

CHAPTER 23 : Process-to-Process Delivery

Solutions to Selected Review Questions

Review Questions

1. Since the length of a datagram must be contained in a 2 byte field, the maximum size of a UDP datagram is **65,535** bytes (header plus data). However, given that the IP layer must also store the total length of the packet in a 2 byte field, the maximum length would be 20 bytes less than this, or **65,515** bytes, to leave room for the IP header. The implementation may impose a smaller limit than this.
2. The minimum size of a UDP datagram is **8** bytes at the transport layer and **28** bytes at the IP layer. This size datagram would contain no data—only an IP header with no options and a UDP header. The implementation may require padding.
3.
 - a. The **FIN** bit is set. This is a FIN segment request to terminate the connection.
 - b. None of the control bits are set. The segment is part of a data transmission without piggybacked acknowledgment.
 - c. The **ACK** and the **FIN** bits are set. This is a **FIN+ACK** in response to a received **FIN** segment.
4. The largest amount of process data that can be encapsulated in a UDP datagram is **65,507** bytes. (65,535 minus 8 bytes for the UDP header minus 20 bytes for the IP header). The implementation may impose a smaller limit than this.
5. **Reliability** is not of primary importance in applications such as echo, daytime, BOOTP, TFTP and SNMP. In custom software, reliability can be built into the client/server applications to provide a more reliable, low overhead service.
6. **Port addresses** do not need to be universally unique as long as each IP address/port address pair uniquely identify a particular process running on a particular host. A good example would be a network consisting of 50 hosts, each running echo server software. Each server uses the well known port number 7, but the IP address, together with the port number of 7, uniquely identify a particular server program on a particular host. Port addresses are **shorter** than IP addresses because their domain, a single system, is smaller than the domain of IP addresses, all systems on the Internet.

7. *Ephemeral* is defined as short-lived or transitory. Ephemeral port numbers are only used for the duration of a single communication between client and server, so they are indeed short-lived.
8. The *maximum size* of the TCP header is **60** bytes. The *minimum size* of the TCP header is **20** bytes.
9. IP and UDP are both *connectionless* and *unreliable protocols*. The main difference in their reliability is that IP only calculates a checksum for the IP header and not for the data while UDP calculates a checksum for the entire datagram.
10. The smallest amount of process data that can be encapsulated in a UDP datagram is **0** bytes.
11. See Table 23.1.

Table 23.1 Answer to the Question 11.

| <i>Fields in UDP</i> | <i>Fields in TCP</i> | <i>Explanation</i> |
|--------------------------|--------------------------|---|
| Source Port Address | Source Port Address | |
| Destination Port Address | Destination Port Address | |
| Total Length | | There is no need for total length. |
| Checksum | Checksum | |
| | Sequence Number | UDP has no flow and error control. |
| | Acknowledge Number | UDP has no flow and error control. |
| | Header Length | UDP has no flow and error control. |
| | Reserved | UDP has no flow and error control. |
| | Control | UDP has no flow and error control. |
| | Window Size | UDP has no flow and error control. |
| | Urgent Pointer | UDP cannot handle urgent data. |
| | Options and Padding | UDP uses no options. |

12. *UDP* is preferred because each user datagram can be used for each chunk of data. However, a better solution is *SCTP*.