COMPUTER COMMUNICATION NETWORK

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Introduction to the Data Link Layer

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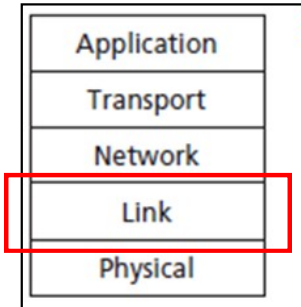
Node and Link

- Data link layer runs on Nodes
- Nodes include hosts, routers, switches, and WiFi access points
- Channels that connect adjacent nodes along the communication path are referred as links
- For transfer of datagram from source host to destination host, it must move over multiple individual links in the end-to-end path
- Data Link Layer is responsible to manage the activity.

Data Link Layer Position and role in stack

- Link layer makes datagram ready for transmission for a specific media
- It receives datagram from Network layer
- Produce frame for the media type
- Decide when to transmit
- Instruct Physical layer to transmit
- Receives frames from physical layer destined for it
- Provides datagram to network layer



TCP/IP model

Link layer:

- Ensures reliable packet flow across each link on the path between a pair of source and destination independently
  - Using respective link layer protocol
- Flow of packets across a link requires identifiers for that node
  - This is accomplished by *MAC address*
- Provides synchronization between sender and receiver of each link
- Divide datagram if required
- Appends a new header to the datagram
- Datagram plus header is called *frame*
- Checks for errors in frame

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This unit contains topics of

- Introduction to the data link layer
- Error Detection and Correction Techniques
- Multiple access link and protocol
- Switched local area network
- Ethernet
- VLAN
- Wireless Network

Link layer hopping

- Network layer (IP address) says about source to destination
- But they may not be directly connected via a link
- There may be many intermediate nodes for actual journey with different types of media
- Network layer determine the scheme of travel data link layer execute the scheme for a packet
- This is like going from college to home with break journey using different transport media like bus, auto

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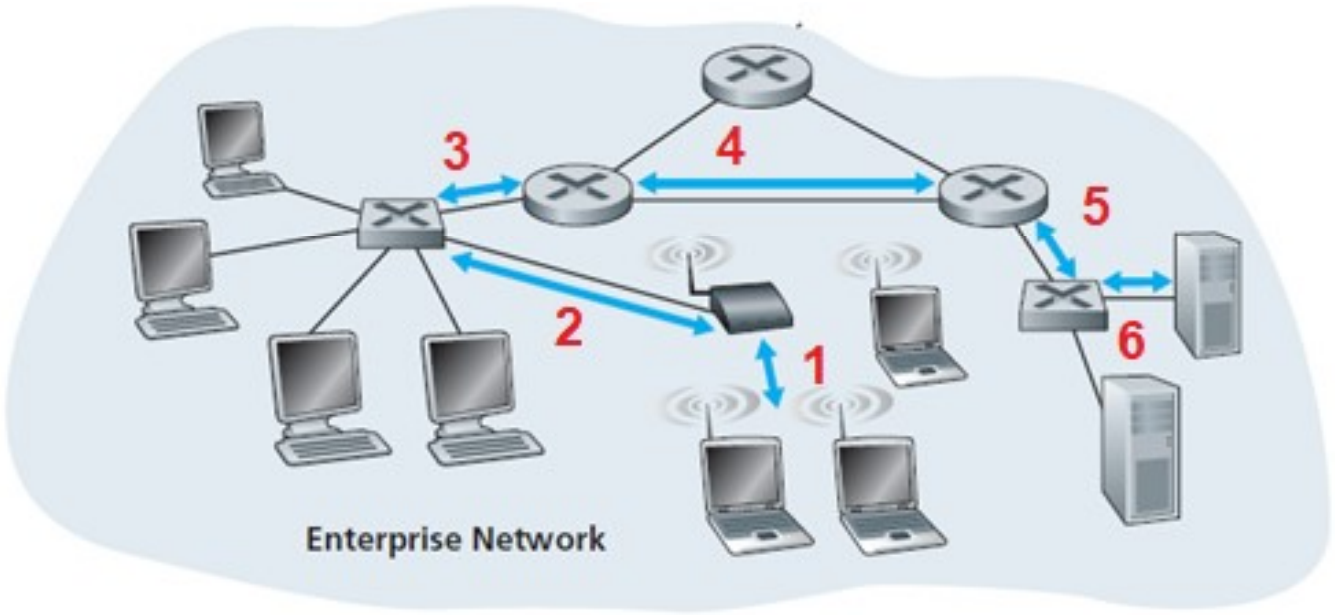

Role and importance

- Implemented in the network adapter
- Moves the datagrams across a link
- Most functions are done in hardware and few in software
- Data at link layer referred to as frames
- Services:
  - Framing: Format is different for medium
  - Link access: Depends on the medium and network topology
  - Reliable delivery: May be offered on error prone links
  - Error detection and correction: Discard corrupt frames

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Role and importance

- Framing:
  - Determine the start and end of a frame from bitstream received through physical layer
  - Consists of frame header followed by the datagram
  - Frame header may contain the MAC address, flags, frame synchronization bits, error detection codes, etc.
  - Determine if the frame is for the host or to reject the frame
- Link access:
  - Sharing of physical medium
  - Random access or guaranteed access

- Reliability:
  - Performance in a wireless medium is prone to errors
  - Kind of TCP, so that problem is handled in lower level only
  - Link access is adapted according to the physical layer
- Error detection techniques :
  - Parity check method
  - Checksumming method
  - Cyclic redundancy check (CRC) method

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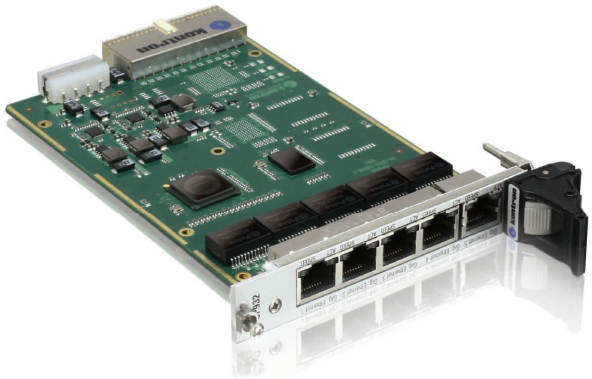
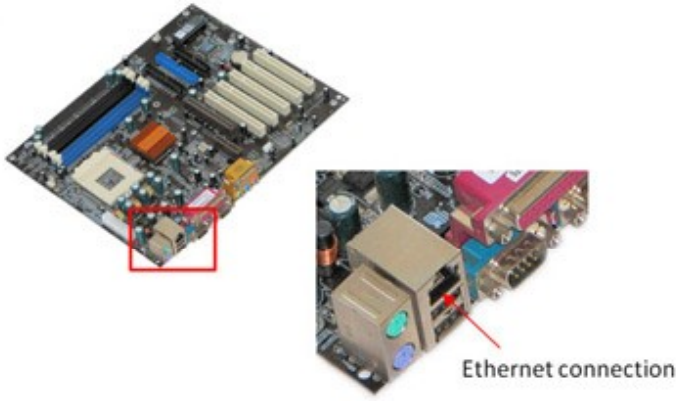
Implementation : NIC examples





- Most network adapters were physically separate cards (such as a PCMCIA card or a plug-in card fitting into a PC's PCI card slot)
- But increasingly, network adapters are being integrated onto the host's motherboard—a so-called LAN-on-motherboard configuration.

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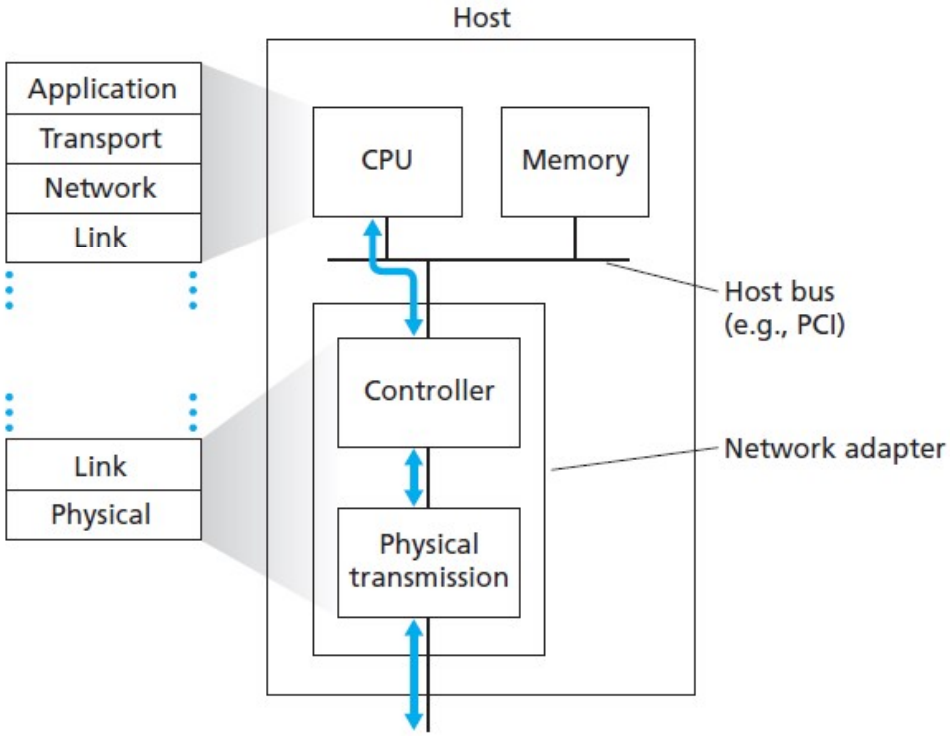
Implementation



- The software components of the link layer implement higher-level link layer functionality such as assembling link-layer information and activating the controller hardware.
- On the receiving side, link-layer software responds to controller interrupts (e.g., due to the receipt of one or more frames), handling error conditions and passing a datagram up to the network layer.
- Thus, the link layer is a combination of hardware and software—the place in the protocol stack where software meets hardware.

THANK YOU

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