# Networks and Transmitting Data

## Networks

- Networks are collections of connected computing devices. They consist of a number of devices known as nodes: mostly computers but also shared peripherals like printers and scanners.

- Devices need to be connected to networks by **network interface cards (NICs)** or by using equivalent circuitry embedded in their electronics. Each device must be uniquely identifiable so that messages intended for it are delivered correctly.

**Reasons for Having Networks**

- Most organisations and individuals have networks. They have become important because of the need to communicate and share data.

- A central store of data enables all the users of the system to see the same up-to-date version of the data they need.

**Private Networks**

- Most organisations still have their own private networks. The advantages of having these include:

- Control over security.

- Complete control over who has access to what resource.

- Control over what software is provided.

- Confidence of availability.

- However, these conveniences come at a cost. A large network needs specialist staff to keep it running all the time and also to maintain security.

- Most organisations are completely dependent on their networks so if it loses functionality this could be a major disaster.

- Various methods are utilised to minimise this risk:

**- Redundancy** - Where essential equipment is duplicated.

**- A sensible backup regime** - So that there is always a copy of essential data stored somewhere else.

**- Failover System** - These detect abnormalities and automatically transfer operations to an alternative system.

**- A Disaster Recovery Plan** - This is necessary so that in the event of a major failure procedures are in place to limit the impact of the failure and remedies are applied effectively.

## **Hardware**

Networks are built on certain common items of hardware. These are concerned with generating, transmitting and interpreting electric signals.

**Network Interface Cards (NICs)**

- Circuits that in the past were plugged into the computer’s bus to produce signals that are placed on the transmission medium and also receive signals from it.

- NICs are designed to work with particular networks standards, and by far the most widespread is Ethernet. So common most computers have Ethernet circuitry built onto their motherboards rather than requiring cards as add-on.

- NICs work as the physical and data link layers of the OSI network model.

**MAC Addresses**

- These are 48 bit identifiers allocated to network devices by the manufacturer. Normally they are quoted in human readable groups as 6 bytes or octets and displayed as Hex digits. A typical MAC address could be 08:01:27:OE:B8.

- The first three octets identify the manufacturer the others are allocated to make each one unique.

**Routers**

- A router is a device that connects networks. It receives data packets from one network and forwards them to another network based on the address information in the packet.

- Routers determine where to send a packet according to either a table of information about neighbouring networks or by using an algorithm