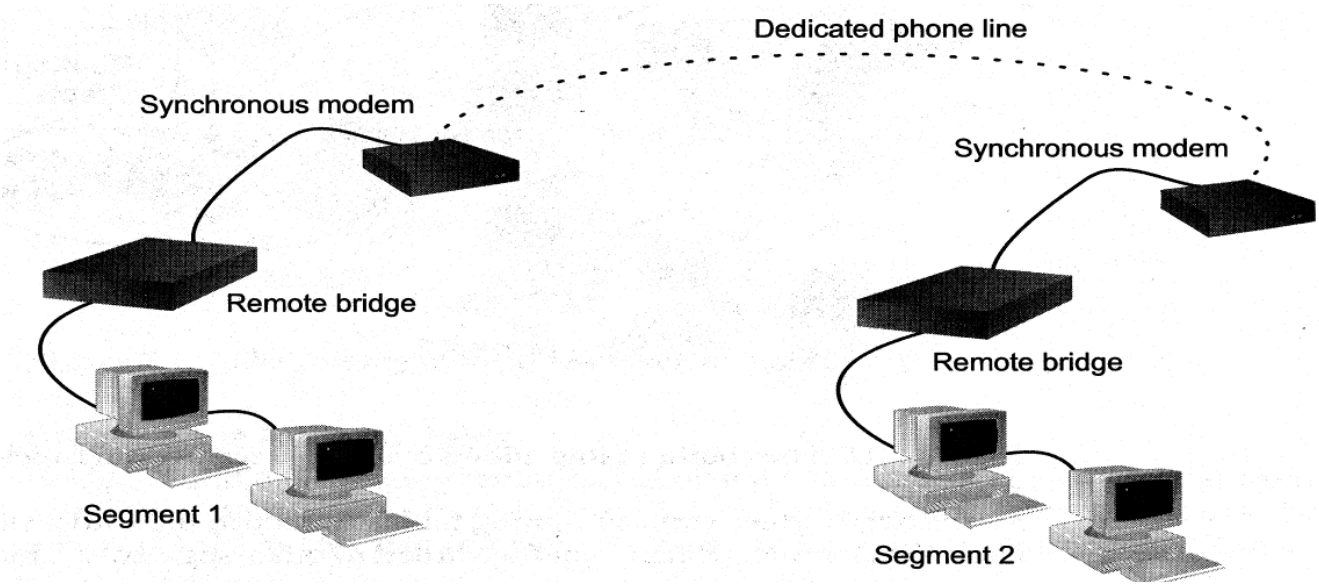
Remote Bridges

• Bridges are often used in large networks that have widely dispersed segments
• Remote bridges can be used to connect remote segments via data-grade telephone line

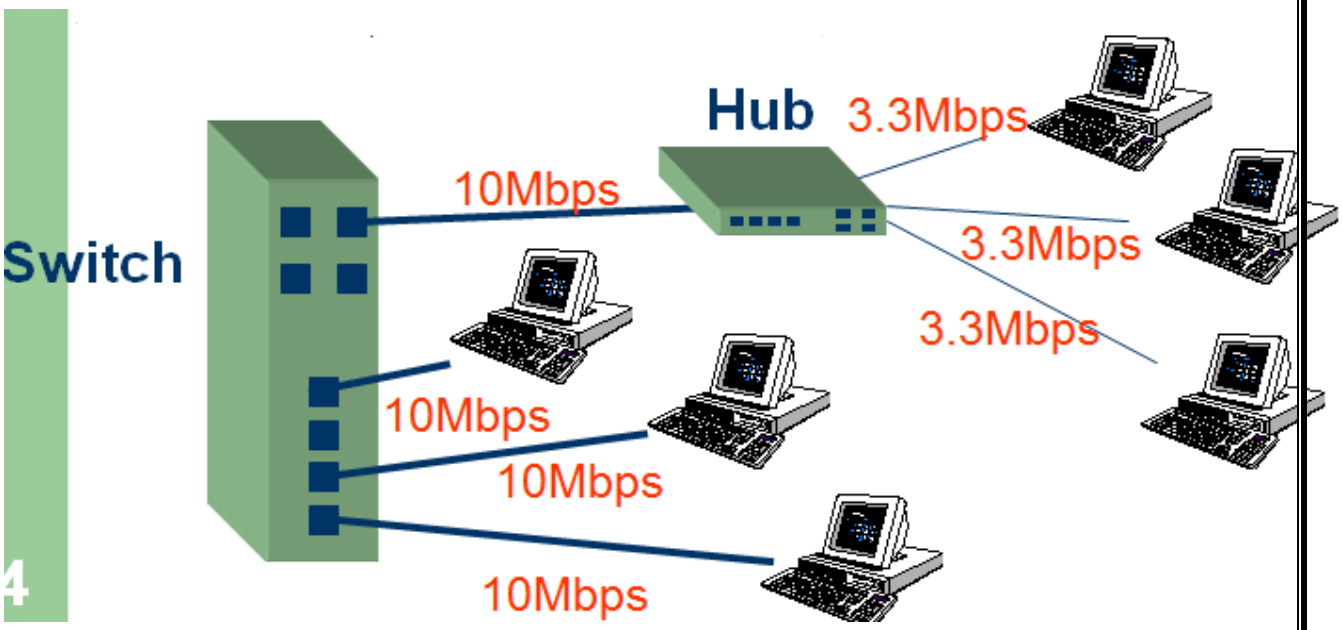


Switches

1. It operates at the Data Link layer.
2. To improve performance, LANs are usually divided into multiple smaller LANs interconnected by a Layer 2 LAN switch.
3. Have some intelligence—they send data to a port only if the data needs to go there.
4. The traffic received by a device is reduced because only frames addressed to a specific device are forwarded to the port on which that device is connected.
5. Switches ***read the source and destination MAC addresses in the frames*** and therefore can keep track of who is where, and who is talking to whom, and send data only where it needs to go.
6. All devices connected to one switch port are in the same collision domain, but devices connected to different ports are in different collision domains.
7. Switches are significantly ***faster than bridge*** because they switch in hardware.
8. Switches can interconnect LANs of ***unlike bandwidth***. A 10-Mbps Ethernet LAN and a 100Mbps Ethernet LAN
9. Switches typically have ***more ports*** than bridges.

dvantages of Switches

• Switches divide a network into several isolated channels (or collision domains)
• Reduce the possibility of collision
• Each channel has its own network capacity
• Suitable for real-time applications, e.g. video conferencing
• Since isolated, hence secure



Method of Switching - Store and Forward Mode(**Three Switch Functions at layer2)**

- **Address learning**
- **Forward/filter decisions**
- **Loop avoidance**
-

Routers

1. It operates at the Network layer.
2. Has much more intelligence than a hub or switch.
3. By using logical Layer 3 addresses, routers allow devices on different LANs to communicate with each other and with distant devices
4. All devices connected to one router port are in the same collision domain and same broadcast domain, but devices connected to different ports are in different collision domains and in different broadcast domains.
5. Helps control the amount of traffic on the network.
6. The main functions of a router are first to determine the best path that each packet should take to get to its destination
7. The router doesn't care what is in the higher layers—what kind of data is in the packet. The router is just responsible for sending the packet the correct way. The router does have to be concerned with the data link and physical layers, though, because **it might have to receive and send data on different media**.
   For example, a packet received on an Ethernet LAN might have to be sent out on a Frame Relay WAN, requiring the router to know how to communicate on both these types of media. In terms of layers, therefore, a router unencapsulates received data up to the network layer and then encapsulates the data again into the appropriate frame and bit types.

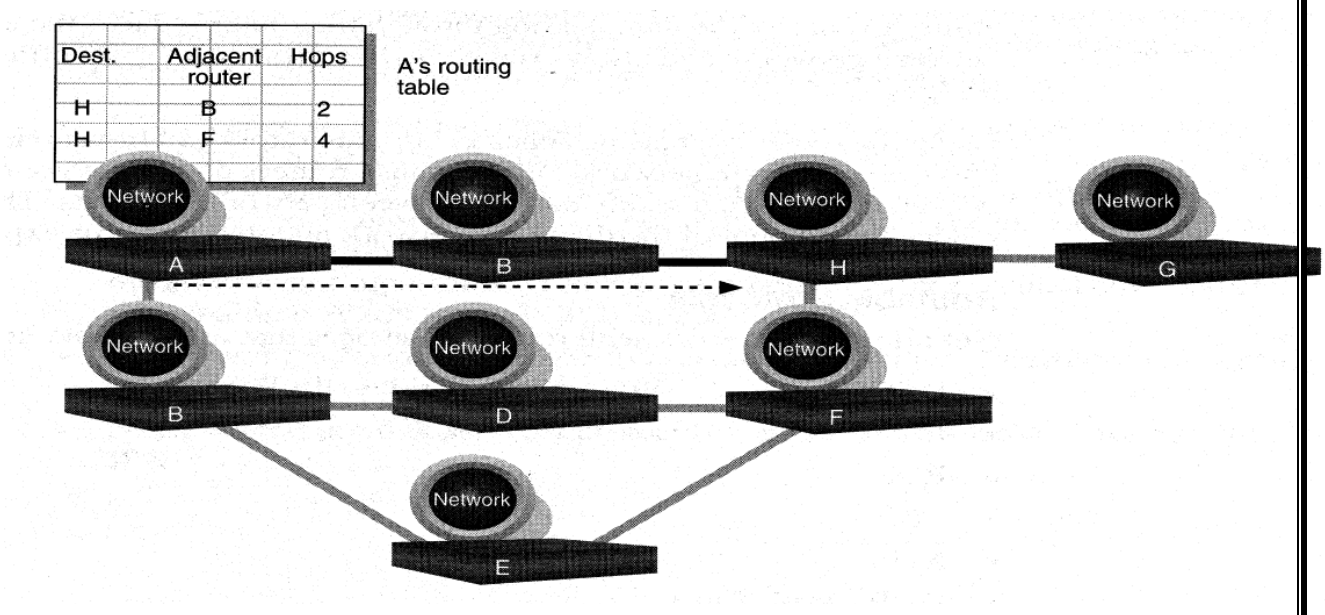
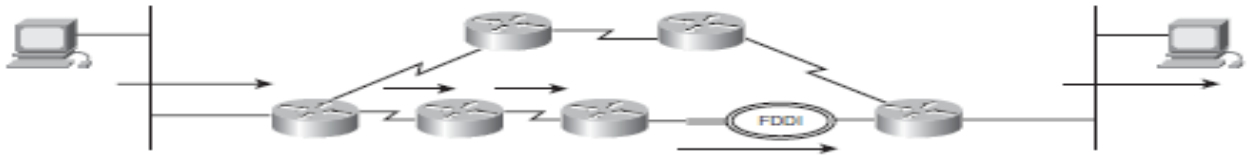
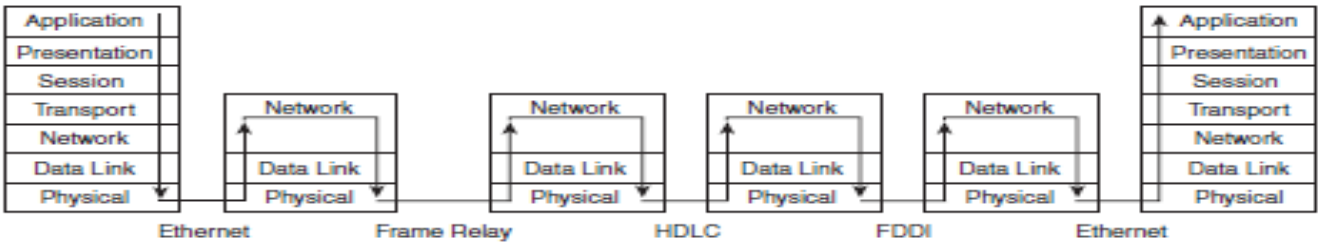


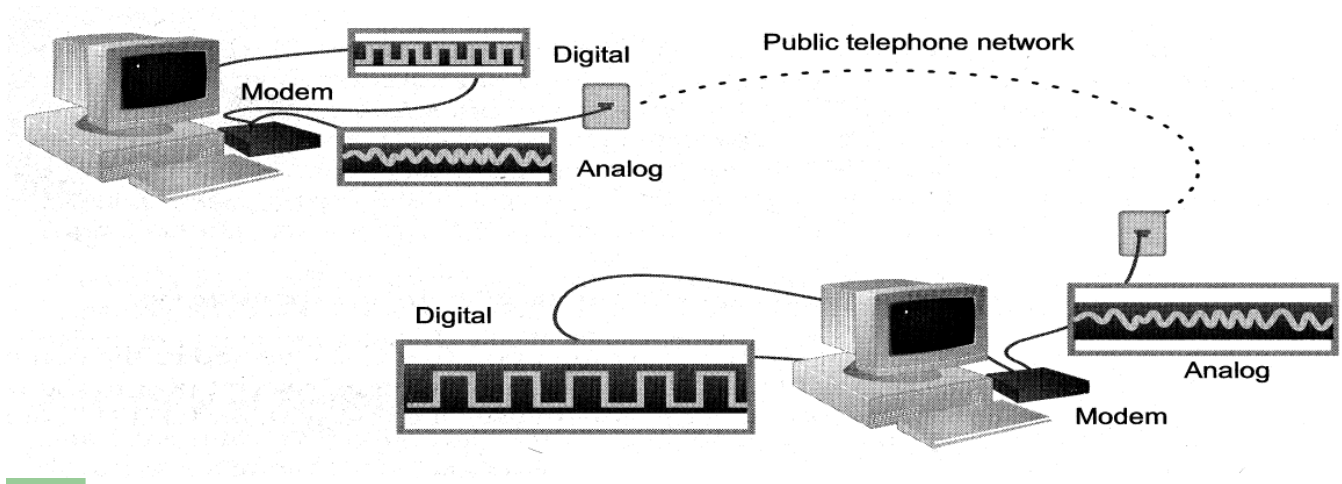
Figure 1-12 *Router Works at the Network Layer*

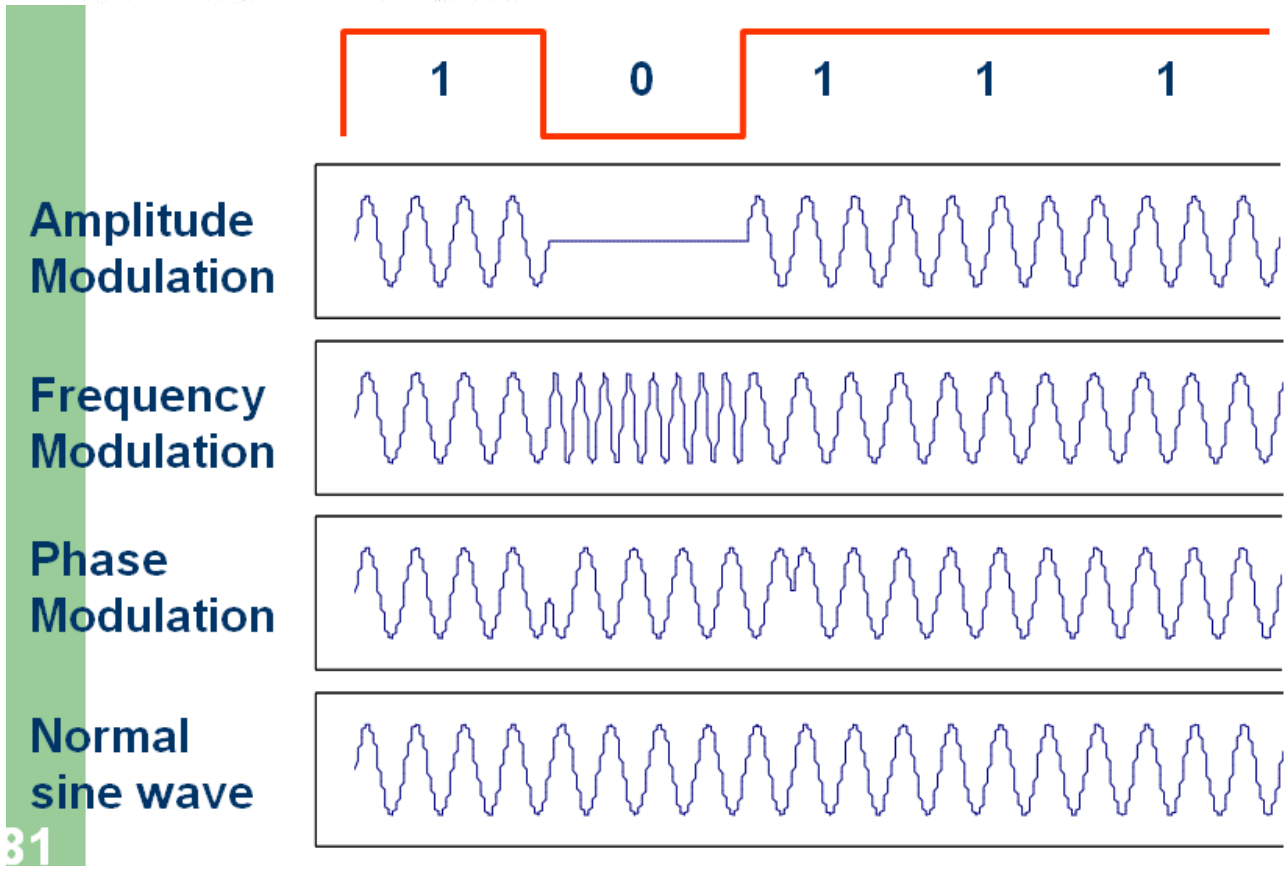




Remote Access Devices (Modems)

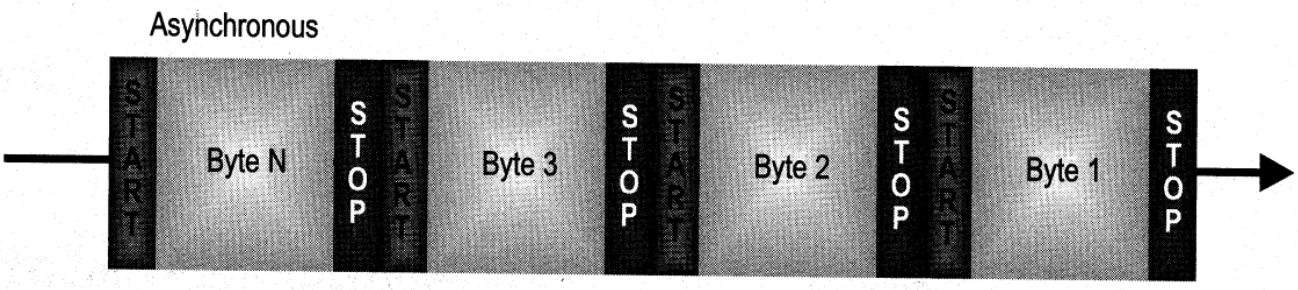
- Allow computers to communicate over a telephone line
- Enable communication between networks or connecting to the world beyond the LAN
- Cannot send digital signal directly to telephone line
- Sending end: MODulate the computer's digital signal into analog signal and transmits
- Receiving end: DEModulate the analog signal back into digital form
- Modems typically have the following I/O interface:
- A serial RS-232 communication interface
- An RJ-11 telephone-line interface (a telephone plug)


Digital
Public telephone network
Modem
Analog
Digital
Analog
Modem


1
0
1
1
1
Amplitude Modulation
Frequency Modulation
Phase Modulation
Normal sine wave
31

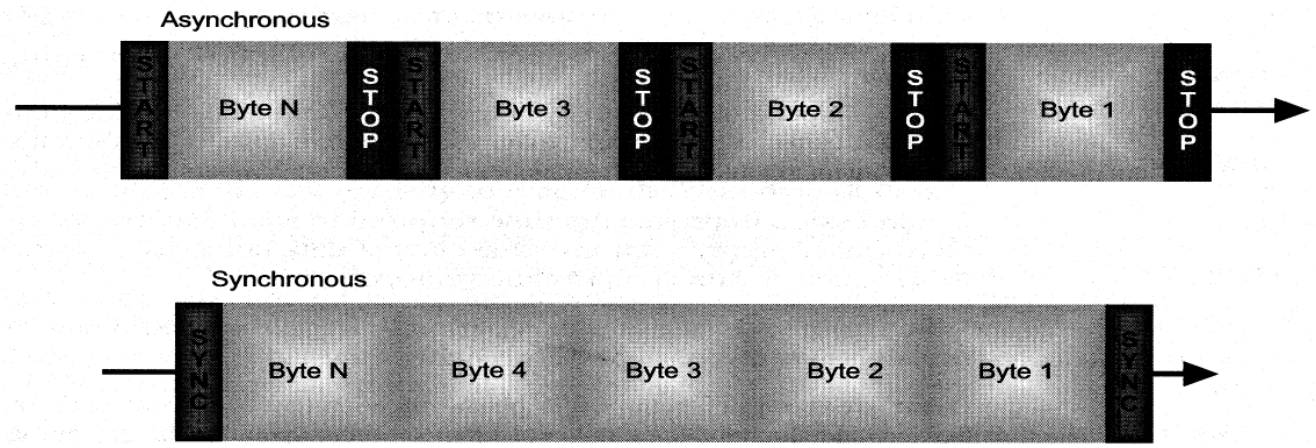
Types of Modem - Asynchronous Modems

- No clocking devices
- Commonly used in telephone networks
- Data is transmitted in a serial stream.
- Each of these characters is separated by one start bit and one or two stop bits



Types of Modem - Synchronous Modems

- Need clocking devices
- Data are transmitted in blocks
- Used in digital networks



Comparison

- **Asynchronous modems are relatively simple and economic**
- **Large overhead –**
- **Error control is done by using parity bit or higher layer protocols.**
- **Synchronous modems are relatively complicated and expensive**
- **use in home market**
- **Less overhead means higher efficiency**
- **More sophisticated error control protocol is required**