UNIT 5

HARDWARE TROUBLESHOOTING AND PREVENTIVE MAINTENANCE

Learning Outcomes

At the end of this unit, students will be able to:

❖ Explain maintenance procedures and troubleshooting

❖ State hardware problems

❖ Describe hardware preventive maintenance

❖ Perform basic hardware troubleshooting & preventive maintenance

❖ Recognize the value of hardware troubleshooting to keep computer safety

5.1. Hardware Troubleshooting

- ***Hardware troubleshooting*** is a systematic approach to locating the cause of a fault in a computer system and solving technical problems.

- It starts with general issues and then gets more specific.

5.1.1 Hardware Troubleshooting Procedures

- ***Hardware troubleshooting*** is the process of reviewing, diagnosing, and identifying operational or technical problems within a hardware device or equipment.

- **Software troubleshooting** is the process of scanning, identifying, diagnosing, and resolving problems, errors, and bugs in software.

➢ **Many computer problems can be solved by checking the following simple hardware problems:**

- Check that your computer is plugged into a working power outlet.

- Check that everything is turned on.

- If the computer is on but the screen is blank, there may be an issue with the *connection between the computer and the screen.*

- First, check to see if the monitor is plugged into a power outlet and if the *connection between the monitor and computer system unit* is connected securely.

- Check that the keyboard, mouse, monitor, speakers, etc. are *properly plugged into the computer system.*

- Try a different port to check if it is a port issue, or change the device if the device is damaged.

Notes

- **It is necessary to switch off the computer before undertaking any hardware maintenance such as removing or replacing computer parts.**

- ❖ **POST** stands for **Power On Self-Test.**

- ❖ **This is part of a computer's startup program** that is used to diagnose the keyboard, the Random Access Memory (RAM), disk drives, and other hardware *to make sure they are working properly.*

- ❖ **If the POST detects any errors in the hardware, it either displays a text** *error message on the screen or emits a series of short and long beeps*.

5.1.3 Beep Codes

➢ **Beep codes** are sounds emitted by the computer during **Power on Self-Test (POST)**.

● **Each BIOS manufacturer** has a **unique beep sequence,** a combination of long and short beeps, for hardware failures.

● **Most computers emit *one beep* to indicate that the system is booting properly.**

● **If there is a problem with the computer,** listen for the beep codes when the computer starts.

● **If there is an error,** you might hear **multiple beeps.**

Some of the beep codes and the respective problems are as follows:

❖ **No beep but the system turns on and runs fine**

● Under normal circumstances, most computer systems will *beep one short beep when turned on.*

● If your computer *doesn't produce a beep sound, your "beeper" may have died out.*

❖ **No beep**

● The power supply is not plugged in or turned on.

● *If not, the power supply is completely dead.*

❖ **Steady, short beeps** – The power supply may be bad or the voltages might be wrong. *A replacement would usually be necessary.*

Cont…

- ❖ **Steady, long beeps** – The power supply has gone bad.
- ❖ **Long, continuous beep** – Your Random Access Memory (RAM) sticks may have gone bad.
- ● If there is *more than one stick installed*, try taking one out to see if the computer boots.
- ● If it does not, try the same thing with the other stick.
- ● This will tell you which stick has gone bad, and you can replace or upgrade accordingly.
- ● If there is only one stick installed, you will need to *replace or upgrade* it to fix the problem

❖ **One long, two short beeps:**

● **There has been a video card failure.**

● **Your first action is to try reseating the video card.**

● **If reseating doesn't work, replace the video card.**

❖ **One long, two short beeps:**

● **BIOS** stands for basic input/output system

● **BIOS** is a program used by a computer to start the computer system after it is powered on.

● It also manages **data flow** between the computer's operating system (OS) and attached devices, such *as the hard disk, video adapter, keyboard, mouse, and printer*

Cont...

- **If the computer boots and stops after the POST**, your computer has a BIOS setting problem.

- Fixing BIOS problems requires a good knowledge of computer hardware.

- Therefore, when you face a BIOS setting problem, you should computer hardware technician to solve the problem.

5.1.5 CMOS Error

- **The CMOS (Complementary Metal-Oxide Semiconductor)** is an onboard chip that stores information ranging from the time and date to system hardware settings.

- Its primary function is to handle and **store the BIOS configuration settings**

- If a computer shows a CMOS alert message on the screen, it indicates that the CMOS battery **needs to be replaced**

❖ **Event Viewer** is a tool that logs system and application errors.

● This can help troubleshoot and identify hardware or software issues by providing detailed error reports

❖ ***The event viewer records the following info about the problem.***

- **The problem that occurred**
- **The date and time of the problem**
- **The severity of the problem**
- **The source of the problem**
- **The event ID number**
- **Which user was logged in when the problem occurred**

5.1.6 Event Viewer

❖ *The following steps can be followed to launch the Event Viewer:*

1. *On the Windows Search box, write event viewer*

2. *A pop-up menu appears which looks like the one shown in Figure 5.1*

3. *Click on Event Viewer*
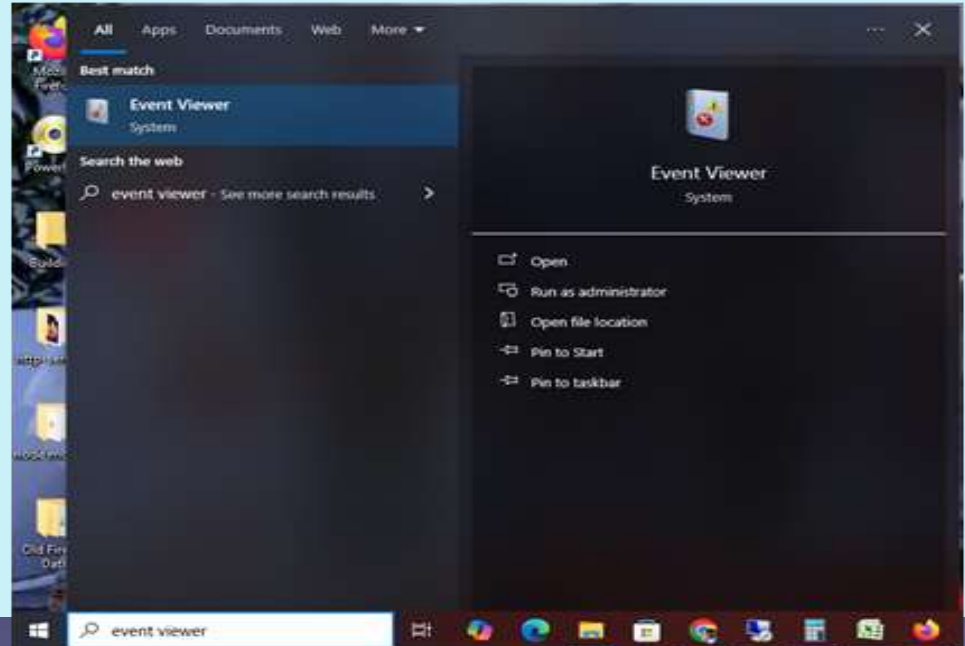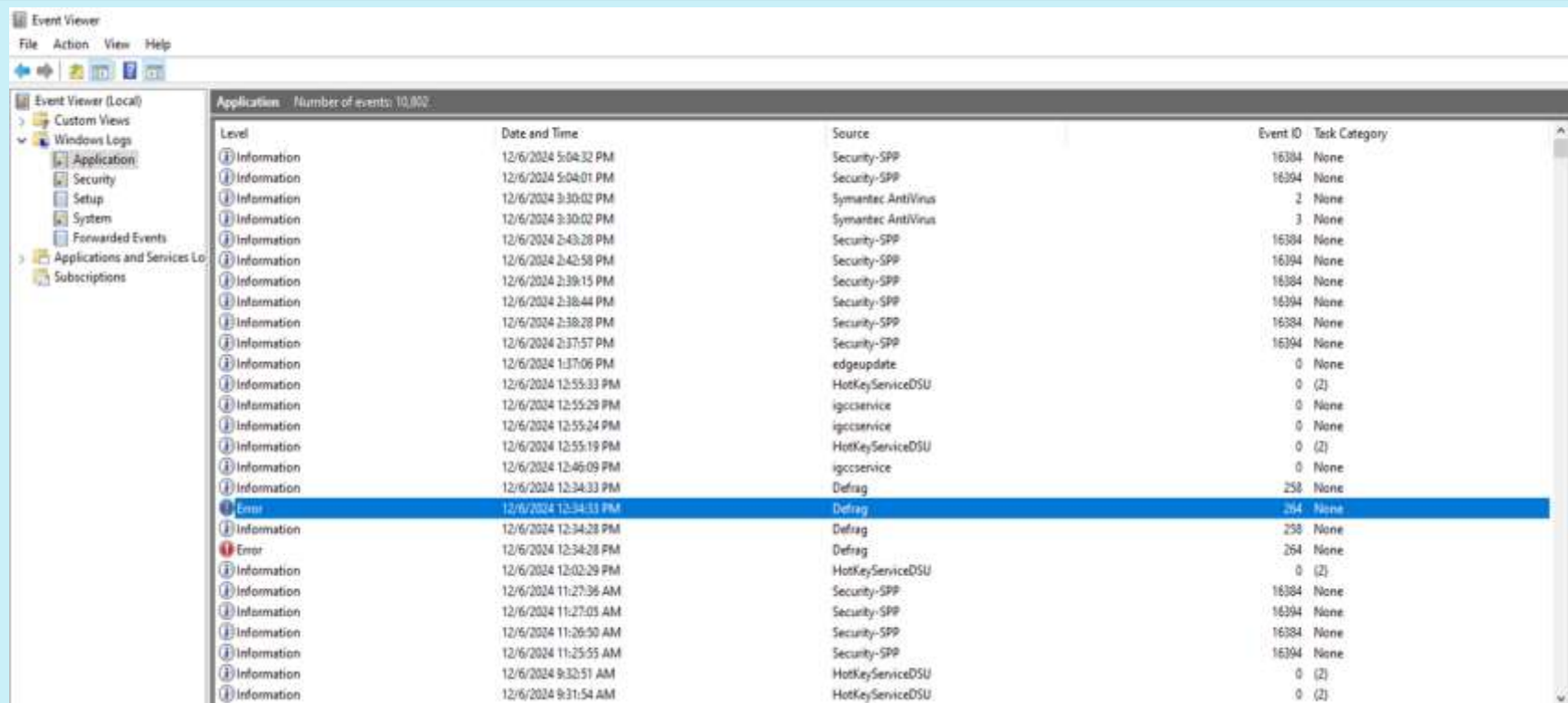
Figure. 5.1 Launching Event Viewer

Cont...

- **Events are placed in different categories as shown on the left side of Figure 5.2.**
- **Each category is related to a log that Windows keeps on events regarding that particular category**

Cont...

Figure. 5.2 Event Viewer

❖ **Windows Log category,** which contains the following items

- **Application-**records events related to Windows system components, such as drivers and built-in interface elements

- **System-**records events related to programs installed on the system

- **Security-**records events related to security, such as logon attempts and resource access

- **Device Manager** is used to check the status of different hardware devices

- **Steps to open device manager:**

1. **Click on the Windows search box** in the lower-left corner.

2. **Type Control Panel.**

3. Double-click the Control Panel on the Windows pop-up menu.

4. Click **Hardware and Sound**.

5. Under Device and Printers, Click on Device Manager (see Figure 5.3)
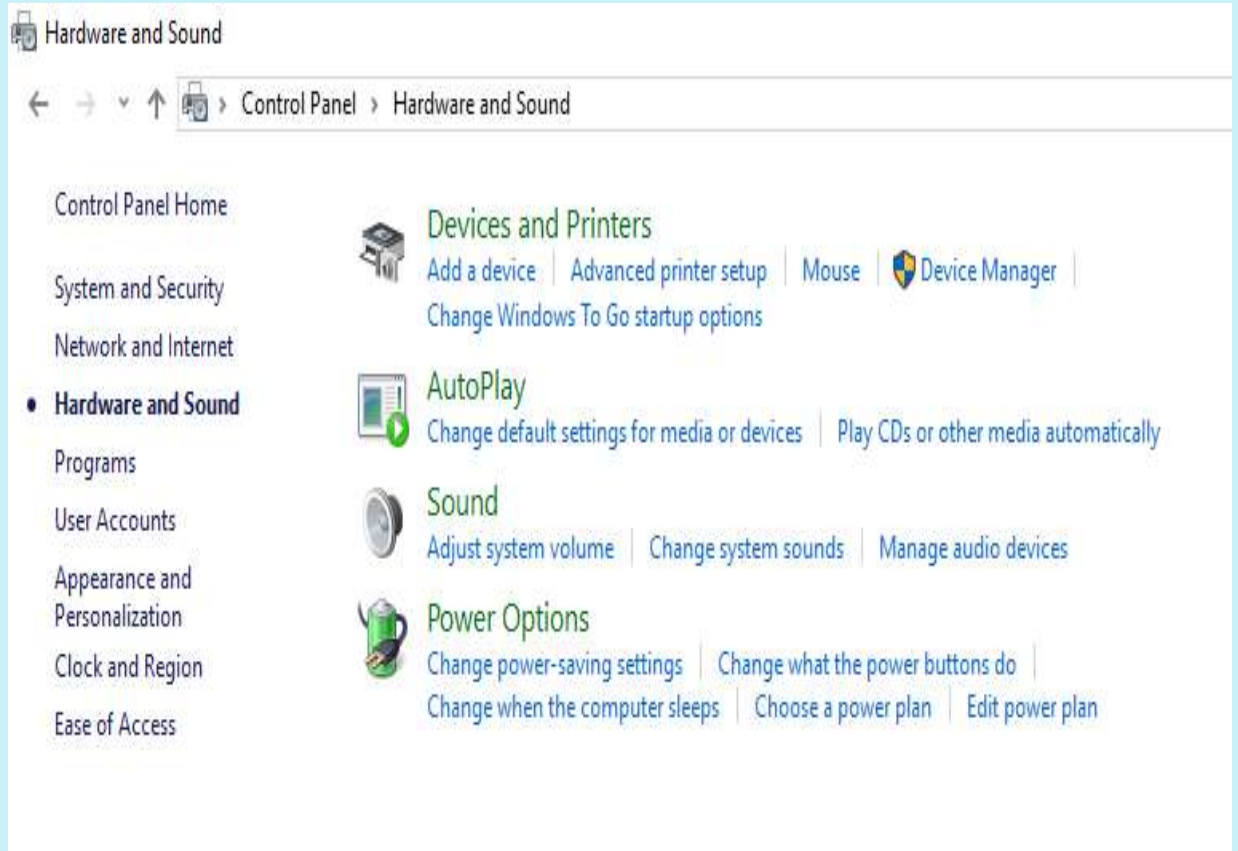
Figure 5.3 Windows Control Panel

The Device Manager has the following four benefits.

1. It works as a centralized utility from which all the hardware on a system can be configured.
2. It provides a central and organized view of all hardware-Microsoft Windows-recognized hardware- installed on a system.
3. It helps to manage all the hardware devices installed on a system. This includes keyboards, hard disk drives, USB devices, etc.
4. It helps to change hardware configuration options, manage drivers, enable or disable hardware, identify conflicts between hardware devices, etc.

Indicators in Device Manager:

- **A yellow triangle: Indicates a device problem, such as driver issues or conflicts.**

- **A red X: Means the device is disabled or not connected.**

- A **downward-pointing arrow** means the device has been disabled.

Cont...

- A **yellow question mark**: indicates that the system does not know which driver to install for the hardware. This problem will be solved by **installing the appropriate driver** software for the device

Figure 5.4 Yellow question mark on device manager

Disk drives
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Imaging devices
Keyboards
Mice and other pointing devices
Modems
Network adapters
Other devices
Audio Device on High Definition Audio Bus
Mass Storage Controller
Unknown device
Unknown device
Unknown device
Video Controller (VGA Compatible)
Processors

5.1.8 Diagnostic Tools

- **Diagnostic Tools** are software tools that are used to help troubleshoot, diagnose and solve hardware problems.

- The top two diagnostic tools are :

   a. Windows Performance Monitor and

   b. windows resource monitor

a) Windows Performance Monitor:

❖ **This tool helps track the overall performance of your computer.**

❖ **It can monitor CPU usage, memory utilization, disk activity, and network performance.**

❖ **(See Figure 5.5).**

Steps to view the Performance Monitor:

1. Press **CTRL + ALT + Delete** button at the same time.

2. Choose **Task Manager**, and the window shows that appears in Figure 5.5.

3. Then click on the **Performance tab** to see the performance of the CPU and other devices in the computer
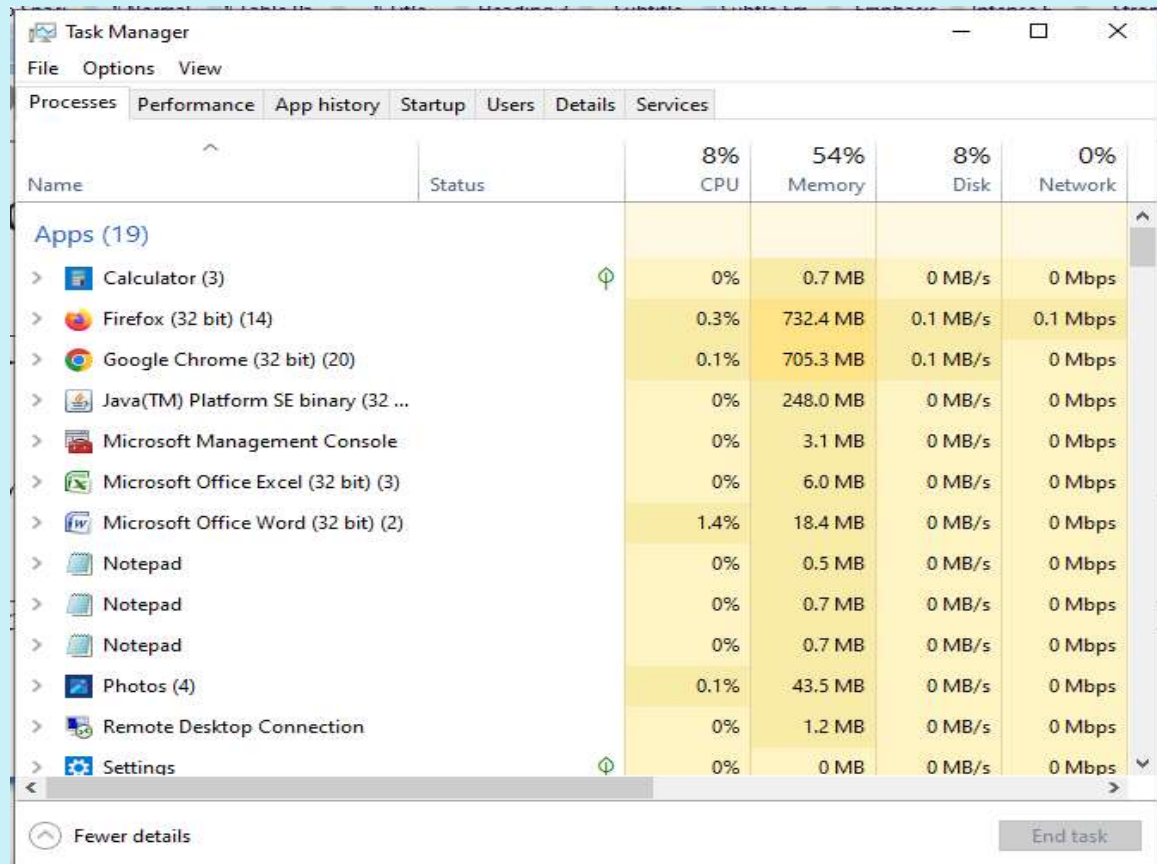
Cont...

Figure 5.5 Task Manager

Notes

Way of reducing the load from the CPU:

- *Restart the computer to remove any unwanted temporary files*
- *If any application shows CPU usage of almost 100%, disable the application and then start it again*

b)   Windows Resource Monitor

❖ This tool allows to take an in-depth look into which processes are affecting the CPU, how much memory is being used, the disk activities,

❖ And the network information such as current TCP (Transport Control Protocol) connections, and which processes are listening on which port

Steps to open the Windows Resource Monitor

1. On the Windows search box, *write Resource Monitor*

2. Click on the Resource Monitor, and then the window shows what appears in
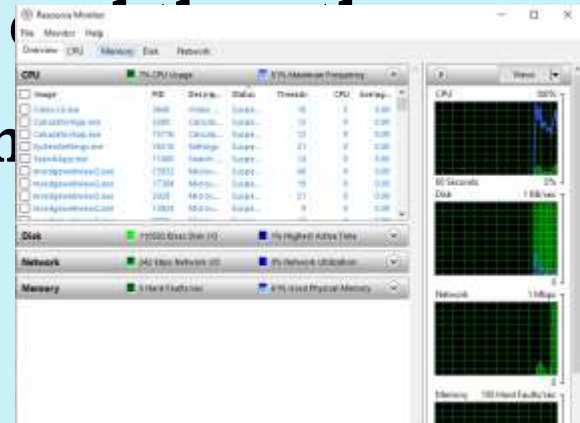
- Clicking on **the CPU tab** in the Windows Resource Monitor lists the four sections namely, **Processes, Services, Associated Handles, and Associated Modules.**
- The processes that are running are shown in **black color** under the Processes section,
- The suspended Processes are shown in **blue color**
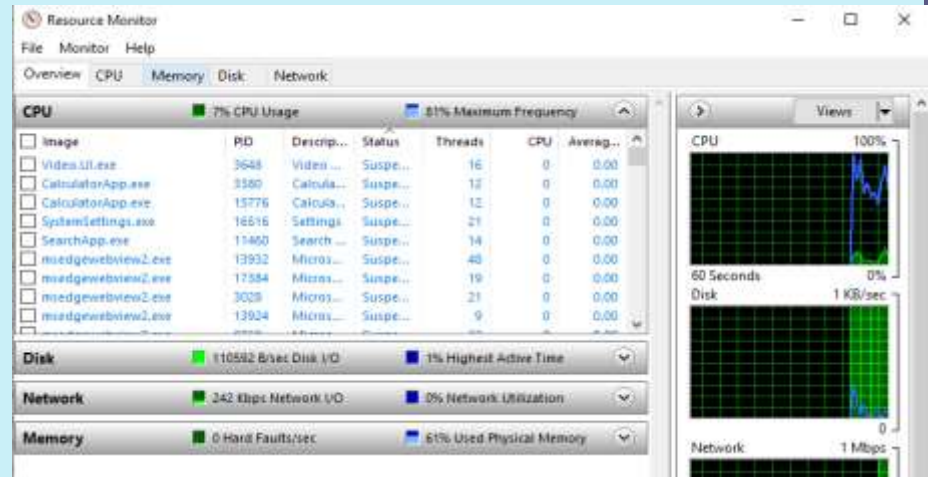- The processes that are not responding are shown in **red color.**

Figure 5.6 Windows Resource Monitor

❖ **If you find your computer slowing down unexpectedly:**

1. **Open resource monitor window**

2. **Click the CPU column**

3. **Right-click on the application** that taking up a lot of CPU resources

4. **Click on End process**

❖ **Preventive maintenance** consists of routine actions to minimize hardware failures and maintain optimal system performance.

❖ Regular maintenance ensures the longevity and efficient functioning of hardware components.

❖ **Activities Include:**

● **Regular diagnostics** to catch issues early.

● **Cleaning the system to prevent dust** accumulation and overheating.

Cleaning Methods:

- **Cloth**: Use microfiber cloths to wipe down the exterior of devices.
- **Chemical Cleaners:** Use safe screen cleaners for displays and monitors.
- **Vacuuming:** Regularly vacuum dust from cooling fans and inside the system to prevent overheating.

- **A computer virus** is a type of computer program that(when executed) replicates itself by modifying other computer programs and inserting its own code.

- **Antivirus,** which is also known as anti-malware, is a computer program used to prevent, detect and remove malware.
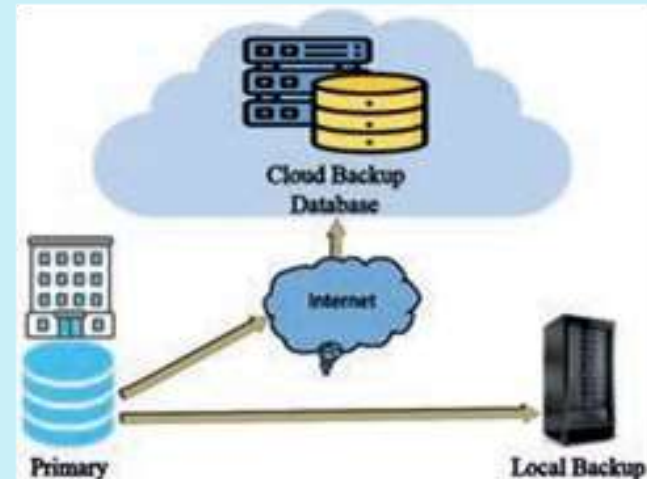
Cont...

❖ **To download and install antivirus:**

● Search the antivirus software, for example, on Google

● Then click on the search result on the name of the Antivirus software you want to download

● You can directly install from the Internet or save the antivirus software on your hard disk

● If it is saved on the hard disk, install the antivirus software

❑ **Scanning** computer systems regularly with antivirus software help prevent the computer system from virus infection.

❑ **Backup** is a process of transferring data or files from a computer system to **external storage devices** or on a **cloud storage** server

❑ The backup file is used to recover data loss during computer failure

Figure 5.7 Data backup

❖ *Steps to take back up*

1. Open the **Control Panel**

2. Choose **Backup and Restore**

3. Choose **Set up back-up**

4. The window will be displayed as shown in Figure 5.10.

5. Click on **Create a system image**,

6. Select the **storage drive** either a hard disk, DVD disk, or a Network drive where you intend to store your backup.

7. Then **click on the next button**, and

8. Finally click on the **start backup** button

Figure 5.8 Disk Backup Window

Note:

Backup is the first step before any troubleshooting on a computer system is done.

- When old files are deleted from the hard disk and new files are saved, the files become fragmented.

- *Fragmentation is the scattering of portions of files in the disk in nonadjacent areas, thus greatly slowing access to the files*

- When a hard disk is new, the operating system puts files on the disk contiguously (next to one another)

- When a file is updated over time, new data for that file is distributed to unused spaces.

- It, therefore, takes the operating system longer to read these fragmented files

- *A defragmenter utility program, commonly called a "defragger," finds all the scattered files on the hard disk and* reorganizes *them* into the smallest number of adjoining regions

- In other words, defragmentation is a process that reduces the degree of fragmentation.

- This increases the computer's speed
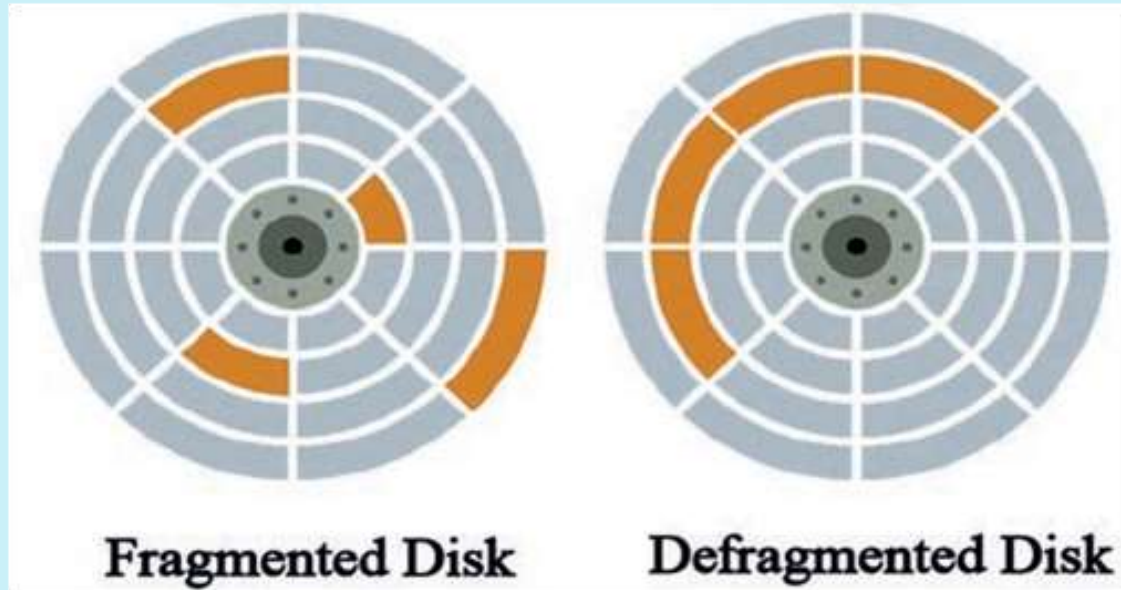
Figure 5.9 Disk Defragmentation

➢ **Steps to undertake disk defragmentation:**

1. Type **Windows Administrative Tools** on the Windows search box and click on Windows Administrative Tools.

2. Double-click on **Defragment and Optimize Drives.**

3. Then the window shown in Figure 5.12 will be displayed.

4. Select **the drive,** and then click on the **Optimize button.**

As shown in this Figure , if the drive's current status says (0% fragmented), there is no need to do defragmentation
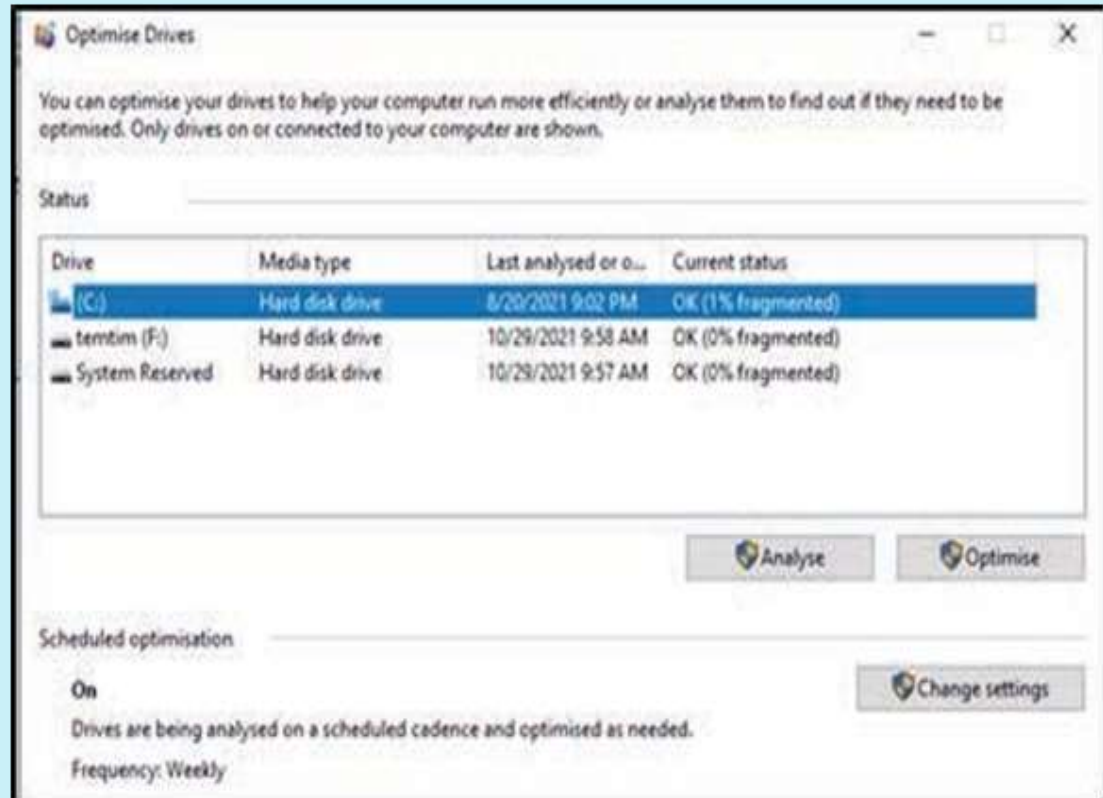
Figure 5.10 Disk Optimization Window

5.2.5 Power Protection Devices

➢ **The following tools are used as a means to prevent potential damages that can be caused by electric powers**

1. *Surge Protectors: Protect devices from voltage spikes that can damage electronic components.*

2. *Voltage Regulators: Help maintain consistent voltage levels, preventing fluctuations that could damage hardware.*

3. *UPS (Uninterruptible Power Supply): Provides backup power during outages, allowing users to save their work and properly shut down the system.*

Cont...

Power surge protectors

Power voltage regulator

UPS power surge

- **Properly shutting down the computer ensures that the system saves all data and minimizes the risk of hardware damage.**

- **It helps in maintaining the longevity of hardware by allowing safe system shutdown.**

Summary

- *To ensure optimal computer performance and longevity, regular preventive maintenance, proper diagnostic tools, and effective troubleshooting techniques are essential.*

- *Protect hardware with surge protectors, clean components regularly, and monitor resource usage.*

- *Use antivirus software, update systems, and backup data to guard against threats and data loss.*

- *Address power issues with a UPS and manage disk performance with defragmentation.*

- *Awareness of error messages, event logs, and hardware alerts is crucial for timely issue resolution.*