Unit VI – Network Protocols & Devices

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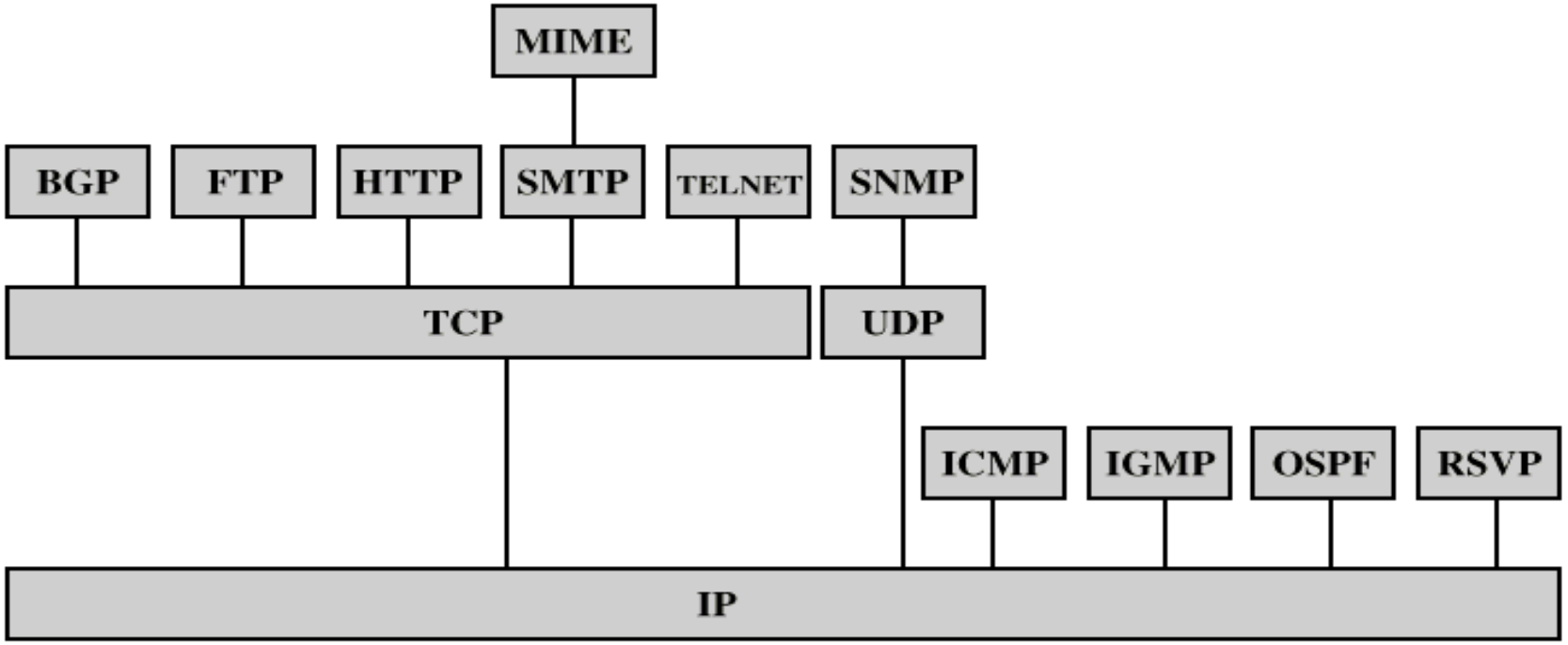
Protocol Hierarchy



BGP = Border Gateway Protocol
FTP = File Transfer Protocol
HTTP = Hypertext Transfer Protocol
ICMP = Internet Control Message Protocol
IGMP = Internet Group Management Protocol
IP = Internet Protocol
MIME = Multi-Purpose Internet Mail Extension
OSPF = Open Shortest Path First
RSVP = Resource ReSerVation Protocol
SMTP = Simple Mail Transfer Protocol
SNMP = Simple Network Management Protocol
TCP = Transmission Control Protocol
UDP = User Datagram Protocol

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Network Protocols - SMTP

- Simple Mail Transport Protocol
  - **MTP** is a set of communication guidelines that allow software to transmit an electronic mail over the internet is called Simple Mail Transfer Protocol.
  - It is a program used for sending messages to other computer users based on e-mail addresses.

Network Protocols - FTP

- File Transfer Protocol
  - FTP is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another.
  - It is mainly used for transferring the web page files from their creator to the computer that acts as a server for other computers on the internet.

Network Protocols - MIME

- Multipurpose Internet Mail Extensions
  - An Internet standard that extends the format of email messages to support text in character sets other than ASCII, as well as attachments of audio, video, images, and application programs.
  - Message bodies may consist of multiple parts, and header information may be specified in non-ASCII character sets.
  - Email messages with MIME formatting are typically transmitted with standard protocols, such as the Simple Mail Transfer Protocol (SMTP), the Post Office Protocol (POP), and the Internet Message Access Protocol (IMAP).

Network Protocols - POP

- Post office protocol
  - An application-layer Internet standard protocol used by e-mail clients to retrieve e-mail from a mail server

Network Protocols - TELNET

- Telnet is an application protocol used on the Internet or local area network to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.

Network Protocols - DNS

- Domain Name System
  - A hierarchical and decentralized naming system for computers, services, or other resources connected to the Internet or a private network.
  - It associates various information with domain names assigned to each of the participating entities.

Network Protocols - DHCP

- Dynamic Host Configuration Protocol
  - A network management protocol used on Internet Protocol networks whereby a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on a network so they can communicate with other IP networks.

Network Protocols - ARP

- Address Resolution Protocol
  - A communication protocol used for discovering the link layer address, such as a MAC address, associated with a given internet layer address, typically an IPv4 address. This mapping is a critical function in the Internet protocol suite.

Network Protocols - RARP

- Reverse Address Resolution Protocol
  - An obsolete computer networking protocol used by a client computer to request its Internet Protocol (IPv4) address from a computer network, when all it has available is its link layer or hardware address, such as a MAC address.

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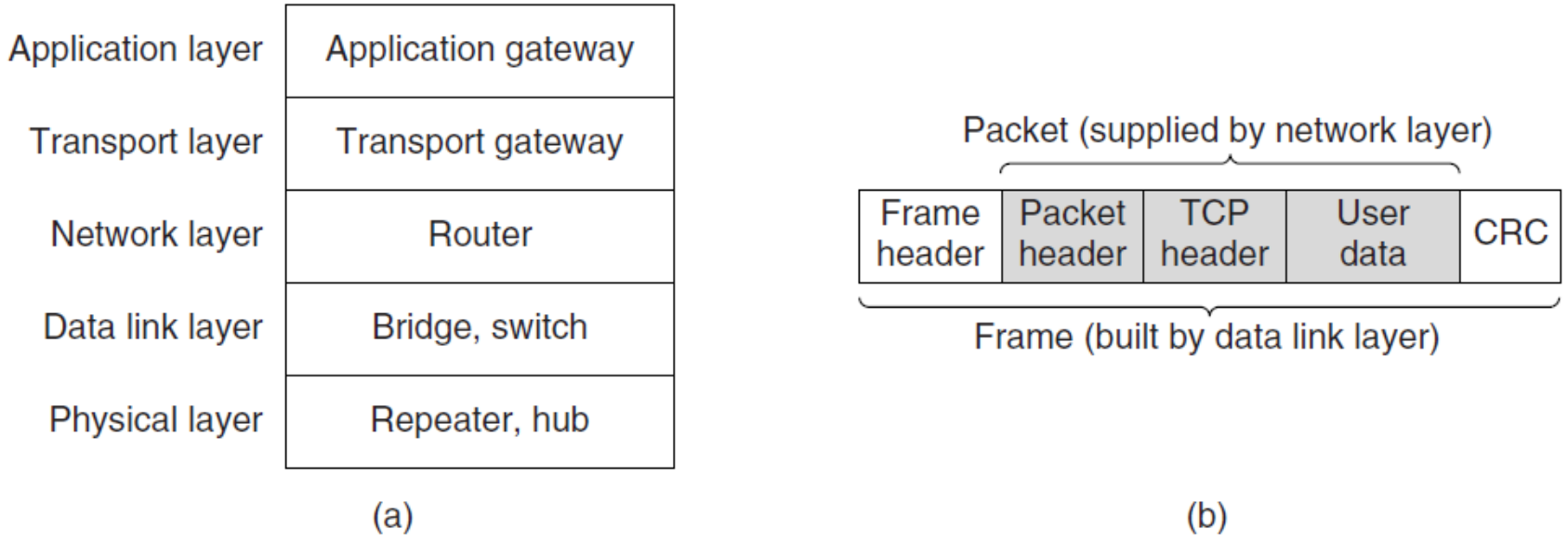
Network Devices



(a) Which device is in which layer.
(b) Frames, packets, and headers.

Network Devices – Repeater

- Analog devices that work on physical layer.
- Signal appearing on one cable is cleaned up, amplified and put on another cable.
- Repeaters do not understand frames, packets or headers. They understand symbols that encode bits as volts.
- Original Ethernet network was designed to allow four repeaters that would boost signals to extend the maximum cable length from 500 meters to 2500 meters.

Network Devices – Hub

- A hub has a number of input lines that it joins electrically.
- Frame arriving on any of the lines are sent out on all the others.
- If two frames arrive at the same time, they will collide, just as on a coaxial cable.
- All lines coming into a hub must operate at the same speed.
- Hubs differ from repeaters in that they do not amplify the incoming signals and are designed for multiple input lines.
- Hubs are also physical layer devices that do not examine link layer addresses or use them in any way.

Network Devices – Bridges

- A bridge connects two or more LANs.
- A bridge has multiple ports, usually enough for 4 to 48 input lines of a certain type.
- Unlike a hub, each port is isolated to be its own collision domain.
- When a frame arrives, the bridge extracts the destination address from the frame header and looks it up in a table to see where to send the frame.
- For Ethernet, this address is the 48-bit destination address.
- The bridge only outputs the frame on the port where it is needed and can forward multiple frame at the same time.

Network Devices – Switch

- Switches are modern bridges by another name.
- Bridges were developed when classic Ethernet was in use, so they tend to join relatively few LANs and thus have relatively few ports.
- Today, networks use point-to-point links, such that individual computers connect directly to switch and thus switch will have many ports.
- A switch may refer to Ethernet switch like a bridge or one that makes forwarding decision, such as a telephone switch.

Network Devices – Routers

- When a packet comes to router, the frame header and trailer are stripped off and packet located in frame's payload field is passed to routing software.
- The software uses this packet header to choose an output line.
- For an IP packet, the header will contain 32-bit (IPv4) or 128-bit (IPv6) address.
- The routing software does not see the frame addresses and does not even know whether the packet came in on a LAN or a point-to-point line.

Network Devices – Gateways

- Gateways connect two computers that use different connection-oriented transport protocols.
- For example, a computer using connection-oriented TCP/IP protocol needs to talk to a computer using a different connection-oriented transport protocol called SCTP.
- The transport gateway can copy the packets from one connection to the other, reformatting them as need be.
- Application gateway understand the format and contents of the data and can translate messages from one format to another.
- An email gateway can translate internet messages into SMS for mobile phones.