Link Layer

Instructor: C. Pu (Ph.D., Assistant Professor)

Lecture 15

puc@marshall.edu

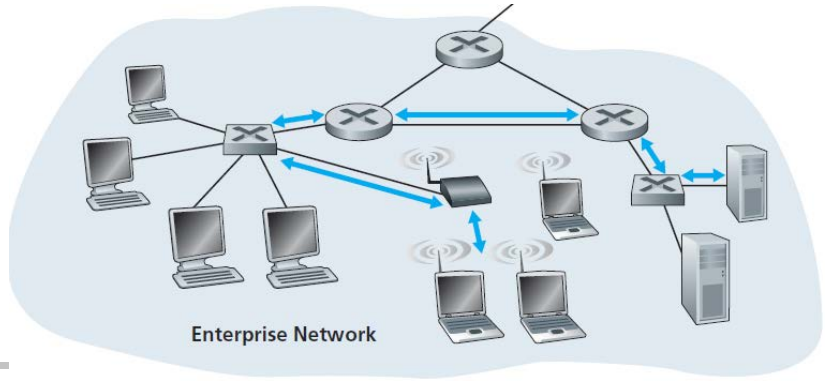
Link Layer

- refer to any device that runs a link-layer (i.e., layer 2) protocol as a node
  - nodes include hosts, routers, switches, and WiFi access points

- we will also refer to the communication channels that connect adjacent nodes along the communication path as links.

- in order for a datagram to be transferred from source host t destination host, it must be moved over each of the individual links in the end-to-end path.

Link Layer



- for example: sending a datagram from one of the wireless hosts to one of the servers
  - this datagram will actually pass through six links:
    - a WiFi link between sending host and WiFi access point,
    - an Ethernet link between the access point and a link-layer switch;
    - a link between the link-layer switch and the router,
    - a link between the two routers;
    - an Ethernet link between the router and a link-layer switch;
    - and finally an Ethernet link between the switch and the server.

- over a given link, a transmitting node encapsulates the datagram in a link-layer frame and transmits the frame into the link.

Link Layer (cont.)

- transportation analogy
  - trip from Princeton (New Jersey) to Provins (Paris)
  - limo: Princeton to JFK airport
  - plane: JFK airport to Paris airport
  - train: Paris airport to Provins

- tourist = datagram
- transport segment = communication link
- transportation mode = link layer protocol
- travel agent = routing algorithm

Link Layer Services

- *the basic service of any link layer is to move a datagram from one node to an adjacent node over a single communication link*
- *framing:*
  - encapsulate datagram into frame, adding header
    - the structure of the frame is specified by the link-layer protocol
- *link access:*
  - channel access if shared medium
  - **Medium Access Control (MAC) protocol**
    - specifies the rules by which a frame a transmitted onto the link
- *reliable delivery between adjacent nodes*
  - when a link-layer protocol provides reliable delivery service, it guarantees to move each network-layer datagram across the link without error.

Link Layer Services (cont.)

- *error detection*:
  - the link-layer hardware in a receiving node can incorrectly decide that a bit in a frame is zero when it was transmitted as a one, and vice versa.
  - such bit errors are introduced by signal attenuation or noise
  - receiver detects presence of errors:
    - signals sender for retransmission or drops frame

- error correction:
  - receiver identifies *and corrects* bit error(s) without resorting to retransmission