Chapter 5

Computing and Communications Resources
Learning Objectives

► Know the various computer components.
► Know about personal computing devices.
► Understand the implications of the rapid advances in information and communication technologies.
► Be familiar with input and output resources.
► Recognize how different storage media differ and the advantages of each.
Learning Objectives (Cont’d)

► Know the advantages of prewritten software.
► Understand the different computer networking strategies.
► Understand how communications over the public telephone system and networks differ.
► Know about network protocols.
► Distinguish between intranets, extranets, and the Internet.
Hardware & Processors

- **Mainframes** adlh komputer besar untuk sistem informasi terpusat.
- **Microcomputers or PCs** are computers used by one person.
- **Processor (CPU)** bertugas melakukan pemrosesan data
- **Kecepatan prosesor** diukur dg brp jumlah penghitungan yang terjadi dalam satu per detik

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Processors

► **MHz** stands for *millions of cycles per second*.

► **Word** is the measure of how many bits can be moved with one cycle of the processor.

► **Word size** is how many characters, “A”, can be moved in a single cycle of the processor.

► **Power** is affected by both word size & processor speed.
## Table 5.1 Major Computer Components

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Processor (central processing unit or CPU)</td>
<td>Controls calculations, controls logical comparisons of data, directs and controls movement of data from one location within the computer to another.</td>
</tr>
<tr>
<td>Memory (random access memory or primary storage)</td>
<td>Memory located on the computer’s main circuit board called the motherboard. Data in memory is lost when the power to the computer is turned off.</td>
</tr>
<tr>
<td>Storage (disk space or secondary storage)</td>
<td>Memory located on a device that is not on the main circuit board. Many types of storage are removable and can be taken from one computer to another. Data in storage is not lost when the power to the computer is turned off. Common storage devices are floppy disks and CDs.</td>
</tr>
<tr>
<td>Input devices</td>
<td>A device that captures data by a manual or electronic method and transmits the data to storage or memory. Common input devices are keyboards, mice, and scanners.</td>
</tr>
<tr>
<td>Output device</td>
<td>A device that presents and/or transmits data from the computer to the user. Common output devices are computer monitors, printers, CDs, and speakers.</td>
</tr>
<tr>
<td>Input/Output devices</td>
<td>A device that can perform both input and output functions. Examples would be a touch-screen monitor and storage disks (such as floppies, Zip disks, and rewritable CDs).</td>
</tr>
</tbody>
</table>
Memory & Storage

- **Memory (primary storage or RAM)** is the storage area on the computer’s circuit board.
  - Volatile
  - Extremely fast
- **Fixed storage** is permanently installed in the computer.
- **Removable storage** media – tape, disk, CD, DVD, USB flash drive, etc.
Figure 5.2 Motherboard
Input Devices

- **Human-captured data** refers to input captured by a person typing on a keyboard, clicking a mouse, speaking into a microphone, or a similar interaction.

- **Machine-captured data** is data captured by an electronic or mechanical device.

- **Point-of-sale terminals** are scanners used in retail stores.
Output Devices

► Monitor
  ▪ Screen resolution, size 17-19” diagonals.
  ▪ Graphic user interface (GUI).

► Printers
  ▪ Lasers are like copier machines.
  ▪ Ink-jets spray ink.

► Multimedia is the use of more than 1 medium at a time.
Personal Computing Devices

- Cell phones with interactive messaging & video
- Smart cell phones are phones that perform tasks associated with PCs i.e. BlackBerry 7270, Treo 650.
- Global Systems for Mobile Communications (GSM) digital cellular phone protocol.
Home Networks

- Home computer networks assess the Internet via **cable modems** or **DSL modems**.
- Setup usually requires the modem, network card(s), wireless router.
- Wireless security uses **Wired equivalent privacy (WEP)** which encrypts the data transferred between the computer & wireless router.
Home Computing Security

► **Updates** for OS an application software.
  - For security & efficiency.
  - *Microsoft Update.*

► **Hackers** are people who try to break into computer systems in order to
  - Gather information;
  - Deny the owner access to his resources;
  - Delete files;
  - Disrupt the use by the owner.
Home Computing Security (Cont’d)

► **Viruses** are small computer programs that replicate by inserting themselves into computer resources such as programs or files.

► **Worms** are self-contained files or programs
  - Does not have to attach to program or file.
  - Can delete, change files, send e-mails, and cause problems.
Home Computing Security (Cont’d)

► **Denial-of-service attack** is when the user is denied access to the services of the computer because it is overwhelmed with e-mail.

► **Antivirus software** – Norton, MacAfee, etc. Keep virus definitions updated

► **Spyware** – Microsoft Defender, Lavasoft Ad-Aware, etc. Free from Microsoft.
Software

► **System software (OS)** performs certain tasks that all computers require.
  - Hardware interfaces, device drivers.
  - Manage computer’s processes.
  - OS – Windows XP, Unix, Mac OS X, Linux.

► **Application software** processes the user’s data.

► **Prewritten application software** is produced by suppliers and sold to users.
Application Software

► **Custom application software** is when programmers for the business write the software.

► **User-written software** in *End-User Computing* is created by the user, such as Excel Macros, Access Wizards.

► **User-friendly software** is computer software that is simple & intuitive to use.
Communications

► Protocol is the specification for formatting data to be transferred between communications equipment.

► Public connections
  - Telephone modems
  - Integrated Services Digital Network (ISDN)
  - Digital Subscriber Line (DSL)
<table>
<thead>
<tr>
<th>Connection</th>
<th>Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone Modem</td>
<td>56 Kbps</td>
<td>Device to connect computers over standard telephone lines.</td>
</tr>
<tr>
<td>Cable Modem</td>
<td>2 Mbps (warning, see description)</td>
<td>Device that connects to the coaxial cable provided by a cable TV provider to a computer for Internet access. Speeds of these modems vary greatly with 2 Mbps being a frequently published speed advertised by the cable TV providers. However, 11 Mbps is the capability of most currently available cable modems, although providers usually limit the communications speed to the customer to 2 Mbps and sometimes to 512 Kbps.</td>
</tr>
<tr>
<td>Integrated Services Digital Network (ISDN)</td>
<td>128 Kbps to 1.5 Mbps</td>
<td>A connection using standard telephone lines as separate channels communicating at 64 Kbps each. The channels are bundled together so that the &quot;basic&quot; bundle of two channels results in the 128 Kbps communications rate. The most frequent bundling is 23 lines, which results in a communications rate of 1.5 Mbps.</td>
</tr>
<tr>
<td>Digital Subscriber Line (DSL)</td>
<td>32 Mbps</td>
<td>Technology similar to ISDN but more sophisticated in taking advantage of the communications speed capabilities of the telephone line. Newer versions, xDSL, can achieve speeds up to 52 Mbps.</td>
</tr>
</tbody>
</table>

Kbps = thousands of bits per second  
Mbps = millions of bits per second
Communications (Cont’d)

► **Packet** is a piece of the total data to be communicated, includes sender & receiver addresses.

► **Cable modems** connect to the Internet via coaxial cable.

► **Asynchronous transfer mode (ATM)**
  - Improve data transmission rates.
  - Increased speed.
Private Line

► **Circuit** is a connection that is always connected.

► **Private line** is a circuit that is always open to your communication traffic.
  - **T-1** line over 1.5 Mbps; **T-3** at 43 Mbps.
  - **Multiplexed** is when the line is broken into separate lanes of communication.
Virtual Private Networks

- Virtual Private Networks (VPNs) allow you to use the security & speed of a private line but still use the low-cost Internet.

- Tunneling software establishes the set of intermediary locations of the telephone equipment that will host a given data communications transfer.

- Privacy is attained because the tunnel is not established unless the sending & receiving computers authenticate one another.
Communications - Networks

- **Open Systems Interconnection (OSI)** standard architecture for network connections established by the **ISO**.

- **Terminal** is a device that has no storage or processor; it allows for entering & displaying data for the computer.

- **Systems Network Architecture (SNA)** is a protocol for large computers; it polls other computers connected by the network for transfers.
Table 5.5 OSI Reference Model

<table>
<thead>
<tr>
<th>Layer</th>
<th>Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Application layer</td>
<td>Perform application-to-application communication</td>
</tr>
<tr>
<td>6</td>
<td>Presentation layer</td>
<td>Manage data-representation conversions</td>
</tr>
<tr>
<td>5</td>
<td>Session layer</td>
<td>Establish and maintain communication channel</td>
</tr>
<tr>
<td>4</td>
<td>Transport layer</td>
<td>Guarantee end-to-end integrity of data transmission</td>
</tr>
<tr>
<td>3</td>
<td>Network layer</td>
<td>Route data from one network address to another</td>
</tr>
<tr>
<td>2</td>
<td>Data link layer</td>
<td>Move data from one network address to another</td>
</tr>
<tr>
<td>1</td>
<td>Physical layer</td>
<td>Put data onto and off the network media</td>
</tr>
</tbody>
</table>
Networks (Cont’d)

► **Token ring** is a peer-to-peer protocol that allows each computer to act as its own controller.

► **Ethernet** is an open protocol for peer-to-peer communications.

► **IEEE** endorses

► **Data transmission crash** is when two peer computers try to send data at the same time.
Figure 5.11 Token Ring Protocol Example
Networks (Cont’d)

- **Data packet** is a piece of the total data to be communicated, combined with the address of the destination computer, the sending computer, and other control information.

- **Transmission Control Protocol/ Internet Protocol (TCP/ IP)**
  - TCP conducts communication over the network.
  - IP handles the packets so they can be routed.
Networks (Cont’d)

- **IP address** is a four-part set of numbers (each from 0 to 255), separated by periods.
- **Network interface card (NIC)** is used to attach a device to the communications medium.
- **Local Area Networks (LANs)** is a group of computers and other devices that are connected together by a communications medium.
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Hub</td>
<td>A device that receives a data packet from a computer at the end of one spoke of the star topology and copies the contents to all other devices. As vendors have tried to differentiate their products, the capabilities of hubs have increased. Some are “manageable” in that they monitor and control the flow of data among the spokes.</td>
</tr>
<tr>
<td>Router</td>
<td>A device to connect LANs together. Routers do not simply rebroadcast data; they process control information contained in communications packets in order to determine which LAN should receive the data. Because there may be many possible paths through a network to connect two computers, the router is key to determining which path will be efficient for data transfer.</td>
</tr>
<tr>
<td>Switch</td>
<td>A device that connects LANs together. Switches perform router tasks and more. Switches filter data from a network path when that path will not contain the destination computer. As a result of filtering, switches eliminate unnecessary data traffic and make communications more efficient.</td>
</tr>
</tbody>
</table>
Networks (Cont’d)

► Medium used by LANs can be copper wire, wireless, fiber-optics, or other media.

► LANs join computers that are physically located together.
  ▪ Same room or building.
  ▪ Total distance is less than \( \frac{1}{2} \) mile.
  ▪ 60 ft. between devices.
Networks (Cont’d)

► Metropolitan area network (MAN) is a network that has a physical distance limit of roughly 30 miles.

► Wide area networks (WANs) are used to connect computers and other devices when the distance exceeds the constraints of LANs & MANs.
  - Uses common carrier, public telephone system.
  - WANs have been replaced by the Internet.
Internet, Intranet & Extranet

► **Internet** is just a collection of networks that can be joined together; Public.

► **Intranet** uses the same network protocols as the Internet but limits accessibility to computer resources to a select group of persons in the organization.

► **Extranet** is when the intranet is expanded to include users beyond the firm; Trusted customers & business partners.
Convergence of Computing & Communications

► Computing devices & communications devices are now incorporating features of the other into themselves.

► Voice over Internet Protocol (VoIP) is the routing of voice communications over the Internet as if they were digital communications.

- **WWW.SKYPE.COM** – free software