COMPUTER NETWORK
Lab 5

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I/ ICMP and Ping

1. What is the IP address of your host? What is the IP address of the destination host?
    Ans:
    The IP address of my host: 192.168.1.6
    The IP address of the destination host: 143.89.12.134

2. Why is it that an ICMP packet does not have source and destination port numbers?
    Ans: The ICMP packet does not have source and destination port numbers because it was designed to communicate network-layer information between hosts and routers, not between application layer processes. Each ICMP packet has a "Type" and a "Code". The Type/Code combination identifies the specific message being received. Since the network software itself interprets all ICMP messages, no port numbers are needed to direct the ICMP message to an application layer process.

3. What are the ICMP type and code numbers? What other fields does this ICMP packet have? How many bytes are the checksum, sequence number and identifier fields?
    Ans:
    ICMP type: 8
    Code number: 0
    The ICMP packet also has checksum, identifier, sequence number, and data fields. The checksum, sequence number and identifier fields are two bytes each.

No.	Time	Source	Destination	Protocol	Length	Info
1410	07:04:50.261175	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1541	07:04:51.766715	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1712	07:04:53.275085	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1839	07:04:54.778933	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1890	07:04:55.346120	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5012/37907, ttl=128 (reply in 1897)
1897	07:04:55.391772	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5012/37907, ttl=51 (request in 1890)
1976	07:04:56.288979	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1984	07:04:56.365340	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5013/38163, ttl=128 (reply in 1988)
1988	07:04:56.411773	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5013/38163, ttl=51 (request in 1984)
2070	07:04:57.393141	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5014/38419, ttl=128 (reply in 2074)
2074	07:04:57.439833	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5014/38419, ttl=51 (request in 2070)
2140	07:04:57.799467	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
2197	07:04:58.414213	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5015/38675, ttl=128 (reply in 2200)
2200	07:04:58.474443	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5015/38675, ttl=51 (request in 2197)
2272	07:04:59.304648	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)

```
> Frame 1890: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 4, Src: 192.168.1.6, Dst: 143.89.12.134
v Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0x39c7 [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 5012 (0x1394)
    Sequence Number (LE): 37907 (0x9413)
    [Response frame: 1897]
  > Data (32 bytes)
```

4. What are the ICMP type and code numbers? What other fields does this ICMP packet have? How many bytes are the checksum, sequence number and identifier fields?

Ans:

ICMP type: 0

Code number: 0

The ICMP packet also has checksum, identifier, sequence number, and data fields. The checksum, sequence number and identifier fields are two bytes each.
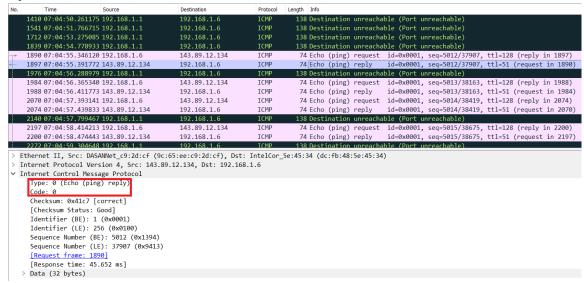
No.	Time	Source	Destination	Protocol	Length	Info
1410	07:04:50.261175	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1541	07:04:51.766715	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1712	07:04:53.275085	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1839	07:04:54.778933	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1890	07:04:55.346120	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5012/37907, ttl=128 (reply in 1897)
1897	07:04:55.391772	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5012/37907, ttl=51 (request in 1890)
1976	07:04:56.288979	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
1984	07:04:56.365340	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5013/38163, ttl=128 (reply in 1988)
1988	07:04:56.411773	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5013/38163, ttl=51 (request in 1984)
2070	07:04:57.393141	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5014/38419, ttl=128 (reply in 2074)
2074	07:04:57.439833	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5014/38419, ttl=51 (request in 2070)
2140	07:04:57.799467	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)
2197	07:04:58.414213	192.168.1.6	143.89.12.134	ICMP	74	Echo (ping) request id=0x0001, seq=5015/38675, ttl=128 (reply in 2200)
2200	07:04:58.474443	143.89.12.134	192.168.1.6	ICMP	74	Echo (ping) reply id=0x0001, seq=5015/38675, ttl=51 (request in 2197)
2272	07:04:59.304648	192.168.1.1	192.168.1.6	ICMP	138	Destination unreachable (Port unreachable)

```
> Ethernet II, Src: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf), Dst: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
> Internet Protocol Version 4, Src: 143.89.12.134, Dst: 192.168.1.6
v Internet Control Message Protocol
    Type: 0 (Echo (ping) reply)
    Code: 0
    Checksum: 0x41c7 [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 5012 (0x1394)
    Sequence Number (LE): 37907 (0x9413)
    [Request frame: 1890]
    [Response time: 45.652 ms]
  > Data (32 bytes)
```

II/ ICMP and Traceroute

5. What is the IP address of your host? What is the IP address of the target destination host?

Ans:

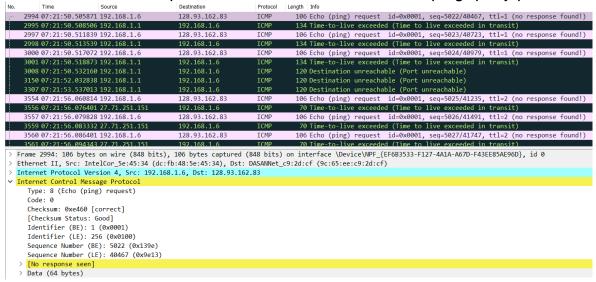The IP address of my host: 192.168.1.6

The IP address of the target destination host: 128.93.162.83

No.	Time	Source	Destination	Protocol	Length	Info
2994	07:21:50.505871	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5022/40467, ttl=1 (no response found!)
2995	07:21:50.508506	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
2997	07:21:50.511839	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5023/40723, ttl=1 (no response found!)
2998	07:21:50.513539	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3000	07:21:50.517072	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5024/40979, ttl=1 (no response found!)
3001	07:21:50.518873	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3008	07:21:50.532160	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3150	07:21:52.032838	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3307	07:21:53.537013	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3554	07:21:56.060814	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5025/41235, ttl=2 (no response found!)
3556	07:21:56.076401	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
3557	07:21:56.079828	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5026/41491, ttl=2 (no response found!)
3559	07:21:56.083332	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
3560	07:21:56.086401	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5027/41747, ttl=2 (no response found!)
3561	07:21:56.094343	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

```
∨ Internet Protocol Version 4, Src: 192.168.1.6, Dst: 128.93.162.83
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 92
    Identification: 0xd460 (54368)
  > Flags: 0x00
    Fragment Offset: 0
  > Time to Live: 1
    Protocol: ICMP (1)
    Header Checksum: 0x0000 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.6
    Destination Address: 128.93.162.83
```

6. If ICMP sent UDP packets instead, would the IP protocol number still be 01 for the probe packets? If not, what would it be?
   Ans: No. If ICMP sent UDP packets instead, the IP protocol number should be 0x11.

7. Is this different from the ICMP ping query packets in the first half of this lab? If yes, how so?
   Ans: The ICMP echo packet has the same fields as the ping query packets.

No.	Time	Source	Destination	Protocol	Length	Info
2994	07:21:50.505871	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5022/40467, ttl=1 (no response found!)
2995	07:21:50.508506	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
2997	07:21:50.511839	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5023/40723, ttl=1 (no response found!)
2998	07:21:50.513539	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3000	07:21:50.517072	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5024/40979, ttl=1 (no response found!)
3001	07:21:50.518873	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3008	07:21:50.532160	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3150	07:21:52.032838	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3307	07:21:53.537013	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3554	07:21:56.060814	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5025/41235, ttl=2 (no response found!)
3556	07:21:56.076401	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
3557	07:21:56.079828	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5026/41491, ttl=2 (no response found!)
3559	07:21:56.083332	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
3560	07:21:56.086401	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5027/41747, ttl=2 (no response found!)
3561	07:21:56.094343	27.71.251.151	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)

```
> Frame 2994: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 4, Src: 192.168.1.6, Dst: 128.93.162.83
∨ Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0xe460 [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 5022 (0x139e)
    Sequence Number (LE): 40467 (0x9e13)
  > [No response seen]
  > Data (64 bytes)
```

8. What is included in those fields?
   Ans: The ICMP error packet is not the same as the ping query packets. It contains both the IP header and the first 8 bytes of the original ICMP packet that the error is for.

No.	Time	Source	Destination	Protocol	Length	Info
2994	07:21:50.505871	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5022/40467, ttl=1 (no response found!)
2995	07:21:50.508506	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
2997	07:21:50.511839	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5023/40723, ttl=1 (no response found!)
2998	07:21:50.513539	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3000	07:21:50.517072	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5024/40979, ttl=1 (no response found!)
3001	07:21:50.518873	192.168.1.1	192.168.1.6	ICMP	134	Time-to-live exceeded (Time to live exceeded in transit)
3008	07:21:50.532160	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3150	07:21:52.032838	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)
3307	07:21:53.537013	192.168.1.1	192.168.1.6	ICMP	120	Destination unreachable (Port unreachable)

```
> Frame 2995: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf), Dst: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
> Internet Protocol Version 4, Src: 192.168.1.1, Dst: 192.168.1.6
v Internet Control Message Protocol
    Type: 11 (Time-to-live exceeded)
    Code: 0 (Time to live exceeded in transit)
    Checksum: 0xf4ff [correct]
    [Checksum Status: Good]
    Unused: 00000000
  > Internet Protocol Version 4, Src: 192.168.1.6, Dst: 128.93.162.83
  v Internet Control Message Protocol
      Type: 8 (Echo (ping) request)
      Code: 0
      Checksum: 0xe460 [unverified] [in ICMP error packet]
      [Checksum Status: Unverified]
      Identifier (BE): 1 (0x0001)
      Identifier (LE): 256 (0x0100)
      Sequence Number (BE): 5022 (0x139e)
      Sequence Number (LE): 40467 (0x9e13)
    > Data (64 bytes)
```

9. How are these packets different from the ICMP error packets? Why are they different?

   Ans: The last three ICMP packets are message type 0 (echo reply) rather than 11 (TTL expired). They are different because the datagrams have made it all the way to the destination host before the TTL expired.

No.	Time	Source	Destination	Protocol	Length	Info
6071	07:22:18.574551	193.51.184.177	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
6134	07:22:19.274018	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5064/51219, ttl=15 (no response found!)
6165	07:22:19.617040	192.93.122.19	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
6167	07:22:19.620788	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5065/51475, ttl=15 (no response found!)
6223	07:22:19.959615	192.93.122.19	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
6224	07:22:19.963067	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5066/51731, ttl=15 (no response found!)
6255	07:22:20.300979	192.93.122.19	192.168.1.6	ICMP	70	Time-to-live exceeded (Time to live exceeded in transit)
6319	07:22:21.035270	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5067/51987, ttl=16 (reply in 6353)
6353	07:22:21.380500	128.93.162.83	192.168.1.6	ICMP	106	Echo (ping) reply id=0x0001, seq=5067/51987, ttl=51 (request in 6319)
6355	07:22:21.383966	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5068/52243, ttl=16 (reply in 6387)
6387	07:22:21.725182	128.93.162.83	192.168.1.6	ICMP	106	Echo (ping) reply id=0x0001, seq=5068/52243, ttl=51 (request in 6355)
6388	07:22:21.729017	192.168.1.6	128.93.162.83	ICMP	106	Echo (ping) request id=0x0001, seq=5069/52499, ttl=16 (reply in 6420)
6420	07:22:22.068893	128.93.162.83	192.168.1.6	ICMP	106	Echo (ping) reply id=0x0001, seq=5069/52499, ttl=51 (request in 6388)

```
> Frame 6353: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf), Dst: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
> Internet Protocol Version 4, Src: 128.93.162.83, Dst: 192.168.1.6
v Internet Control Message Protocol
    Type: 0 (Echo (ping) reply)
    Code: 0
    Checksum: 0xec33 [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 5067 (0x13cb)
    Sequence Number (LE): 51987 (0xcb13)
    [Request frame: 6319]
    [Response time: 345.230 ms]
  > Data (64 bytes)
```

10. Within the tracert measurements, is there a link whose delay is significantly longer than others? Refer to the screenshot in Figure 4, is there a link whose delay is significantly longer than others? On the basis of the router names, can you guess the location of the two routers on the end of this link?

    Ans:

    There is a link between steps 8 and 9 that has a significantly longer delay. This is a transatlantic link from Singapore to Toyohashi, Japan.

    In figure 4 from the lab, there is a link between steps 9 and 10 that has a significantly longer delay. This link is from New York to Pastourelle, France.

```
Command Prompt

C:\Windows\System32>tracert www.inria.fr

Tracing route to inria.fr [128.93.162.83]
over a maximum of 30 hops:

  1     2 ms     1 ms     1 ms  192.168.1.1
  2    15 ms     3 ms     8 ms  DESKTOP-SB5GJ2U [27.71.251.151]
  3     5 ms    26 ms     5 ms  10.255.40.29
  4     9 ms     6 ms    22 ms  DESKTOP-SB5GJ2U [27.68.210.34]
  5     4 ms     4 ms     4 ms  DESKTOP-SB5GJ2U [27.68.237.130]
  6    25 ms    28 ms    27 ms  DESKTOP-SB5GJ2U [27.68.236.122]
  7    37 ms    32 ms    32 ms  DESKTOP-SB5GJ2U [27.68.250.248]
  8    43 ms    33 ms    32 ms  ix-xe-8-3-1-100.tcore2.svw-singapore.as6453.net [180.87.15.61]
  9   204 ms   206 ms   204 ms  if-ae-28-2.tcore1.av3-toyohashi.as6453.net [180.87.3.128]
 10   207 ms   204 ms   204 ms  if-ae-2-2.tcore2.av3-toyohashi.as6453.net [180.87.3.131]
 11   204 ms   208 ms   207 ms  if-ae-28-2.tcore2.lvw-losangeles.as6453.net [64.86.252.32]
 12   341 ms   344 ms   342 ms  renater-gw-ix1.gtt.net [77.67.123.206]
 13   339 ms   344 ms   351 ms  te1-1-inria-rtr-021.noc.renater.fr [193.51.177.107]
 14   341 ms   339 ms   341 ms  inria-rocquencourt-te1-4-inria-rtr-021.noc.renater.fr [193.51.184.177]
 15   343 ms   339 ms   338 ms  unit240-reth1-vfw-ext-dc1.inria.fr [192.93.122.19]
 16   345 ms   341 ms   340 ms  prod-inriafr-cms.inria.fr [128.93.162.83]

Trace complete.

C:\Windows\System32>
```