

COMPUTER NETWORKS

Windroid Academy | Grade 9 | ICT By Nimanka

"I would like to show you the soft copy of this article I prepared for the wallpaper. Can I do it? I need to get a hard copy of my letter. But the printer is connected to your computer, isn't it? Now, tell me what I can do."

"Don't you know that the computers in this laboratory are networked? We can easily share the soft copies and we can also get hard copies from any computer."

A collection of computers in a school computer laboratory or an organization, etc. connected together is called a computer network.

5.1 Advantages of Computer Networking

Connecting computers together provides several core advantages to users, ranging from communication to hardware efficiency.

Communication:

Ability to communicate with network users, using e-mail, short messaging services, etc.

Internet:

Ability to share and route access to the Internet across all devices.

Common Files:

Common use of documents, images, photos, songs, video, etc.

Hardware/Software:

Ability to share physical hardware (like printers) and software (like computer games).

Backups:

Ease of taking backups since the data files are saved in a server computer in the network.

Storage:

Facility to save important information in a centralized network storage device.

Figure 5.1 : Advantages of using computer networks

Types of Network Connections

Computers and devices in a network can be connected using various transmission media. These are broadly categorized into wired and wireless connections.

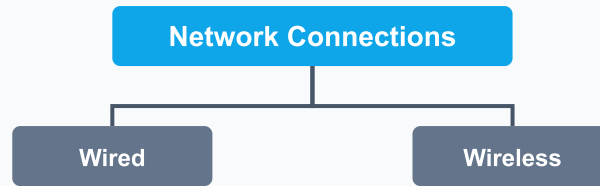


Figure 5.2 : Types of network connections

Cabling used in Wired Connections

Fiber optic cables: Uses light to transmit data at high speeds over long distances.

Twisted pair cables: Standard copper cabling used for local area networks.

Figure 5.3 : Cabling examples

Wireless Media

 **Wi-fi waves:** Modern standard for local wireless networks.

 **Bluetooth:** Used for short-range wireless sharing.

 **Radio waves:** Used for broader wireless communications.

 **Infrared waves:** Requires a direct line of sight between devices.

Figure 5.4 : Wireless media examples

Basic Devices of a Network

To establish a functional computer network, specific hardware components are required to connect devices and route data efficiently.

DEVICE	IMAGE	DESCRIPTION & FUNCTION
Server		The server manages the software, the hardware, the files and communication in the network. Any ordinary computer with the necessary software installed can be used as a server.
Switch		The switch acts as the mediator between two or more computers. The switch recognizes the destination computer or the device when messages are sent from one computer to another in the network. <i>e.g.- when a printing command is given from one computer that message is sent directly to the relevant device (the printer) via the switch.</i>
Network Interface Card (NIC)		The hardware component that connects a computer to a computer network. Modern computers typically have this built into the motherboard.
RJ45 Cables		The connector cables used to physically link devices, switches, and routers together in a wired network.
Router		The router is used to connect one network to another network or to the Internet. It connects your computer or the local network to the World Wide Web easily.

Table 5.1 : Basic device requirements for computer networks

Note on Routers

While a switch connects devices within a single network, a **router** is essential for connecting that local network to external networks, most notably the Internet.

An Example of a Computer Network

The following example illustrates a network topology where multiple computers and devices communicate via a central mediator.

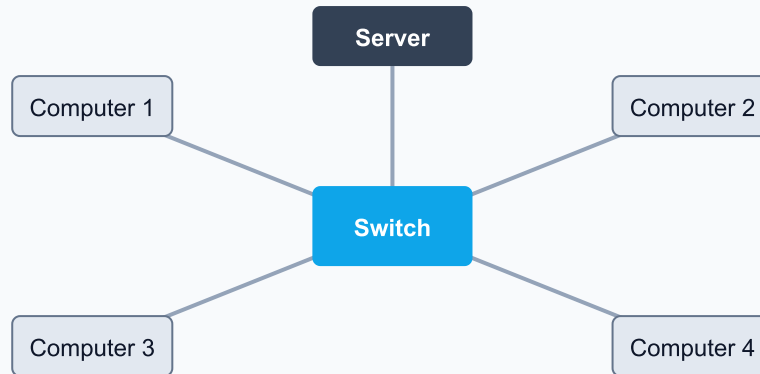


Figure 5.5 & 5.6 : A network involving computers connected via a switch to a server

5.2 Objectives of Computer Networks

Let us consider the basic objectives of establishing computer networks in any organization.

Communication

Messaging
E-mailing

Sharing Resources

Software and hardware
Data and information

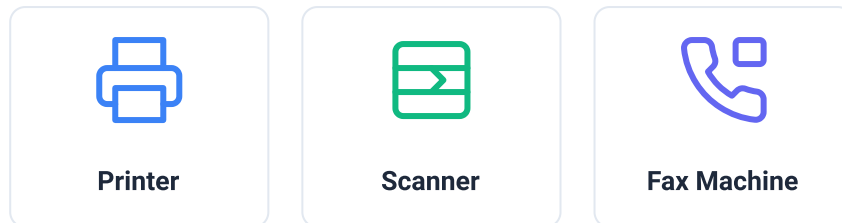
5.2.1 Communication using a computer network

A computer network helps with easy communication among friends or colleagues by messaging. A single message can be directed to many friends in the network at one time.

The Command Line Interface (CLI) can be used for this purpose, alongside modern GUI-based applications.

5.2.2 Sharing Resources Using a Computer Network

Example 1 - Sharing Hardware



When a printer is connected to the network using cables or wireless, everyone in the network can use it when arrangements are made as such. Other common devices shared in a network include the **Scanner** and **Fax machine**.

Advantages of using peripherals in common:

- Ability to use common hardware with several computers
- Saving money (no need to buy a printer for every computer)
- Saving time

Example 2 - Sharing Software

Each stand-alone computer may need individual software licenses. This is very expensive. However, buying multiuser software licenses for a computer network is relatively low. This saves an organization a lot of money and makes updates easier to manage centrally.

Example 3 - Sharing Data and Information

Sharing data and information helps save time, money, and storage capacity while increasing efficiency and productivity.

File Folders: When a folder is shared in a network, all the files in the folder can be accessed by the users in the network. This provides an opportunity to share images, photos, songs, and videos, etc. among friends or coworkers without needing to copy them onto USB flash drives.

Command Line Interface (CLI) - Note

The Command Line Interface is an interface that could be used to give typed commands to a computer sequentially in the form of texts. Before the introduction of the Graphical User Interface (GUI), the operating system of the computer relied entirely on the command line interface. This interface can still be used to send messages to network users. In addition, third-party software such as LAN messages, Net send GUI, POP Messenger, could also be used for network user communications.