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## IP

- 1) The IP address of my computer is 192.168.1.102.
- 2) The value in the upper layer protocol field is 1.
- 3) There are 20 bytes in the IP header. There are 64 bytes in the payload of the IP datagram. I determined this by subtracting the total length and the header length.
- 4) The IP datagram has not been fragmented, because the More fragments bit = 0.
- 5) From one datagram to the next in the series of ICMP messages, the field in the IP datagram that always changes is Source IP.
- 6) The fields that stay constant are Version and Header length because it keeps the data whole. The fields that must change are Time to live and Checksums because it keeps the data moving between the messages.
- 7) The pattern I observed in the identification field is that it decreases to 0x0000.
- 8) The value in the identification field is 42029, and the TTL field is 224.
- 9) Identification changes because two or more packets with same ID indicates presence of a larger piece of data. TTL does not change because the TTL for the first hop router is always the same.
- 10) Yes, the message has been fragmented.
- 11) The information that indicates the packet has been fragmented is the offset of 0. We can indicate this is the first or last fragment is by checking the More Fragments flag. This IP datagram is 1500.
- 12) We know this is not the first datagram fragment because the offset is 0, and there are more fragments because the More Fragments number is higher than 0.
- 13) The fields that change between the first and second fragment is total length, flags, and segment offset.
- 14) Only one fragment was created from the original datagram.
- 15) The fields that change from are fragment offset and checksum.

```
8 6.163045      192.168.1.102      128.59.23.100      ICMP      98      Echo (ping) request      id=0x0300, seq=20483/848, ttl=1
(no response found!)
Frame 8: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
  Encapsulation type: Ethernet (1)
  Arrival Time: Aug 21, 2004 21:48:02.821397000 Eastern Daylight Time
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1093139282.821397000 seconds
  [Time delta from previous captured frame: 0.297584000 seconds]
  [Time delta from previous displayed frame: 0.297584000 seconds]
  [Time since reference or first frame: 6.163045000 seconds]
  Frame Number: 8
  Frame Length: 98 bytes (784 bits)
  Capture Length: 98 bytes (784 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:icmp:data]
  [Coloring Rule Name: ICMP]
  [Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
  Destination: LinksysG_da:af:73 (00:06:25:da:af:73)
    Address: LinksysG_da:af:73 (00:06:25:da:af:73)
      ....0. .... = LG bit: Globally unique address (factory default)
      ....0. .... = IG bit: Individual address (unicast)
  Source: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
    Address: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
      ....0. .... = LG bit: Globally unique address (factory default)
      ....0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
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)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    ....00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  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
    [Expert Info (Note/Sequence): "Time To Live" only 1]
      ["Time To Live" only 1]
      [Severity level: Note]
      [Group: Sequence]
  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]
  [Destination GeoIP: Unknown]
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]
    [Expert Info (Warning/Sequence): No response seen to ICMP request]
      [No response seen to ICMP request]
      [Severity level: Warning]
      [Group: Sequence]
  Data (56 bytes)
0000  37 32 20 aa aa aa aa aa aa aa aa aa aa aa aa aa  72 .....
0010  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0020  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0030  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
      Data: 373220aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa...
      [Length: 56]
```

```
347 53.626815      192.168.1.102      128.59.23.100      IPv4      1514      Fragmented IP protocol (proto=ICMP 1, off=0, ID=3344)
[Reassembled in #349]
Frame 347: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)
  Encapsulation type: Ethernet (1)
  Arrival Time: Aug 21, 2004 18:48:50.285167000 Pacific Daylight Time
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1093139330.285167000 seconds
  [Time delta from previous captured frame: 0.011736000 seconds]
  [Time delta from previous displayed frame: 0.011736000 seconds]
  [Time since reference or first frame: 53.626815000 seconds]
  Frame Number: 347
  Frame Length: 1514 bytes (12112 bits)
  Capture Length: 1514 bytes (12112 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:data]
Ethernet II, Src: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
  Destination: LinksysG_da:af:73 (00:06:25:da:af:73)
    Address: LinksysG_da:af:73 (00:06:25:da:af:73)
      .... ..0. .... .. = LG bit: Globally unique address (factory default)
      .... ...0 .... .. = IG bit: Individual address (unicast)
  Source: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
    Address: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
      .... ..0. .... .. = LG bit: Globally unique address (factory default)
      .... ...0 .... .. = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
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: 1500
  Identification: 0x3344 (13124)
  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: 7
  Protocol: ICMP (1)
  Header checksum: 0x0130 [validation disabled]
  [Header checksum status: Unverified]
  Source: 192.168.1.102
  Destination: 128.59.23.100
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
  Reassembled IPv4 in frame: 349
Data (1480 bytes)
0000  08 00 88 cb 03 00 be 03 38 31 20 aa aa aa aa .....81 .....
0010  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0020  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
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 .....
0060  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0070  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0080  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0090  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00a0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00b0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00c0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00d0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00e0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00f0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0100  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0110  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0120  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0130  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0140  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0150  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0160  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0170  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0180  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0190  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01a0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01b0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01c0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01d0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01e0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01f0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0200  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
```

```
Data: 080088cb0300be03383120aaaaaaaaaaaaaaaaaaaaaaaaaaaa...
[Length: 1480]
```

```
92 28.441511      192.168.1.102      128.59.23.100      IPv4      1514      Fragmented IP protocol (proto=ICMP 1, off=0, ID=32f9)
[Reassembled in #93]
Frame 92: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)
  Encapsulation type: Ethernet (1)
  Arrival Time: Aug 21, 2004 21:48:25.099863000 Eastern Daylight Time
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1093139305.099863000 seconds
  [Time delta from previous captured frame: 5.488773000 seconds]
  [Time delta from previous displayed frame: 5.488773000 seconds]
  [Time since reference or first frame: 28.441511000 seconds]
  Frame Number: 92
  Frame Length: 1514 bytes (12112 bits)
  Capture Length: 1514 bytes (12112 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:data]
  [Coloring Rule Name: TTL low or unexpected]
  [Coloring Rule String: ( ! ip.dst == 224.0.0.0/4 && ip.ttl < 5 && !pim && !ospf) || (ip.dst == 224.0.0.0/24 && ip.dst != 224.0.0.251
&& ip.ttl != 1 && !(vrrp || carp))]
Ethernet II, Src: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
  Destination: LinksysG_da:af:73 (00:06:25:da:af:73)
    Address: LinksysG_da:af:73 (00:06:25:da:af:73)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ..0. .... = IG bit: Individual address (unicast)
  Source: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
    Address: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ..0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
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)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  Total Length: 1500
  Identification: 0x32f9 (13049)
  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: 1
    [Expert Info (Note/Sequence): "Time To Live" only 1]
      ["Time To Live" only 1]
      [Severity level: Note]
      [Group: Sequence]
  Protocol: ICMP (1)
  Header checksum: 0x077b [validation disabled]
  [Header checksum status: Unverified]
  Source: 192.168.1.102
  Destination: 128.59.23.100
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
  Reassembled IPv4 in frame: 93
Data (1480 bytes)
0000  08 00 d0 c6 03 00 77 03 37 36 20 aa aa aa aa aa .....w.76 .....
0010  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0020  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
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 .....
0060  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0070  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0080  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0090  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00a0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00b0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00c0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00d0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00e0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00f0  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0100  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0110  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0120  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0130  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0140  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0150  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0160  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0170  aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
```

[Length: 1480]

```
379 54.967184      128.59.23.100      192.168.1.102      IPv4      1514      Fragmented IP protocol (proto=ICMP 1, off=1480,
ID=0959) [Reassembled in #380]
Frame 379: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)
  Encapsulation type: Ethernet (1)
  Arrival Time: Aug 21, 2004 21:48:51.625536000 Eastern Daylight Time
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1093139331.625536000 seconds
  [Time delta from previous captured frame: 0.008797000 seconds]
  [Time delta from previous displayed frame: 0.008797000 seconds]
  [Time since reference or first frame: 54.967184000 seconds]
  Frame Number: 379
  Frame Length: 1514 bytes (12112 bits)
  Capture Length: 1514 bytes (12112 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:data]
Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
  Destination: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
    Address: PremaxPe_8a:70:1a (00:20:e0:8a:70:1a)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ...0 .... = IG bit: Individual address (unicast)
  Source: LinksysG_da:af:73 (00:06:25:da:af:73)
    Address: LinksysG_da:af:73 (00:06:25:da:af:73)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ...0 .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
Internet Protocol Version 4, Src: 128.59.23.100, Dst: 192.168.1.102
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  Total Length: 1500
  Identification: 0x0959 (2393)
  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: 0xff60 [validation disabled]
  [Header checksum status: Unverified]
  Source: 128.59.23.100
  Destination: 192.168.1.102
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
  Reassembled IPv4 in frame: 380
Data (1480 bytes)
0000 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0010 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0020 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
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 .....
0060 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0070 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0080 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0090 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00a0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00b0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00c0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00d0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00e0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
00f0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0100 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0110 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0120 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0130 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0140 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0150 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0160 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0170 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0180 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
0190 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01a0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01b0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01c0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01d0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
01e0 aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa .....
```

[illegible]