Introduction to Networks and the Internet

CMPE 80N

Winter 2004

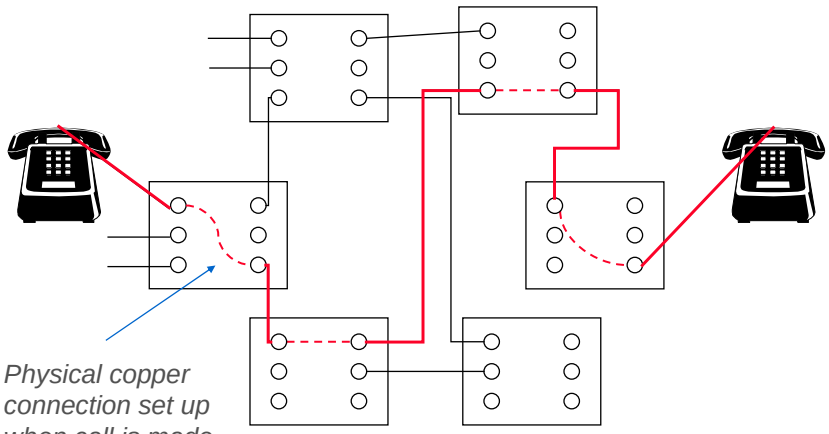
Lecture 15

Announcements

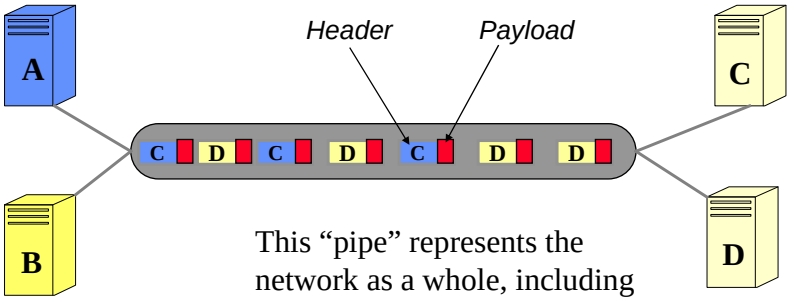
- *Quiz 3 on Friday, 02.13.*
- *Discussion session on Thu during Debasree's office hours.*
  - *Test quiz.*
- *Kiran has office hours just before quiz.*
- *HTML session.*

Circuit versus Packet Switching

Circuit Switching



Packet Switching



The Internet

- *Example of packet switching network!*

Datagram and Virtual Circuit

- *Packet switching networks can provide 2 different types of services to transport layer.*
  - *Virtual circuit.*
  - *Datagram.*

Virtual Circuit

- *Analogy to physical circuits used by telephone networks.*
- *At connection establishment time, path from source to destination is selected and used throughout connection lifetime.*
- *When connection is over, virtual circuit terminated.*

Datagram

- *No logical connection.*
- *Each packet (datagram) routed independently; successive packets may follow different routes.*
- *More work at intermediate routers, but more robust and adaptive to failures and congestion.*

The Internet

- *Datagram network!*
- *Datagrams are formed by **header** and **payload.***
- *IP Datagrams can have different sizes*
  - *Header is fixed (20 bytes)*
  - *Data area can contain between 1 byte and 65 KB*

Forwarding Datagrams

- *Header contains all information needed to deliver datagrams to **destination.***
  - *Destination address.*
  - *Source address.*
- *Router examines header of each datagram and forwards it along path to destination.*

Routers

- *For VCs, routers keep a table with (VC number, outgoing interface) entries.*
  - *Packets only need to carry VC number.*
- *For datagrams, routing table.*
  - *(destination, outgoing interface) entries.*
  - *Each packet must carry destination address.*

Routing Algorithms

- *Routing algorithm: decides which route a packet should take from source to destination.*
  - *For router: which interface a packet should be forwarded.*

Routing Algorithms (cont'd)

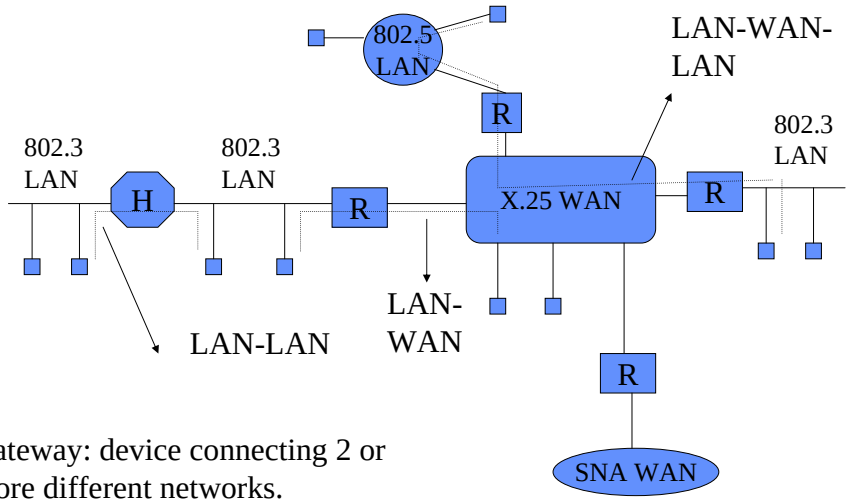
- *If datagram network, decision is made for every packet.*
- *If VC, decision is made only once when VC is setup.*

Internetworking

Internetworking

- *Interconnection of 2 or more networks forming an internetwork, or internet.*
  - *LANs, MANs, and WANs.*
- *Different networks mean different protocols.*
  - *TCP/IP, IBM's SNA, DEC's DECnet, ATM, Novell and AppleTalk.*

Example Internetwork



Gateway: device connecting 2 or more different networks.

Gateways

- *Repeaters/hubs: operate at physical layer (bits); amplify/regenerate signal.*
- *Routers: operate at network layer.*
- *Gateways: interconnect (different) networks.*

How do networks differ?

- *Service offered: datagram versus virtual circuit.*
- *Protocols: Ethernet, token ring, etc.*
- *Addressing: flat (802) versus hierarchical (IP).*
- *Maximum transmission unit.*
- *Etc…*

Summary

- *Main functions of the network layer:*
  - *Routing.*
  - *Forwarding.*
- *What is routing?*
  - *What does a routing algorithm do?*
  - *Different routes may exist.*
- *Forwarding.*
- *Switches and routers.*
  - *Switched network versus a network connecting a host to every other host directly.*

Summary (cont'd)

- *Switch internals.*
  - *Incoming and outgoing interfaces.*
- *Store and forward.*
  - *Queuing.*
- *Next-hop forwarding.*
- *Routing table.*
  - *What it is and what it is used for.*
  - *How to build one based on a given topology.*
  - *Role of hierarchical addresses.*

Summary (cont'd)

- *Circuit- versus packet switching.*
- *Packet switching.*
  - *Virtual circuit versus datagram.*
  - *What does the Internet use?*
  - *Implications to routers.*