Week 5 – MAC Contd & Network Layer Starts

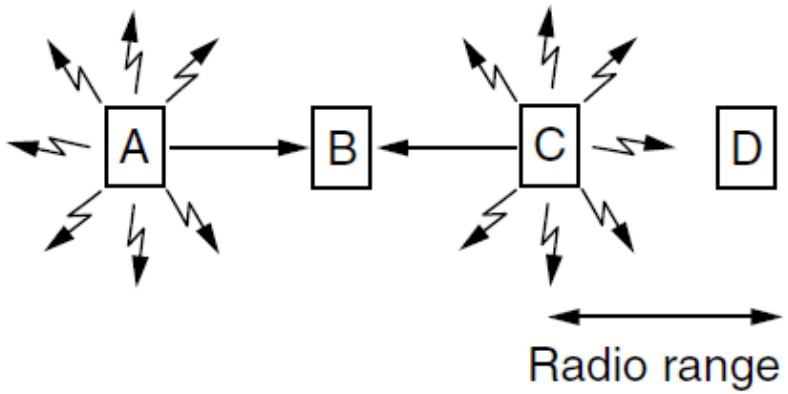
Internet Technologies
COMP90007

Wireless LAN Protocols & MAC

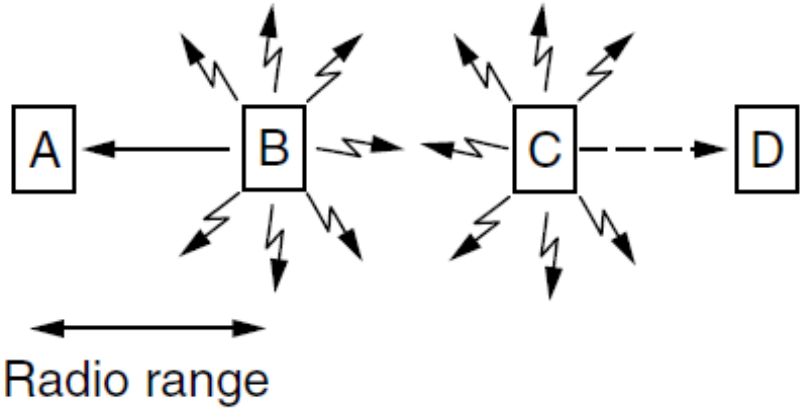
- Wireless Complications: **when a station is in the range of two transmitters or relays**, interference affects signal reception
- Leads to **hidden** and **exposed terminal** problems
- Require **detection of transmissions to receiver, not just carrier sensing**
- Transmission Protocols for Wireless LANs (802.11)
  - Multiple Access with Collision Avoidance for Wireless (MACAW)

Hidden and Exposed terminals

- **Hidden terminals** are senders that cannot sense each other but nonetheless collide at intended receiver
- A and C are hidden terminals when sending to B



- **Exposed terminals** are senders who can sense each other but still transmit safely (to different receivers)
  - Desirably concurrency; improves performance
  - B → A and C → D are exposed terminals



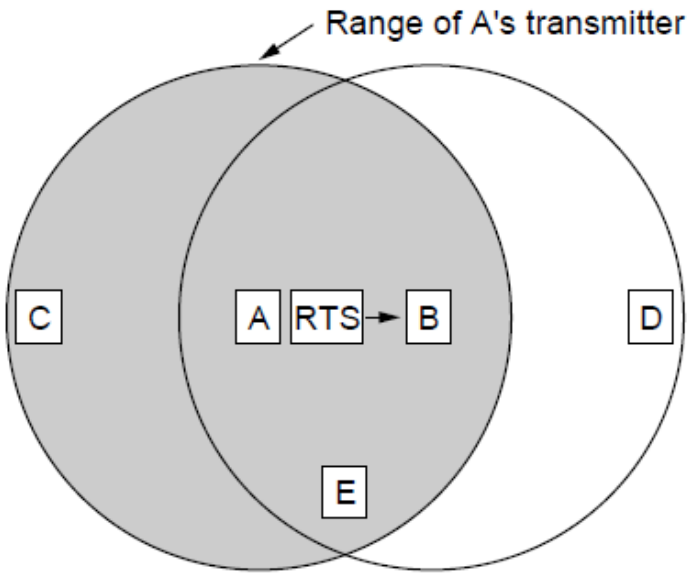
Multiple Access with Collision Avoidance (MACA)

- Sender asks receiver to transmit short control frame
- Stations near receiver hear control frame
- Sender can then transmit data to receiver

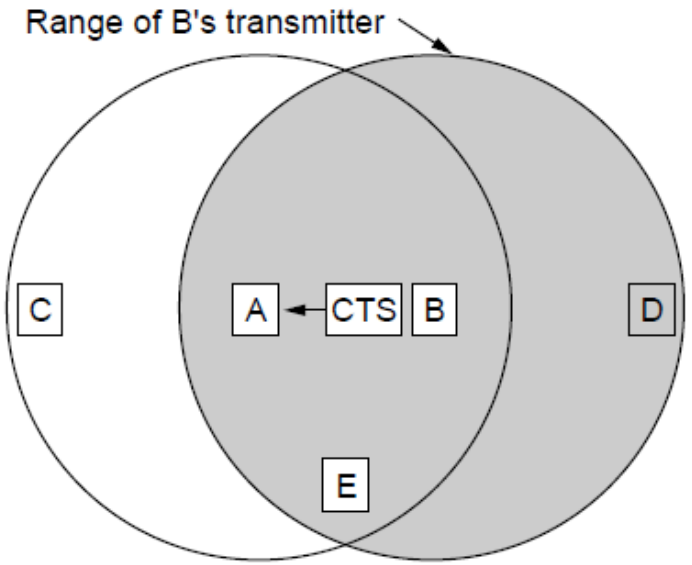
MACA

MACA protocol grants access for A to send to B:

- A sends RTS to B [left]; B replies with CTS [right]



A sends RTS to B; C and E hear and defer for CTS



B replies with CTS; D and E hear and defer for data

Network Layer Starts

Reading

We start Chapter 5 from the book.

This is one of the longest chapters with 150 pages.

Please skim this chapter while referring to slides.

Focus on content that we cover when reading in detail.

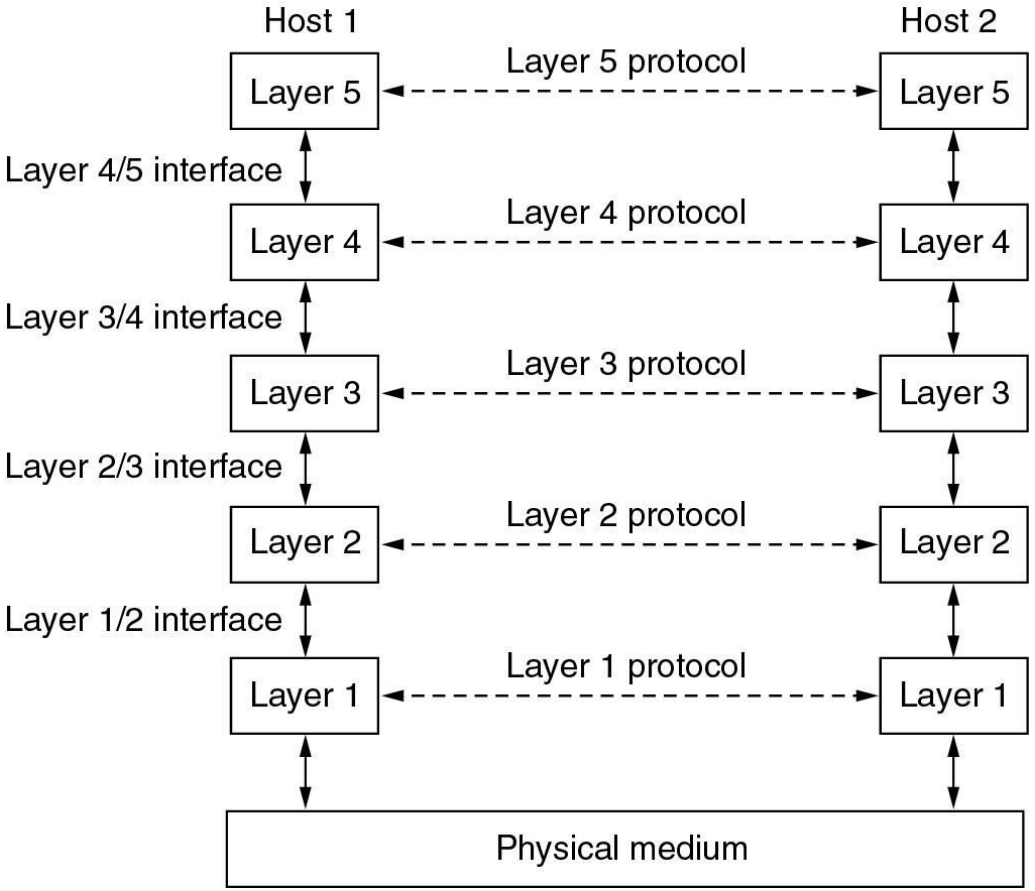
Some of the content will be covered later in semester.
(Congestion control within another chapter so skim now but we will refer back later.)

Network Model

Connecting different networks (internetworking)

Framing, reliability and flow control (direct conn.)

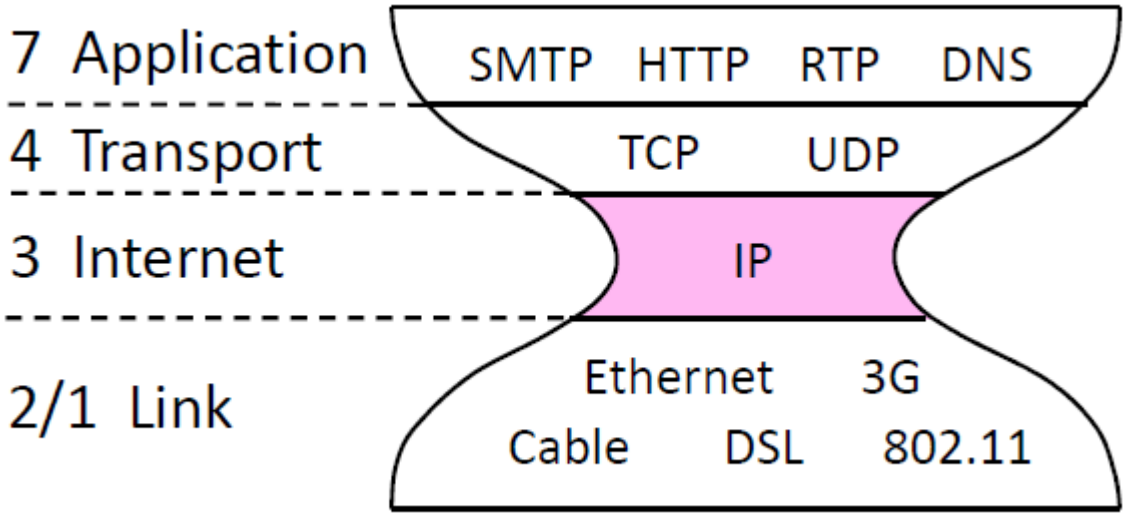
Different Cables, wireless signalling digital to analogue



Internet Protocol (IP)

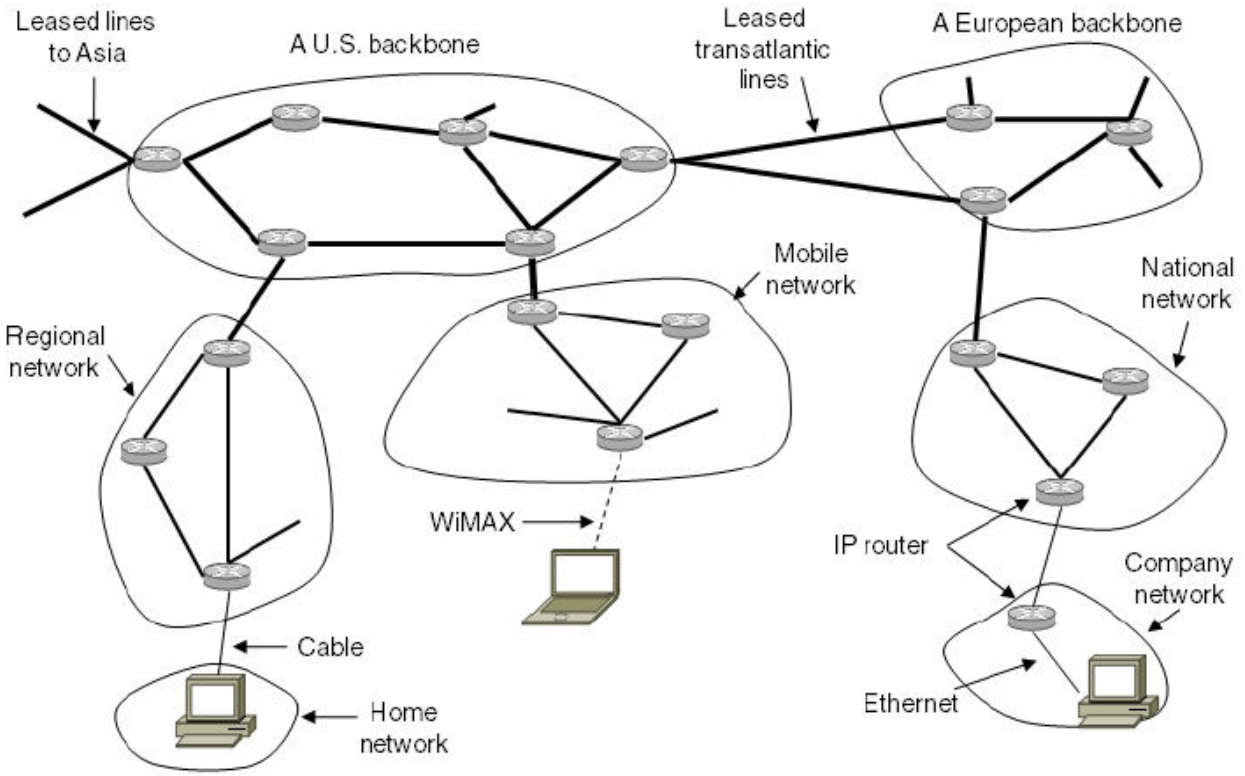
- The ***glue that holds the whole Internet together*** is the network layer protocol, IP (Internet Protocol)
- Provides a "best-effort" service to route **datagrams** from source host to destination host
- These hosts may be
  - On same network
  - On different networks
- Each network is called an Autonomous System (AS)

Protocol Stack



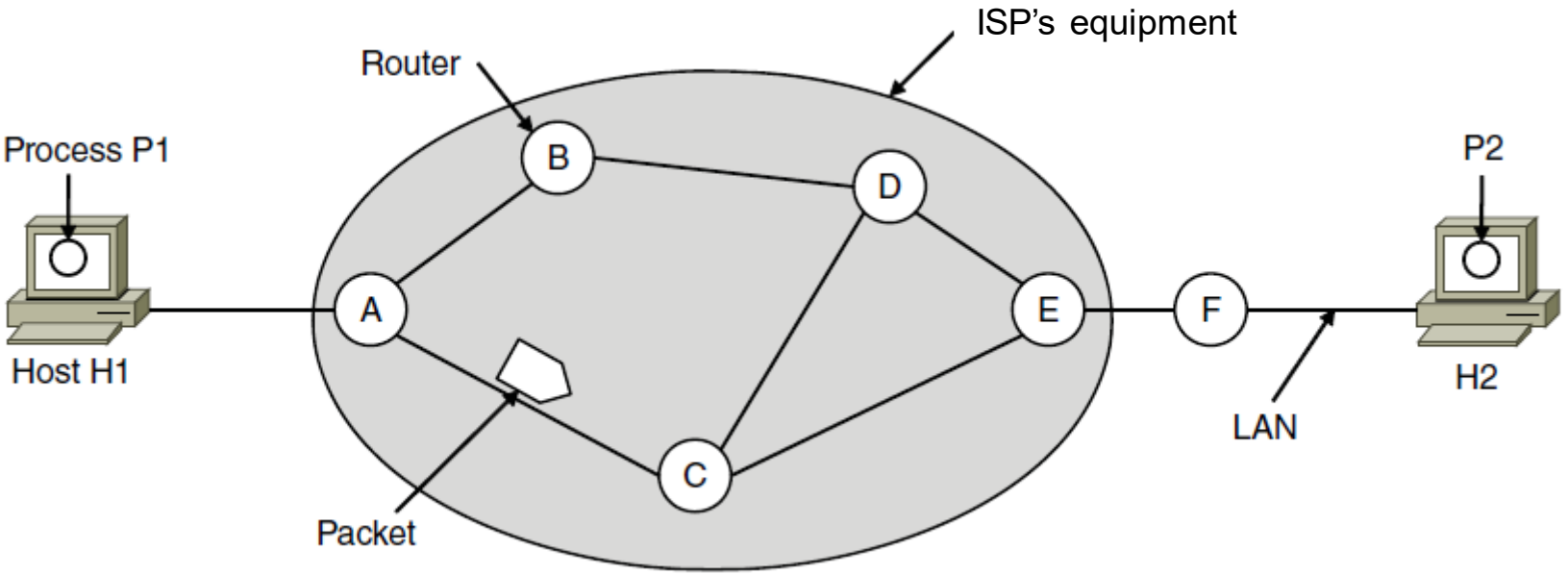
Network Layer in the Internet

- Internet is an interconnected collection of many networks of Autonomous systems that is held together by the IP protocol

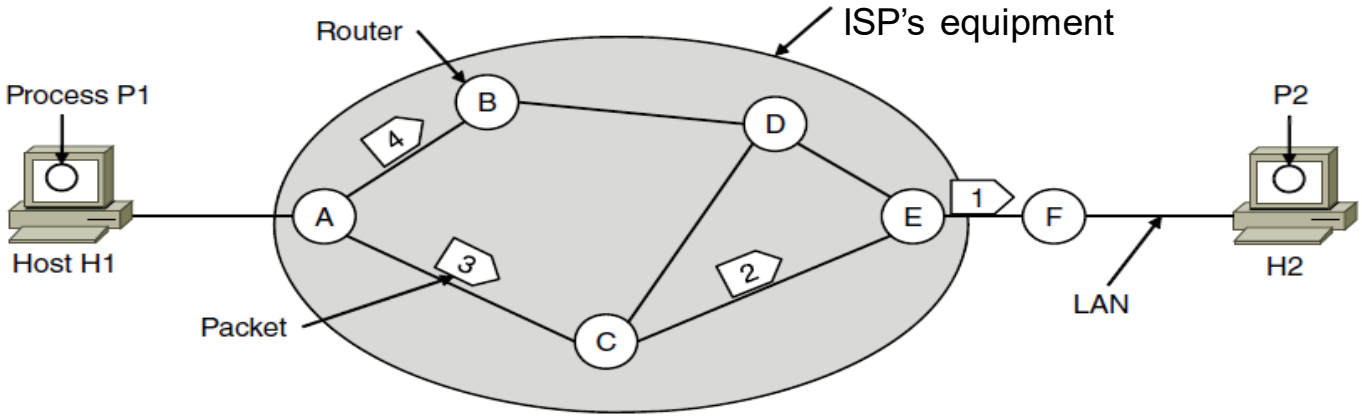


Store & Forward Packet Switching

- Hosts generate packets and injects into the network
- Routers treat packets as “messages”, receiving (storing) them and then forwarding them based on how the it is addressed
- ***Router routes packets through the network***



Routing



A's table (initially)

Dest.	Line
A	⊠
B	B
C	C
D	B
E	C
F	C

A's table (later)

A	⊠
B	B
C	C
D	B
E	B
F	B

C's Table

A	A
B	A
C	⊠
D	E
E	E
F	E

E's Table

A	C
B	D
C	C
D	D
E	⊠
F	F

Services Provided to the Transport Layer

- Design goals:
  - Services should be **independent of router technologies**
  - **Transport layer should be shielded** from number, type and topology of routers
  - **Network addressing should use a uniform numbering** plan

Types of Services

1. Connectionless: Datagram Packets injected into subnet independently and **packets individually routed to destination**
   - Internet moves packets in a potentially unreliable environment - **QoS is not easily implemented**
   - Flow and error control done by the hosts

2. Connection-oriented: Alternatively, data travelling between destinations all use the same route
   - Telco: guarantee reliability - QoS is important