Ministry of Higher Education and Scientific

Research Al-Mustaqbal University College

Department of Technical Computer Engineering

Computer Network 3rd Stage

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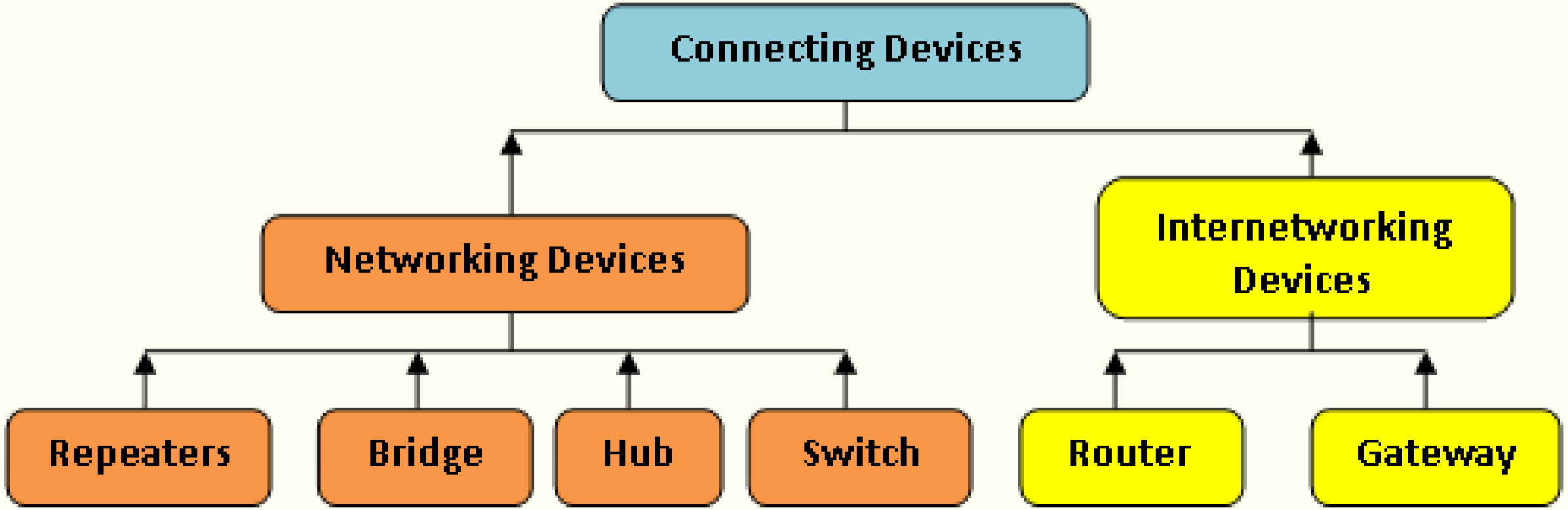
2020-2021

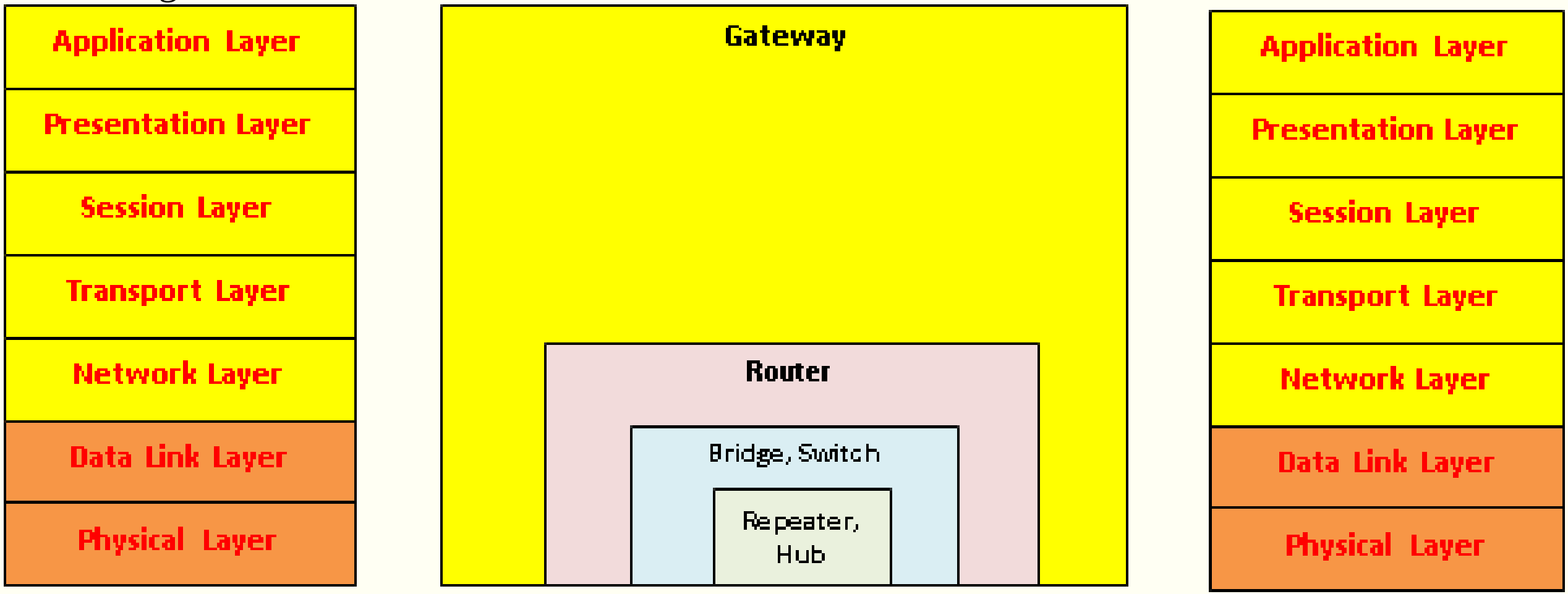
Networking and Internetworks

To connect a network or multiple networks together there are different types of connecting devices as illustrated in figure below:



Networking and Internetworks

Each of these devices operates at different layer of the OSI model as shown in figure below:



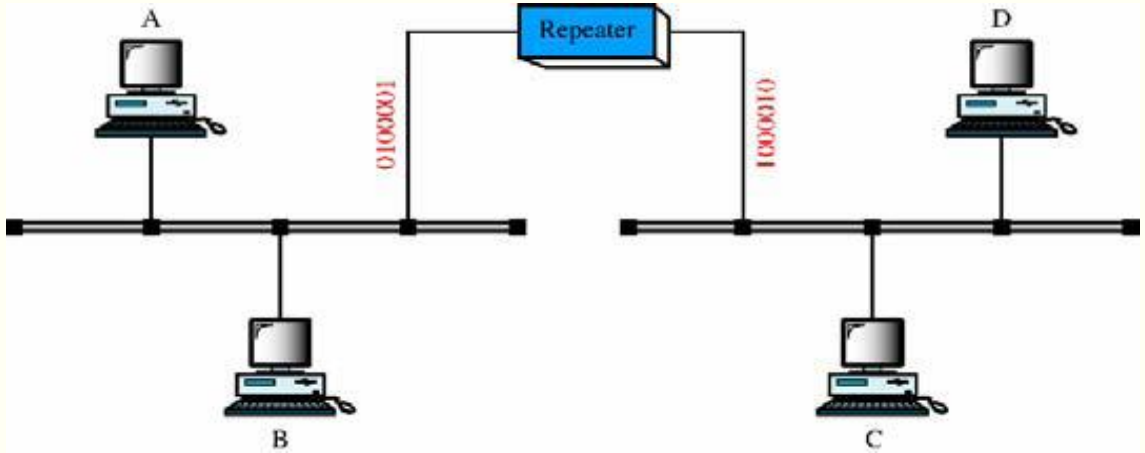
Networking and Internetworks

Repeater:

Devices used to extend the network cable length beyond the limit of the specified cable.

The purpose of a repeater is to regenerate and retime network signals at the bit level to allow them to travel a longer distance on the media.

Repeaters are classified as Layer 1 devices in the OSI model, because they act only on the bit level and look at no other information.



Networking and Internetworks

Hubs:

The purpose of a hub is to regenerate and retime network signals at the bit level to a large number of hosts (e.g. 4, 8, or even 24).

Hub is also known as a multi-port repeater.

The difference with repeater is the number of cables that connect to the device.

Two reasons for using hubs are to create a central connection point for the wiring media, and increase the reliability of the network.

Hubs are considered Layer 1 devices because they only regenerate the signal and broadcast it out all of their ports (network connections).

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Bridges:

A bridge is a Layer 2 device designed to connect two LAN segments.

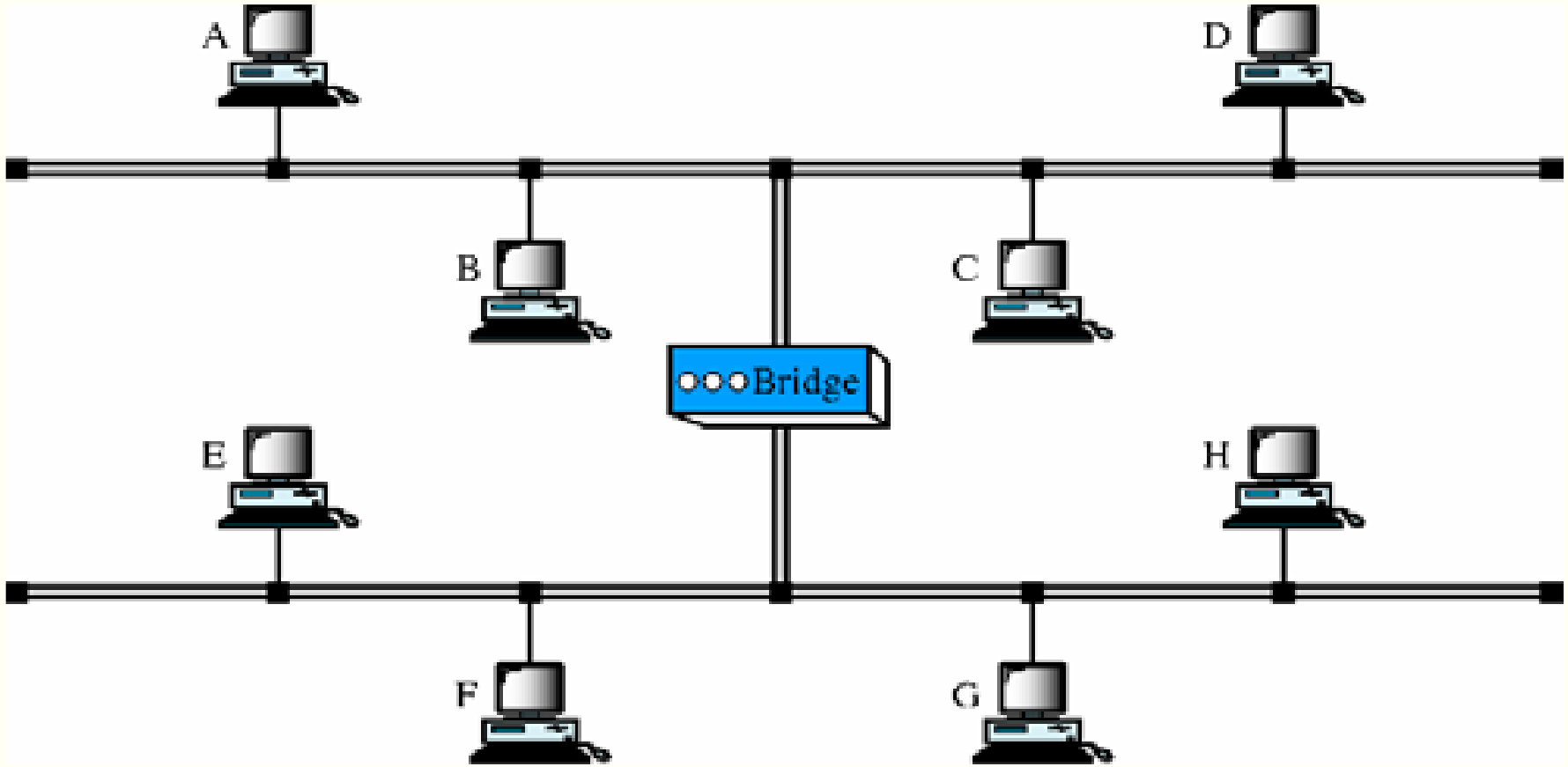
The purpose of a bridge is to filter traffic on a LAN, to keep local traffic local, yet allow connectivity to other parts of the LAN for traffic that has been directed there.

Question: how the bridge knows which traffic is local and which is not.

Every networking device has a unique MAC address on the NIC, the bridge keeps track of which MAC addresses are on each side of the bridge and makes its decisions based on this MAC address list.

Networking and Internetworks

Bridges:



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Switches:

A **switch** is a Layer 2 device.

Switch is called a multi-port bridge, just like a hub is called a multi-port repeater.

The difference between the hub and switch is that switches make decisions based on MAC addresses and hubs don't make decisions at all.

Switch make a LAN much more efficient.

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Routers:

A router is a Layer 3 device.

Routers can also connect different Layer 2 technologies.

The purpose of a router is to examine incoming packets (Layer 3 data), choose the best path for them through the network, and then switch them to the proper outgoing port.

Because of their ability to route packets, routers have become the backbone of the Internet.

Networking and Internetworks

Gateway:

Gateways are multi-purpose connection devices.

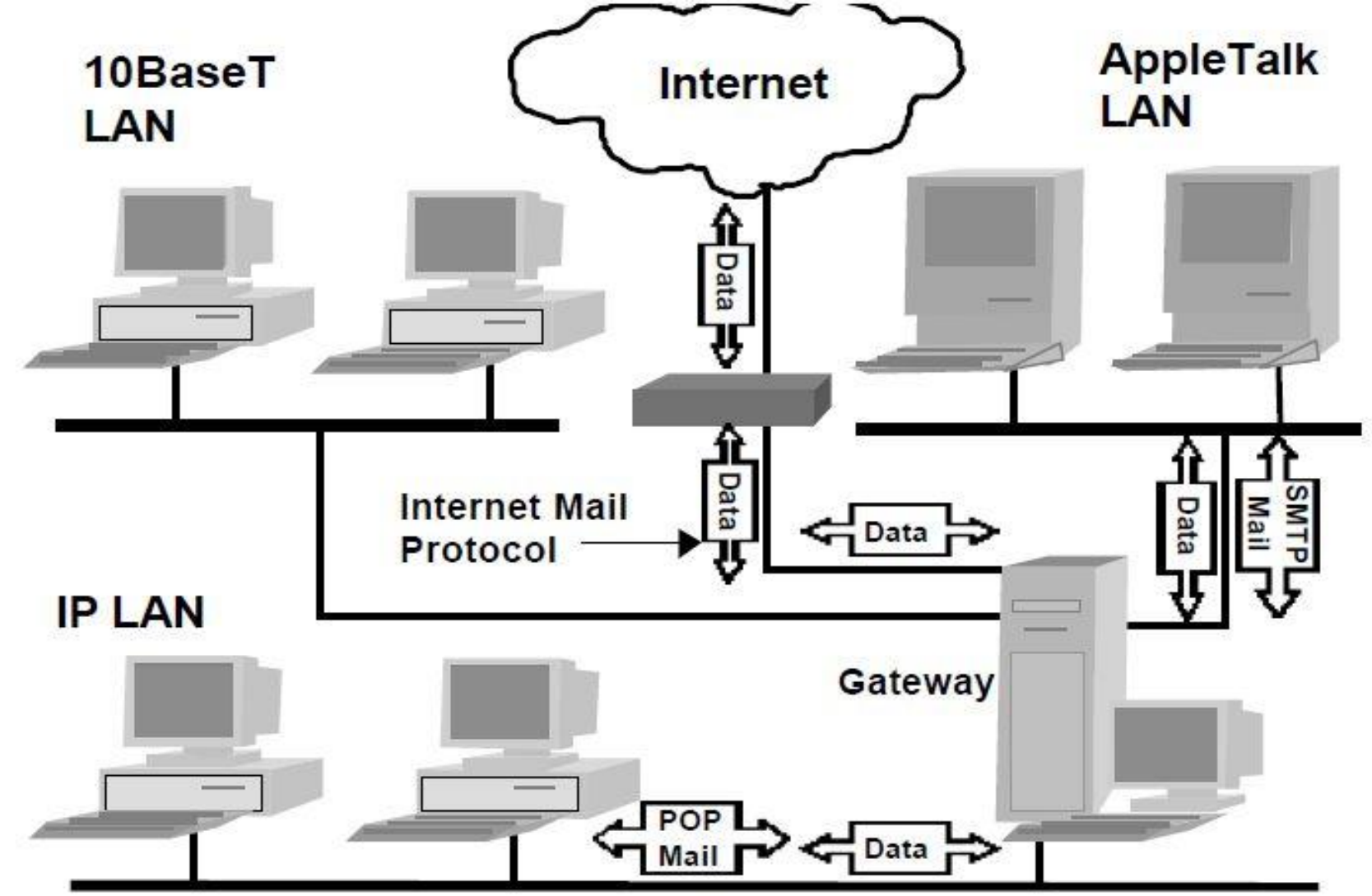
They are able to convert the format of data in one computing environment to a format that is usable in another computer environment (for example, AppleTalk and DECnet).

Gateways can operate at all layers of the OSI model.

Gateways are available as stand-alone devices or in the form of a network station functioning as a gateway server.

Networking and Internetworks

Gateway:



Connection-Oriented Versus Connectionless Communication

- Transport protocols are used to deliver information from one port to another and thereby enable communication between application programs.
- They use either a connection-oriented or connectionless method of communication.
- TCP is a connection-oriented protocol and UDP is a connectionless transport protocol.
- The TCP **connection-oriented protocol** establishes a communication link between a source port/IP address and a destination port/IP address (example a telephone conversation).
- The **reliability** of the communication between the source and destination programs is ensured through error-detection and error-correction mechanisms that are implemented within TCP.

Connection-Oriented Versus Connectionless Communication

- The **UDP connectionless** protocol differs from the **TCP connection-oriented** protocol in that it does not establish a link for the duration of the connection (example of a connectionless protocol is postal mail).
- When using UDP, an application program writes the destination port and IP address on a datagram and then sends the datagram to its destination.
- UDP is less reliable than TCP **because** there are no delivery-assurance or error-detection and -correction mechanisms built into the protocol.
- Application protocols such as FTP, SMTP, and HTTP **use TCP** to provide **reliable**, stream-based communication between client and server programs.
- Other protocols, such as the Time Protocol, **use UDP** because speed of delivery is more important than end-to-end reliability.