

Tyler Cope

CS372 Lab 3

1. IP address of my computer: 192.168.1.102

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
7	21:48:02.523813	192.168.1.100	192.168.1.1	SSDP	175	M-SEARCH * HTTP/1.1
8	21:48:02.821397	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20483/848, ttl=1 (n...
9	21:48:02.835178	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
10	21:48:02.846981	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20739/849, ttl=2 (n...
11	21:48:02.861309	24.218.0.153	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
12	21:48:02.866949	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20995/850, ttl=3 (n...
13	21:48:02.892857	24.128.190.197	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
14	21:48:02.897047	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21251/851, ttl=4 (n...
15	21:48:02.916024	24.128.0.101	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
16	21:48:02.917102	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21507/852, ttl=5 (n...
17	21:48:02.944369	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Flags: 0x00
0... .. = Reserved bit: Not set
.0.. .. = Don't fragment: Not set
..0. .. = More fragments: Not set
Fragment offset: 0
> Time to live: 1
Protocol: ICMP (1)
Header checksum: 0x2d2c [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.102
Destination: 128.59.23.100
[Source GeoIP: Unknown]

0010 00 54 32 d0 00 00 01 01 2d 2c c0 a8 01 66 80 3b .T2.... -,...f.:
0020 17 64 08 00 f7 ca 03 00 50 03 37 32 20 aa aa aa .d..... P.72 ...
0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa

Destination (ip.dst), 4 bytes | Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 | Profile: Default

2. The value is 1.

ip-ethereal-trace-1

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12	21:48:02.866949	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20995/850, ttl=3 (n...
13	21:48:02.892857	24.128.190.197	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
14	21:48:02.897047	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21251/851, ttl=4 (n...
15	21:48:02.916024	24.128.0.101	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
16	21:48:02.917102	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21507/852, ttl=5 (n...
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Flags: 0x00
 0... = Reserved bit: Not set
 .0... = Don't fragment: Not set
 ..0... = More fragments: Not set
 Fragment offset: 0
 Time to live: 1
 Protocol: ICMP (1)
 Header checksum: 0x2d2c [validation disabled]
 [Header checksum status: Unverified]
 Source: 192.168.1.102
 Destination: 128.59.23.100
 [Source GeoIP: Unknown]

0010 00 54 32 d0 00 00 01 01 2d 2c c0 a8 01 66 80 3b .T2....-,...f.;
 0020 17 64 08 00 f7 ca 03 00 50 03 37 32 20 aa aa aa .d.....P.72 ...
 0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

Protocol (ip.proto), 1 byte

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default

3.

a. There are 20 bytes in the header.

ip-ethereal-trace-1

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No.	Time	Source	Destination	Protocol	Length	Info
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11	21:48:02.861309	24.218.0.153	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
12	21:48:02.866949	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20995/850, ttl=3 (n...
13	21:48:02.892857	24.128.190.197	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
14	21:48:02.897047	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21251/851, ttl=4 (n...
15	21:48:02.916024	24.128.0.101	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
16	21:48:02.917102	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21507/852, ttl=5 (n...
17	21:48:02.944369	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

> Frame 8: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
 > Ethernet II, Src: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
 > Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.59.23.100
 0100 = Version: 4
 0101 = Header Length: 20 bytes (5)
 > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 84
 Identification: 0x32d0 (13008)
 > Flags: 0x00
 Fragment offset: 0
 Time to live: 1
 Protocol: ICMP (1)

0000 00 06 25 da af 73 00 20 e0 8a 70 1a 08 00 45 00 ..%.s. .p...
 0010 00 54 32 d0 00 00 01 01 2d 2c c0 a8 01 66 80 3b .T2....-,...f.;
 0020 17 64 08 00 f7 ca 03 00 50 03 37 32 20 aa aa aa .d.....P.72 ...
 0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

Header Length (ip_hdr_len), 1 byte

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default

b. There are 36 bytes in the payload. This was determined because the next screenshot shows there were 56 bytes sent and 20 were for the header.

The screenshot shows the Wireshark interface with a packet capture of an ICMP Echo request. The packet list shows a packet from 192.168.1.102 to 128.59.23.100. The packet details pane shows the Internet Control Message Protocol (ICMP) Type 8 (Echo (ping) request) with a sequence number of 20483. The packet data pane shows the raw data of the packet, which is 56 bytes long. The data is displayed in hexadecimal and ASCII format. The ASCII part shows the string "P.72 ...".

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12	21:48:02.866949	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20995/850, ttl=3 (n...
13	21:48:02.892857	24.128.190.197	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
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16	21:48:02.917102	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21507/852, ttl=5 (n...
17	21:48:02.944369	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.59.23.100

Internet Control Message Protocol

Type: 8 (Echo (ping) request)

Code: 0

Checksum: 0xf7ca [correct]

[Checksum Status: Good]

Identifier (BE): 768 (0x0300)

Identifier (LE): 3 (0x0003)

Sequence number (BE): 20483 (0x5003)

Sequence number (LE): 848 (0x0350)

[No response seen]

Data (56 bytes)

0020 17 64 08 00 f7 ca 03 00 50 03 37 32 20 aa aa aa .d..... P.72 ...

0030 aa aa aa aa aa aa aa aa aa aa aa aa aa

0040 aa aa aa aa aa aa aa aa aa aa aa aa aa

0050 aa aa aa aa aa aa aa aa aa aa aa aa aa

0060 aa aa

Data (data), 56 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 Profile: Default

4. This IP datagram has not been fragmented. We can tell because the “More fragments” flag is not set.

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12	21:48:02.866949	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=20995/850, ttl=3 (n...
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16	21:48:02.917102	192.168.1.102	128.59.23.100	ICMP	98	Echo (ping) request id=0x0300, seq=21507/852, ttl=5 (n...
17	21:48:02.944369	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

0100 = Version: 4
 0101 = Header Length: 20 bytes (5)
 > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 84
 Identification: 0x32d0 (13008)
 Flags: 0x00
 0... = Reserved bit: Not set
 .0.. = Don't fragment: Not set
 ..0. = More fragments: Not set
 Fragment offset: 0
 > Time to live: 1
 Protocol: ICMP (1)

0010 00 54 32 d0 00 00 01 01 2d 2c c0 a8 01 66 80 3b .T2... -,...f.;
 0020 17 64 08 00 f7 ca 03 00 50 03 37 32 20 aa aa aa .d..... P.72 ...
 0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

More fragments (ip.flags.mf), 1 byte

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 | Profile: Default

5. Time to live, Header checksum, and Identification always change from one datagram to the next.

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
57	21:48:08.046363	192.205.32.106	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
27	21:48:03.041309	192.205.32.106	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
→ 368	21:48:50.437073	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=50179/964, ttl=13 (...)
• 367	21:48:50.436184	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=334a...)
• 366	21:48:50.435513	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=334a) [...]
365	21:48:50.416936	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49923/963, ttl=12 (...)
364	21:48:50.416055	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3349...)
363	21:48:50.415388	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3349) [...]
361	21:48:50.386870	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49667/962, ttl=11 (...)
360	21:48:50.385983	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3348...)
359	21:48:50.385321	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3348) [...]

Total Length: 568
 Identification: 0x334a (13130)
 > Flags: 0x00
 Fragment offset: 2960
 Time to live: 13
 Protocol: ICMP (1)
 Header checksum: 0x1d5c [validation disabled]
 [Header checksum status: Unverified]
 Source: 192.168.1.102
 Destination: 128.59.23.100
 [Source GeoIP: Unknown]
 [Destination GeoIP: Unknown]

0010 02 38 33 4a 01 72 0d 01 1d 5c c0 a8 01 66 80 3b .83Jr... \...f.;
 0020 17 64 aa aa aa aa aa aa aa aa aa aa aa aa aa aa .d.....
 0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
 0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

Frame (582 bytes) Reassembled IPv4 (3508 bytes)
 Flags (3 bits) (p.flags), 1 byte

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0:3 · Profile: Default

6.

- a. The fields that stay constant: Version, Header Length, Differentiated Services Field, Source, Destination, Protocol
 - b. The fields that must stay constant are the same as the fields that do stay constant.
 - c. Same answer as #5. Time to live, header checksum, and indemnification must change.
7. I notice that the header is incrementing from each request as well as the Time to live.

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→ 368	21:48:50.437073	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=50179/964, ttl=13 (...)
• 367	21:48:50.436184	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=334a...)
• 366	21:48:50.435513	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=334a) [...]
365	21:48:50.416936	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49923/963, ttl=12 (...)
364	21:48:50.416055	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3349...)
363	21:48:50.415388	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3349) [...]
361	21:48:50.386870	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49667/962, ttl=11 (...)
360	21:48:50.385983	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3348...)
359	21:48:50.385321	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3348) [...]

Flags: 0x00
Fragment offset: 2960
Time to live: 13
Protocol: ICMP (1)
Header checksum: 0xd5c [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.102
Destination: 128.59.23.100
[Source GeoIP: Unknown]
[Destination GeoIP: Unknown]
3 IPv4 Fragments (3508 bytes): #366(1480), #367(1480), #368(548)]

Internet Control Message Protocol

0010 02 38 33 4a 01 72 0d 01 1d 5d c0 a8 01 66 80 3b .83J.r...f.;
0020 17 64 aa aa aa aa aa aa aa aa aa aa aa aa aa aa .d.....
0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

Frame (582 bytes) Reassembled IPv4 (3508 bytes)
Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default

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368	21:48:50.437073	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=50179/964, ttl=13 (...)
367	21:48:50.436184	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=334a...)
366	21:48:50.435513	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=334a) [...]
• 365	21:48:50.416936	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49923/963, ttl=12 (...)
• 364	21:48:50.416055	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3349...)
• 363	21:48:50.415388	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3349) [...]
361	21:48:50.386870	192.168.1.102	128.59.23.100	ICMP	582	Echo (ping) request id=0x0300, seq=49667/962, ttl=11 (...)
360	21:48:50.385983	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=3348...)
359	21:48:50.385321	192.168.1.102	128.59.23.100	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=3348) [...]

Flags: 0x00
Fragment offset: 2960
Time to live: 12
Protocol: ICMP (1)
Header checksum: 0xe5d [validation disabled]
[Header checksum status: Unverified]
Source: 192.168.1.102
Destination: 128.59.23.100
[Source GeoIP: Unknown]
[Destination GeoIP: Unknown]
3 IPv4 Fragments (3508 bytes): #363(1480), #364(1480), #365(548)]

Internet Control Message Protocol

0010 02 38 33 49 01 72 0c 01 1e 5d c0 a8 01 66 80 3b .83I.r...f.;
0020 17 64 aa aa aa aa aa aa aa aa aa aa aa aa aa aa .d.....
0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..
0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa ..

Frame (582 bytes) Reassembled IPv4 (3508 bytes)
Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default

8. The identification is 0x927C (40316) and the TTL is 255.

The image shows a Wireshark packet capture window titled 'ip-ethereal-trace-1'. The packet list pane shows a series of ICMP 'Time-to-live exceeded' messages from 10.216.228.1 to 192.168.1.102. The packet details pane shows the structure of an Internet Protocol Version 4 packet with the following fields: Version: 4, Header Length: 20 bytes (5), Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT), Total Length: 56, Identification: 0x9d7c (40316), Flags: 0x00, Fragment offset: 0, Time to live: 255, Protocol: ICMP (1), Header checksum: 0x6ca0 [validation disabled], [Header checksum status: Unverified]. The packet bytes pane shows the raw data of the packet, with the identification field (0x9d7c) highlighted in blue. The status bar at the bottom indicates 'Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default'.

No.	Time	Source	Destination	Protocol	Length	Info
21	21:48:02.992672	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
330	21:48:50.159434	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
274	21:48:45.151425	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
219	21:48:40.144138	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
179	21:48:35.150169	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
135	21:48:30.128900	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
94	21:48:25.120616	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
65	21:48:12.838001	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
40	21:48:07.832847	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
9	21:48:02.835178	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Internet Protocol Version 4, Src: 10.216.228.1, Dst: 192.168.1.102

- 0100 = Version: 4
- 0101 = Header Length: 20 bytes (5)
- > Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
- Total Length: 56
- Identification: 0x9d7c (40316)
- > Flags: 0x00
- Fragment offset: 0
- Time to live: 255
- Protocol: ICMP (1)
- Header checksum: 0x6ca0 [validation disabled]
- [Header checksum status: Unverified]

0000 00 20 e0 8a 70 1a 00 06 25 da af 73 08 00 45 c0 % E .
0010 00 38 9d 7c 00 00 ff 01 6c a0 0a d8 e4 01 c0 a8 . 8 . | l
0020 01 66 0b 00 d9 46 00 00 00 00 45 00 00 54 32 d0 . f . . . F . . . E . . T2 .
0030 00 00 01 01 f6 16 c0 a8 01 66 80 3b 17 64 08 00 f . ; . d . .
0040 f7 ca 03 00 50 03 P .

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 · Profile: Default

9.

a. The identification field will change for all of the ICMP TTL-exceeded replies sent to my computer by the nearest (first hop) router. This is because the identification for each request must be unique. If datagrams had the same identification, it just means they're fragmented parts of the same datagram.

b. The TTL will not change because the TTL for the nearest router is always the same.

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
21	21:48:02.992672	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
330	21:48:50.159434	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
274	21:48:45.151425	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
219	21:48:40.144138	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
179	21:48:35.150169	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
135	21:48:30.128900	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
94	21:48:25.120616	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
65	21:48:12.838001	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
40	21:48:07.832847	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
9	21:48:02.835178	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Internet Protocol Version 4, Src: 10.216.228.1, Dst: 192.168.1.102

0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
Total Length: 56
Identification: 0x9d7c (40316)
> Flags: 0x00
Fragment offset: 0
Time to live: 255
Protocol: ICMP (1)
Header checksum: 0x6ca0 [validation disabled]
[Header checksum status: Unverified]

0000 00 20 e0 8a 70 1a 00 06 25 da af 73 08 00 45 c0 . .p... %..s..E.
0010 00 38 9d 7c 00 00 ff 01 6c a0 0a d8 e4 01 c0 a8 .8.|.... 1a.....
0020 01 66 0b 00 d9 46 00 00 00 00 45 00 00 54 32 d0 .f...F.. ..E..T2.
0030 00 00 01 01 f6 16 c0 a8 01 66 80 3b 17 64 08 00f.;.d..
0040 f7 ca 03 00 50 03P.

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 | Profile: Default

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
21	21:48:02.992672	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
330	21:48:50.159434	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
274	21:48:45.151425	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
219	21:48:40.144138	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
179	21:48:35.150169	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
135	21:48:30.128900	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
94	21:48:25.120616	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
65	21:48:12.838001	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
40	21:48:07.832847	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
9	21:48:02.835178	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Internet Protocol Version 4, Src: 10.216.228.1, Dst: 192.168.1.102

0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
Total Length: 56
Identification: 0x9d98 (40344)
> Flags: 0x00
Fragment offset: 0
Time to live: 255
Protocol: ICMP (1)
Header checksum: 0x6c84 [validation disabled]
[Header checksum status: Unverified]

0000 00 20 e0 8a 70 1a 00 06 25 da af 73 08 00 45 c0 . .p... %..s..E.
0010 00 38 9d 98 00 00 ff 01 6c 84 0a d8 e4 01 c0 a8 .8..... 1a.....
0020 01 66 0b 00 d9 47 00 00 00 00 45 00 00 54 32 de .f...G.. ..E..T2.
0030 00 00 01 01 f6 08 c0 a8 01 66 80 3b 17 64 08 00f.;.d..
0040 ea c9 03 00 5d 03].

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0.3 | Profile: Default

10. The message has been fragmented across more than one IP datagram.

The image shows a Wireshark capture of network traffic. The packet list pane displays several fragmented IP datagrams (IPv4) with a length of 554 bytes each, identified as 'Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)'. The packet details pane for the selected packet (No. 123) shows the following structure:

- Frame 123: 554 bytes on wire (4432 bits), 554 bytes captured (4432 bits)
- Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
- Internet Protocol Version 4, Src: 12.123.40.218, Dst: 192.168.1.102
 - 0100 = Version: 4
 - 0101 = Header Length: 20 bytes (5)
 - Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - Total Length: 540
 - Identification: 0x0000 (0)
 - Flags: 0x01 (More Fragments)
 - 0... = Reserved bit: Not set
 - .0.. = Don't fragment: Not set
 - ..1. = More fragments: Set

The packet bytes pane shows the raw data, with the first 20 bytes (0010 to 0050) corresponding to the IP header. The 'More fragments' flag is set, indicating that the data is fragmented.

11.

a. You can see in the header that More fragments is set so that tells us that it is fragmented.

b. We know it's the first fragment because the offset is 0.

c. The total length is 540 bytes. You can see under Data that 520 bytes were sent so you just add the 20-byte header.

The image shows a Wireshark packet capture window titled "ip-ethereal-trace-1". The packet list pane shows several ICMP "Time-to-live exceeded" messages. The selected packet (No. 317) is expanded, showing the ICMP header and data. The data field is expanded to show the raw bytes of the packet, which is a fragmented IP packet. The packet details pane shows the following information:

- Header checksum: 0xa97d [validation disabled]
- [Header checksum status: Unverified]
- Source: 12.123.40.218
- Destination: 192.168.1.102
- [Source GeoIP: Unknown]
- [Destination GeoIP: Unknown]

The packet data pane shows the raw bytes of the packet, which is a fragmented IP packet. The packet details pane shows the following information:

- Header checksum: 0xa97d [validation disabled]
- [Header checksum status: Unverified]
- Source: 12.123.40.218
- Destination: 192.168.1.102
- [Source GeoIP: Unknown]
- [Destination GeoIP: Unknown]

The packet data pane shows the raw bytes of the packet, which is a fragmented IP packet. The packet details pane shows the following information:

- Header checksum: 0xa97d [validation disabled]
- [Header checksum status: Unverified]
- Source: 12.123.40.218
- Destination: 192.168.1.102
- [Source GeoIP: Unknown]
- [Destination GeoIP: Unknown]

12.

a. The header has offset 1480 so we know it's not the first datagram fragment.

b. There are more fragments because the More fragments flag is set.

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
380	21:48:51.632018	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=50179/964, ttl=242 ...
379	21:48:51.625536	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0959...
378	21:48:51.616739	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [...]
324	21:48:46.628941	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=46851/951, ttl=242 ...
323	21:48:46.621637	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958...
322	21:48:46.613031	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [...]
270	21:48:41.630015	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957)
269	21:48:41.622684	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=43523/938, ttl=242 ...
268	21:48:41.615409	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957...
267	21:48:41.608683	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [...]
214	21:48:35.980918	128.59.23.100	192.168.1.102	ICMP	562	Echo (ping) reply id=0x0300, seq=40195/925, ttl=242 ...

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 1500
 Identification: 0x0957 (2391)
 Flags: 0x03 (Don't Fragment) (More Fragments)
 0... = Reserved bit: Not set
 .1... = Don't fragment: Set
 .1. = More fragments: Set
 Fragment offset: 1480
 Time to live: 242
 Protocol: ICMP (1)
 Header checksum: 0xff62 [validation disabled]
 [Header checksum status: Unverified]

0010	05 dc 09 57 60 b9 f2 01 ff 62 80 3b 17 64 c0 a8	...W`... .b.;d..
0020	01 66 aa aa aa aa aa aa aa aa aa aa aa aa aa aa	.f.....
0030	aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0040	aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0050	aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Load time: 0:0:3 | Profile: Default

13. The checksum, total length, fragment offset, and flags change between the first and second fragment.

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
316	21:48:45.862189	12.122.10.22	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
261	21:48:40.849470	12.122.10.22	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
207	21:48:35.551086	12.122.10.22	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
165	21:48:30.544205	12.122.10.22	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
124	21:48:25.530306	12.122.10.22	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
77	21:48:12.996430	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
52	21:48:07.990461	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
21	21:48:02.992672	12.122.10.22	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)
330	21:48:50.159434	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
274	21:48:45.151425	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
219	21:48:40.144138	10.216.228.1	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

Internet Protocol Version 4, Src: 12.122.10.22, Dst: 192.168.1.102

0100 ... = Version: 4
... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 540
Identification: 0x0000 (0)
Flags: 0x01 (More Fragments)
0... .. = Reserved bit: Not set
.0.. .. = Don't fragment: Not set
..1. = More fragments: Set
Fragment offset: 0
Time to live: 247

0010 02 1c 00 00 20 00 f7 01 c9 42 0c 7a 0a 16 c0 a8 .B.z...
0020 01 66 0b 00 4a 55 00 00 00 00 45 00 05 dc 32 ff .f..JU.. ..E...2.
0030 20 00 01 01 d0 5f 18 5b e0 c8 80 3b 17 64 08 00[...;d..
0040 ca c6 03 00 7d 03 37 36 20 aa aa aa aa aa aa aa}.76
0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
.....

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Marked: 2 (0.5%) · Load time: 0:0.3 | Profile: Default

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
378	21:48:51.616739	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [...]
324	21:48:46.628941	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=46851/951, ttl=242 ...
323	21:48:46.621637	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958) [...]
322	21:48:46.613031	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [...]
270	21:48:41.630015	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [...]
269	21:48:41.622684	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=43523/938, ttl=242 ...
268	21:48:41.615409	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957) [...]
267	21:48:41.608683	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [...]
214	21:48:35.980918	128.59.23.100	192.168.1.102	ICMP	562	Echo (ping) reply id=0x0300, seq=40195/925, ttl=242 ...
213	21:48:35.972615	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0956) [...]
173	21:48:30.971216	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0955) [...]

... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 1500
Identification: 0x0957 (2391)
Flags: 0x03 (Don't Fragment) (More Fragments)
0... .. = Reserved bit: Not set
.1.. = Don't fragment: Set
..1. = More fragments: Set
Fragment offset: 1480
Time to live: 242
Protocol: ICMP (1)
Header checksum: 0xff62 [validation disabled]

0010 05 dc 09 57 60 b9 f2 01 ff 62 80 3b 17 64 c0 a8 ..W^... .b.;d..
0020 01 66 aa aa aa aa aa aa aa aa aa aa aa aa aa aa .f.....
0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
.....

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Marked: 2 (0.5%) · Load time: 0:0.3 | Profile: Default

14. There are three fragments created after changing the Packet Size to 3500.

15. It looks like the checksum and the offset change between each header. The length and the flags also has variation.

ip-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
120	21:48:25.393027	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
73	21:48:12.947050	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
48	21:48:07.931696	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
17	21:48:02.944369	12.125.47.49	192.168.1.102	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
371	21:48:50.747508	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
315	21:48:45.734475	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
260	21:48:40.726160	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
206	21:48:35.482361	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
164	21:48:30.468199	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
123	21:48:25.463315	12.123.40.218	192.168.1.102	IPv4	554	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0000)
75	21:48:12.971223	12.123.40.218	192.168.1.102	ICMP	126	Time-to-live exceeded (Time to live exceeded in transit)

.... 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)

Total Length: 540

Identification: 0x0000 (0)

Flags: 0x01 (More Fragments)

0... = Reserved bit: Not set

.0.. = Don't fragment: Not set

..1. = More fragments: Set

Fragment offset: 0

Time to live: 248

Protocol: ICMP (1)

Header checksum: 0xa97d [validation disabled]

0010 02 1c 00 00 20 00 f8 01 a9 7d 0c 7b 28 da c0 a8j.

0020 01 66 0b 00 81 6a 00 00 00 00 45 00 05 dc 32 fe .f...j... ..E...2.

0030 20 00 01 01 d0 60 c0 a8 01 66 80 3b 17 64 08 00f;.d..

0040 cb c6 03 00 7c 03 37 36 20 aa aa aa aa aa aa|.76

0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa

Header checksum (ip.checksum), 2 bytes

Packets: 380 · Displayed: 380 (100.0%) · Marked: 2 (0.5%) · Load time: 0:0.3 | Profile: Default

ip-ethereal-trace-1

File
Edit
View
Go
Capture
Analyze
Statistics
Telephony
Wireless
Tools
Help

Apply a display filter ... <Ctrl-/>
Expression...

No.	Time	Source	Destination	Protocol	Length	Info
379	21:48:51.625536	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0959...
378	21:48:51.616739	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0959) [...]
324	21:48:46.628941	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=46851/951, ttl=242 ...
323	21:48:46.621637	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0958...
322	21:48:46.613031	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0958) [...]
270	21:48:41.630015	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957)
* 269	21:48:41.622684	128.59.23.100	192.168.1.102	ICMP	582	Echo (ping) reply id=0x0300, seq=43523/938, ttl=242 ...
268	21:48:41.615409	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=1480, ID=0957...
267	21:48:41.608683	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0957) [...]
214	21:48:35.980918	128.59.23.100	192.168.1.102	ICMP	562	Echo (ping) reply id=0x0300, seq=40195/925, ttl=242 ...
213	21:48:35.972615	128.59.23.100	192.168.1.102	IPv4	1514	Fragmented IP protocol (proto=ICMP 1, off=0, ID=0956) [...]

.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 1500
Identification: 0x0957 (2391)
▼ Flags: 0x03 (Don't Fragment) (More Fragments)
0... = Reserved bit: Not set
.1.. = Don't fragment: Set
..1. = More fragments: Set
Fragment offset: 1480
Time to live: 242
Protocol: ICMP (1)
Header checksum: 0xff62 [validation disabled]

0010 05 dc 09 57 60 b9 f2 01 ff 62 80 3b 17 64 c0 a8 ...W... .b.;d..
0020 01 66 aa aa aa aa aa aa aa aa aa aa aa aa aa aa .f.....
0030 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0040 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
0050 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa

Header checksum (ip.checksum), 2 bytes
Packets: 380 · Displayed: 380 (100.0%) · Marked: 2 (0.5%) · Load time: 0:0.3 · Profile: Default