

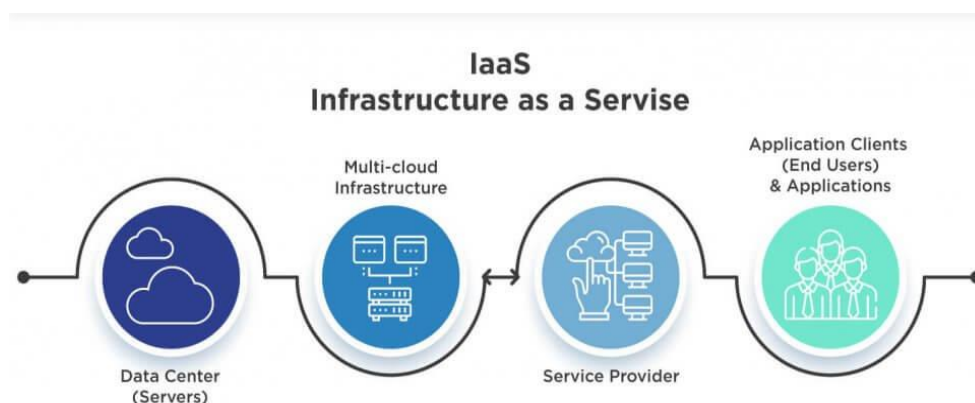
Experiment No. 4

Aim: To study and Implement Infrastructure as a Service using AWS/Microsoft Azure.

Requirements: Windows/Mac/Linux O.S, AWS/Azure account and Remmina for Linux.

Theory:

Infrastructure as a service: IaaS provides businesses with ready-to-use IT infrastructure: development environment, private networks, secure data storage, instruments for software development and testing, functionality monitoring, etc. The enterprises don't need to build and secure their own IT infrastructure — they fully power the development process with third-party servers and cloud backup storage.



Examples of IaaS:

Amazon Web Services: a public cloud that offers subscribers access to virtual servers for product deployment, Cloud storage, tools for development, testing, and analytics. The application provides a ready-to-use environment to develop and test the product and offers the full cloud infrastructure for its deployment and maintenance.

Microsoft Azure: the combination of IaaS and platform as a service, the software offers 100+ services for software development, administration, and deployment, provides tools for working with innovative technologies (big data, machine learning, Internet of Things), etc.

IBM Infrastructure: IBM uses its in-house services to store the data of infrastructure users, enabling remote data access via Cloud computing. IBM servers support AI, block chain, and the Internet of Things. The infrastructure also provides Cloud storage and virtual development environments, enabled on the subscription basis.

Google Cloud Infrastructure: the large network of international servers that provides users access to remote Cloud data centres. Companies can store their information in Asia, Europe, and Latin America, which minimizes the risk of a security breach.

Implementation:

1. Creating Virtual Machine in Azure:

i) Basics

The screenshot shows the 'Create a virtual machine' page in the Microsoft Azure portal, specifically the 'Basics' tab. The page is for creating a new virtual machine. The left sidebar shows the 'Virtual machines' section with a 'Create' button and a 'Switch to classic' link. The main content area is titled 'Create a virtual machine' and contains the following fields and options:

- Subscription:** Azure for Students
- Resource group:** CCL
- Instance details:**
 - Virtual machine name:** adnan
 - Region:** (Asia Pacific) Central India
 - Availability options:** No infrastructure redundancy required
 - Security type:** Standard
 - Image:** Windows 10 Pro, version 20H2 - Gen2
 - Azure Spot instance:** ☐
 - Size:** Standard_DS2_v3 - 2 vcpus, 8 GiB memory (₹5,522.27/month)
- Administrator account:**
 - Username:** adnan
 - Password:** [masked]
 - Confirm password:** [masked]
- Inbound port rules:** Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.
- Public inbound ports:** ☐ None, ☒ Allow selected ports

At the bottom, there are buttons for 'Review + create', '< Previous', and 'Next: Disks >'.

ii) Disks

The screenshot shows the 'Create a virtual machine' page in the Microsoft Azure portal, specifically the 'Disks' tab. The page is for configuring the disks for the virtual machine. The left sidebar is the same as the previous screenshot. The main content area is titled 'Create a virtual machine' and contains the following fields and options:

- Basics** | **Disks** | Networking | Management | Advanced | Tags | Review + create
- OS disk type:** Premium SSD (locally-redundant storage)
- Delete with VM:** ☒
- Encryption at host:** ☐
- Encryption type:** (Default) Encryption at rest with a platform-managed key
- Enable Ultra Disk compatibility:** ☐
- Data disks for adnan:** You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.
- Table:**

LUN	Name	Size (GiB)	Disk type	Host caching	Delete with VM
- Buttons:** Create and attach a new disk, Attach an existing disk
- Advanced:** [Collapsible section]

At the bottom, there are buttons for 'Review + create', '< Previous', and 'Next: Networking >'.

iii) Network

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with 'Virtual machines' and a 'No virtual machines to display' message. The main content area is titled 'Create a virtual machine' and shows the 'Network interface' configuration step. The configuration includes:

- Virtual network:** CCL-vnet (with a 'Create new' link)
- Subnet:** default: (10.0.0.0/24) (with a 'Manage subnet configuration' link)
- Public IP:** [new] adnan-ip (with a 'Create new' link)
- NIC network security group:** Basic (selected), with options for None or Advanced.
- Public inbound ports:** Allow selected ports (selected), with options for None or Allow selected ports.
- Select inbound ports:** RDP (3389)
- Warning:** This will allow all IP addresses to access your virtual machine. This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.
- Delete public IP and NIC when VM is deleted:** Checked.
- Accelerated networking:** Checked.
- Load balancing:** Section header.

At the bottom, there are buttons for 'Review + create', '< Previous', and 'Next: Management >'.

iv) Management

The screenshot shows the Microsoft Azure portal interface, continuing from the previous step. The main content area is titled 'Create a virtual machine' and shows the 'Monitoring' and 'Identity' configuration steps. The configuration includes:

- Monitoring:**
 - Boot diagnostics:** Enable with managed storage account (recommended) (selected), with options for Enable with custom storage account or Disable.
 - Enable OS guest diagnostics:** Unchecked.
- Identity:**
 - System assigned managed identity:** Unchecked.
 - Azure AD:**
 - Login with Azure AD:** Unchecked.
 - Warning:** RBAC role assignment of Virtual Machine Administrator Login or Virtual Machine User Login is required when using Azure AD login. (Learn more)
- Auto-shutdown:**
 - Enable auto-shutdown:** Checked.
 - Shutdown time:** 7:00:00 PM
 - Time zone:** UTC Coordinated Universal Time
 - Notification before shutdown:** Checked.
 - Email:** adnanali1331@hotmail.com
- Site Recovery:**
 - Enable Disaster Recovery:** Unchecked.
- Guest OS updates:** Section header.

At the bottom, there are buttons for 'Review + create', '< Previous', and 'Next: Advanced >'.

v) Tags

Microsoft Azure

Home > Virtual machines > Virtual machines

Default Directory

+ Create [Switch to classic](#)

Filter for any field...

Name ↑ Type ↓

No virtual machines to display

Create a virtual machine that runs Linux or Windows. Select an image from the marketplace or use your own customized image.

[Learn more about Windows virtual machines](#)

[Learn more about Linux virtual machines](#)

Create a virtual machine

Basics Disks Networking Management Advanced **Tags** Review + create

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. [Learn more about tags](#)

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name	Value	Resource
ccl	testing	12 selected
		12 selected

[Review + create](#) [Previous](#) [Next: Review + create](#)

vi) Creating

Microsoft Azure

Home > Virtual machines > Virtual machines

Default Directory

+ Create [Switch to classic](#)

Filter for any field...

Name ↑ Type ↓

No virtual machines to display

Create a virtual machine that runs Linux or Windows. Select an image from the marketplace or use your own customized image.

[Learn more about Windows virtual machines](#)

[Learn more about Linux virtual machines](#)

Create a virtual machine

Basics Disks Networking Management Advanced Tags **Review + create**

Validation passed

PRODUCT DETAILS

1 X Standard D2s v3 by Microsoft

Subscription credits apply

7,5648 INR/hr

[Terms of use](#) [Privacy policy](#) [Pricing for other VM sizes](#)

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

You have set RDP port(s) open to the internet. This is only recommended for testing. If you want to change this setting, go back to Basics tab.

Basics

Subscription	Azure for Students
Resource group	CCL
Virtual machine name	adnan
Region	Central India
Availability options	No infrastructure redundancy required
Security type	Standard
Image	Windows 10 Pro, version 20H2 - Gen2
Size	Standard D2s v3 (2 vcpus, 8 GiB memory)

[Create](#) [Previous](#) [Next](#) [Download a template for automation](#)

vii) Deployment complete

The screenshot shows the Microsoft Azure portal interface. The main heading is "CreateVm-MicrosoftWindowsDesktop.Windows-10-20h2--20220320125023 | Overview". A green checkmark icon indicates "Your deployment is complete". The deployment details show:

- Deployment name: CreateVm-MicrosoftWindowsDesktop.Windows-10-20h2--20220320125023
- Subscription: Azure for Students
- Resource group: CCL
- Start time: 3/20/2022, 12:55:19 PM
- Correlation ID: 747b84b0-81ab-4d53-b64c-1c6cf7f25b08

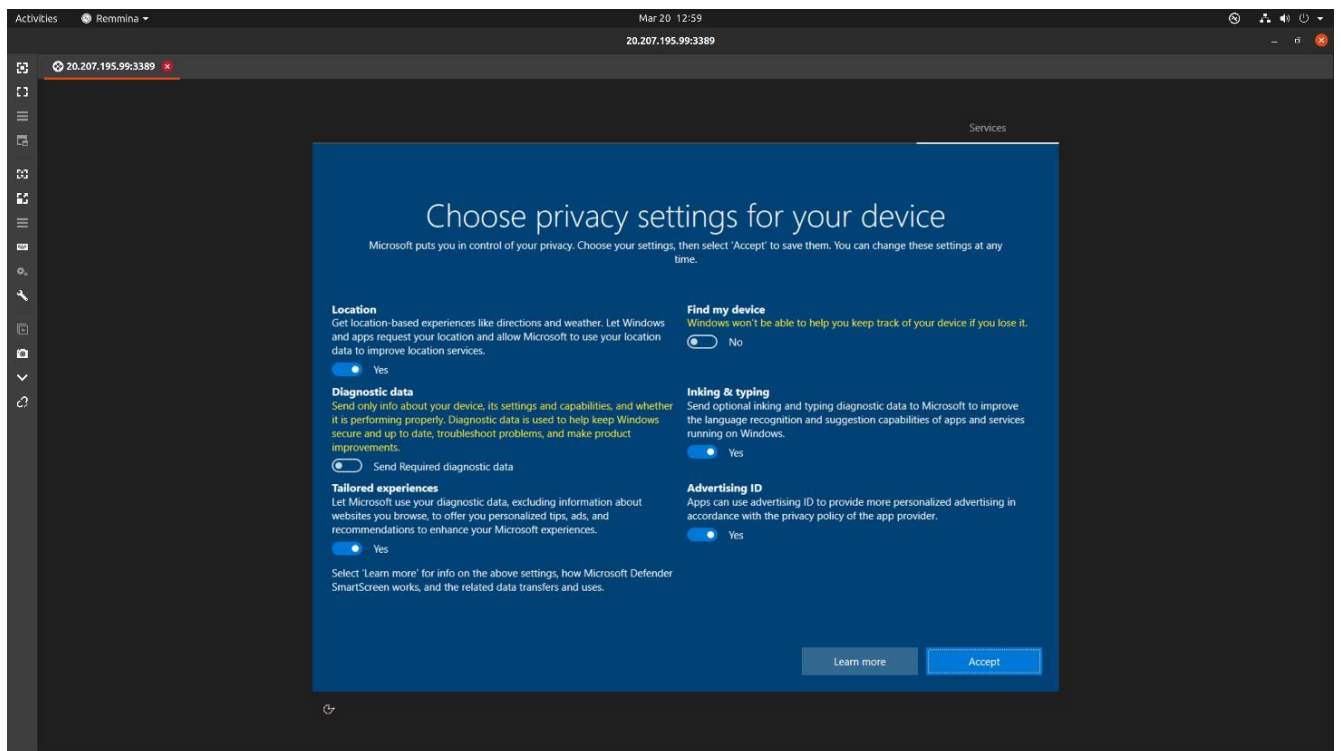
 Under "Next steps", there are three recommended actions: "Setup auto-shutdown", "Monitor VM health, performance and network dependencies", and "Run a script inside the virtual machine". A "Go to resource" button is visible. A notification banner at the top right says "Deployment succeeded". On the right sidebar, there are links for "Cost Management", "Microsoft Defender for Cloud", "Free Microsoft tutorials", and "Work with an expert".

2) RDP connection:

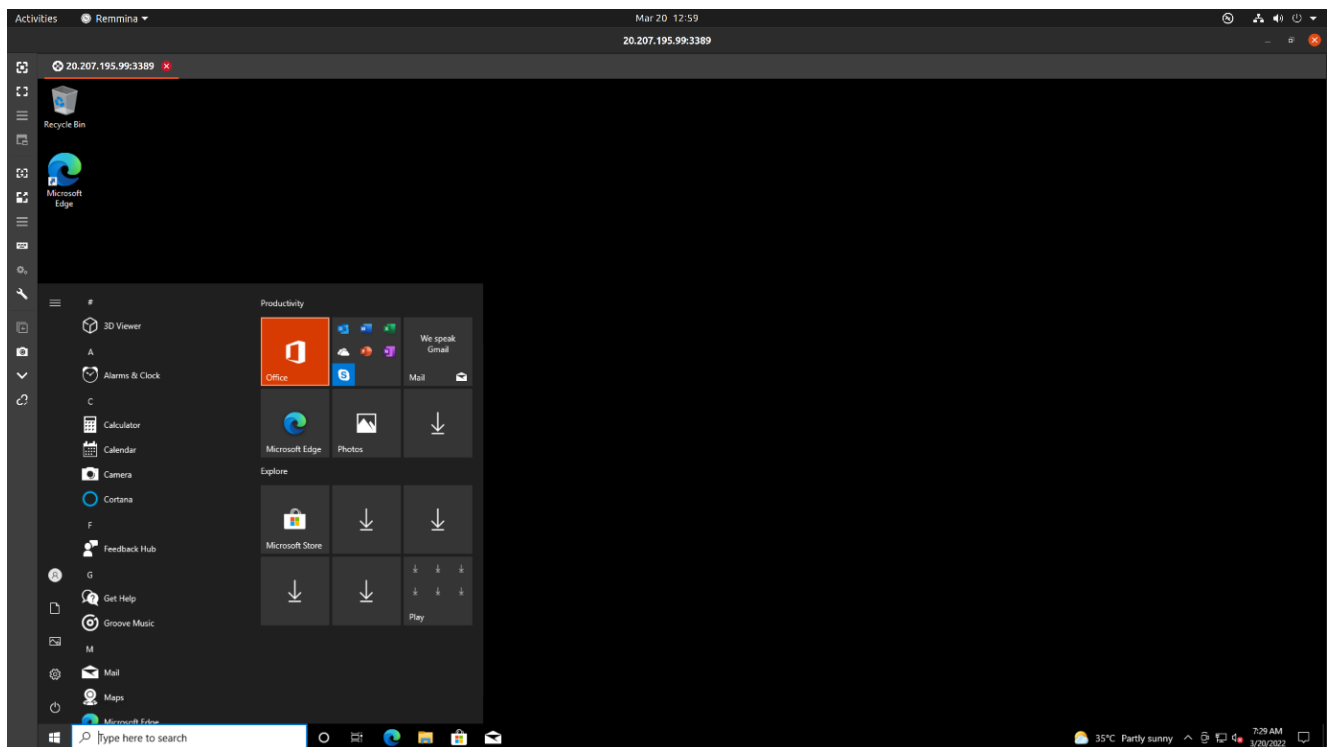
i) Configuring and downloading RDP file

The screenshot shows the "Connect" page for a virtual machine named "adnan" in the "adnan | Connect" section. The page has tabs for "RDP", "SSH", and "Bastion". The "RDP" tab is selected. A warning banner at the top says "To improve security, enable just-in-time access on this VM." The "Connect with RDP" section provides instructions: "To connect to your virtual machine via RDP, select an IP address, optionally change the port number, and download the RDP file." There are input fields for "IP address" (set to "Public IP address (20.207.195.99)") and "Port number" (set to "3389"). A "Download RDP File" button is present. Below this, there is a "Can't connect?" section with links for "Test your connection", "Troubleshoot RDP connectivity issues", and "Feedback on connections".

ii) Connecting through Remmina



3) Result:



Conclusion: We have successfully implemented infrastructure as a service using Azure.