

HACETTEPE UNIVERSITY
COMPUTER ENGINEERING DEPARTMENT
COMPUTER NETWORKS LABORATORY



EXPERIMENT IP

Deniz Ece AKTAŞ 21626901

Ece OMURTAY 21627543

GROUP NUMBER : 12

IP address of our computer: 192.168.1.55

1. The IP address of our computer is: 192.168.1.55

18.4.893843	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=437/46337, ttl=255 (reply in 31)
19.4.932165	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=438/46593, ttl=1 (no response found!)
20.4.933655	192.168.1.1	192.168.1.55	ICMP	98 Time-to-live exceeded (Time to live exceeded in transit)	
> Frame 18: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-9568-3A40FB10F6C4}, id 0					
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)					
▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 56					
Identification: 0xe0a3 (57507)					
Flags: 0x0000					
Fragment offset: 0					
Time to live: 255					
Protocol: ICMP (1)					
Header checksum: 0xa3bd [validation disabled]					
[Header checksum status: Unverified]					
Source: 192.168.1.55					
Destination: 128.119.245.12					
> Internet Control Message Protocol					

2. Within the IP package header, the value in upper layer protocol field is ICMP(1).

18.4.893843	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=437/46337, ttl=255 (reply in 31)
19.4.932165	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=438/46593, ttl=1 (no response found!)
20.4.933655	192.168.1.1	192.168.1.55	ICMP	98 Time-to-live exceeded (Time to live exceeded in transit)	
> Frame 18: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-9568-3A40FB10F6C4}, id 0					
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)					
▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 56					
Identification: 0xe0a3 (57507)					
Flags: 0x0000					
Fragment offset: 0					
Time to live: 255					
Protocol: ICMP (1)					
Header checksum: 0xa3bd [validation disabled]					
[Header checksum status: Unverified]					
Source: 192.168.1.55					
Destination: 128.119.245.12					
> Internet Control Message Protocol					

3. There are 20 bytes in the IP header, 56 bytes in total length so 56-20=36 bytes is the payload bytes.

18.4.893843	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=437/46337, ttl=255 (reply in 31)
19.4.932165	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=438/46593, ttl=1 (no response found!)
20.4.933655	192.168.1.1	192.168.1.55	ICMP	98 Time-to-live exceeded (Time to live exceeded in transit)	
> Frame 18: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-9568-3A40FB10F6C4}, id 0					
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)					
▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 56					
Identification: 0xe0a3 (57507)					
Flags: 0x0000					
Fragment offset: 0					
Time to live: 255					
Protocol: ICMP (1)					
Header checksum: 0xa3bd [validation disabled]					
[Header checksum status: Unverified]					
Source: 192.168.1.55					
Destination: 128.119.245.12					
> Internet Control Message Protocol					

4. The fragments bit is equal to 0, so the data is not fragmented.

18.4.893843	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=437/46337, ttl=255 (reply in 31)
19.4.932165	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=438/46593, ttl=1 (no response found!)
20.4.933655	192.168.1.1	192.168.1.55	ICMP	98 Time-to-live exceeded (Time to live exceeded in transit)	
> Frame 18: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-9568-3A40FB10F6C4}, id 0					
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)					
▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 56					
Identification: 0xe0a3 (57507)					
Flags: 0x0000					
Fragment offset: 0					
Time to live: 255					
Protocol: ICMP (1)					
Header checksum: 0xa3bd [validation disabled]					
[Header checksum status: Unverified]					
Source: 192.168.1.55					
Destination: 128.119.245.12					
> Internet Control Message Protocol					

5. The Identification field, time to live field and header checksum fields change.

219	11.104577	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=514/514, ttl=24 (reply in 223)
217	11.054324	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=513/258, ttl=23 (no response found!)

> Frame 219: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)
> Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12
0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 56
Identification: 0xe0f0 (57584)
Flags: 0x0000
Fragment offset: 0
Time to live: 24
Protocol: ICMP (1)
Header checksum: 0x8a71 [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.55
Destination: 128.119.245.12
> Internet Control Message Protocol

219	11.104577	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=514/514, ttl=24 (reply in 223)
217	11.054324	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=513/258, ttl=23 (no response found!)

> Frame 217: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)
> Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12
0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 56
Identification: 0xe0ef (57583)
Flags: 0x0000
Fragment offset: 0
Time to live: 23
Protocol: ICMP (1)
Header checksum: 0x8b72 [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.55
Destination: 128.119.245.12
> Internet Control Message Protocol

6. The constant fields are; version because IPv4 usage is continuous, header length because ICMP packets stay the same length, source IP because source doesn't change, destination IP because destination doesn't change, Upper Layer protocol because ICMP stays the same, differentiated services because ICMP use same type of service class.

The fields that must stay constant are; version because IPv4 usage is continuous, header length because ICMP packets stay the same length, source IP because source doesn't change, destination IP because destination doesn't change, Upper Layer protocol because ICMP stays the same, differentiated services because ICMP use same type of service class.

The fields that must change are; Identification because IP packets have different identifications, time to live field because traceroute gets one less each packet, header checksum because headers change.

7. The pattern is Identification increments with each ping.

219	11.104577	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=514/514, ttl=24 (reply in 223)
217	11.054324	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=513/258, ttl=23 (no response found!)

> Frame 219: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0

> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)

▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12

0100 = Version: 4
 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 56
 Identification: 0xe0f0 (57584)
 Flags: 0x0000
 Fragment offset: 0
 Time to live: 24
 Protocol: ICMP (1)
 Header checksum: 0x8a71 [validation disabled]
 [Header checksum status: Unverified]
 Source: 192.168.1.55
 Destination: 128.119.245.12

> Internet Control Message Protocol

219	11.104577	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=514/514, ttl=24 (reply in 223)
217	11.054324	192.168.1.55	128.119.245.12	ICMP	70 Echo (ping) request	id=0x0001, seq=513/258, ttl=23 (no response found!)

> Frame 217: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0

> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)

▼ Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12

0100 = Version: 4
 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 56
 Identification: 0xe0ef (57583)
 Flags: 0x0000
 Fragment offset: 0
 Time to live: 23
 Protocol: ICMP (1)
 Header checksum: 0x8b72 [validation disabled]
 [Header checksum status: Unverified]
 Source: 192.168.1.55
 Destination: 128.119.245.12

> Internet Control Message Protocol

8. Identification: 54625

TTL: 41

31	5.030696	128.119.245.12	192.168.1.55	ICMP	70 Echo (ping) reply	id=0x0001, seq=437/46337, ttl=41 (request in 18)
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> Frame 31: 70 bytes on wire (560 bits), 70 bytes captured (560 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0

> Ethernet II, Src: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80), Dst: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5)

▼ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.55

0100 = Version: 4
 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 56
 Identification: 0xd561 (54625)
 Flags: 0x0000
 Fragment offset: 0
 Time to live: 41
 Protocol: ICMP (1)
 Header checksum: 0x8500 [validation disabled]
 [Header checksum status: Unverified]
 Source: 128.119.245.12
 Destination: 192.168.1.55

▼ Internet Control Message Protocol

Type: 0 (Echo (ping) reply)
 Code: 0
 Checksum: 0x3c88 [correct]
 [Checksum Status: Good]
 Identifier (BE): 1 (0x0001)
 Identifier (LE): 256 (0x0100)
 Sequence number (BE): 437 (0x01b5)
 Sequence number (LE): 46337 (0xb501)
[\[Request frame: 18\]](#)
 [Response time: 136.853 ms]

9. The identification changes for every value if 2 IP datagrams have the same identification value then it means that IP datagrams are fragment parts of a large IP datagram.

The time to live stays same because TTL for first hop router is the same.

10. Yes, the packet have been fragmented across more than one IP datagram.

```

24 7.663358 192.168.1.55 128.119.245.12 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=e5f2) [Reassembled in #32]
> Frame 24: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)
v Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 1500
    Identification: 0xe5f2 (58866)
  v Flags: 0x2000, More fragments
    0... .. = Reserved bit: Not set
    .0.. .. = Don't fragment: Not set
    ..1. .... = More fragments: Set
    Fragment offset: 0
    Time to live: 255
    Protocol: ICMP (1)
    Header checksum: 0x78ca [validation disabled]
    [Header checksum status: Unverified]
    Source: 192.168.1.55
    Destination: 128.119.245.12
    [Reassembled IPv4 in frame: 32]
> Data (1480 bytes)

```

11. The Flags field is 0x2000 and more fragments part is set and this shows that the datagram has been fragmented. Because the fragment offset is 0, this is the first fragment and the total length is 1500 bytes as shown above.

12. This is not the first fragment because the fragment offset is 11840. This is the last fragment because the more fragments field is not set.

```

32 7.663358 192.168.1.55 128.119.245.12 ICMP 174 Echo (ping) request id=0x0001, seq=1796/1031, ttl=255 (reply in 87)
> Frame 32: 174 bytes on wire (1392 bits), 174 bytes captured (1392 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:81 (1c:44:19:62:5c:81)
v Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 160
    Identification: 0xe5f2 (58866)
  v Flags: 0x05c8
    0... .. = Reserved bit: Not set
    .0.. .. = Don't fragment: Not set
    ..0. .... = More fragments: Not set
    Fragment offset: 11840
    Time to live: 255
    Protocol: ICMP (1)
    Header checksum: 0x983e [validation disabled]
    [Header checksum status: Unverified]
    Source: 192.168.1.55
    Destination: 128.119.245.12
  > [9 IPv4 Fragments (11980 bytes): #24(1480), #25(1480), #26(1480), #27(1480), #28(1480), #29(1480), #30(1480), #31(1480), #32(140)]
v Internet Control Message Protocol
  Type: 8 (Echo (ping) request)
  Code: 0
  Checksum: 0xc1cb [correct]
  [Checksum Status: Good]
  Identifier (BE): 1 (0x0001)
  Identifier (LE): 256 (0x0100)
  Sequence number (BE): 1796 (0x0704)
  Sequence number (LE): 1031 (0x0407)

```

13. Fields that have changed are; total length, flags, fragment offset, header checksum as shown above.

14. From the start of the first fragment to the reply point there are 5 packets created from the original datagram.

```

100 6.007483 192.168.1.55 128.119.245.12 ICMP 774 Echo (ping) request id=0x0001, seq=1899/27399, ttl=255 (reply in 206)
101 6.045231 192.168.1.55 128.119.245.12 IPv4 1514 Fragmented IP protocol (proto=ICMP 1, off=0, ID=e65a) [Reassembled in #114]
> Frame 87: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)
v Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 1500
    Identification: 0xe659 (58969)
  v Flags: 0x2000, More fragments
    0... .. = Reserved bit: Not set
    .0.. .. = Don't fragment: Not set
    ..1. .... = More fragments: Set
    Fragment offset: 0
    Time to live: 255
    Protocol: ICMP (1)

```

205 6.202832	128.119.245.12	192.168.1.55	IPv4	1466	Fragmented IP protocol (proto=ICMP 1, off=17808, ID=c895) [Reassembled in #206]
206 6.202832	128.119.245.12	192.168.1.55	ICMP	774	Echo (ping) reply id=0x0001, seq=1899/27399, ttl=41 (request in 100)

15. The fields that have changed are; fragment offset, and header checksum values. Also at the last fragments last packet total length is set to 760 bytes, we know that this is the last package because the more fragment field is not set and is 0.

87 6.007483	192.168.1.55	128.119.245.12	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=e659) [Reassembled in #100]
88 6.007483	192.168.1.55	128.119.245.12	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=e659) [Reassembled in #100]
> Frame 87: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0					
> Ethernet II, Src: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5), Dst: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80)					
Internet Protocol Version 4, Src: 192.168.1.55, Dst: 128.119.245.12					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 1500					
Identification: 0xe659 (58969)					
Flags: 0x2000, More fragments					
0... .. = Reserved bit: Not set					
.0.. .. = Don't fragment: Not set					
..1. = More fragments: Set					
Fragment offset: 0					
Time to live: 255					
Protocol: ICMP (1)					
Header checksum: 0x7863 [validation disabled]					
[Header checksum status: Unverified]					
Source: 192.168.1.55					
Destination: 128.119.245.12					
[Reassembled IPv4 in frame: 100]					
> Data (1480 bytes)					

206 6.202832	128.119.245.12	192.168.1.55	ICMP	774	Echo (ping) reply id=0x0001, seq=1899/27399, ttl=41 (request in 100)
> Frame 206: 774 bytes on wire (6192 bits), 774 bytes captured (6192 bits) on interface \Device\NPF_{2F86FA23-1860-4715-956B-3A40FB10F6C4}, id 0					
> Ethernet II, Src: Tp-LinkT_62:5c:80 (1c:44:19:62:5c:80), Dst: IntelCor_83:5e:f5 (f8:94:c2:83:5e:f5)					
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.55					
0100 = Version: 4					
.... 0101 = Header Length: 20 bytes (5)					
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)					
Total Length: 760					
Identification: 0xc895 (51349)					
Flags: 0x0965					
0... .. = Reserved bit: Not set					
.0.. .. = Don't fragment: Not set					
..0. = More fragments: Not set					
Fragment offset: 19240					
Time to live: 41					
Protocol: ICMP (1)					
Header checksum: 0x85a7 [validation disabled]					
[Header checksum status: Unverified]					
Source: 128.119.245.12					
Destination: 192.168.1.55					