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Class: Msc. Computer Science

Subject: Cloud Computing

Year: 2022-23

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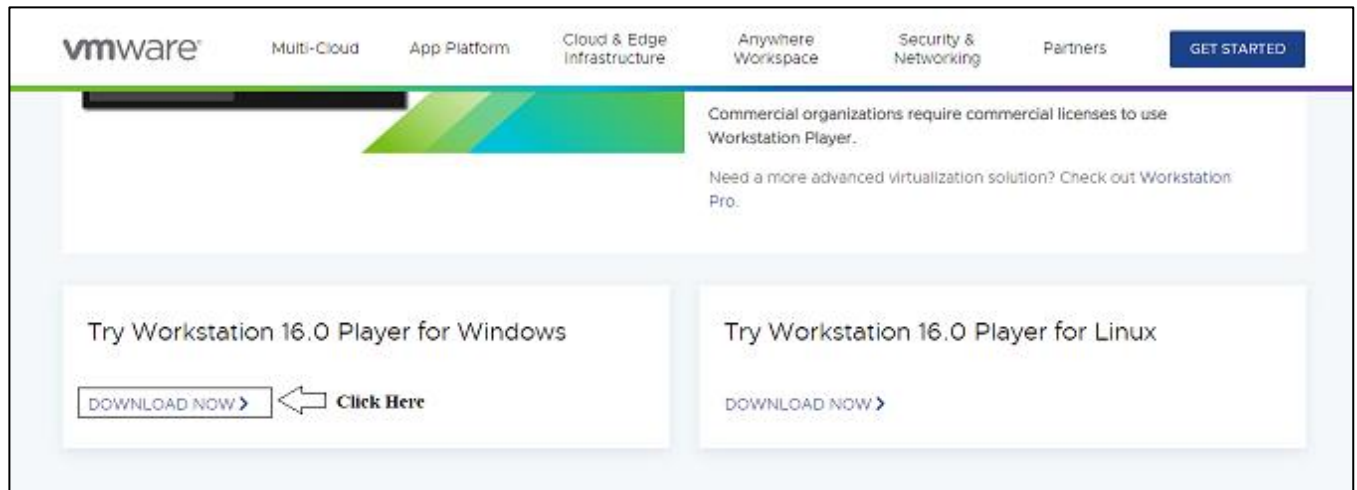
Practical 1

Aim: Implementation of Bare-metal and hosted virtualization

Code:

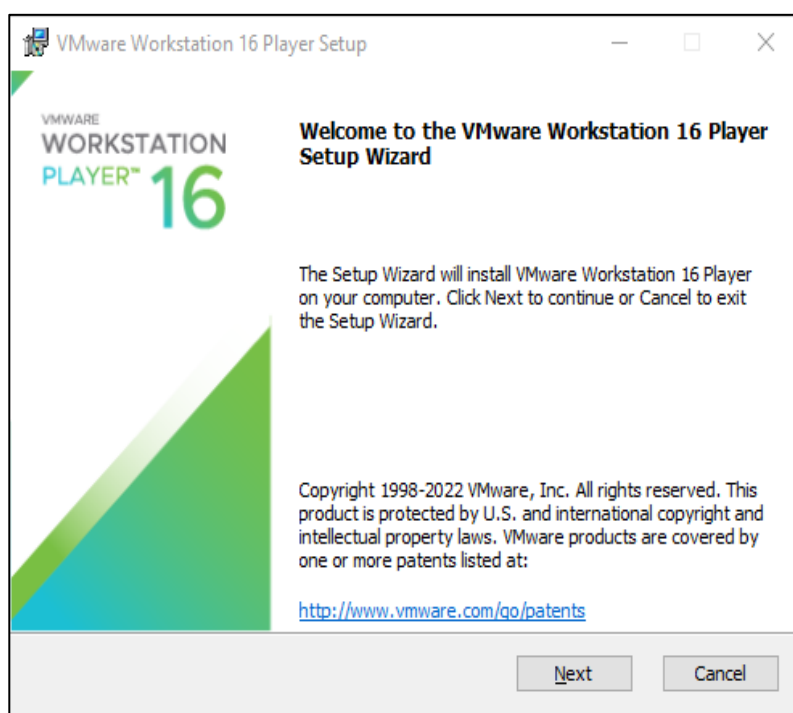
Installation of VMWare WorkStation

Step 1: [Click here](#) and download the Work Station

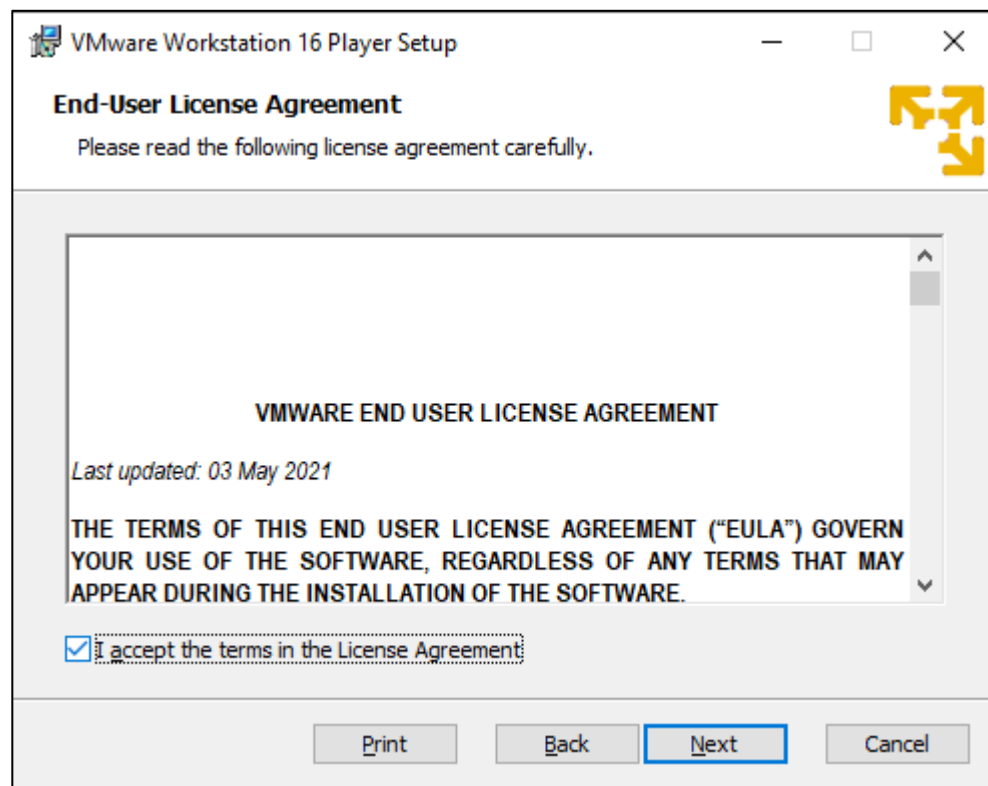
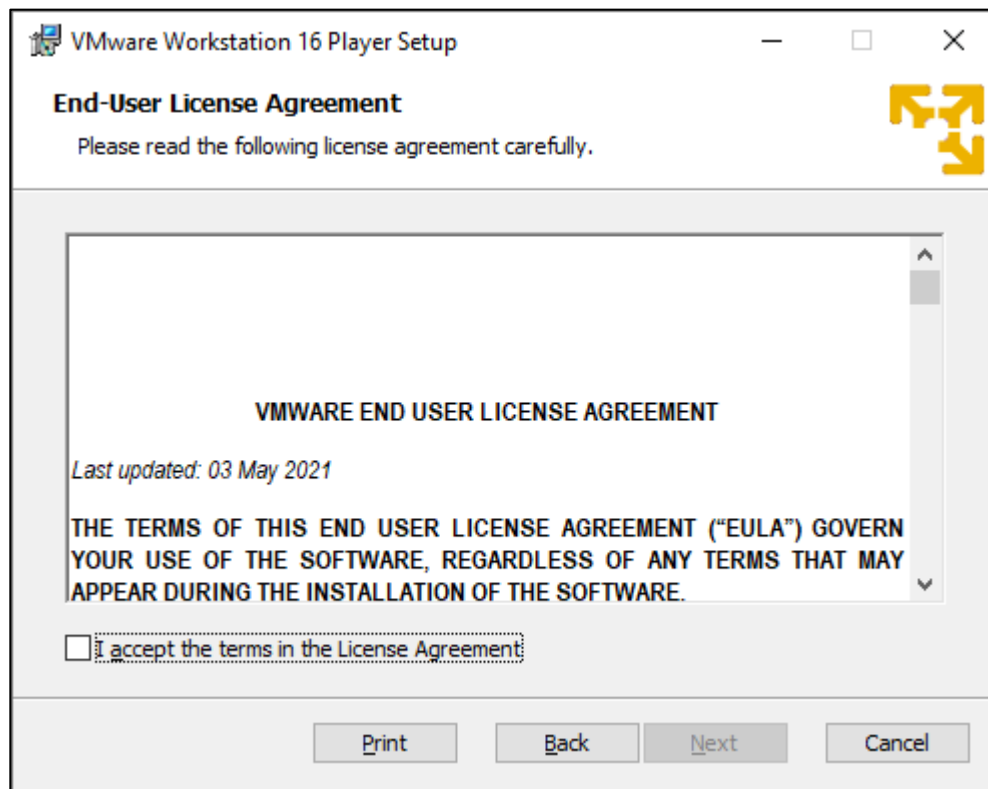


Step 2: Once Downloaded double tap to start the installation

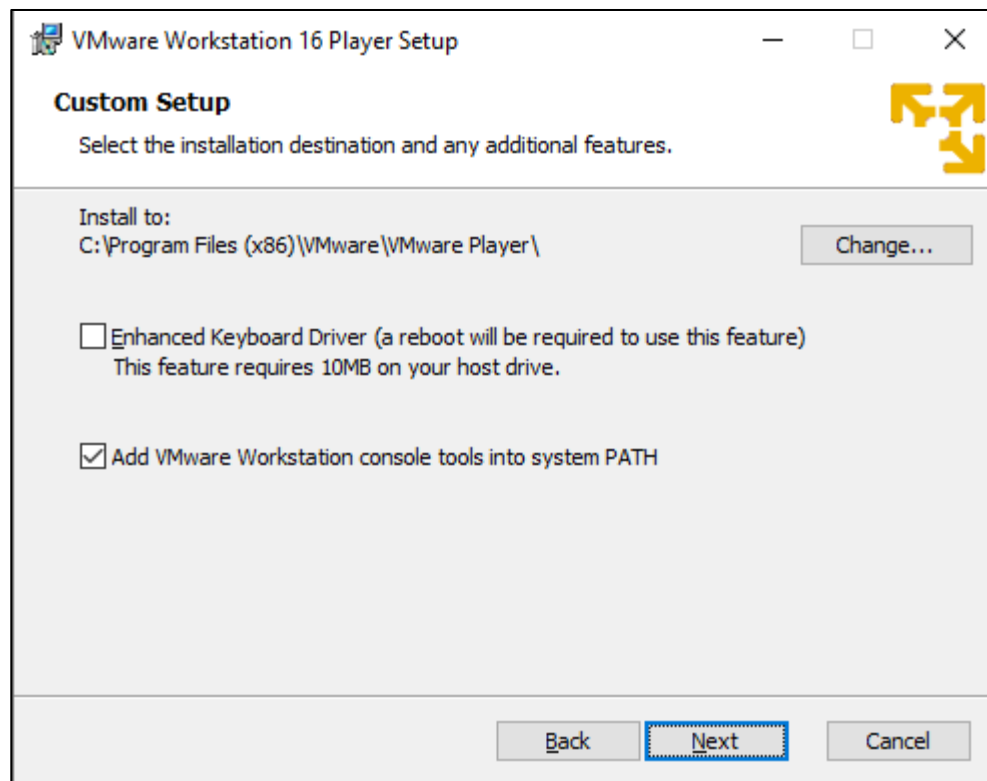
Step 3: Click on Next



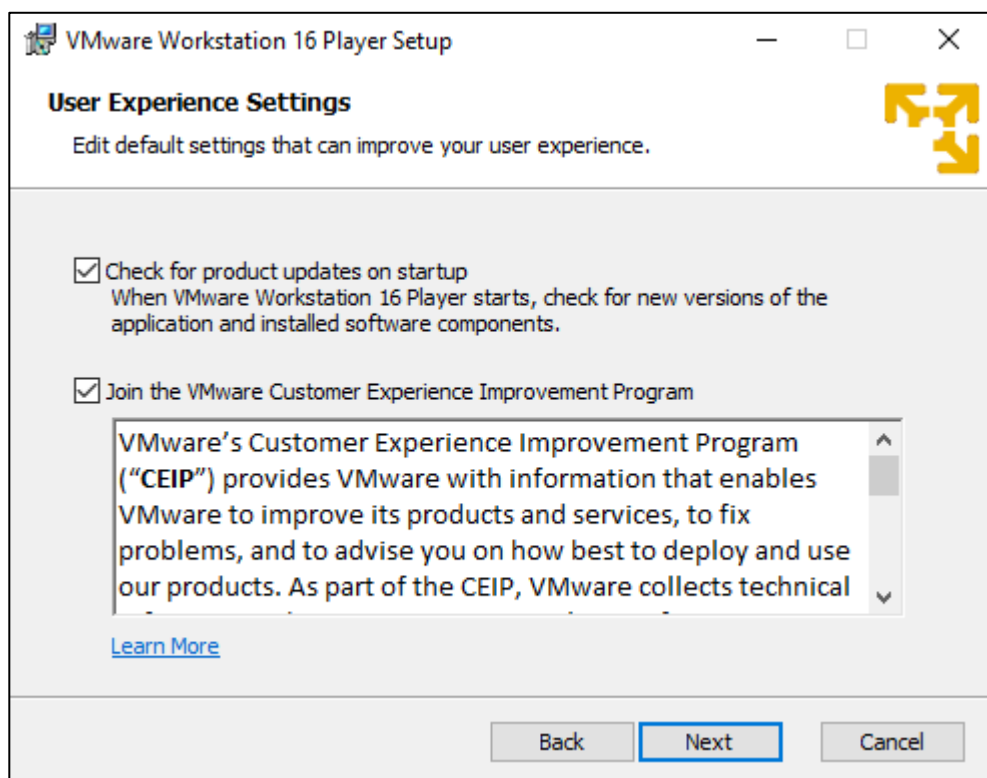
Step 4: Check the terms and conditions and click on NEXT



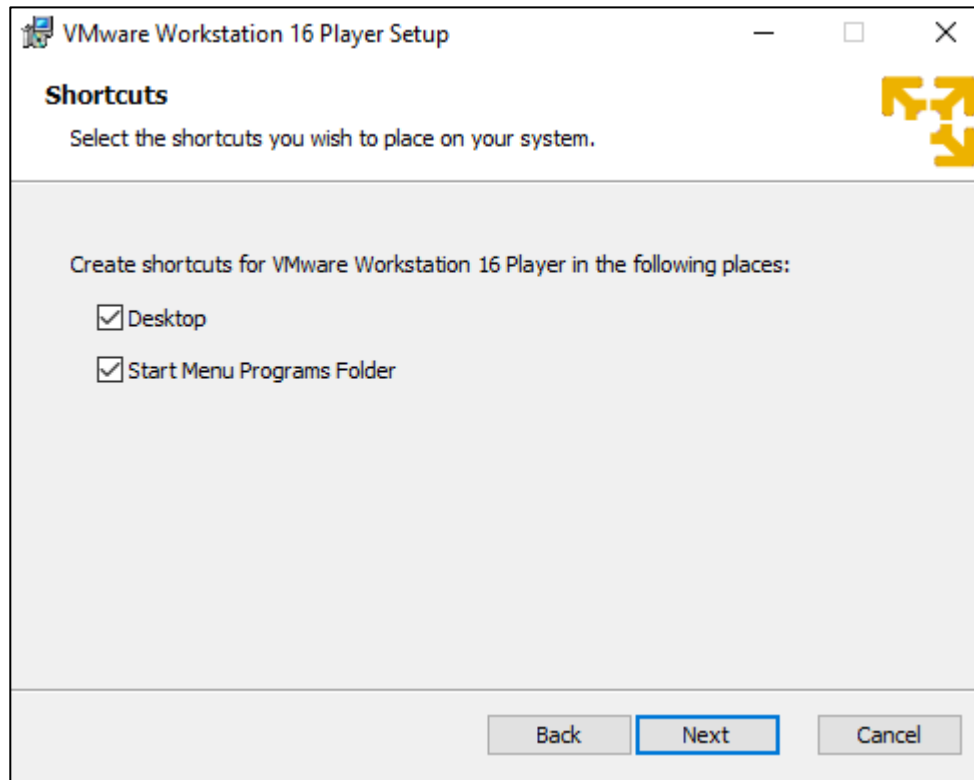
Step 5: Keep the default setup and Click on NEXT



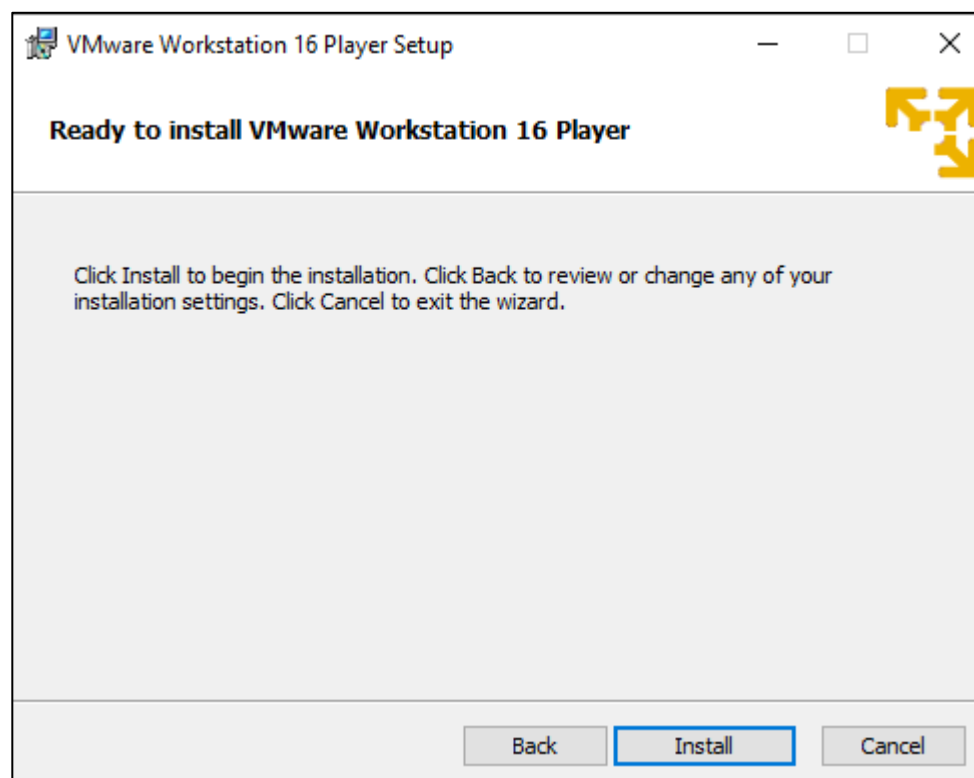
Step 6: Click on NEXT



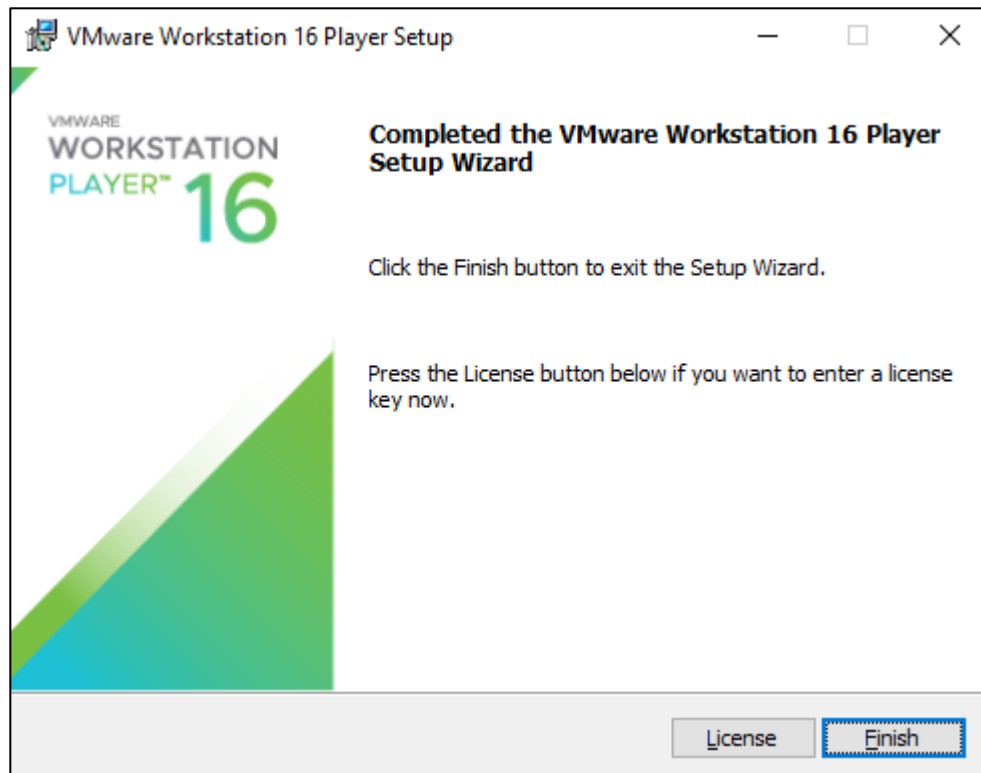
Step 7: Click on NEXT



Step 8: Click on INSTALL

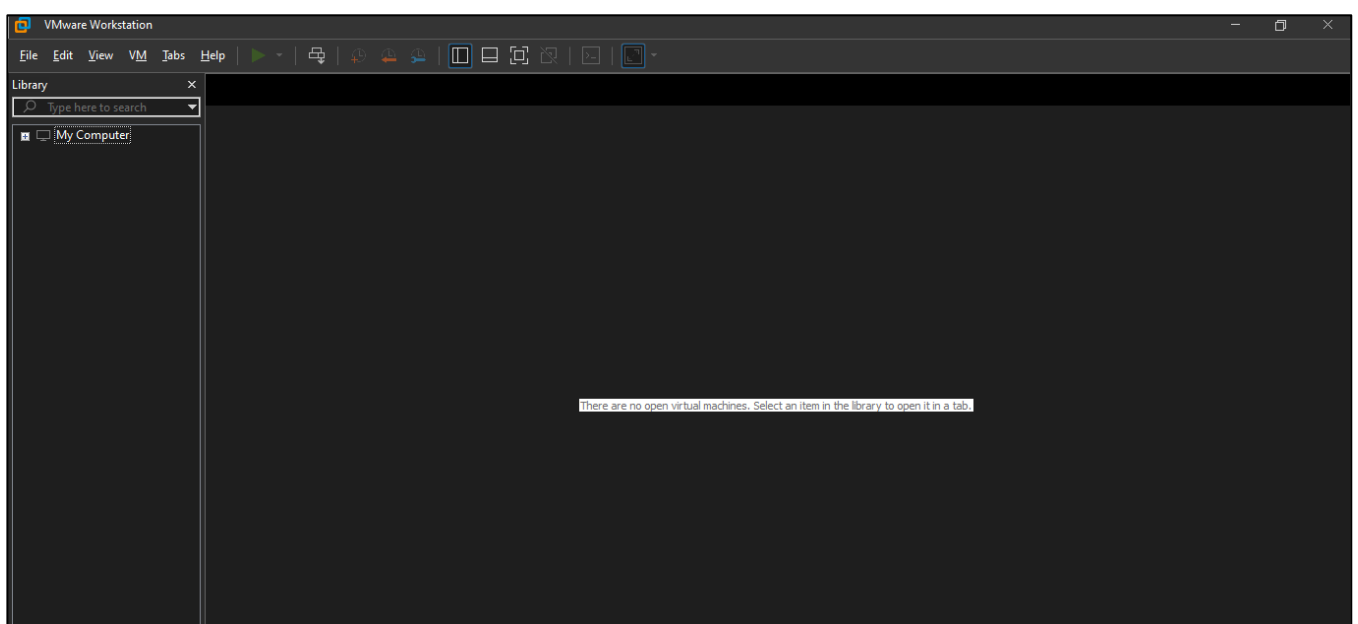


Step 9: Once Finish the installation and you have the License Key then CLICK on the License Button and add the license key else click on FINISH

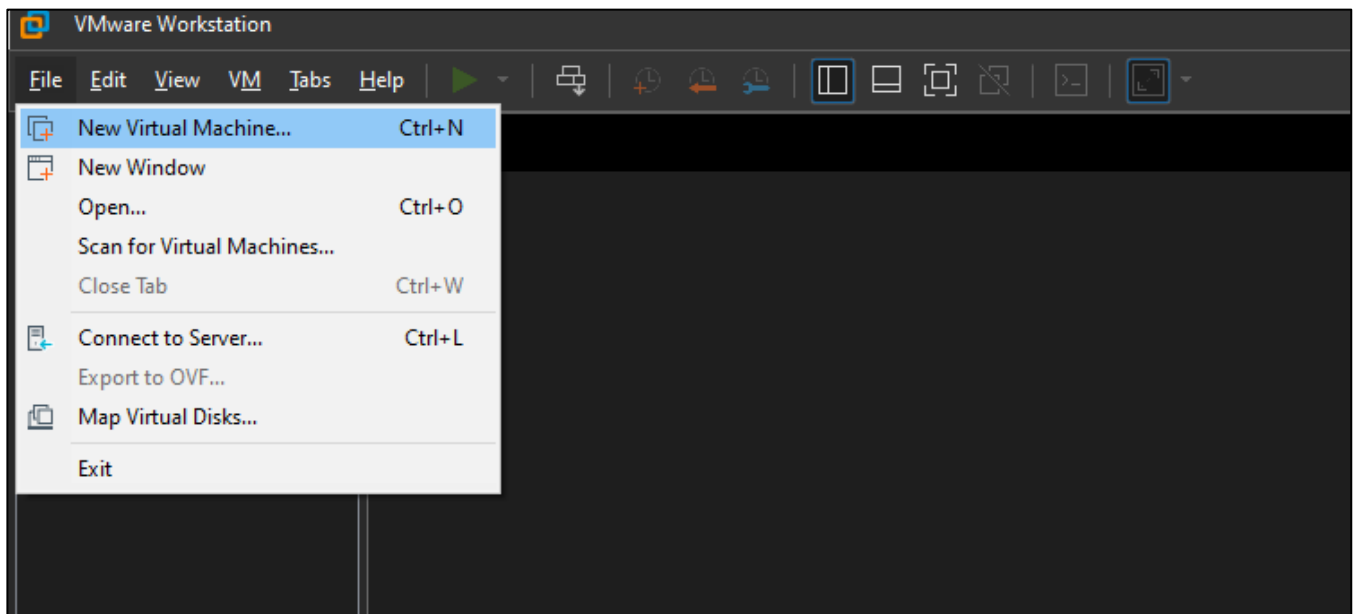


Creation of the Virtual Machine in VMWare Workstation Pro

Step 1: Open VM Ware WorkStation



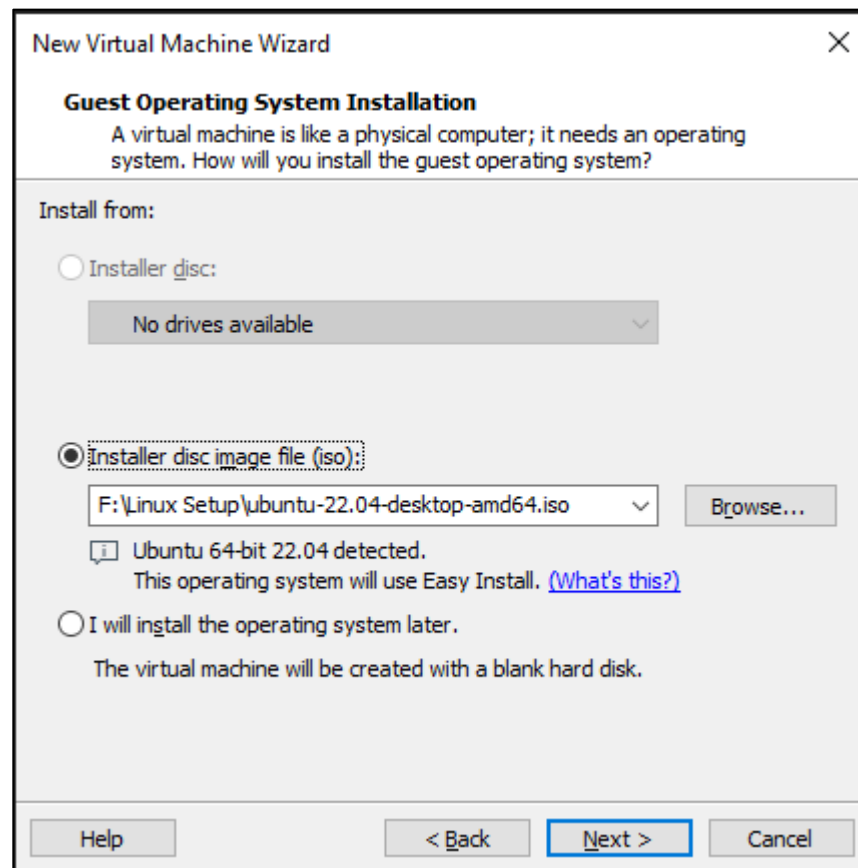
Step 2: Click on File → Create New Virtual Machine



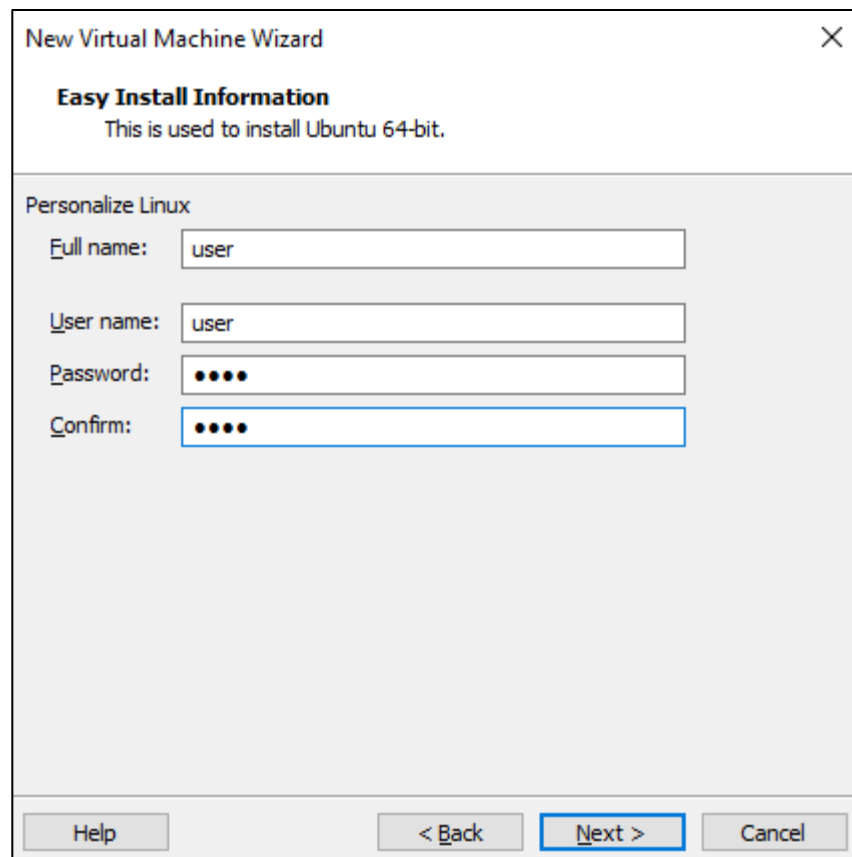
Step 3: Select Typical and click on NEXT



Step 4: Click on Installer Disc_Image file and provide the ISO file path and click on NEXT



Step 5: Provide the Full Name, Username and password and click on NEXT



New Virtual Machine Wizard [X]

Easy Install Information
This is used to install Ubuntu 64-bit.

Personalize Linux

Full name:

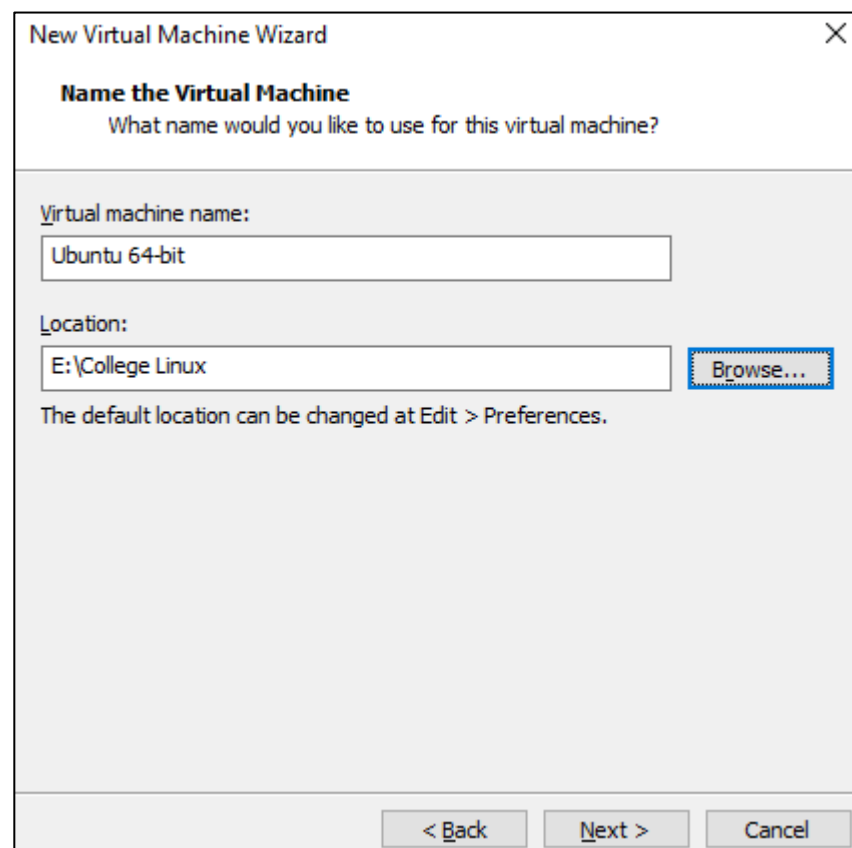
User name:

Password:

Confirm:

Help < Back **Next >** Cancel

Step 6: Provide the Virtual Machine Name and the path where to save the image



New Virtual Machine Wizard [X]

Name the Virtual Machine
What name would you like to use for this virtual machine?

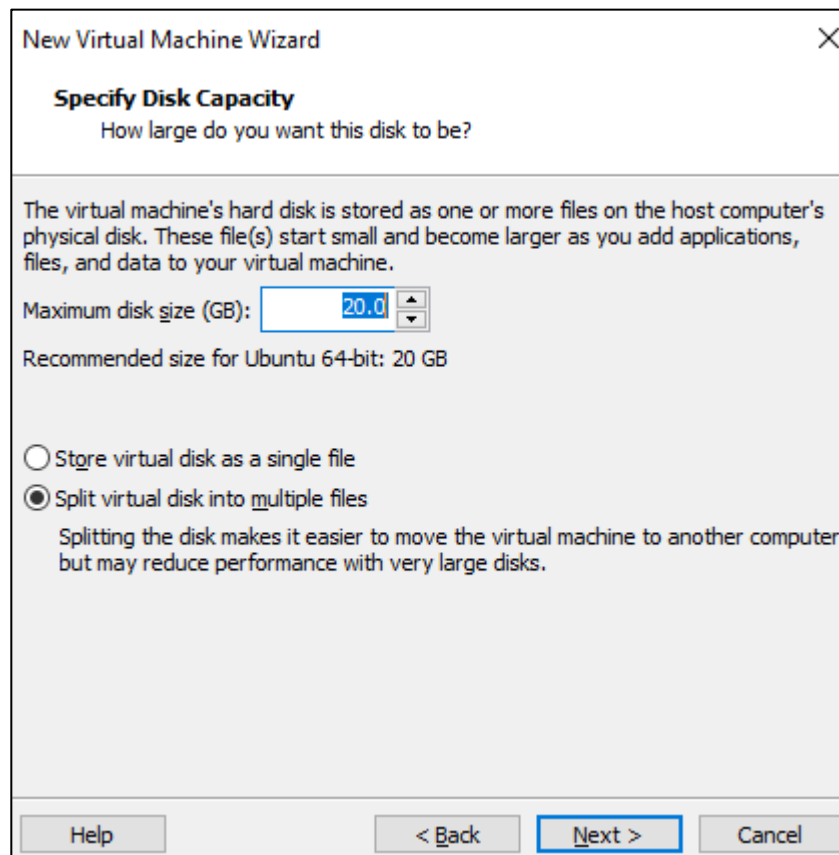
Virtual machine name:

Location:
 Browse...

The default location can be changed at Edit > Preferences.

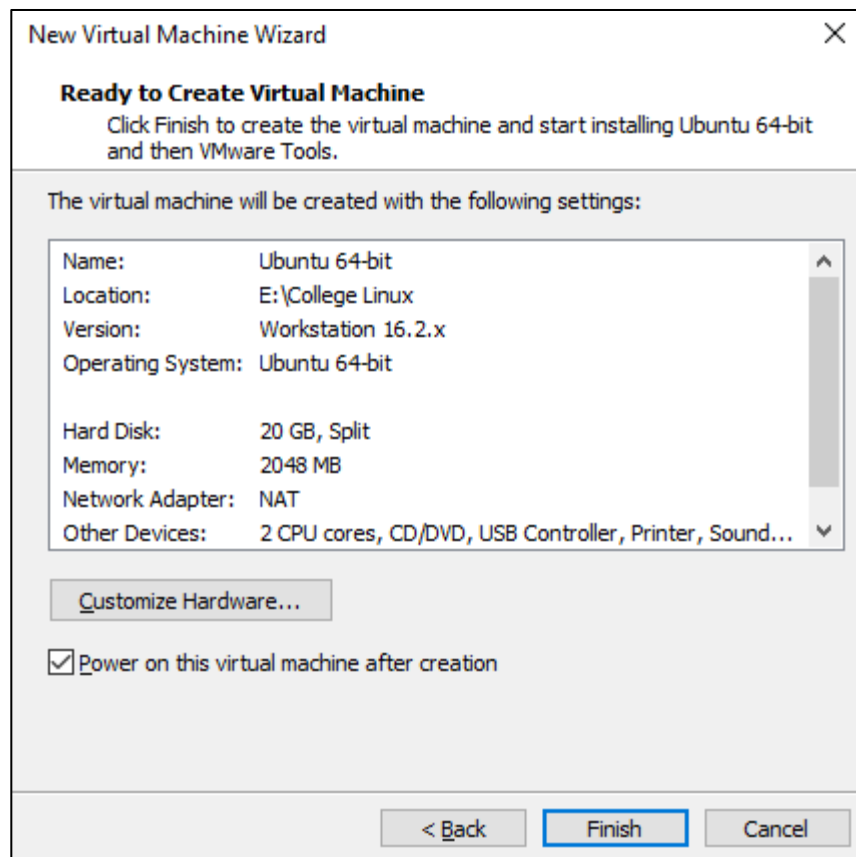
< Back **Next >** Cancel

Step 7: Provide the disk Size (Recommended 20GB) and click on NEXT



The screenshot shows a 'New Virtual Machine Wizard' window with a close button (X) in the top right corner. The title bar is 'New Virtual Machine Wizard'. The main heading is 'Specify Disk Capacity' with a subtitle 'How large do you want this disk to be?'. Below this, a text block explains: '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.' Below the text, there is a label 'Maximum disk size (GB):' followed by a text input field containing '20.0' and a spinner control. Below the input field, it says 'Recommended size for Ubuntu 64-bit: 20 GB'. There are two radio button options: 'Store virtual disk as a single file' (unselected) and 'Split virtual disk into multiple files' (selected). Below the selected option, a note states: 'Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.' At the bottom, there are four buttons: 'Help', '< Back', 'Next >' (highlighted with a blue border), and 'Cancel'.

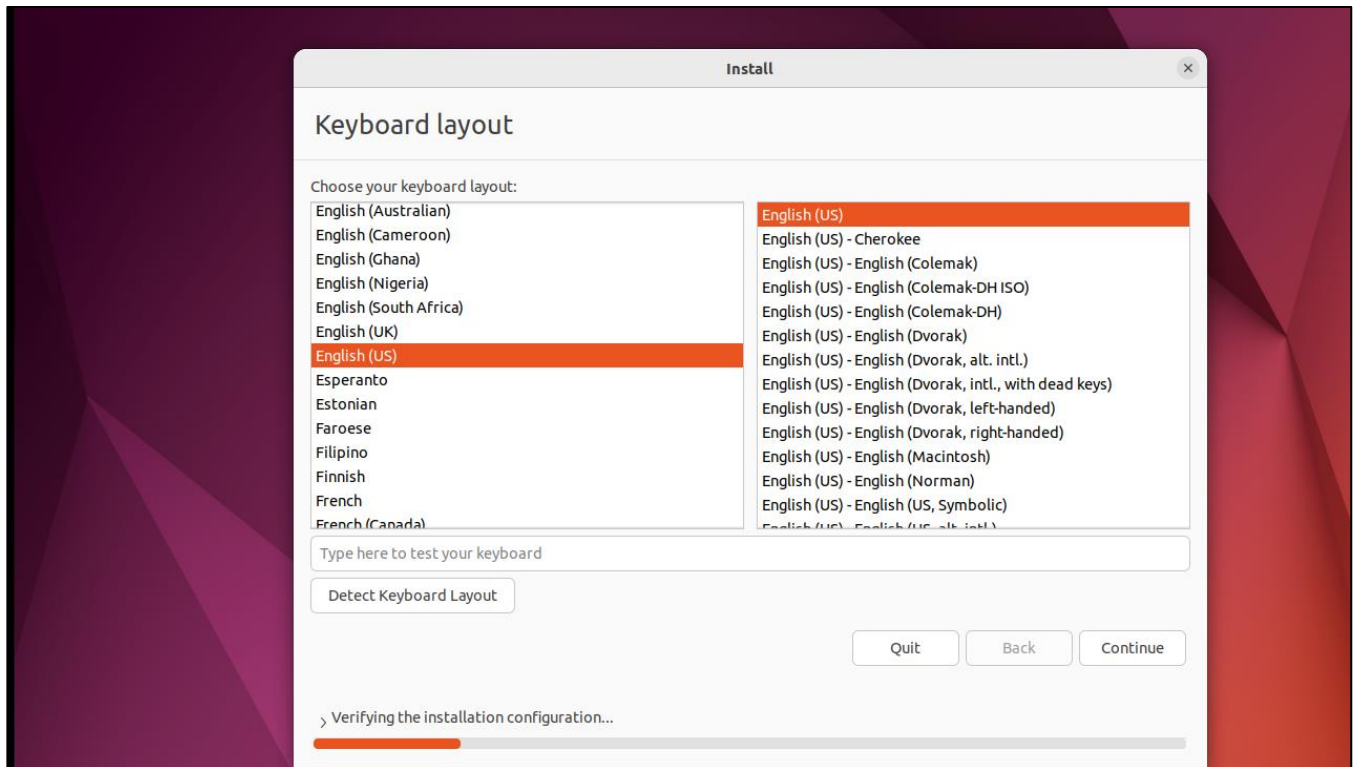
Step 8: Click on FINISH



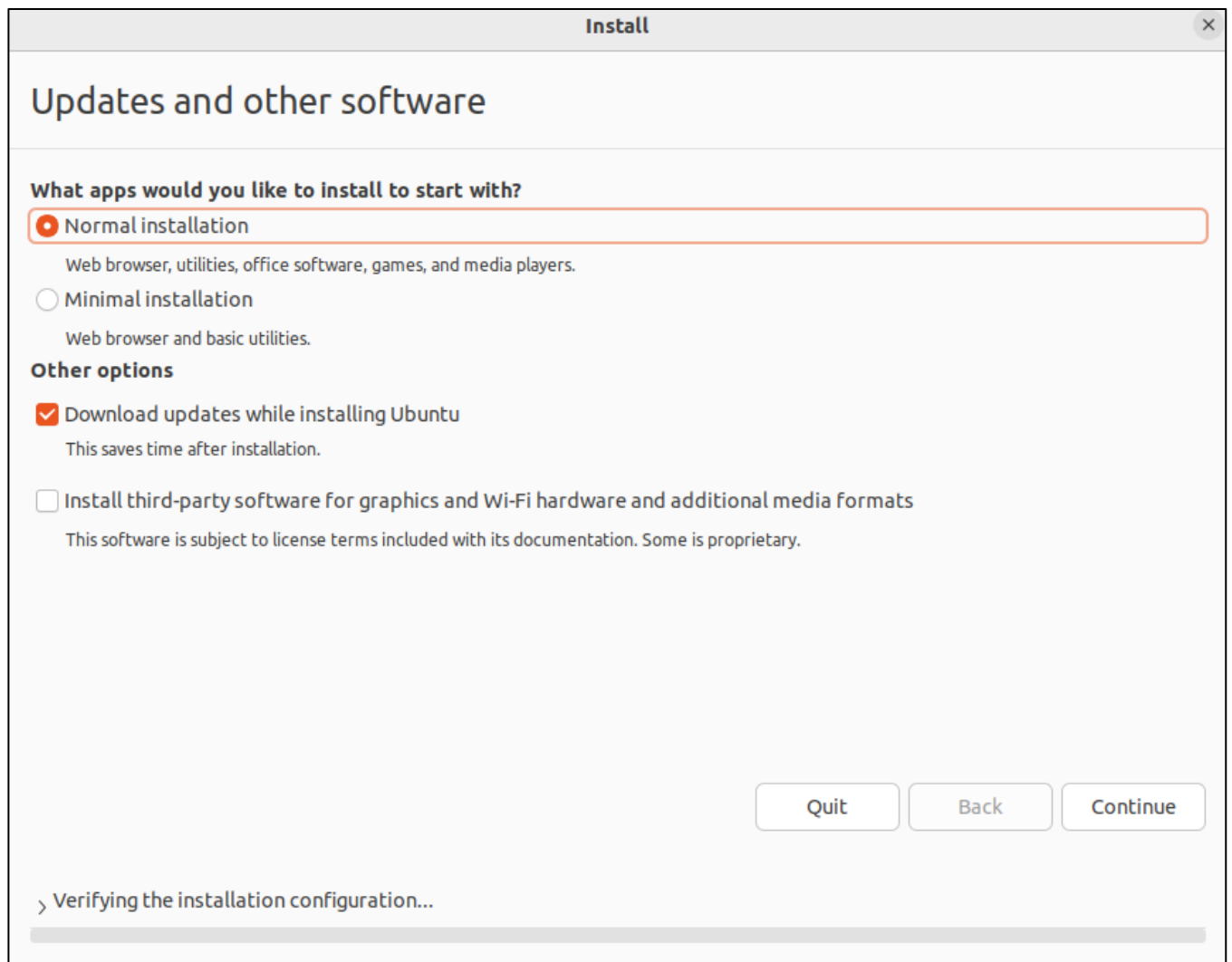
Configuring and Installing Ubuntu

Step 1: Run the Machine

Step 2: Select the language and click on CONTINUE



Step 3: Click on CONTINUE



Step 4: Click on Erase Disk and click on INSTALL

Install

Installation type

This computer currently has no detected operating systems. What would you like to do?

☒ Erase disk and install Ubuntu

Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

Advanced features... None selected

☐ Something else

You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

Quit

Back

Install Now

> Verifying the installation configuration...

Write the changes to disks?

If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI33 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #2 of SCSI33 (0,0,0) (sda) as ESP
partition #3 of SCSI33 (0,0,0) (sda) as ext4

Go Back

Continue

Step 5: Select the Country and click on Continue

Install

Where are you?



> Creating ext4 file system for / in partition #3 of SCSI133 (0,0,0) (sda)...

Step 6: Provide the Name, Username, and Password and click on Continue


Install

Who are you?

Your name: ✓

Your computer's name: ✓
The name it uses when it talks to other computers.

Pick a username: ✓

Choose a password:  **Short password**

Confirm your password: ✓

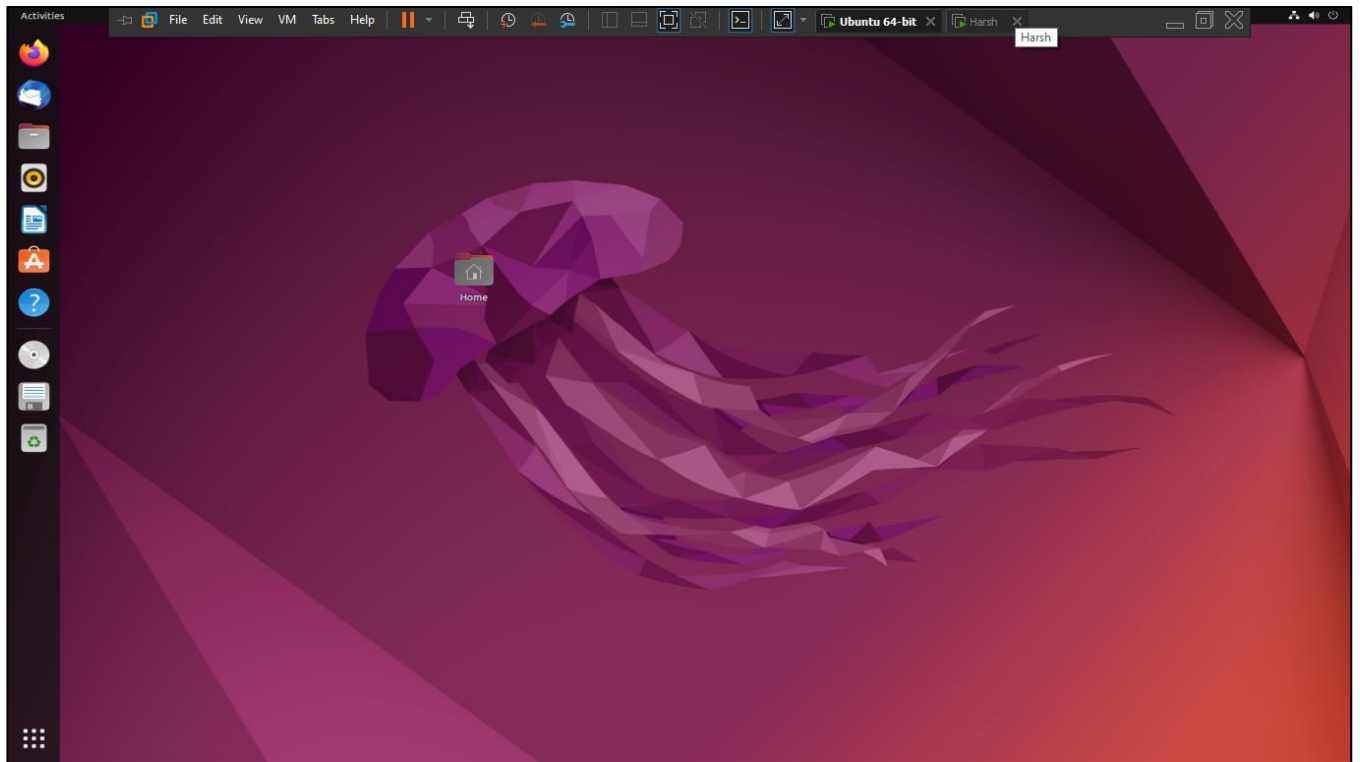
☒ Log in automatically

☐ Require my password to log in

☐ Use Active Directory
You'll enter domain and other details in the next step.

[Back](#) [Continue](#)

> Copying files...



Practical 2

Aim: Implementation of containerization using Docker

Code:

Installation of Docker

```
apt -y install docker.io
```

```
root@harsh-virtual-machine:~# apt -y install docker.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  bridge-utils containerd git git-man liberror-perl pigz runc ubuntu-fan
Suggested packages:
  ifupdown aufs-tools btrfs-progs cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils git-daemon-run | git-daemon-sysvinit git-doc git-email
  git-gui gitk gitweb git-cvs
  git-mediawiki git-svn
The following NEW packages will be installed:
  bridge-utils containerd docker.io git git-man liberror-perl pigz runc ubuntu-fan
0 upgraded, 9 newly installed, 0 to remove and 314 not upgraded.
Need to get 69.4 MB of archives.
After this operation, 303 MB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils amd64 1.7-1ubuntu3 [34.4 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 runc amd64 1.1.0-0ubuntu1 [4,087 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 containerd amd64 1.5.9-0ubuntu3 [27.0 MB]
Get:5 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 docker.io amd64 20.10.12-0ubuntu4 [34.0 MB]
Get:6 http://in.archive.ubuntu.com/ubuntu jammy/main amd64 liberror-perl all 0.17029-1 [26.5 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 git-man all 1:2.34.1-1ubuntu1.4 [952 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 git amd64 1:2.34.1-1ubuntu1.4 [3,131 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 69.4 MB in 11s (6,425 kB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 159854 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7-1ubuntu3_amd64.deb ...
Unpacking bridge-utils (1.7-1ubuntu3) ...
Selecting previously unselected package runc.
Preparing to unpack .../2-runc_1.1.0-0ubuntu1_amd64.deb ...
Unpacking runc (1.1.0-0ubuntu1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../3-containerd_1.5.9-0ubuntu3_amd64.deb ...
Unpacking containerd (1.5.9-0ubuntu3) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../4-docker.io_20.10.12-0ubuntu4_amd64.deb ...
Unpacking docker.io (20.10.12-0ubuntu4) ...
Selecting previously unselected package liberror-perl.
Preparing to unpack .../5-liberror-perl_0.17029-1_all.deb ...
Unpacking liberror-perl (0.17029-1) ...
```

Docker Version

```
docker version
```

```
root@harsh-virtual-machine:~# docker version
Client:
Version:           20.10.12
API version:       1.41
Go version:        go1.17.3
Git commit:        20.10.12-0ubuntu4
Built:             Mon Mar  7 17:10:06 2022
OS/Arch:           linux/amd64
Context:           default
Experimental:      true

Server:
Engine:
Version:           20.10.12
API version:       1.41 (minimum version 1.12)
Go version:        go1.17.3
Git commit:        20.10.12-0ubuntu4
Built:             Mon Mar  7 15:57:50 2022
OS/Arch:           linux/amd64
Experimental:      false
containerd:
Version:           1.5.9-0ubuntu3
GitCommit:
runc:
Version:           1.1.0-0ubuntu1
GitCommit:
docker-init:
Version:           0.19.0
GitCommit:
root@harsh-virtual-machine:~#
```

Download an official image and create a container and output the words [Welcome to the Docker World] inside the container

Downloading the official image

```
docker pull ubuntu
```

```
root@harsh-virtual-machine:~# docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
2b55860d4c66: Pull complete
Digest: sha256:20fa2d7bb4de7723f542be5923b06c4d704370f0390e4ae9e1c833c8785644c1
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
root@harsh-virtual-machine:~#
```

Run echo inside the Container

```
docker run ubuntu /bin/echo "Welcome to the Docker World!"
```

```
root@harsh-virtual-machine:~# docker run ubuntu /bin/echo "Welcome to the Docker World!"
Welcome to the Docker World!
root@harsh-virtual-machine:~#
```

Connect to the interactive session of a Container with [i] and [t] option like follows. If exit from the Container session, the process of a Container finishes.

```
docker run -it ubuntu /bin/bash

uname -a

exit
```

```
root@harsh-virtual-machine:~# docker run -it ubuntu /bin/bash
root@657d7215c3dc:/# uname -a
Linux 657d7215c3dc 5.15.0-25-generic #25-Ubuntu SMP Wed Mar 30 15:54:22 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
root@657d7215c3dc:/# exit
exit
root@harsh-virtual-machine:~#
```

If exit from the Container session with keeping container's process, push [Ctrl+p] and [Ctrl+q] key.

```
docker run -it ubuntu /bin/bash
```

```
root@harsh-virtual-machine:~# docker run -it ubuntu /bin/bash
root@6f6b3bb2cbce:/#
root@6f6b3bb2cbce:/# root@harsh-virtual-machine:~# CTRL + p , CTRL +q
```

Show docker processes

```
docker ps
```

```
root@harsh-virtual-machine:~# docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS        NAMES
6f6b3bb2cbce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes                serene_hodgkin
5db3fece30ce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes                dazzling_hamilton
root@harsh-virtual-machine:~#
```

Connect to container's Session

```
docker attach 6f6b3bb2cbce
```

```
root@harsh-virtual-machine:~# docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
6f6b3bb2cbce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           serene_hodgkin
5db3fece30ce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           dazzling_hamilton
root@harsh-virtual-machine:~# docker attach 6f6b3bb2cbce
root@6f6b3bb2cbce:/#
```

```
root@harsh-virtual-machine:~# docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
6f6b3bb2cbce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           serene_hodgkin
5db3fece30ce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           dazzling_hamilton
root@harsh-virtual-machine:~# docker attach 6f6b3bb2cbce
root@6f6b3bb2cbce:/#
```

Shutdown container's process from Host's console

```
docker kill 6f6b3bb2cbce
```

```
root@harsh-virtual-machine:~# docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
6f6b3bb2cbce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           serene_hodgkin
5db3fece30ce   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes           dazzling_hamilton
root@harsh-virtual-machine:~# docker attach 6f6b3bb2cbce
root@6f6b3bb2cbce:/# read escape sequence
root@harsh-virtual-machine:~# docker kill 6f6b3bb2cbce
6f6b3bb2cbce
root@harsh-virtual-machine:~# docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
5db3fece30ce   ubuntu   "/bin/bash"             7 minutes ago Up 7 minutes           dazzling_hamilton
root@harsh-virtual-machine:~#
```

Add Container images you created.

For example, update official image with installing Nginx and add it as a new image for container. The container is generated every time for executing docker run command, so add the latest executed container like follows.

Show images

```
docker images
```

```
root@harsh-virtual-machine:~# docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
ubuntu        latest    2dc39ba059dc   2 weeks ago   77.8MB
root@harsh-virtual-machine:~#
```

Start a container and install nginx

```
docker run ubuntu /bin/bash -c "apt-get update; apt-get -y install nginx"
```

```

root@harsh-virtual-machine:~# docker run ubuntu /bin/bash -c "apt-get update; apt-get -y install nginx"
Get:1 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [114 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [99.8 kB]
Get:5 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [402 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [357 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [349 kB]
Get:10 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [4644 B]
Get:11 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:12 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [525 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [8088 B]
Get:15 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [398 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [724 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [3175 B]
Get:18 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [7276 B]
Fetched 23.1 MB in 58s (394 kB/s)
Reading package lists...
Reading package lists...
Building dependency tree...
Reading state information...
The following additional packages will be installed:
  fontconfig-config fonts-dejavu-core iproute2 libatm1 libbpf0 libbrotli1
  libbsd0 libcap2-bin libdeflate0 libelf1 libexpat1 libfontconfig1
  libfreetype6 libgd3 libc6 libc6-dev libjpeg-turbo8 libjpeg8 libmaxminddb0
  libmd0 libmnl0 libnginx-mod-http-geoip2 libnginx-mod-http-image-filter
  libnginx-mod-http-xslt-filter libnginx-mod-mail libnginx-mod-stream
  libnginx-mod-stream-geoip2 libpam-cap libpng16-16 libtiff5 libwebp7 libx11-6
  libx11-data libxau6 libxcb1 libxdmcp6 libxml2 libxpm4 libxslt1.1
  libxtables12 nginx-common nginx-core ucf
Suggested packages:
  iproute2-doc libgd-tools mmdns-bin fcgiwrap nginx-doc ssl-cert
The following NEW packages will be installed:
  fontconfig-config fonts-dejavu-core iproute2 libatm1 libbpf0 libbrotli1
  libbsd0 libcap2-bin libdeflate0 libelf1 libexpat1 libfontconfig1
  libfreetype6 libgd3 libc6 libc6-dev libjpeg-turbo8 libjpeg8 libmaxminddb0
  libmd0 libmnl0 libnginx-mod-http-geoip2 libnginx-mod-http-image-filter
  libnginx-mod-http-xslt-filter libnginx-mod-mail libnginx-mod-stream
  libnginx-mod-stream-geoip2 libpam-cap libpng16-16 libtiff5 libwebp7 libx11-6
  libx11-data libxau6 libxcb1 libxdmcp6 libxml2 libxpm4 libxslt1.1
  libxtables12 nginx nginx-common nginx-core ucf
0 upgraded, 44 newly installed, 0 to remove and 4 not upgraded.
Need to get 17.5 MB of archives.
After this operation, 56.4 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy/main amd64 libelf1 amd64 0.186-1build1 [51.0 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 libbpf0 amd64 1:0.5.0-1 [140 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy/main amd64 libmd0 amd64 1.0.4-1build1 [23.0 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy/main amd64 libbsd0 amd64 0.11.5-1 [44.8 kB]

```

```
docker ps -a | head -2
```

```

root@harsh-virtual-machine:~# docker ps -a | head -2
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
2ea735ff2f51   ubuntu   "/bin/bash -c 'apt-g..."  2 minutes ago   Exited (0)   35 seconds ago           objective_cor1
root@harsh-virtual-machine:~#

```

Add the image

```
docker commit 2ea735ff2f51 srv.world/ubuntu-nginx
```

```

root@harsh-virtual-machine:~# docker ps -a | head -2
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
2ea735ff2f51   ubuntu   "/bin/bash -c 'apt-g..."  2 minutes ago   Exited (0)   35 seconds ago           objective_cor1
root@harsh-virtual-machine:~# docker commit 2ea735ff2f51 srv.world/ubuntu-nginx
sha256:3efa7fe549f6d2d2ead74c6ea072aa77671f207e4f93ff29622ca0616802bd35
root@harsh-virtual-machine:~#

```

```
docker images
```

```
root@harsh-virtual-machine:~# docker images
REPOSITORY          TAG             IMAGE ID        CREATED         SIZE
srv.world/ubuntu-nginx  latest         3efa7fe549f6   44 seconds ago 170MB
ubuntu               latest         2dc39ba059dc   2 weeks ago    77.8MB
root@harsh-virtual-machine:~#
```

Generate a container from the new image and execute [which] to make sure nginx exists

```
docker run srv.world/ubuntu-nginx /usr/bin/which nginx
```

```
root@harsh-virtual-machine:~# docker run srv.world/ubuntu-nginx /usr/bin/which nginx
/usr/sbin/nginx
root@harsh-virtual-machine:~#
```

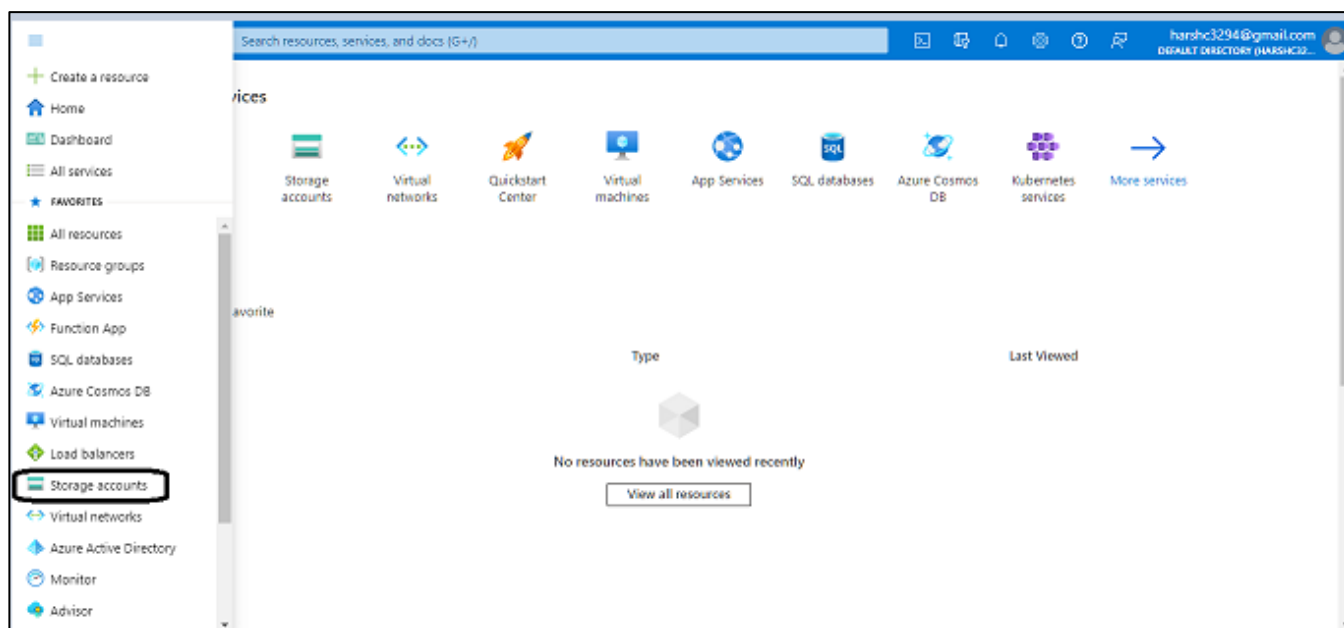
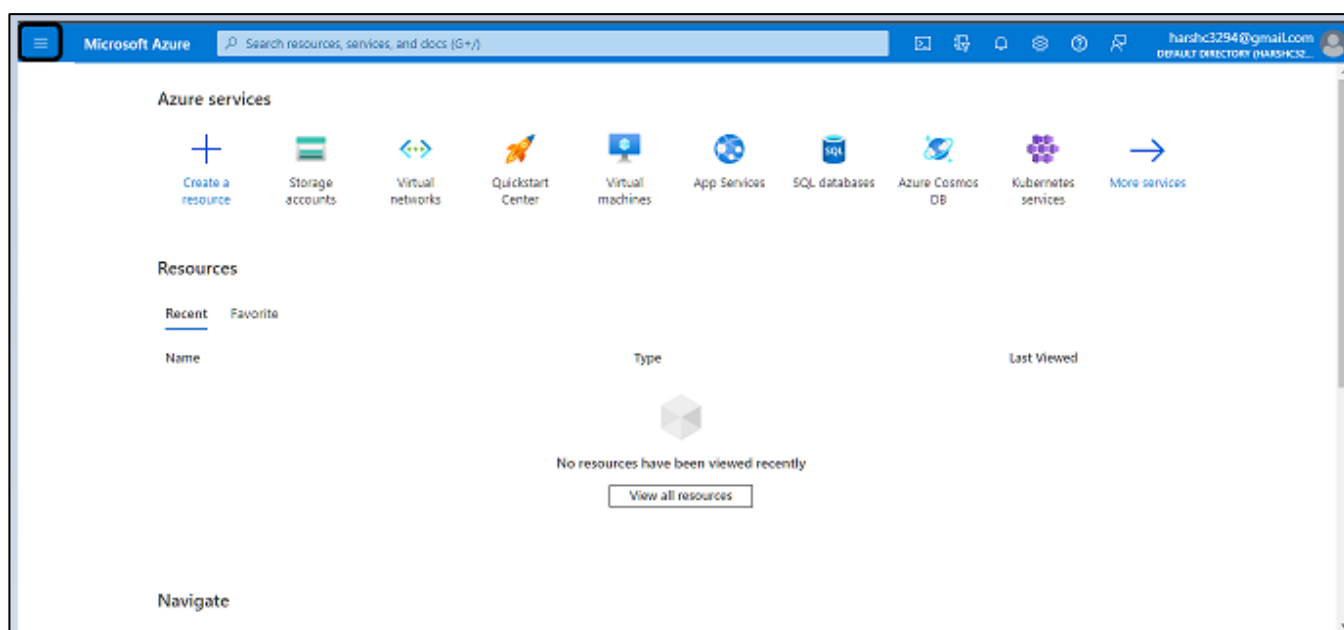

Practical 3

Aim: Demonstration of IaaS cloud

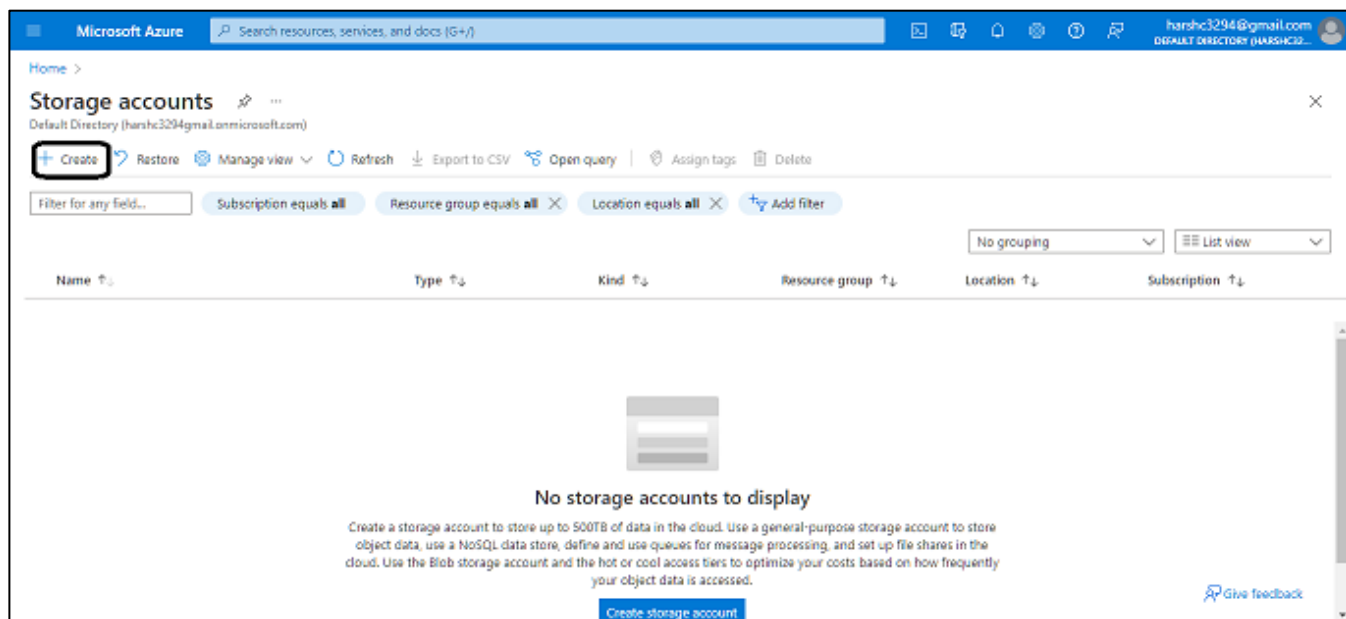
Code:

To create an Azure storage account with the Azure portal, follow these steps

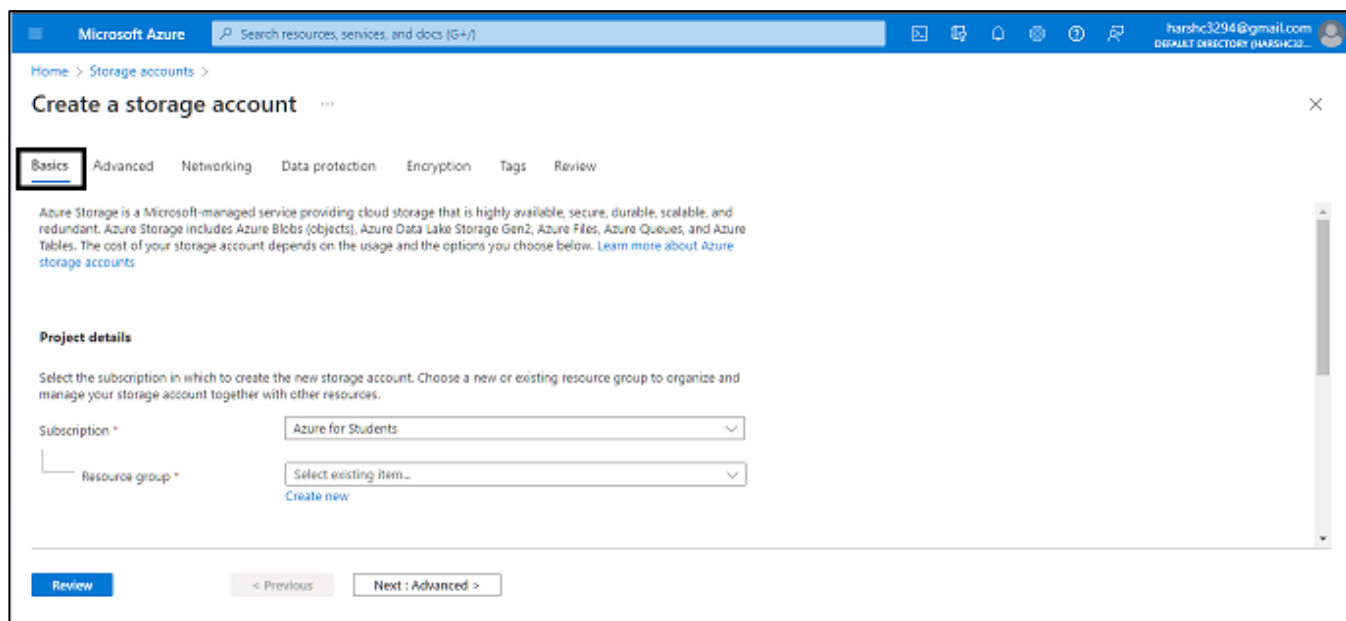
1. From the left portal menu, select Storage accounts to display a list of your storage accounts.
If the portal menu isn't visible, click the menu button to toggle it on.



2. On the Storage accounts page, select Create









3. The following image shows a standard configuration of the basic properties for a new storage account.



Microsoft Azure

Search resources, services, and docs (G+)



harshc3294@gmail.com
DEFAULT DIRECTORY (HARSHC32...

[Home](#) > [Storage accounts](#) >

Create a storage account

[Basics](#) [Advanced](#) [Networking](#) [Data protection](#) [Encryption](#) [Tags](#) [Review](#)

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription *

Azure for Students

Resource group *

(New) Harsh

[Create new](#)

Instance details

If you need to create a legacy storage account type, please click [here](#).

Storage account name ⓘ *

harsh

Region ⓘ *

(US) East US

Performance ⓘ *

☒ Standard: Recommended for most scenarios (general-purpose v2 account)

☐ Premium: Recommended for scenarios that require low latency.

Redundancy ⓘ *

Geo-redundant storage (GRS)

☒ Make read access to data available in the event of regional unavailability.

Review

< Previous

Next : Advanced >

4. The following image shows a standard configuration of the advanced properties for a new storage account.

The screenshot displays the 'Create a storage account' wizard in the Microsoft Azure portal, specifically the 'Advanced' tab. The interface includes a top navigation bar with the Microsoft Azure logo, a search bar, and user information (harshc3294@gmail.com). The breadcrumb trail shows 'Home > Storage accounts >'. The main heading is 'Create a storage account' with a close button (X). Below the heading, there are tabs for 'Basics', 'Advanced' (which is selected and highlighted with a red box), 'Networking', 'Data protection', 'Encryption', 'Tags', and 'Review'. A blue information banner states: 'Certain options have been disabled by default due to the combination of storage account performance, redundancy, and region.' The 'Advanced' tab contains several sections: 'Security' with settings for REST API operations, public access on containers, key access, and authorization; 'Data Lake Storage Gen2' with a checkbox for hierarchical namespace; 'Blob storage' with checkboxes for SFTP and network file system v3, and radio buttons for cross-tenant replication and access tier; and 'Azure Files' with a checkbox for large file shares. At the bottom, there are buttons for 'Review', '< Previous', and 'Next : Networking >'.

Microsoft Azure Search resources, services, and docs (G+)

Home > Storage accounts >

Create a storage account

Basics **Advanced** Networking Data protection Encryption Tags Review

ⓘ Certain options have been disabled by default due to the combination of storage account performance, redundancy, and region.

Security

Configure security settings that impact your storage account.

Require secure transfer for REST API operations ☒

Allow enabling public access on containers ☒

Enable storage account key access ☒

Default to Azure Active Directory authorization in the Azure portal ☐

Minimum TLS version

Permitted scope for copy operations (preview)

Data Lake Storage Gen2

The Data Lake Storage Gen2 hierarchical namespace accelerates big data analytics workloads and enables file-level access control lists (ACLs). [Learn more](#)

Enable hierarchical namespace ☐

Blob storage

Enable SFTP ☐
ⓘ To enable SFTP, 'hierarchical namespace' must be enabled.

Enable network file system v3 ☐
ⓘ To enable NFS v3 'hierarchical namespace' must be enabled. [Learn more about NFS v3](#)

Allow cross-tenant replication ☒

Access tier ☒ Hot: Frequently accessed data and day-to-day usage scenarios
☐ Cool: Infrequently accessed data and backup scenarios

Azure Files

Enable large file shares ☐

[Review](#) [< Previous](#) [Next : Networking >](#)

Microsoft Azure

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Create a storage account

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Network connectivity

You can connect to your storage account either publicly, via public IP addresses or service endpoints, or privately, using a private endpoint.

Network access *

☒ Enable public access from all networks

☐ Enable public access from selected virtual networks and IP addresses

☐ Disable public access and use private access

ⓘ

Enabling public access from all networks might make this resource available publicly. Unless public access is required, we recommend using a more restricted access type. [Learn more](#)

Network routing

Determine how to route your traffic as it travels from the source to its Azure endpoint. Microsoft network routing is recommended for most customers.

Routing preference ⓘ *

☒ Microsoft network routing

☐ Internet routing

Review

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Next : Data protection >

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Recovery

Protect your data from accidental or erroneous deletion or modification.

☐

Enable point-in-time restore for containers
Use point-in-time restore to restore one or more containers to an earlier state. If point-in-time restore is enabled, then versioning, change feed, and blob soft delete must also be enabled. [Learn more](#)

☒

Enable soft delete for blobs
Soft delete enables you to recover blobs that were previously marked for deletion, including blobs that were overwritten. [Learn more](#)
Days to retain deleted blobs

☒

Enable soft delete for containers
Soft delete enables you to recover containers that were previously marked for deletion. [Learn more](#)
Days to retain deleted containers ☒

Tracking

Manage versions and keep track of changes made to your blob data.

☐

Enable versioning for blobs
Use versioning to automatically maintain previous versions of your blobs. [Learn more](#)
Consider your workloads, their impact on the number of versions created, and the resulting costs. Optimize costs by automatically managing the data lifecycle. [Learn more](#)

☐

Enable blob change feed
Keep track of create, modification, and delete changes to blobs in your account. [Learn more](#)

Access control

☐

Enable version-level immutability support
Allows you to set time-based retention policy on the account-level that will apply to all blob versions. Enable this feature to set a default policy at the account level. Without enabling this, you can still set a default policy at the container level or set policies for specific blob versions. Versioning is required for this property to be enabled. [Learn more](#)

Review

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Next : Encryption >

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Encryption type

☒ Microsoft-managed keys (MMK)
☐ Customer-managed keys (CMK)

Enable support for customer-managed keys

☒ Blobs and files only
☐ All service types (blobs, files, tables, and queues)

This option cannot be changed after this storage account is created.

Enable infrastructure encryption

☐







Review

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[Home](#) > [Storage accounts](#) >

Create a storage account

Basics Advanced Networking Data protection Encryption **Tags** Review

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
<input type="text"/>	:	<input type="text"/> All resources selected







Review

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Microsoft Azure

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Create a storage account

Running final validation...

Basics

Advanced

Networking

Data protection

Encryption

Tags

Review

Basics

Subscription

Azure for Students

Resource Group

Harsh

Location

eastus

Storage account name

harsh

Deployment model

Resource manager

Performance

Standard

Replication

Read-access geo-redundant storage (RA-GRS)

Advanced

Create

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Download a template for automation

Allow cross-tenant replication

Enabled

Default to Azure Active Directory authorization in the Azure portal

Disabled

Blob public access

Enabled

Minimum TLS version

Version 1.2

Permitted scope for copy operations (preview)

From any storage account

Enable hierarchical namespace

Disabled

Enable SFTP

Disabled

Large file shares

Disabled

Networking

Network connectivity

Public endpoint (all networks)

Default routing tier

Microsoft network routing

Endpoint type

Standard

Data protection

Create

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Blob soft delete

Enabled

Blob retainment period in days

7

Container soft delete

Enabled

Container retainment period in days

7

File share soft delete

Enabled

File share retainment period in days

7

Versioning

Disabled

Blob change feed

Disabled

Version-level immutability support

Disabled

Encryption

Encryption type

Microsoft-managed keys (MMK)

Enable support for customer-managed keys

Blobs and files only

Enable infrastructure encryption

Disabled

Create

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Practical 4

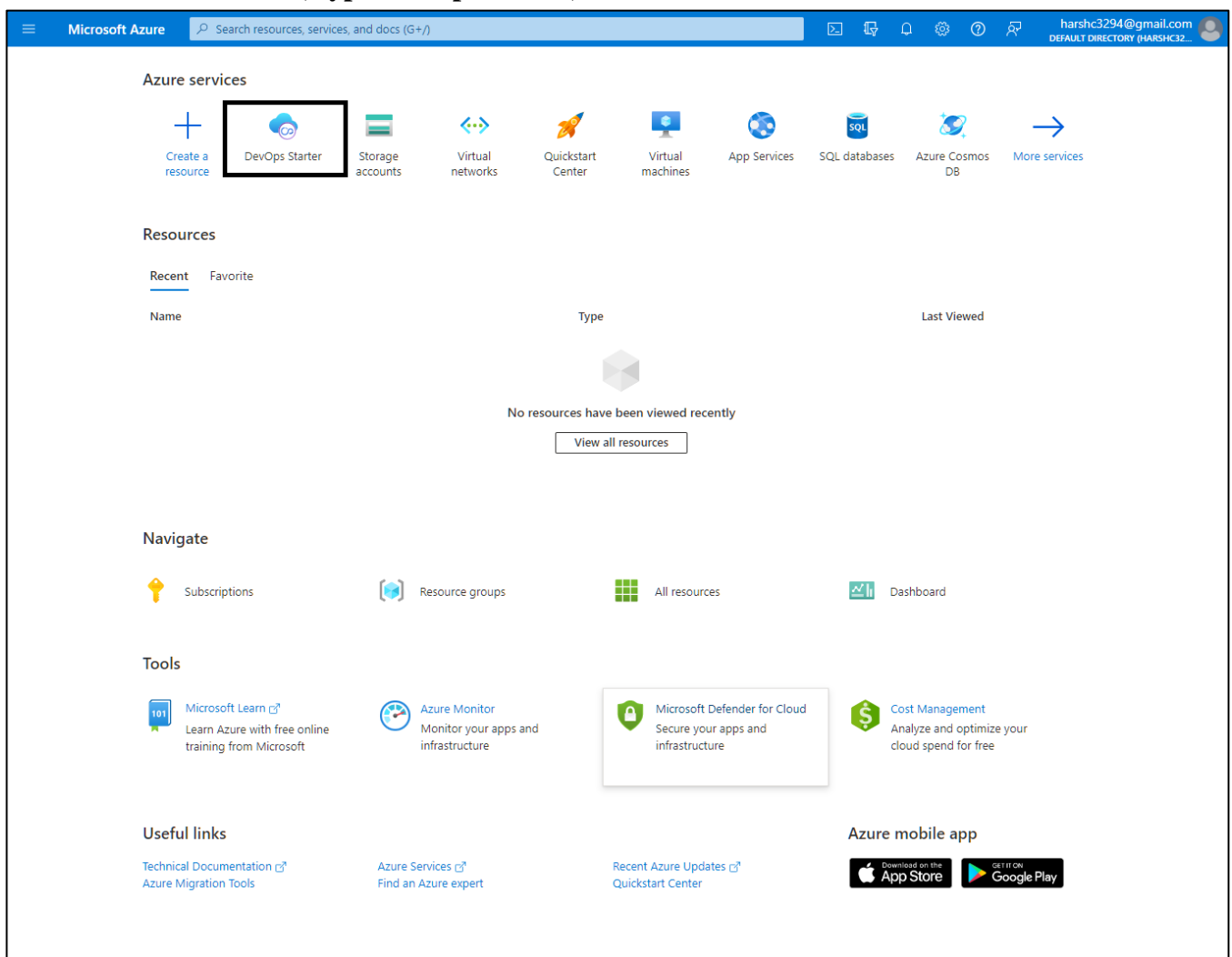
Aim: Demonstration of PaaS cloud

Code:

Deploy Node.js app to Azure Web App using DevOps Starter for GitHub Actions Use DevOps Starter to deploy a Node.js app

DevOps Starter creates a workflow in GitHub. You can use an existing GitHub organization. DevOps Starter also creates Azure resources such as Web App in the Azure subscription of your choice.

1. Sign in to the Azure portal.
2. In the search box, type DevOps Starter, and then select. Click on Add to create a new one.



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Home > DevOps Starter

Default Directory (harshc3294gmail.onmicrosoft.com)

+ Create Manage view Refresh Export to CSV Open query Assign tags

Filter for any field... Subscription equals all Resource Group Name equals all Location equals all Add filter

No grouping List view

Name Resource... Subscription

No DevOps starter to display

Try changing or clearing your filters.

Create DevOps starter

Learn more Give feedback

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Home > DevOps Starter >

DevOps Starter

Create

Launch an app running in Azure in a few quick steps
Everything you need, created and ready to go: code repository, CI/CD pipeline or GitHub Workflow, and the necessary Azure resources.

Start fresh with a new application

Setting up DevOps starter with GitHub, change settings here

.NET
New Web App using ASP.NET or ASP.NET Core, or a new IoT app

Node.js
New Web app using Node.js, Express.js or Sails.js, or a new IoT app

PHP
New Web app using simple PHP

Java
New Web App using Spring or JSF, or a new IoT app

Static Website
New static website using HTML, CSS, and JavaScript

Python
New Web App using Bottle, Django, or Flask

Ruby
New Web App using Ruby on Rails

Go
New Web App using Go

We are continuously adding support for more scenarios. Stay tuned!

Next: Framework >

DevOps starter settings

Azure DevOps
Build, test and deploy with your code in Azure repos and CI/CD using Azure Pipelines

GitHub
Build, test and deploy with your code in GitHub repo and CI/CD using GitHub Actions

Done

Microsoft Azure

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Home > DevOps Starter >

Create

DevOps Starter

×

1

2

3

4

Runtime Framework Service Create

Choose an application framework

EX Express.js

✓

Node.js web framework for building fast, minimalistic web apps and services

Simple Node.js app

Simple Node.js web app

Sails.js

Node.js web framework for building custom, enterprise-grade web apps

Add a database ☐

Cosmos DB

A globally distributed, multi-model database

< Previous

Next: Service >

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4

Runtime Framework Service Create

Select an Azure service to deploy the application

Windows Web App

✓

Fully managed compute platform on Windows for web applications and websites.

Kubernetes Service

Fully managed Kubernetes container orchestration service for managing containers without container expertise

Web App for Containers

Fully managed compute platform on Linux for deploying and running containerized web applications.

Don't see a service you're looking for? We're continuously adding support for more Azure services and app frameworks. [Learn more](#)

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Next: Create >

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DevOps Starter

Create

Runtime Framework Service **Create**

Select Repository and Subscription

Ready to deploy Express.js app to Azure Windows Web App.

i Azure needs permission to access your GitHub account to create the workflow

Authorize

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DevOps Starter

Create

Runtime Framework Service **Create**

Select Repository and Subscription

Ready to deploy Express.js app to Azure Windows Web App.

Organization * harsh3294

Repository * tinder

Subscription * ⓘ Azure for Students

Web app name * ⓘ harsh tinder clone .azurewebsites.net

Location ⓘ South Central US

Pricing tier: S1 Standard (1 Core, 1.75 GB RAM)
[Additional settings](#)

By continuing, you agree to the [Terms of Service](#) and the [Privacy Statement](#).

< Previous **Review + Create**

Practical 5

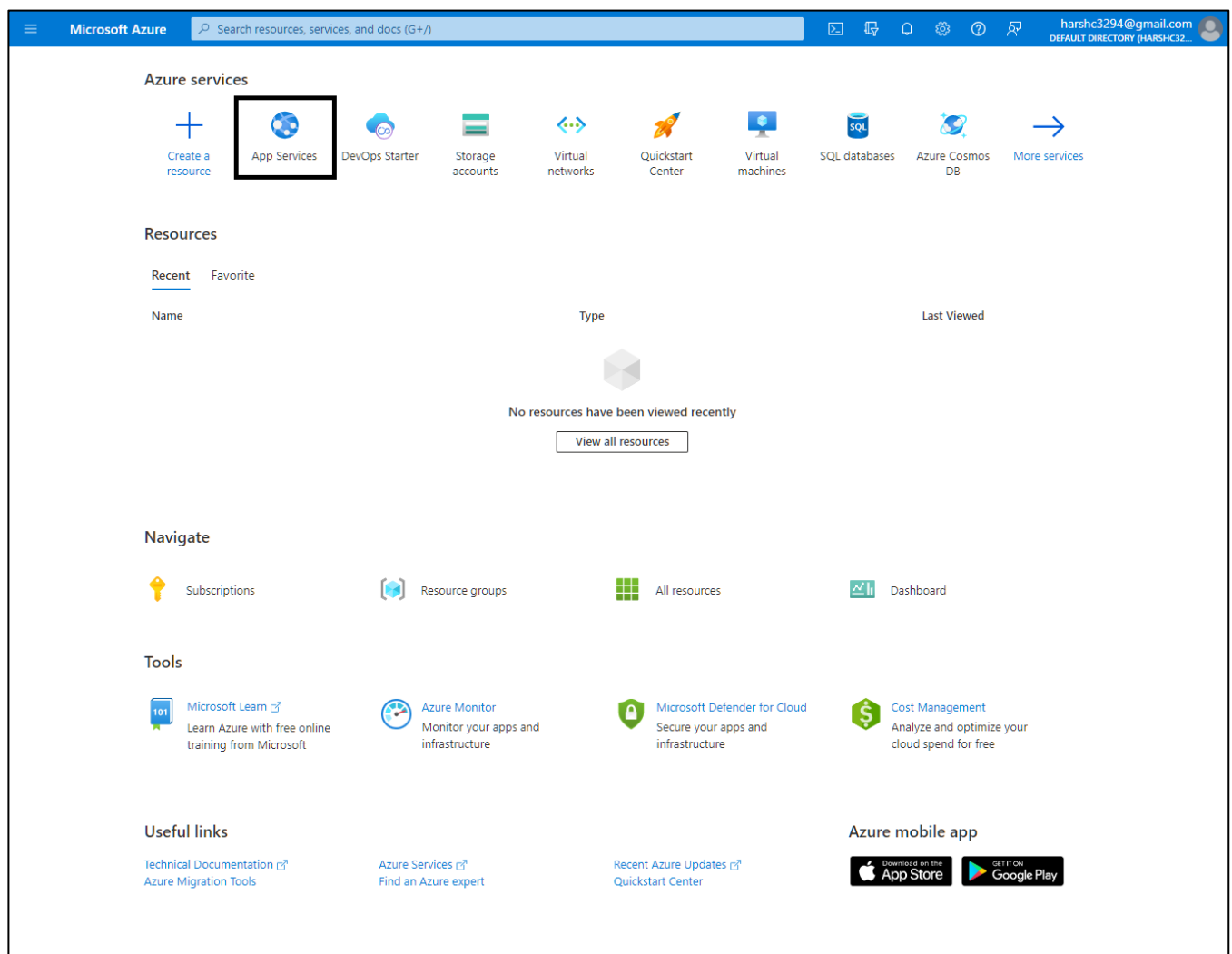
Aim: Demonstration of SaaS cloud

Code:

Manage the Azure app

To manage your web app, go to the Azure portal, and search for and select App Services.

On the **App Services** page, select the name of your web app.



The screenshot shows the Microsoft Azure portal interface for App Services. The top navigation bar includes the Microsoft Azure logo, a search bar, and user information (harshc3294@gmail.com). The main header displays 'App Services' and the default directory. A toolbar contains various actions: '+ Create' (highlighted with a red box), 'Manage view', 'Refresh', 'Export to CSV', 'Open query', 'Assign tags', 'Start', 'Restart', 'Stop', and 'Delete'. Below the toolbar, there are filter buttons for 'Subscription equals all', 'Resource group equals all', and 'Location equals all', along with an 'Add filter' button. A table header lists columns: Name, Status, Location, Pricing Tier, App Service Plan, Subscription, and App Type. The main content area shows a large circular icon with three dots and the text 'No app services to display'. Below this, a description states: 'Create, build, deploy, and manage powerful web, mobile, and API apps for employees or customers using a single back-end. Build standards-based web apps and APIs using .NET, Java, Node.js, PHP, and Python.' A blue button labeled 'Create app service' is present, along with a link to 'Learn more about App Service' and a 'Give feedback' link.

Microsoft Azure Search resources, services, and docs (G+)

Home > App Services Default Directory (harshc3294gmail.onmicrosoft.com)

+ Create Manage view Refresh Export to CSV Open query Assign tags Start Restart Stop Delete

Filter for any field... Subscription equals all Resource group equals all Location equals all Add filter

No grouping List view

Name	Status	Location	Pricing Tier	App Service Plan	Subscription	App Type
------	--------	----------	--------------	------------------	--------------	----------

No app services to display

Create, build, deploy, and manage powerful web, mobile, and API apps for employees or customers using a single back-end. Build standards-based web apps and APIs using .NET, Java, Node.js, PHP, and Python.

Create app service

Learn more about App Service

Give feedback

Microsoft Azure

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Home > App Services >

Create Web App

Basics Deployment Networking Monitoring Tags Review + create

App Service Web Apps lets you quickly build, deploy, and scale enterprise-grade web, mobile, and API apps running on any platform. Meet rigorous performance, scalability, security and compliance requirements while using a fully managed platform to perform infrastructure maintenance. [Learn more](#)

Project Details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription *

Azure for Students

Resource Group *

Harsh

[Create new](#)

Instance Details

Need a database? [Try the new Web + Database experience.](#)

Name *

huluc1one

.azurewebsites.net

Publish *

☒ Code ☐ Docker Container ☐ Static Web App

Runtime stack *

Node 16 LTS

Operating System *

☒ Linux ☐ Windows

Region *

Central US

Not finding your App Service Plan? Try a different region or select your App Service Environment.

App Service Plan

App Service plan pricing tier determines the location, features, cost and compute resources associated with your app. [Learn more](#)

Linux Plan (Central US) *

(New) ASP-Harsh-a4a4

[Create new](#)

Sku and size *

Basic B1

100 total ACU, 1.75 GB memory

[Change size](#)

Zone redundancy

An App Service plan can be deployed as a zone redundant service in the regions that support it. This is a deployment time only decision. You can't make an App Service plan zone redundant after it has been deployed. [Learn more](#)

Zone redundancy

☐ Enabled: Your App Service plan and the apps in it will be zone redundant. The minimum App Service plan instance count will be three.

☒ Disabled: Your App Service Plan and the apps in it will not be zone redundant. The minimum App Service plan instance count will be one.

Review + create

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Next : Deployment >

Microsoft Azure

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Home > App Services >

Create Web App

Basics Deployment Networking Monitoring Tags Review + create

Enable GitHub Actions to continuously deploy your app. GitHub Actions is an automation framework that can build, test, and deploy your app whenever a new commit is made in your repository. If your code is in GitHub, choose your repository here and we will add a workflow file to automatically deploy your app to App Service. If your code is not in GitHub, go to the Deployment Center once the web app is created to set up your deployment. [Learn more](#)

GitHub Actions settings

Continuous deployment ☒ Disable ☐ Enable

GitHub Actions details

Select your GitHub details, so Azure Web Apps can access your repository.

GitHub account

Organization

Repository

Branch

Workflow configuration

File with the GitHub Actions workflow configuration.

i Complete the Basics tab and the form above to preview the GitHub Actions workflow file.

Microsoft Azure

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Home > App Services >

Create Web App

Basics Deployment **Networking** Monitoring Tags Review + create

Web Apps can be provisioned with the inbound address being public to the internet or isolated to an Azure virtual network. Web Apps can also be provisioned with outbound traffic able to reach endpoints in a virtual network, be governed by network security groups or affected by virtual network routes. By default, your app is open to the internet and cannot reach into a virtual network. These aspects can also be changed after the app is provisioned. [Learn more](#)

Enable network injection * ☐ On ☒ Off

Review + create

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Microsoft Azure

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Create Web App

Basics Deployment Networking **Monitoring** Tags Review + create

Azure Monitor application insights is an Application Performance Management (APM) service for developers and DevOps professionals. Enable it below to automatically monitor your application. It will detect performance anomalies, and includes powerful analytics tools to help you diagnose issues and to understand what users actually do with your app. [Learn more](#)

Application Insights

Enable Application Insights * ☒ No ☐ Yes

Review + create

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Create Web App

Basics Deployment Networking Monitoring **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.

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

Name	Value	Resource
<input type="text"/>	<input type="text"/>	2 selected

Review + create

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Home > App Services >

Create Web App

Basics Deployment Networking Monitoring Tags **Review + create**

Summary

Web App by Microsoft

Basic (B1) sku
Estimated price - 946.67 INR/Month

Details

Subscription	dae0e6b2-cbcb-4871-9b55-35c6aeeebd02
Resource Group	Harsh
Name	hulucclone
Publish	Code
Runtime stack	Node 16 LTS

App Service Plan (New)

Name	ASP-Harsh-a4a4
Operating System	Linux
Region	Central US
SKU	Basic
Size	Small
ACU	100 total ACU
Memory	1.75 GB memory

Monitoring

Application Insights	Not enabled
----------------------	-------------

Deployment

Continuous deployment	Not enabled / Set up after app creation
-----------------------	---

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

Microsoft Azure Search resources, services, and docs (G+/)

Home >

Microsoft.Web-WebApp-Portal-2533241d-b620 | Overview

Deployment

Search < Delete Cancel Redeploy Download Refresh

Overview Inputs Outputs Template

We'd love your feedback! →

... Deployment is in progress

Deployment name: Microsoft.Web-WebApp-Portal-2533241... Start time: 9/24/2022, 6:11:57 PM
Subscription: [Azure for Students](#) Correlation ID: dff6b4ef-d542-41f9-b2cf-d3b4a6b1f129
Resource group: [Harsh](#)

Deployment details

Resource	Type	Status	Operation details
No results.			

Microsoft Defender for Cloud
Secure your apps and infrastructure
[Go to Microsoft Defender for Cloud >](#)

Free Microsoft tutorials
[Start learning today >](#)

Work with an expert
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.
[Find an Azure expert >](#)

The screenshot displays the Microsoft Azure portal interface. At the top, the header includes the Microsoft Azure logo, a search bar, and user information for 'harshc3294@gmail.com'. The main content area is titled 'Microsoft.Web-WebApp-Portal-2533241d-b620 | Overview'. A left sidebar contains navigation links for 'Overview', 'Inputs', 'Outputs', and 'Template'. The main panel shows a green checkmark icon and the text 'Your deployment is complete'. Below this, deployment details are listed: 'Deployment name: Microsoft.Web-WebApp-Portal-2533241...', 'Subscription: Azure for Students', 'Resource group: Harsh', 'Start time: 9/24/2022, 6:11:57 PM', and 'Correlation ID: dff6b4ef-d542-41f9-b2cf-d3b4a6b1f129'. A 'Deployment details' section is expanded, showing 'Next steps' with links to 'Manage deployments for your app' and 'Protect your app with authentication'. A 'Go to resource' button is visible. On the right, a sidebar contains recommendations for 'Cost Management', 'Microsoft Defender for Cloud', 'Free Microsoft tutorials', and 'Work with an expert'.

Microsoft Azure

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Home >

Microsoft.Web-WebApp-Portal-2533241d-b620 | Overview

Deployment

Search

Delete Cancel Redeploy Download Refresh

We'd love your feedback! →

✓ Your deployment is complete

Deployment name: Microsoft.Web-WebApp-Portal-2533241... Start time: 9/24/2022, 6:11:57 PM
Subscription: Azure for Students Correlation ID: dff6b4ef-d542-41f9-b2cf-d3b4a6b1f129
Resource group: Harsh

Deployment details

Next steps

Manage deployments for your app. Recommended
Protect your app with authentication. Recommended

Go to resource

Cost Management
Get notified to stay within your budget and prevent unexpected charges on your bill.
Set up cost alerts >

Microsoft Defender for Cloud
Secure your apps and infrastructure
Go to Microsoft Defender for Cloud >

Free Microsoft tutorials
Start learning today >

Work with an expert
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.
Find an Azure expert >