EXPERIMENT 1

Feb 11,2024

AIM : Introduction to Computer hardware : Physical identification of major components of a computer system such as mother board, RAM modules, daughter cards, bus slots, SMPS, internal storage device, interfacing ports, Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use.

COMPUTER HARDWARE

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), random access memory (RAM), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard.

By contrast, software is the set of instructions that can be stored and run by hardware. Hardware is so-termed because it is hard or rigid with respect to changes, whereas software is soft because it is easy to change.

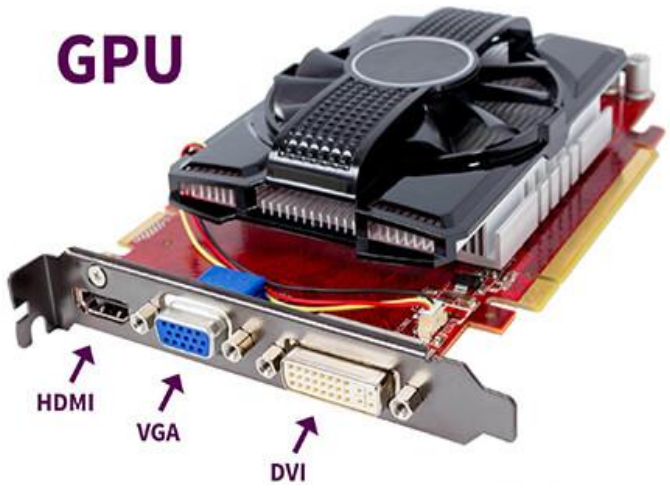
Hardware is typically directed by the software to execute any command or instruction. A combination of hardware and software forms a usable computing system, although other systems exist with only hardware.

MOTHER BOARD

The motherboard serves as a single platform to connect all of the parts of a computer together. It connects the CPU, memory, hard drives, optical disk, video card, sound card, and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer. Motherboard contains ports to connect all of the internal components. It holds together many of the crucial components of a computer, including central processing unit, memory and connectors for input and output devices.

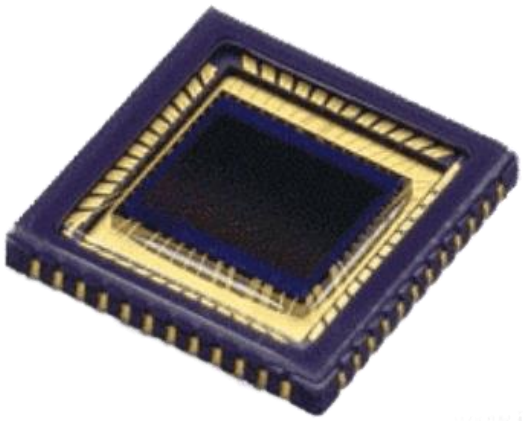
GPU(GRAPHIC PROCESSING UNITS)

GPUs also known as graphic cards or video cards or graphics cards. In order to display pictures, videos, audios, and 2D or 3D animations, each device uses a GPU. A GPU performs fast calculations of arithmetic and frees up the CPU to do different things.



CMOS (COMPLEMENTARY METAL OXIDE SEMICONDUCTOR)

CMOS is a combination of NMOS and PMOS transistors that operates under the applied electrical field. The structure of CMOS was initially developed for high density and low power logic gates .The main purpose of CMOS in computers is to store important system settings and configurations such as the date and time, boot order, hardware settings ,and password information .This information stored in a small battery-powered chip on the motherboard called CMOS battery



HDMI (HIGH DEFINITION MULTIMEDIA INTERFACE)

It is an all digital audio-video interface which transmits signals in uncompressed format.

Eg: uncompressed video data and compressed or uncompressed digital data from a HDMI-compliant source device to a computer monitor, video projector, digital television…etc.

DGA (DOMAIN GENERATION ALGORITHM)

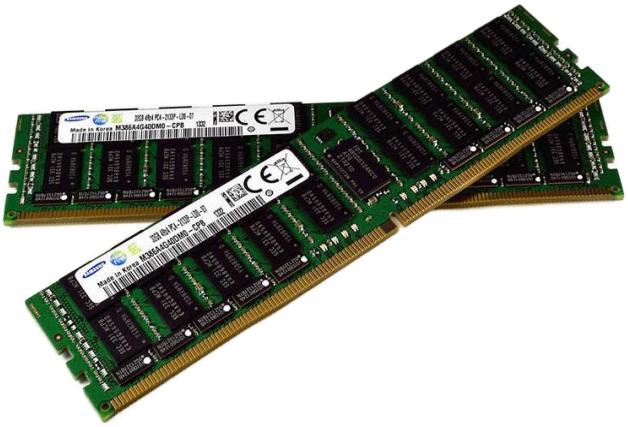
It is a technique used by cyber attackers to generate new domain names and IP addresses for malware's command and control servers.

COOLING FAN

A computer is any fan inside, or attached to, a computer case used for active cooling. Fans are used to draw cooler air into the case from the outside. Expel warm air from inside and move air across a heat sink to cool a particular component.

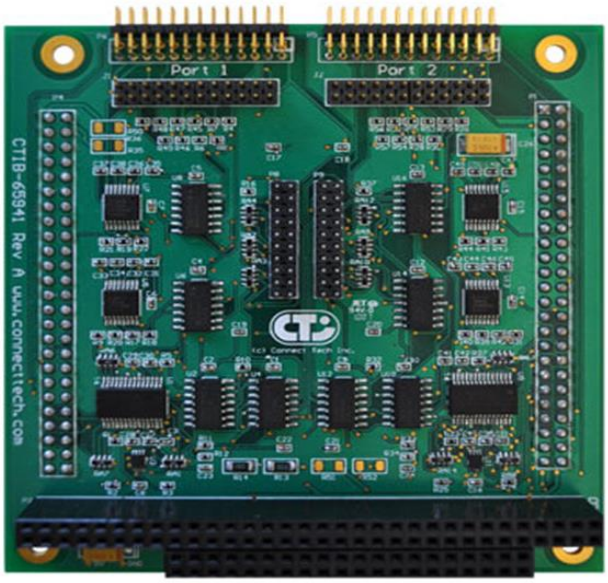
RAM MODULES

In computing, a memory module or RAM (random access memory) stick is a printed circuit board on which memory integrated circuit are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, word stations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer.



DAUGHTER CARD

A daughterboard (or daughter board , daughter card , or daughtercard is a circuit board that plugs into and extends the circuitry of another circuit board. The other circuit board may be the computer's main board (its motherboard) or it may be another board or card that is already in the computer, often a sound card. The term is commonly used by manufacturers of wavetable daughterboards that attach to existing sound cards.

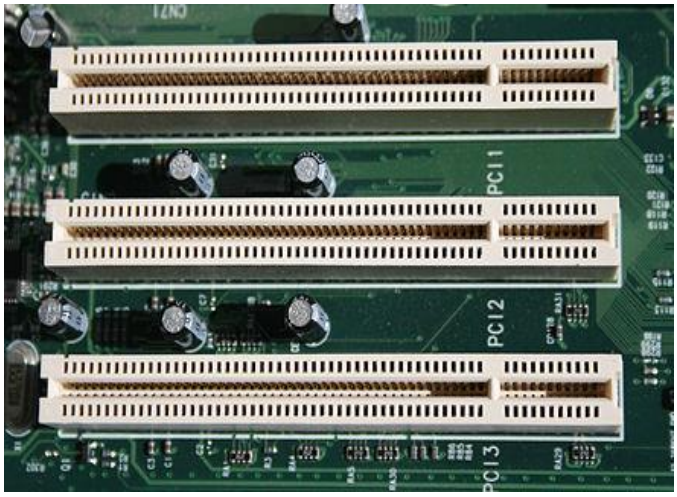


SMPS (SWITCHED MODE POWER SUPPLY)

SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (POWER SUPPLY UNIT) and is usually used in computers to change the voltage to the appropriate range for the computer.

BUS SLOT

Alternatively known as a bus slot or expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected. For example, if you wanted to install a new video card in the computer, you'd purchase a video expansion card and install that card into the compatible expansion slot.



STORAGE DEVICES

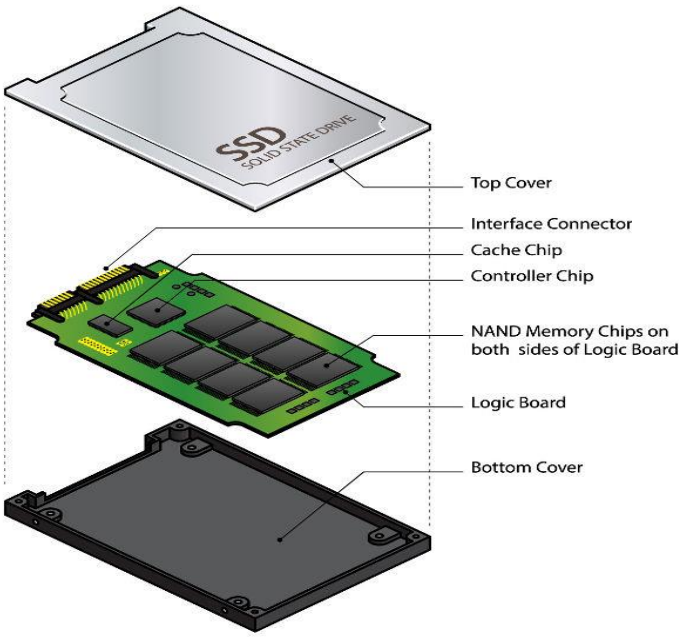
A storage device is a kind of hardware, which is also known as storage, storage medium, digital storage, or storage media that has the ability to store information either temporarily or permanently. It is used to hold, port, and extract data files.

Two storage devices are

- **SSD**
- **HDD**

SSD (SOLID STATE DRIVE)

SSD is non-volatile storage device, it stores the data on flash memory chips and maintains the data in a permanent state, even when the power is off. As compared to electromechanical drives, SSDs have lower latency and access quickly. These storage devices store the data in the semiconductor cells.



Several types of SSD are,

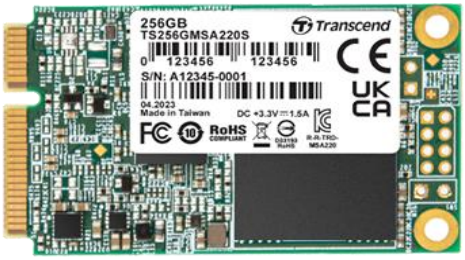
- **SATA SSD**
- **mSATA SSD**
- **M.2 SATA SSD**

SATA SSD

SATA is the acronym for ‘serial advanced technology attachment’. Speaking of SSD type SSD is the most popular today.

mSATA SSD

Its mini version of SATA. It has a smaller form factor mainly used in ultra-compact computers, laptops, mobile devices with an mSATA slot, in which the installation of an extended size SATA SSD is impossible.



M.2 SATA SSD

Its newer. and its format is lighter and smaller than the SATA SSD.

HDD (HARD DISK DRIVE)

HDD is an electro mechanical storage device, which is an abbreviation of hard disk drive. It uses magnetic storage for storing and retrieving the digital data. It is a non-volatile storage device. Hard disk is installed internally in our computer systems, which is connecter directly to the disk controllers of the motherboard. HDD means data is retained when our computer system is shut down.

INPUT DEVICES /UNIT

An input device is essentially a piece of instrument or hardware that allows users to provide data, information, or control instructions to a computer used for interaction and control. Data is entered into a computer in a raw format, which is converted into computer understandable language by input devices and processed by a central processing unit (CPU) to produce output.

Some common types of input devices are:

- **KEYBOARD**
- **SCANNER**
- **MOUSE**

KEYBOARD

The keyboard is one of the primary input devices, which helps in entering data and commands in a computer. A normal keyboard is

usually has a variety of keys, such as alphabetic character keys, function keys, number keys, arrow keys, and control keys. The keyboard can be connected to a computer using USB or BLUETOOTH.

SCANNER

Scanner is an input device, which works more like a photocopy machine. It used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

MOUSE

Mouse is the most common and very popular pointing device that helps interact with a common through a process called ‘point and click’. This

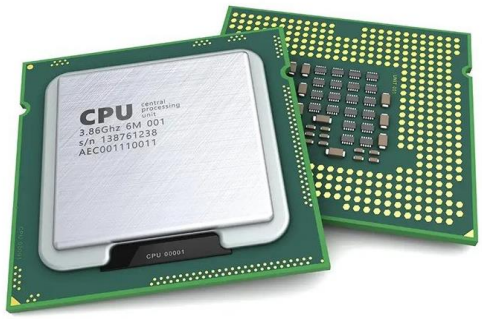
is mainly used to move a cursor on the computer's screen and click on the corresponding object using buttons (usually left, right, and middle key roller buttons).

PROCESSING UNIT

The part of a computer that performs logical and arithmetical operation on the data as specified in the instructions.

CPU(CENTRAL PROCESSING UNIT)

A central processing unit is also called a processor, central processor, or microprocessor. It carries out all the important functions of a computer. It stores all important programs like operating systems and application software. It is often referred to as the brain of the computer.



OUTPUT DEVICES/UNITS

The output device displays the result of the processing of raw data that is entered in the computer through an input device. There are a number of output devices that displays output in different ways such as text, images, hard copies, and audio or video.

Some popular output devices are:

- **MONITOR**
- **SPEAKERS**
- **PROJECTOR**

MONITOR

A monitor is a piece of computer hardware that accepts data from a computer and displays it on the system screen through the computers video card. Monitors have the ability to display information at much

higher resolution. Additionally, these are much like televisions and also known as video screen, display, video display terminal, or video display unit.

SPEAKER

The most common output devices, speakers accept sound data from a computer and play the sounds for users to hear.

PROJECTOR

Projector is an output device that accepts data from a computer and projects that data or information as a picture onto a wall or screen or any large surface.

INTERFACING PORTS

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

An interfacing port, also known as a communication port, is a physical socket on a device that allows it to connect to other devices and exchange data. It acts as a gateway for sending and receiving information between different electronic systems.

USB, Keyboard and Mouse


USB Type A (male)


USB Type A (female)


USB Type B (male)


USB Type B (female)


USB Mini-A (male)


USB Micro-A (male)


USB Type C (male)


USB Type C (female)


USB 3.0 Type A (male)


USB 3.0 Type A (female)


USB 3.0 Type B (male)


USB 3.0 Micro B (male)


PS/2 (male)


PS/2 (female)

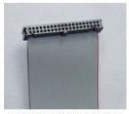

AT Keyboard (male)


AT Keyboard (female)

Storage / Disk


SATA Type A


e-SATA

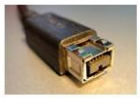

IDE 40-pin Connector


IDE 40-pin Port


Thunderbolt


Firewire 400 1394a 6-pin


Firewire 400 1394a 4-pin


Firewire 800/3200 1394b/c

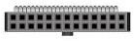

SCSI VHCDI 8.mm 68-pin


SCSI Micro DB68 (male)


SCSI Micro DB68 (female)


SCSI Micro DB50 (male)


Internal 50-pin SCSI (m)


Internal 50-pin SCSI (f)


Internal 68-pin SCSI (m)


Internal 68-pin SCSI (f)

Network / Communications


Ethernet RJ-45


Modem/Phone RJ-11


DB-25 Serial (male)


DB-25 Serial (female)


DE-9 Serial RS232 (m)


DE-9 Serial RS232 (f)


Centronics Parallel 36-pin


MIDI/gameport/DA-15

Audio

Line-Out, Headphones

Microphone

Stereo Line In

Subwoofer/Center Out

Rear Surround Speakers

Mid Surround Speakers

Digital Audio (RCA)

Optical Audio "Toslink"

Video

VGA/SVGA (male)

VGA/SVGA (female)

DisplayPort (male)

DisplayPort (female)

Mini DisplayPort (m)

Mini DisplayPort (f)

HDMI Type A (male)

HDMI Type A (female)

DVI-I Single Link

DVI-I Dual Link

DVI-D Single Link

DVI-D Dual Link LFH-60

DVI-D Dual Link DMS-59

Micro-DVI

Mini-DVI

Mini HDMI Type C

Composite A/V (RCA)

S-Video

Component Video (m)

Component Video (f)

RF/Coaxial (male)

RF/Coaxial (female)

Apple Display Conn (ADC)

Micro HDMI Type D

Power

IEC 320 C13/C14 Connector

IEC 320 C13 Socket (f)

IEC 320 C14 Plug (m)

IEC 320 C19 (f)

IEC 320 C20 (m)

IEC 320 C5 Connector

SATA Power Connector

Molex 4-pin Connector

- **Serial port(COM Port):** A serial port is also called a communication port and they are used for connection of external devices like a modem, mouse, or keyboard (basically in older PCs). Serial cables are cheaper to make in comparison to parallel cables and they are easier to shield from interference. There are two versions of it, which are 9 pin model and 25 pin model. It transmits data at 115 KB/sec.

- **Parallel Port (LPT ports):** Parallel ports are generally used for connecting scanners and printers. It can send several bits at the same time as it uses parallel communication. Its data transfer speed is much higher in comparison with the serial port. It is a 25 pin model. It is also known as Printer Port or Line Printer Port.

- **USB (Universal Serial Bus):** In 1997 USB was first introduced. This can connect all kinds of external USB devices, like external hard disk, printer, scanner, mouse, keyboard, etc. There are minimum of two USB Ports provided in most of the computer systems. It is a kind of new type serial connection Port that is much faster than the old serial Ports and These USB Ports are much smarter and more versatile, as it allows the "daisy chaining" of up to 127 USB peripherals connected to one port. The data transfer rate in this is Data12 megabits per second. It also provides plug & plays communication.

- **PS/2 Port:** PS/2 ports are special ports used for connecting old computer keyboard and mouse. It was invented by IBM. In old computers, there are minimum of two PS/2 Ports, each for the keyboard and the mouse. It is a 6 pin mini Din connector.

- **VGA Port:** VGA ports also known as Video Graphic Array connector are those which connect the monitor to a computer's video card. VGA port has 15 holes and it is similar to the serial port connector. But VGA Ports have holes in it and the serial port connector has pins in it.

- **Sockets:** Microphones and speakers are connected with the help of Sockets to the sound card of the computer.

- **FireWire Port:** The IEEE 1394 interface, which is developed in the late 1980s and early 1990s by Apple as FireWire. It can transfer large amount of data at very high speed. It is used to connect camcorders and video equipment to the computer. It comes up with three variants which are 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector

- **Infrared Port:** An Infrared(IR) port is used to sends and receives infrared signals from other devices. It is a kind of wireless type port with a limited range of 5-10ft.

- **Game Port:** These ports are used previously to connect a joystick to a PC. But nowadays it is replaced by USB ports.

- **Modem Port:** As the name suggests, a Modem port is used to connects a PC's modem to the telephone network.

- **Digital Video Interface(DVI) Port:** DVI Port is used to connects LCD(flat panel) monitor to the computer's high-end video graphic cards and it is very popular among video card manufacturers.

- **Ethernet Port:** Ethernet Port helps to connect to a network and high-speed Internet(provided by LAN or other sources). It connects the network cable to a computer and resides in a Ethernet card. It provides a data travel speed of 10 Mb to 1000 Mb(megabits) per second.

DESKTOP

A desktop computer is a personal computer designed for regular use at a single location on or near a desk due to its size and power requirements. The most common configuration has a case that houses the power supply, motherboard (a printed circuit board with a microprocessor as the central processing unit, memory, bus, certain peripherals and other electronic components), disk storage (usually one or more hard disk drives, solid state drives, optical disc drives, and in early models a floppy disk drive), a keyboard and mouse for input; and a computer monitor, speakers, and, often, a printer for output. The case may be oriented horizontally or vertically and placed either underneath, beside, or on top of a desk.

SERVER OPERATING SYSTEM

A server operating system is a type of operating system that is designed to be installed and used on a server computer. It is advanced version of operating system, having features and capabilities required within a client-server architecture or similar enterprise computing environment.

Example: Windows Operating System, Linux Operating System

DATA SERVER

A data server is a software program/platform used to provide database service like storing, processing, and securing data.

FILE SERVERS

File servers store and distribute files. Multiple clients or users may share files stored on a server. In addition, centrally storing files offers easier backup or fault tolerance solutions than attempting to provide security and integrity for files on every device in an organization. File server hardware can be designed to maximize read and write speeds to improve performance.

MAIL SERVERS

Mail servers are a very common type of application server. Mail servers receive emails sent to a user and store them until requested by a client on behalf of said user. Having an email server allows for a single machine to be properly configured and attached to the network at all times. It is then ready to send and receive messages rather than requiring every client machine to have its own email subsystem continuously running.

WEB SERVERS

One of the most abundant types of servers in today's market is a web server. A web server is a special kind of application server that hosts programs and data requested by users across the Internet or an intranet. Web servers respond to requests from browsers running on client computers for web pages, or other web-based services. Common web

servers include Apache web servers, Microsoft Internet Information Services (IIS) servers and Nginx servers.

Server-class computers:

BLADE SERVERS

The original computer server hardware was large and stored in racks that could hold hundreds of pounds. Over time, however, faster means of connecting hardware resulted in parts of the server being extracted from a single self-contained device. By removing hard drives, eliminating internal cooling, and the ongoing miniaturization of computing parts, servers were eventually reduced to a single thin server known as a blade server. While still stored in racks in server rooms, blade servers are smaller and can be replaced more easily.

RACK SERVERS

A rack server, also known as a rack mount server, rack-mounted server or rack mount computer, is a computer designed to be situated in a rectangular structure called a server rack. The advantages of a server rack include better space conservation for rack servers, increased scalability, maximized air flow when coupled with a cooling system and ease of regular computer maintenance and diagnostics, given that

their design allows technicians and operators to easily slide rack servers in and out of them.

TOWER SERVERS

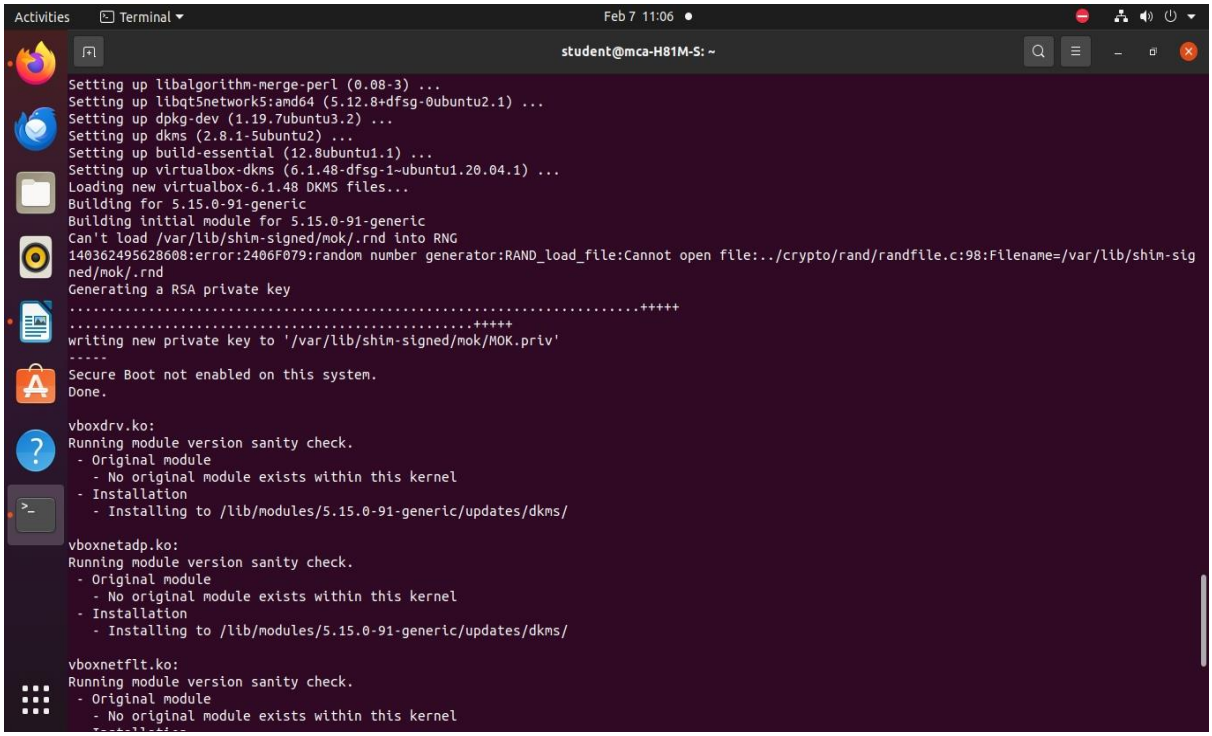
A tower server is a computer intended for use as a server and built in an upright cabinet that stands alone. The cabinet, called a tower, is similar in size and shape to the cabinet for a tower-style personal computer. This is in contrast to rack servers or blade servers, which are designed to be rack-mounted. Advantages of tower servers include: Easier cooling, because the overall component density is fairly low. Scalability, because an unlimited number of servers can be added to an existing network.

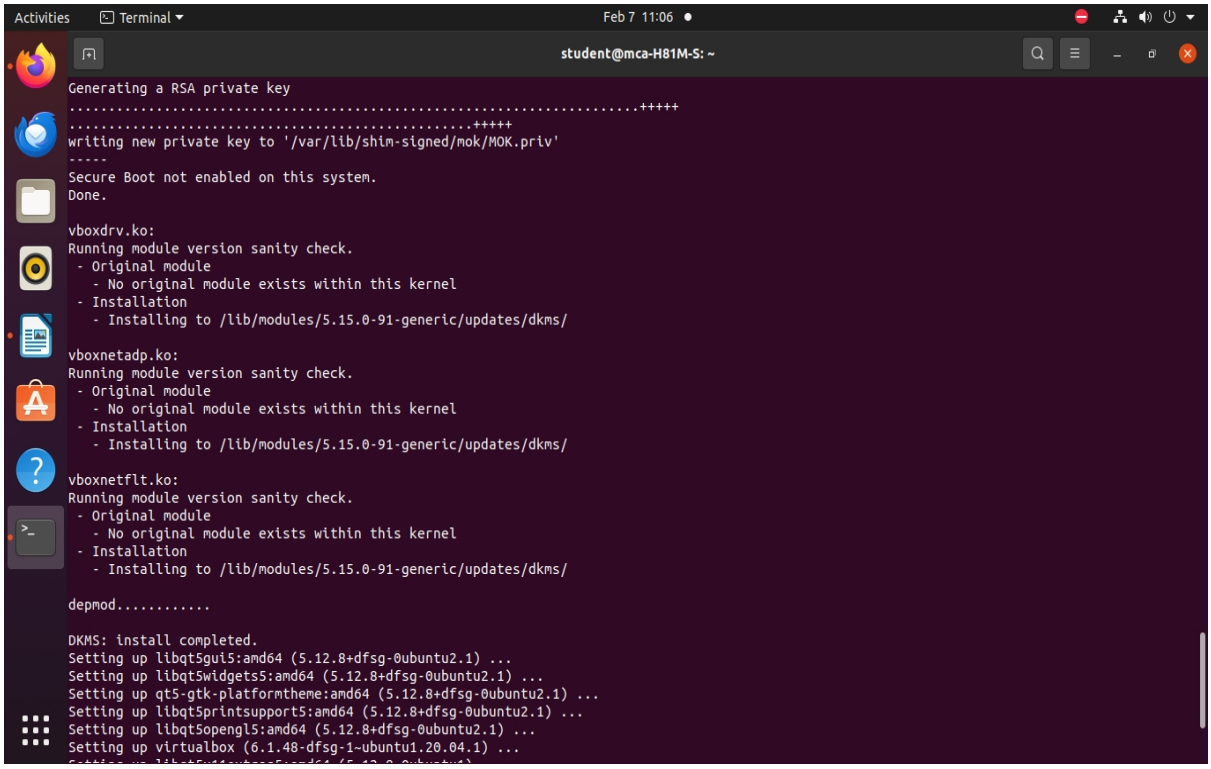
INSTALL UBUNTU ON VIRTUALBOX

Oracle VM VirtualBox is free and open-source and being developed by oracle corporation. Oracle VirtualBox is a cross-platform virtualization application. It installs on your existing Intel or AMD-based computers, whether they are running Windows, Mac, Linux or Solaris operating systems .VirtualBox can create and run a "guest" operating system (virtual machine) in a window of the host operating system. The virtual machine provides a self-contained environment in which to experiment with new software without risking damaging changes to the host operating system

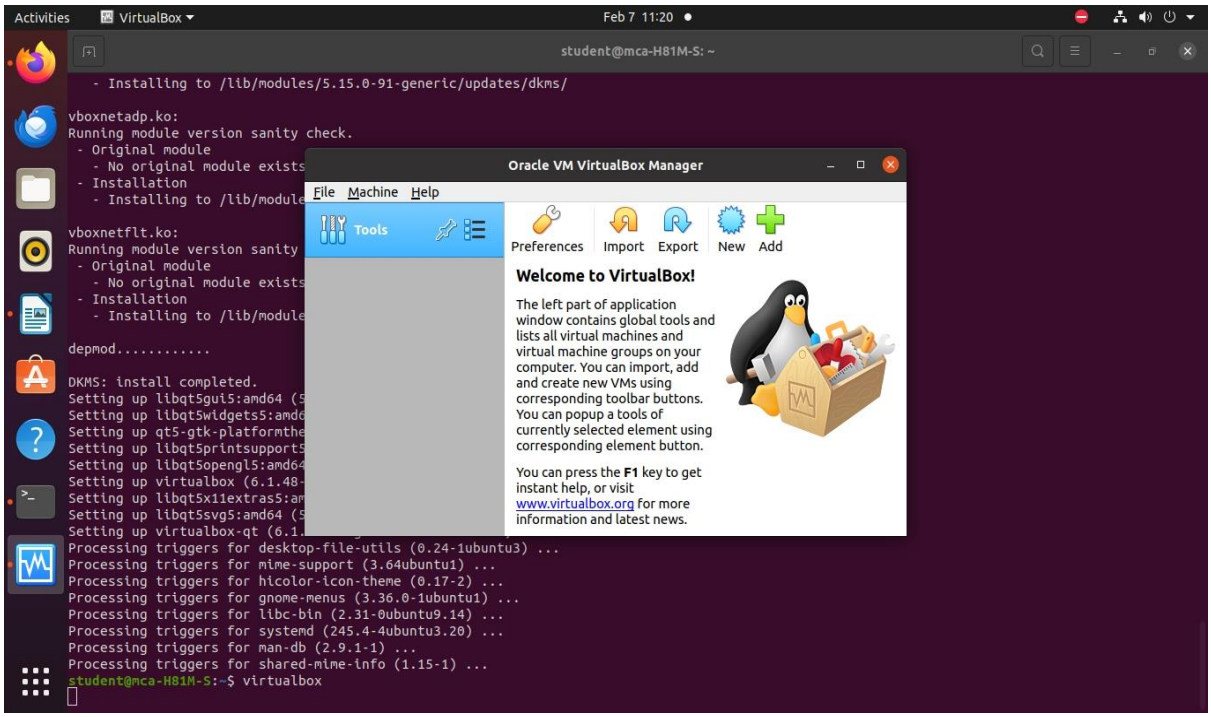
VirtualBox Installation

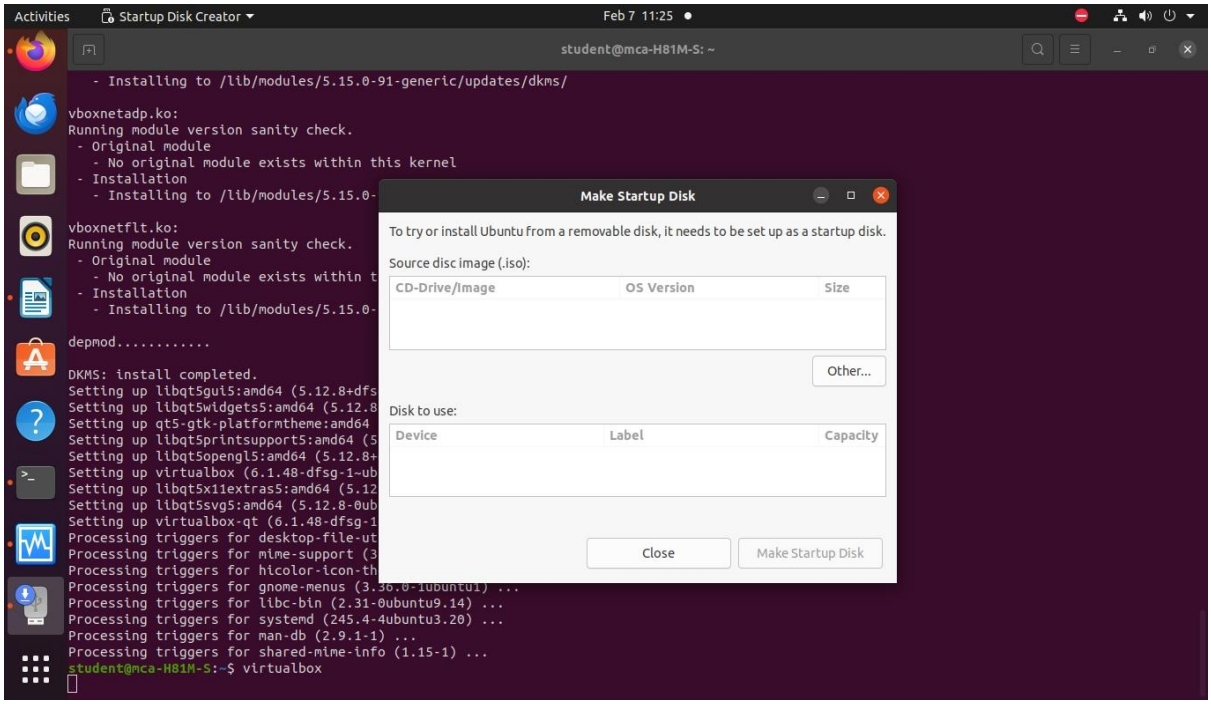
- sudo apt-get install virtualbox
- sudo apt-get install virtualbox-ext-pack




Activities
Terminal
Feb 7 11:06
student@mca-H81M-S: ~
Generating a RSA private key
.....+++++
.....+++++
writing new private key to '/var/lib/shim-signed/mok/MOK.priv'

Secure Boot not enabled on this system.
Done.
vboxdrv.ko:
Running module version sanity check.
- Original module
- No original module exists within this kernel
- Installation
- Installing to /lib/modules/5.15.0-91-generic/updates/dkms/
vboxnetadp.ko:
Running module version sanity check.
- Original module
- No original module exists within this kernel
- Installation
- Installing to /lib/modules/5.15.0-91-generic/updates/dkms/
vboxnetflt.ko:
Running module version sanity check.
- Original module
- No original module exists within this kernel
- Installation
- Installing to /lib/modules/5.15.0-91-generic/updates/dkms/
depmod.....
DKMS: install completed.
Setting up libqt5gui5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5widgets5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up qt5-gtk-platformtheme:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5printsupport5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5opengl5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up virtualbox (6.1.48-dfsg-1~ubuntu1.20.04.1) ...


Activities
VirtualBox
Feb 7 11:20
student@mca-H81M-S: ~
- Installing to /lib/modules/5.15.0-91-generic/updates/dkms/
vboxnetadp.ko:
Running module version sanity check.
- Original module
- Installation
vboxnetflt.ko:
Running module version sanity
- Original module
- Installation
depmod.....
DKMS: install completed.
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.14) ...
Processing triggers for systemd (245.4-4ubuntu3.20) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for shared-mime-info (1.15-1) ...
student@mca-H81M-S:~$ virtualbox
Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add
Welcome to VirtualBox!
The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.
You can press the F1 key to get instant help, or visit www.virtualbox.org for more information and latest news.


Activities
Startup Disk Creator
Feb 7 11:25
student@mca-H81M-S: ~
- Installing to /lib/modules/5.15.0-91-generic/updates/dkms/
vboxnetadp.ko:
Running module version sanity check.
- Original module
- No original module exists within this kernel
- Installation
- Installing to /lib/modules/5.15.0-
vboxnetflt.ko:
Running module version sanity check.
- Original module
- No original module exists within t
- Installation
- Installing to /lib/modules/5.15.0-
depmod.....
DKMS: install completed.
Setting up libqt5gui5:amd64 (5.12.8+dfs
Setting up libqt5widgets5:amd64 (5.12.8
Setting up qt5-gtk-platformtheme:amd64
Setting up libqt5printsupport5:amd64 (5
Setting up libqt5opengl5:amd64 (5.12.8+
Setting up virtualbox (6.1.48-dfsg-1~ub
Setting up libqt5x11extras5:amd64 (5.12
Setting up libqt5svg5:amd64 (5.12.8-0ub
Setting up virtualbox-qt (6.1.48-dfsg-1
Processing triggers for desktop-file-ut
Processing triggers for mime-support (3
Processing triggers for hicolor-icon-th
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.14) ...
Processing triggers for systemd (245.4-4ubuntu3.20) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for shared-mime-info (1.15-1) ...
student@mca-H81M-S:~$ virtualbox
Make Startup Disk
To try or install Ubuntu from a removable disk, it needs to be set up as a startup disk.
Source disc image (.iso):
CD-Drive/Image
OS Version
Size
Other...
Disk to use:
Device
Label
Capacity
Close
Make Startup Disk