

Terna Engineering College
Computer Engineering Department
Program: Sem VIII

Course: Cloud Computing Lab (CSL803)

Faculty: Reshma Koli

Experiment No. 2

A.1 Aim: Implement Software Virtualization using Hypervisors (VMWARE).

PART B
(PART B: TO BE COMPLETED BY STUDENTS)

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Date of Experiment: 17-01-2021	Date of Submission: 17-01-2021
Grade:	

B.1 Question of Curiosity:

Q1: What is Hypervisor? List out various hypervisors which are used to create Virtual Machines.

ANS:

Hypervisor:

- A hypervisor is a form of virtualization software used in Cloud hosting to divide and allocate the resources on various pieces of hardware. The program which provides partitioning, isolation or abstraction is called virtualization hypervisor. The hypervisor is a hardware virtualization technique that allows multiple guest operating systems (OS) to run on a single host system at the same time. A hypervisor is sometimes also called a virtual machine manager(VMM).

There are two types of hypervisors:

- Type 1 hypervisor: hypervisors run directly on the system hardware – A “bare metal” embedded hypervisor.
- Type 2 hypervisors:
 1. VMware ESX and ESXi
 2. Microsoft Hyper-V
 3. Citrix XenServer
 4. Oracle VM

1. VMware ESX and ESXi

- These hypervisors offer advanced features and scalability but require licensing, so the costs are higher. There are some lower-cost bundles that VMware offers and they can make hypervisor technology more affordable for small infrastructures. VMware is the leader in Type-1 hypervisors. Their vSphere/ESXi product is available in a free edition and 5 commercial editions.

2. Microsoft Hyper-V

- The Microsoft hypervisor, Hyper-V doesn't offer many of the advanced features that VMware's products provide. However, with XenServer and vSphere, Hyper-V is one of the top 3 Type-1 hypervisors. It was first released with Windows Server, but now Hyper-V has been greatly enhanced with Windows Server 2012 Hyper-V. Hyper-V is available in both a free edition (with no GUI and no virtualization rights) and 4 commercial editions – Foundations (OEM only), Essentials, Standard, and Datacenter. Hyper-V

3. Citrix XenServer

- It began as an open-source project. The core hypervisor technology is free, but like VMware's free ESXi, it has almost no advanced features. Xen is a type-1 bare-metal hypervisor. Just as Red Hat Enterprise Virtualization uses KVM, Citrix uses Xen in the commercial XenServer.

4. Oracle VM

- The Oracle hypervisor is based on the open-source Xen. However, if you need hypervisor support and product updates, it will cost you. Oracle VM lacks many of the advanced features found in other bare-metal virtualization hypervisors.

- Type 2 hypervisor: hypervisors run on a host operating system that provides virtualization services, such as I/O device support and memory management.

- Type 2 hypervisor

1. VMware Workstation/Fusion/Player
2. VMware Server
3. Microsoft Virtual PC
4. Oracle VM VirtualBox
5. Red Hat Enterprise Virtualization

1. VMware Workstation/Fusion/Player

- VMware Player is a free virtualization hypervisor. It is intended to run only one virtual machine (VM) and does not allow creating VMs. VMware Workstation is a more robust hypervisor with some advanced features, such as record-and-replay and VM snapshot support.

2. VMware Server

- VMware Server is a free, hosted virtualization hypervisor that's very similar to the VMware Workstation.
- VMware has halted development on Server since 2009

3. Microsoft Virtual PC

- This is the latest Microsoft's version of this hypervisor technology, Windows Virtual PC and runs only on Windows 7 and supports only Windows operating systems running on it.

4. Oracle VM VirtualBox

- VirtualBox hypervisor technology provides reasonable performance and features if you want to virtualize on a budget. Despite being a free, hosted product with a very small footprint, VirtualBox shares many features with VMware vSphere and Microsoft Hyper-V.

5. Red Hat Enterprise Virtualization

- Red Hat's Kernel-based Virtual Machine (KVM) has the qualities of both a hosted and a bare-metal virtualization hypervisor. It can turn the Linux kernel itself into a hypervisor so the VMs have direct access to the physical hardware.

Q2: Compare and Contrast Hardware and Software Virtualization.

ANS:

Virtualization is the process of simulating a specific computer/device/environment on a different one. A few examples:

- Nintendo emulator which you can run on your PC.
- Windows XP mode in Windows.
- A virtual web server that runs on a distributed platform (cloud hosting example).

Software vs. Hardware virtualization:

- In the case of software virtualization, the host system needs to completely emulate the guest's platform (i.e. ranging from hardware, CPU instructions, through its firmware and even the operating system /if there is one/). The advantage is that host and guest platforms are independent (our example of the Nintendo emulator). The disadvantage is that this approach is very slow and resource-consuming (since we have to emulate everything).
- Hardware(-assisted) virtualization provides a significant performance gain over software virtualization by running some guest code directly on the host hardware with limited or no assistance from the host system - the hardware however needs to support this (search for Intel VT or AMD-V). The disadvantage of software virtualization is that the guest and host systems

need to use the same platform (i.e. you cannot use hardware virtualization for our Nintendo example).

Q3: Write down steps to install VM ware workstation (with appropriate screenshot).

ANS:

Step 1:

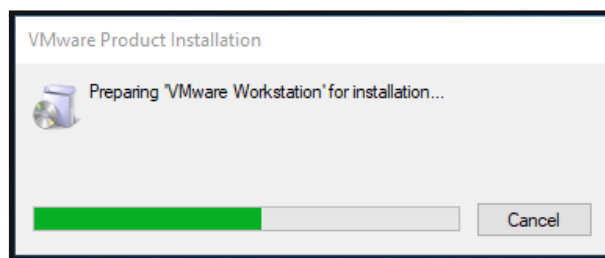
- To download and install the VMware product visit the official website of VMware.
- We have chosen VMware Workstation Pro for installation:
<https://www.vmware.com/in.html>

Step 2:

- Click on Free Product Trials & Demo >> Workstation Pro. You will be redirected to the download page. Click on Download Now according to your Operating System. We have chosen Workstation 15 Pro for Windows.
- While downloading make sure you have a proper internet connection as the file may have a large size.

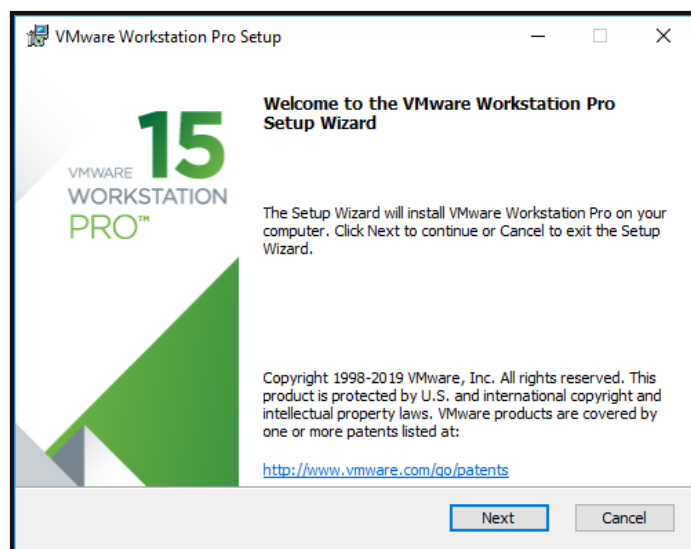
Step 3:

- Once the download is complete, run the .exe to install VMware Workstation. Popup will appear.



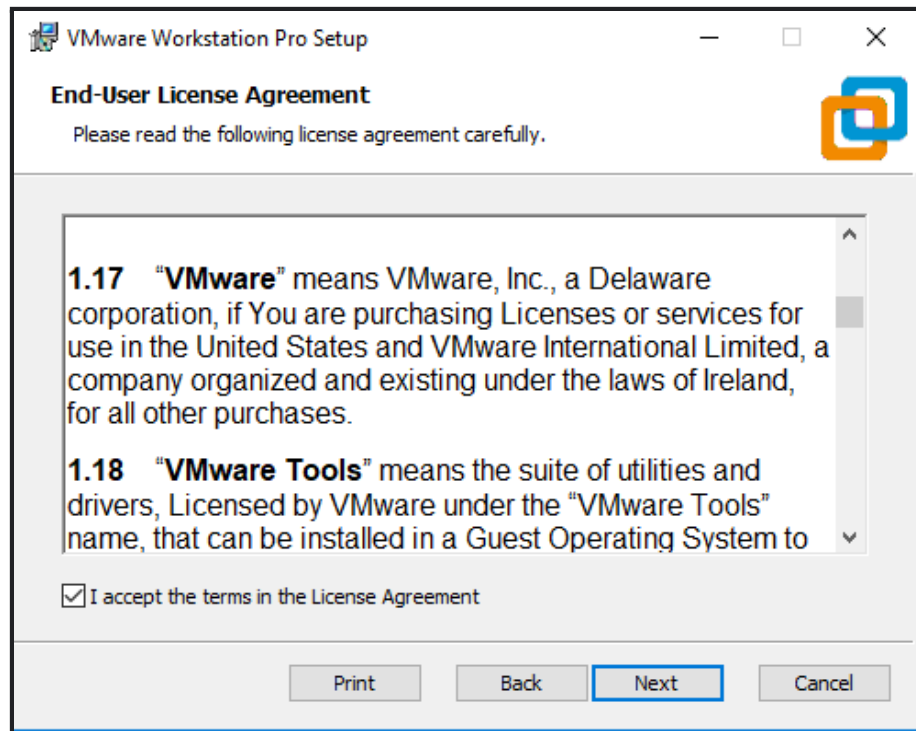
Step 4:

- Once Initialization gets completed, Click on Next.



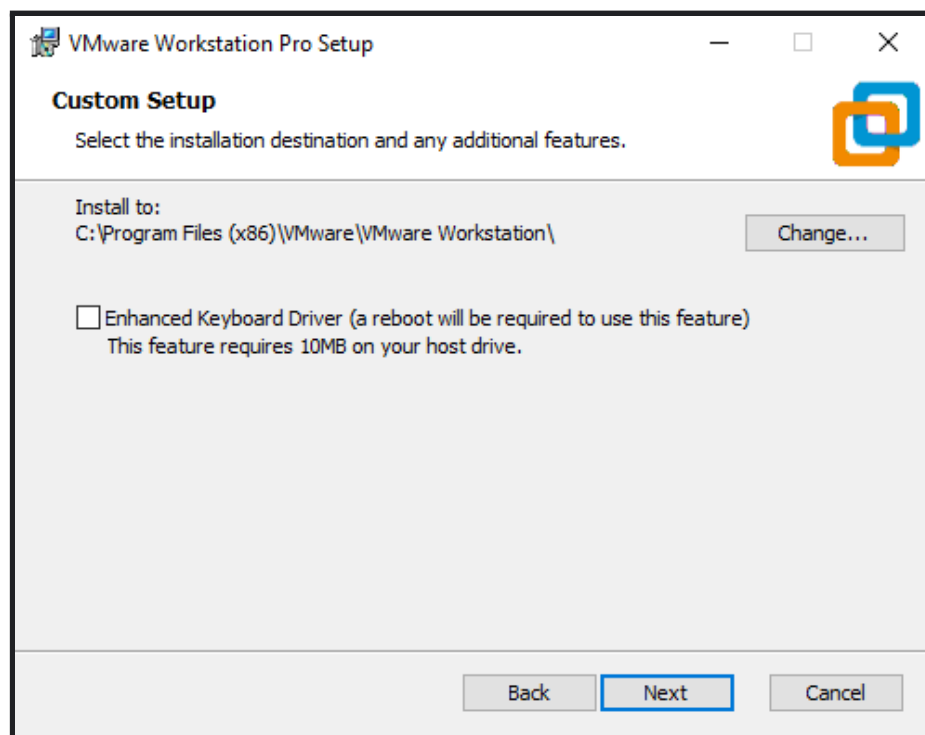
Step 5:

- Accept the terms and click Next



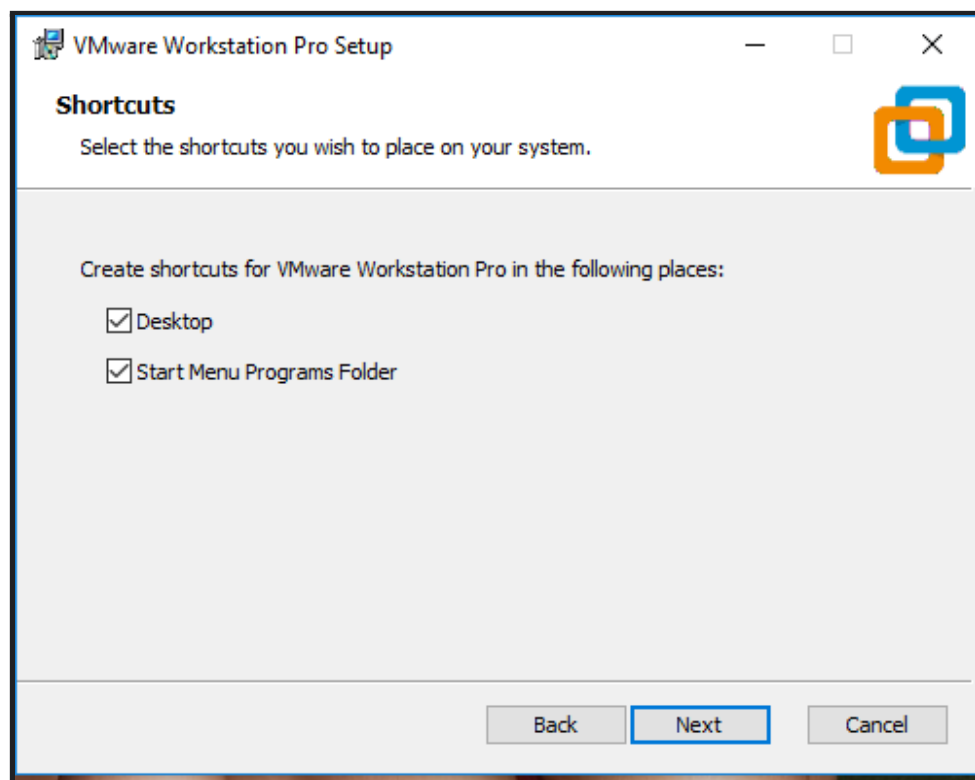
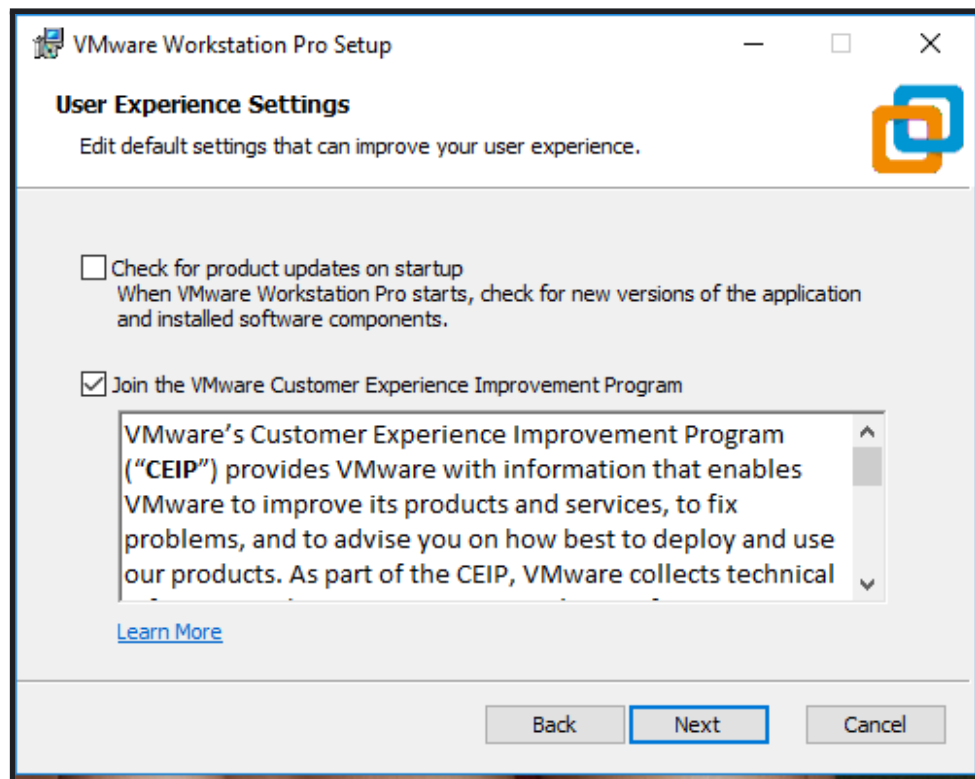
Step 6:

- In the next screen, It will ask for some additional features, it is not mandatory to check this box. Click on Next.



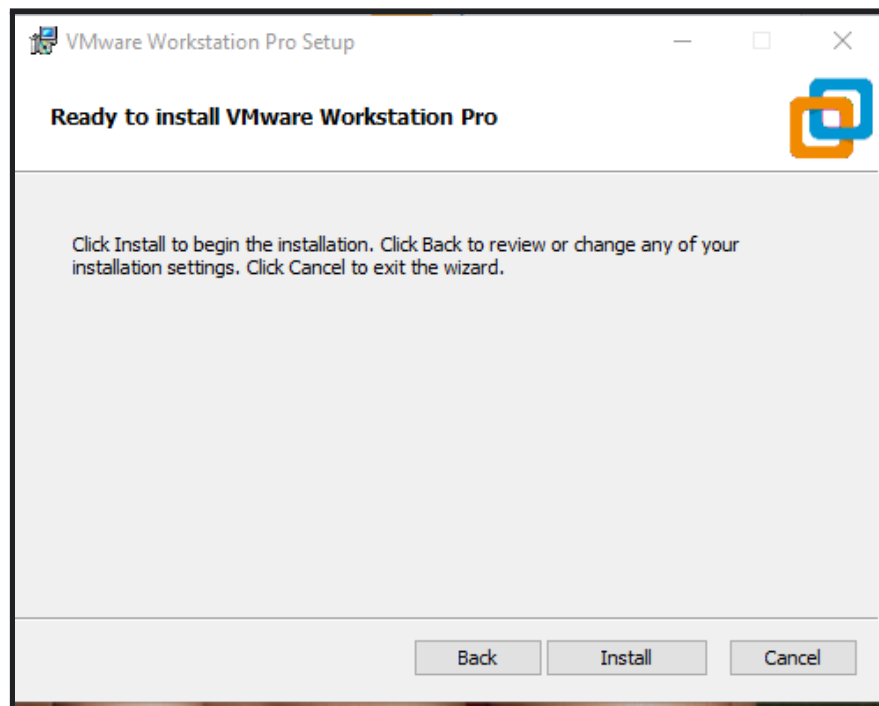
Step 7:

- On the next screen, some checkboxes are populated, Check them as per your requirement.



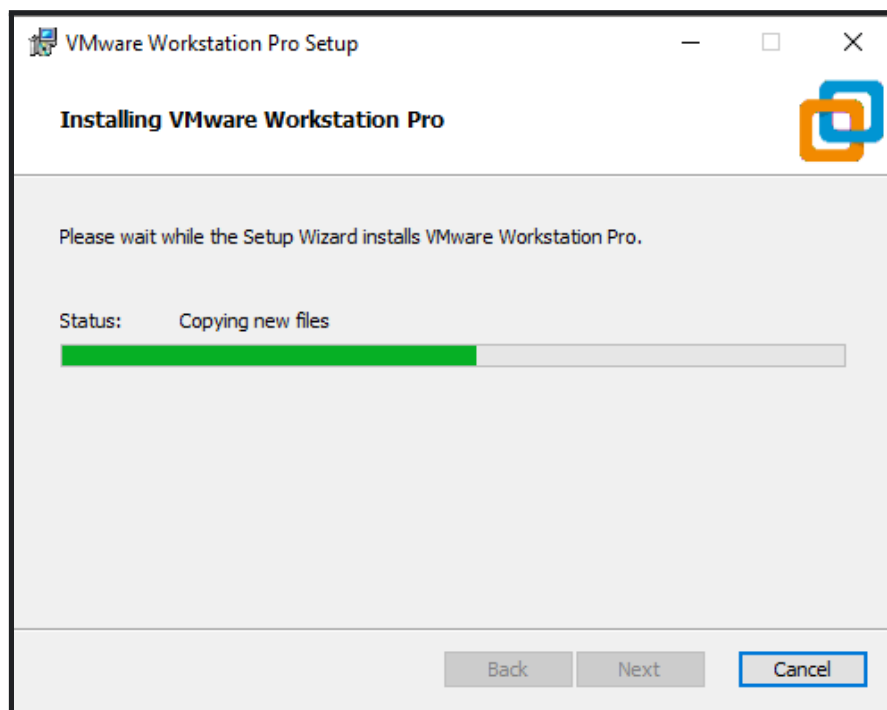
Step 8:

- At this step, VMware Workstation is ready to install. Click on Install. Click on Next.



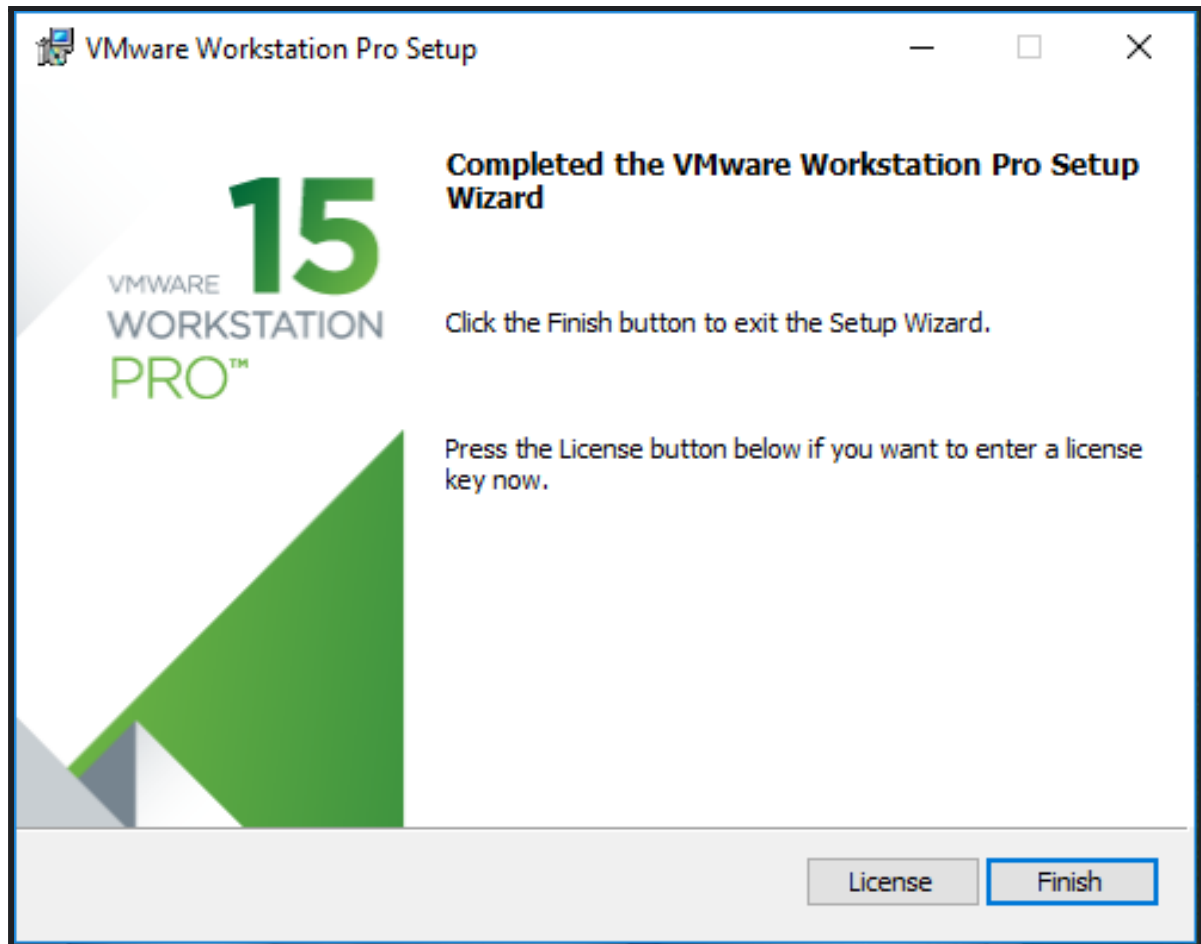
Step 9:

- At this step, you can see installation taking place. The installation will take some time, wait for it to properly install.



Step 10:

- Once the installation gets completed you will see the following dialogue box. Click on Finish. If you have purchased the product and have a license key, then you can click on License to enter the key.



Step 11:

- Upon Finishing, the window will close, and You can see the VMware Workstation installed icon on your Desktop. The icon looks like this, Double Click on the Icon to open the application.



Step 12:

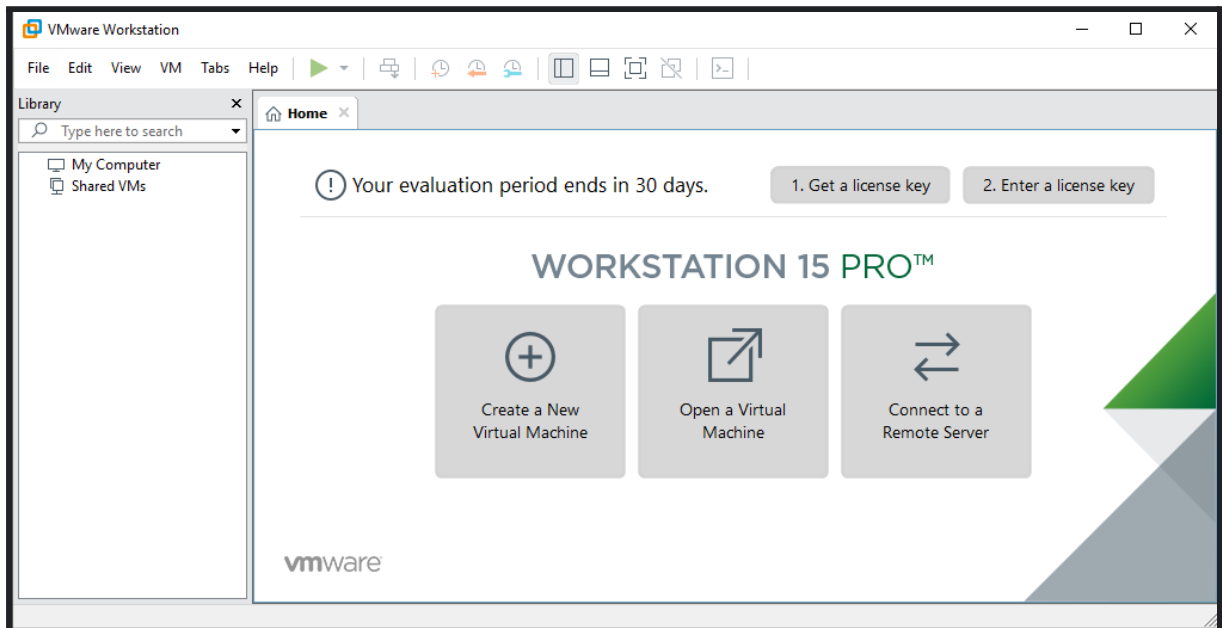
- For the first time opening, if you have not entered the License key in step 7, then it will ask for a license key. You can go for the trial version which is available free for 15 to 30 days. Click on Continue. Make sure you have Admin rights for this in Windows.



- At this stage, you will get the final installation message.



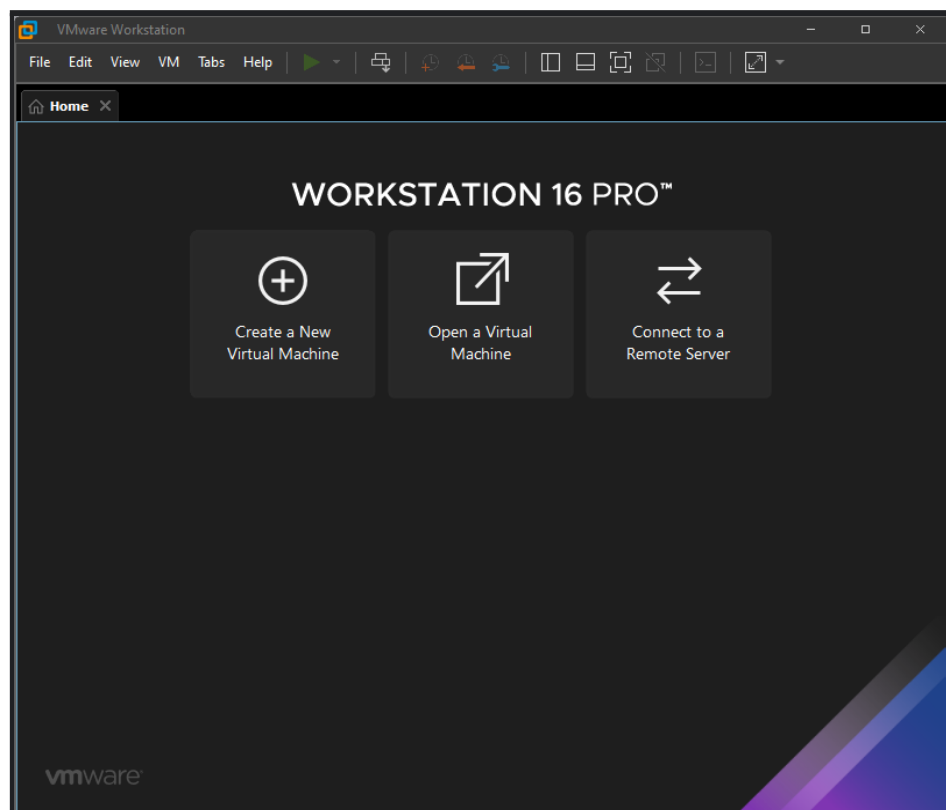
- Click on Finish. Finally, this will open a window of VMware Workstation Pro.



Q4: Write down steps to create virtual machines (with appropriate screenshot).
ANS:

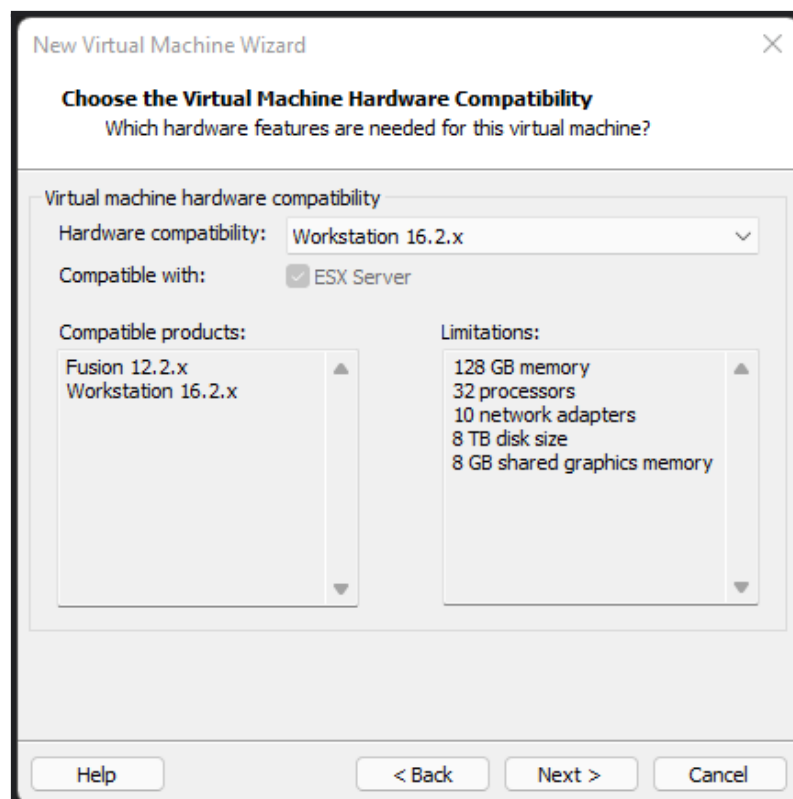
Step 1:

- Open VMware and select create a new Virtual Machine



Step 2:

- Just follow the screenshots below and get ready to install the Windows 10 OS.



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\Windows.iso Browse...

☒ 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 ✕

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

Virtual machine name:
Windows 10

Location:
D:\VMW2 Browse...

The default location can be changed at Edit > Preferences.

< Back Next > Cancel

New Virtual Machine Wizard ✕

Firmware Type
What kind of boot device should this virtual machine have?

Firmware type

☐ BIOS

☒ UEFI

☐ Secure Boot

< Back Next > Cancel

New Virtual Machine Wizard ✕

Processor Configuration
Specify the number of processors for this virtual machine.

Processors

Number of processors: ▾

Number of cores per processor: ▾

Total processor cores: 4

Help < Back Next > Cancel

New Virtual Machine Wizard

Memory for the Virtual Machine

How much memory would you like to use for this virtual machine?

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

128 GB

64 GB

32 GB

16 GB

8 GB

4 GB

2 GB

1 GB

512 MB

256 MB

128 MB

64 MB

32 MB

16 MB

8 MB

4 MB

Memory for this virtual machine:

8192

MB

Maximum recommended memory:

13.4 GB

Recommended memory:

2 GB

Guest OS recommended minimum:

1 GB

Help

< Back

Next >

Cancel

New Virtual Machine Wizard

Network Type

What type of network do you want to add?

Network connection

☐ Use bridged networking

Give the guest operating system direct access to an external Ethernet network. The guest must have its own IP address on the external network.

☒ Use network address translation (NAT)

Give the guest operating system access to the host computer's dial-up or external Ethernet network connection using the host's IP address.

☐ Use host-only networking

Connect the guest operating system to a private virtual network on the host computer.

☐ Do not use a network connection

Help

< Back

Next >

Cancel

14

New Virtual Machine Wizard ✕

Select I/O Controller Types
Which SCSI controller type would you like to use for SCSI virtual disks?

I/O controller types

SCSI Controller:

☐ BusLogic (Not available for 64-bit guests)

☐ LSI Logic (Not supported by Windows 10 and later x64)

☒ LSI Logic SAS (Recommended)

☐ Paravirtualized SCSI

Help < Back Next > Cancel

New Virtual Machine Wizard ✕

Select a Disk Type
What kind of disk do you want to create?

Virtual disk type

☐ IDE

☐ SCSI

☐ SATA

☒ NVMe (Recommended)

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Disk

Which disk do you want to use?

Disk

☒ Create a new virtual disk

A virtual disk is composed of one or more files on the host file system, which will appear as a single hard disk to the guest operating system. Virtual disks can easily be copied or moved on the same host or between hosts.

☐ Use an existing virtual disk

Choose this option to reuse a previously configured disk.

☐ Use a physical disk (for advanced users)

Choose this option to give the virtual machine direct access to a local hard disk. Requires administrator privileges.

Help

< Back

Next >

Cancel

New Virtual Machine Wizard

Specify Disk Capacity

How large do you want this disk to be?

Maximum disk size (GB):

Recommended size for Windows 10 and later x64: 60 GB

☐ Allocate all disk space now.

Allocating the full capacity can enhance performance but requires all of the physical disk space to be available right now. If you do not allocate all the space now, the virtual disk starts small and grows as you add data to it.

☐ Store virtual disk as a single file

☒ Split virtual disk into multiple files

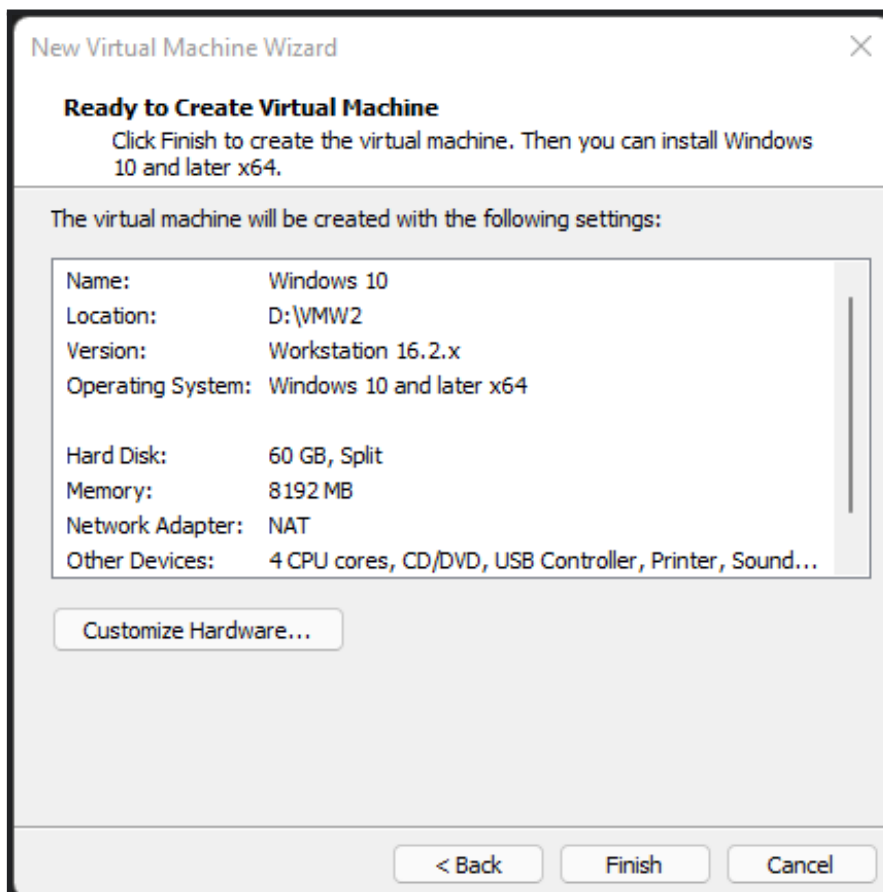
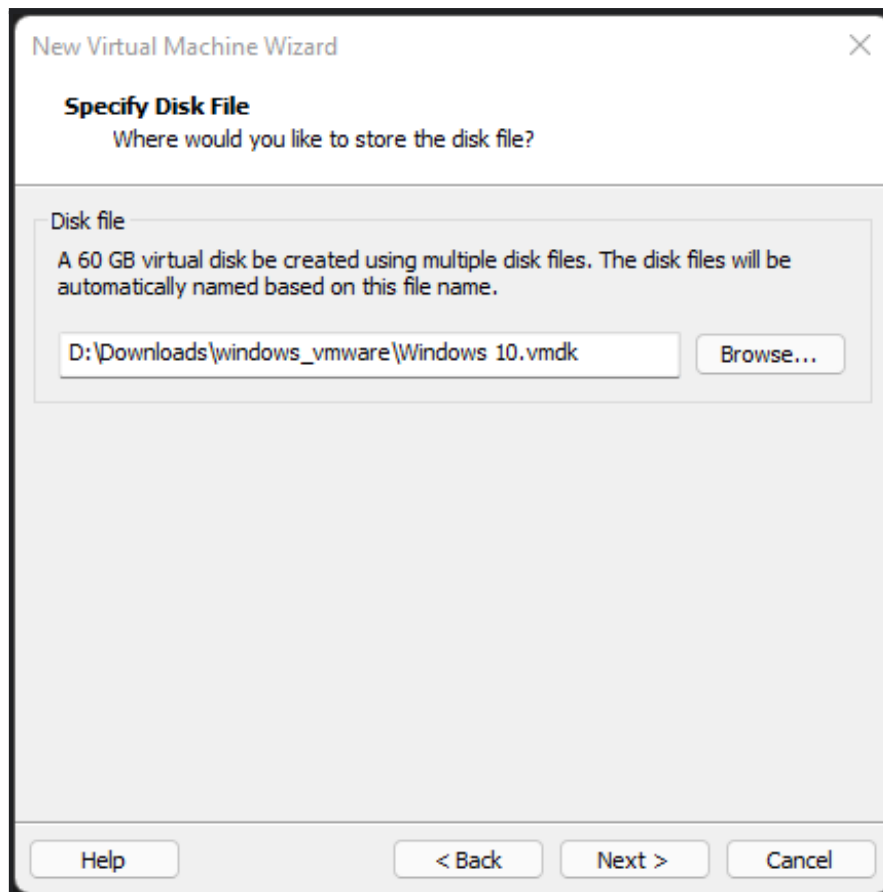
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

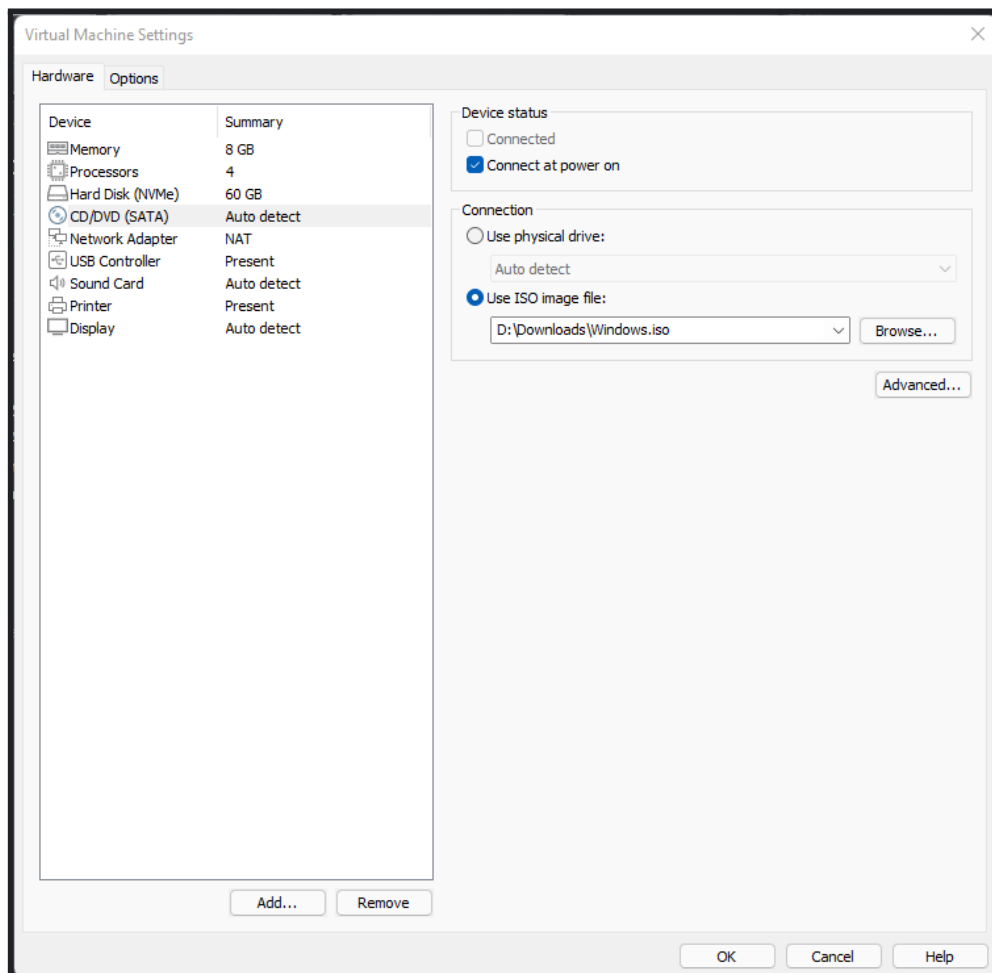
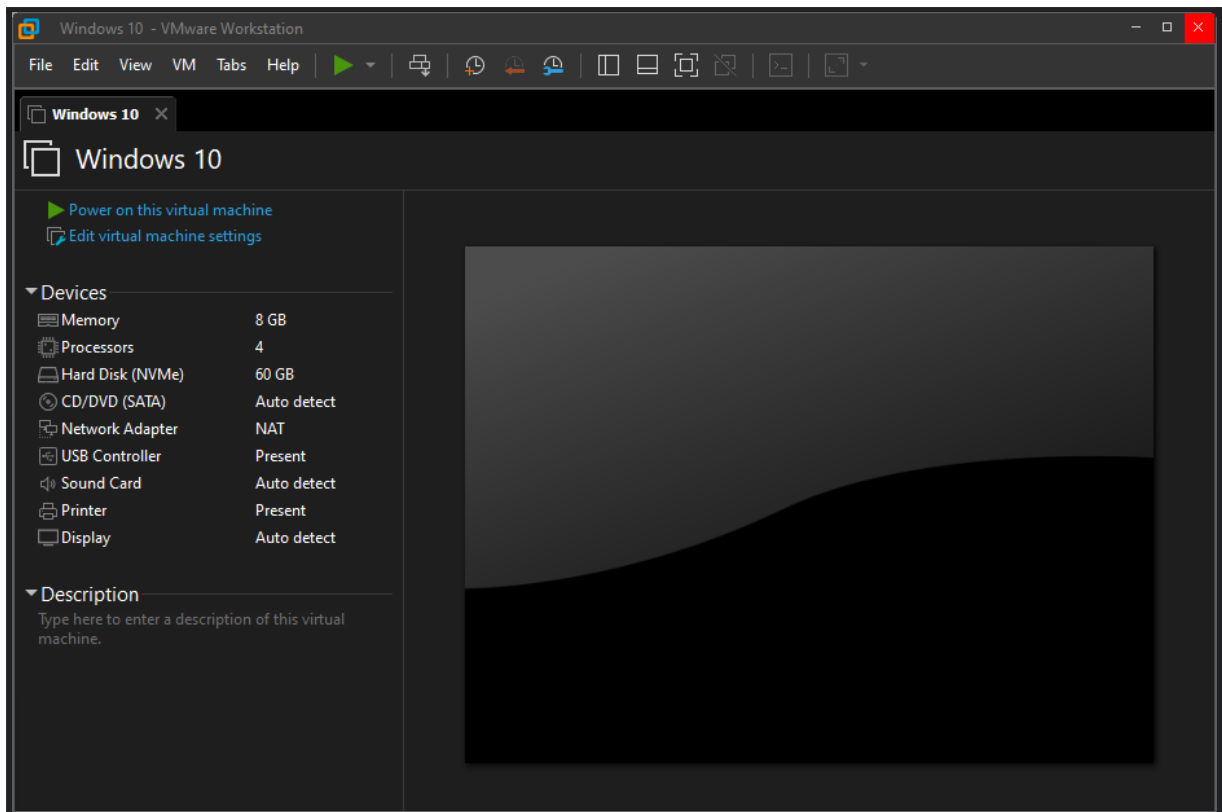
Help

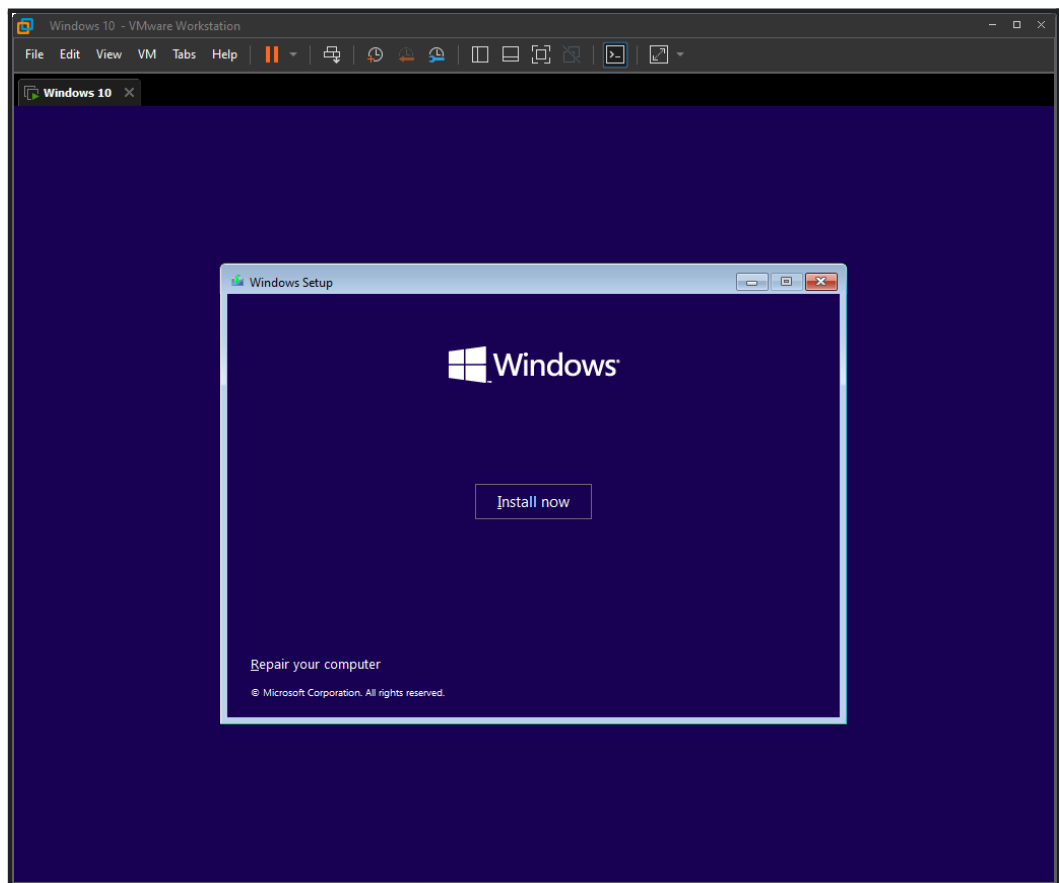
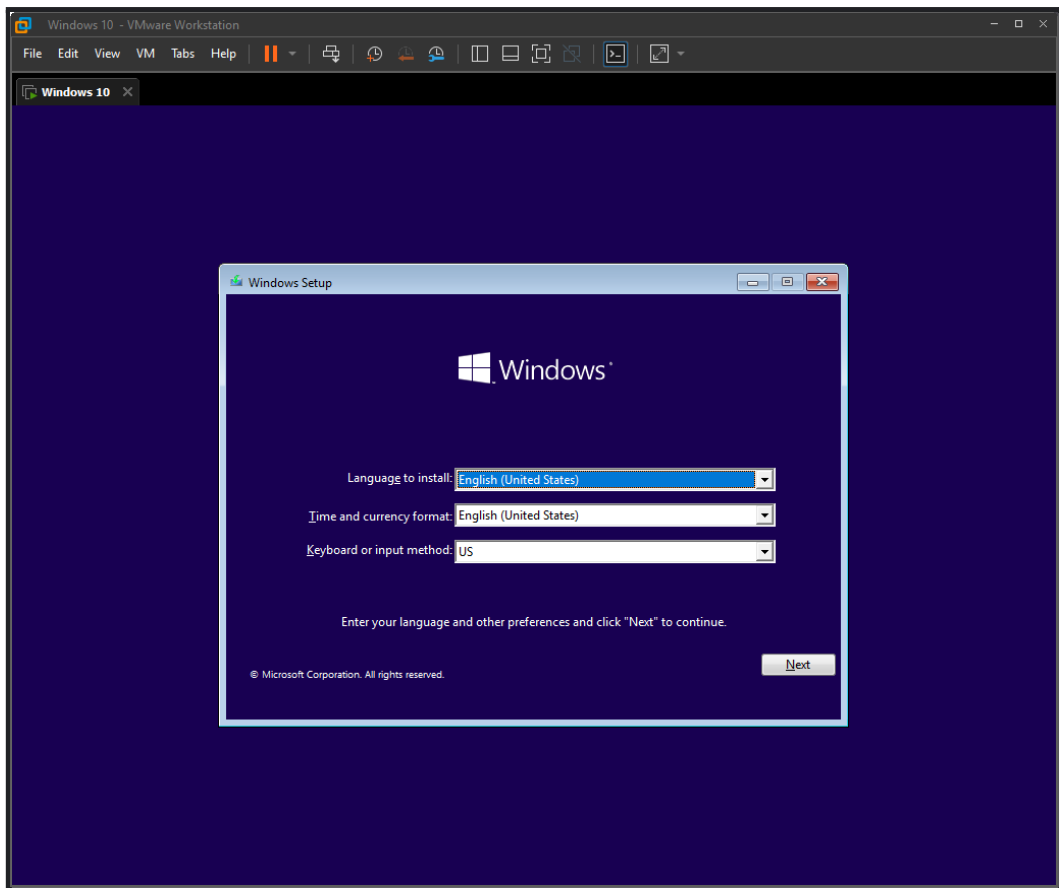
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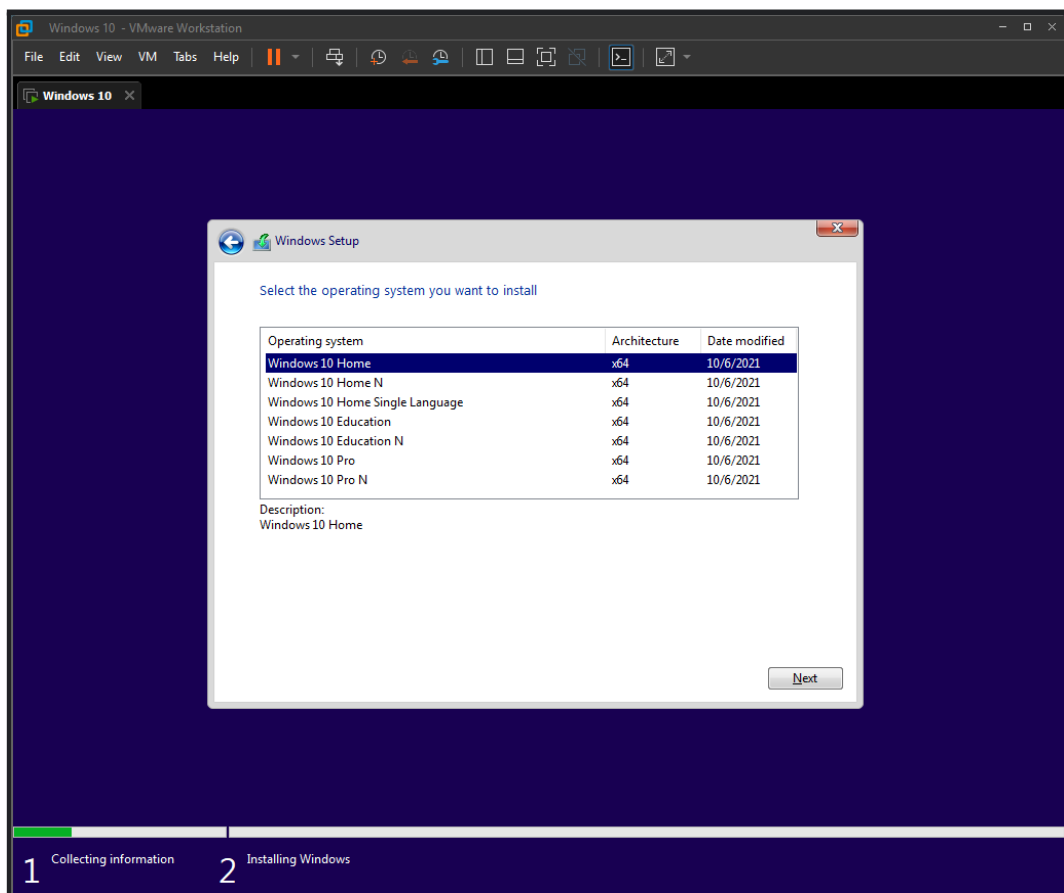
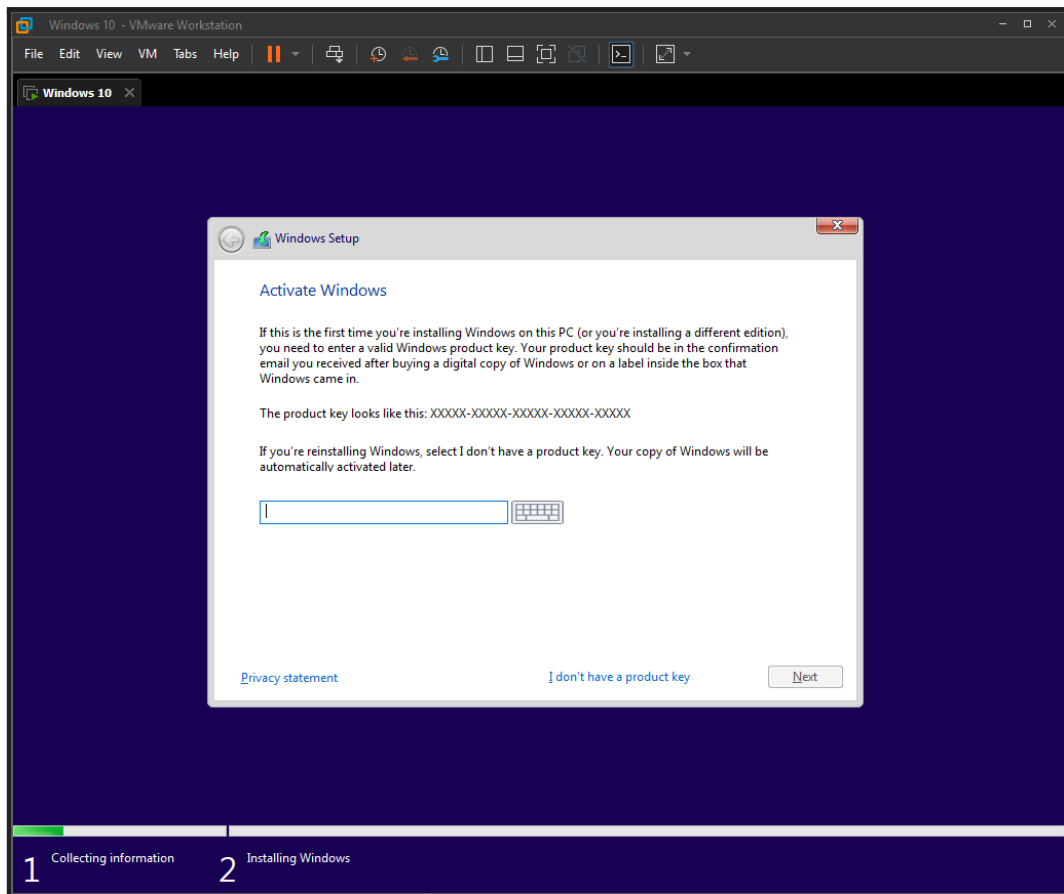
Next >

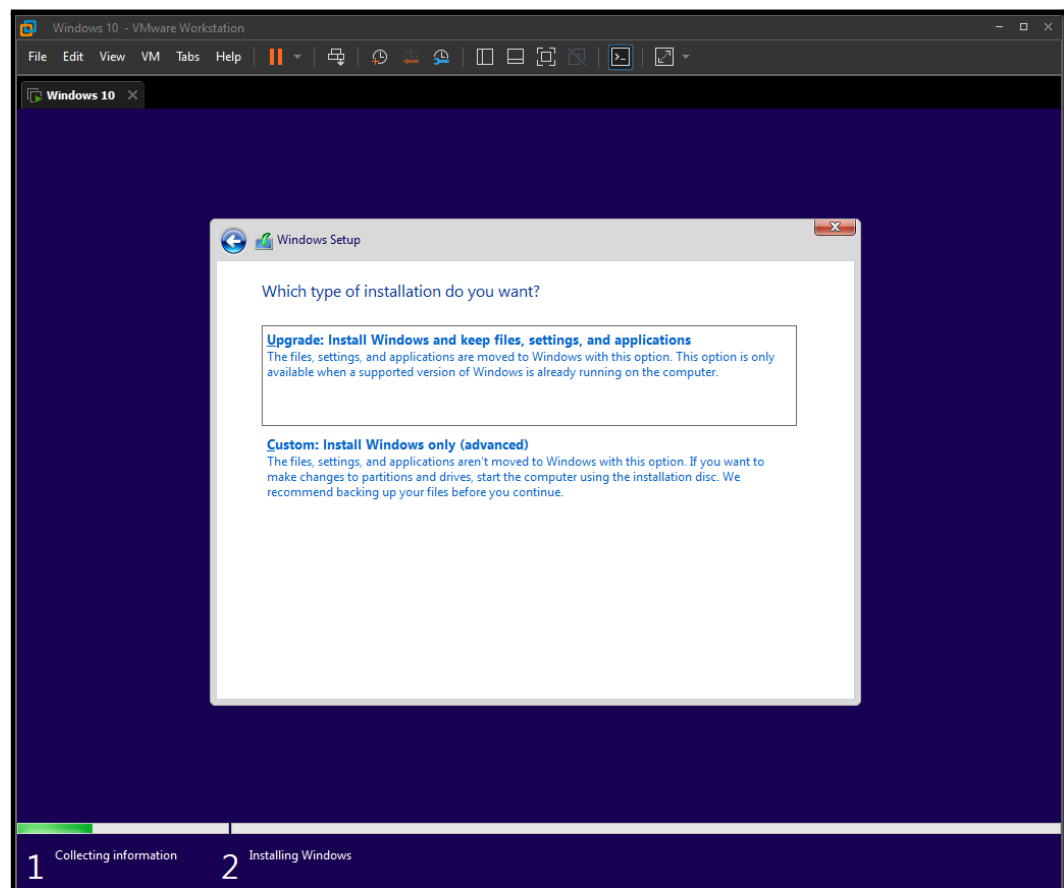
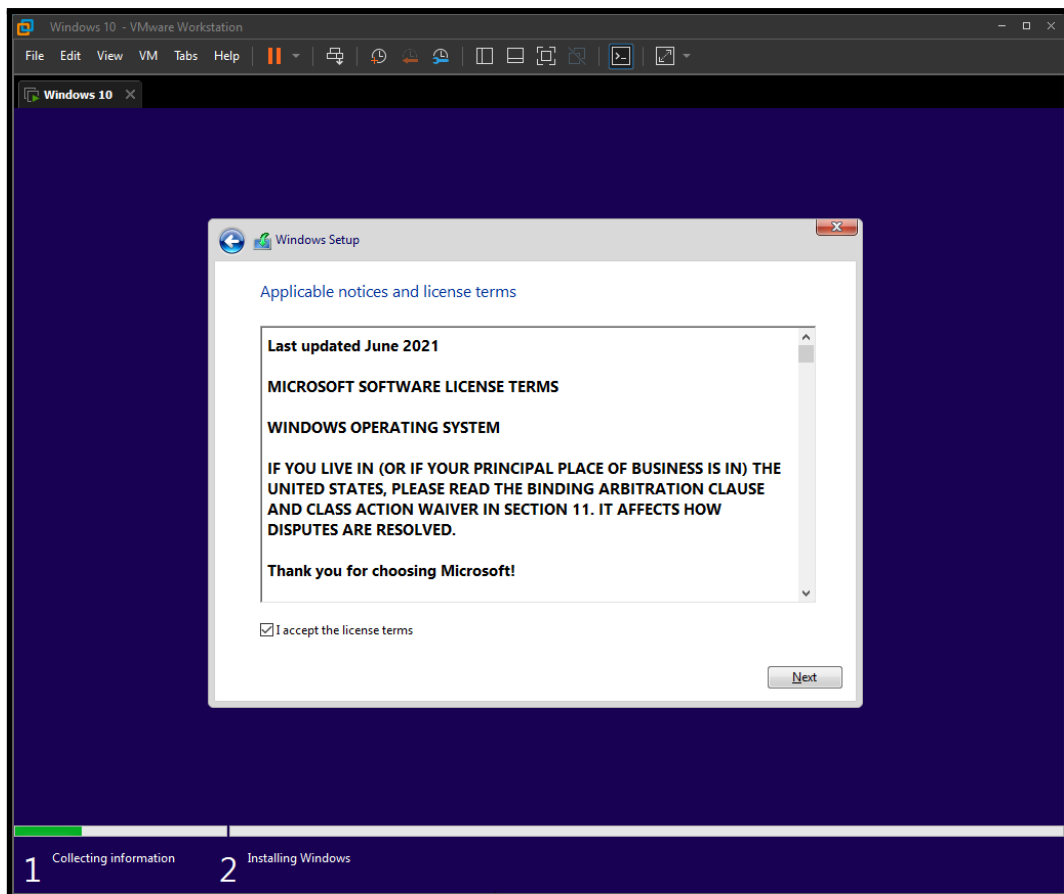
Cancel

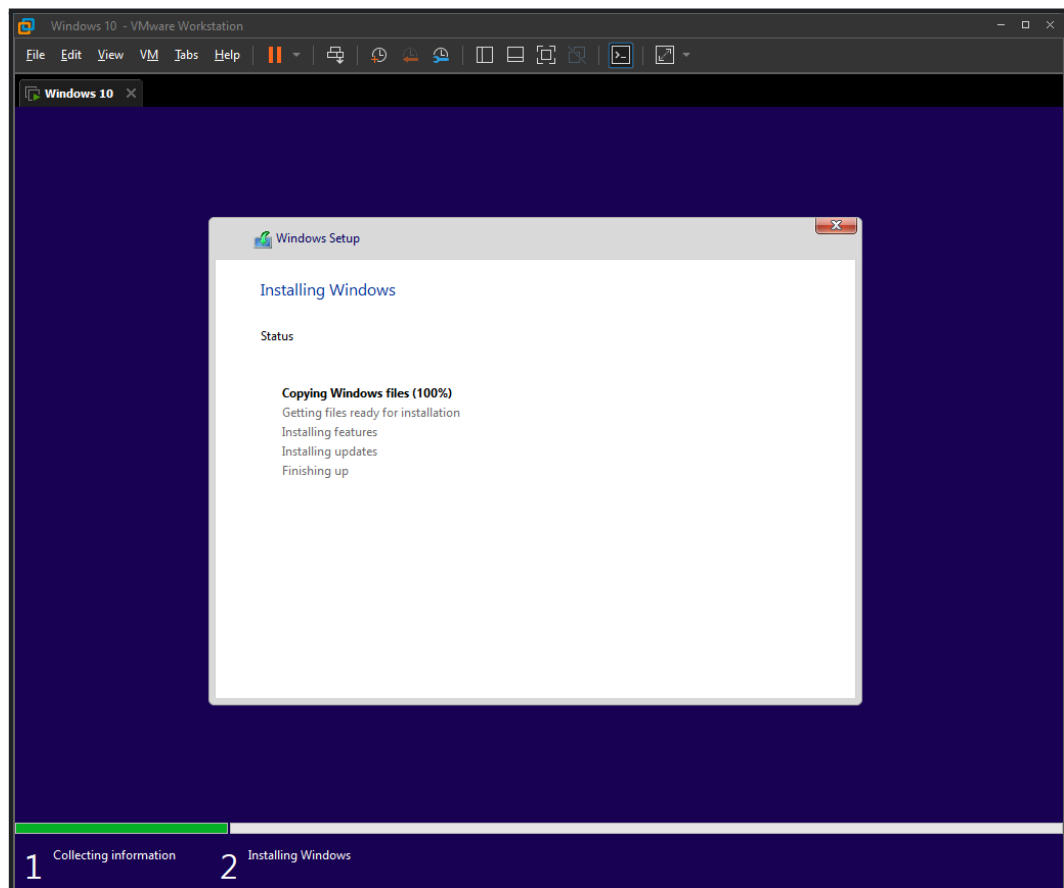
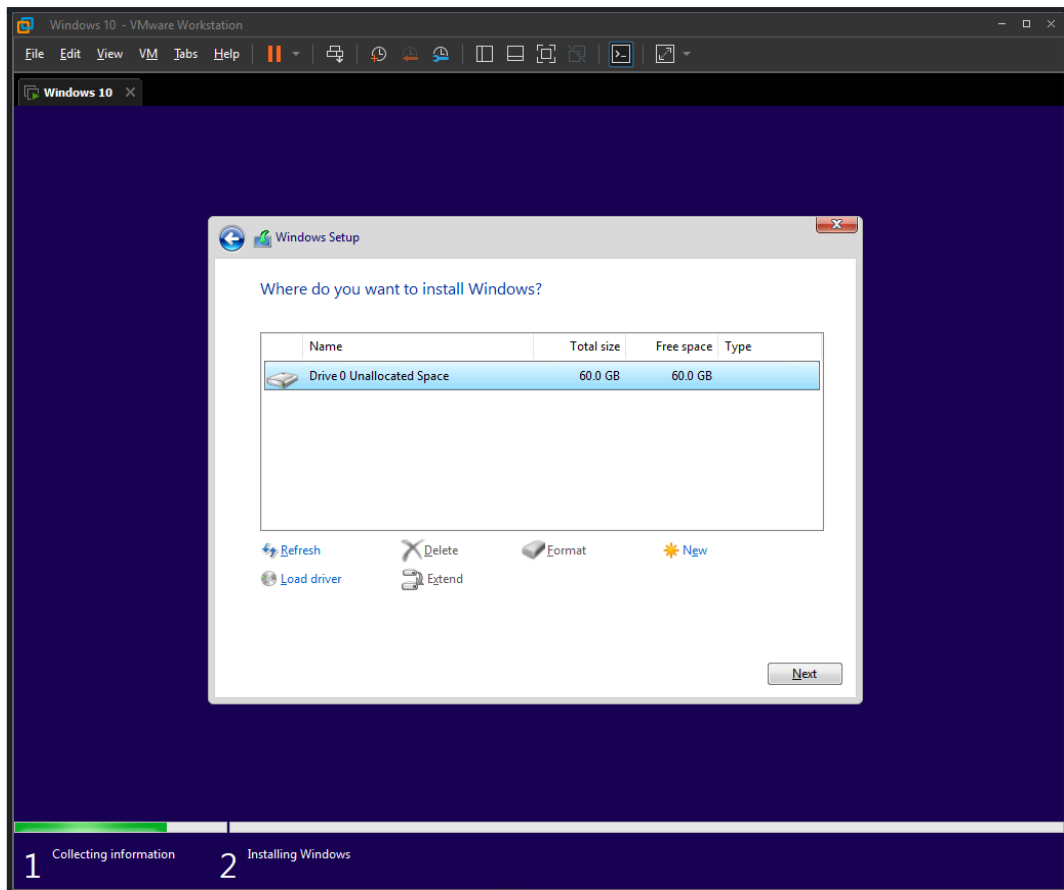


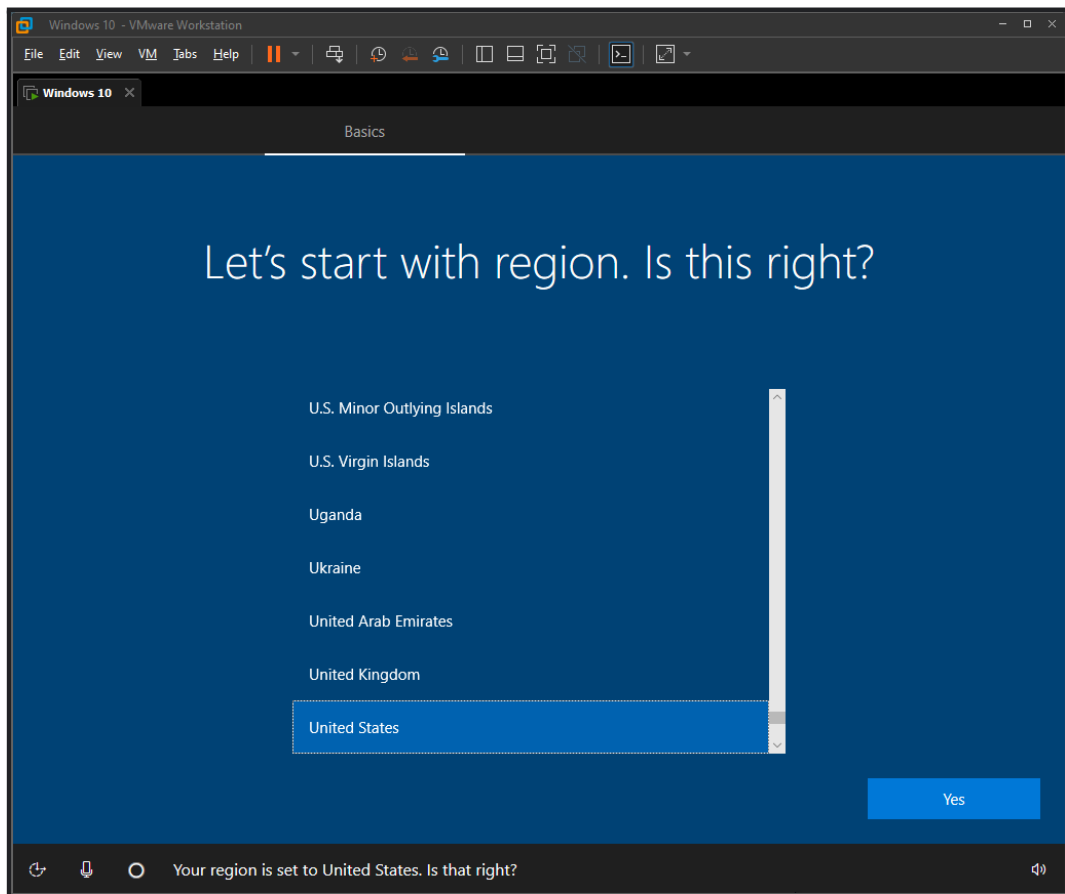
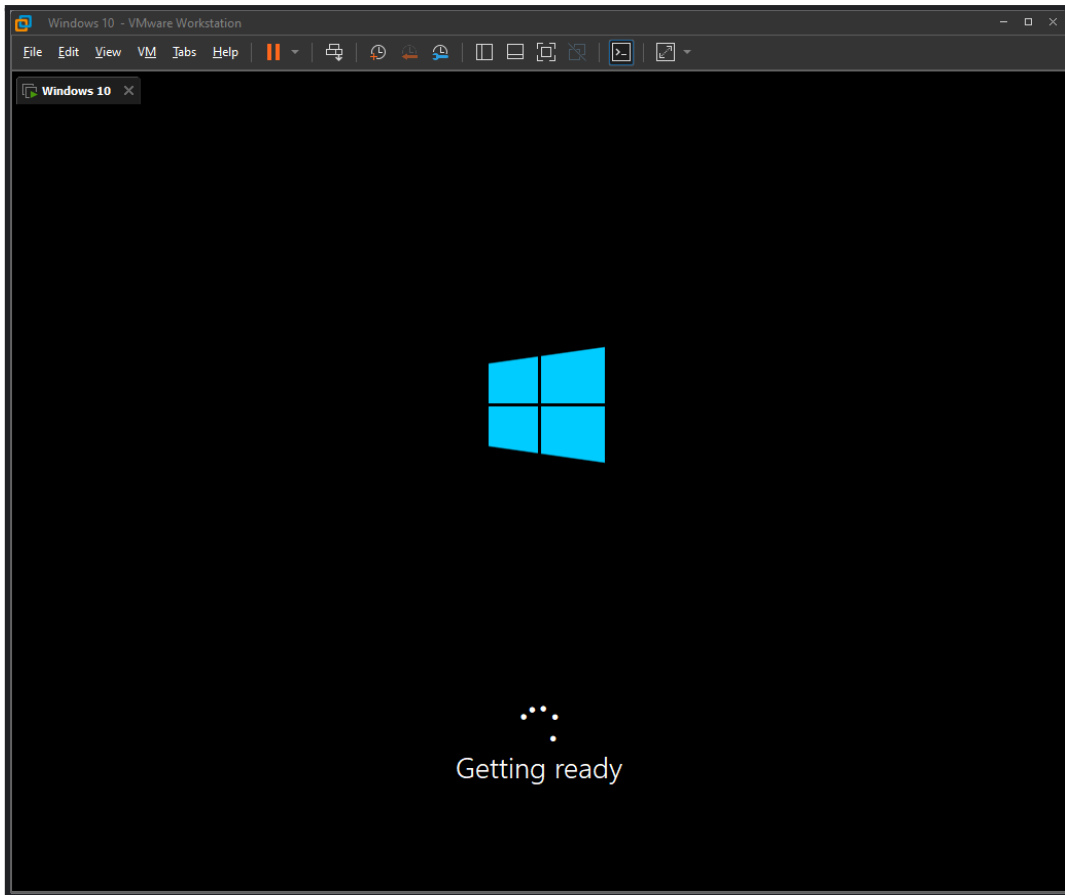


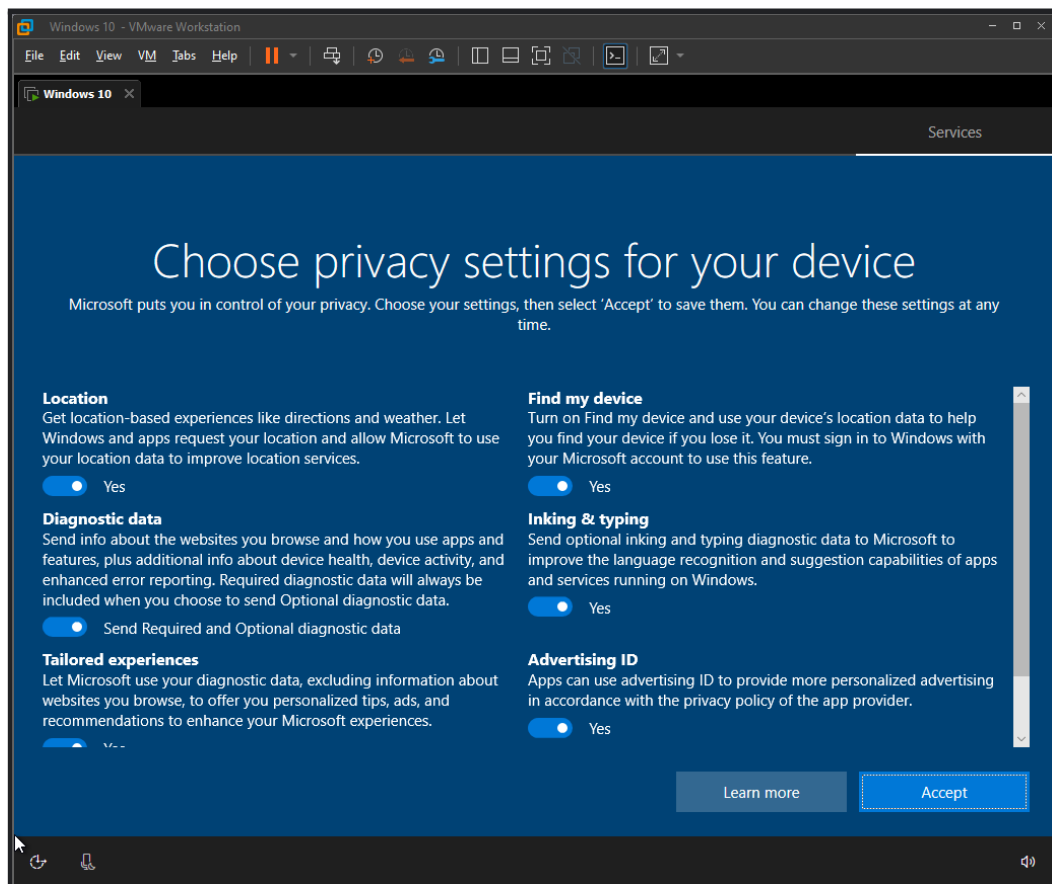
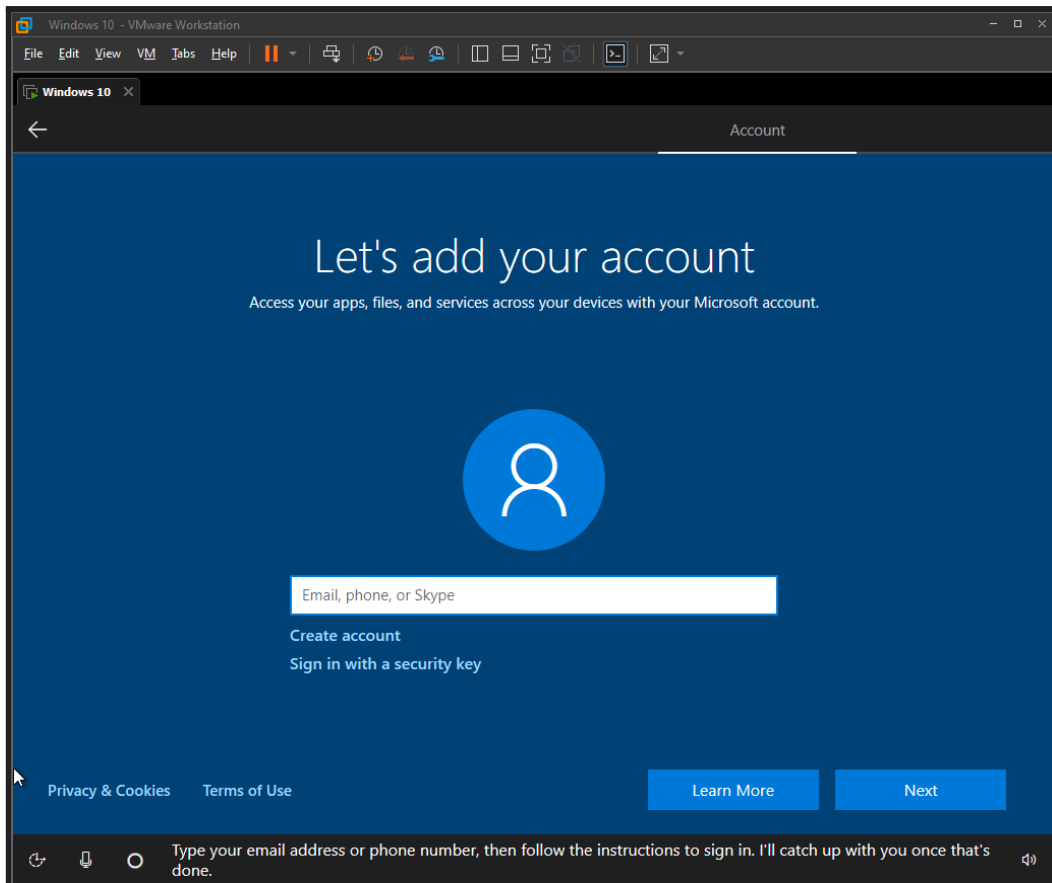


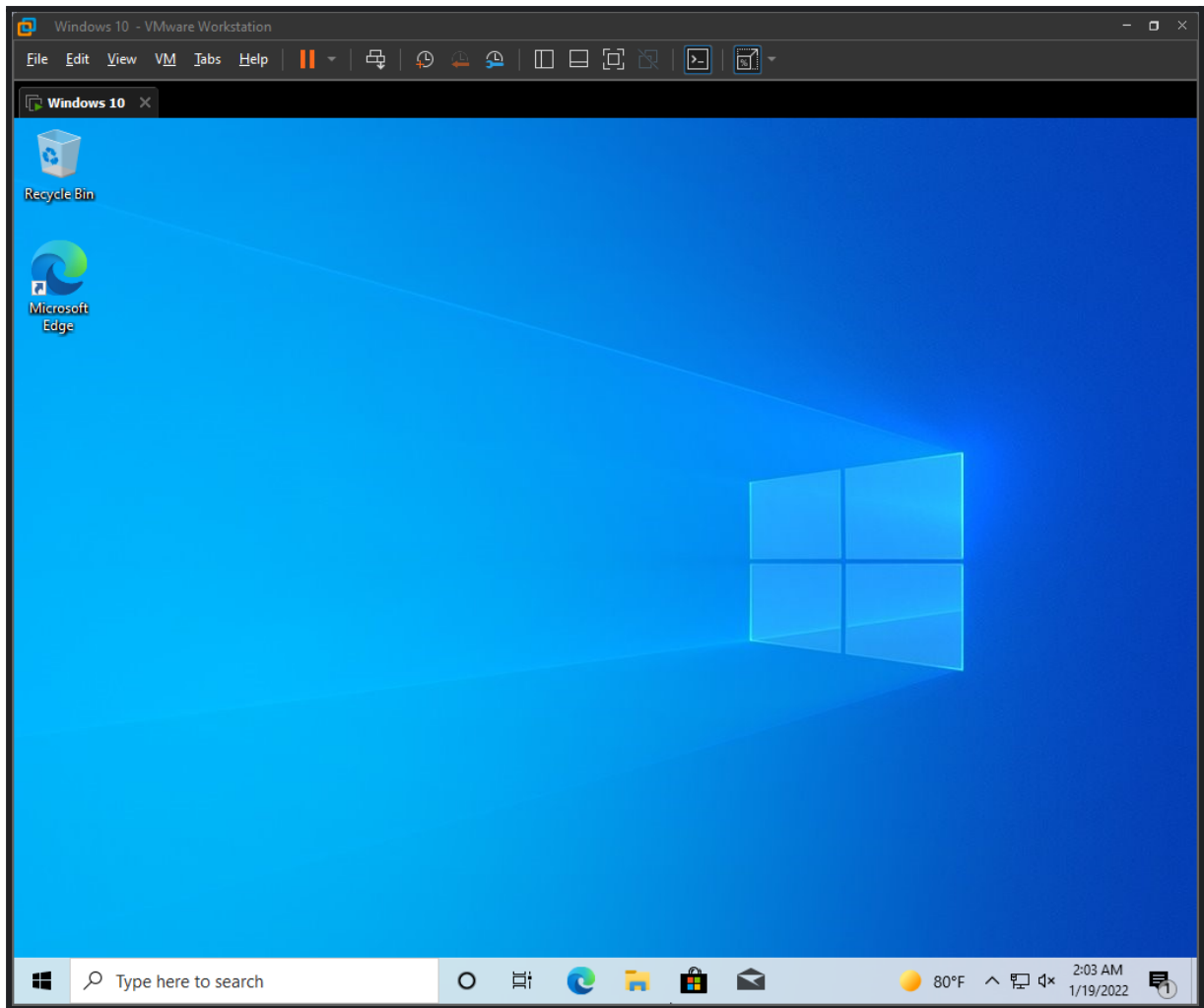












Q.5 What do you mean by system image?

ANS:

- System image is static data containing the software (the OS and applications together with their configuration and data files etc) that the virtual machine will run once started. It is usually stored on a disk (though you can store it anywhere you like).
- In computing, a system image is a serialized copy of the entire state of a computer system stored in some non-volatile form such as a file. A system is said to be capable of using system images if it can be shut down and later restored to exactly the same state. In such cases, system images can be used for backup.

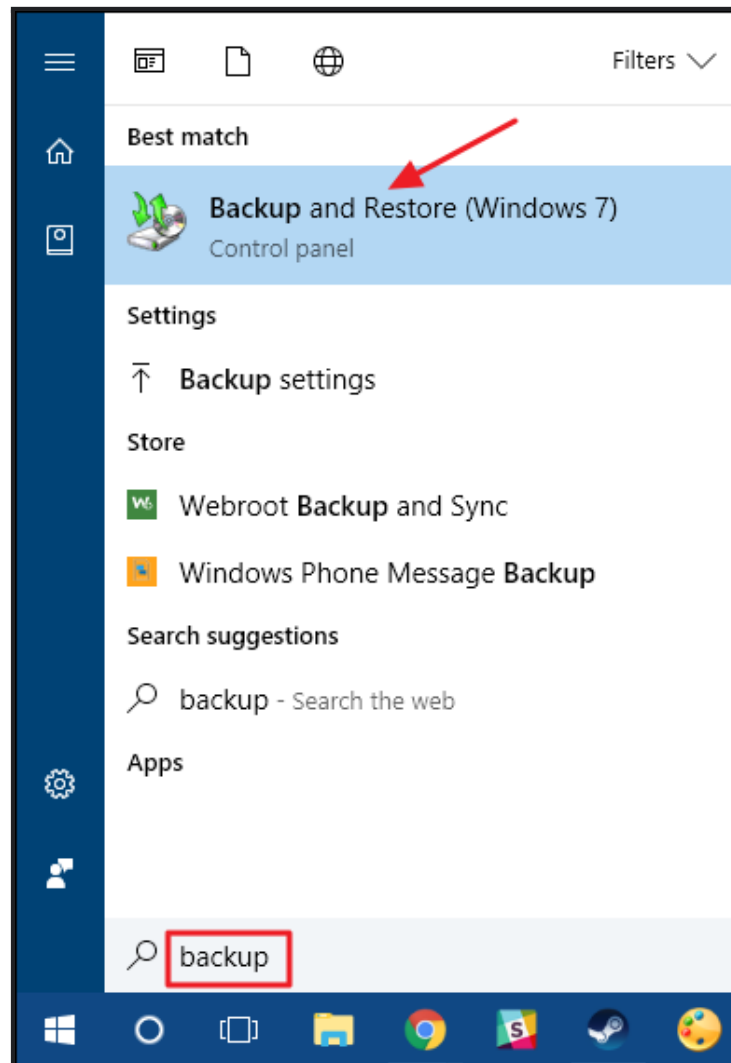
Q.6 List out steps to create a system image backup.

ANS:

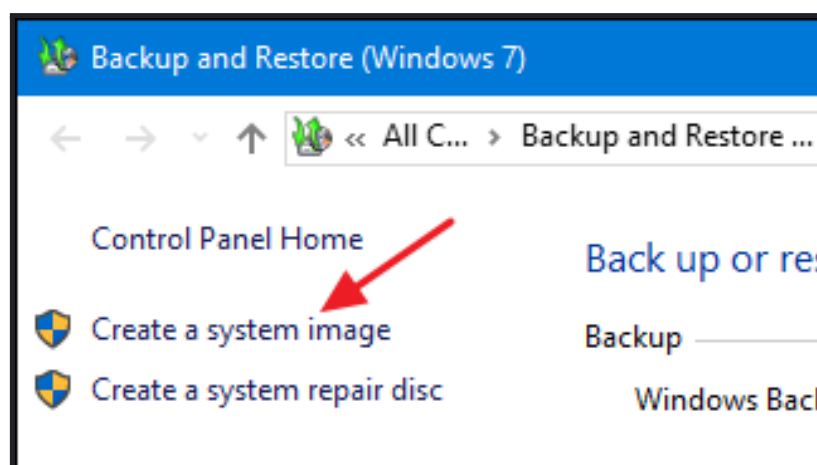
Step 1:

- Open System Image Backup.
- The process of finding the System Image Backup tool is different in Windows 7 than in Windows 8 and 10.

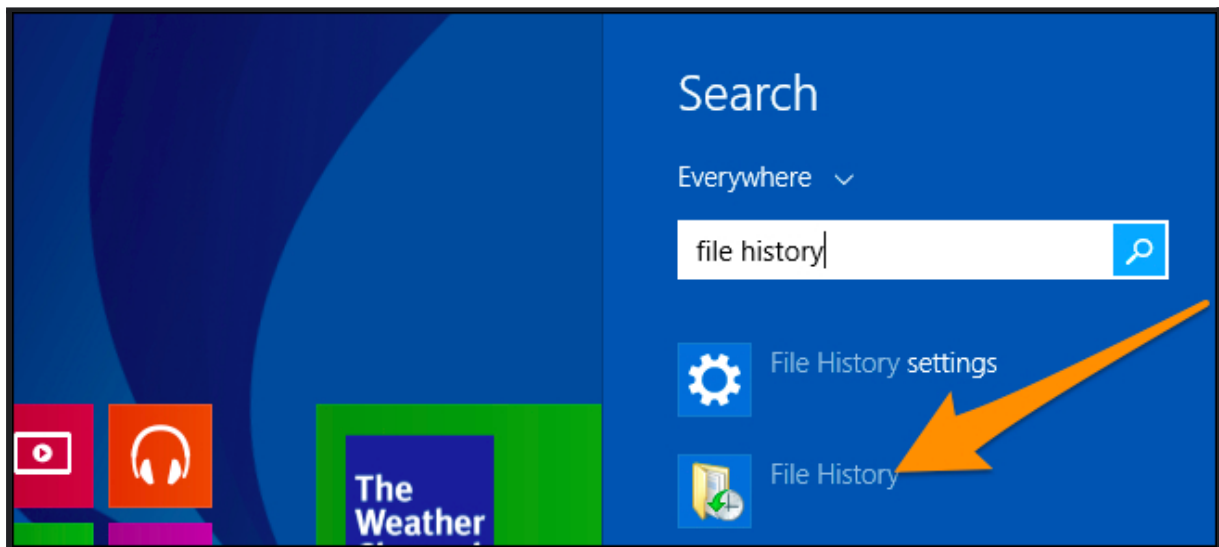
- Open System Image Backup in Windows 10.
- In Windows 10, hit Start, type “backup,” and then select the entry.



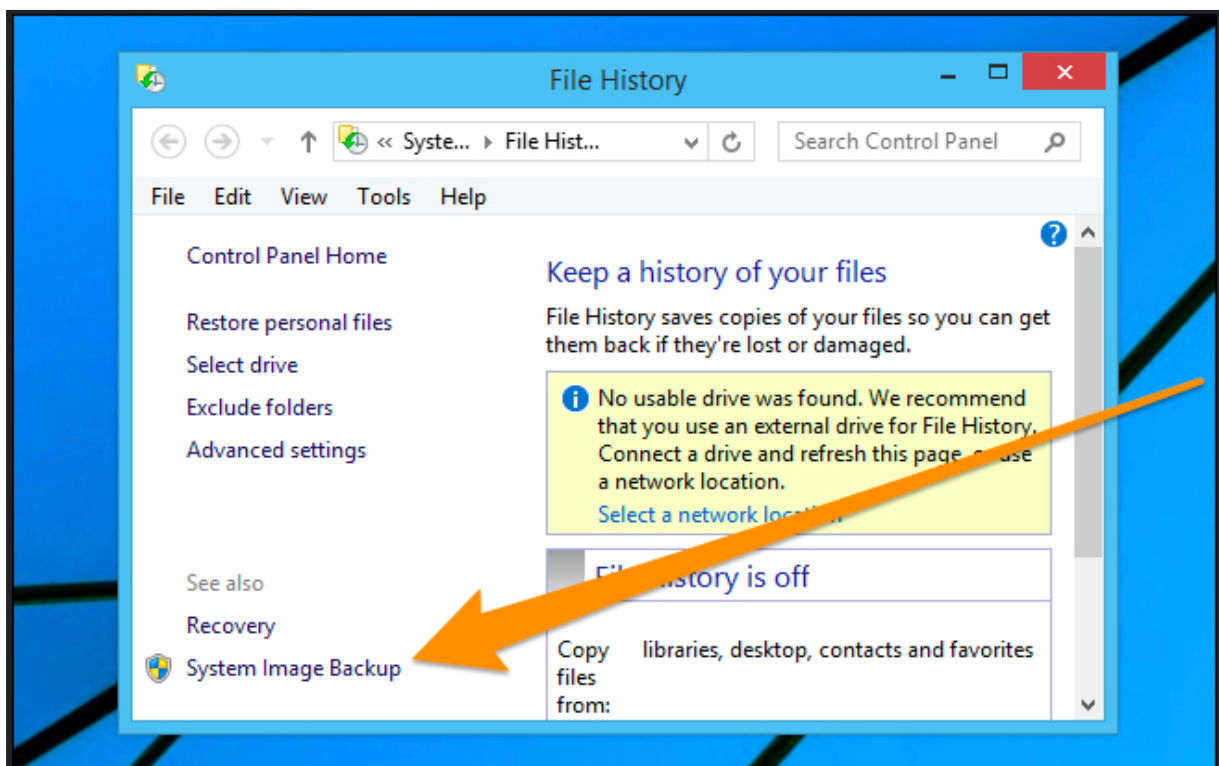
- In the “Backup and Restore (Windows 7)” window, click the “Create a system image” link.



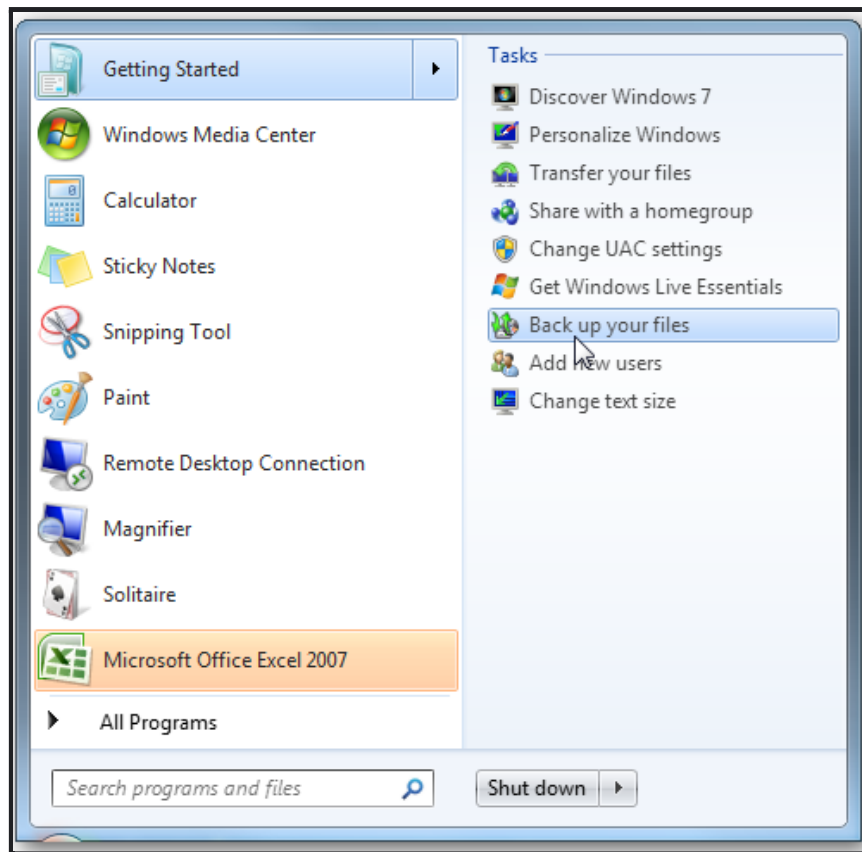
- Open System Image Backup in Windows 8.
- In Windows 8, hit Start, type “file history,” and then select the “File History” entry.



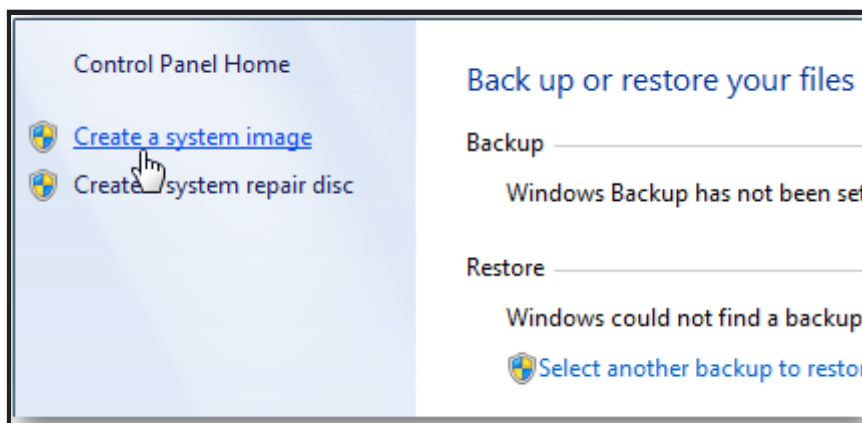
- In the “File History” window, click the “System Image Backup” link.



- Open System Image Backup in Windows 7
- Hit Start, click the arrow to the right of the “Getting Started” item, and then click “Back up your files.”

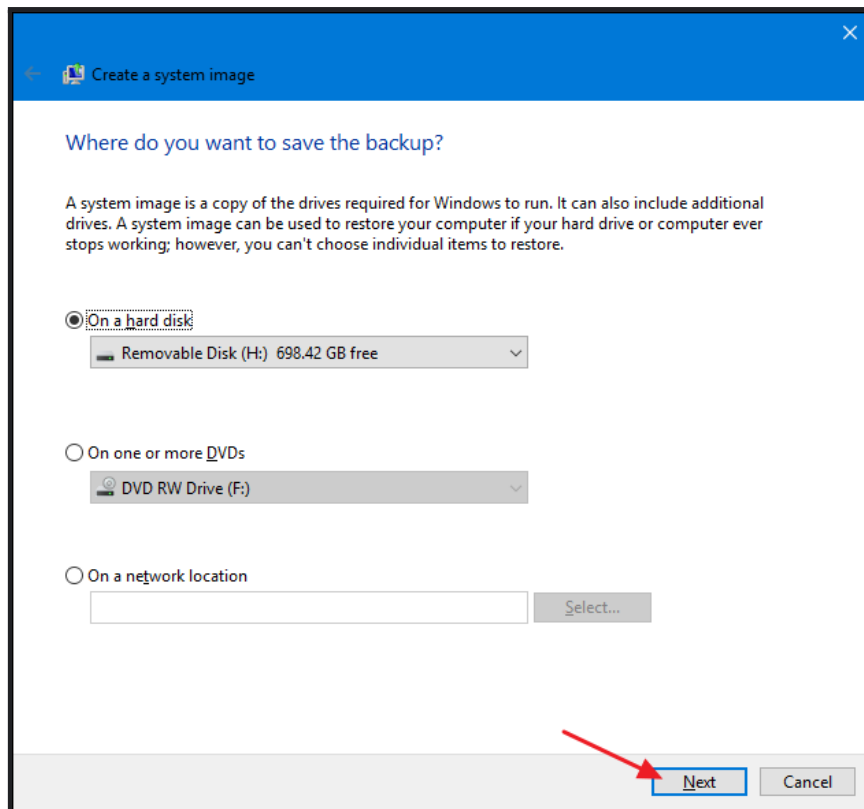


- In the “Backup and Restore” window, click the “Create a system image” link.

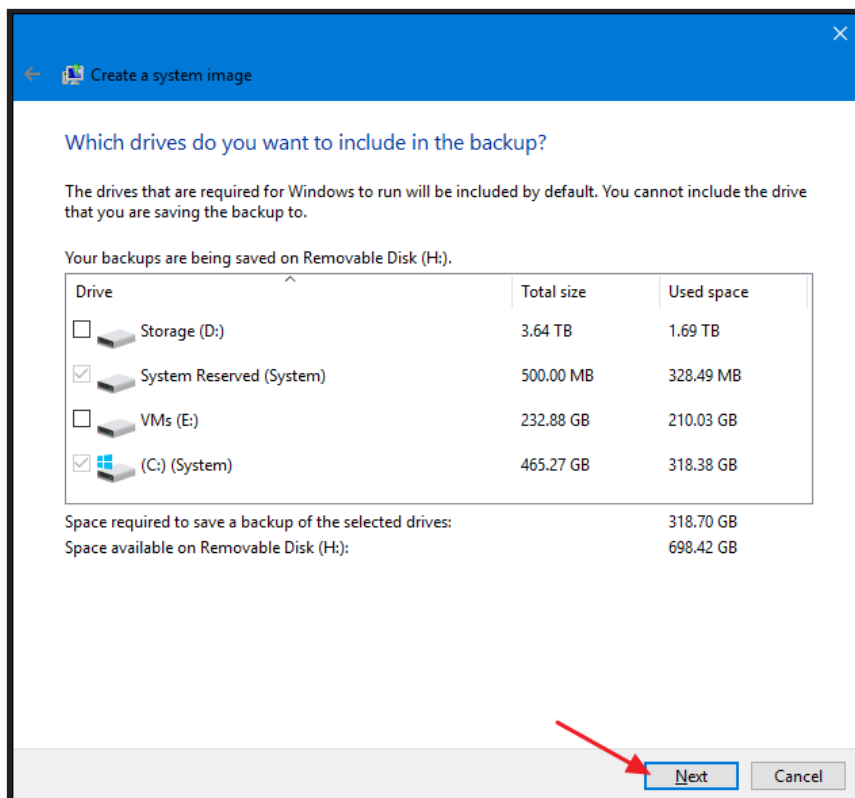


Step 2:

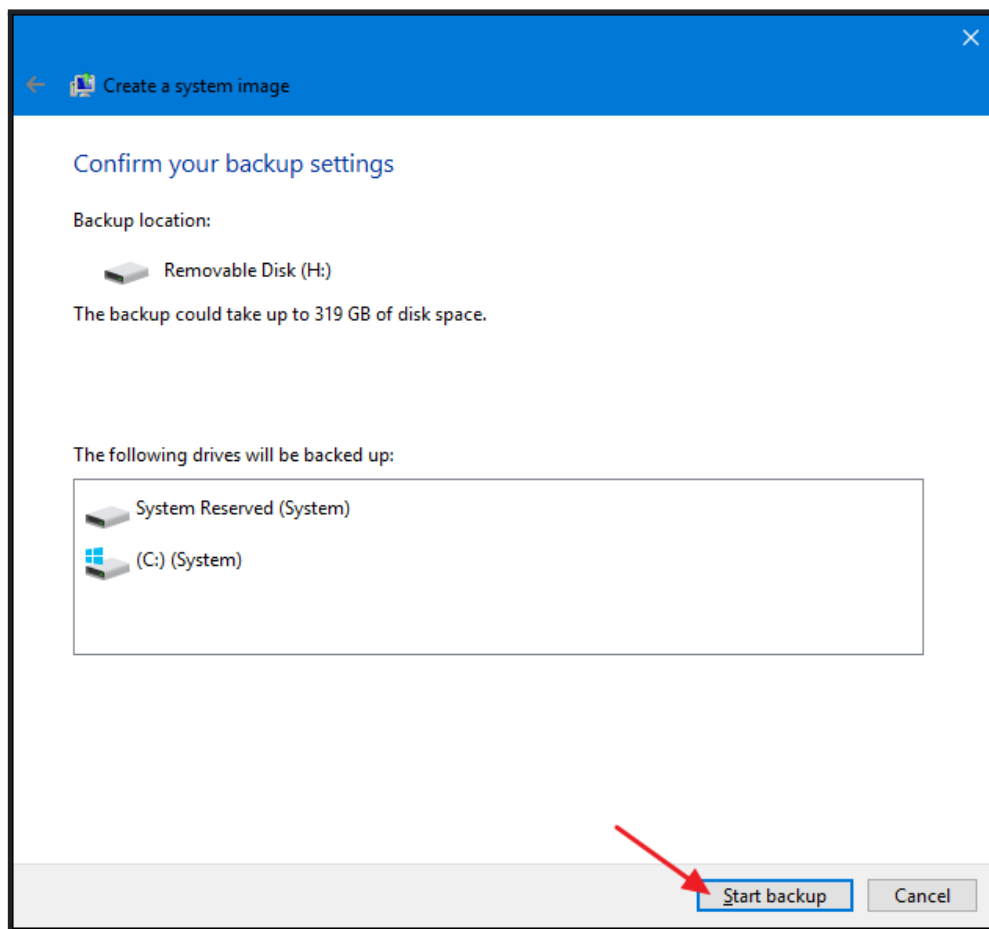
- Create a System Image Backup.
- Once you’ve opened the system image tool, the steps for creating a system image are the same in Windows 7, 8, or 10.
- When you first open the tool, it will scan your system for external drives. You can then decide where you want to save the image. It can be on an external drive, multiple DVD’s, or on a network location. Select where you want to save your backup and then click “Next.”



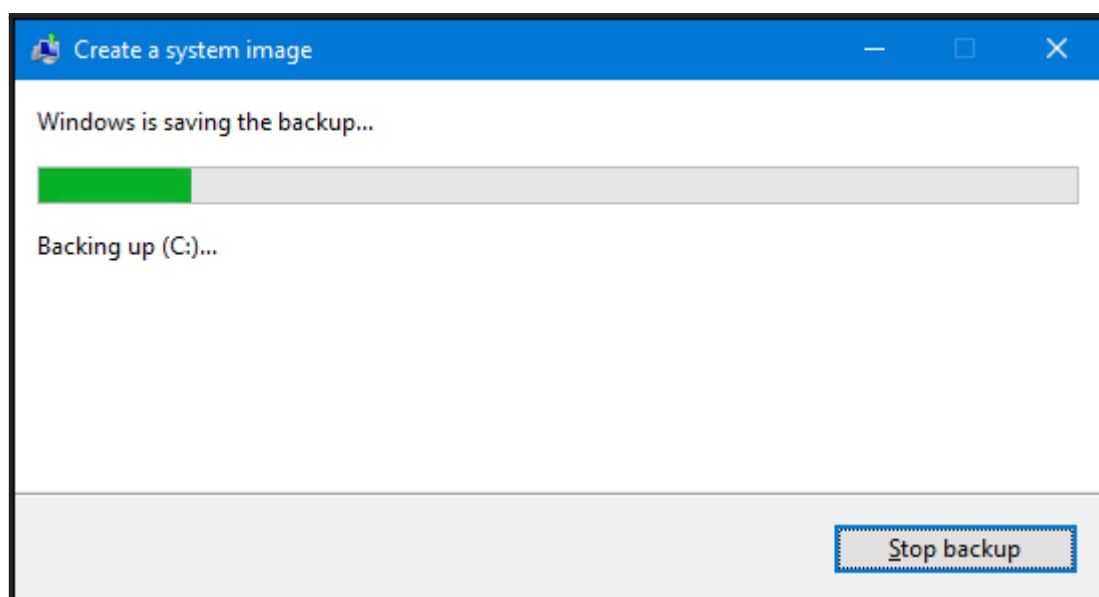
- By default, the tool only backs up your system drive. You can include other drives if you want, but remember that this will add to the size of the final image. Typically, we like to create separate image backups for each drive.



- At the confirmation screen, notice the amount of space the image may take. If anything doesn't look right, you can still go back and make adjustments. If everything looks okay, click the "Start Backup" button.



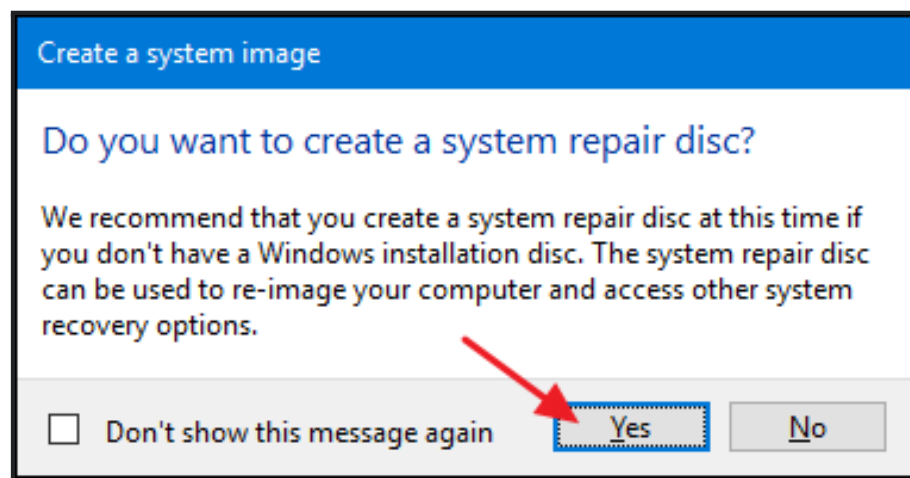
- You'll see a progress meter as the tool creates the image.



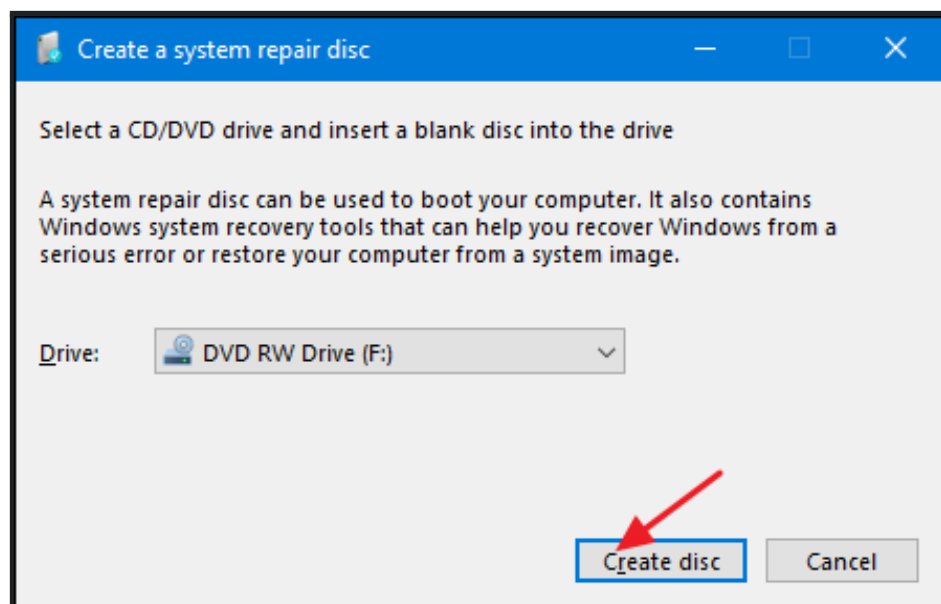
- It can take a while. In this example, we're backing up a drive with about 319 GB of data. It took about 2.5 hours when backed up to an external hard disk connected to our PC via USB. Your time will vary depending on your PC and the type of storage to which you're backing up.

Step 3:

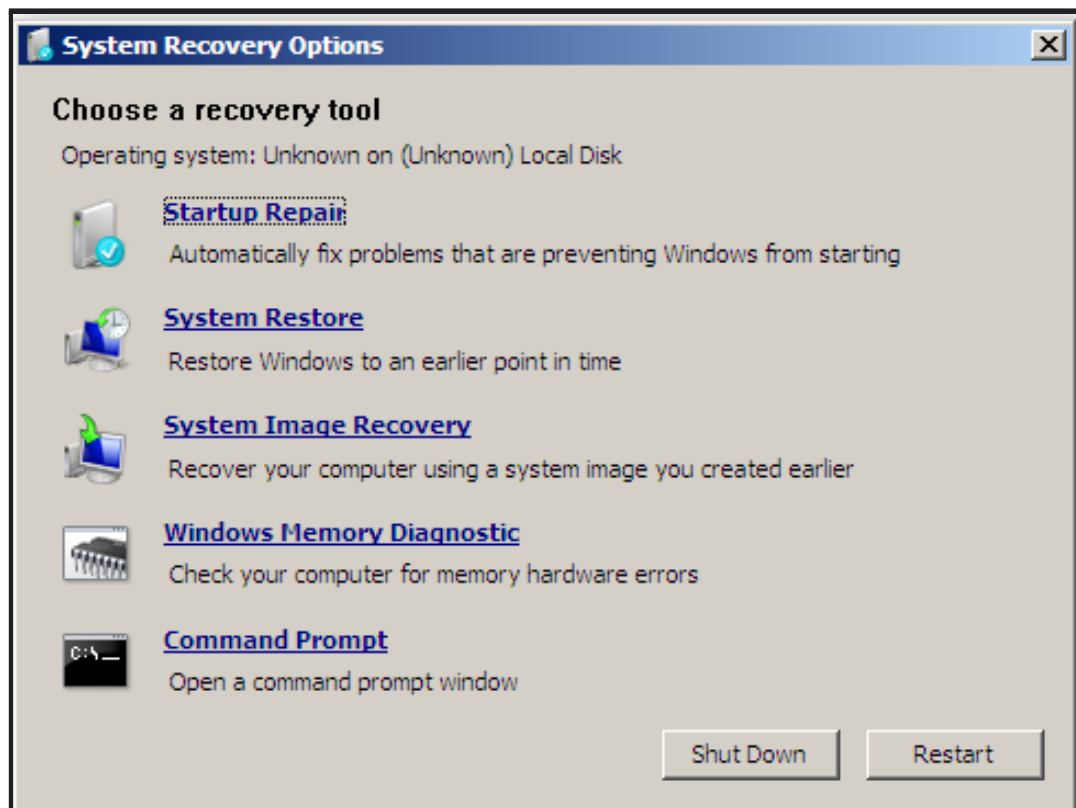
- Create a System Repair Disc
- When the backup is complete, Windows gives you the option to create a system repair disc. You can use this disc to start your PC and restore from your image backup in the event you ever need to replace your hard drive and can't start Windows. We highly recommend you go ahead and create the disc, then label and store it in a secure location.



- Select the drive you want to use to create the disc and then click the "Create Disc" button.



- When it comes time to restore the image, you can start your PC from the recovery disc to get access to a number of recovery tools—including “System Image Recovery.”



B.2 Conclusion:

We can now comprehend virtualization and construct virtual machines utilising multiple VMWARE and the provided ISO image file after successfully completing this experiment.