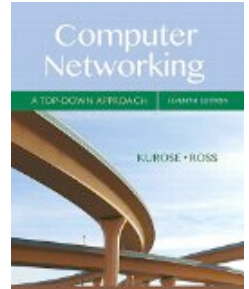


# COMP 375: Lecture 14



- **News & Notes:**
  - Quiz #3 in class today
  - Project #2 due Friday @ 10PM
  - Midterm #1 in class Monday
- **Reading (Fri, March 2)**
  - Sections 3.4.{0-1}

## Quiz #3

- Closed book and notes.
- Happy Public Sleeping Day!



**How many** of these services **might** we provide at the transport layer? Which?

1. Reliable transfers
2. Error detection
3. Error correction
4. Bandwidth guarantees
5. Latency guarantees
6. Encryption
7. Message ordering
8. Link sharing fairness

A.	$\leq 4$
B.	5
C.	6
D.	7
E.	8

*Be prepared to discuss which ones might be provided!*

UDP provides very few service. TCP offers more, but not all that we can think of.

- |                         |                          |
|-------------------------|--------------------------|
| 1. Reliable transfers   | 5. Latency guarantees    |
| 2. Error detection      | 6. Encryption            |
| 3. Error correction     | 7. Message ordering      |
| 4. Bandwidth guarantees | 8. Link sharing fairness |

- ***TCP provides: 1, 2, 3, 7, 8***
- ***UDP provides: 2***

# TCP sounds great! UDP... meh?

## Why do we need UDP?

- |           |  |
|-----------|--|
| <b>A.</b> | It has good performance characteristics.             |
| <b>B.</b> | Sometimes all we need is error detection.            |
| <b>C.</b> | We still need to distinguish between sockets.        |
| <b>D.</b> | It basically just fills a gap in our layering model. |

There's no such thing as a "free" feature.



Payload Data

A dark teal rectangular box containing the text "Payload Data".



TCP/UDP  
Header

A diagram showing a network packet structure. It consists of a white rectangular box on the left containing the text "TCP/UDP Header" and a dark teal rectangular box on the right containing the text "Payload Data". The two boxes are joined together horizontally.

Payload Data

TCP's features all come at a cost,  
which may or may not be worth it.

What are the costs associated with the  
following features?

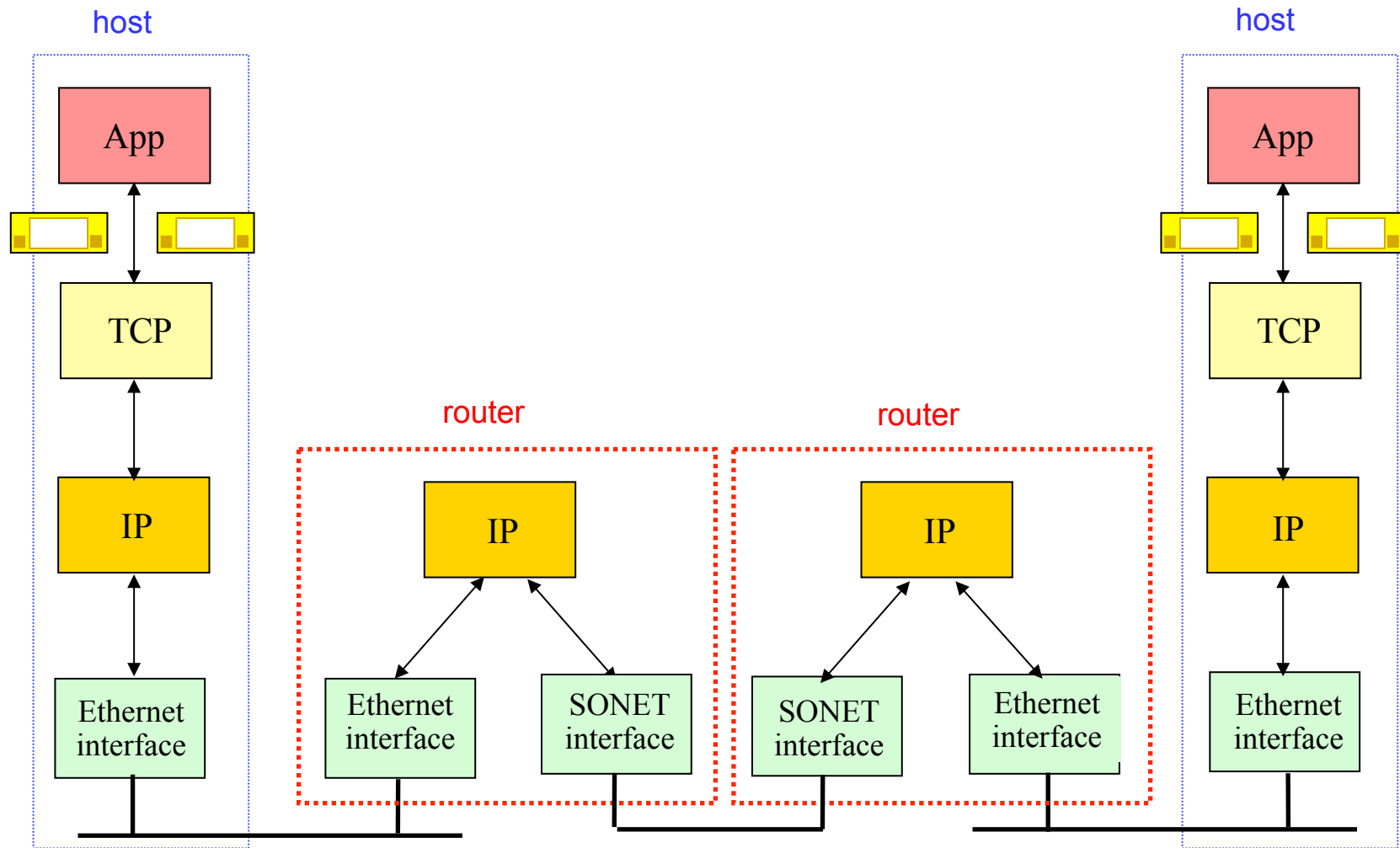
- Connections
- Reliability
- Congestion Control

Section 3.2

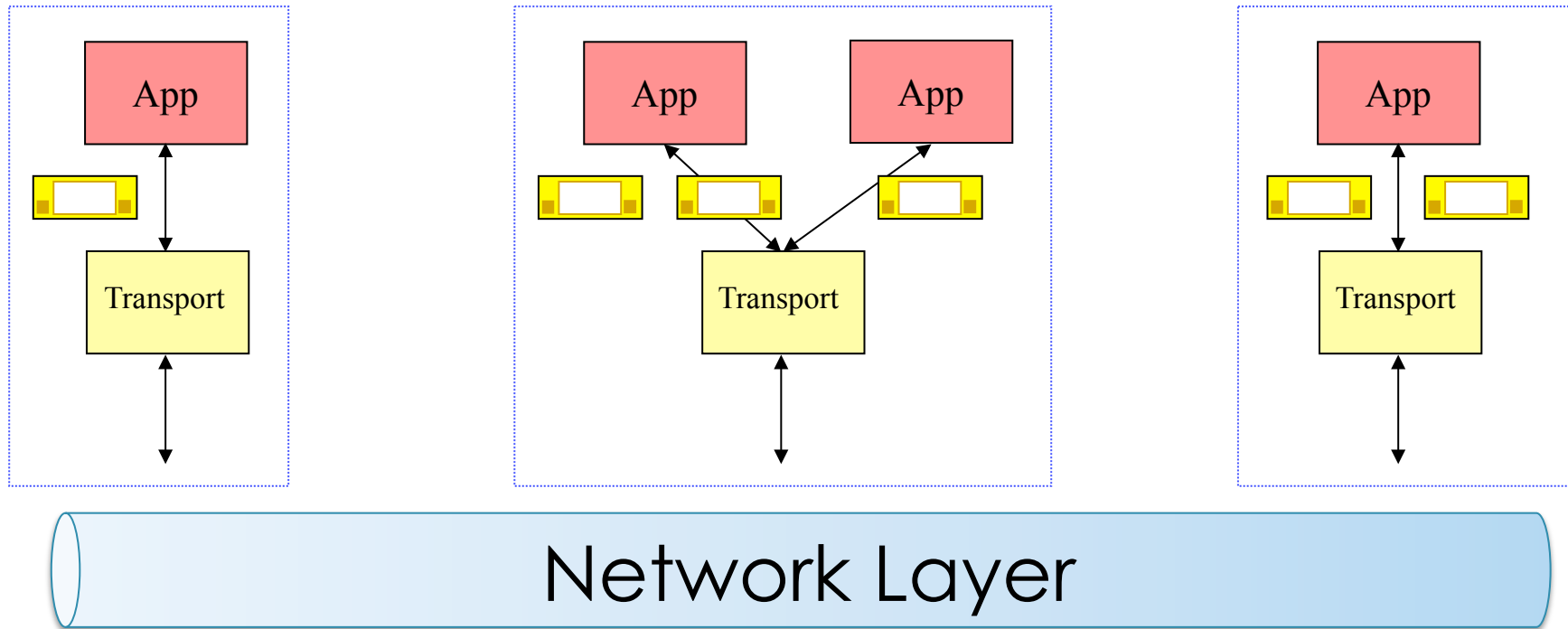
# **MULTIPLEXING/ DEMULTIPLEXING**



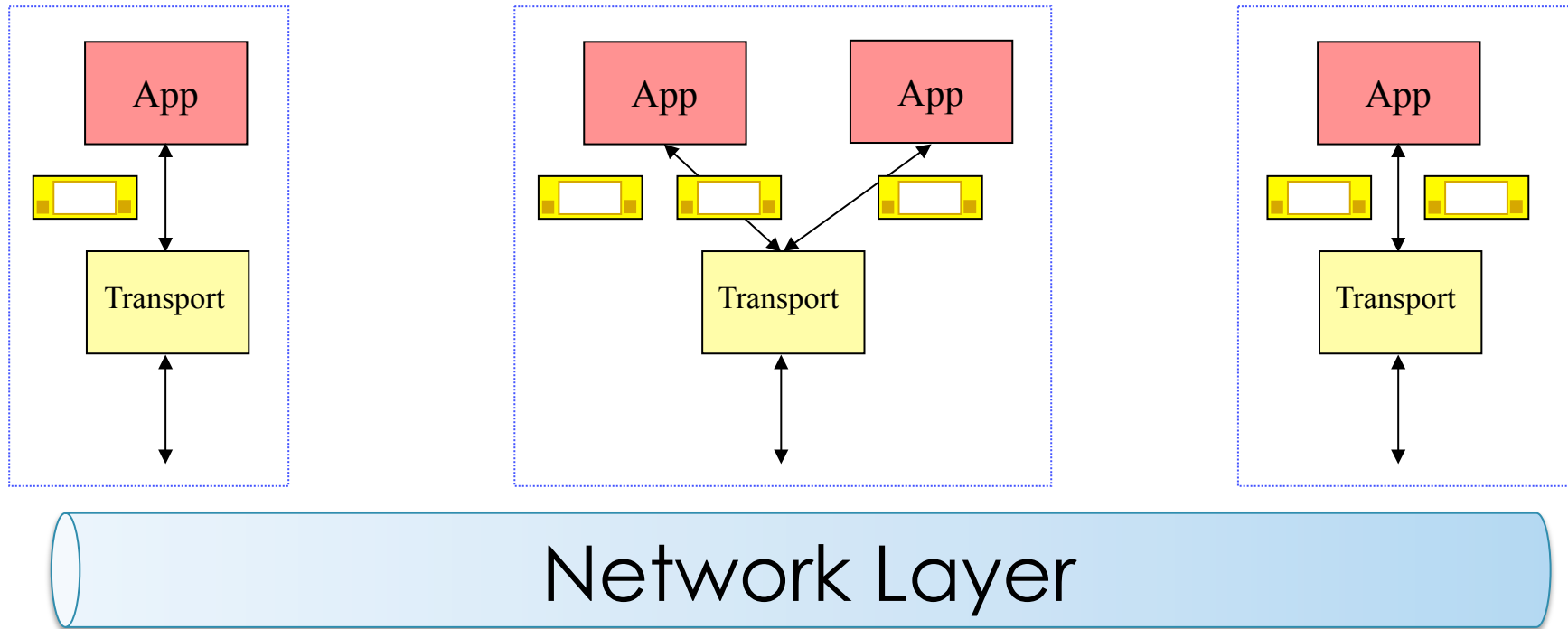
IP address identifies device interface,  
but need ports to differentiate sockets.



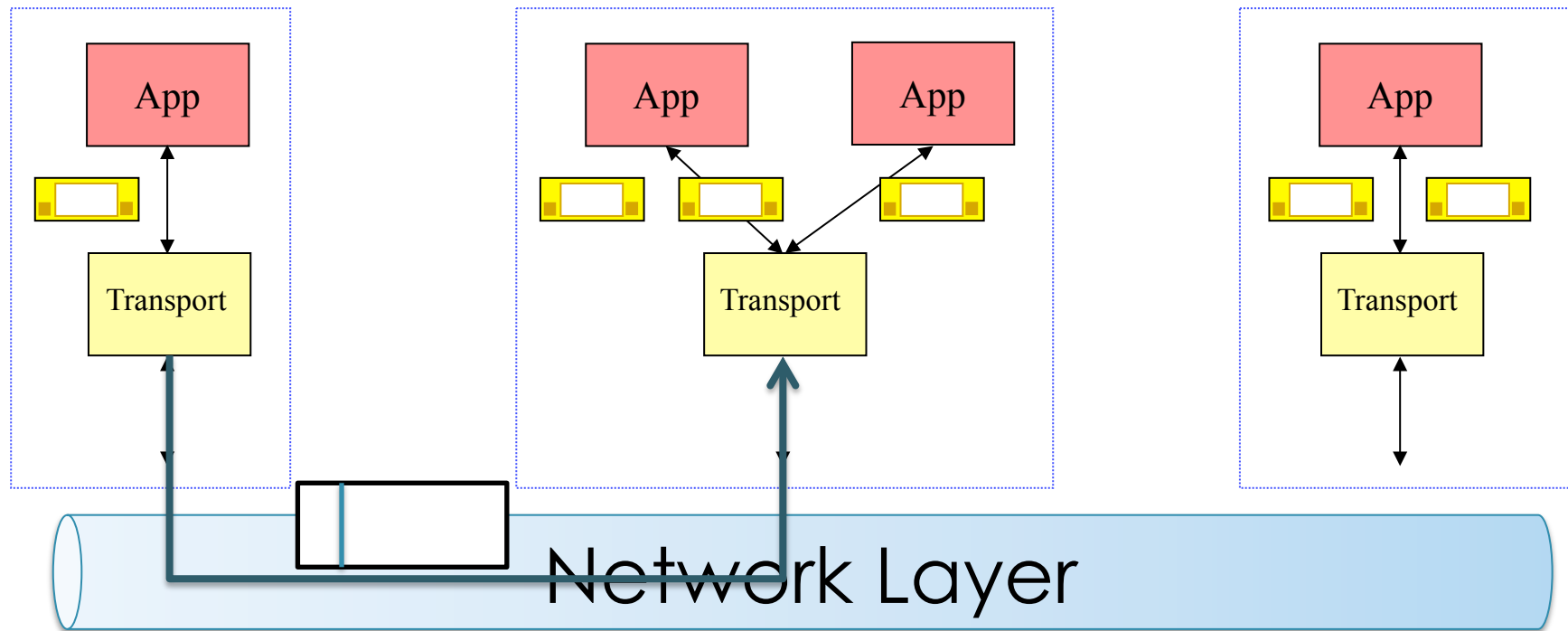
The network is a shared resource that doesn't know about apps/sockets/etc.



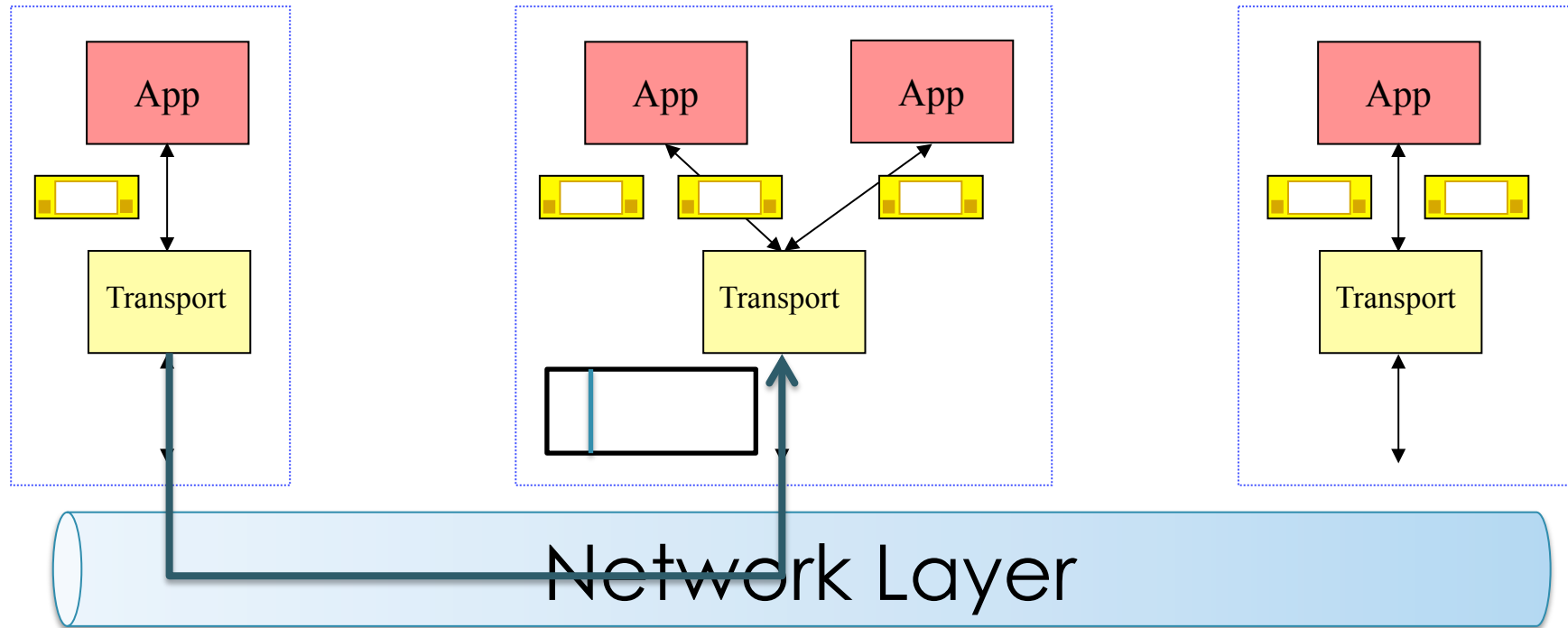
Senders **multiplex** by adding a header with source/dest port numbers.



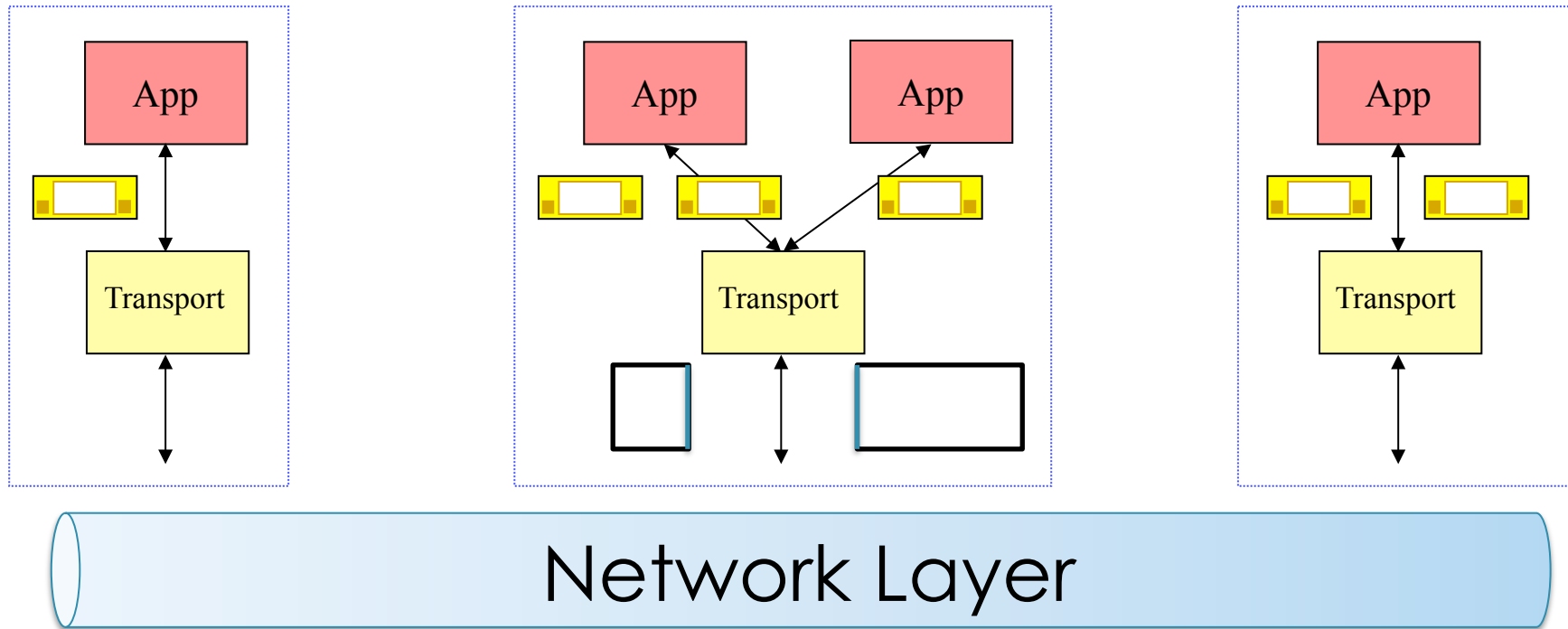
Senders **multiplex** by adding a header with source/dest port numbers.



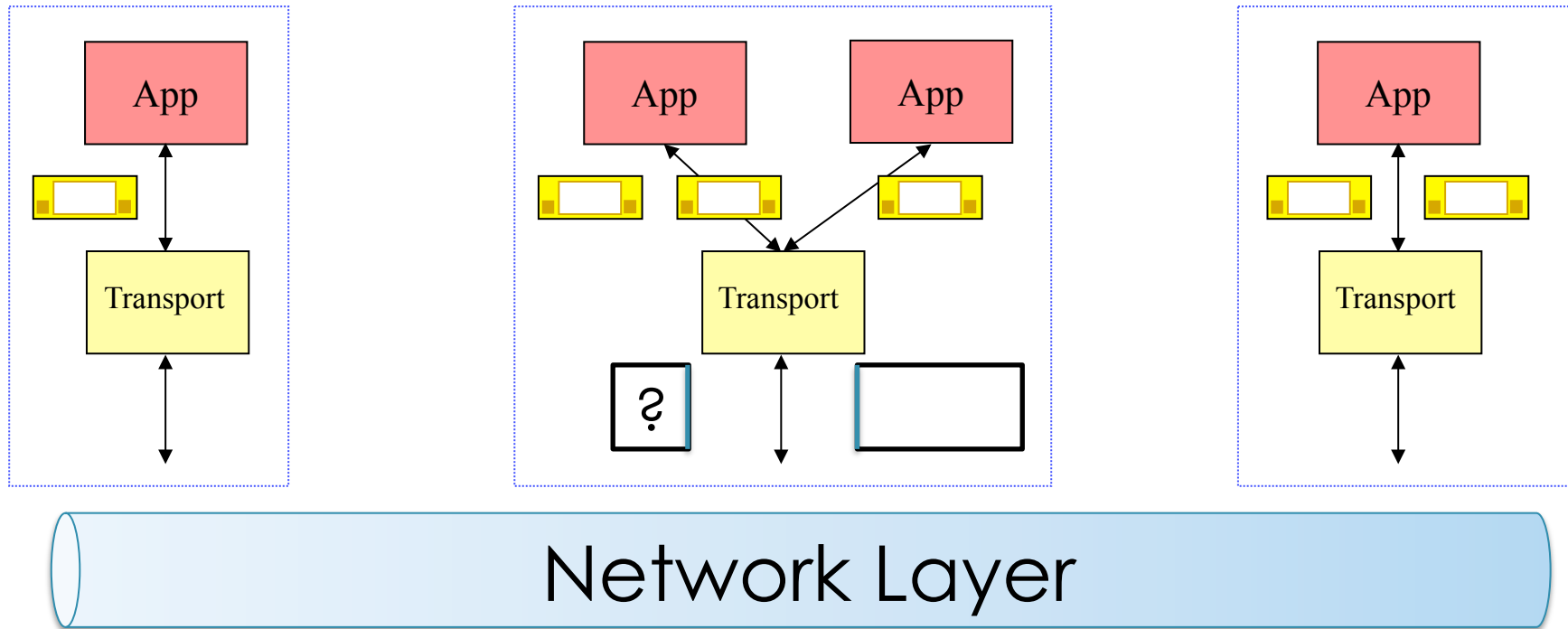
Receivers **demultiplex** by inspecting the transport layer header.



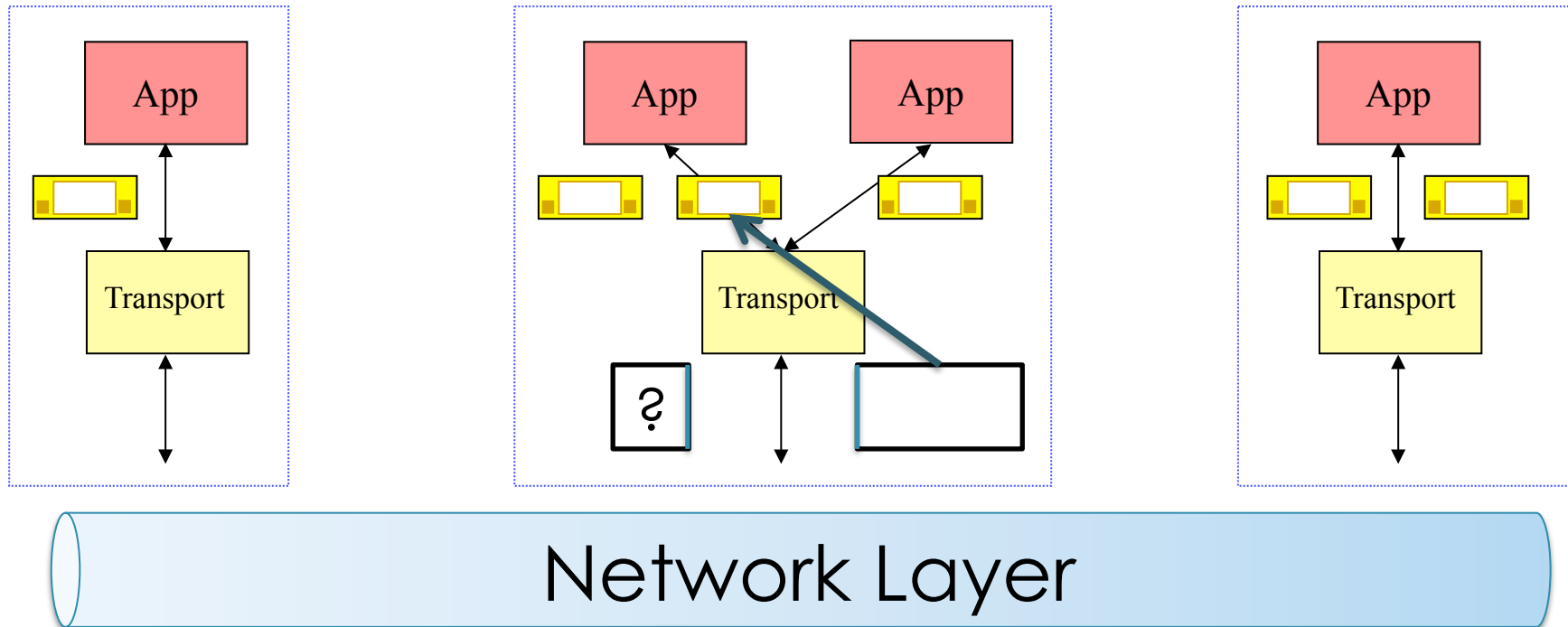
Receivers **demultiplex** by inspecting the transport layer header.



Based on the destination port, the correct destination socket is chosen.



Based on the header, the correct destination socket is chosen.





Section 3.3

# UDP

UDP is **connectionless**, with **best effort** service and **minimal overhead**.

