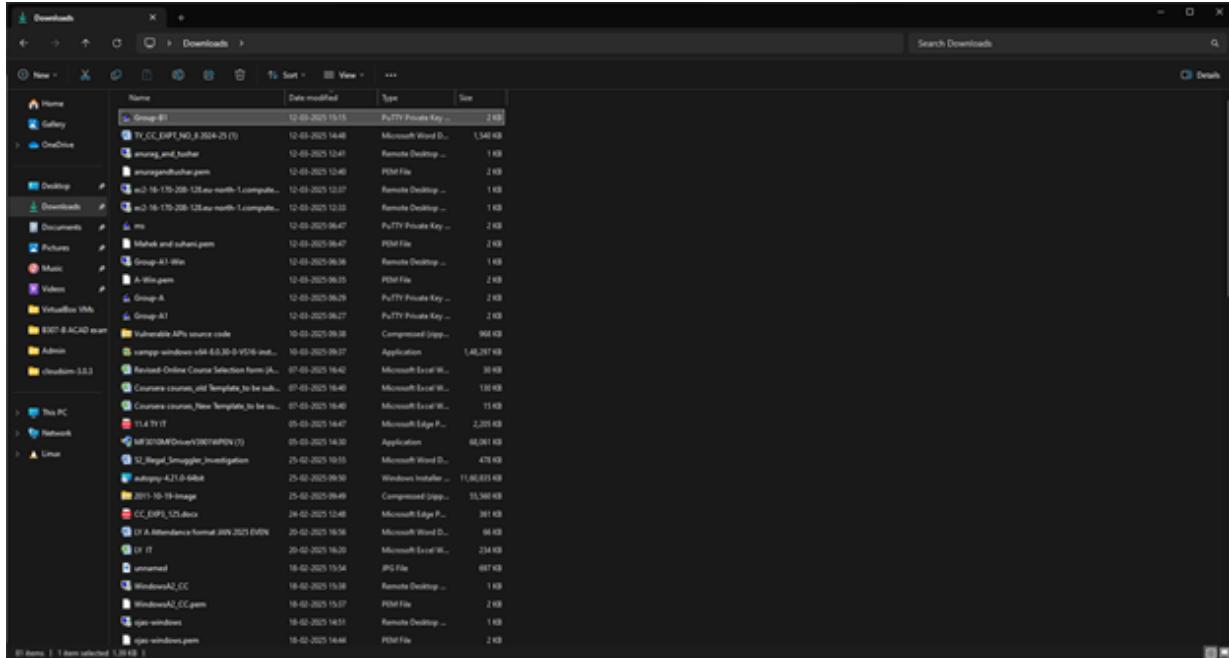
Instance summary

Images

Network & Security

Load Balancing





```

ec2-user@ip-172-31-23-170:~ 
[1] login as: ec2-user
[2] Authenticating with public key "Group-B1" from agent
[3]
[4]      #
[5]      #####          Amazon Linux 2023
[6]      \###\
[7]      \###|          https://aws.amazon.com/linux/amazon-linux-2023
[8]      \|/  _>
[9]      V~' '-->
[10]     /
[11]     /
[12]     /`--/
[13]     /m/
[14] [ec2-user@ip-172-31-23-170 ~]$ 

```

Questions:

(1) Explain two examples of each IaaS, PaaS and SaaS services.

1. Infrastructure as a Service (IaaS)

IaaS provides virtualized computing resources over the internet, such as servers, storage, and networking.

- **Amazon Web Services (AWS EC2)** – AWS Elastic Compute Cloud (EC2) provides scalable virtual servers, allowing businesses to host applications and manage their own infrastructure.
- **Google Compute Engine (GCE)** – Offers virtual machines on Google's infrastructure, enabling users to deploy, manage, and scale applications without investing in physical hardware.

2. Platform as a Service (PaaS)

PaaS provides a development platform with tools and services needed to build, test, and deploy applications.

- **Google App Engine** – A fully managed platform that allows developers to build and deploy applications without managing the underlying infrastructure.
- **Microsoft Azure App Services** – Provides a cloud-based environment for hosting and managing web applications, APIs, and mobile backends with built-in scaling and security features.

3. Software as a Service (SaaS)

SaaS delivers fully developed software applications that users can access via a web browser without installing anything on their devices.

- **Google Workspace (Gmail, Docs, Sheets)** – A suite of cloud-based productivity tools that allow users to collaborate in real time.
- **Salesforce** – A cloud-based customer relationship management (CRM) software used by businesses to manage sales, customer support, and marketing automation.

Outcomes: CO2 — Study the Evolution of Cloud Computing and its models

Conclusion: (Conclusion to be based on the objectives and outcomes achieved)

This experiment demonstrates the creation of both Windows and Linux virtual machines (VMs) on AWS, utilizing RDP for accessing the Windows instance and SSH via PuTTY for accessing the Linux instance. AWS EC2 instances provide flexible, on-demand compute resources, allowing users to run applications on both Windows and Linux environments remotely. By using RDP for graphical access to the Windows instance and SSH with PuTTY for Linux, users can effectively manage both operating systems in a secure and scalable cloud environment. Additionally, the direct download of .pem and .ppk files from AWS simplifies the setup process without requiring conversion, ensuring efficient access to the virtual machines.

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of faculty in-charge with date

References:

Books/ Journals/ Websites:

1. <https://azure.microsoft.com/en-us/free/students/>
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