

Lecture 2 | Link & Network layers (Ethernet/IP)

- Ethernet

 - collision detection / handling

- End-to-end principle

- Naming

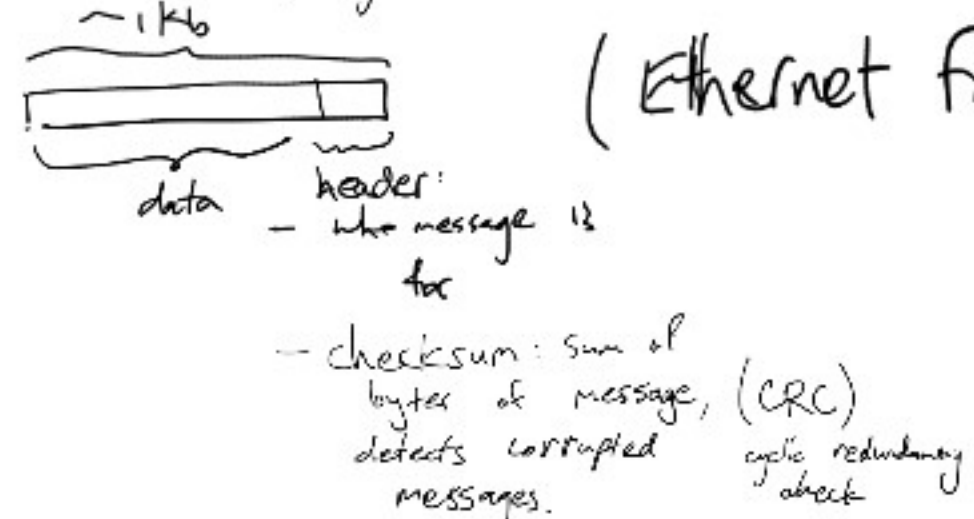
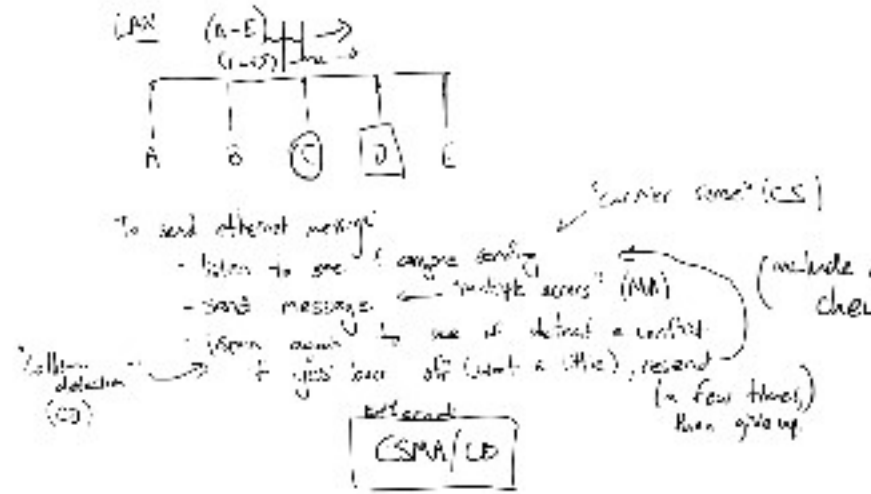
 - DHCP, ARP, MAC address / IP address

- IP

End-to-end principle:

Try to make each layer as dumb as possible!

- ⇒ cheaper
 - ⇒ applications might not need guarantees
 - ⇒ application needs to handle failure anyway.
- Still make "best-effort" attempt.
(best-effort: make small cheap effort)



(Ethernet frame: unit of transmission)

- data
- header
 - address
 - CRC
 - length of data.

needs minimum size: ensures that collisions are detected

need max size

different for different physical layers (wireless have larger) frame size

Ethernet addresses are built into network card.

- MAC addresser.
- intent: no two network cards have same MAC address.
 - large #s (~~64~~⁴⁸ bit) 0F:3C:AB:12:34:56
 - needs to be unique locally.
 - single manufacturer assign MAC addresses uniquely.

Addressing

- Need to know physical address of recipient to send Ethernet messages

- Logical addresses tied to identity of service independent of phys. hardware.

(IP addresses)

usual format: 4 decimal digits separated by period.

- LAN protocols for translation.

o ARP: address resolution protocol.

for looking up MAC address of a given IP addr.

ARP request: who has IP address 123.45.21.0

ARP response: I have addr 123.45.21.0,
my MAC addr is 01:23:45:67:89:00

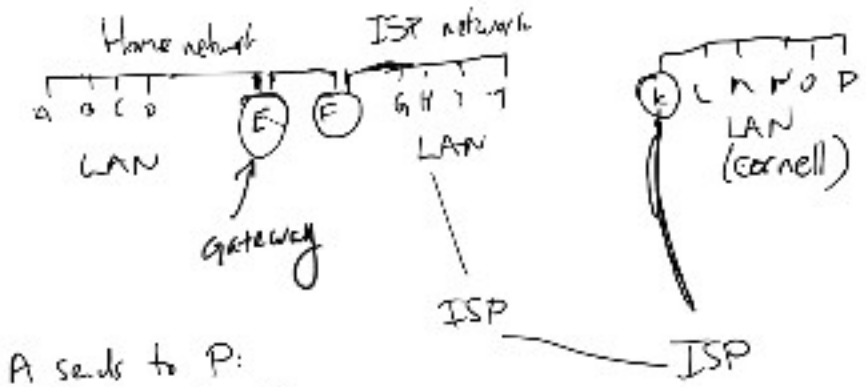
o DHCP: dynamic host control protocol.

- DHCP request: Who am I? (what's my IP?)
(send MAC addr)

- response (central DHCP server):

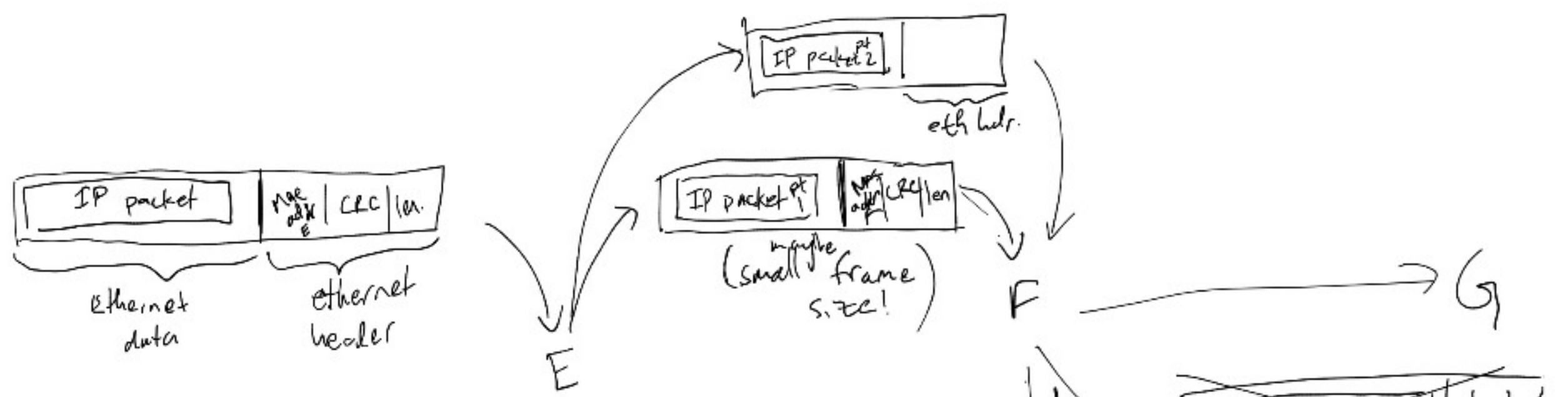
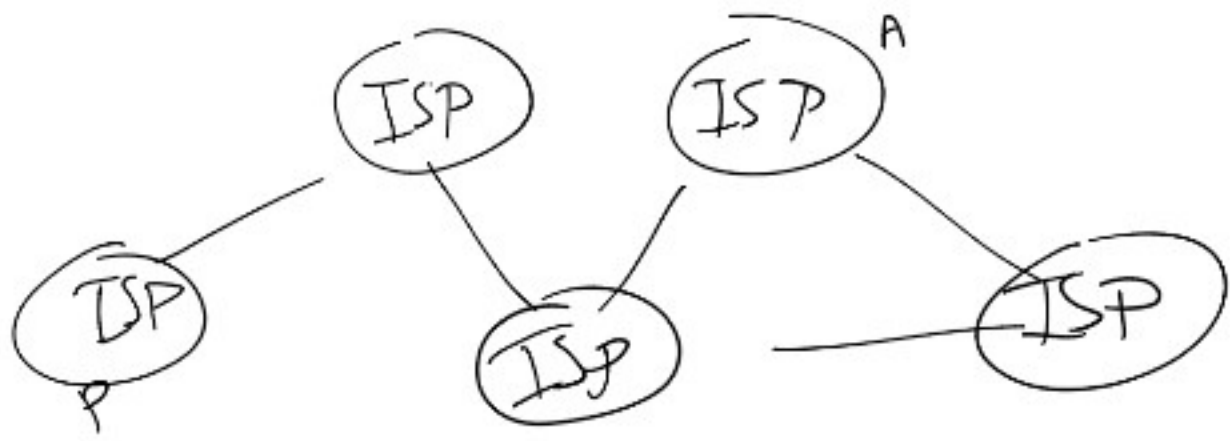
your IP addr is ...

Internetworking layer (IP, network layer)

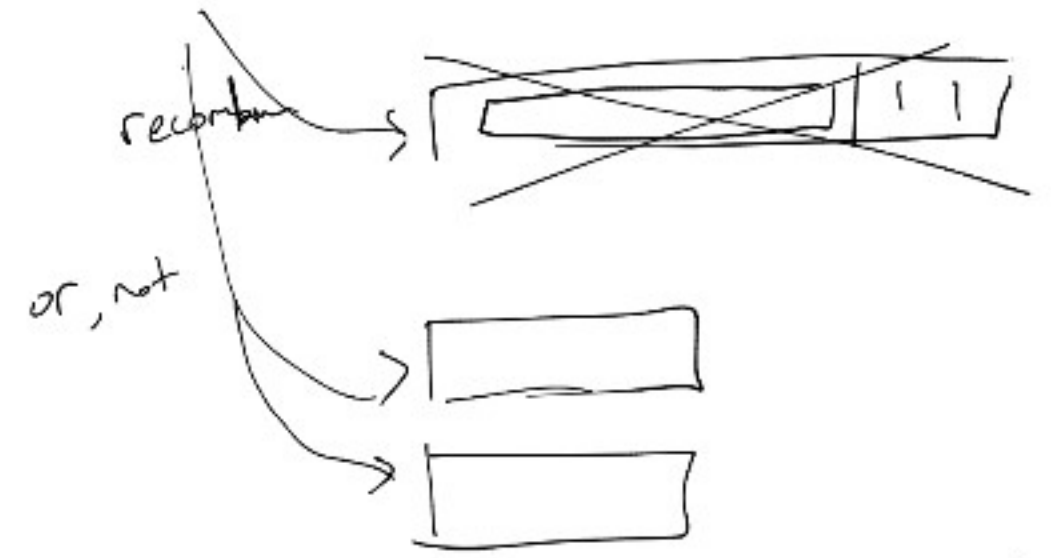


- A sends to P:
- send to E
 - who forwards to F
 - ...
 - who forwards to H
 - who forwards to P.

- Routing: how to find path from source to dest.
- Send same data along different kinds of links. (different size frames)

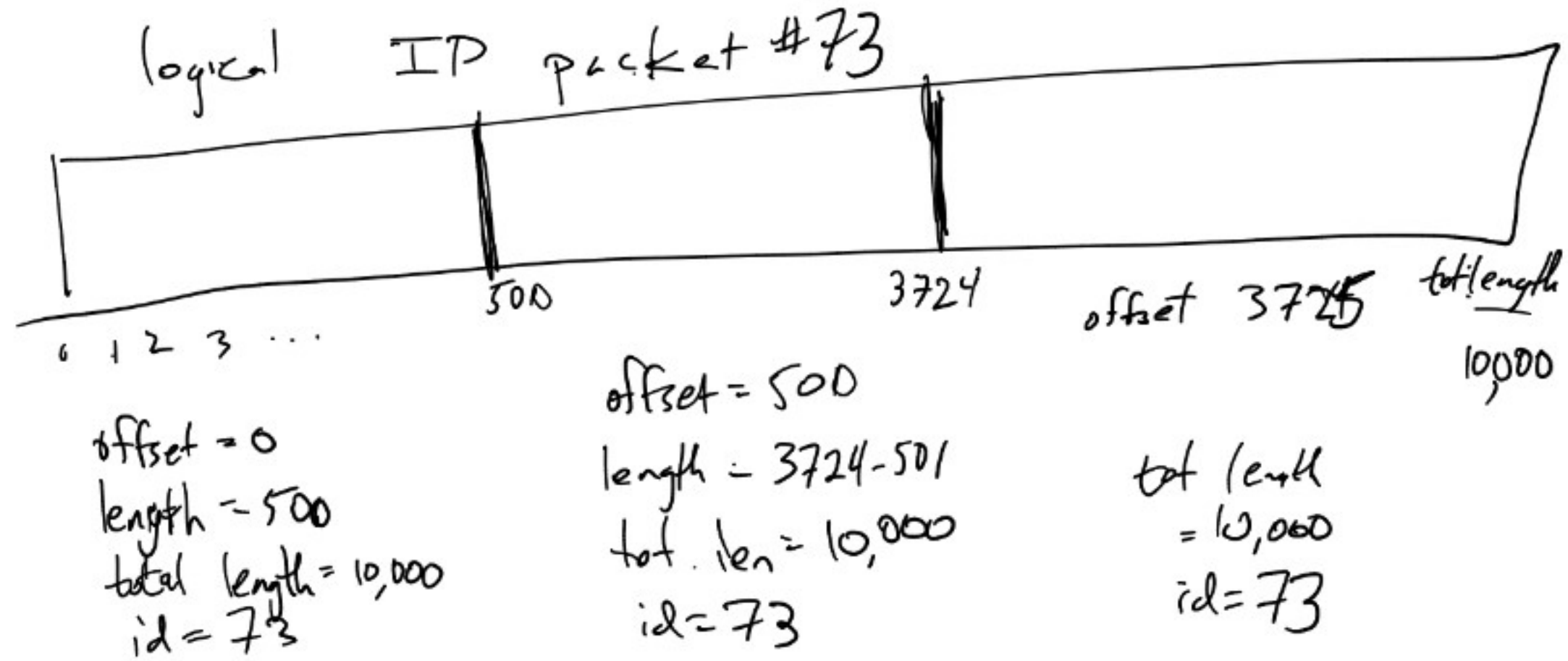
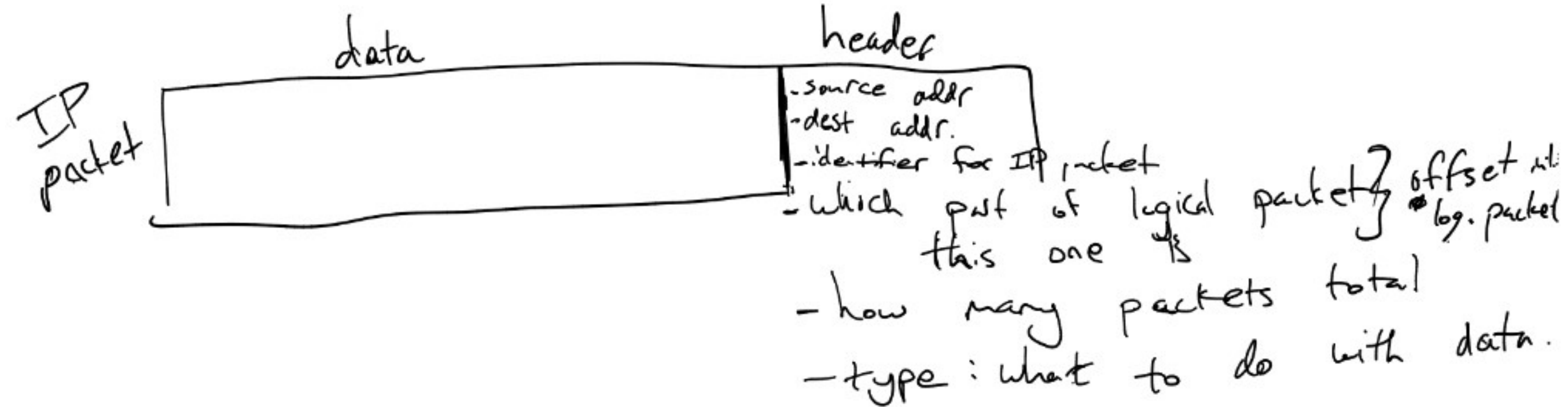


IP Fragmentation



- F will forward split packets independently.
- endpoint will collect all packets, recombine

IP fragmentation



- fragments can be different sizes, can follow diff. paths through network, arrive out of order

- endpoint waits for all of them, then reassembles, passes to next layer up.