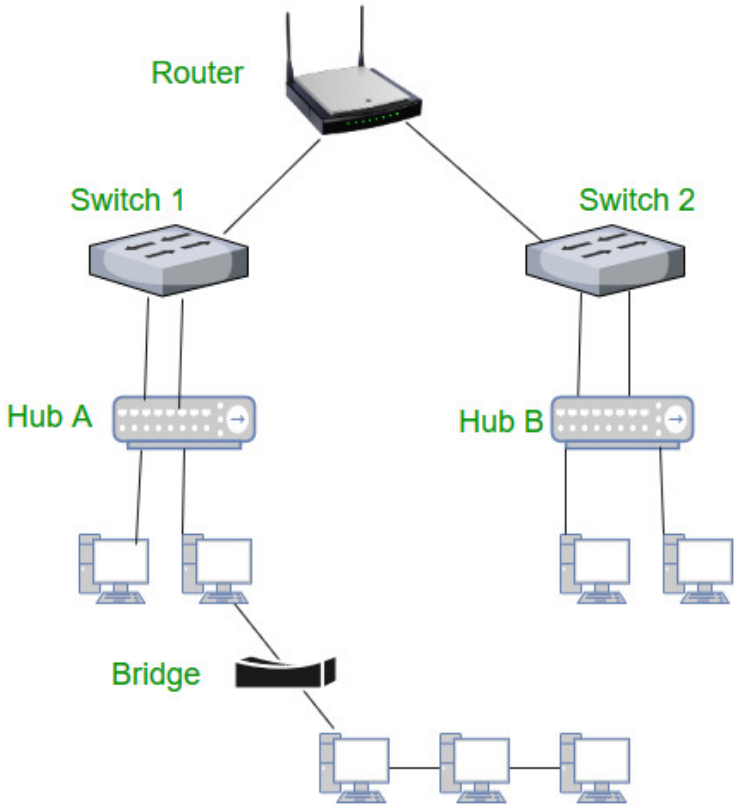
Lecture Notes for Data Communications for CCA Programme

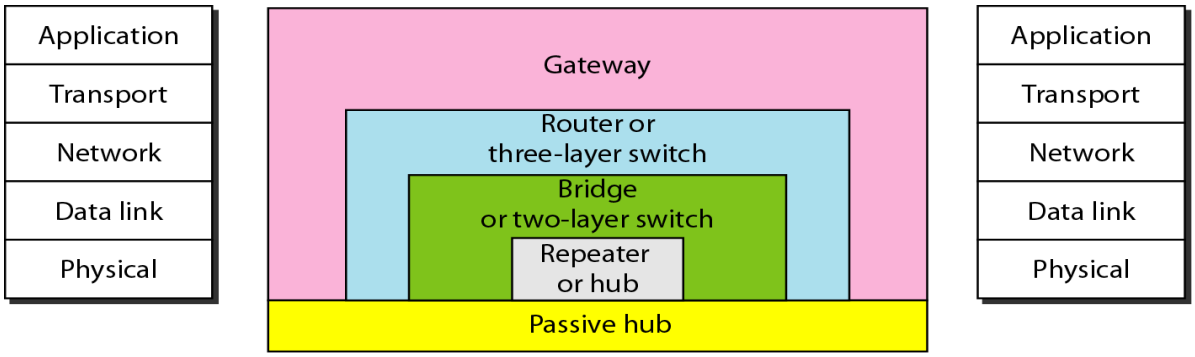
Lecture 3&4:

Network Connecting Devices

- Network devices, or networking hardware, are physical devices that are required for communication and interaction between hardware on a computer network.



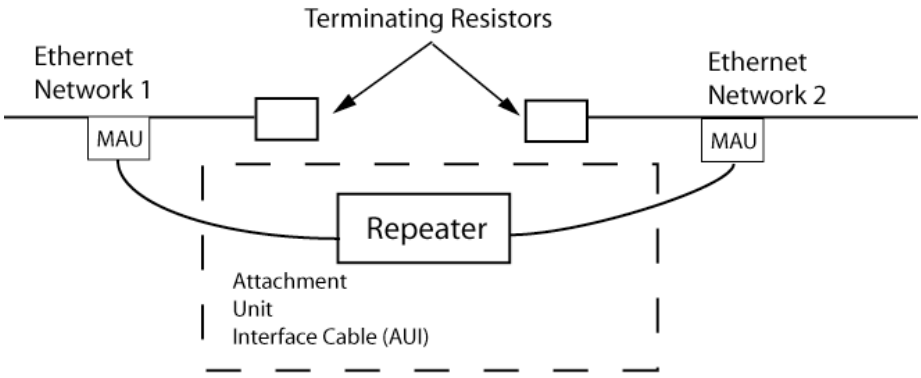
- Connecting devices at various layers



- There are various network connecting devices devices which are given here:
  - **Hub:** Those hubs which operate below the physical layer are passive hub. Those hubs which operate at the physical layer are called a repeater or an active hub.
  - A passive hub is just a connector. It connects the wires coming from different branches.
  - An active hub is actually a multipart repeater.

Lecture Notes for Data Communications for CCA Programme

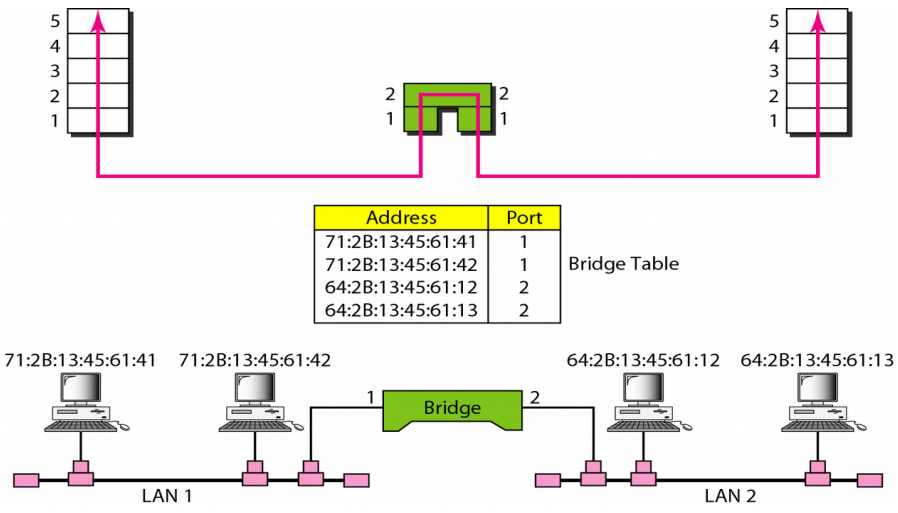
- **Repeater:** Repeaters are low-level devices that just amplify or regenerate weak signals.
- A repeater is a device that operates only in the physical layer.
- Signals that carry information within a network can travel a fixed distance before attenuation endangers the integrity of the data.
- A repeater receives a signal and, before it becomes too weak or corrupted, regenerates the original bit pattern.
- The repeater then sends the refreshed signal.
- A repeater can extend the physical length of a LAN



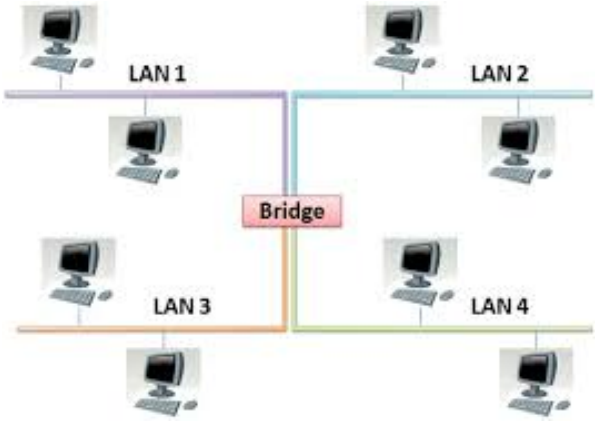
MAU (Medum Attachment Unit) and AUI can be optionally combined in a single unit with the Repeater

Source: Datapro Reports on PC & LAN Communications: LAN Internetworking Overview 521-104 May 1992

- **Bridge:** Bridges are store and forward devices.

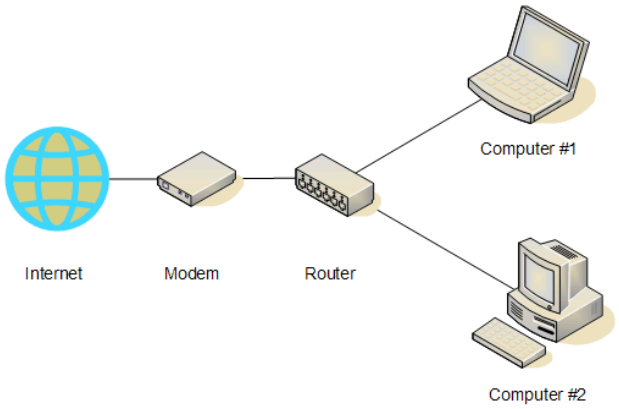


- A bridge operates in both the physical and the data link layer. As a physical layer device, it regenerates the signal it receives.
- As a data link layer device, the bridge can check the physical (MAC) addresses (source and destination) contained in the frame.
- There are various types of bridges such as transparent bridges, remote bridges, spanning tree and source routing bridges.
- A bridge with many ports and design allows better (faster) performance. A bridge with a few ports can connect a few LANs together.
- A bridge with many ports may be able to allocate a unique port to each station, with each station on its own independent entity. This means there is no competing traffic (no collision).



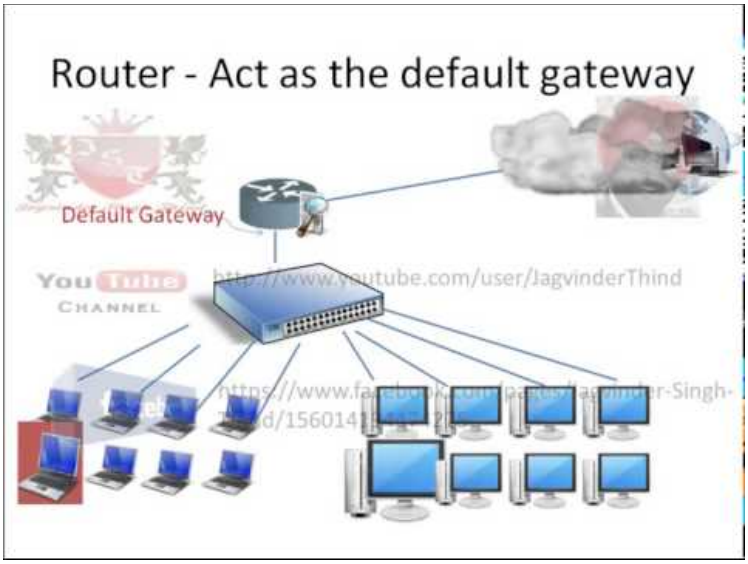
- **L2 Switch:** When we use the term switch, we must be careful because a switch can mean two different things. We must clarify the term by adding the level at which the device operates.
- We can have a layer 2 (L2) switch or a layer 3 (L3) switch.
- The L3 switch is used at the network layer; it is a kind of router.
- The L2 switch performs at the physical and data link layers.
- A L2 switch is a bridge.
- A L2 switch, as a bridge does, makes a filtering decision based on the MAC address of the frame it received.
- A L2 switch can have a buffer to hold the frames for processing.
- It can have a switching factor that forwards the frames faster.
- **L3 Switches:** A three-layer switch is a router, but a faster and more sophisticated. The switching fabric in a three-layer switch allows faster table lookup and forwarding. L3 switch and router is synonymous.
- **Router:** Routers are conceptually similar to bridges, except that they are found in the network layer.
- They just take incoming packets from one line and forward them on another, just as all routers do, but the lines may belongs to different networks and use different protocols.
- A router is a three-layer device that routes packets based on their logical addresses (host-to-host addressing).
- A router normally connects LANs and WANs in the Internet and has a routing table that is used for making decisions about the route.
- The routing tables are normally dynamic and are updated using routing protocols.

- Following figure shows a router placement.



- **Gateway:** Gateway is a device that connects two or more dissimilar networks.
- Transport gateways make a connection between two networks at the transport layer.
- Application gateways connect two parts of an application in the application layer.

- A gateway is normally a computer that operates in all five layers of the Internet.



- A gateway takes an application message, reads it, and interprets it.

- This means that it can be used as a connecting device between two internetworks that use different models.

- The gateway connecting the two systems can take a frame as it arrives from the first system, move it up to the OSI application layer, and remove the message.

References

1. Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill Forouzan Networking Series