**CSCI 367 - Computer Networks I (5)**

Network – Ethernet Maximum Transmission Unit (MTU) and IP Fragmentation

References

<https://en.wikipedia.org/wiki/IP_fragmentation>

<https://stackoverflow.com/questions/7846442/why-the-ip-fragments-must-be-in-multiples-of-8-bytes>

<https://www.sciencedirect.com/topics/computer-science/maximum-segment-size>

1. IP Fragmentation is a process that breaks packets into smaller pieces called fragments.
2. The size of a fragment is based on the Layer-2 Datalink’s MTU (Maximum Transmission Unit).
3. IP fragments are reassembled by the receiving host’s Layer-3 Network process.
4. When setting up a TCP connection, a Maximum Segment Size (MSS) is agreed upon. This could be considered a Layer-4 Transport MTU, but the MSS is not fixed like the MTU is.
5. The Maximum Segment Size (MSS) is a TCP Option and sets the largest segment that the local host will accept. The MSS is usually the link MTU size minus the 40 bytes of the TCP and IP headers, but many implementations use segments of 512 or 536 bytes (it's a maximum, not a demand).
6. The MSS is often set to the largest payload that can be sent in a TCP segment without causing fragmentation, thus reflecting the lowest Layer-2 Datalink MTU on the path. With an Ethernet MTU of 1500, this MSS would be 1460 after subtracting 20 bytes for the IPv4 and TCP header.

Scenario: Ping with ICMP Packet Size = 1473

Gateway IP Address: ping 192.168.1.1

Option: -l 1473

Calculation:

MTU: 1500 Bytes

IP Header: 20 Bytes

ICMP Header: 8 Bytes

Maximum IP Payload without fragmentation: 1480

Subtract ICMP Header: Maximum IP Payload without fragmentation: 1472

A picture containing graphical user interface

Description automatically generated

Wireshark Capture of ICMP Ping Request

Graphical user interface, text, application

Description automatically generated

Wireshark Capture of ICMP Ping Request’s First Fragment

Graphical user interface, text, application, email

Description automatically generated

Wireshark Capture of ICMP Ping Request’s Second Fragment

Graphical user interface, text, application, email

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