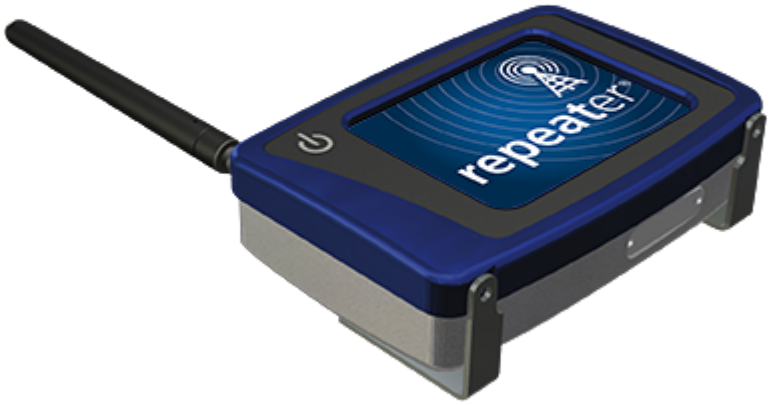
Network Devices,Frame Relay and X.25

Hardware/Networking Devices: Networking hardware may also be known as network equipment computer networking devices.

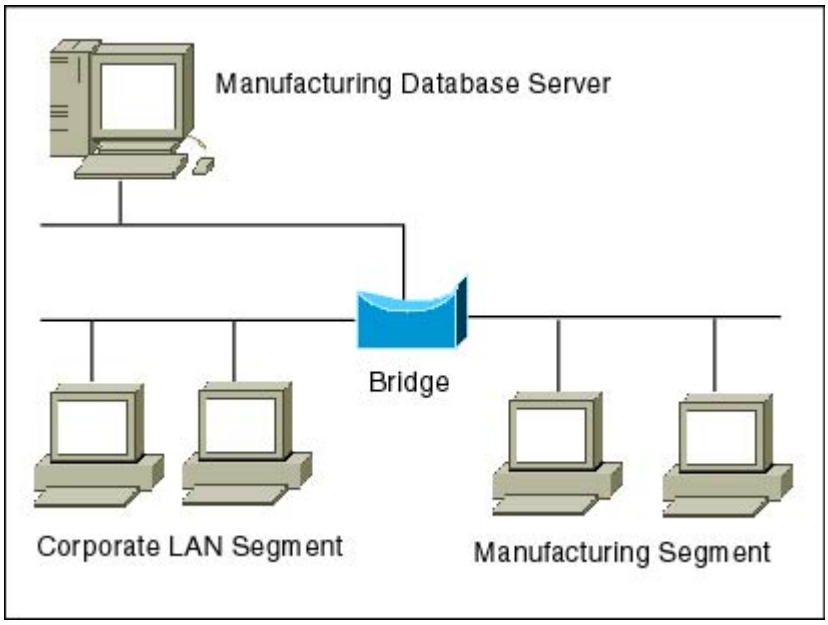
Network Interface Card (NIC): NIC provides a physical connection between the networking cable and the computer's internal bus. NICs come in three basic varieties 8 bit, 16 bit and 32 bit. The larger number of bits that can be transferred to NIC, the faster the NIC can transfer data to network cable.

Repeater: Repeaters are used to connect together two Ethernet segments of any media type. In larger designs, signal quality begins to deteriorate as segments exceed their maximum length. We also know that signal transmission is always attached with energy loss. So, a periodic refreshing of the signals is required.



Hubs: Hubs are actually multi part repeaters. A hub takes any incoming signal and repeats it out all ports.

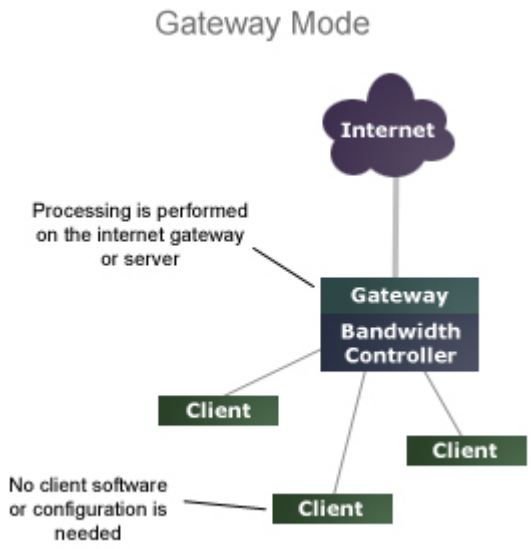
Bridges: When the size of the LAN is difficult to manage, it is necessary to breakup the network. The function of the bridge is to connect separate networks together. Bridges do not forward bad or misaligned packets.



Switch: Switches are an expansion of the concept of bridging. Cut through switches examine the packet destination address, only before forwarding it onto its destination segment, while a store and forward switch accepts and analyzes the entire packet before forwarding it to its destination. It takes more time to examine the entire packet, but it allows catching certain packet errors and keeping them from propagating through the network.

Routers: Router forwards packets from one LAN (or WAN) network to another. It is also used at the edges of the networks to connect to the Internet.

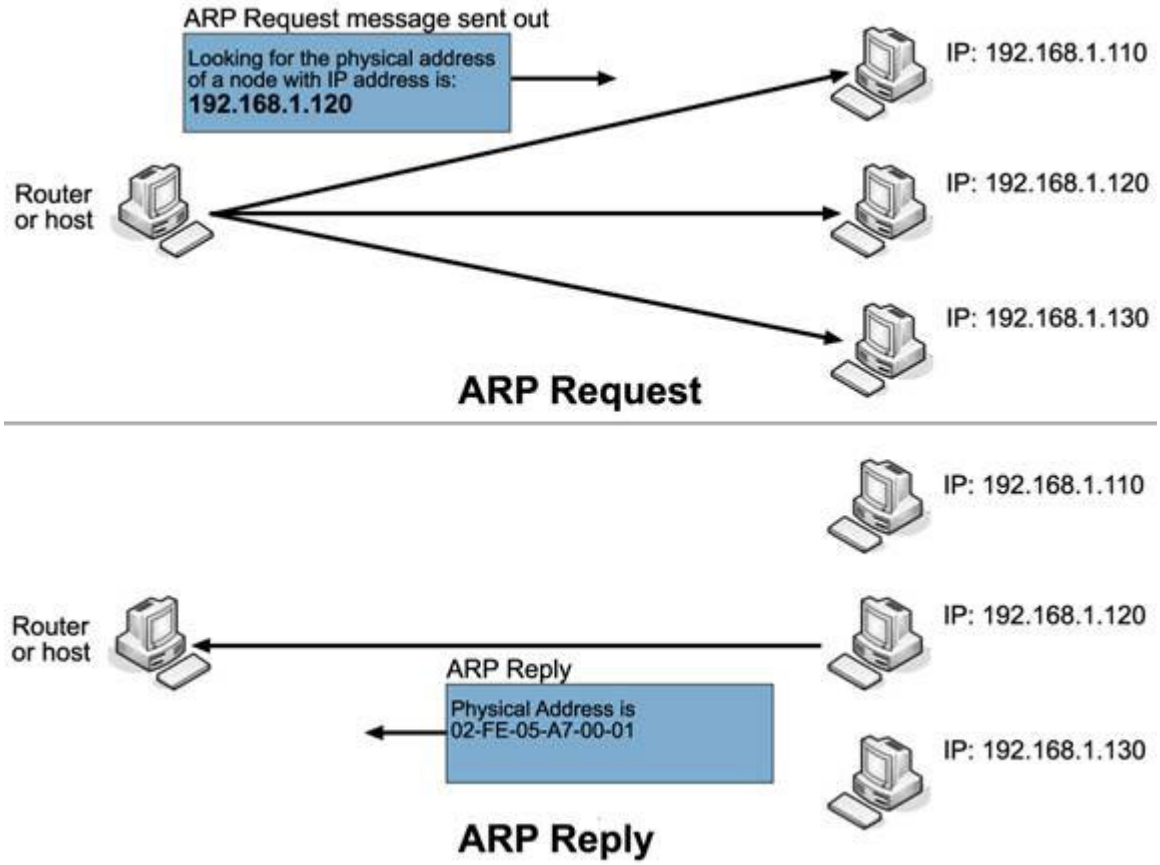
Gateway: Gateway acts like an entrance between two different networks. Gateway in organisations is the computer that routes the traffic from a work station to the outside network that is serving web pages. ISP (Internet Service Provider) is the gateway for Internet service at homes.



ARP: Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address that is recognized in the local network. For example, in IP Version 4, the most common level of IP in use today, an address is 32 bits long. In an Ethernet

local area network, however, addresses for attached devices are 48 bits long. (The physical machine address is also known as a Media Access Control or MAC address.) A table, usually called the ARP cache, is used to maintain a correlation between each MAC address and its corresponding IP address. ARP provides the protocol rules for making this correlation and providing address conversion in both directions.

There are four types of arp messages that may be sent by the arp protocol. These are identified by four values in the "operation" field of an arp message. The types of message are:
1)ARP request
2)ARP reply
3)RARP request
4)RARP reply



Frame Relay:

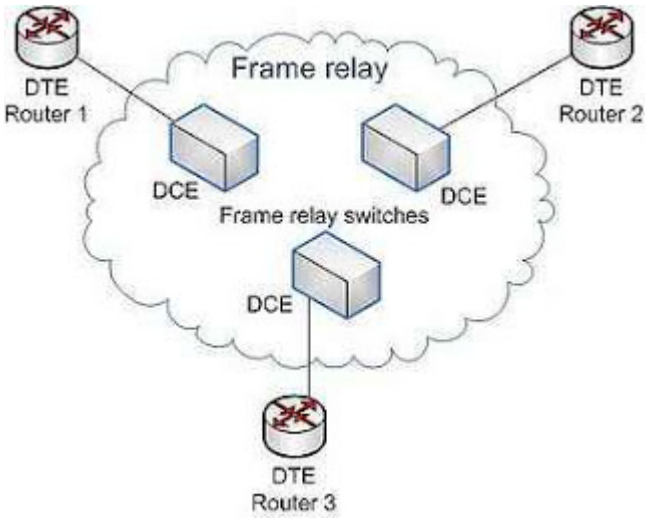
Frame Relay is a standardized wide area network technology

that operates at the physical and logical link layers of OSI model. Frame relay originally designed for transport across Integrated Services Digital Network (ISDN) infrastructure, it may be used today in the context of many other network interfaces.
Frame relay is an example of a packet switched technology. Packet switched network enables end stations to dynamically share the network medium and the available bandwidth.
Frame Relay is often described as a streamlined version of X.25, it is because frame relay typically operates over WAN facilities that offer more reliable connection services. Frame relay is strictly a layer 2 protocol suite, where as X.25 provides services at layer 3.
Some important characteristics of frame relay are,

- It allows bursty data.
- It allows the frame size 9000 bytes, which can accumulate all LANs.
- It is less expensive than other traditional WANs.
- It has error detection only at data link layer, there is no any flow control and error control.
- There is also a retransmission policy if frame is damaged.
- 56 kbps, 64 kbps, 128 kbps, 256 kbps, 512 kbps and 1.5 Mbps.

For most services, the network provides a permanent virtual circuit (PVC), which means that the customer sees a continuous, dedicated connection without having to pay for a full-time leased line, while the service provider figures out the route each frame travels to its destination and can charge based on usage. Switched virtual circuits (SVC), by contrast, are temporary connections that are destroyed after a specific data transfer is completed.In order for a frame relay WAN to transmit data, data terminal equipment (DTE) and data circuit-terminating equipment (DCE) are required. DTEs are typically located on the customer’s premises and can encompass terminals, routers, bridges and personal computers. DCEs are managed by the carriers and provide switching and associated

services.



Frame Relay Virtual Circuits:

Frame Relay provides connection-oriented data link layer communications. This means that a defined communication exists between each pair of devices and that these connections are associated with a connection identifier (ID). This service is implemented by using a FR virtual circuit, which is a logical connection created between two DTE devices across a Frame Relay packet-switched network (PSN).Virtual circuits provide a bidirectional communication path from one DTE device to another and are uniquely identified by a data-link connection identifier (DLCI). A virtual circuit can pass through any number of intermediate DCE devices (switches) located within the Frame Relay PSN.

Frame Relay virtual circuits fall into two categories: switched virtual circuits (SVCs) and permanent virtual circuits (PVCs).

Switched Virtual Circuits (SVCs)

Switched virtual circuits (SVCs) are temporary connections used in situations requiring only sporadic data transfer between DTE devices across the Frame Relay network. A communication session across an SVC consists of the following four operational states:

Call setup—The virtual circuit between two Frame Relay DTE devices is established.

Data transfer—Data is transmitted between the DTE devices over the virtual circuit.

Idle—The connection between DTE devices is still active, but no data is transferred. If an SVC remains in an idle state for a defined period of time, the call can be terminated.

Call termination—The virtual circuit between DTE devices is terminated.

Permanent Virtual Circuits (PVCs)

Permanent virtual circuits (PVCs) are permanently established connections that are used for frequent and consistent data transfers between DTE devices across the Frame Relay network. Communication across a PVC does not require the call setup and termination states that are used with SVCs. PVCs always operate in one of the following two operational states:

Data transfer—Data is transmitted between the DTE devices over the virtual circuit.

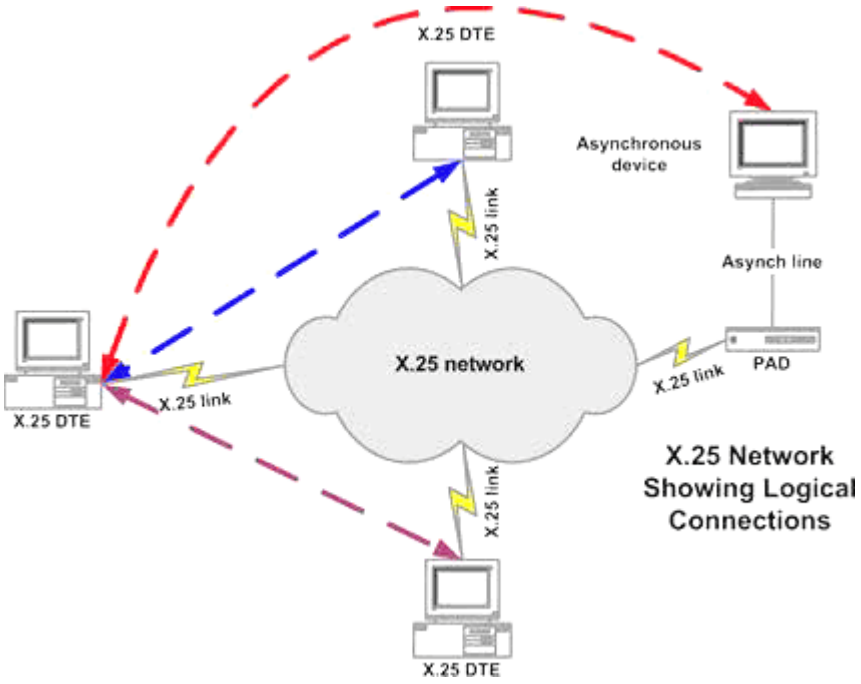
Idle—The connection between DTE devices is active, but no data is transferred. Unlike SVCs, PVCs will not be terminated under any circumstances when in an idle state.

DTE devices can begin transferring data whenever they are ready because the circuit is permanently established.

X.25:

X.25 Packet Switched networks allow remote devices to communicate with each other over private digital links without the expense of individual leased lines. Packet Switching is a technique whereby the network routes individual packets of HDLC data between different destinations based on addressing within each packet. An **X.25 network** consists of a network of

interconnected nodes to which user equipment can connect. The user end of the network is known as **Data Terminal Equipment** (**DTE**) and the carrier's equipment is **Data Circuit-terminating Equipment** (**DCE**) . X.25 routes packets across the network from DTE to DTE.



The X.25 standard corresponds in functionality to the first three layers of the Open Systems Interconnection (OSI) reference model for networking. Specifically, X.25 defines the following:

- The physical layer interface for connecting data terminal equipment (DTE), such as computers and terminals at the customer premises, with the data communications equipment (DCE), such as X.25 packet switches at the X.25 carrier's facilities. The physical layer interface of X.25 is called X.21bis and was derived from the RS-232 interface for serial transmission.
- The data-link layer protocol called Link Access Procedure, Balanced (LAPB), which defines encapsulation (framing) and error-correction methods. LAPB also enables the DTE or the DCE to initiate or terminate a communication session or initiate data transfer. LAPB is

derived from the High-level Data Link Control (HDLC) protocol.

- The network layer protocol called the Packet Layer Protocol (PLP), which defines how to address and deliver X.25 packets between end nodes and switches on an X.25 network using permanent virtual circuits (PVCs) or switched virtual circuits (SVCs). This layer is responsible for call setup and termination and for managing transfer of packets.