

# Four basic elements of networks

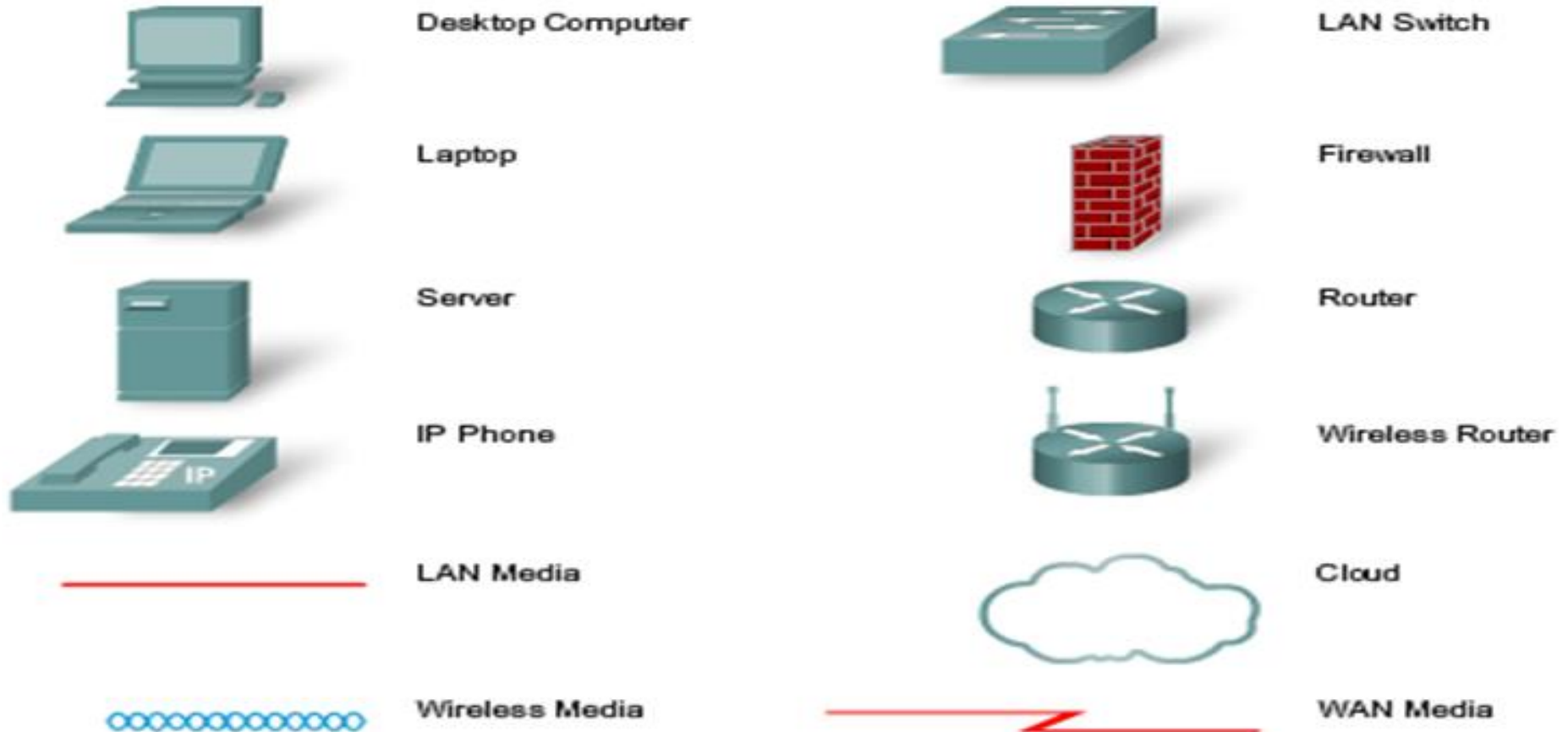
**Rules** or agreements to govern *how the messages are sent, directed, received and interpreted.*

**The messages** or units of *information that travel from one device to another.*

**Devices** on the network that exchange messages with each other.

A means of interconnecting these devices - **a medium** that *can transport the messages from one device to another.*

## Common Data Network Symbols



# Hardware, Software and Networks Peripherals (device)

1. Network Interface Card (NIC)
2. Repeater
3. Bridge
4. Hub
5. Switch
6. Router

# Hardware, Software and Networks Peripherals (cont.)

## 1-Network Interface Card (NIC)

NIC provides the physical interface between computer and cabling.

It prepares data, sends data, and controls the flow of data. It can also receive and translate data into bytes for the CPU to understand.

The following factors should be taken into consideration when choosing a NIC:

1. - Preparing data
2. - Sending and controlling data
3. - Configuration
4. - Drivers
5. - Compatibility
6. - Performance

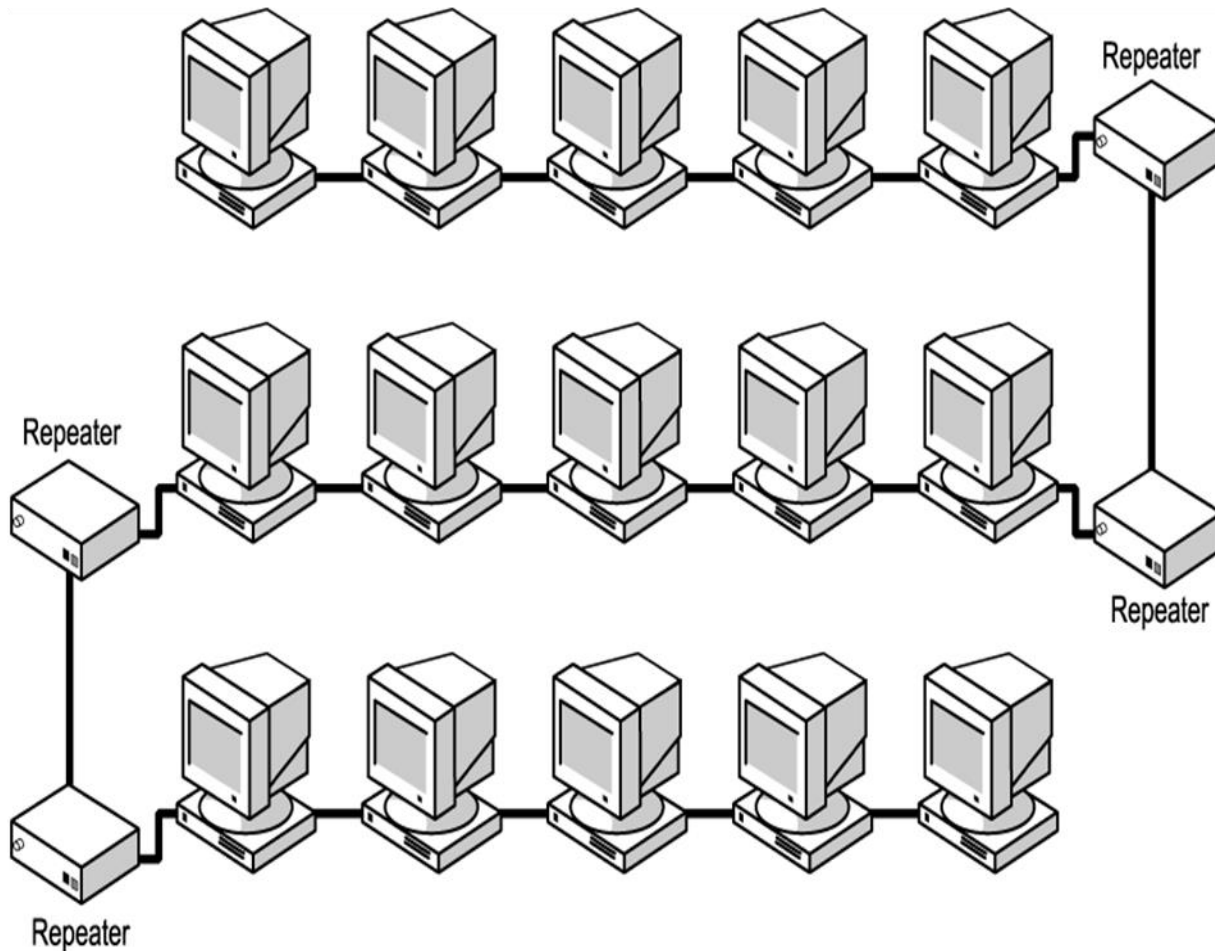
## Hardware, Software and Networks Peripherals (cont.)

### 2-Repeaters

- Repeaters are very simple devices. They allow a cabling system to extend beyond its maximum allowed length by amplifying the network voltages so they travel farther.
- Repeaters are nothing more than amplifiers and, as such, are very inexpensive.
- Repeaters can only be used to regenerate signals between similar network segments.
- For example, we can extend an Ethernet 10Base2 network to 400 meters with a repeater. But can't connect an Ethernet and Token Ring network together with one.
- The main disadvantage to repeaters is that they just amplify signals. These signals not only include the network signals, but any noise on the wire as well.
- Eventually, if you use enough repeaters, you could possibly drown out the signal with the amplified noise. For this reason, repeaters are used only as a temporary fix.

# Hardware, Software and Networks Peripherals (cont.)

## Repeaters



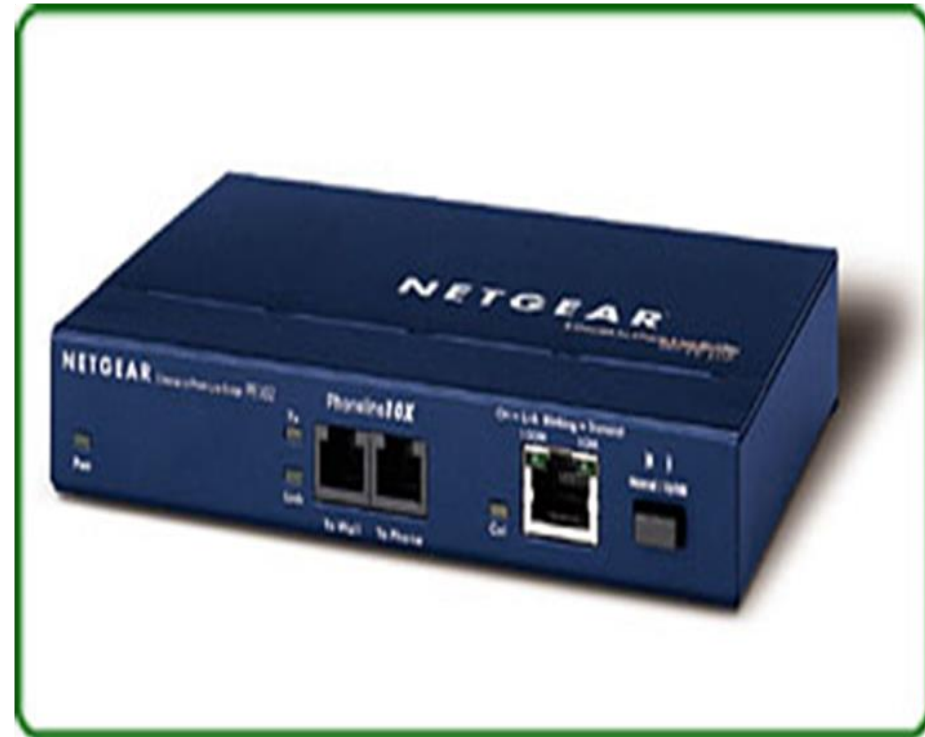
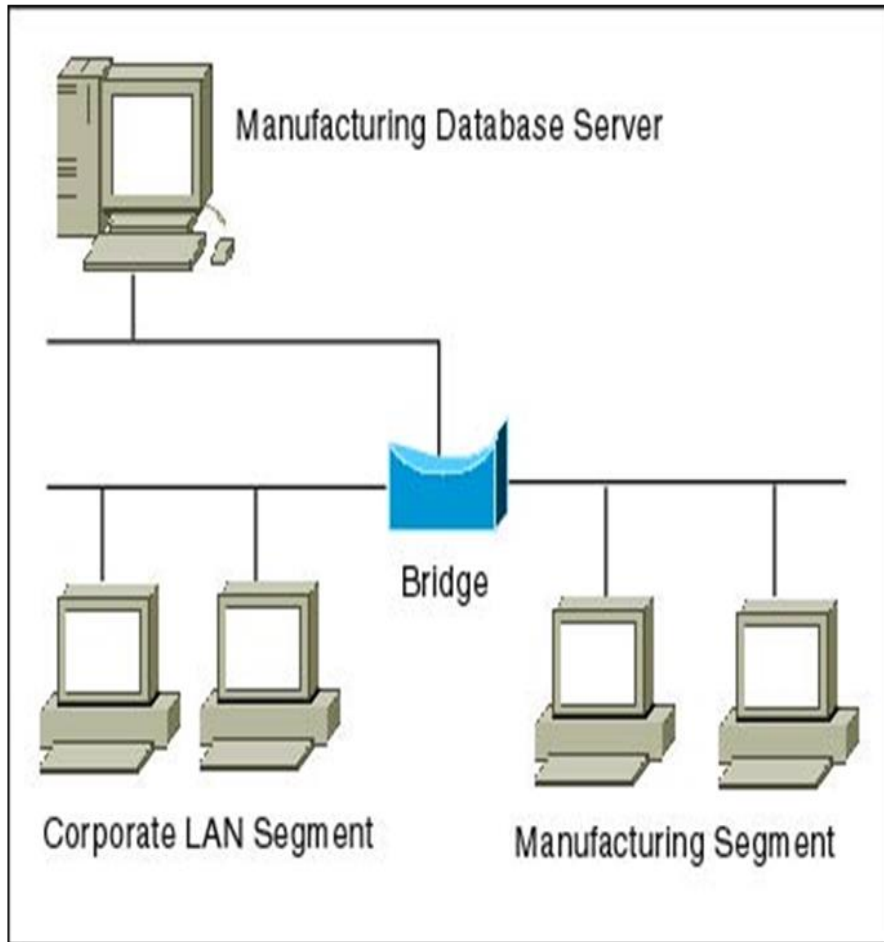
# Hardware, Software and Networks Peripherals (cont.)

## 3-Bridges

- They join similar topologies and are used to divide network segments.
- For example, with 200 people on one Ethernet segment, the performance will be mediocre, because of the design of Ethernet and the number of workstations that are fighting to transmit. If you divide the segment into two segments of 100 workstations each, the traffic will be much lower on either side and performance will increase.
- If it is aware of the destination address, it is able to forward packets; otherwise a bridge will forward the packets to all segments. They are more intelligent than repeaters but are unable to move data across multiple networks simultaneously.
- Unlike repeaters, bridges *can* filter out noise.
- The main disadvantage to bridges is that they can't connect dissimilar network types or perform intelligent path selection. For that function, you would need a router.

# Hardware, Software and Networks Peripherals (cont.)

## Bridges





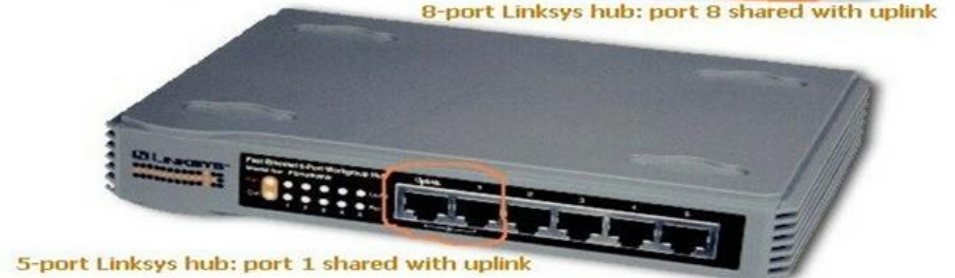
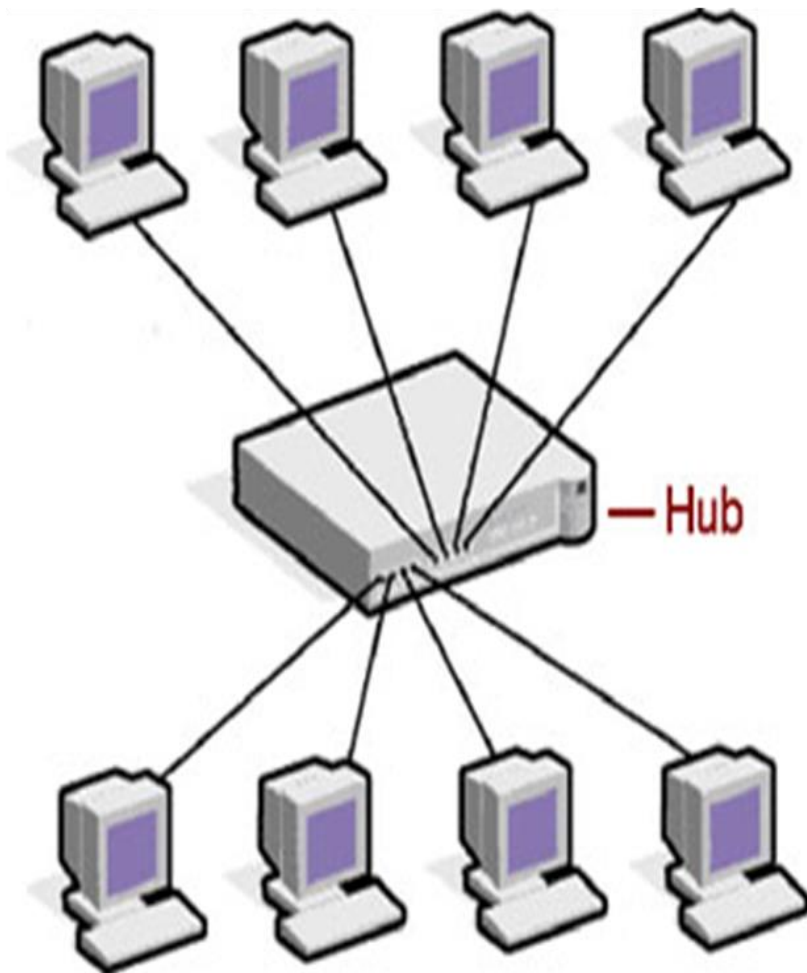
# Hardware, Software and Networks Peripherals (cont.)

## 4-Hubs

- Hubs are devices used to link several computers together.
- They repeat any signal that comes in on one port and copy it to the other ports (a process that is also called *broadcasting*).
- There are two types of hubs: active and passive.
- *Passive hubs* simply connect all ports together electrically and are usually not powered.
- *Active hubs* use electronics to amplify and clean up the signal before it is broadcast to the other ports.
- In the category of active hubs, there is also a class called “intelligent” hubs, which are hubs that can be remotely managed on the network.

# Hardware, Software and Networks Peripherals (cont.)

## Hubs



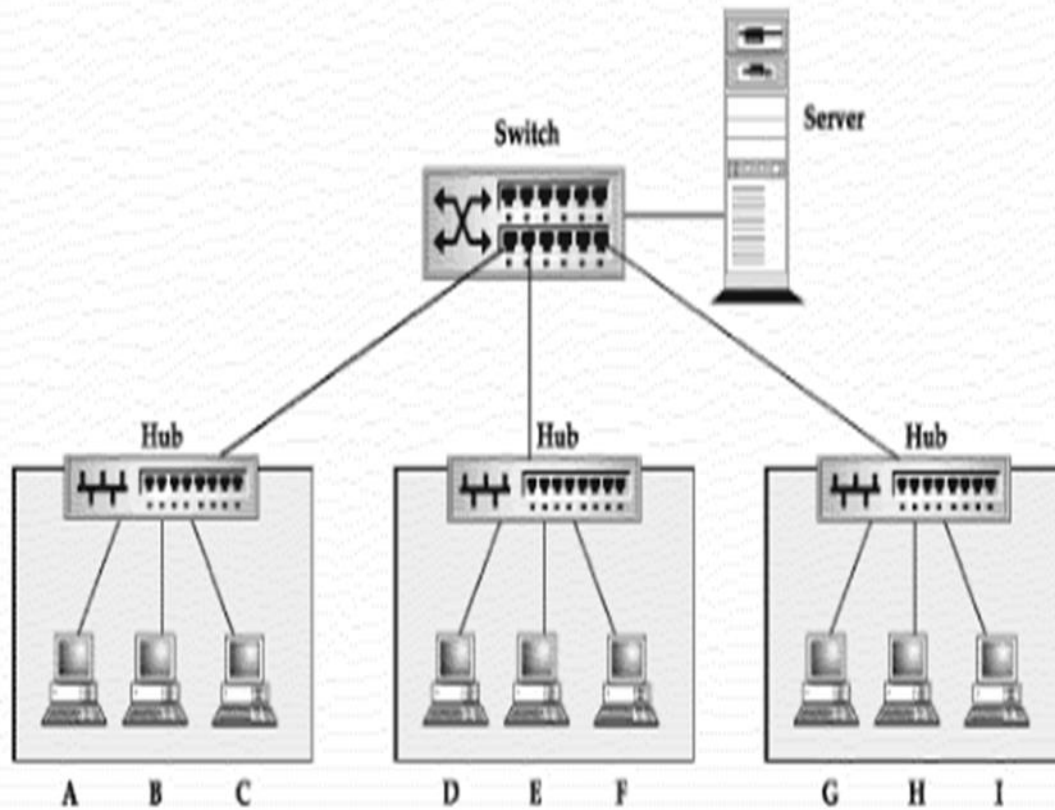
# Hardware, Software and Networks Peripherals (cont.)

## 5-Switch

- A **network switch** is a computer networking device that connects network segments.
- Low-end network switches appear nearly identical to network hubs, but a switch contains more "intelligence" (and a slightly higher price tag) than a network hub.
- Network switches are capable of inspecting data packets as they are received, determining the source and destination device of that packet, and forwarding it appropriately.
- By delivering each message only to the connected device it was intended for, a network switch conserves network bandwidth and offers generally better performance than a hub.
- A **vital difference** between a **hub** and a **switch** is that all the nodes connected to a hub share the bandwidth among themselves, while a device connected to a switch port has the **full bandwidth** all to itself.
- For example, if 10 nodes are communicating using a hub on a 10-Mbps network, then each node may only get a portion of the 10 Mbps if other nodes on the hub want to communicate as well. .
- But with a switch, each node could possibly communicate at the full 10 Mbps.

# Hardware, Software and Networks Peripherals (cont.)

## Switch



# Hardware, Software and Networks Peripherals (cont.)

## 6-Routers

Routers are highly intelligent devices that connect multiple network types and determine the best path for sending data.

The advantage of using a router over a bridge is that routers can determine the best path that data can take to get to its destination.

Like bridges, they can segment large networks and can filter out noise.

However, they are slower than bridges because they are more intelligent devices; as such, they analyze every packet, causing packet-forwarding delays. Because of this intelligence, they are also more expensive.

Routers are normally used to connect one LAN to another.

Typically, when a WAN is set up, there will be at least two routers used.

# Hardware, Software and Networks Peripherals (cont.)

## Routers

