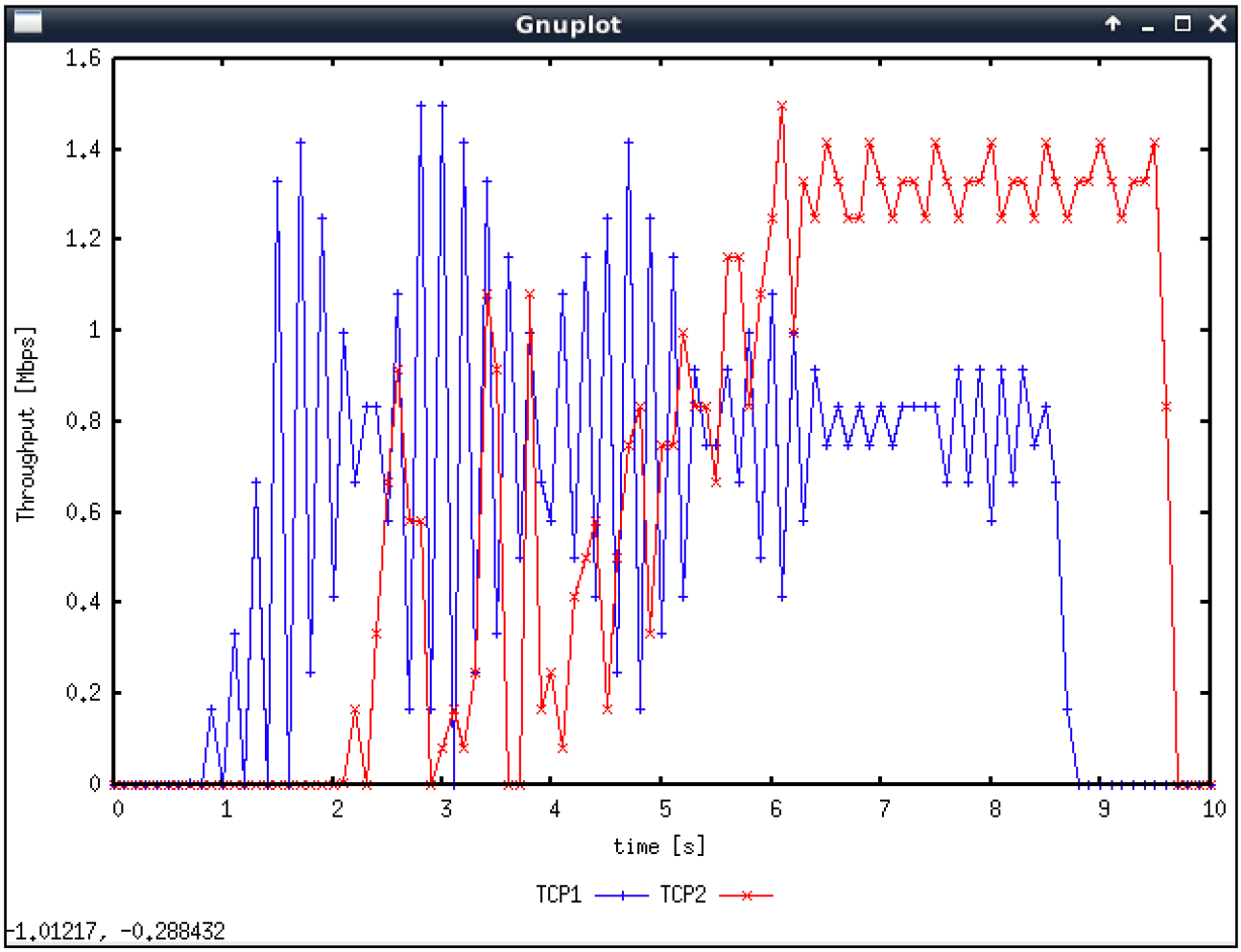
ZID: z5230310 Name: Tian Liu Date: 24/07/2019

E1:



Q1:

The reason is that flow tcp 1 has to traverse more routers than flow tcp 2, which means it has a longer delay.

Q2:

Tcp 1 is using slow-start to detect available bandwidth.

Q3:

During time 0.5 - 2.0 sec, tcp 1 is the only flow active but it is still in the slow-start phase and have to compete with other flows starting at 2.0 sec before it can reach the maximum bandwidth.

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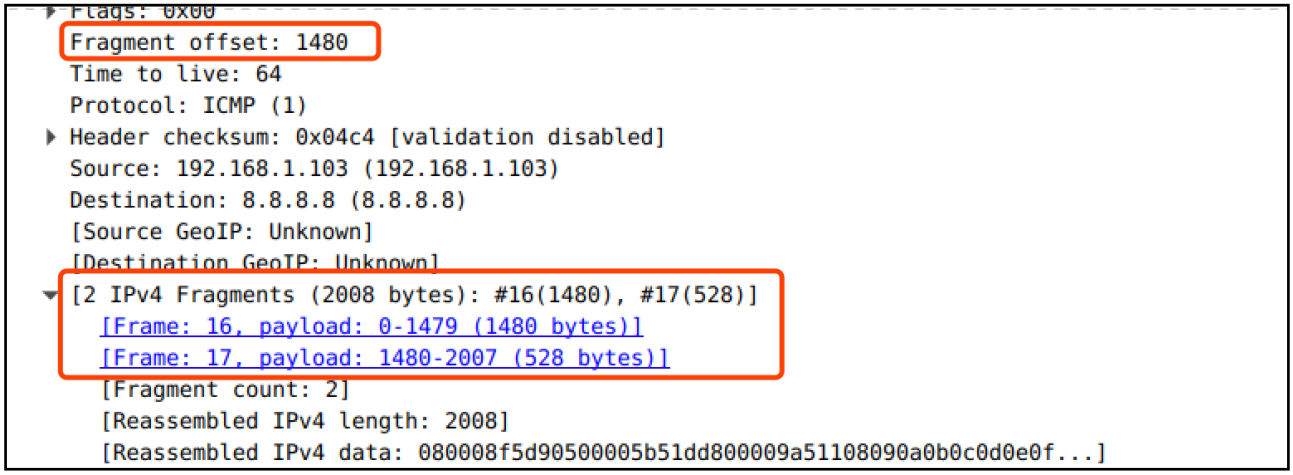
E2:

Q1:

The data size **2000** and **3500** caused fragmentation because there is offset flag in frame, picture shows below:

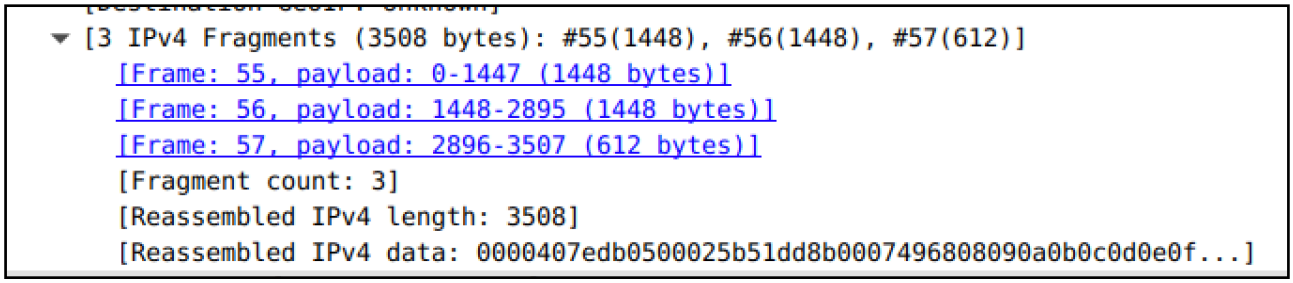


192.168.1.103 fragmented the original datagram.

And in data size id specifies as 2000, there will be **2** fragments created.

Q2:

The reply from the destination 8.8.8.8 for 3500-byte data size also get fragmented, as picture shows below:



The reason is that data size is too large to transmit, and must be fragmented.

Q3:

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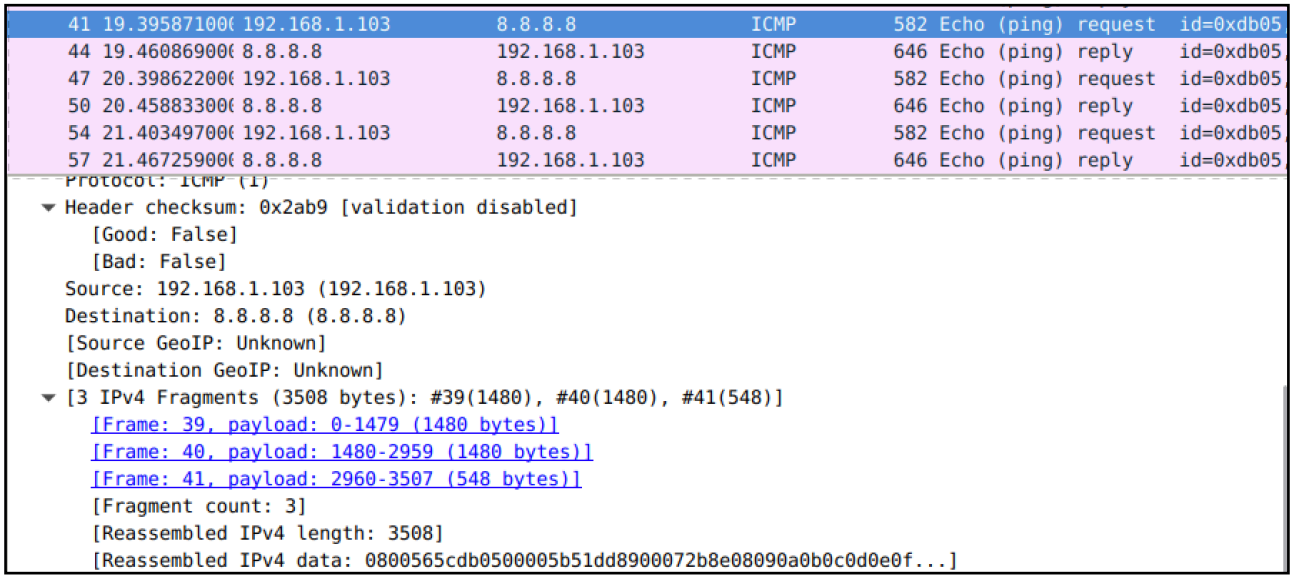
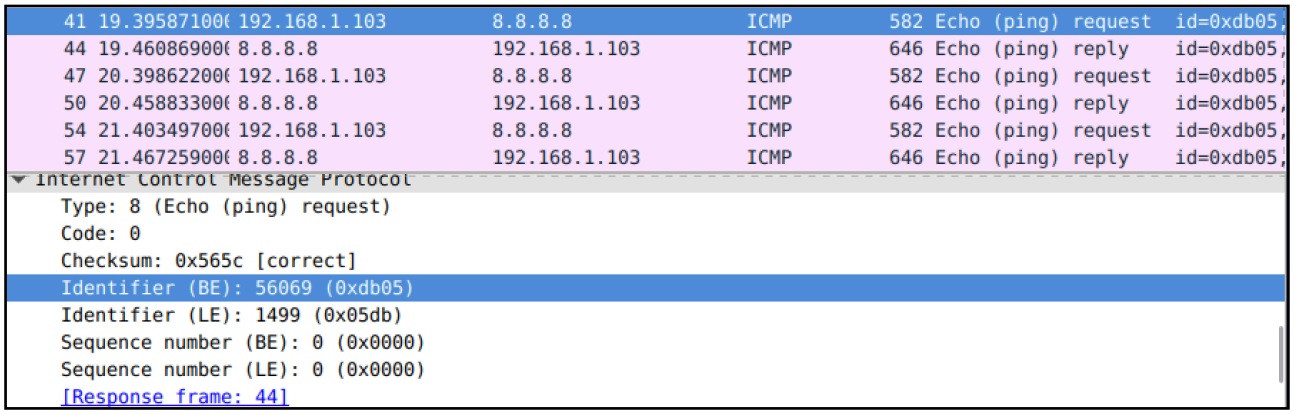
Like the picture shows below:





ID: 0Xdb05, length = 1500, flag = 1, offset = 0

ID: 0Xdb05, length = 1500, flag = 1, offset = 185

ID: 0Xdb05, length = 568, flag = 0, offset = 370

Q4:

This is not sure, I can only sure about that there is no further fragmentation occur in the last packet of the fragment. But in the former two fragments, I can not sure whether there is fragmentation occur only we can found the offset value is between 0 and 185 or 185 and 370.

Q5:

If one fragment is lost, the whole packet should be retransmitted, and the packet with one fragment missing will be discarded.

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E3:

Q1:

Node 0 sends packets to Node 5, follow the route 0 - 1 - 4 - 5.
Node 2 sends packets to Node 5, follow the route 2 - 3 - 5.
Both the routes do not change over time.

Q2:

At time 1.0 the link between Node 1 and Node 4 goes down, the route between Node 1 and Node 5 does not change, but Node 0 cannot reach Node 5.
At time 1.2 the link between Node 1 and Node 4 goes up, and the packets can be forwarded again, and Node 0 can reach Node 5 again.

Q3:

When the link between Node 1 and Node 4 goes down, the route changes to 0 - 1 - 2 - 3 - 5.
However, when link between Node 1 and Node 4 goes up, the route back to 0 - 1 - 4 - 5.
The reason is that the original route has lower cost than 0 - 1 - 2 - 3 - 5.

Q4:

This changes the cost of the link between Node 1 to Node 4 to Node3.
The route changes to 0 - 1 - 2 - 3 - 5 since the cost of route 0 - 1 - 2 - 3 - 5 is 4 which is lower than the cost of route 0 - 1 - 4 - 5 is 5.

Q5:

Node 2 can transmit data use route 2 - 1 - 4 - 5 or route 2 - 3 -5.
Since the network is now using multi path routing, Node 2 will split traffic equally on both these paths.