EXPIRIMENT-1:

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 devices, interfacing ports. Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use.

INTRODUCTION:

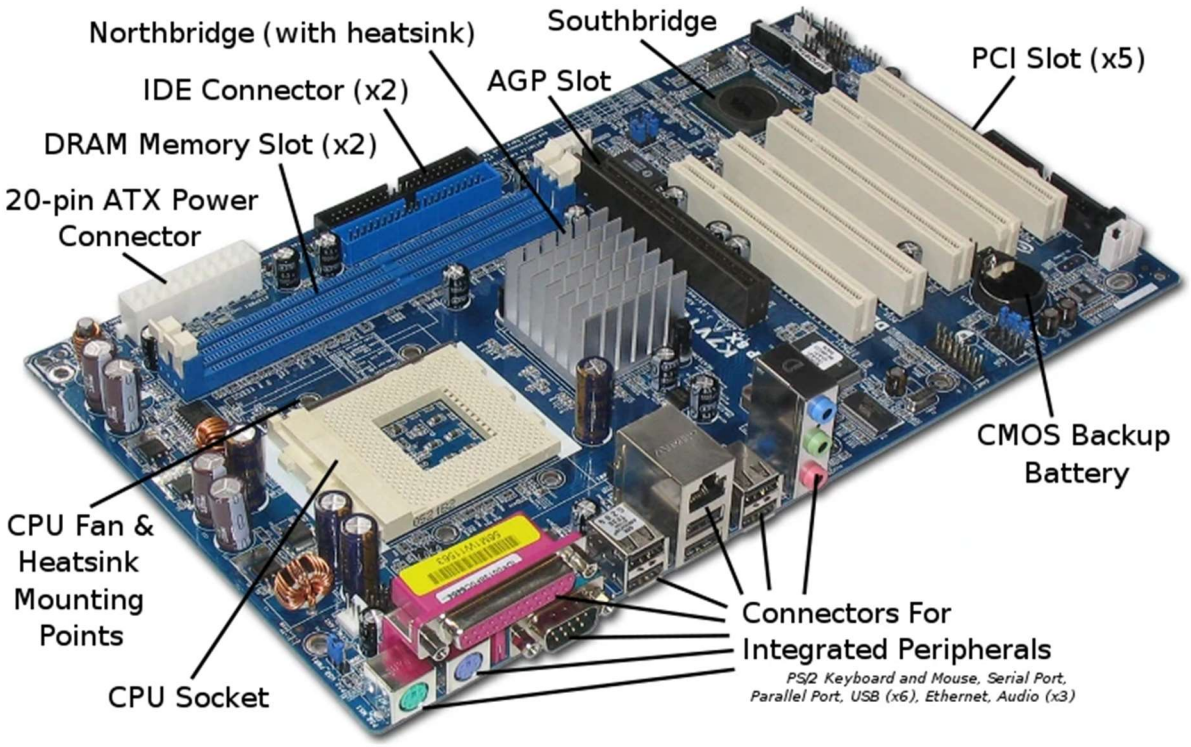
Computer hardware (usually simply called hardware when a computing context is concerned) is the collection of physical elements that constitutes a computer system. Computer hardware is the physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), graphic cards, sound cards, memory, motherboard, and so on, all of which are physical objects that are tangible.

MOTHER BOARD

The motherboard is mounted inside the case and is securely attached via small screws through pre-drilled holes. Motherboard contains ports to connect all of the internal components. It provides a single socket for CPU, whereas for memory, normally one or more slots are available. Motherboards provide ports to attach the floppy drive, hard drive, and optical drives via ribbon cables. Motherboard carries fans and a special port designed for power supply.

There is a peripheral card slot in front of the motherboard using which video cards, sound cards, and other expansion cards can be connected to the motherboard.

On the left side, motherboards carry a number of ports to connect the monitor, printer, mouse, keyboard, speaker, and network cables. Motherboards also provide USB ports, which allow compatible devices to be connected in plug-in/plug-out fashion. For example, pen drive, digital cameras, etc.

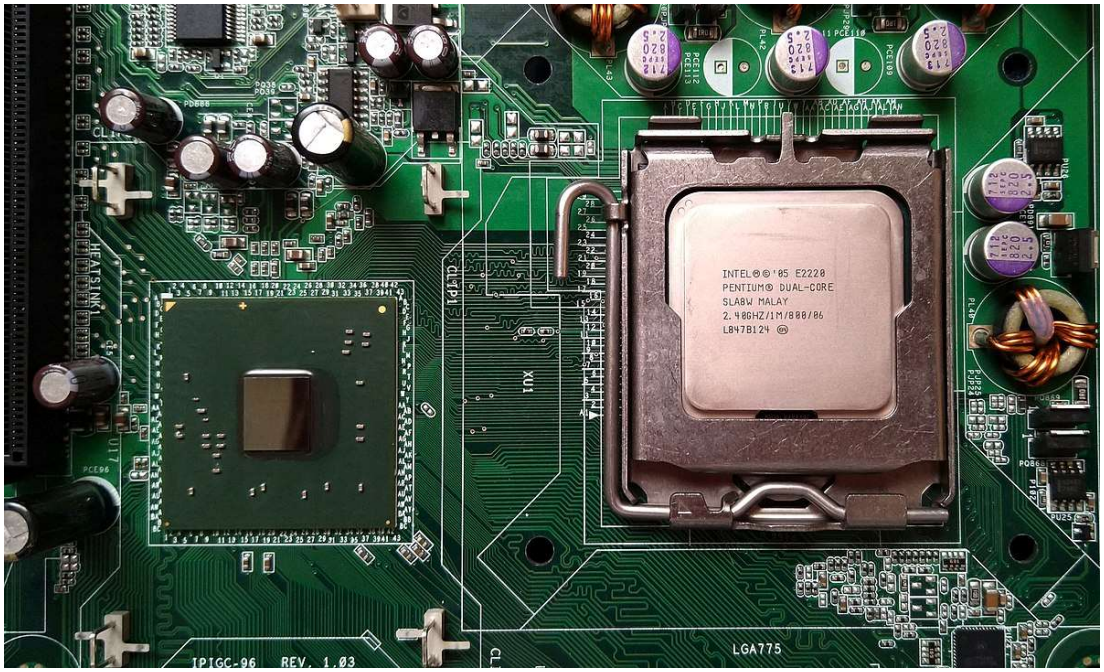


MAJOR MOTHERBOARD COMPONENTS AND THEIR FUNCTIONS:

1) Chip-sets

A chipset is a group of small circuits that coordinate the flow of data to and from a PC's key components. These key components include the CPU itself, the main memory, the secondary cache, and any devices situated on the buses.

A chipset also controls data flow to and from hard disks and other devices connected to the IDE channels.



A computer has got two main chipsets:

- The NorthBridge (also called the memory controller) is in charge of controlling transfers between the processor and the RAM, which is why it is located physically near the processor. It is sometimes called the GMCH, for Graphic and Memory Controller Hub.
- The SouthBridge (also called the input/output controller or expansion controller) handles communications between slower peripheral devices. It is also called the ICH (I/O Controller Hub). The term "bridge" is generally used to designate a component which connects two buses.

Chipset manufacturers include SIS, VIA, ALI, and OPTI.

2) The BIOS

BIOS stands for Basic Input/Output System. BIOS is a "read-only" memory, which consists of low-level software that controls the system hardware and acts as an interface between the operating system and the hardware.

Most people know the term BIOS by another name—device drivers, or just drivers. BIOS is essentially the link between the computer hardware and software in a system.

All motherboards include a small block of Read-Only Memory (ROM) which is separate from the main system memory used for loading and running software. On PCs, the BIOS contains all the code required to control the keyboard, display screen, disk drives, serial communications, and a number of miscellaneous functions.

The system BIOS is a ROM chip on the motherboard used during the start-up routine (boot process) to check out the system and prepare to run the hardware.

The BIOS is stored on a ROM chip because ROM retains information even when no power is being supplied to the computer.

3) The CMOS Battery

Motherboards also include a small separate block of memory made from CMOS RAM chips which are kept alive by a battery (known as a CMOS battery) even when the PC's power is off. This prevents reconfiguration when the PC is powered on.

CMOS devices require very little power to operate.

The CMOS RAM is used to store basic information about the PC's configuration for instance: -

- Floppy disk and hard disk drive types
- Information about CPU
- RAM size
- Date and time
- Serial and parallel port information
- Plug and Play information
- Power Saving settings

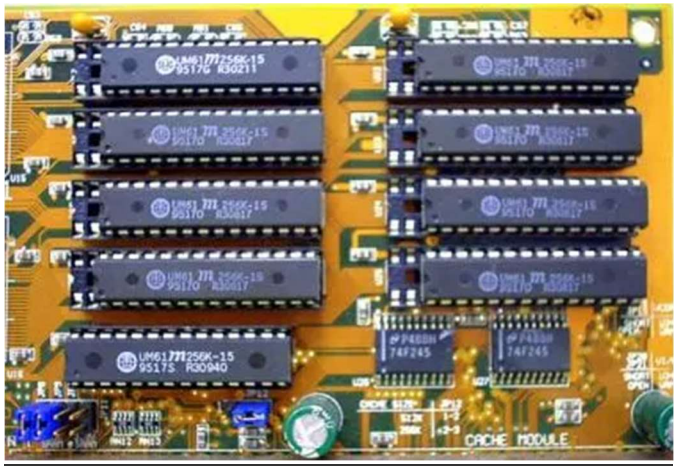
Other Important data kept in CMOS memory is the time and date, which is updated by a Real-Time Clock (RTC).

4) Cache Memory

Cache memory is a small block of high-speed memory (RAM) that enhances PC performance by pre-loading information from the (relatively slow) main memory and passing it to the processor on demand.

Most CPUs have an internal cache memory (built into the processor) which is referred to as Level 1 or primary cache memory. This can be supplemented by external cache memory fitted on the motherboard. This is the Level 2 or secondary cache.

In modern computers, Levels 1 and 2 cache memory are built into the processor die. If a third cache is implemented outside the die, it is referred to as the Level 3 (L3) cache.

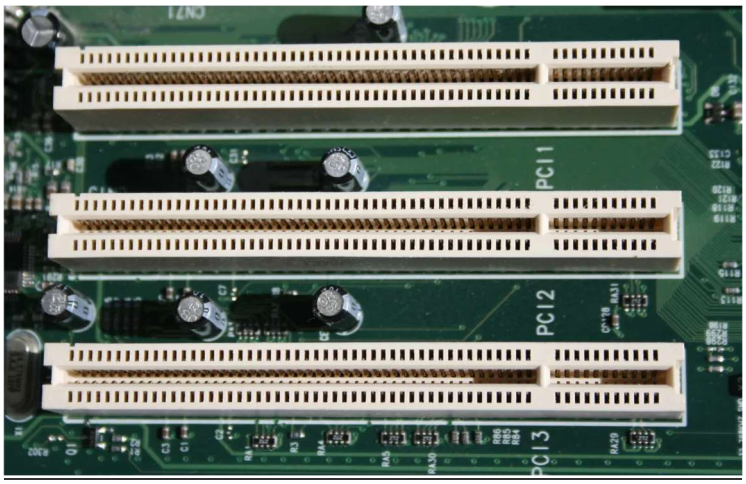


5) Expansion Bus

An expansion bus is an input/output pathway from the CPU to peripheral devices and it is typically made up of a series of slots on the motherboard. Expansion boards (cards) plug into the bus.

PCI is the most common expansion bus in a PC and other hardware platforms. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include ISA and EISA.

Expansion buses enhance the PCs capabilities by allowing users to add missing features in their computers by slotting adapter cards into expansion slots.



6) **POST (Power-On Self-Test):**

Test the computer hardware and make sure no errors exist before loading the operating system.

7) **Bootstrap Loader:**

Locate the operating system. If a capable operating system is 3 located, the BIOS will pass control to it.

RAM (Random Access Memory)

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e., data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

ROM (Read Only Memory)

ROM stands for **Read Only Memory**. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as **bootstrap**. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.

The various types of ROMs are:

- MROM (Masked ROM)
- PROM (Programmable Read Only Memory)
- EPROM (Erasable and Programmable Read Only Memory)
- EEPROM (Electrically Erasable and Programmable Read Only Memory)

Daughter cards

The daughter board is a computer hardware. It is also known as the piggyback board, riser card, daughter board, daughtercard or daughter card. A daughter board is a printed circuit board which is connected to the motherboard or expansion card. As compared to the motherboard, it is smaller in size. A daughter board does not act as an expansion card. An expansion card adds extra new functions to the computer. But a daughter board that is connected to the motherboard adds or supports the main functions of the motherboard.

Daughter boards are directly connected to the motherboards. You know that expansion cards are connected to the motherboard by using the bus and other serial interfaces. But daughter

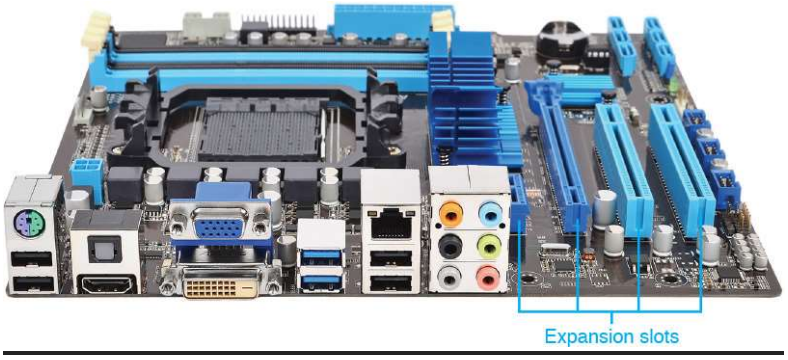
board is directly connected to the board by soldering. As an update of the motherboard or expansion card, daughter boards are released to extend the features and services of the motherboard or expansion cards.

Bus slots

Alternatively known as an 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 5 expansion card and install that card into the compatible expansion slot.

An expansion slot is a socket on the motherboard that is used to insert an expansion card (or circuit board), which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory.

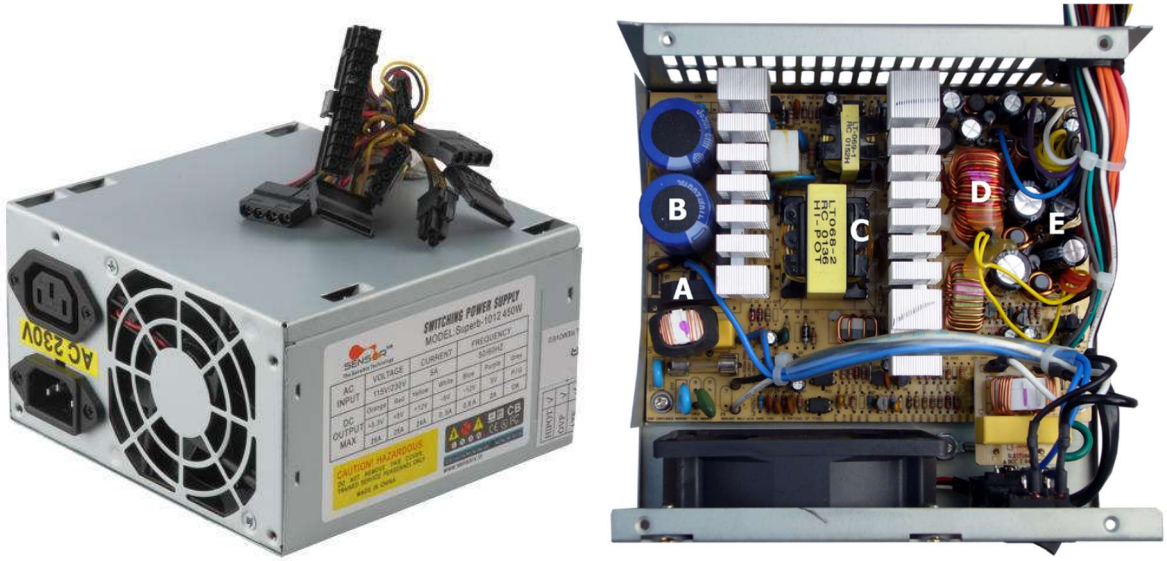
The expansion card has an edge connector that fits precisely into the expansion slot as well as a row of contacts that is designed to establish an electrical connection between the motherboard and the electronics on the card, which are mostly integrated circuits. Depending on the form factor of the case and motherboard, a computer system generally can have anywhere from one to seven expansion slots. With a backplane system, up to 19 expansion cards can be installed.



SMPS

The full form of SMPS is Switched Mode Power Supply also known as Switching 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.

An SMPS adjusts output voltage and current between different electrical configurations by switching the basics of typically lossless storage such as capacitors and inductors. Ideal switching concepts determined by transistors controlled outside of their active state that have no resistance when 'on' and carry no current when 'off.' It is the idea why switches with an ideal function will operate with 100 per cent output, that is, all input energy is provided to the load; no power is wasted as dissipated heating. In fact, such ideal systems do not exist, which is why a switching power source cannot be 100 per cent proficient, but it is still a vital improvement in effectiveness over a linear regulator.



Benefits of SMPS

- The switch-mode power source is small in scale.
- The SMPS is very lightweight.
- SMPS power consumption is typically 60 to 70 per cent, which is ideal for use.
- SMPS is strongly anti-interference.
- The SMPS production range is large.

Limitations of SMPS

- The complexity of SMPS is very large.
- The production reflection is high and its control is weak in the case of SMPS.
- Use of SMPS can only be a step-down regulator.
- In SMPS, the voltage output is just one.

Internal storage devices

Some storage devices are classed as 'internal' which means they are inside the computer case.

Most computers have some form of internal storage. The most common type of internal storage is the hard disk.

At the most basic level, internal storage is needed to hold the operating system so that the computer is able to access the input and output devices. It will also be used to store the applications software that you use and more than likely, the original copies of your data files. Internal storage allows the data and applications to be loaded very rapidly into memory, ready for use.

The data can be accessed much faster than data which is stored on an external storage device. This is because internal storage devices are connected directly to the motherboard and its data bus whereas external devices are connected through a hardware interface such as USB, which means they are considerably slower to access. Internal storage also means that if the computer is moved around, it will still retain its most commonly used data.

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost. This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup.

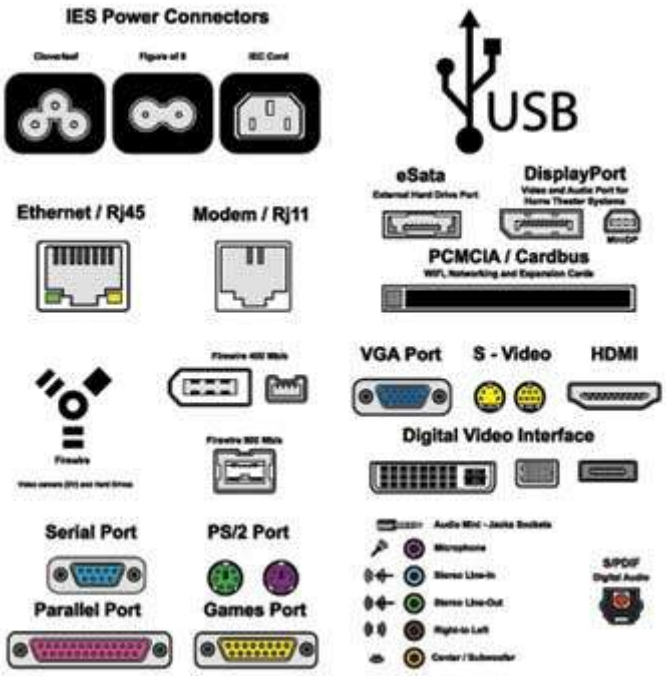
Interfacing Ports

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.

Characteristics of Ports

A port has the following characteristics −

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.



Let us now discuss a few important types of ports:

Serial Port

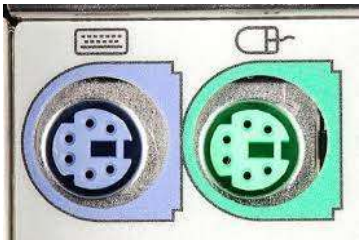
- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second

Parallel Port

- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

PS/2 Port

- Used for old computer keyboard and mouse
- Also called mouse port
- Most of the old computers provide two PS/2 port, each for the mouse and keyboard
- IEEE 1284-compliant Centronics port

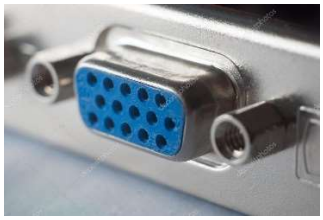


Universal Serial Bus (or USB) Port

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.
- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port.

VGA Port

- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.



Ethernet Port

- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

EXPLANATION ABOUT SYSTEM SPECIFICATIONS AND SERVERS.

SYSTEM SPECIFICATIONS

System requirements are the configuration that a system must have in order for a hardware or software application to run smoothly and efficiently. Failure to meet these requirements can result in installation problems or performance problems. The former may prevent a device or application from getting installed, whereas the latter may cause a product to malfunction or perform below expectation or even to hang or crash.

System requirements are also known as minimum system requirements.

System requirements can be broadly classified as functional requirements, data requirements, quality requirements and constraints. They are often provided to consumers in complete detail. System requirements often indicate the minimum and the recommended configuration. The former is the most basic requirement, enough for a product to install or run, but performance is not guaranteed to be optimal. The latter ensures a smooth operation.

Hardware system requirements often specify the operating system version, processor type, memory size, available disk space and additional peripherals, if any, needed. Software system requirements, in addition to the aforementioned requirements, may also specify additional software dependencies (e.g., libraries, driver version, framework version). Some hardware/software manufacturers provide an upgrade assistant program that users can download and run to determine whether their system meets a product's requirements.

FACTORS THAT AFFECT THE COMPUTER PERFOMANCE

1. **Processor speed and Architecture**

   The speed of a computer's processor chip (technically known as its "clock speed") is measured in gigahertz (GHz), with the fastest modern processors currently running at up to 4.7GHz. However, for most computing tasks -- including web browsing, sending e-mails, word processing and spreadsheet work -- any processor running at 1GHz or more remains perfectly sufficient. (No really guys, it does!).

   Where higher processor speeds become more important is for applications such as video editing, 3D graphics work and (for the majority of "power users") playing computer games! For any of these applications, within reason the faster the processor the better. This said, people in need a very powerful computer have to be aware that CPU performance is now determined by far more than raw speed alone. Intel made this very clear when it introduced its system of processor numbers. These provide an indication of a processor's "architecture", "cache" and "front side bus (FSB) speed" in addition to its clock speed.

   Alongside clock speed, the architecture of a processor is the most important factor to determine its performance, and refers to its basic design and complexity. Some processors are simply more sophisticated than others, with Intel (for example) producing "basic" processors called Celerons and Pentiums, as well as more powerful

processors under its "Core" processor family. The later include the Core 2, Core i3, Core i5 and Core i7, with the last of these being the most powerful.

2. Random Access Memory (RAM)

RAM -- or "random access memory" -- is the temporary storage space that a computer loads software applications and user data into when it is running. All current RAM technologies are "volatile", which means that everything held in RAM is lost when a computer's power is removed. To a large extent, the more RAM a computer has the faster and more effectively it will operate. Computers with little RAM have to keep moving data to and from their hard disks in order to keep running. This tends to make them not just slow in general, but more annoyingly intermittently sluggish.

RAM is measured in megabytes (MB) and gigabytes (GB), as detailed on the storage page. Just how much RAM a computer needs depends on the software it is required to run effectively. A computer running Windows XP will usually function quite happily with 1GB of RAM, whereas twice this amount (ie 2GB) is the realistic minimum for computers running Windows 7. Most mobile computers usually feature far less RAM, and indeed even desktop computers running smaller operating systems (such as some versions of Linux or Windows 98) can run very effectively with as little as 128MB of RAM in certain situations.

3. Graphic System

A computer's graphics system determines how well it can work with visual output. Graphics systems can either be integrated into a computer's motherboard, or plugged into the motherboard as a separate "video card". Graphics systems integrated into the motherboard (also known as "onboard graphics") are now quite powerful, and sufficient for handling the requirements of most software applications aside from games playing, 3D modelling, and some forms of video editing.

Any form of modern computer graphics system can now display high-resolution colour images on a standard-sized display screen (ie any monitor up to about 19" in size). What the more sophisticated graphics cards now determine is how well a computer can handle the playback of high-definition video, as well as the speed and quality at which 3D scenes (including games!) can be rendered. Another key feature of separate graphics cards is that most of them now allow more than one display screen to be connected to a computer. Others also permit the recording of video.

4. Hard drive speed and Capacity

Hard disk drives are the high-capacity storage devices inside a computer from which software and user data are loaded. Like most other modern storage devices, the capacity of the one or more internal hard disks inside a computer is measured in gigabytes (GB), as detailed on the storage page. Today 40GB is an absolute minimum hard drive size for a new computer running Windows 7, with a far larger capacity being

recommended in any situation where more than office software is going to be installed. Where a computer will frequently be used to edit video, a second internal hard disk dedicated only to video storage is highly recommended for stable operation. Indeed, for professional video editing using a program like Premiere Pro CS5, Adobe now recommend that a PC has at least three internal hard disks (one for the operating system and programs, one for video project files, and one for video media). This is also not advice to be lightly ignored if you want your computer to actually work!

Most computers are configured to use a proportion of a computer's internal hard disk to store temporary files. Such a "swap file" enables the computer to operate effectively, and means that some free hard disk space always needs to be available for a computer to run properly. However, providing that a hard disk is large enough to store the required software and user data without getting beyond about 80 per cent full, hard disk capacity will have no impact on overall system performance. However, what does impact significantly on overall system performance is the speed of a computer's main internal hard disk. This is simply because the longer it takes to read software and data from the disk, and to access temporary files, the slower the computer will run.

Two key factors determine the speed of traditional, spinning hard disks. The first is the rotational velocity of the physical disk itself. This can currently be 4200, 5400, 7200, 10000 or 15000 rpm (revolutions per minute). The faster the disk spins, the quicker data can be read from or written to it, hence the faster the disk the better (although faster disks consume more power, make more noise, and generate more heat). Most desktop hard disks run at either 5400 or 7200 rpm, whilst most laptop hard disks run at 4200 or 5400. However, upgrading to a 10000 or 15000 rpm disk -- such as a Velociraptor from Western Digital -- can prove one of the most cost-effective upgrades for increasing the performance and responsiveness of a desktop computer.

The second key factor that determines performance of a traditional, internal hard disk is the interface used to connect it to the computer's motherboard. Three types of interfaces exist: SATA, which is the most modern and now pretty much the norm on new PCs; IDE (also known as UDMA), which is a slower and older form of interface, and finally SCSI, which is happens to be the oldest but in it most modern variant is still the fastest disk interface standard. This said, SCSI is now all but redundant in desktop computing since the introduction of SATA, as SATA provides a fairly high-speed interface at much lower cost and complexity than SCSI.

SERVER

A server is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network. In theory, whenever computers share resources with client machines, they are considered servers. There are many types of servers, including web servers, mail servers, and virtual servers.

An individual system can provide resources and use them from another system at the same time. This means that a device could be both a server and a client at the same time.

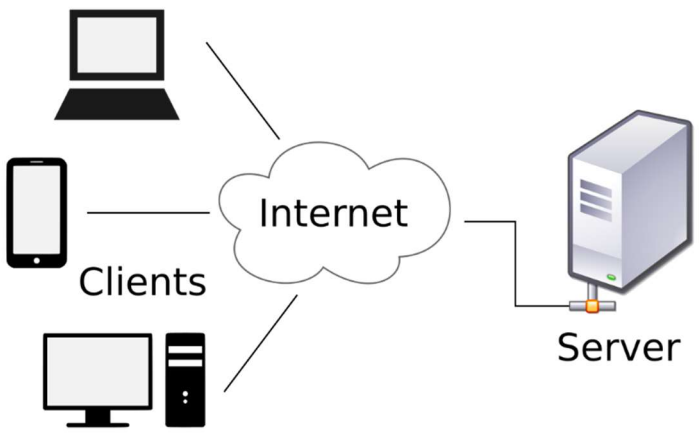
Some of the first servers were mainframe computers or minicomputers. Minicomputers were much smaller than mainframe computers, hence the name. However, as technology progressed, they ended up becoming much larger than desktop computers, which made the term microcomputer somewhat farcical.

Initially, such servers were connected to clients known as terminals that did not do any actual computing. These terminals, referred to as dumb terminals, existed simply to accept input via a keyboard or card reader and to return the results of any computations to a display screen or printer. The actual computing was done on the server.

Later, servers were often single, powerful computers connected over a network to a set of less-powerful client computers. This network architecture is often referred to as the client-server model, in which both the client computer and the server possess computing power, but certain tasks are delegated to servers. In previous computing models, such as the mainframe-terminal model, the mainframe did act as a server even though it wasn't referred to by that name.

As technology has evolved, the definition of a server has evolved with it. These days, a server may be nothing more than software running on one or more physical computing devices. Such servers are often referred to as virtual servers. Originally, virtual servers were used to increase the number of servers functions a single hardware server could do. Today, virtual servers are often run by a third-party on hardware across the Internet in an arrangement called cloud computing.

A server may be designed to do a single task, such as a mail server, which accepts and stores email and then provides it to a requesting client. Servers may also perform several tasks, such as a file and print server, which both stores files and accepts print jobs from clients and then sends them on to a network-attached printer.



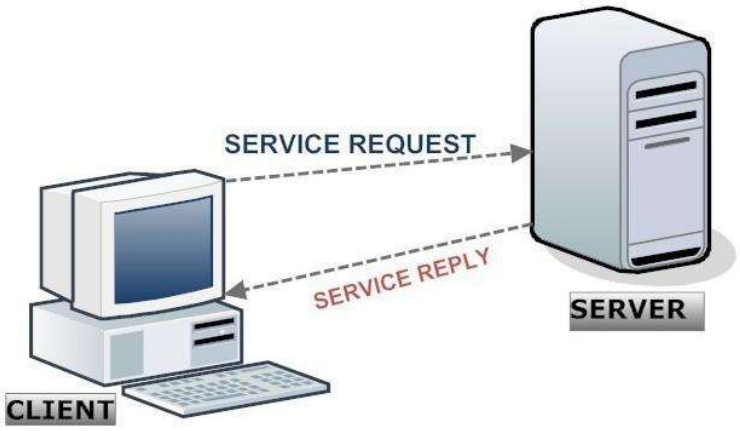
Working of a Server

To function as a server, a device must be configured to listen to requests from clients on a network connection. This functionality can exist as part of the operating system as an installed application, role, or a combination of the two.

For example, Microsoft's Windows Server operating system provides the functionality to listen to and respond to client requests. Additionally, installed roles or services increase which kinds of client requests the server can respond to. In another example, an Apache web server responds to Internet browser requests via an additional application, Apache, installed on top of an operating system.

When a client requires data or functionality from a server, it sends a request over the network. The server receives this request and responds with the appropriate information. This is the request and response model of client-server networking, also known as the call and response model.

A server will often perform numerous additional tasks as part of a single request and response, including verifying the identity of the requestor, ensuring that the client has permission to access the data or resources requested, and properly formatting or returning the required response in an expected way.



Server Machines

Servers can come in many shapes and forms. Technically any computer with a suitable server operating system / software installed, and a way for devices to connect to it, is capable of being a server.

However, in most cases, servers are specialized computers which are designed and built for the specific task of being a server:

- Servers are designed to be running 24-7.
- The processing power of servers can generate a lot of heat.

- They need to be capable of computing and handling the tasks they are built for.
- They need to be able to cope with the number of clients that are accessing it.

Types of Servers

1. 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.

2. 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.

3. **Database Servers**

The amount of data used by companies, users, and other services is staggering. Much of that data is stored in databases. Databases need to be accessible to multiple clients at any given time and can require extraordinary amounts of disk space. Both of these needs lend themselves well to locating such databases on servers. Database servers run database applications and respond to numerous requests from clients. Common database server applications include Oracle, Microsoft SQL Server, DB2, and Informix.

4. **Application Servers**

Application servers run applications in lieu of client computers running applications locally. Application servers often run resource-intensive applications that are shared by a large number of users. Doing so removes the need for each client to have sufficient resources to run the applications. It also removes the need to install and maintain software on many machines as opposed to only one.

5. **Game Servers**

Game Servers takes the pain out of managing your global game server infrastructure, so you can focus on creating great games faster, without increasing complexity or compromising on performance.

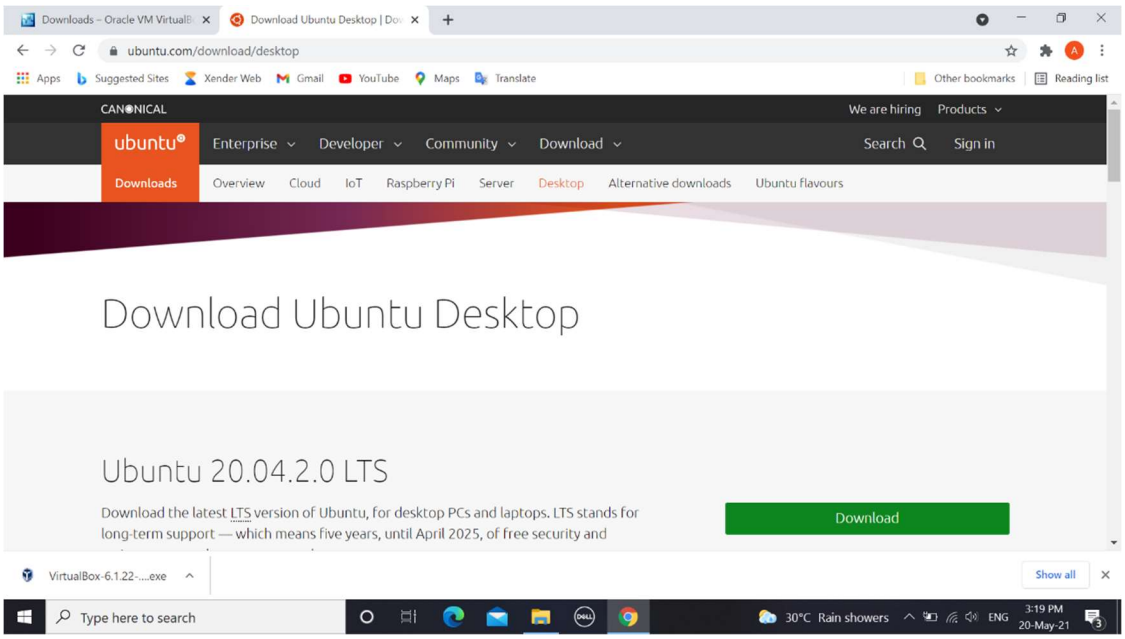
Game Servers fully manages Agones, an open-source game server management project that runs on Kubernetes.

Automatically scale your fleet for daily peaks, game events, or content drops, and easily manage multiple versions of your game server code.

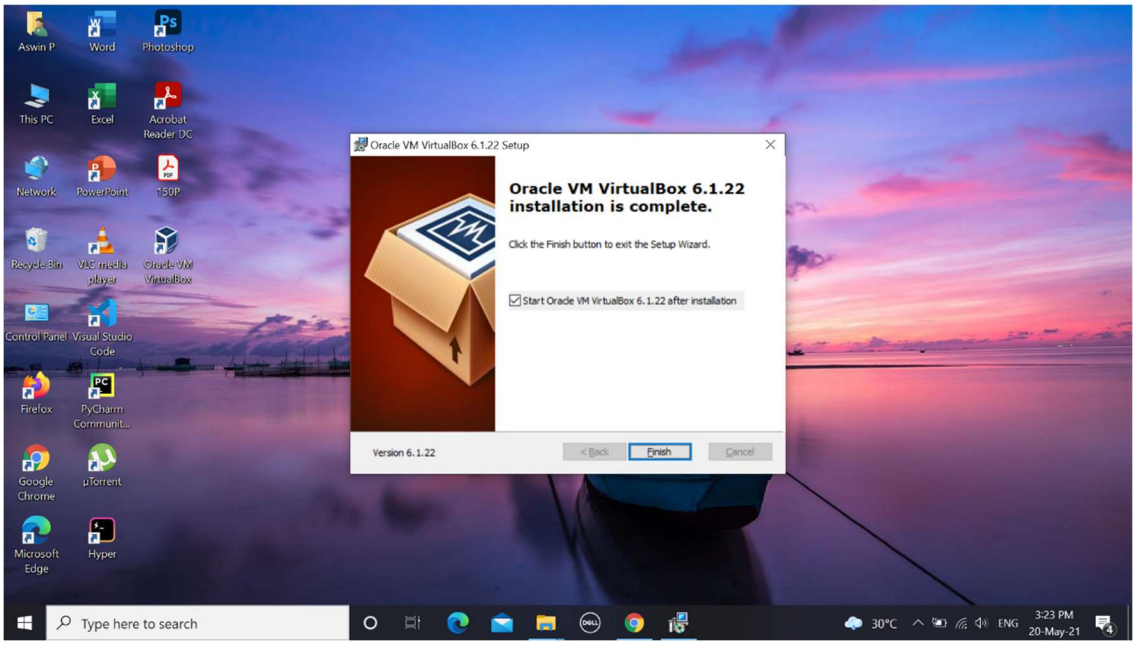
INSTALLATION OF UBUNTU OS USING VIRTUAL BOX

SOLUTION

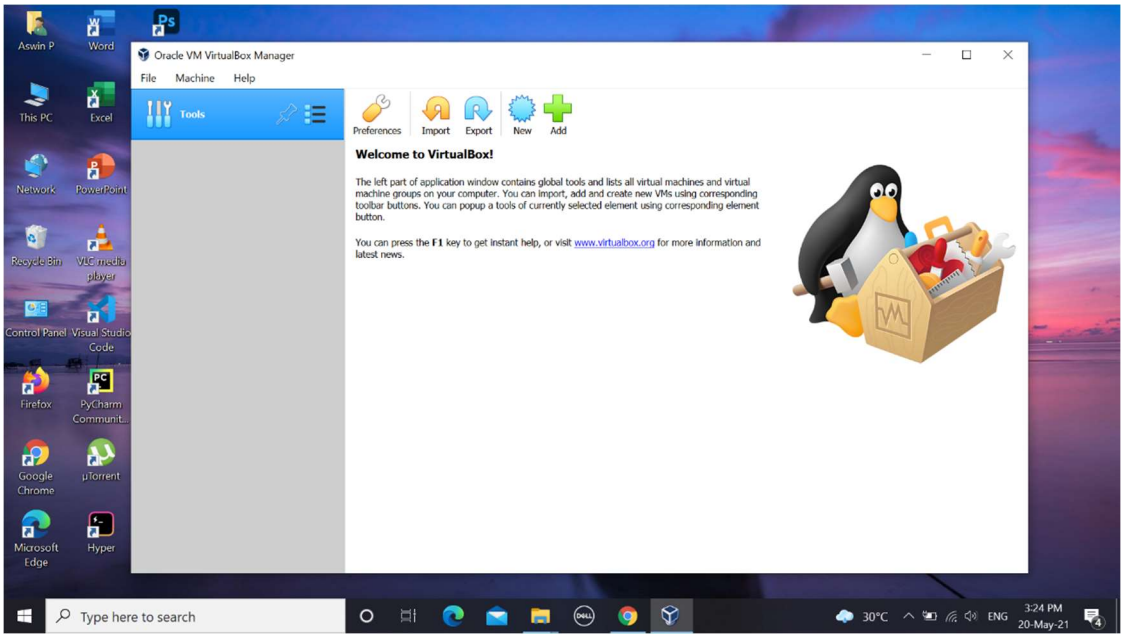
1) Open the Ubuntu website. Go to https://www.ubuntu.com/download/desktop in your computer's web browser. You can download the Ubuntu disk image (also known as an ISO file) here.



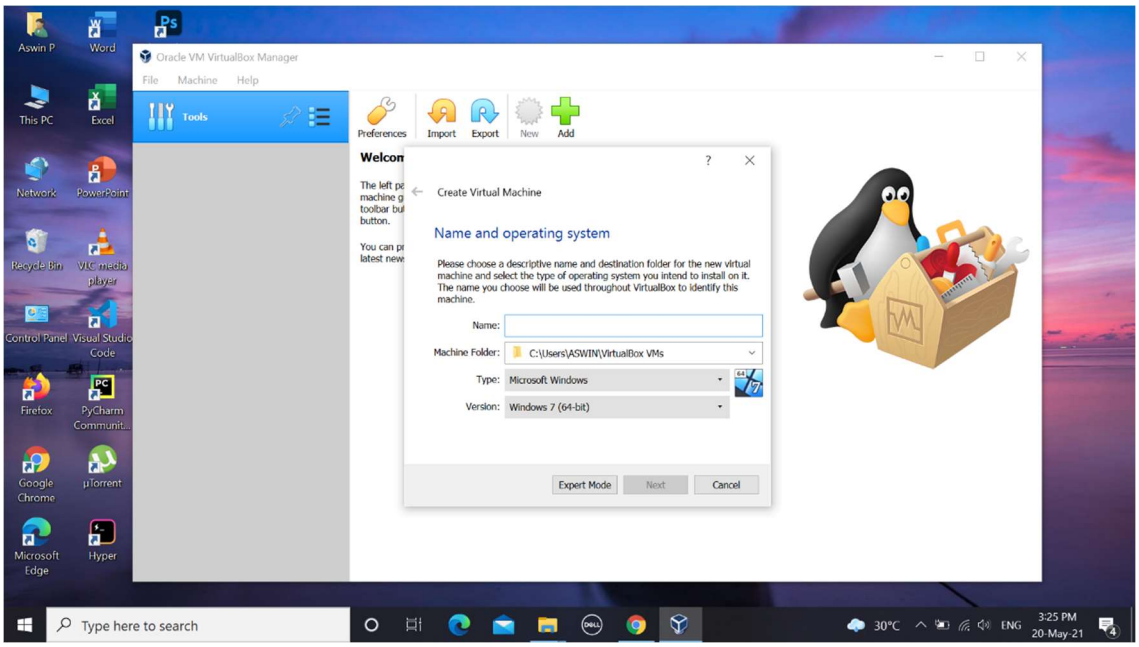
2) Install VirtualBox if you haven't yet done so. If you don't already have VirtualBox installed on your Windows or Mac computer, you'll need to install it before proceeding.



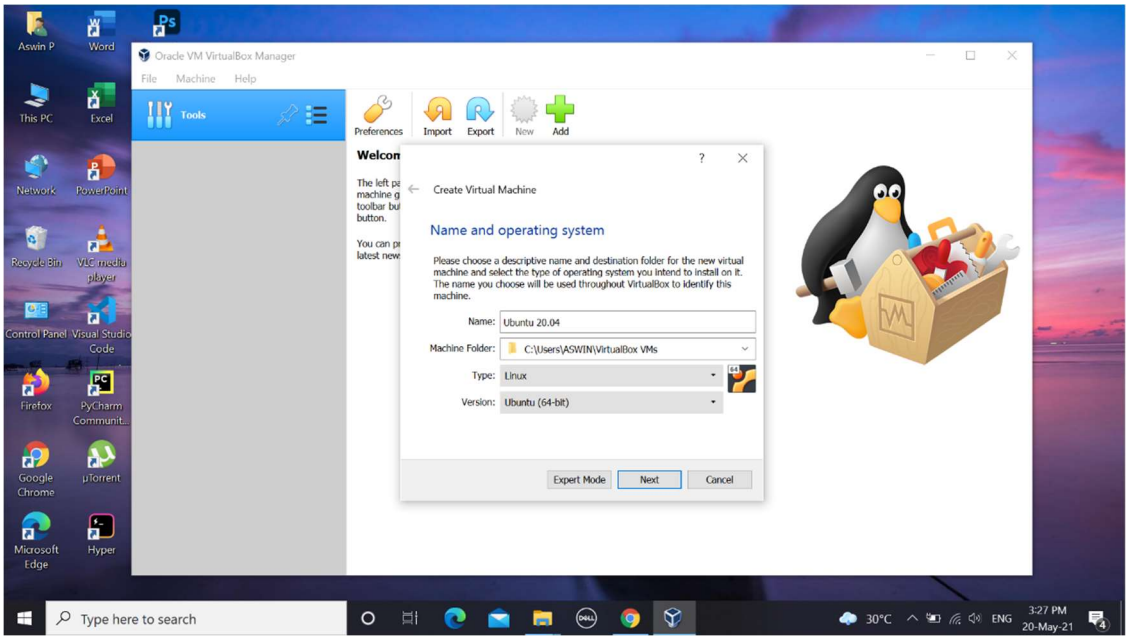
3) Open VirtualBox. Double-click (or click once on a Mac) the VirtualBox app icon.



4) Click NEW. It's a blue badge in the upper-left corner of the VirtualBox window. Doing so opens a pop-up menu.

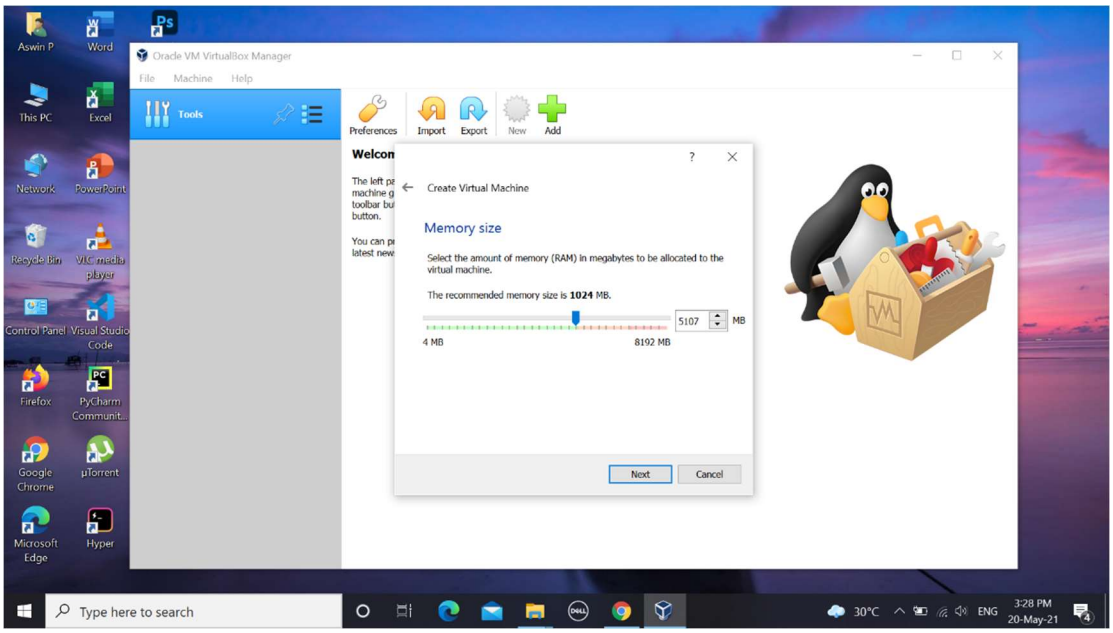


5) Enter a name for your virtual machine. Type whatever you want to name your virtual machine (e.g., `Ubuntu 20.04`) into the "Name" text field that's near the top of the pop-up menu.

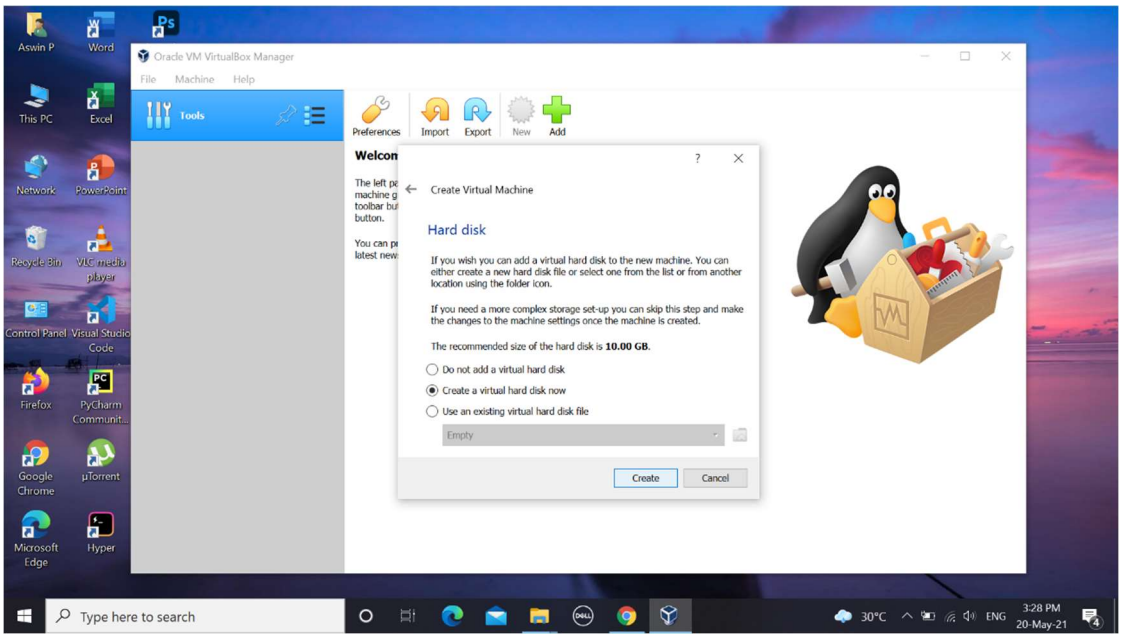


6) Click Next. It's at the bottom of the menu.
Select an amount of RAM to use. Click and drag the slider left or right to decrease or increase the amount of RAM that VirtualBox will have available for your Ubuntu virtual machine.

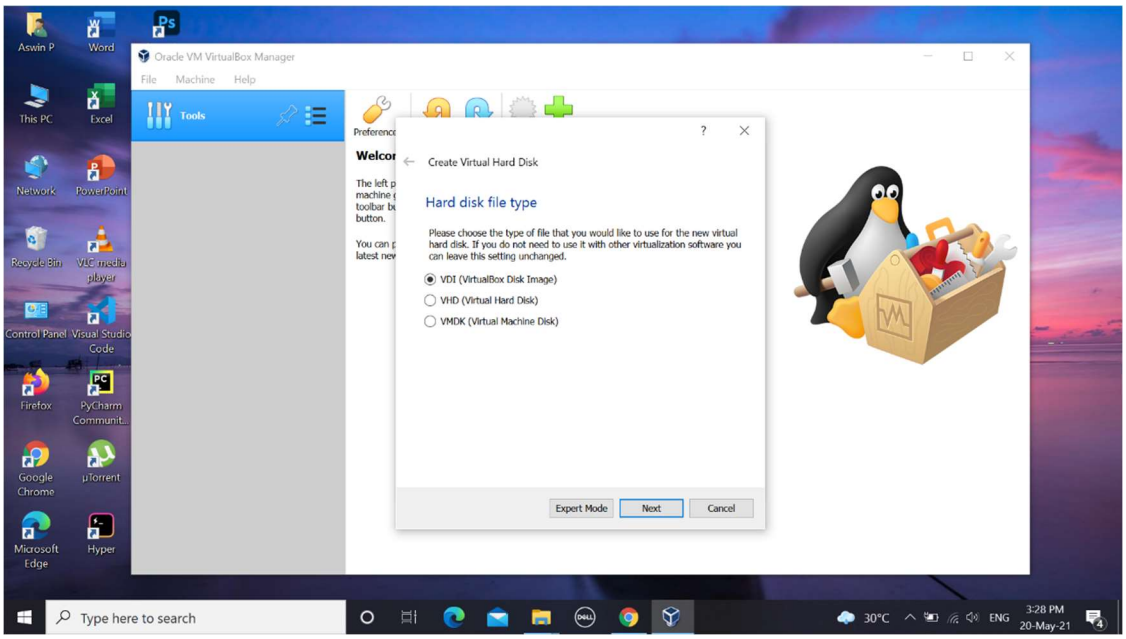
- The ideal amount of RAM will automatically be selected when you get to this page.
- Make sure not to increase the RAM into the red section of the slider; try to keep the slider in the green.



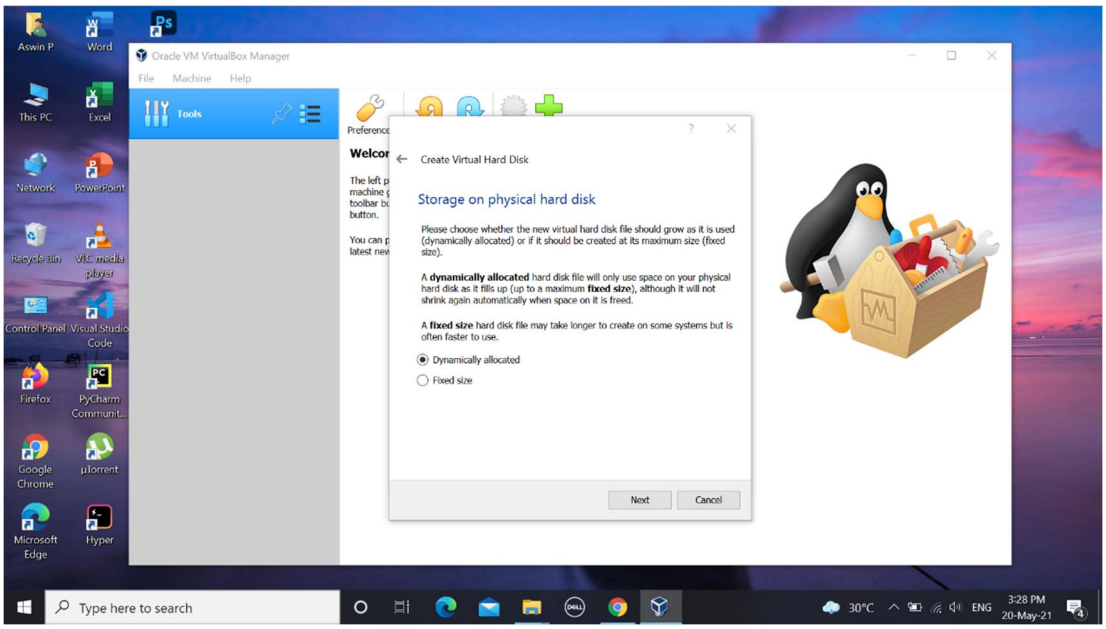
7) Click Next. It's at the bottom of the menus.



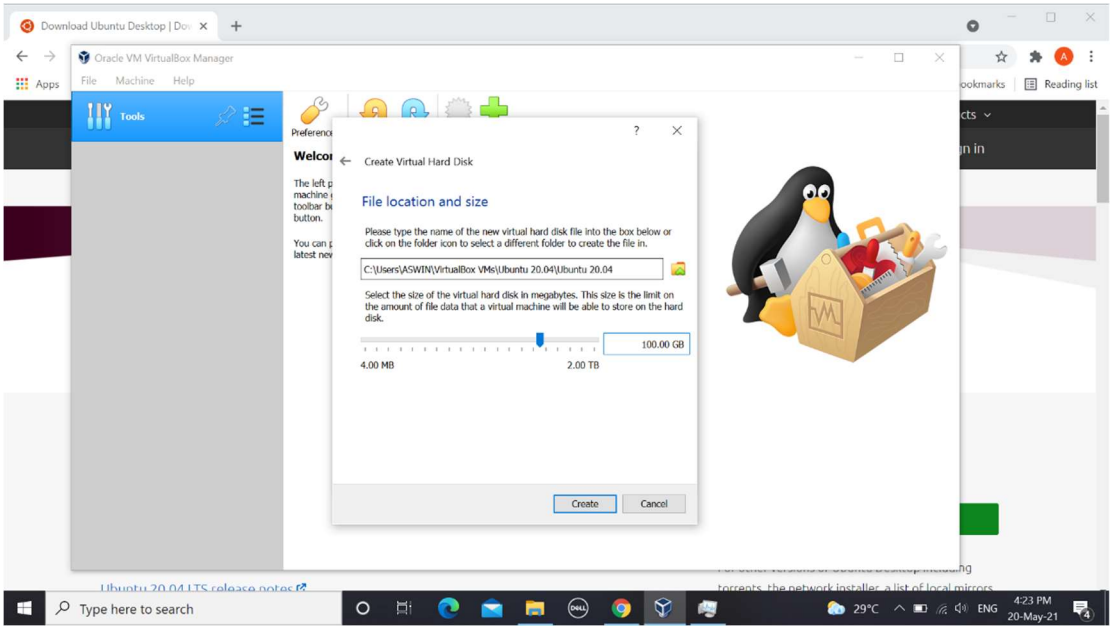
8) Click Next.
let the options be default i.e., hard drive file type VDI (virtual disk image)



9) Click Next.
let the options be the default (Dynamically allocated)

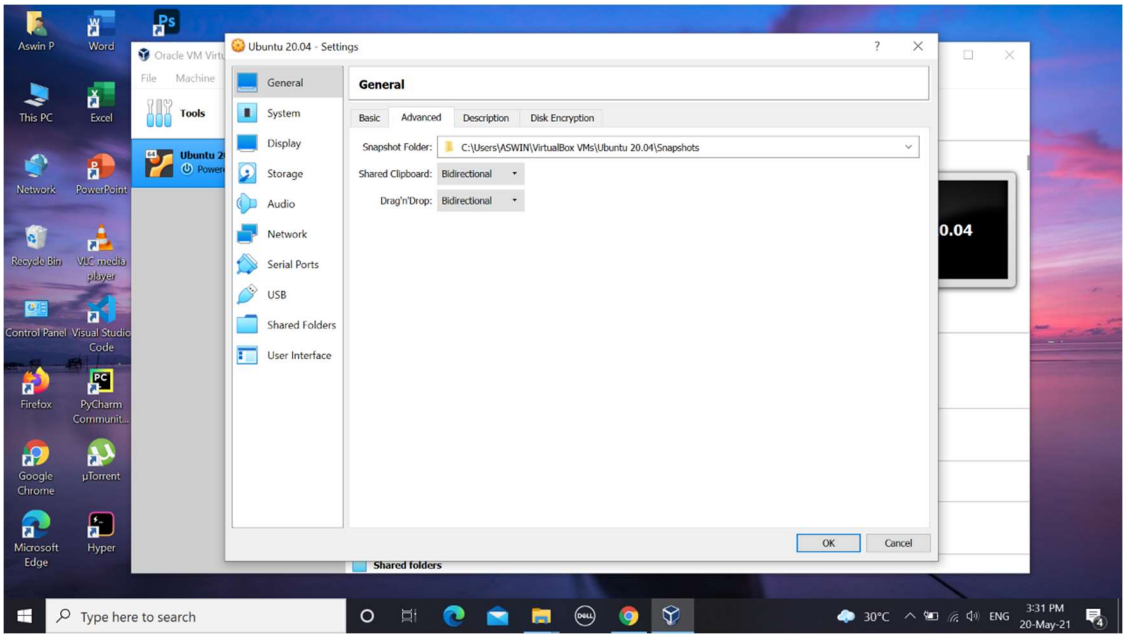


10) Enter Size of Virtual Hard Drive= 100 GB and Click Create.

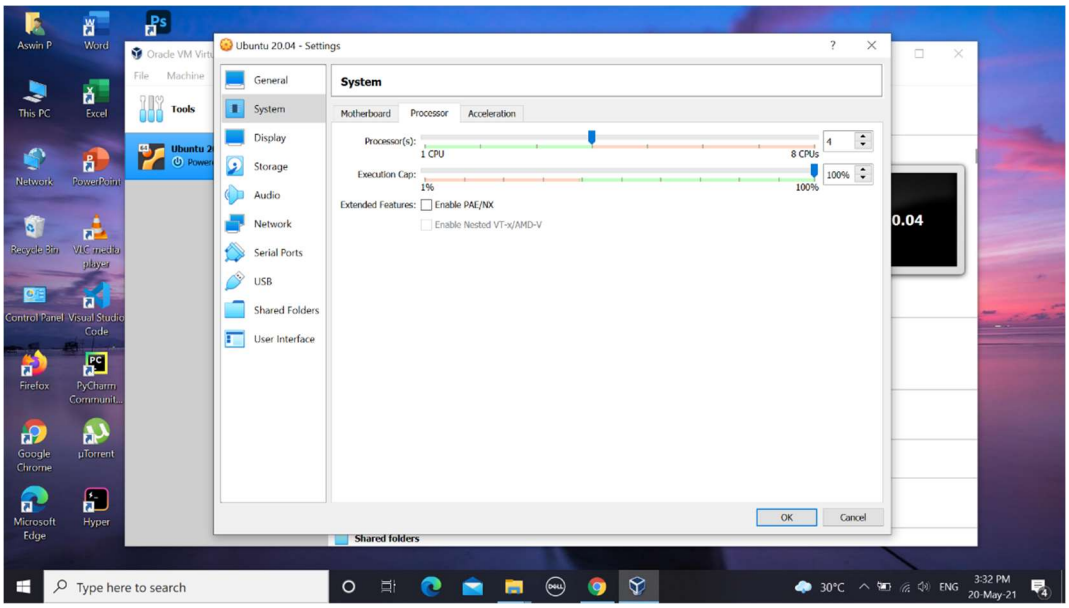


11) Click on “Settings” to start the virtual machine.

Click on “General → Advanced”



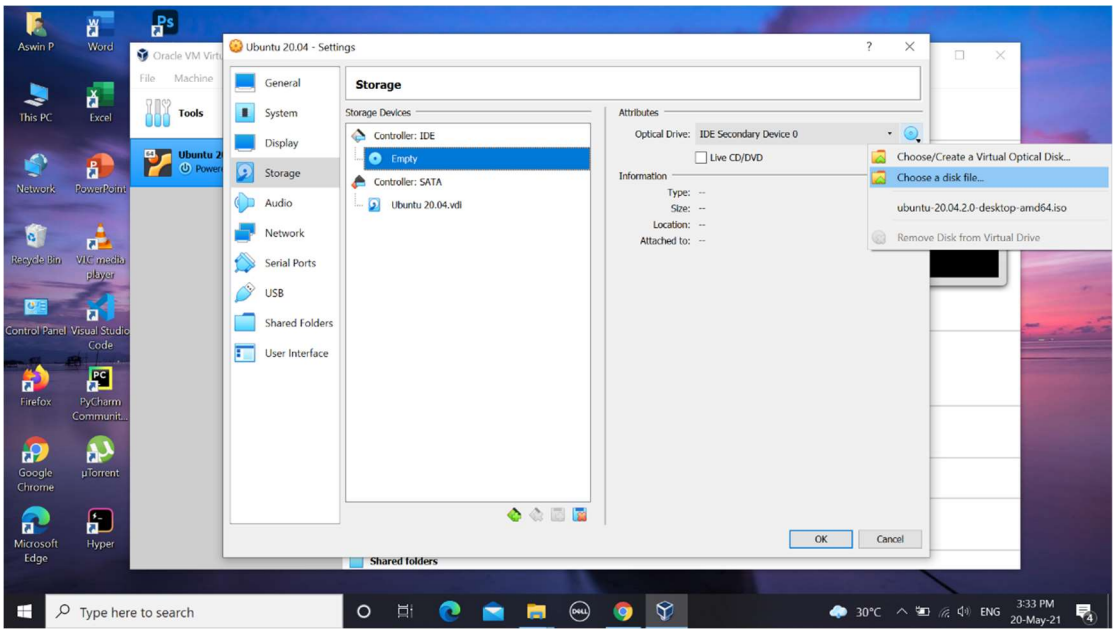
12) Click on “System → Processor”



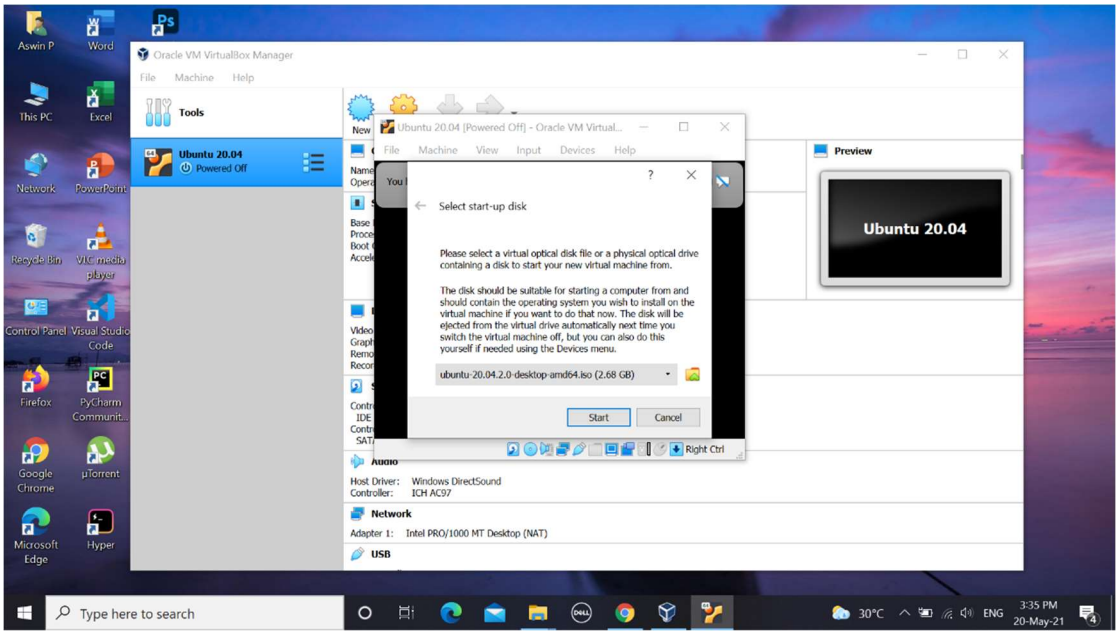
13) Click on “Storage → Controller IDE”

Click the disk symbol.

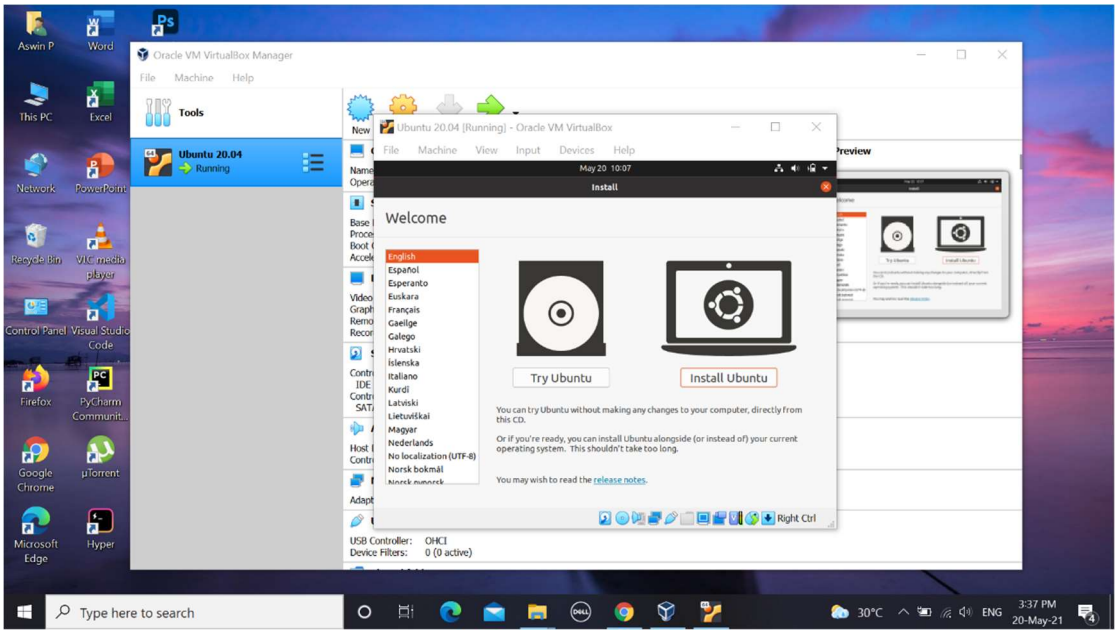
Select disk file source by clicking on the folder icon to start an installation of OS.



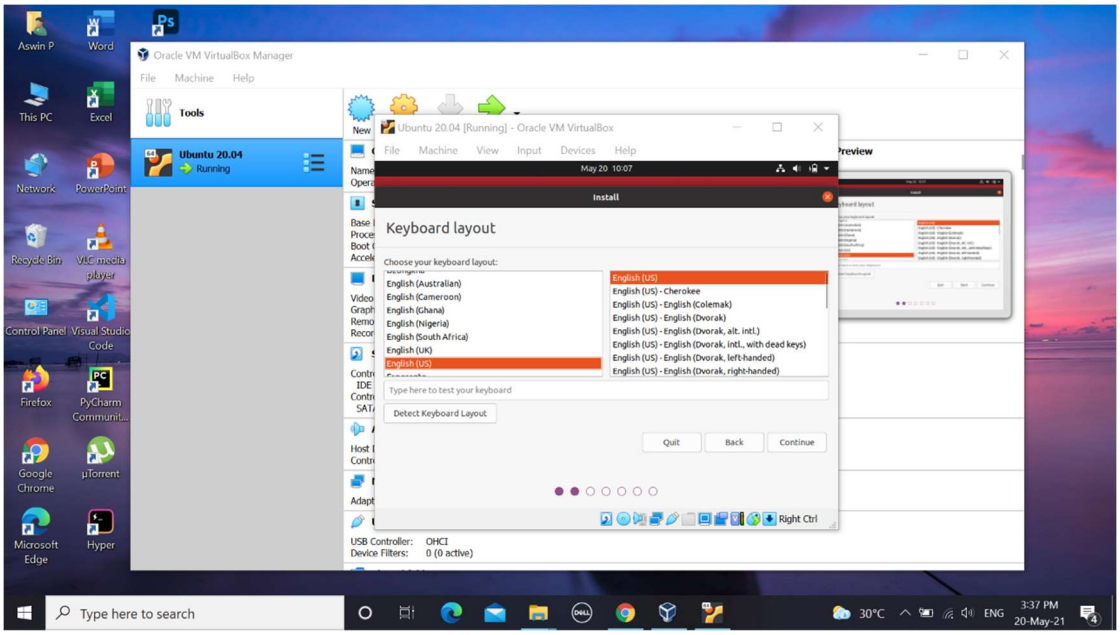
14) Click “Start”.



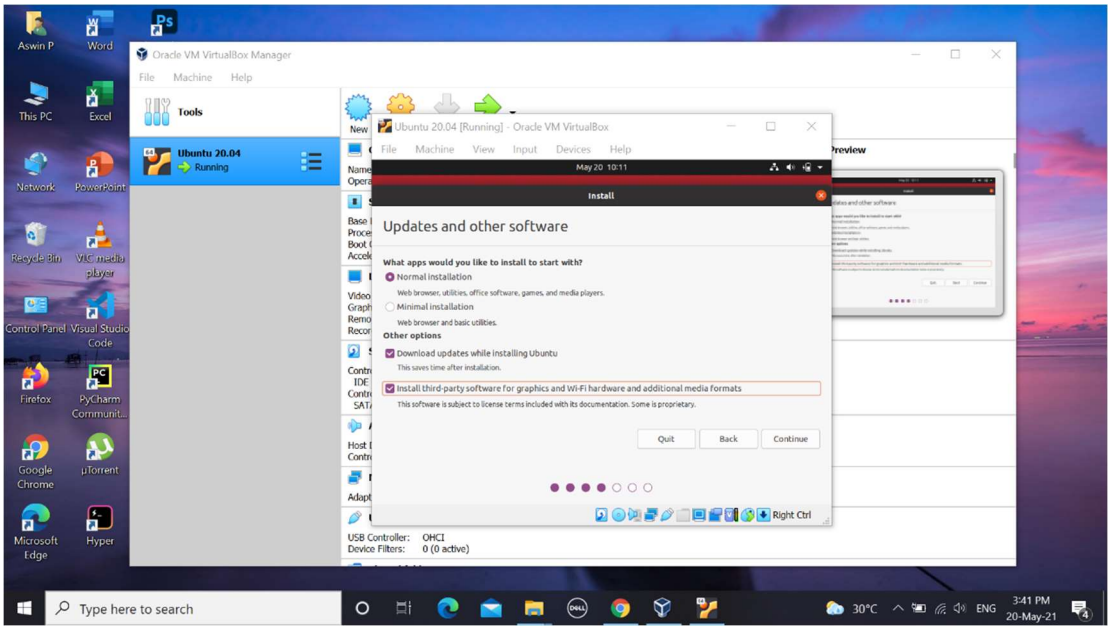
15) Click “Install Ubuntu”.



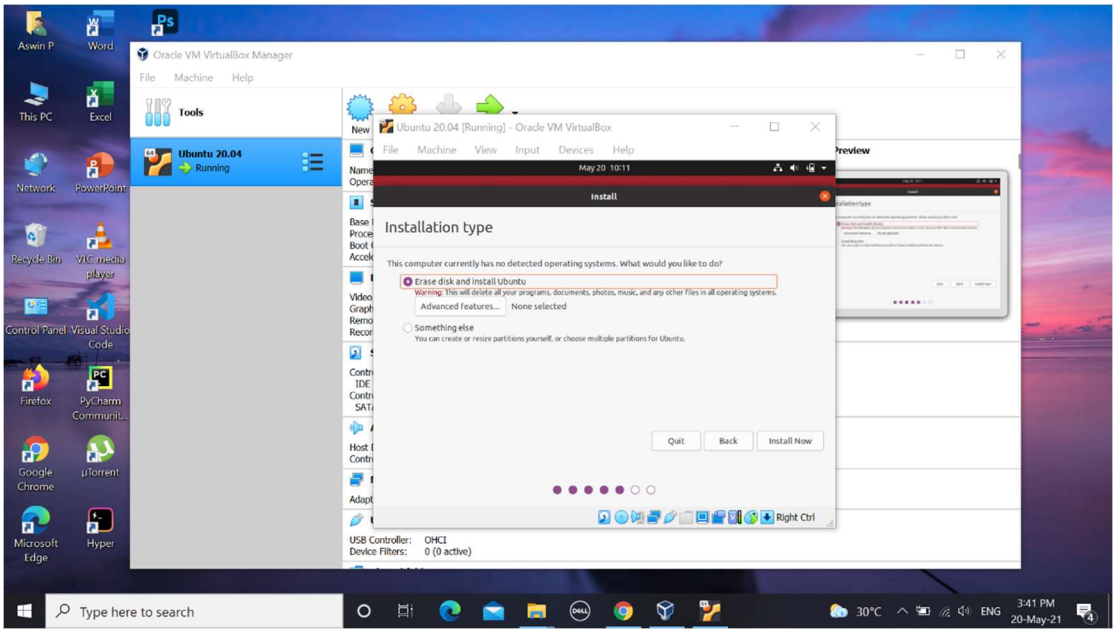
16) Select Keyboard layout



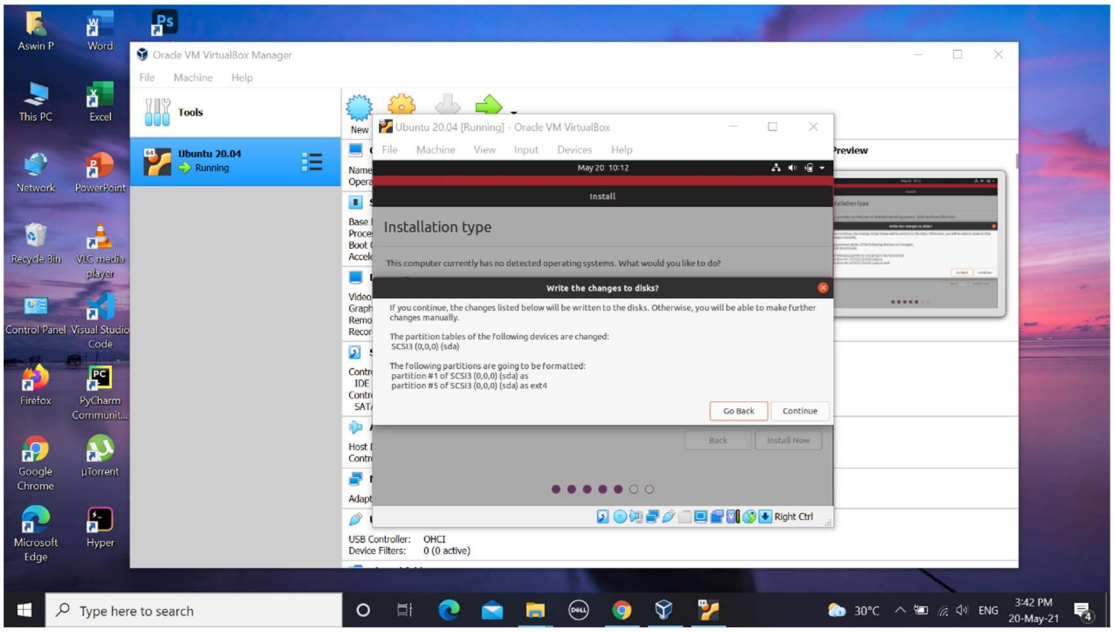
17) Click continue.



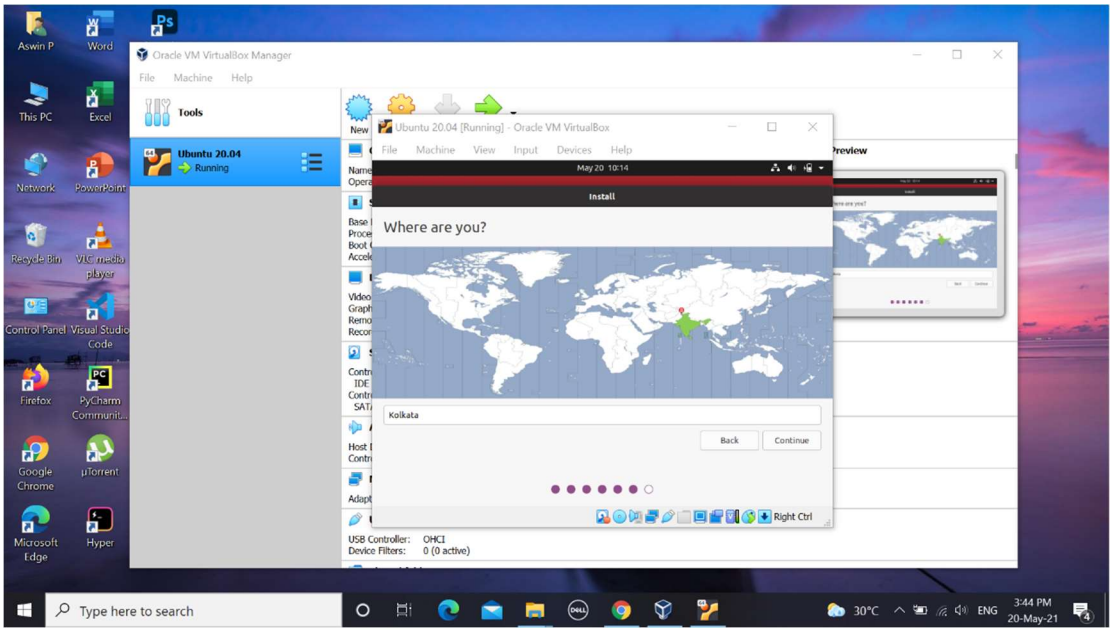
18) Check Erase disk and install ubuntu.



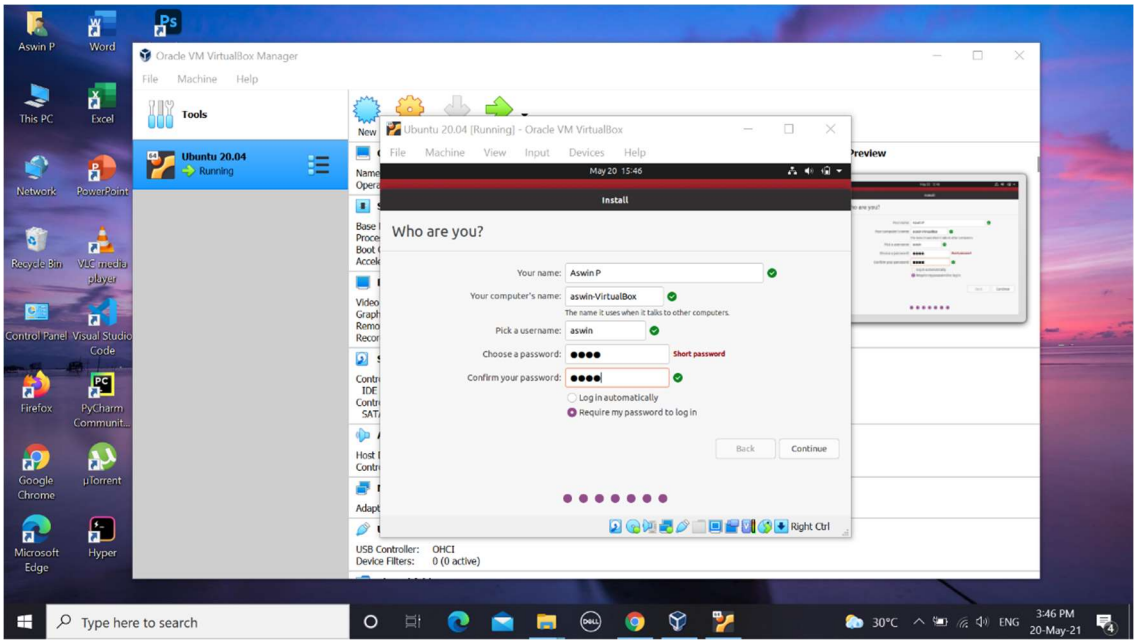
19) Click Continue.



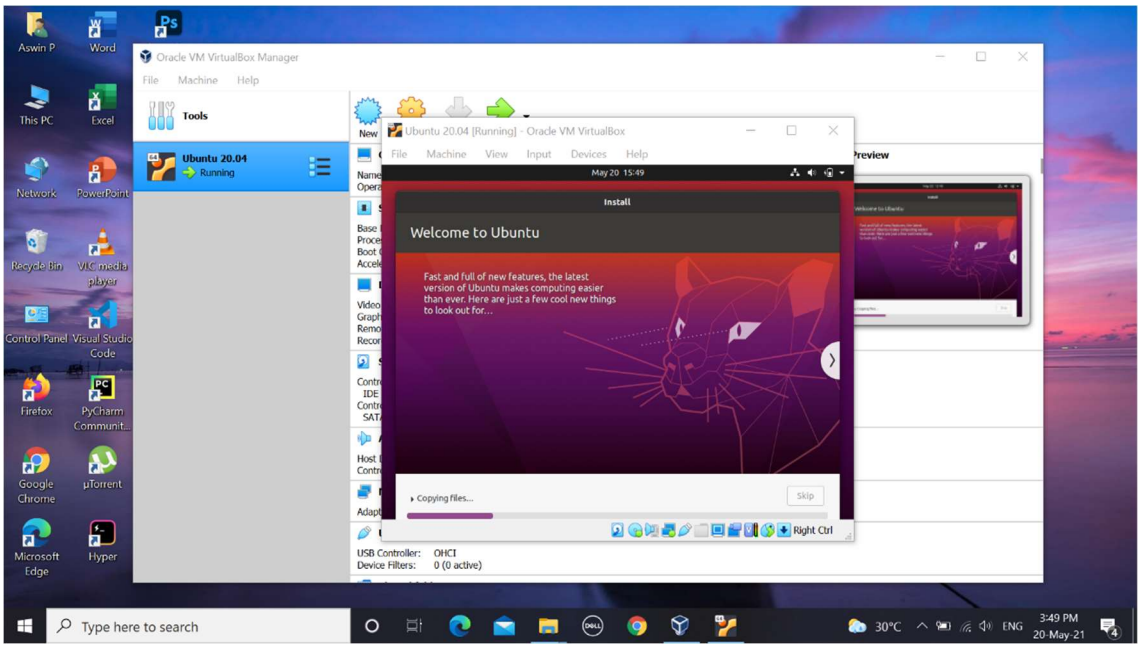
20) Select location and click continue.



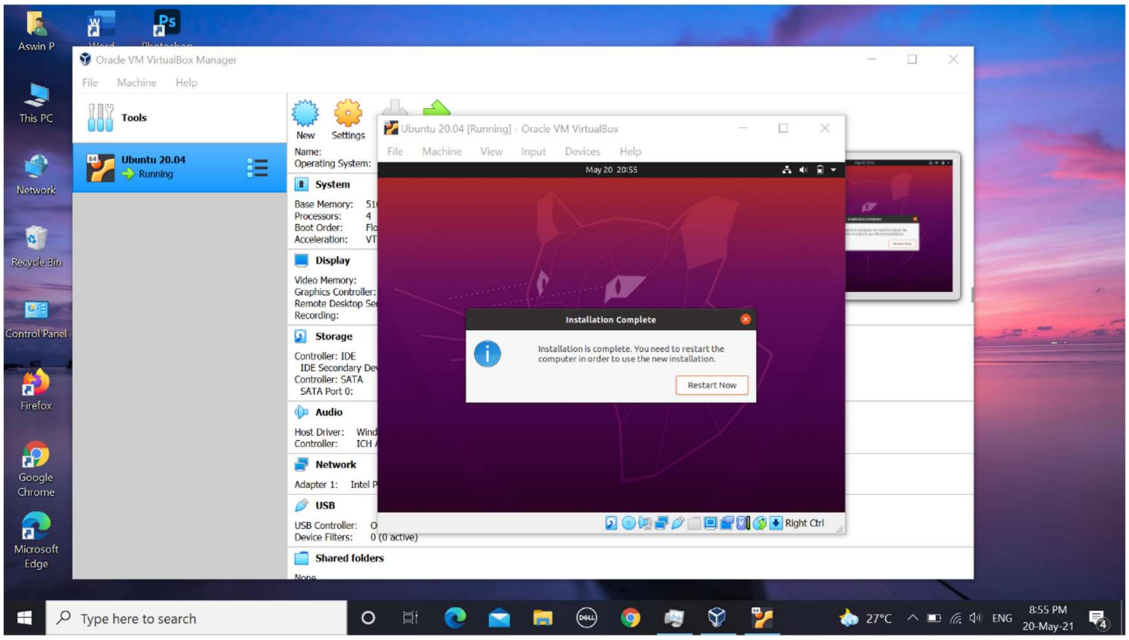
21) Fill all the details and Click “Continue”.



22) Now the installation process will start and installation window will appear.



23) Click “Restart Now”.



24) Ubuntu is successfully installed.