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| ECE 358 S20 |
| Encapsulation and Network Utilities |
| Lab 3 |

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# Question 1

I’m examining frames 6 and 16.

## Frame 6

00 00 00 00 00 00 00 00 00 00 00 00 08 00 45 00

00 ca 5c 0d 00 00 80 11 00 00 0a 20 1b a0 0a 20

7f ff eb 35 00 8a 00 b6 8e c0 11 0a 80 22 0a 20

1b a0 00 8a 00 a0 00 00 20 46 47 45 4a 46 43 46

45 46 46 45 42 45 4d 46 49 46 41 43 4e 44 49 44

45 44 41 44 46 44 44 41 41 00 20 46 48 45 50 46

43 45 4c 45 48 46 43 45 50 46 46 46 41 43 41 43

41 43 41 43 41 43 41 43 41 42 4e 00 ff 53 4d 42

25 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

00 00 00 00 00 00 00 00 00 00 00 00 11 00 00 06

00 00 00 00 00 00 00 00 00 e8 03 00 00 00 00 00

00 00 00 06 00 56 00 03 00 01 00 01 00 02 00 17

00 5c 4d 41 49 4c 53 4c 4f 54 5c 42 52 4f 57 53

45 00 09 04 02 00 00 00

### Link Layer (Layer 2/Ethernet header)

Destination Address: **00 00 00 00 00 00** 00 00 00 00 00 00 08 00

* 0x000000000000 means localhost

Source Address: 00 00 00 00 00 00 **00 00 00 00 00 00** 08 00

* 0x000000000000 means localhost

Type of Payload: 00 00 00 00 00 00 00 00 00 00 00 00 **08 00**

* 0x0800 means type is IPv4

### Network Layer (Layer 3/IP header)

IP Version: **4**5 00 00 ca 5c 0d 00 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* 4 🡪 IPv4

Internet Header Length: 4**5** 00 00 ca 5c 0d 00 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* Header length is 5 × 4 = 20 bytes 🡪 there is no *options* field in this header

Type of Service: 45 **00** 00 ca 5c 0d 00 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* In binary: 0 0 0 0 0 0 0 0
* **0 0 0** 0 0 0 0 0 🡪 The datagram has *routine* (the lowest) precedence.
* 0 0 0 **0** 0 0 0 0 🡪 Normal Delay
* 0 0 0 0 **0** 0 0 0 🡪 Normal Throughput
* 0 0 0 0 0 **0** 0 0 🡪 Normal Reliability
* 0 0 0 0 0 0 **0 0** 🡪 Unused bits

Total Length: 45 00 **00 ca** 5c 0d 00 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* 0x00ca = 202 in decimal 🡪 IP datagram is 202 bytes long

Identification: 45 00 00 ca **5c 0d** 00 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* 0x5c0d is identity assigned by the sender for reconstruction of a fragmented datagram

Flags (first 3 bits of underlined): 45 00 00 ca 5c 0d ***0***0 00 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* In binary: 0 0 0
* **0** 0 0 🡪 Reserved bit (must be zero)
* 0 **0** 0 🡪 May fragment
* 0 0 **0** 🡪 Last fragment

Fragment Offset (latter 13 bits of underlined): 45 00 00 ca 5c 0d **00 00** 80 11 00 00 0a 20 1b a0 0a 20 7f ff

* Fragment offset is zero, and we know there are no fragments after this datagram (last fragment bit from earlier). This means while the datagram could’ve been fragmented (may fragment bit from earlier), it wasn’t, and this is the last and only fragment of the datagram (because the offset is zero).

Time to Live: 45 00 00 ca 5c 0d 00 00 **80** 11 00 00 0a 20 1b a0 0a 20 7f ff

### Transport Layer (Layer 4/TCP header)