

ECE 358 Assignment 4

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2. During the first hop, the MTU is 1000 bytes, but the initial packet is $20 + 1800 = 1820$ bytes. Therefore, after fragmentation, f_1 will have 20 bytes of header and 976 bytes of payload since the offset has to be a multiple of 8 while maximizing the total packet size to less than 1000 bytes. Similarly, f_2 will have a header of 20 bytes and payload of the remaining $1800 - 976 = 824$ bytes (offset of 122).

Afterwards, f_1 undergoes fragmentation again with MTU of 500 bytes. The first part, $f_{1.1}$ will have 20 bytes for the header and 480 bytes for payload. The second part, $f_{1.2}$ will have 20 bytes for the header and 480 bytes for payload (offset of 60). The third part, $f_{1.3}$ will have 20 bytes for the header and $976 - 480 - 480 = 16$ bytes for the payload (offset of 120).

In conclusion, the final fragments received at the destination in order of offset is:

- First fragment: ID = abcd, More fragments = 1, Fragment offset = 0, Total length = 500 bytes (480 bytes of payload)
 - Second fragment: ID = abcd, More fragments = 1, Fragment offset = 60, Total length = 500 bytes (480 bytes of payload)
 - Third fragment: ID = abcd, More fragments = 1, Fragment offset = 120, Total length = 36 bytes (16 bytes of payload)
 - Fourth fragment: ID = abcd, More fragments = 0, Fragment offset = 122, Total length = 844 bytes (824 bytes of payload)
3. (a) The header checksum is not necessarily the same, because the TTL field is decremented at each hop, so the header checksum is recomputed at each hop (hence, a different value than the initial checksum).
 - (b) I do not concur, even if an odd number of bits are flipped, it is not guaranteed to detect an error. A counter-example is 01 FF (checksum FE) because if you flip all nine 1-bits into 00, the checksum is still FE.
 - (c) Yes, the UDP checksum at the destination should match that of the source because UDP checksums are end-to-end and is not modified in transit (except when it passes through NAT).

- (d) No, the converse is "if the MTU is supported, you will always get a response". This is not necessarily true, because there are other reasons for no response other than just a non-supported MTU (such as network congestion).

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