

MAC protocol

Channel

partitioning

- TDMA

- FDMA

Random

Access

- ALOHA

- slotted ALOHA

- CSMA,
CSMA/CD
(wired)

- CSM/CA
(wireless)

Taking

turns

No ch.p.

⇒ Full link b/w

- use concept of
taking turns to avoid
collisions

↑ prevent collisions ^(some) before they happen

Ch. p.

R. A.

T.T.

High traffic

Performs

Poor

well, collision

coll. ↑

free

Low traffic Poor performance Performs well

Polling: master/slave, master is SPoF,

invites slave nodes to tx in turn

typically used w/ dumb slave devices

no collisions and no empty slots

- polling overhead, latency

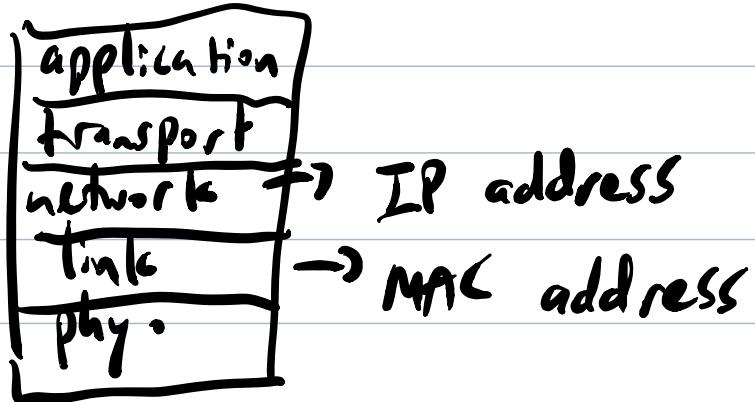
Token passing

- control token from one node to next sequentially in a ring
- token message
- concerns: token overhead, latency, token is SPDF

5.4 LANs

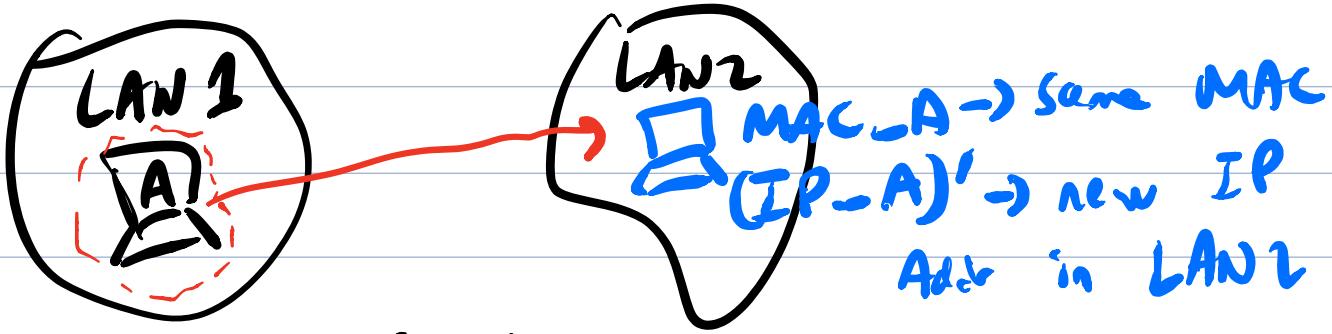
- addressing, ARP
- Ethernet
- switches

MAC Addresses and ARP



MAC address is used locally (within one network) to deliver frames from one interface to another physically connected interface.

- 48-bit MAC Addr burned in NIC ROM
- allocation administered by IEEE, sold to mfgs



Q: How to determine intf MAC Addr from IP?

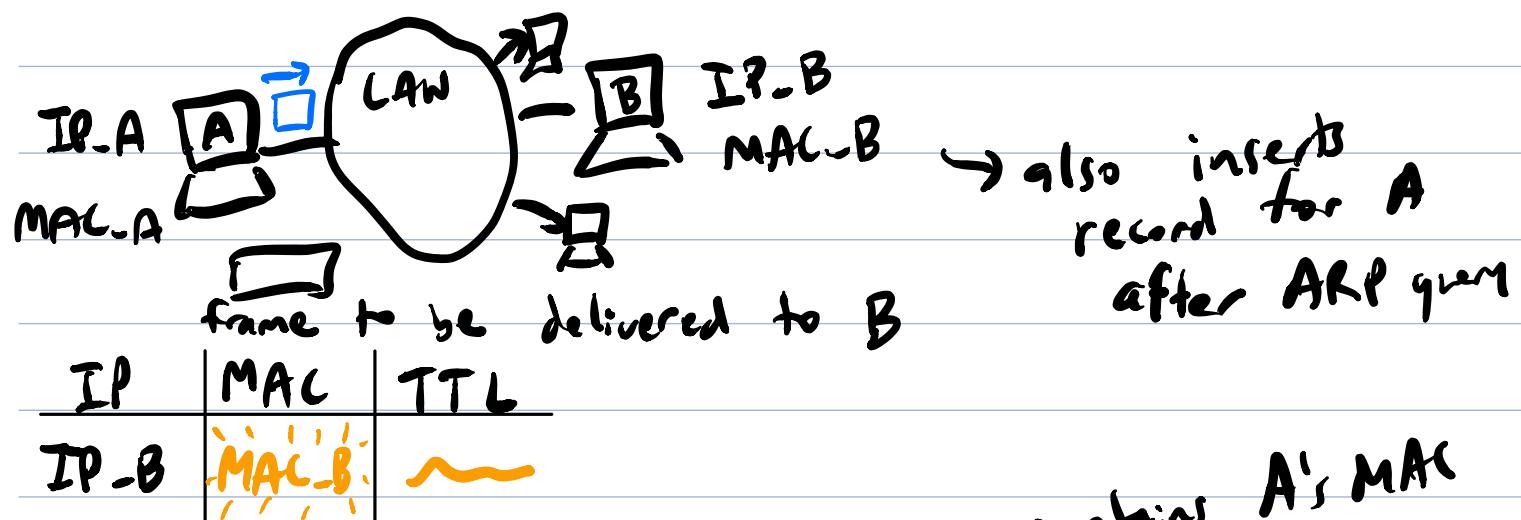
ARP: Addr. Resolution Protocol

Each IP node (every node has a network layer in its stack) will have an ARP table.

IP Addr \leftrightarrow MAC Addr \leftrightarrow TTL

- ttl : time after which mapping will be forgotten (typically 20 min)

Tx frame within one network:



- send **ARP Query** to every other host

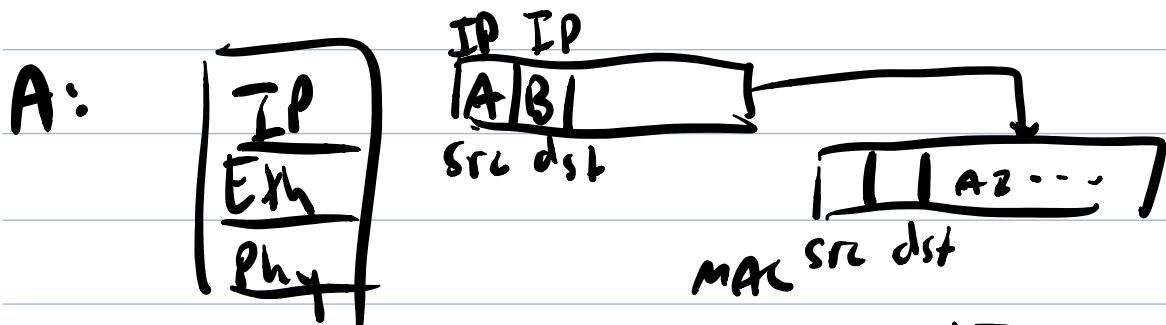
→ uses a broadcast MAC address

FF - FF - FF - FF - FF - FF

→ host B sends ARP reply (unicast) to A

- update A's ARP table, send packet
- plug-and-play protocol
 - create table without intervention

what about different LANs?



- A creates IP datagram w/ IP src A, dst B
- A creates link-layer frame with R's MAC address as dest (ARP)
- frame sent from A to R
- frame rec'd at R, datagram removed
- R forwards datagram with B's MAC as dst

Ethernet (802.3)

- family of protocols used for LANs

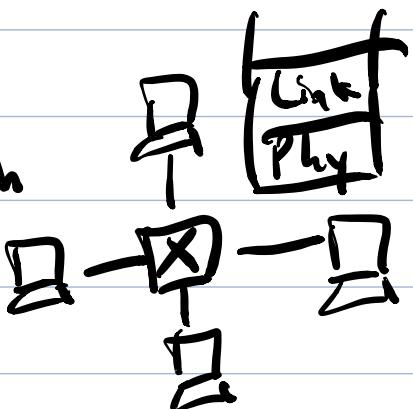
physical topology

bus

- popular thru mid -90s
- coaxial cable
- all nodes in same collision domain

star

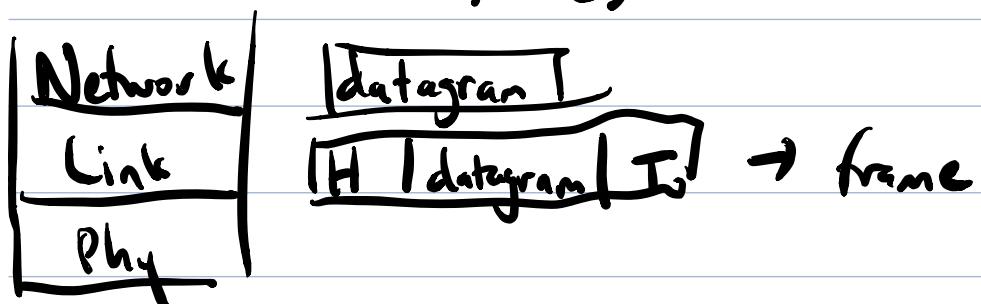
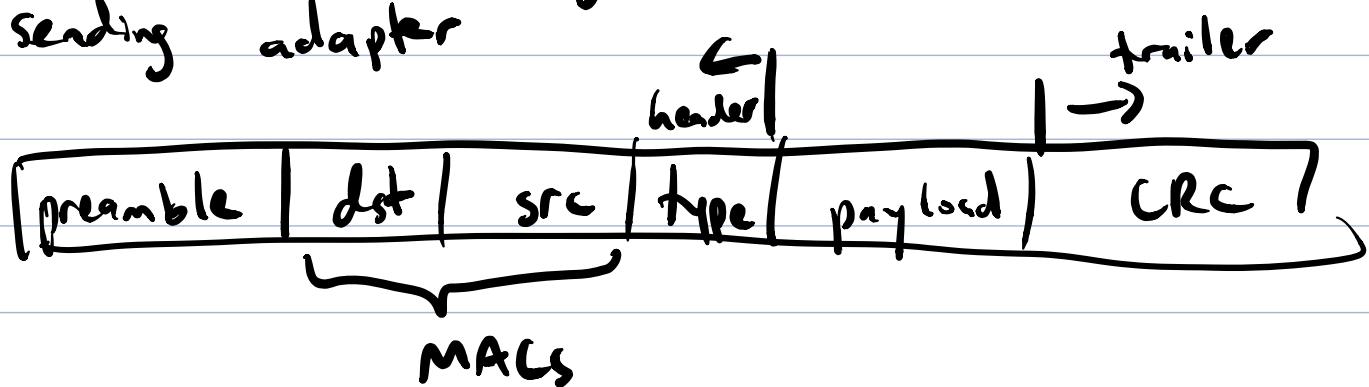
- active switch in centre



- each spoke runs a separate Ethernet protocol (nodes do not collide)

Ethernet frame structure

- encapsulates IP datagram in Eth. frame at sending adapter



preamble: (wakes up) 7 bytes w/ pattern 10101010
 followed by 1 byte w/ 10101011
 - used to synchronize clock rates to mitigate drifts in tx rates

address: 6 byte src, dst MAC addrs

- adapter accepts frame iff dst addr matches or broadcast addr

type: higher layer protocol (mostly IP but others possible)

(RC = error detected \Rightarrow frame dropped)

- connectionless: no handshake

- unreliable: no ACKs, NACKs to sending NICs

\hookrightarrow data lost if dropped; if no higher layer rdt

- unslotted CSMA/CD w/ exponential backoff