"Module 5: Assignment 2 - Computer Peripherals and Storage Devices"

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Tasks:

1. The two common computer peripherals: displays (monitors) and printers, with their comparison are as follows:

   Monitors:

   - Features:
     - Monitors are devices that visually present information to users.
     - Key features include screen size, resolution, panel type (e.g., LCD, OLED), refresh rate, and color depth.
     - Many modern monitors come with additional features like touchscreens, built-in speakers, and adjustable stands.
   - Advantages:
     - High-quality monitors deliver clear and detailed visual output, making them well-suited for various tasks.
     - Different panel types cater to specific needs, such as OLED for vibrant colors and IPS for wide viewing angles.
     - Large screens enhance productivity for activities like video editing, design, and multitasking
     - Touchscreen monitors provide interactivity and are utilized in kiosks, educational settings, and some laptops.
   - Limitations:
     - Expensive displays can have a financial impact on some users' budgets.
     - The power consumption of displays varies, with larger screens potentially using more energy.
     - Physical size limits the practicality of displays for portable devices.
     - Lower-quality panels may have restricted viewing angles and color accuracy.
   - Significance:

- ○ In an office setting, high-resolution displays contribute to productivity and comfort.

- ○ For gaming and multimedia, having high refresh rates and low response times is crucial.

- ○ Touchscreen displays are essential in kiosks, educational institutions, and healthcare.

Printers:

- ● Features:

  - ○ A printer is a machine that makes copies of printed documents.

  - ○ Examples include dot matrix printers, inkjet printers, laser printers, and thermal printers.

  - ○ Features include print speed, quality, networking options, and paper use.

- ● Advantages:

  - ○ The digital information that is typically required for paper is copied by the printer.

  - ○ Beautiful color printing produces images and graphics of the highest caliber.

  - ○ For their quickness and effectiveness, laser printers are well-known.

  - ○ Many printers provide wireless and mobile printing for increased convenience.

- ● Limitations:

  - ○ Cartridges for ink or toner can accumulate over time.

  - ○ Printers may be loud and occupy a lot of space. Printing in color will take longer than printing in monochrome.

  - ○ Maintenance tasks include unclogging paper jams and replacing equipment.

- ● Significance:

  - ○ To make copies of documents, information, and presentations, offices must have printers.

  - ○ Portfolios and proofs are created using high-resolution color printers in graphic design and photography.

  - ○ To print receipts and attachments, businesses employ dot matrix printers.

  - ○ Retailers utilize receipt printers to keep track of transactions.

  - ○ Users print assignments, photos, and other materials from home.

2. Storage device like Solid State Drive could be explained in detail as follows:

- **Characteristics:**
  - ○ SSDs are non-volatile storage devices, which means they keep data even when the power is switched off. As a result, they are suited for long-term data storage.
  - ○ SSDs, as opposed to traditional hard drives (HDDs), contain no moving components. Data is stored on NAND flash memory chips, which allow for faster access and greater power.
  - ○ When compared to HDD, SSD delivers quicker data access and transfer speed. This speeds up startup, app loading, and general performance.

- **Working Principle:**
  - ○ SSDs use NAND flash memory chips to store data.
  - ○ The cells that make up these plates are electrical charge-catching devices that employ electrical charges to represent binary data (0s and 1s).
  - ○ NAND cells are layered several times into the pages and blocks of SSDs. Data is read from the cell, written to it electronically, and then deleted.
  - ○ The life of your SSD is extended by wear leveling algorithms that help distribute write and remove cycles.

- **Applications:**
  - ○ One example of a computer application SSDs are often used in laptops, desktop computers, and ultrabooks to increase system responsiveness and performance. Particularly advantageous are they for gaming, multimedia, and general computing.
  - ○ SSDs in data centers increase server and storage array efficiency, speed up data processing, and lower latency. They are necessary for cloud computing, virtualization, and databases.
  - ○ Industrial and military applications SSDs are used in ruggedized and military-grade devices because of their durability in harsh environments. High heat, stress, and vibration are all things they can withstand.

- **Pros:**
  - SSDs offer blazingly fast data access and transfer speeds, cutting down on programme loading times and boosting system performance.
  - SSDs are more dependable since they have no moving parts and are resistant to physical shocks.
  - SSDs use less power, extending the life of laptop batteries and reducing the cost of data center electricity.
  - SSDs are available in a number of shapes and sizes, making them appropriate for a variety of hardware and software.

- **Cons:**
  - SSDs sometimes cost more per gigabyte than regular HDDs. This may be a limitation when large storage capacities are needed.
  - NAND flash memory cells have a certain number of write and erase cycles, which may affect SSD longevity. Nevertheless, modern SSDs have made significant improvements in this area.
  - HDDs are the preferred option for bulk data storage since they continue to offer greater storage possibilities while SSD capacities have increased with time.

3. The speed of data access is crucial to the storage hierarchy concept. The hierarchy's top level is occupied by the CPU register, which provides information on speed. "The cache is the subsequent level, if existent, where fresh instructions and data are stored."Always remember that technologies such as flash memory, hard discs, optical drives, and cartridges arrive later" (Wiley, 2020, p. 324).

Tapes, disc drives, and flash memory are all essential forms of secondary storage. Hierarchy. They may be used for offline storage and data backup because they are simply removed from the computer. Service tools have the advantage of permanence since the data they save are static and may be kept for a long period. They can store massive data and are less costly than pricey RAMs. However, retrieving

data via secondary storage takes longer than storage owing to limitations (such storage time and physical transmission). On the other hand, storage is necessary for both offline backup storage and data transmission between computers.

4. **Working Principles:** Solid state memory, sometimes referred to as flash memory, is non-volatile memory. It is ideally suited for supplemental storage and employs a different technology from standard RAM. Flash memory reads and writes data in blocks and stores data on chips or chips. On the other hand, magnetic discs feature a flat surface coated in magnetic material. "On these discs, information is stored in the form of magnetic polarization, which can be used to distinguish 1s from 0s." A read/write head and a drive motor are used by magnetic discs to access and save data" (Wiley, 2020, p. 324).

Performance: Performance-wise, flash memory outperforms disc memory. Accessing data stored in flash memory RAM might be 100 times faster than accessing data saved on disc. Even if both devices' read/write speeds are comparable, many computer applications depend on the ability to quickly access stored data. "Flash memory also offers the benefit of avoiding issues brought on by physical stress and vibration as it has no moving parts. On the other hand, flash memory's erasing time is longer than its reading and writing times" (Wiley, 2020, p. 325).

Applications: Flash memory is extensively used in tablet computers, cellphones, memory cards, flash drives, and other mobile devices since it is widely used for storing and storage. Flash memory is the material of choice for these applications because of its small size, low power need, light weight, and short access time. Additionally, it is used to create backup CDs and transmit data between computers and mobile devices. "Big computer systems commonly use discs to store software and data. They are suitable for applications that need modest storage capacity and provide high storage capacity at an affordable price. However, improvements in flash memory's price and capacity suggest that disc storage may someday be replaced in many applications" (Wiley, 2020, p. 345).

5. RAID is a technology that integrates several disc drives into a single logical unit to improve performance, fault tolerance, and data availability.

- **RAID 0:**
  - Also referred to as striping, it is deficient in redundancy and error checking.
  - Data is striped over all discs for rapid access.
  - On the other hand, if any one disc block in the array fails, the entire data set is corrupted.
  - Rapid data transfer speeds made possible by it are tempting, but excellent backup is needed to ensure data security.

- **RAID 1:**
  - Mirroring, or RAID 1, improves data availability and redundancy.
  - Data recovery is achievable even if one disc dies since each disc has the exact same data.
  - Access times for multiblock reads are sped up by the array's larger number of discs.
  - "It offers excellent reliability but requires more disc space for redundant data storage" (Wiley, 2020, p. 332).

- **RAID 5:**
  - It uses striping with distributed parity to boost performance and fault tolerance.
  - There are various discs in the array that hold data and parity information.
  - The parity information on the remaining discs can be used to retrieve the data if a disc fails.
  - It offers a great balance of fault tolerance, storage economy, and data availability.

- **RAID 6:**
  - With the exception of using double parity to increase fault tolerance, it is similar to RAID 5.
  - Without losing data, it can withstand the simultaneous failure of two discs.
  - It offers more data availability and fault tolerance than RAID 5, but it takes up more disc space to hold the extra parity data.

6. Optical storage devices like **CD-ROM**s are used to store and transmit data and software. Data is stored in a spiral pattern that extends from the center of the disc out to the edge. The disc is read using a laser beam that is focused from the disc surface. "Pits and dirt on the disc are made into objects to provide data input. Continuous volume (CLV) technology may be used to read CD-ROMs, which have a storage capacity of around 550 MB" (Wiley, 2020, p. 625).

The optical media known as **DVD** is equivalent to CD-ROM. Data on discs is compressed using short lasers. The format of DVD discs is the same as that of CD-ROMs. Contrarily, a single DVD may carry many layers of data on the same side, increasing storage capacity. Each DVD set has a data capacity of roughly 4.7GB; if both sides of the disc are used, the capacity may increase to nearly 17 GB. Up to 50 GB of capacity may be added using a blue laser.

Blu-Ray is "a newer optical storage format that offers even higher storage capacities than DVDs. It uses a blue-violet laser, which allows for even tighter packing of data on the disk. Each layer on a Blu-Ray disk can hold approximately 25 GB of data, and if both sides of the disk are used, the capacity can be increased to approximately 50 GB" (Wiley, 2020, p. 565). The use of multiple layers and a blue-violet laser allows for even higher capacities, with some Blu-Ray disks capable of holding up to 100 GB of data.

7. **Advantages:**
   - Since the tape is non-volatile, data is kept even when the power is turned off. This location allows for continuous data storage, making it perfect for long-term backup and preservation.
   - In the past, data storage was more expensive and had a higher storage capacity. Tape storage is still a viable solution for large storage applications, despite the fact that this advantage is waning as corporations use cloud storage services and new technology.
   - It is appropriate for entry-level employment since it is intermediate level. It is therefore suitable for continuous operation and the storage of massive amounts of data, including entire data.

Disadvantage:

- Storage on tape is, in general, very easy. If you frequently or infrequently need to access data, tape storage might not be the best choice.

- When compared to alternative storage options, tape storage is slow, especially when accessing data. Searching through cleaning tape websites for the products you need could take a while.

- As organizations use cloud storage services and new technologies, tape storage is losing favor. The primary trend is towards another storage option, even though it is still useful for some applications.

8. LCD technology uses "a liquid crystal matrix to display images. Light emitted by LED or fluorescent lighting is polarized using filters. Polarized light passes through the liquid crystal cell and modifies the polarization response in accordance with the data received. For color images, a three-unit-per-pixel filter is used" (Wiley, 2020, p. 226). Because they offer rich graphics, low power consumption, and a slim profile, LCD screens are excellent for laptops and desktop computers. Additionally, they are utilized in computer projectors having sizable displays.

   OLED technology uses thin screens with red, green, and blue LEDs for each pixel. Each LED's transistor produces a current that illuminates the LED directly. "OLED displays outperform LCD displays in terms of brightness, color brilliance, and contrast. They are thinner and consume less energy since they do not need a backlight" (Wiley, 2020, p. 545). Currently, OLED technology is used in tablets and smartphones. Although OLED monitors and TVs have been produced, they are not yet commonly used.

   Comparison:

   - Image quality: OLED screens provide brighter images, more vivid colors, and better contrast when compared to LCD panels. OLED displays' direct LED lighting improves the quality of the images.

- OLED technology uses less energy than LCD technology, which is good for the environment. OLED displays don't require a backlight because of its straightforward design, which allows for thinner screens and less power use.

- Although LCD technology is more expensive than OLED technology, it is more reliable and offers superior performance. However, the price gap will close as OLED technology develops.

- Laptops, desktop monitors, and widescreen computer projectors all frequently include LCD screens. OLED technology is used in tablets and smartphones, and OLED gadgets and televisions will soon be accessible.

9. Laser printers use "lasers or light-emitting diodes to produce computer images. The laser strikes the dots that need to be printed, and the rotating mirror then distributes the dots throughout the drum. To print a continuous line and apply a charge everywhere it travels, the drum rotates" (Wiley, 2020, p. 427). When paper is fed into the drum, toner adheres to the charge and is absorbed. The fuser melts the toner on the paper to produce the printed page.

By transferring the print over the paper, inkjet printers produce rows of dots. Micro Nozzles and ink cartridges are combined in ink cartridge printers to produce many lines at once. Each nozzle, which is hardly wider than a human hair, creates a space behind it where the ink is warmed, allowing it to spray tiny drops of ink onto the paper. High-quality inkjet printers are capable of printing in color.

Laser printers are frequently used in a variety of applications due to their excellent quality and speed. They provide precise and clear words and images. On the other hand, "inkjet printers are well renowned for their small size, inexpensive price, and capacity to produce beautiful images. They are frequently used to print high-quality pictures at home or in small businesses. Inkjet printers are more expensive for small prints, whereas laser printers are more effective for large prints" (Wiley, 2020, p. 623).

10. People can engage directly with a computer or mobile phone using a touch screen device. They interpret touches from a fingertip or stylus into orders or actions. "Touch screens are frequently seen in kiosks, interactive systems, cellphones, tablets, and other mobile devices. They facilitate menu access, option selection, text entry on touch screens, which enhances usability" (Wiley, 2020, p. 423).

A barcode reader is a tool that can read barcodes, which are visual representations of alphanumeric data, and decode them. They work by utilizing a light source and a light source to capture the pattern of bars and spaces in the barcode. "The stored alphanumeric data is identified when the recorded data is converted into an electrical signal. Inventory control, retail sales, and information retrieval are just a few of the many uses for barcode scanners" (Wiley, 2020, p. 425).

A magnetic stripe reader is a tool that can read data from a magnet, which is frequently seen on credit cards, ID cards, and other cards that are similar to them. "They work by utilizing a magnetic head to detect changes in the magnetic field brought on by the magnetic properties of the strip. The visual signal is then converted into digital data, which may then be used for a number of purposes, such as management, analysis, and payment" (Wiley, 2020, p. 424).

Users can enter data into a computer or mobile device by speaking into it using the voice input technique. It operates by employing speech recognition algorithms to transform spoken words into digital data. The processed input data is then converted to text, commands, and voice commands. Virtual assistants like Siri regularly use speech input in speech software, audio equipment, and other applications.

References

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