TRIBHUVAN UNIVERSITY

Faculty of Humanities and Social Sciences

JANAMAITRI MULTIPLE CAMPUS

Kuleshwar, Kathmandu

A LAB REPORT ON CLOUD COMPUTING

In the partial fulfillment of the requirements for the Bachelors of Computer Applications

Submitted by:
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Under the supervision of
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Letter of Recommendation

This report entitled **"A lab report on Cloud Computing"** by **Manoj Pathak (TU Reg. No: 6-2-263-30-2022)** has been prepared under our supervision for partial fulfillment of the requirement of Bachelors of Computer Applications (BCA) 7th semester. I, therefore recommend it for evaluation by the thesis committee.

Mrs. Abita Kunwar

Certificate of Acceptance

This report **"A lab report on Cloud Computing"** written by **Manoj Pathak (TU Reg. No: 6-2-263-30-2022)** has been accepted as partial fulfillment of the requirement for a Bachelors of Computer Applications (BCA) 7th Semester.

Evaluation Committee:

…..……..
External Signature

…….
Supervisor

Declaration Letter

I declare that I completed this work on my own and that information which has been directly or indirectly taken from other sources has been noted as such. Neither this, nor a similar work, has been published or presented to an examination committee.

Manoj Pathak
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Acknowledgement

This research report is prepared for the partial fulfillment of the requirement of BCA 7th Semester with the prescribed rules and regulations of the TU board. Firstly, I would like to acknowledge special thanks to **Mrs. Abita Kunwar** ,our Cloud Computing teacher, for giving me an opportunity to prepare a report on **"A lab report on Cloud Computing"**. Her guidance, comments and recommendations helped me to conduct this research. Secondly, I would like to thank all my friends who inspired me during this lab report. I would also like to thank my family members who shared their knowledge in this report topic.

Thank you!

Self-Declaration Letter

I, **Manoj Pathak**, candidate of BCA 7th Semester, hereby declare that the contents included on this Practical Lab Book is entirely done by myself as a part of study. None of the portion on the Lab Book is duplicated or copied from any other source. I am liable and obliged to all the corrections and suggestions given by the faculty members, Internal Examiner as well as External Examiner during the evaluation.

Manoj Pathak

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Level: - ---------- Semester: - ----------

Internal Examiner	External Examiner
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Signature: ----------	**Signature: ----------**
Date: ----------	**Date: ----------**

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1) Compare the services, pricing, and user interfaces offered by different cloud providers

We compare the three major cloud providers:

- Amazon Web Services (AWS)
- Microsoft Azure
- Google Cloud Platform (GCP)

A. Comparison of Services

Category	AWS	Azure	GCP
Compute	EC2, Lambda	Virtual Machines, Functions	Compute Engine, Cloud Functions
Storage	S3, Glacier	Blob Storage, Disk Storage	Cloud Storage, Persistent Disk
Database	RDS, DynamoDB, Aurora	SQL Database, Cosmos DB	Cloud SQL, Firestore, BigQuery
Networking	VPC, Route53, CloudFront	Virtual Network, DNS, CDN	VPC, Cloud DNS, Cloud CDN
AI/ML	SageMaker	Azure AI + Cognitive Services	Vertex AI (strong ML focus)
DevOps	CodePipeline, CodeBuild	Azure DevOps	Cloud Build, Cloud Deploy

Summary

- AWS → Most mature & widest services
- Azure → Best for Microsoft ecosystem (.NET, Windows Server)
- GCP → Best for AI/ML & big data analytics

B. Pricing Comparison

Factor	AWS	Azure	GCP
Pricing model	Pay-as-you-go	Pay-as-you-go	Pay-as-you-go
Free Tier	12 months + limited always free	12 months + credits	Always free + $300 credit
Discounts	Reserved & Spot Instances	Reserved VM Instances	Sustained-use & committed discounts
Overall cost	Medium	Medium–High	Often cheapest for compute & storage

Summary

- AWS → Flexible but complex pricing
- Azure → Good for enterprise licensing users
- GCP → Most transparent and cost-efficient

C. User Interface Comparison

Feature	AWS Console	Azure Portal	GCP Console
Ease of use	Complex (many services)	Beginner friendly	Clean & simple
Navigation	Deep menus	Dashboard oriented	Minimal & modern
Learning curve	Steep	Moderate	Easy
Target users	Advanced developers	Enterprises & Microsoft users	Developers & data scientists

Summary

- AWS → Powerful but complex UI
- Azure → Balanced UI
- GCP → Simplest and cleanest UI

Final Comparison Conclusion

Best for	Provider
Largest service ecosystem	AWS
Enterprise integration	Azure
AI/ML & data analytics	GCP
Beginners	GCP / Azure

2) Case Study: Organization moving from Traditional IT → Cloud

Case Study Example:

Netflix migration to AWS

A. Background (Traditional Infrastructure)

Netflix originally used **on-premise data centers**.

Problems faced:

- Frequent server failures
- Scaling issues during high traffic
- High maintenance cost
- Disaster recovery difficulties

A major database failure in 2008 caused **3 days downtime**.
This motivated migration to cloud.

B. Migration to Cloud

Netflix migrated fully to **AWS cloud infrastructure**.

Migration steps:

1. Gradual service migration (not all at once)
2. Microservices architecture adoption
3. Use of auto-scaling & distributed systems

4. Shutdown of physical data centers (2016)

C. Benefits Achieved

1. Scalability

- Can serve millions of users globally
- Auto-scaling during peak hours

Example:
Traffic spikes during new show releases.

2. Cost Reduction

- No need for physical servers
- Pay only for used resources

3. High Availability

- Services distributed across multiple regions
- Reduced downtime

4. Faster Innovation

- Developers deploy features quickly
- Continuous integration & delivery possible

5. Global Reach

- Cloud CDN delivers content worldwide
- Better streaming performance

D. Challenges Faced

1. Migration Complexity

- Moving massive data & applications is difficult
- Requires redesign of architecture

2. Security Concerns

- Needed strong cloud security practices
- Identity & access management setup

3. Staff Training

- Employees had to learn cloud technologies

4. Vendor Dependency

- Heavy reliance on AWS (vendor lock-in)

E. Final Outcome

Netflix successfully became a **fully cloud-native company**.

Result:

- Highly scalable streaming platform
- Reliable global service
- Faster feature delivery

Final Conclusion

Cloud computing provides:

Benefits

- Scalability
- Cost efficiency
- Reliability
- Global accessibility

Challenges

- Migration complexity
- Security & training
- Vendor lock-in

VMWare

VMware Description

VMware is a leading cloud computing and virtualization technology company that provides software and services for creating and managing virtual machines (VMs). Founded in 1998, VMware enables organizations and individuals to run multiple operating systems on a single physical computer through virtualization.

VMware's core technology is the **hypervisor**, which allows a physical computer's hardware resources (CPU, memory, storage, and network) to be shared among multiple virtual machines. Each virtual machine behaves like a real computer and can run its own operating system such as Windows, Linux, or macOS independently.

Key Features

- **Virtualization:** Run multiple operating systems on a single physical system.
- **Isolation:** Each virtual machine operates independently without affecting others.
- **Resource Optimization:** Efficient use of hardware resources.
- **Snapshots & Cloning:** Save the state of a VM and restore it later.
- **Easy Testing Environment:** Ideal for software testing, development, and learning.

Common VMware Products

- **VMware Workstation:** Used on Windows/Linux for creating and running virtual machines.
- **VMware Fusion:** Virtualization software for macOS.
- **VMware ESXi:** Enterprise-level hypervisor for data centers and servers.
- **VMware vSphere:** Cloud computing virtualization platform for managing virtual infrastructures.

Uses in Education and Labs

VMware is widely used in computer labs and IT training because it allows students to:

- Install and test different operating systems safely.

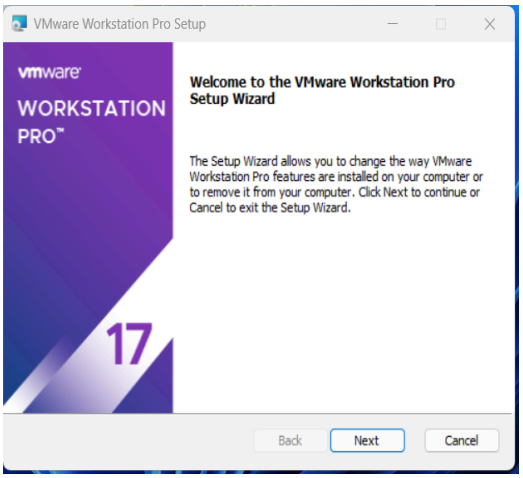
- Practice networking and server configuration.
- Create virtual lab environments without needing multiple physical computers.

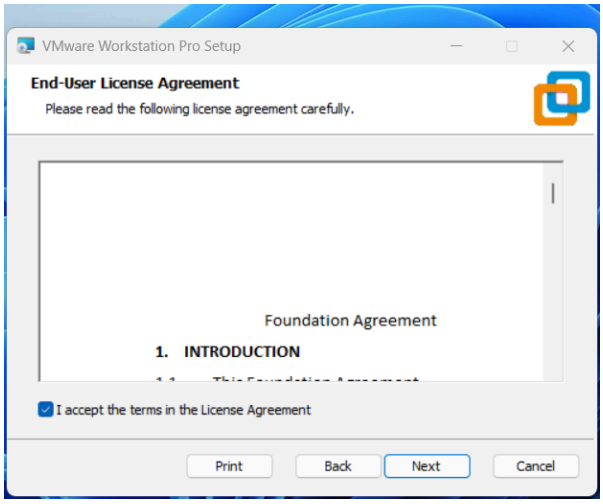
Conclusion:

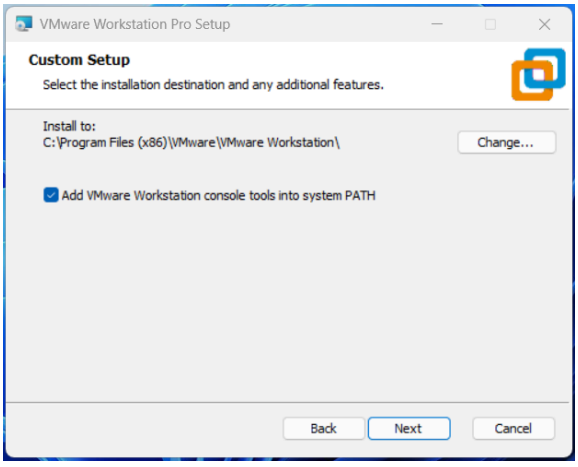
VMware is an essential tool in modern computing that simplifies virtualization, improves resource utilization, and provides a flexible environment for development, testing, and learning.

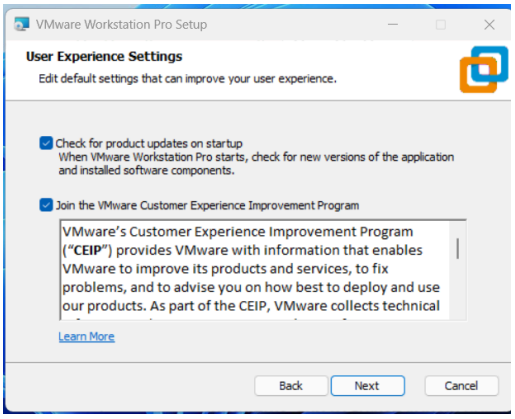
These are the ss of how I installed vmware on my system

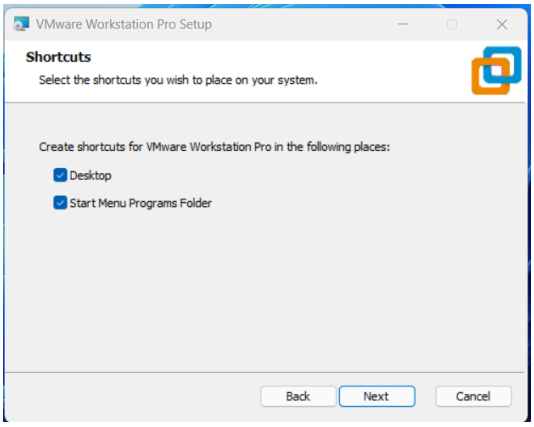


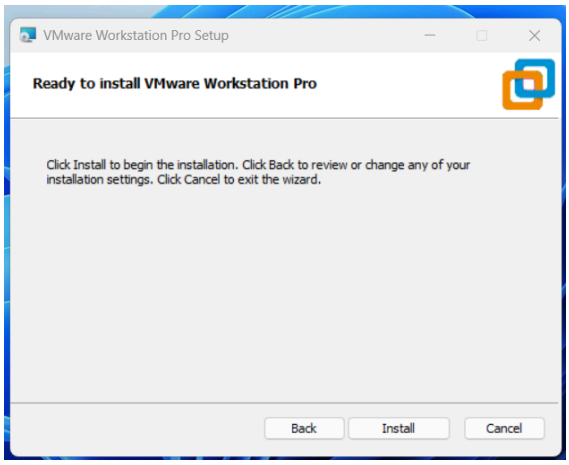


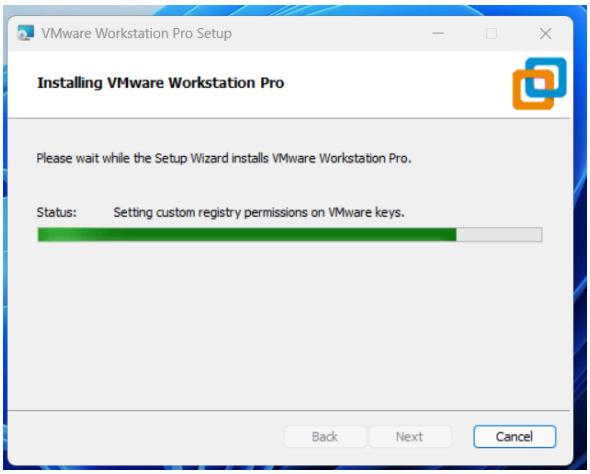


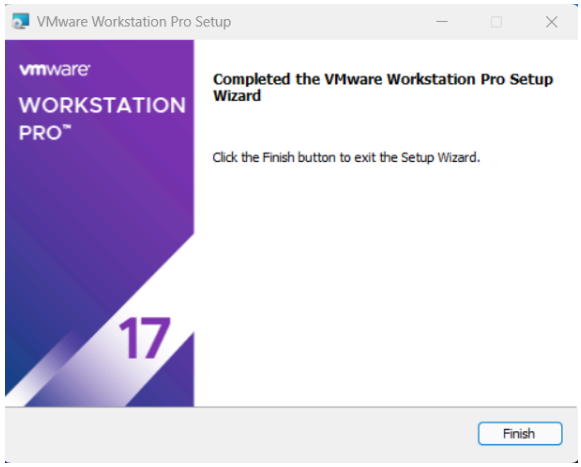



VMware Workstation Pro Setup
User Experience Settings
Edit default settings that can improve your user experience.
Check for product updates on startup
When VMware Workstation Pro starts, check for new versions of the application and installed software components.
Join the VMware Customer Experience Improvement Program
VMware's Customer Experience Improvement Program ("CEIP") provides VMware with information that enables VMware to improve its products and services, to fix problems, and to advise you on how best to deploy and use our products. As part of the CEIP, VMware collects technical
Learn More
Back
Next
Cancel

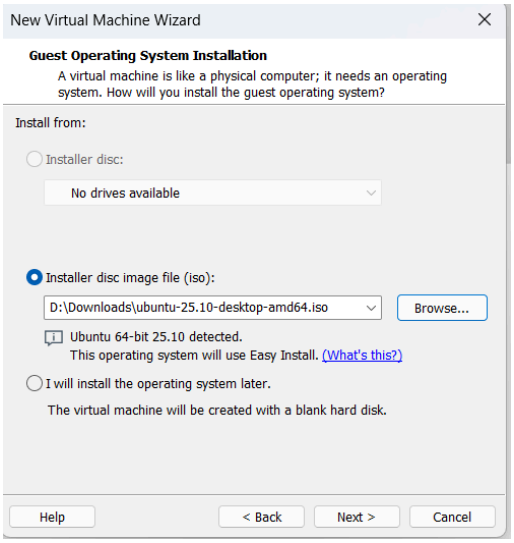

VMware Workstation Pro Setup
Shortcuts
Select the shortcuts you wish to place on your system.
Create shortcuts for VMware Workstation Pro in the following places:
Desktop
Start Menu Programs Folder
Back
Next
Cancel

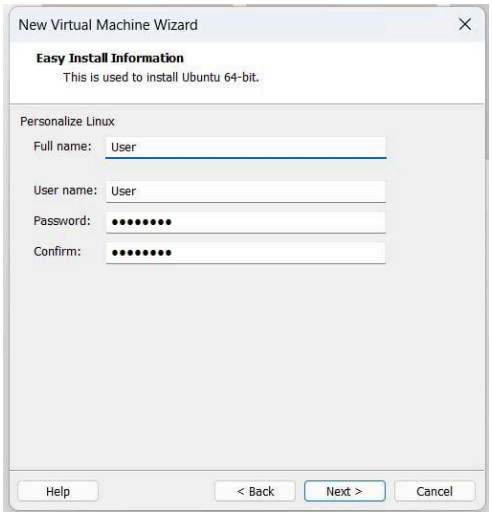

VMware Workstation Pro Setup
Ready to install VMware Workstation Pro
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel

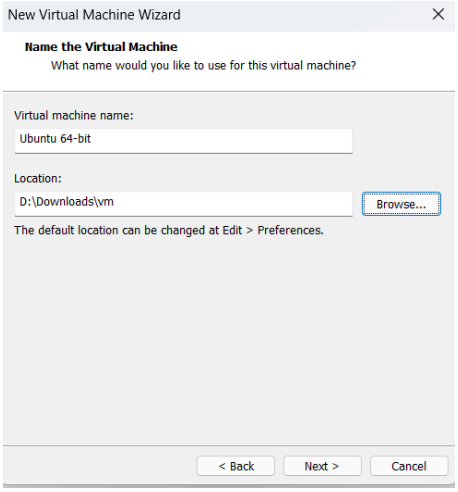

VMware Workstation Pro Setup
Installing VMware Workstation Pro
Please wait while the Setup Wizard installs VMware Workstation Pro.
Status: Setting custom registry permissions on VMware keys.
Back
Next
Cancel

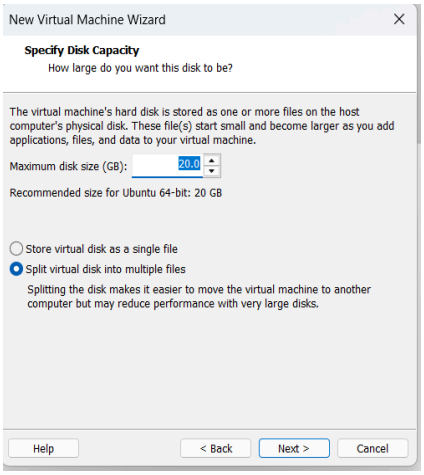

VMware Workstation Pro Setup
vmware
WORKSTATION PRO™
17
Completed the VMware Workstation Pro Setup Wizard
Click the Finish button to exit the Setup Wizard.
Finish

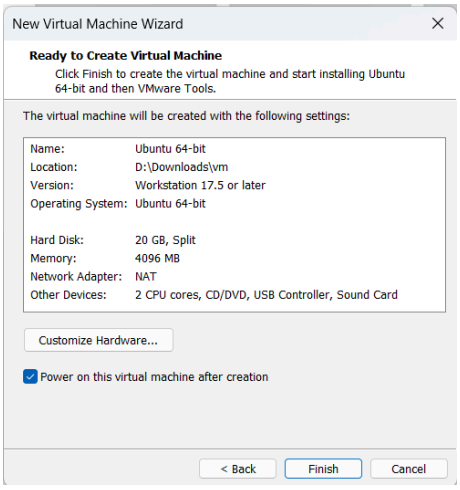

New Virtual Machine Wizard
vmware
WORKSTATION PRO™
17
Welcome to the New Virtual Machine Wizard
What type of configuration do you want?
Typical (recommended)
Create a Workstation 17.5 or later virtual machine in a few easy steps.
Custom (advanced)
Create a virtual machine with advanced options, such as a SCSI controller type, virtual disk type and compatibility with older VMware products.
Help
< Back
Next >
Cancel


New Virtual Machine Wizard
Guest Operating System Installation
A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?
Install from:
Installer disc:
No drives available
Installer disc image file (iso):
D:\Downloads\ubuntu-25.10-desktop-amd64.iso
Browse...
Ubuntu 64-bit 25.10 detected.
This operating system will use Easy Install. (What's this?)
I will install the operating system later.
The virtual machine will be created with a blank hard disk.
Help
< Back
Next >
Cancel


New Virtual Machine Wizard
Easy Install Information
This is used to install Ubuntu 64-bit.
Personalize Linux
Full name: User
User name: User
Password: ••••••••
Confirm: ••••••••
Help
< Back
Next >
Cancel


New Virtual Machine Wizard
Name the Virtual Machine
What name would you like to use for this virtual machine?
Virtual machine name:
Ubuntu 64-bit
Location:
D:\Downloads\vm
Browse...
The default location can be changed at Edit > Preferences.
< Back
Next >
Cancel


New Virtual Machine Wizard
Specify Disk Capacity
How large do you want this disk to be?
The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.
Maximum disk size (GB): 20.0
Recommended size for Ubuntu 64-bit: 20 GB
Store virtual disk as a single file
Split virtual disk into multiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.
Help
< Back
Next >
Cancel


New Virtual Machine Wizard
Ready to Create Virtual Machine
Click Finish to create the virtual machine and start installing Ubuntu 64-bit and then VMware Tools.
The virtual machine will be created with the following settings:
Name: Ubuntu 64-bit
Location: D:\Downloads\vm
Version: Workstation 17.5 or later
Operating System: Ubuntu 64-bit
Hard Disk: 20 GB, Split
Memory: 4096 MB
Network Adapter: NAT
Other Devices: 2 CPU cores, CD/DVD, USB Controller, Sound Card
Customize Hardware...
Power on this virtual machine after creation
< Back
Finish
Cancel