

Computer Networks



Media Access Control

Jianping Pan
Fall 2022



11/22/22

CSc 361

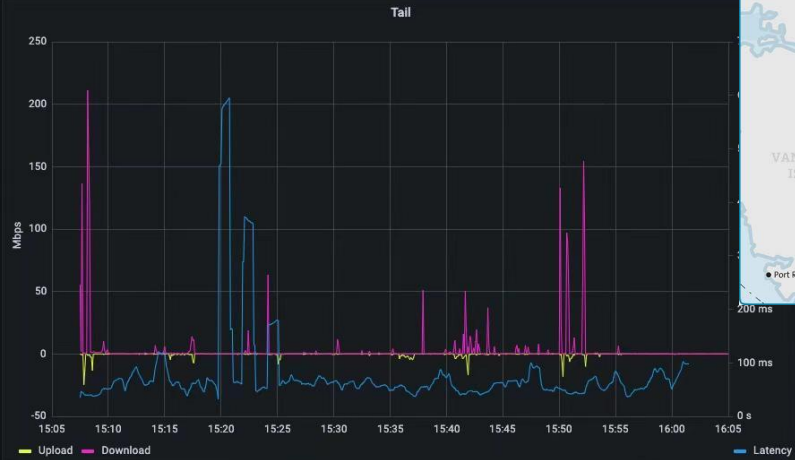
at parking lot e (south of maclaurin building) today¹
ssid: @starlink password: @starlink



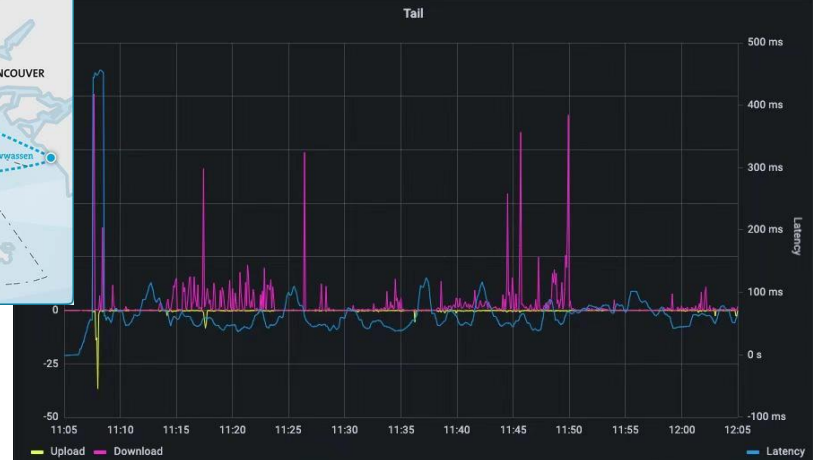
starlink on bcferries

with some happy
free wifi customers

especially at some
cellular blind spots



bcferries used to
have free wifi for
its customers thru
its ship-to-shore
radio link but had to
scrape it off in 2021

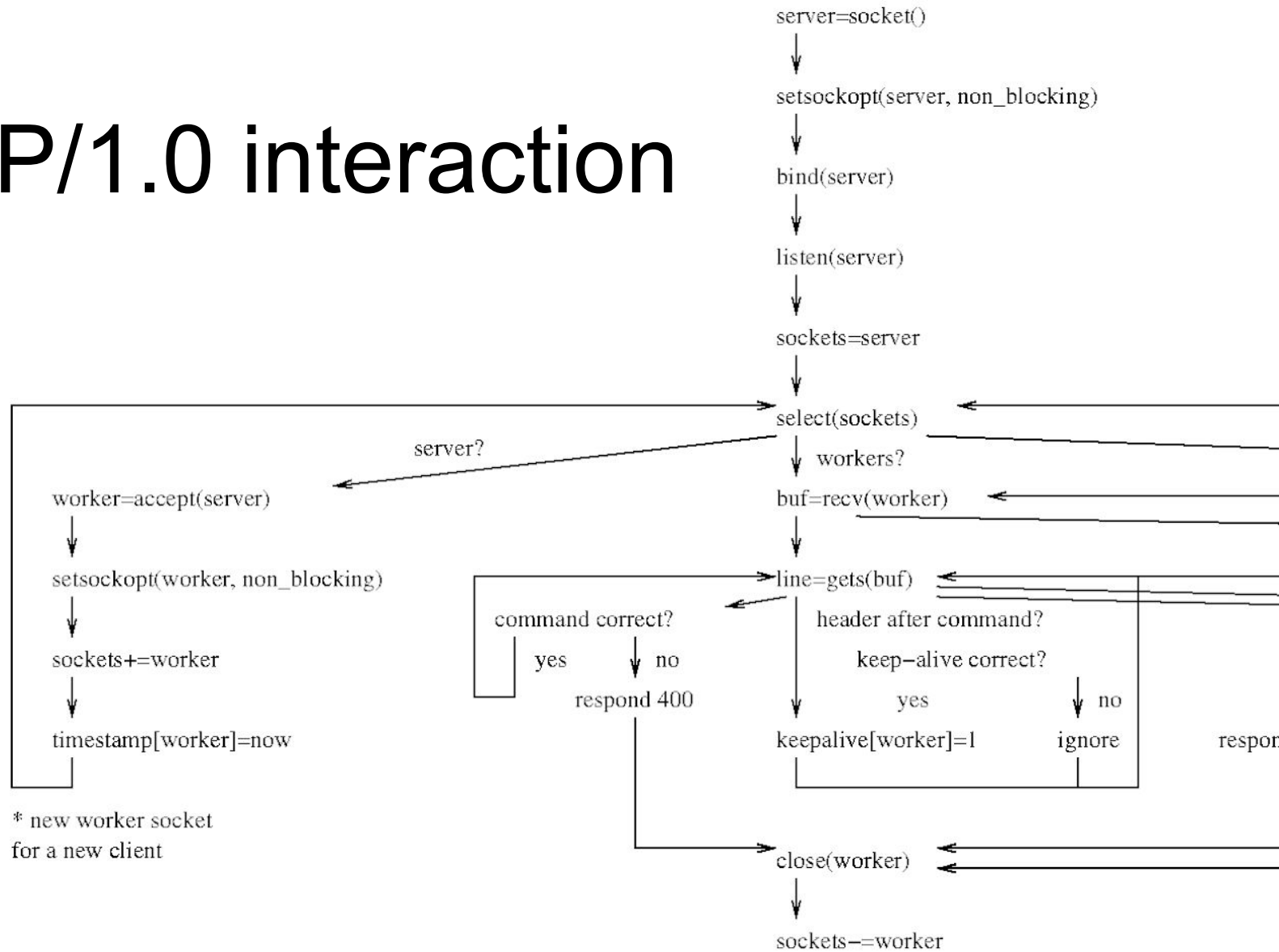


@bcferries: please put
wifi back on boats for
your customers!!!

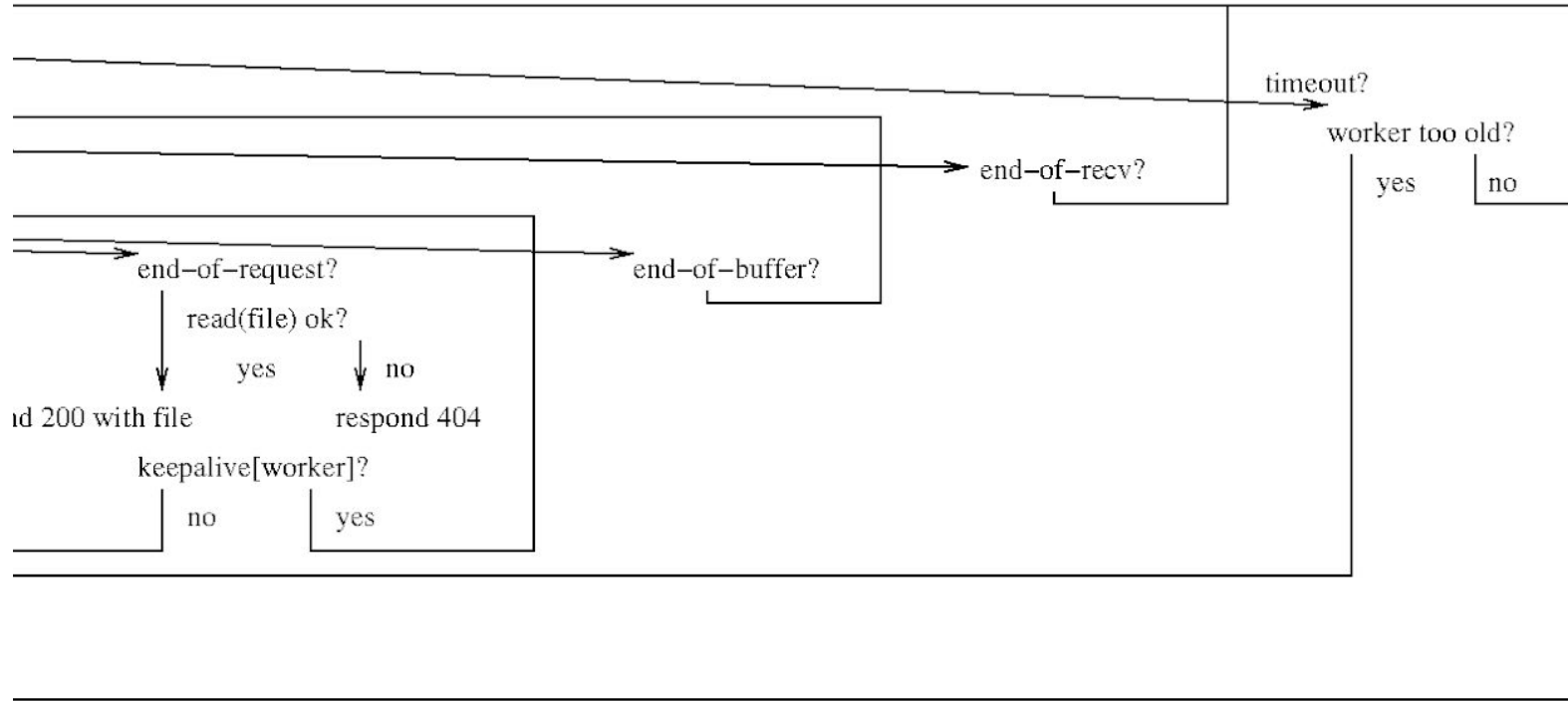
also met jonathan who
worked for aws and
tesla before and will
work for spacex on
starlink ground station
sourcing in asia pacific

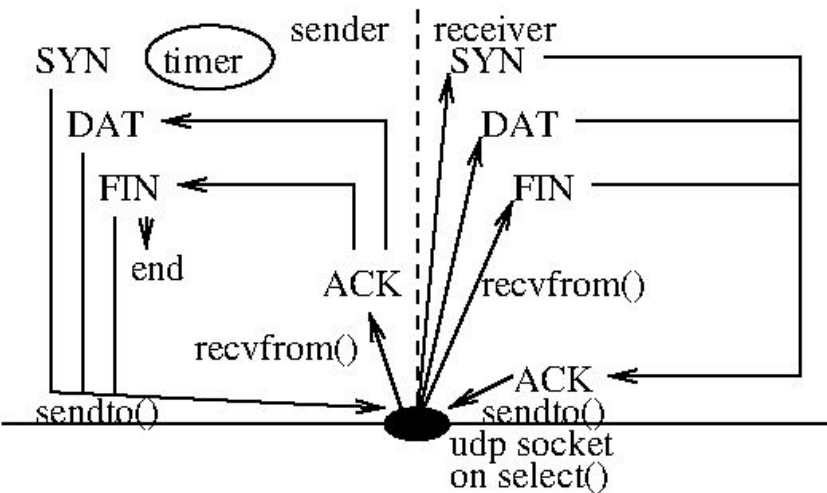


HTTP/1.0 interaction



SWS: keep-alive, idle clients, etc





sender pseudo code in open state

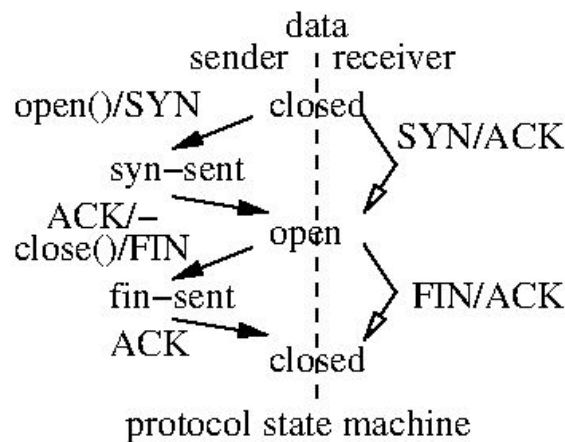
```

forever{
  on application write:
    packetize into packets
    send per receiver's window
    setup timer if not running
    update send_next

  on receiving ACK:
    cancel timer if covered
    setup timer if still unacked packets
    resend the oldest if enough dupacks
    send more if allowed by window

  on sender timeout:
    resend the oldest packet
    setup timer properly
}

```

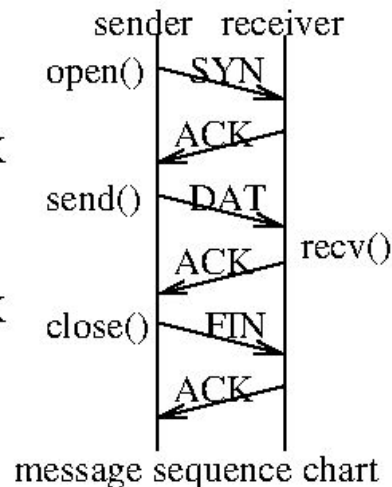


receiver pseudo code in open state

```

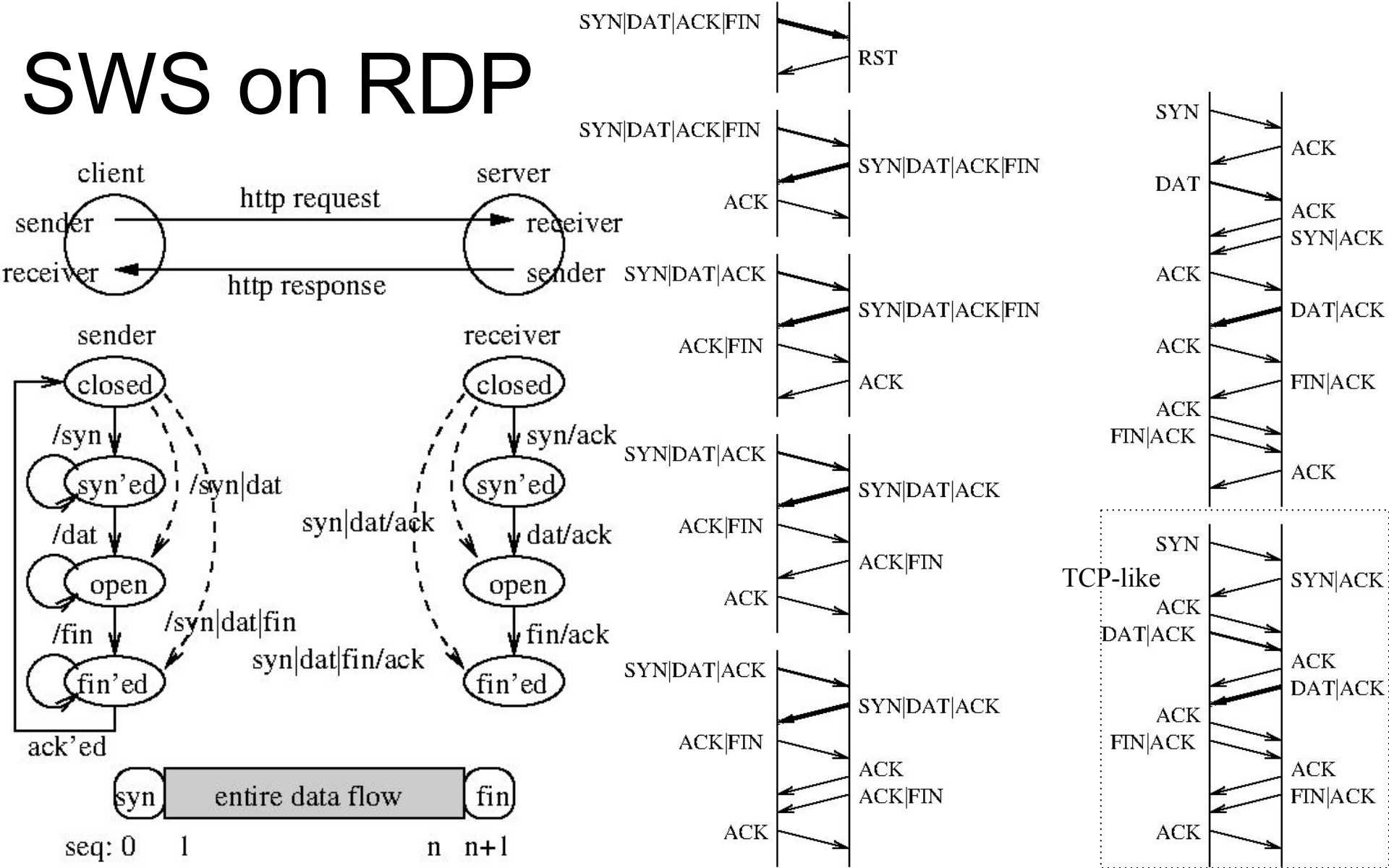
forever{
  on receiving DAT:
    below acked?
      drop
    beyond acked+window?
      send RST; exit
    out of order?
      buffer or drop
    in order?
      buffer and update ackno
      enough in-order data?
        write to file
        update window size
        send ACK
}

```



RDP

SWS on RDP



Review

- Link layer mechanisms
 - frame control
 - error control
 - flow control
- Link layer protocols
 - HDLC, SLIP, PPP
- What if there are multiple transmitters?
 - media access control

Types of links

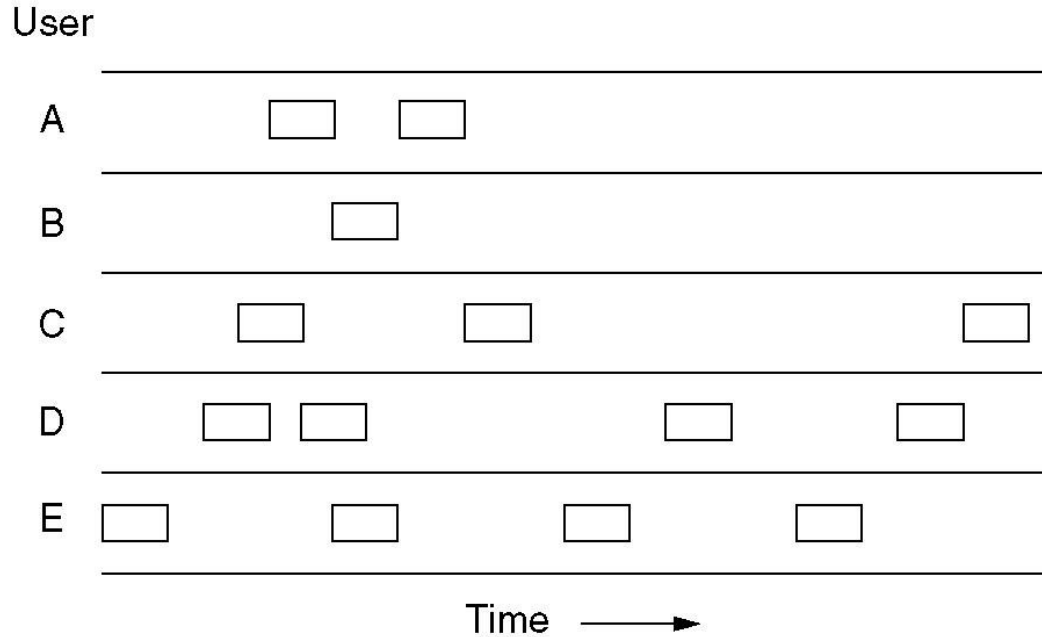
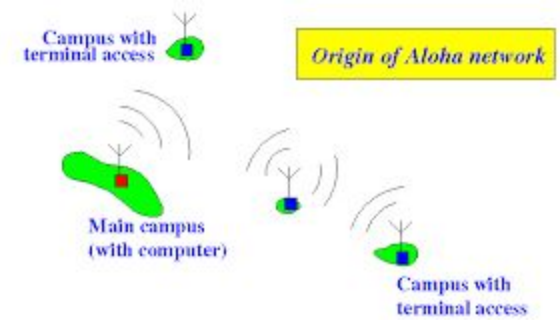
- Point-to-point link
 - dedicated medium for a pair of transceivers
 - e.g., PPP, switched Ethernet
- Broadcast link
 - shared medium by multiple nodes
 - e.g., traditional Ethernet, 802.11
 - collision by concurrent transmission

Media access control

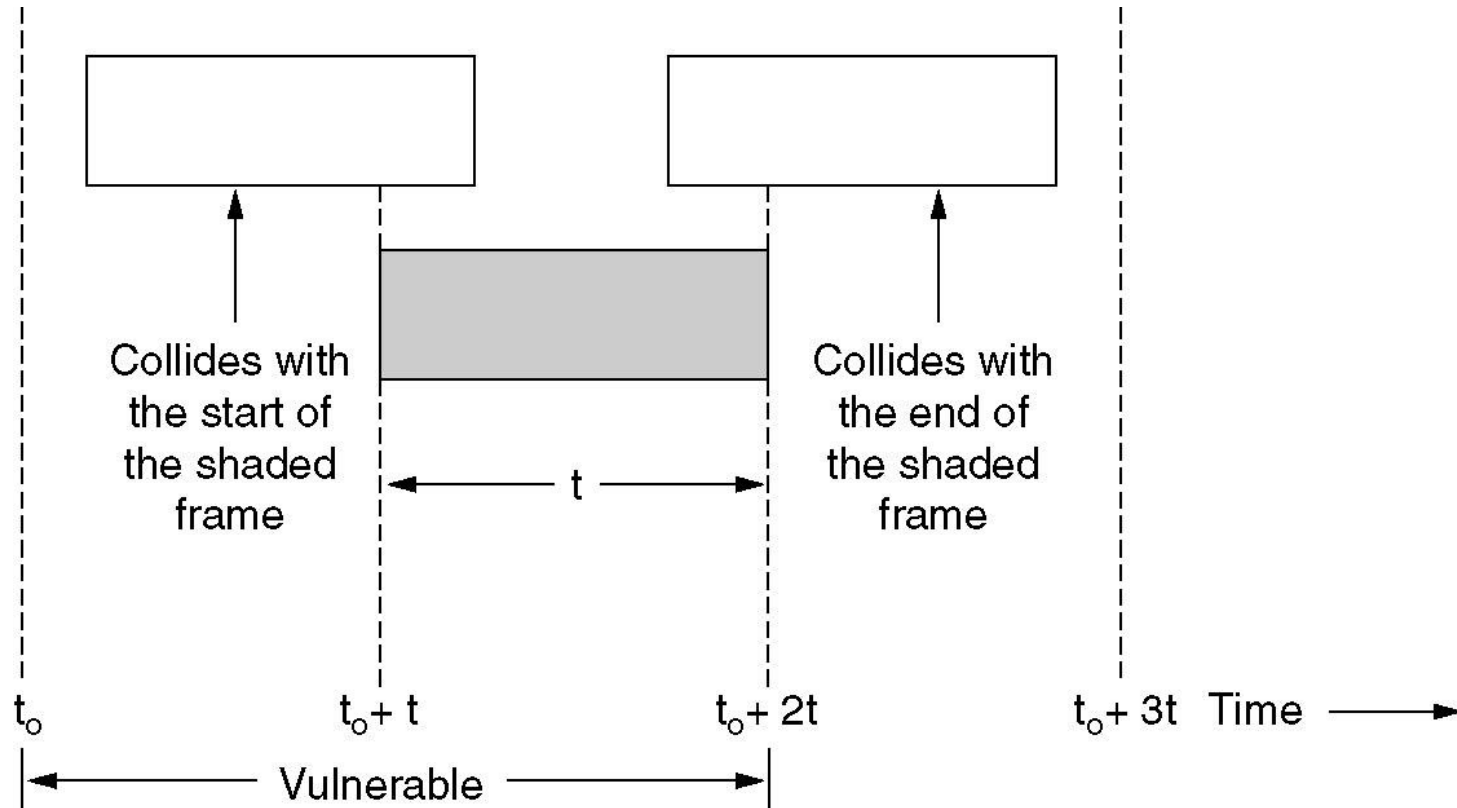
- Deterministic allocation
 - frequency division multiple access (FDMA)
 - time division multiple access (TDMA)
 - code division multiple access (CDMA)
- Contention-based
 - ALOHA
 - CSMA
 - CSMA/CD
 - CSMA/CA

Pure Aloha

- Transmission at any time
 - if collision, random back-off

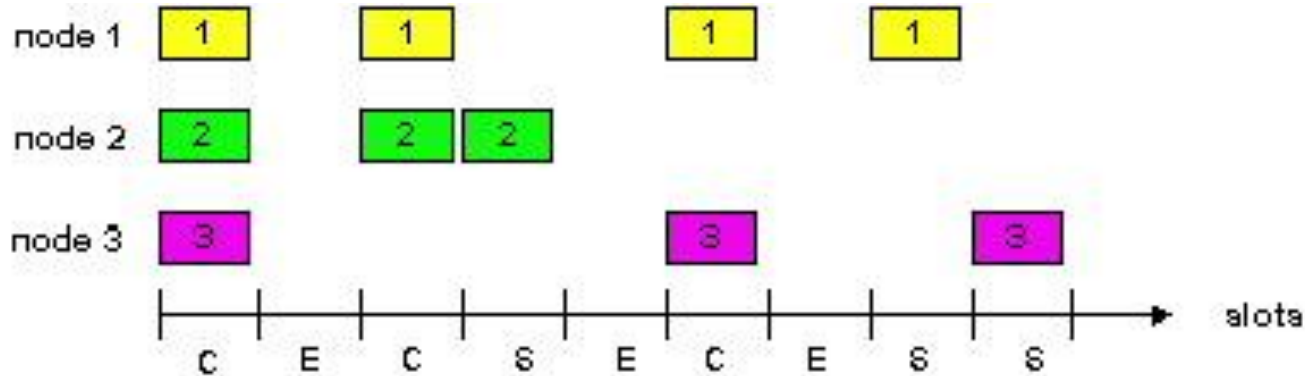


Pure Aloha: vulnerable period



Slotted Aloha

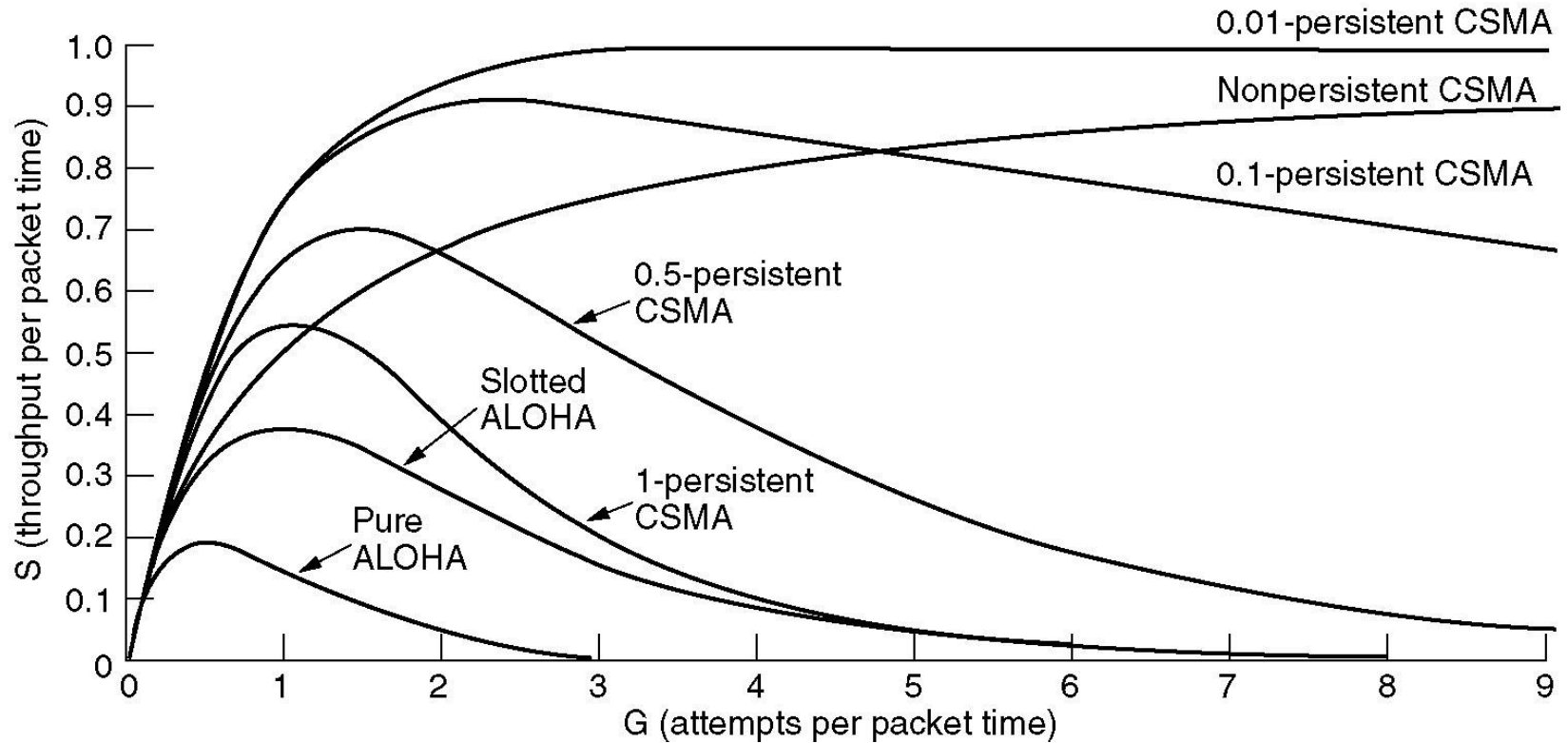
- Slotted time
- Synchronized nodes
- Transmission only at the beginning of a slot
 - if collision, retransmit in next slot with prob. p



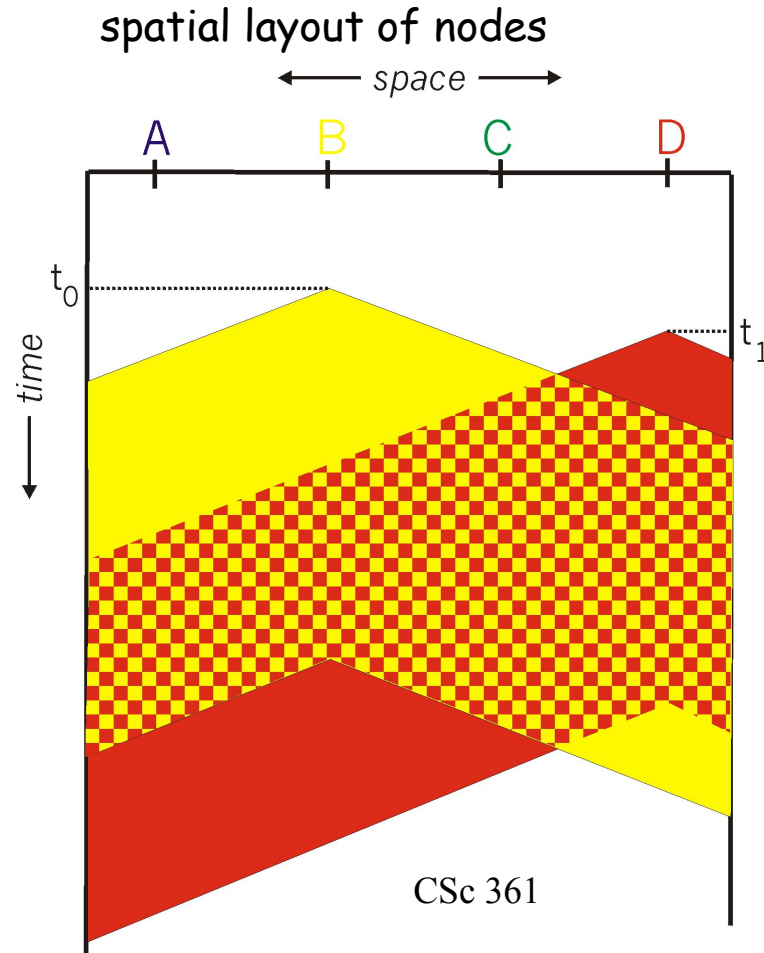
Carrier sense multiple access

- 1-persistent CSMA
 - if channel is busy, wait
 - if channel is idle, transmit immediately
 - if collision, random back-off
- p -persistent CSMA
 - if busy, wait
 - if idle, transmit with probability p
- Non-persistent CSMA
 - if busy, back-off

Performance comparison

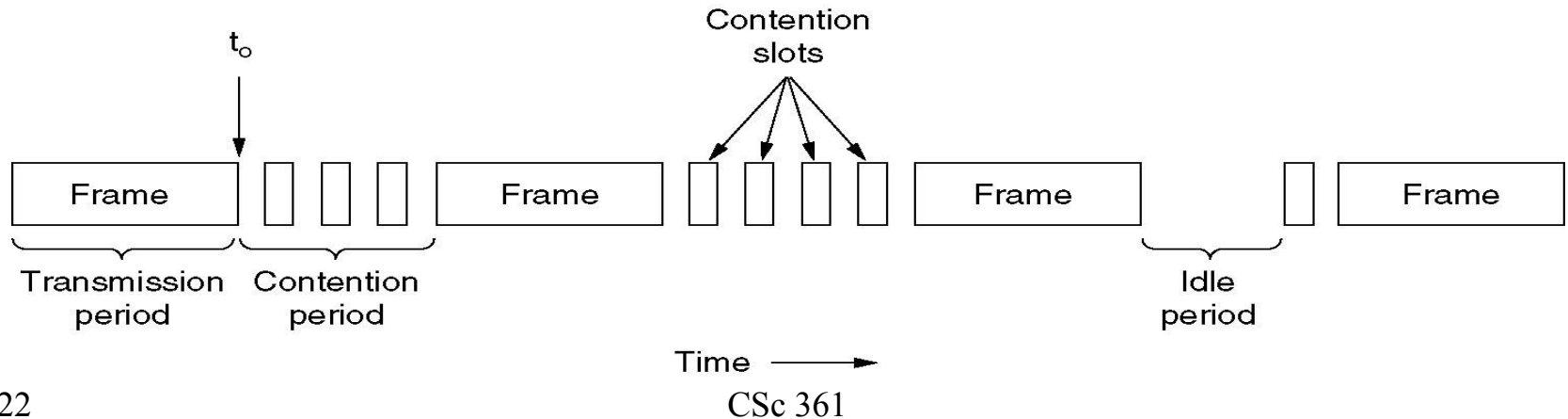


CSMA: collision “area”

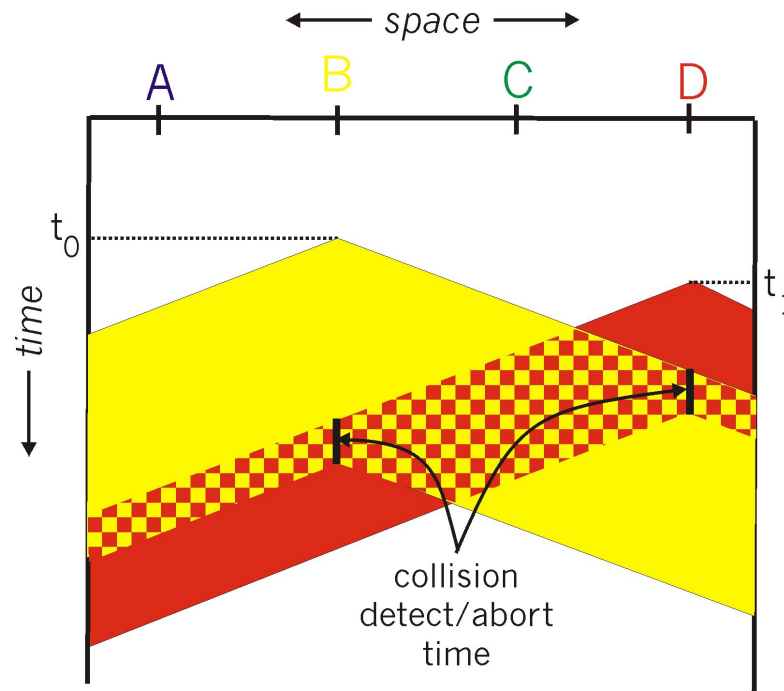


CSMA/collision detection

- CSMA
- CD
 - if collision, *abort* and back-off
 - receiving while sending

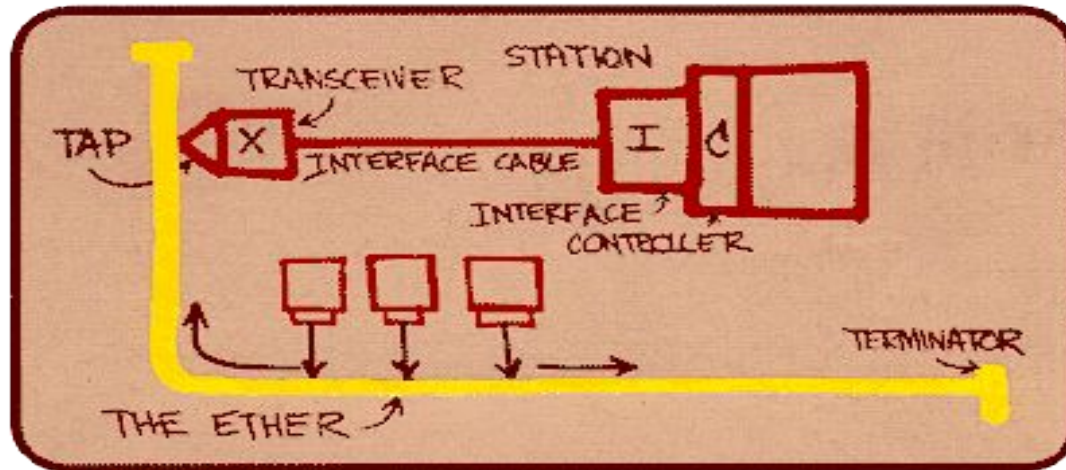


CSMA/CD: collision “area”



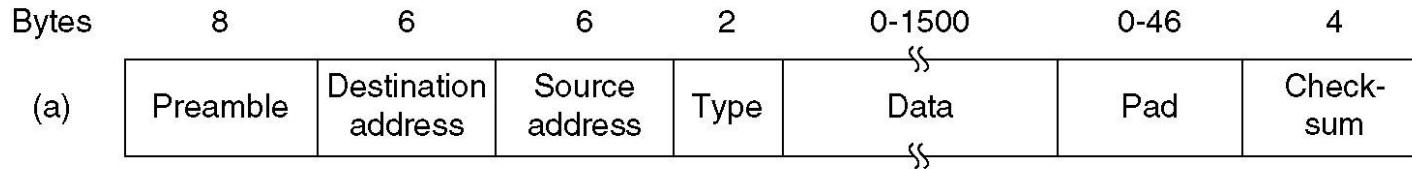
Ethernet

- Pervasive!
 - speed: 10- > 100Mbps, 1- > 10- > 40- > 100Gbps
 - medium: coaxial, twist-pair, fiber
 - topology: bus, tree, star; range: LAN, MAN

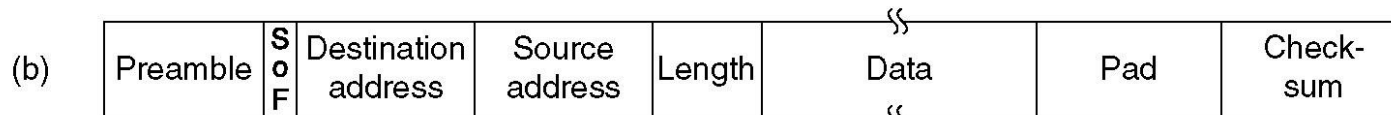


Ethernet frames

- DIX format
 - type
- IEEE 802.3 format
 - length



DIX



802.3

20

* why pad? how to distinguish type vs length?

This lecture

- MAC
 - Aloha
 - slotted Aloha
 - CSMA
 - CSMA/CD
 - Ethernet
 - IEEE 802.3

Next lecture

- Wireless Ethernet
 - CSMA/CA
 - RTS/CTS
 - IEEE 802.11