Data Communications Laboratory
IP Fragmentation

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Exercise 1: Fragments

Open the merged packet capture file with Wireshark and answer the following questions.

Use the following filter rule in Wireshark

```
ip.flags.mf == 1 || (ip.flags.mf == 0 && ip.frag_offset > 0)
```

Answer the following questions

1. What is the size of the largest fragment you are able to find?

The largest fragment has a length of 1514 bytes.

```
1514 Fragmented IP protocol (proto=ICMP 1, off=5920, ID=0107) [Reassembled in #1931]
1514 Fragmented IP protocol (proto=ICMP 1, off=4440, ID=0107) [Reassembled in #1931]
1514 Fragmented IP protocol (proto=ICMP 1, off=2960, ID=0107) [Reassembled in #1931]
1514 Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0107) [Reassembled in #1931]
1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=0107) [Reassembled in #1931]
```

2. What address is common to all the fragments of this size?

The address common to all fragments of this size is 10.46.34.22

Source	Destination
10.46.32.1	10.46.34.22
10.46.32.1	10.46.34.22
10.46.32.1	10.46.34.22
10.46.32.1	10.46.34.22
10.46.32.1	10.46.34.22
10.46.34.22	10.46.32.1
10.46.34.22	10.46.32.1
10.46.34.22	10.46.32.1
10.46.34.22	10.46.32.1
10.46.34.22	10.46.32.1
10.46.34.22	172.16.0.2
10.46.34.22	172.16.0.2
10.46.34.22	172.16.0.2
10.46.34.22	172.16.0.2
10.46.34.22	172.16.0.2
10.46.34.22	137.111.33.3
10.46.34.22	137.111.33.3
10.46.34.22	137.111.33.3
10.46.34.22	137.111.33.3
10.46.34.22	137.111.33.3
10.46.34.22	9.8.7.6
10.46.34.22	9.8.7.6

3. What is the size of the smallest fragment you are able to find?

The smallest fragment has a length of 60 bytes.

```
IPv4          60 Fragmented IP protocol (proto=ICMP 1, off=1472, ID=29c0)
```

Change the Wireshark filter to

```
ip.flags.mf == 1
```

4. What is the size of the smallest fragment you are now able to find?

The smallest fragment I can find is 60 bytes in length.

Source	Destination	Protocol	Length	I
10.46.34.22	192.168.0.11	IPv4	60	F
10.46.34.22	192.168.0.11	IPv4	60	F
10.46.34.22	192.168.0.11	IPv4	60	F
10.46.34.22	192.168.0.11	IPv4	60	F
192.168.0.11	10.46.34.22	IPv4	60	F
192.168.0.11	10.46.34.22	IPv4	60	F
192.168.0.11	10.46.34.22	IPv4	60	F
192.168.0.11	10.46.34.22	IPv4	60	F
10.46.34.22	9.8.7.6	IPv4	60	F
10.46.34.22	9.8.7.6	IPv4	60	F
10.46.34.22	9.8.7.6	IPv4	60	F
10.46.34.22	137.111.33.3	IPv4	60	F

5. Is this value different from what you found above in step 3?

No, they are the same. Both are 60 bytes in length.

6. Why do you think it is the same or different?

These are the same because they all contain the 8 bytes of data. Each packet contains a different fragment of data

Exercise 2: Path MTU

Change the Wireshark filter to

```
ip.flags.df == 1
```

Examine the ICMP Destination Unreachable (Fragmentation needed)

7. Are you able to determine the MTU of the 172.16.0.0/30 network?

Yes, we can determine the MTU of the 172.16.0.0/30 network.

8. If so, what is it? If not, why not?

The MTU its 576 bytes.

9. Are you able to determine the MTU of the 137.111.0.0/16 network?

No, we cannot determine the MTU of 137.111.0.0/16 network.

10. If so, what is it? If not, why not?

We cannot determine the packet size is smaller than the MTU. I believe that the MTU is shown if the packet is too large and needs to be told to the transmitting pc.

11. Are you able to determine the MTU of the 9.0.0.0/8 network?

No, we cannot determine the MTU of 9.0.0.0/8 network.

12. If so, what is it? If not, why not?

We cannot determine the packet size is smaller than the MTU. I believe that the MTU is shown if the packet is too large and needs to be told to the transmitting pc

Remove the Wireshark filter

13. Are you able to determine the MTU of the 10.46.32.0/21 network?

Yes, we can determine the MTU of the 10.46.32.0/21 network.

14. If so, what is it? If not, why not?

The MTU its 1492 bytes.

15. What is the Path MTU of the pathway between PC1 and PC2?

We can determine that the PMTU is 576 bytes as that is the lowest MTU seen within all packets sent from PC1 to PC2.
This is from R1 to R2.

Exercise 3

If a packet gets fragmented all of the resulting fragments should be the same size with the exception of the last fragment.

16. Packet 1567 is fragmented into frames 1544 through to 1566. What are the sizes of the individual frames?

The sizes of the individual packets are 586 bytes, 402 bytes and 60 bytes.

17. What do think causes this pattern?

This pattern is determined by the previous MTU information collected when determining the PMTU of the ICMP ping request.

Each of the ICMP Ping packets have different patterns and use different sizes within those patterns. I believe that this is because each of these represents a jump within the network and each of the jumps has a different MTU.

The fragment sizing is changing to suit the next jump based on its MTU for that hop.