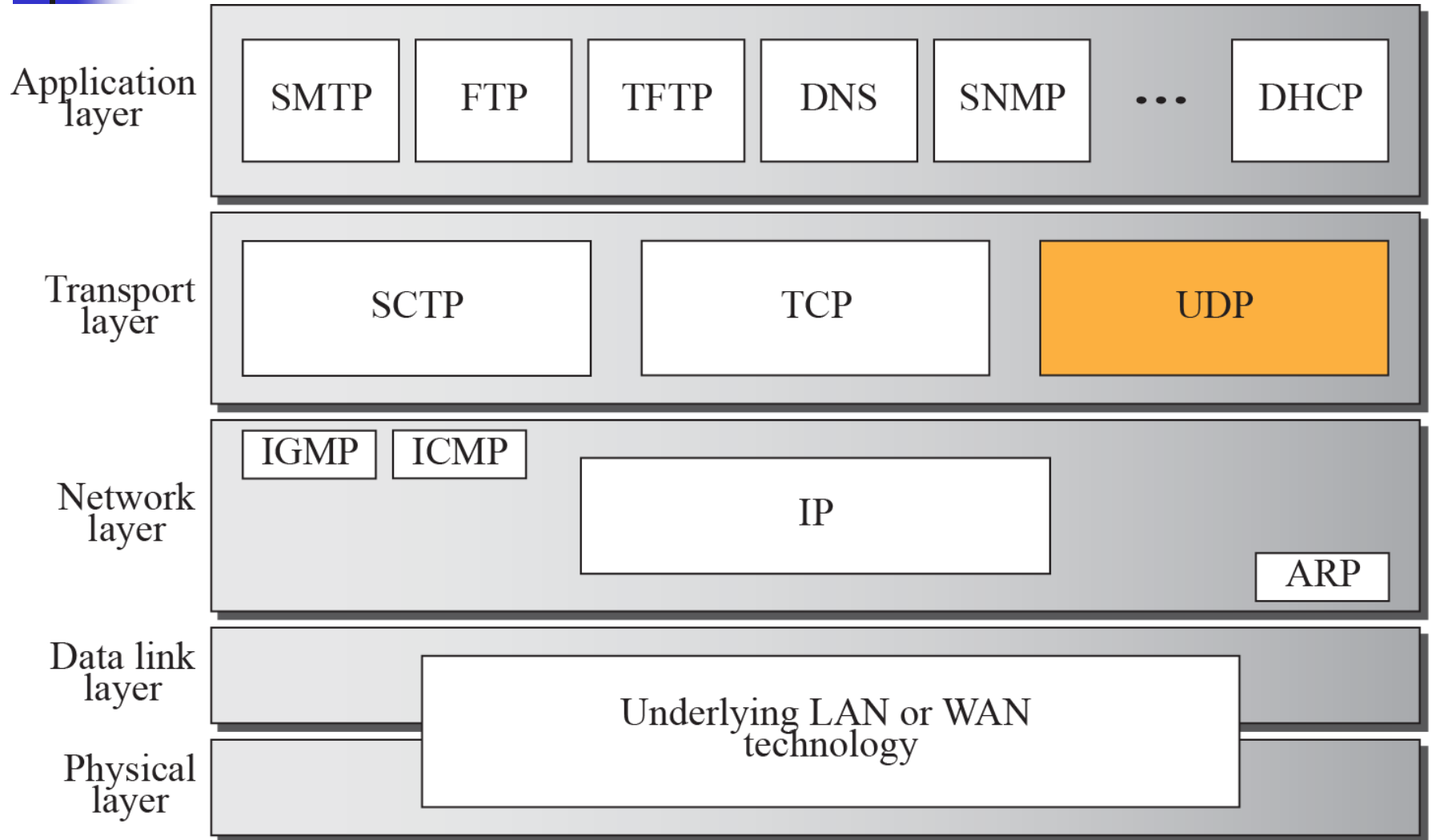


# User Datagram Program (UDP)

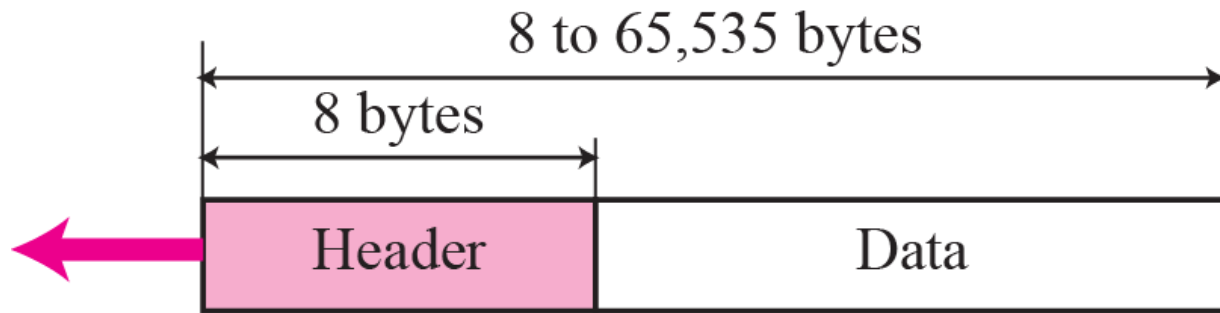
# *Position of UDP in the TCP/IP protocol suite*



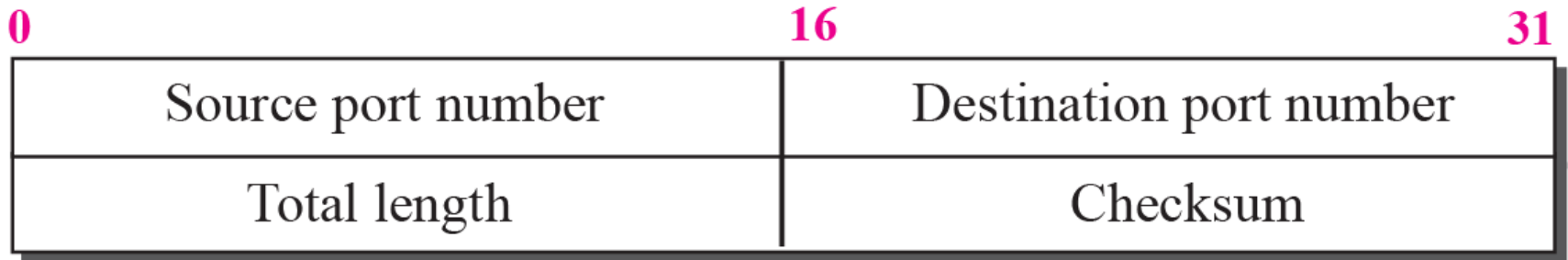
# USER DATAGRAM

**UDP packets, called user datagrams, have a fixed-size header of 8 bytes.**

## User datagram format



a. UDP user datagram



b. Header format

# Example

The following is a dump of a UDP header in hexadecimal format.

```
CB84000D001C001C
```

- a. What is the source port number?
- b. What is the destination port number?
- c. What is the total length of the user datagram?
- d. What is the length of the data?
- e. Is the packet directed from a client to a server or vice versa?
- f. What is the client process?

## Example - *Continued*

### *Solution*

- a.** The source port number is the first four hexadecimal digits  $(CB84)_{16}$  or 52100.
- b.** The destination port number is the second four hexadecimal digits  $(000D)_{16}$  or 13.
- c.** The third four hexadecimal digits  $(001C)_{16}$  define the length of the whole UDP packet as 28 bytes.
- d.** The length of the data is the length of the whole packet minus the length of the header, or  $28 - 8 = 20$  bytes.
- e.** Since the destination port number is 13 (well-known port), the packet is from the client to the server.
- f.** The client process is the Daytime.

## ***Topics Discussed in the Section*** (UDP Services)

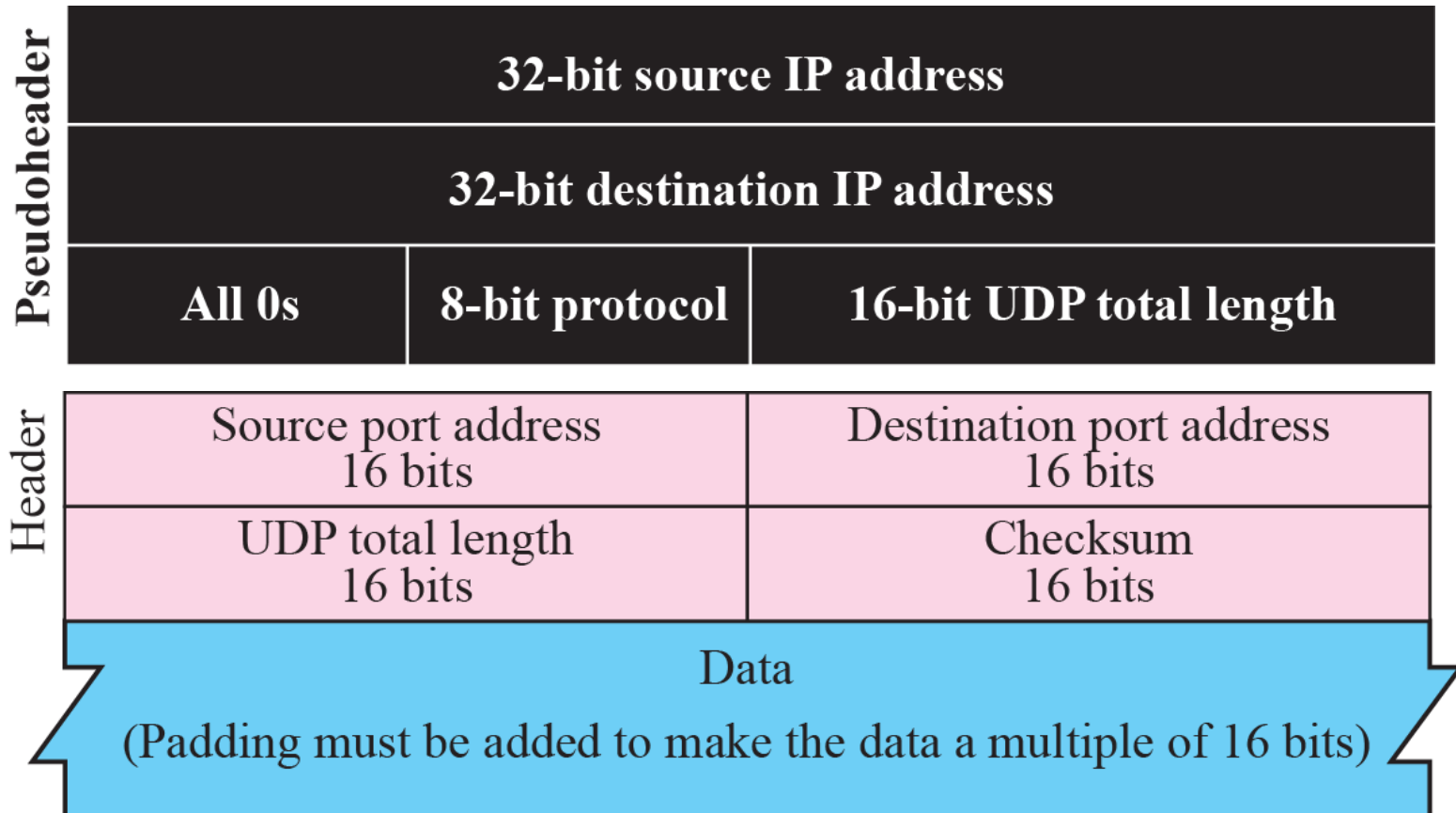
- ✓ **Process-to-Process Communication**
- ✓ **Connectionless Service**
- ✓ **Flow Control**
- ✓ **Error Control**
- ✓ **Congestion Control**
- ✓ **Encapsulation and Decapsulation**
- ✓ **Queuing**
- ✓ **Multiplexing and Demultiplexing**
- ✓ **Comparison between UDP and Generic Simple Protocol**

## Well-Known Port used with UDP

<i>Port</i>	<i>Protocol</i>	<i>Description</i>
7	Echo	Echoes a received datagram back to the sender
9	Discard	Discards any datagram that is received
11	Users	Active users
13	Daytime	Returns the date and the time
17	Quote	Returns a quote of the day
19	Chargen	Returns a string of characters
53	Domain	Domain Name Service (DNS)
67	Boots	Server port to download bootstrap information
68	Bootpc	Client port to download bootstrap information
69	TFTP	Trivial File Transfer Protocol
111	RPC	Remote Procedure Call
123	NTP	Network Time Protocol
161	SNMP	Simple Network Management Protocol
162	SNMP	Simple Network Management Protocol (trap)



## *Pseudoheader for checksum calculation*



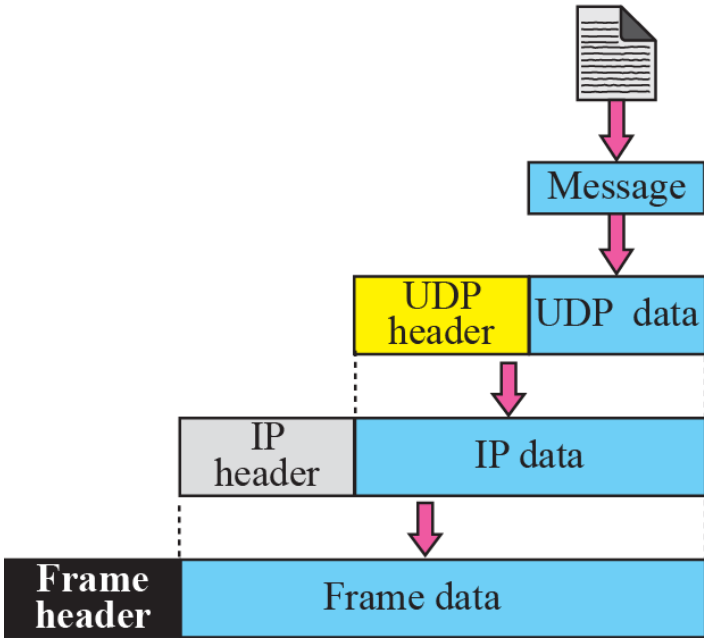
**Figure 14.4** *Checksum calculation for a simple UDP user datagram*

153.18.8.105			
171.2.14.10			
All 0s	17	15	
1087		13	
15		All 0s	
T	E	S	T
I	N	G	Pad

10011001	00010010	→	153.18
00001000	01101001	→	8.105
10101011	00000010	→	171.2
00001110	00001010	→	14.10
00000000	00010001	→	0 and 17
00000000	00001111	→	15
00000100	00111111	→	1087
00000000	00001101	→	13
00000000	00001111	→	15
00000000	00000000	→	0 (checksum)
01010100	01000101	→	T and E
01010011	01010100	→	S and T
01001001	01001110	→	I and N
01000111	00000000	→	G and 0 (padding)
<hr/>			
10010110	11101011	→	Sum
<b>01101001</b>	<b>00010100</b>	→	<b>Checksum</b>

# Encapsulation and decapsulation

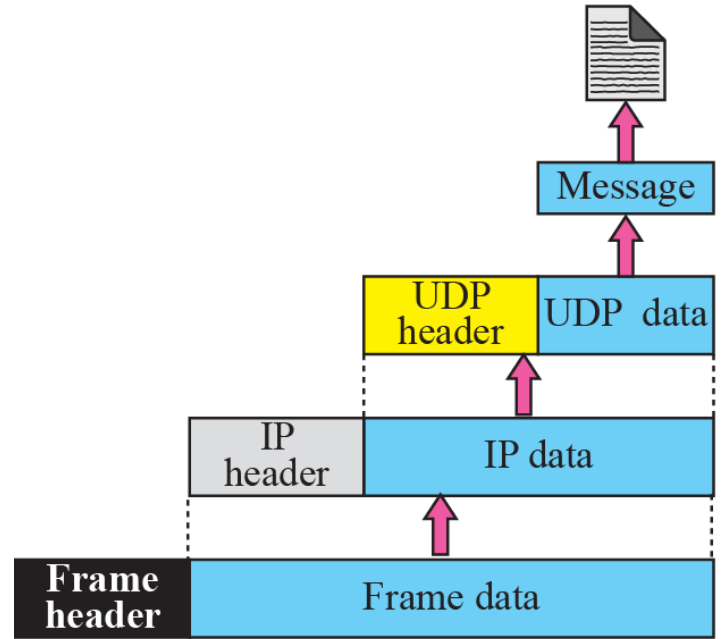
Sender Process



a. Encapsulation

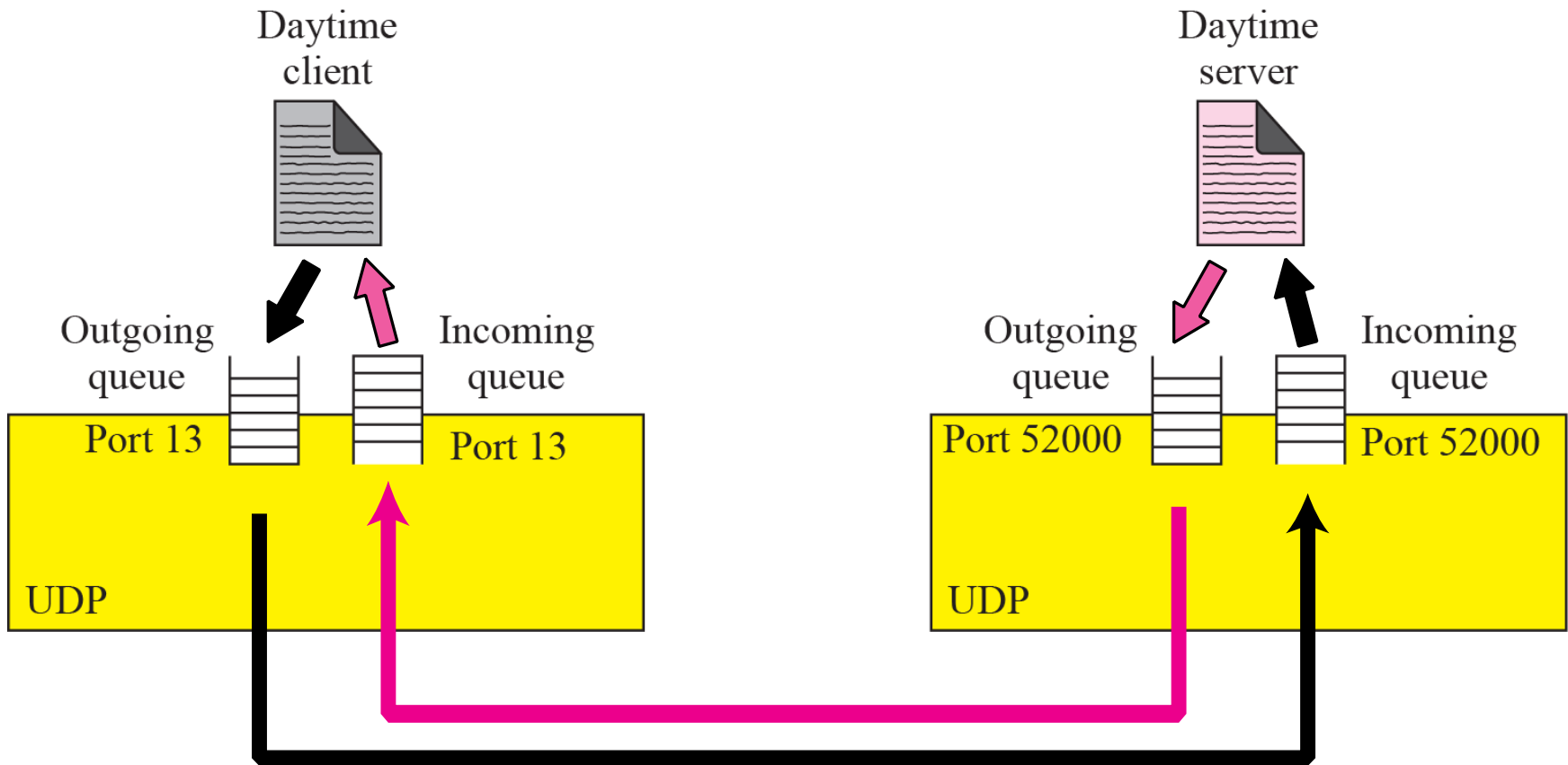


Receiver Process

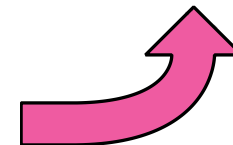
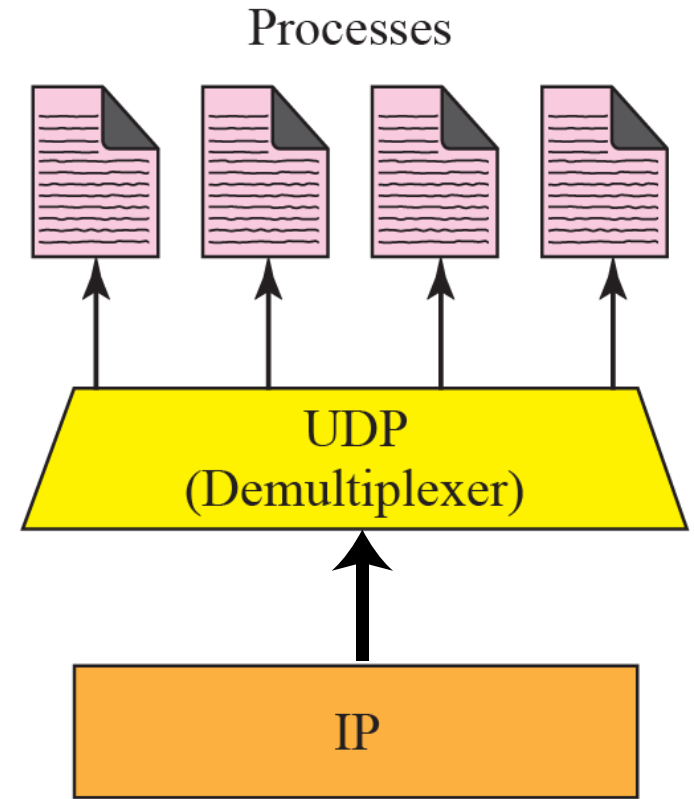
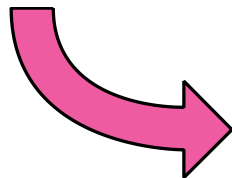
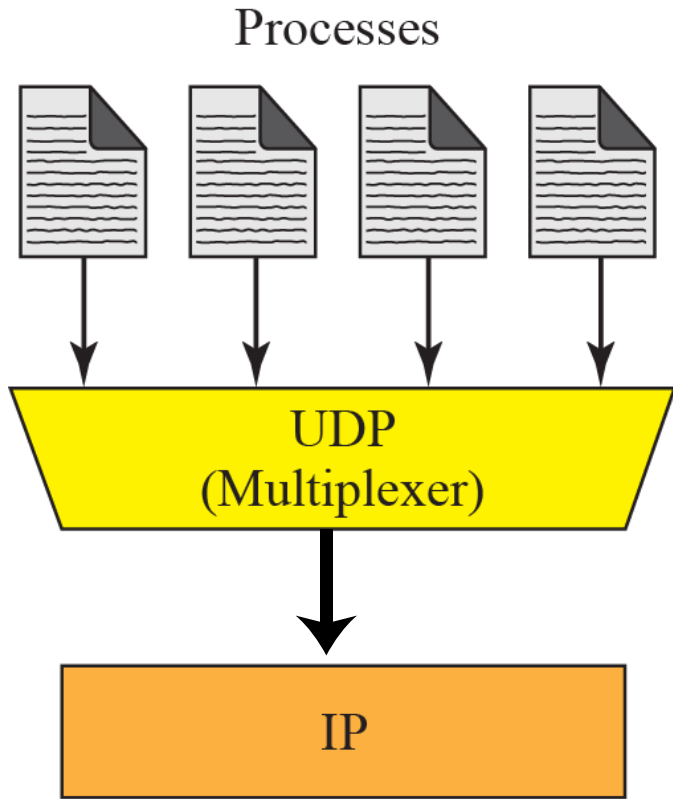


b. Decapsulation

# Queues in UDP



# Multiplexing and demultiplexing





*Note*

***UDP is an example of the connectionless simple protocol with the exception of an optional checksum added to packets for error detection.***