

# Computer Skills – Second Year

## Security and Networking

### Weeks 1

#### What is a Network?

When you buy a new computer, the first thing you usually do is connect it to the Internet. To do this, you create a connection with your **router**, which receives data from the Internet and then directs it to your computer.

Of course, that's not all — you can also connect your **printer, smartphone, or television** to the same router so that these devices are also connected to the Internet.

Now, by connecting different devices through a central access point, you have created **your own network**.

In **Information Technology (IT)**, a **network** is defined as a connection between **two or more devices**, either through a **wired cable** or a **wireless connection**.

The simplest network consists of **two computers** connected by a single cable.

This type of network is called a **Peer-to-Peer (P2P) Network**, where both computers have equal privileges — there is **no hierarchy**.

Each computer can access the other's data and share resources like **disk storage, applications, or peripheral devices** such as **printers**.

Modern networks, however, are much more complex and usually include many computers.

These systems often use a **Client–Server Network** model, where a **central computer (the server)** provides resources to all other devices (the clients) connected to the network.

In short, a **network** is a collection of **two or more computers or electronic devices** that are connected to exchange data and share resources.

These devices may be connected using **wired or wireless** links.

#### Types of Networks

A simple example of a modern network is your **home Wi-Fi network**, which is a **Wireless Local Area Network (Wireless LAN)**.

It connects different devices in your home — like phones, laptops, and smart TVs — to your **router**, which works as the **central server**.

The router connects your home network to a much larger network — the **Internet**.

Because all devices in your home are connected to the router, they can also communicate **with each other directly**, without needing the Internet.

For example, you can **print documents wirelessly** from your computer to your printer

without any cables.

This is one of the main advantages of modern wireless networking.

Before modern networks appeared, computers were usually connected by **physical cables** through **LAN (Local Area Network)** switches.

However, physical connections had many limitations — devices had to be **close together**, and sharing peripherals was more difficult.

Now, **wireless connections** have solved these issues, allowing flexibility and mobility.

## **Main Functions and Advantages of Networks**

The main purpose of a network is to **provide a reliable platform** for users to **share data and resources**.

This purpose is so important that it affects almost every part of **modern life**.

Without networks, many aspects of our world today would simply **not be possible**.

For example:

In a typical **office**, every employee has their own computer.

Without a network, it would be very difficult for a team to work on the same project, since there would be **no shared location** for saving or exchanging files.

Also, offices usually have only one or two shared **printers** — without a network, every computer would have to be connected **individually**, which is technically complicated.

A **network** solves this problem elegantly by connecting all computers to the printer **through a single central point**.

## **The Main Advantages of Networks:**

1. **Shared access to data** – All users can share and access common files.
2. **Shared use of resources** – Printers, scanners, and storage devices can be used by multiple users.
3. **Centralized control** – Software and data can be managed from a single server.
4. **Centralized storage and backup** – Files can be saved and backed up safely in one place.
5. **Shared processing power and storage capacity** – Resources are distributed efficiently among users.

## **How Does a Network Work?**

In a **Client–Server Network**, there is a **central point** called the **server**.

The server connects to all other devices, called **clients**.

This connection can be **wired** or **wireless (Wi-Fi)**.

In a **home network**, for example, the **router** acts as the **server**.

It connects to the Internet and then provides Internet access to all other devices such as computers, smartphones, and tablets.

In this way, the router **links** all wired and wireless devices into one **local network**.

## Advantages of Computer Networks

Here are the main **benefits** of using computer networks:

1. They allow multiple computers to **send and receive information** over the same network.
2. They help share devices such as **printers, scanners, and email systems**.
3. They enable **very fast data exchange**.
4. **Electronic communication** becomes more efficient and less expensive than working without a network.

## Disadvantages of Computer Networks

Some possible **drawbacks** of using networks include:

1. **High initial cost** – Hardware and software setup can be expensive.
2. **Security risks** – Without proper protection (like encryption and firewalls), data can be exposed to danger.
3. **Hardware lifespan** – Some components may fail or become outdated after a few years.
4. **Maintenance** – Networks require continuous management and technical support.
5. **System failures** – Servers or cables can fail and interrupt communication.

## The Main Components of a Network

Computer networks include common **devices, functions, and features**, such as **servers, clients, transmission media, shared data, shared printers**, and other physical or software resources. Below are the most important components of a typical computer network:

### 1. Switches

A **switch** is a control device that connects **computers, printers**, and other hardware devices inside a network, such as in a **university campus** or **office building**.

Switches allow all devices in the same network to **communicate** with each other, and also to connect with **other external networks**.

They help in **sharing resources** efficiently and **reducing costs** for organizations.

### 2. Routers

A **router** connects several networks together.

It allows you to **share a single Internet connection** between multiple devices — this saves money and improves communication.

The router analyzes the data that travels through it and automatically **chooses the best route** to

send that data to its destination.

In short, it acts as a **distributor** or **traffic manager** of the network.

### 3. Servers

**Servers** are powerful computers that store and manage shared **software, files, and network operating systems**.

They allow all users on the network to **access shared resources**, such as applications, documents, and databases.

### 4. Clients

**Clients** are computers or devices that **connect to and use** the network.

They also **share** their own resources with others on the same network.

In other words, they are the **users** of the network — sending and receiving data requests from the **server**.

### 5. Transmission Media

**Transmission media** are the **physical paths** used to connect computers within a network.

Examples include:

- **Coaxial cables**
- **Twisted-pair wires**
- **Optical fiber cables**

These are also known as **links, channels, or lines**.

They serve as the “roads” that carry digital data between devices.

### 6. Access Points

An **Access Point (AP)** allows devices to connect **wirelessly** to the network without cables.

Wireless networks make it easier to **add new devices** and provide **flexibility** for **mobile users**.

For example, laptops and phones can connect to Wi-Fi anywhere in the building.

### 7. Shared Data

**Shared data** refers to the information that users exchange within the network — such as **files, printer access programs, or emails**.

These shared resources help multiple people work on the same information efficiently.

### 8. Network Interface Card (NIC)

The **Network Interface Card** is a hardware component that **sends and receives data**. It controls the flow of data between a computer and the rest of the network. Every computer must have a NIC to connect to a network.

### 9. Local Operating System (LOS)

A **Local Operating System** helps personal computers access **files and printers** on a **local network**.

It allows users to work with **shared drives or CDs** located on another computer. Examples include Windows, macOS, and Linux in local configurations.

### 10. Network Operating System (NOS)

A **Network Operating System** is software that runs on both **servers** and **clients**. It enables computers to **communicate** with one another across the network. It also provides **security, file sharing, and network management tools**.

### 11. Protocol

A **protocol** is a set of **rules** that define how devices communicate over a network. Protocols make it possible for different systems to understand each other. Common examples include:

- **TCP/IP** (Transmission Control Protocol / Internet Protocol)
- **UDP** (User Datagram Protocol)
- **FTP** (File Transfer Protocol)

### 12. Hub

A **hub** is a device that **divides a network connection** among multiple computers. It works as a **central point** for data distribution. When a computer sends data to the hub, the hub **forwards** that data to all other connected devices on the network.

### 13. LAN Cable

A **LAN cable** (also called an **Ethernet cable**) is used to connect computers to the **local area network (LAN)** or directly to the **Internet**. It is a common physical medium for wired connections.