CHAPTER 23

IP Over ATM

Exercises

1.

The minimum size of an IP datagram is 20 bytes. Therefore, only 1 cell is needed for this datagram.
The maximum size of an IP datagram is 65536 bytes. Therefore 65536 + 8 bytes of trailer = 65544 bytes. 65544/48 = 1365 with a remainder. So 1366 cells are needed.

3.

a. **40 bytes of data**; (40 + 0 + 8) mod 48 = 0
b. **48 bytes of data**; (48 + 40 + 8) mod 48 = 0
c. **41 bytes of data**: (41 + 47 + 8) mod 48 = 0

5.

42 bytes of data + 8 bytes of trailer = 50 bytes. 2 cells are needed:

Cell 1: 42 bytes of data, 6 bytes of pad

Cell 2: 40 bytes of pad, 8 bytes of trailer

7. See Figure 23.1

9. See Figure 23.2.

Figure 23.1 *Exercise 7*

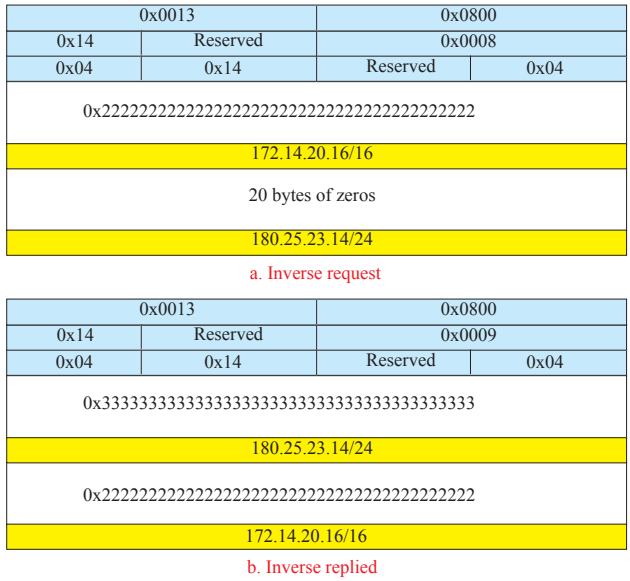
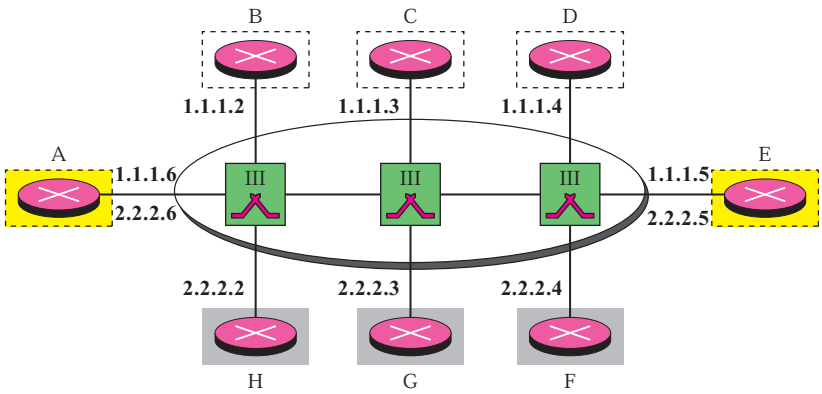


Figure 23.2 *Exercise 9*



11. The trailer carries length information so that the receiver knows if any data is missing.

13.

a.

- Let us assume that the original datagram has only 20 bytes of header. This means that the payload at this layer is 1024 – 20 or **1004** bytes.
- A cell has a trailer of 8 bytes (at AAL5 level) and a header of 5 bytes (at ATM level). This means that a cell can carry only 53 – 13 = **40** bytes of payload.
- Each IP fragment has a 20-byte of header, this means that a cell can carry only **20** bytes of data at the IP level.
- To carry 1004 bytes of data, we need 1004 / 20 = 50.2 or **51** cells.
- The efficiency can be calculated as 1004 / (51 × 53) = 0.3714 or **37.14%**.

b.

- The datagram of 1024 bytes cannot evenly divides into cells of 48 bytes. Before adding the trailer we need to add 24 bytes of padding. So the total length of the datagram is 1024 + 24 + 8 = **1056**.
- This means that we need 1056 / 48 = **22** cells.
- The efficiency can be calculated as 1004 / (22 × 53) = 0.8610 or **86.10%**. This is a big improvement over part a.