山东大学 计算机 学院

计算机网络 课程实验报告

学号：	姓名：	班级：
实验题目： 实验八 ICMP		
实验学时：2h	实验日期： 2023.04.17	
实验目的： 学习 ICMP 的相关内容		
硬件环境： Windows10 家庭版		
软件环境： Wireshark		

实验步骤与内容：

实验内容：

1. What is the IP address of your host? What is the IP address of the destination host?

2. Why is it that an ICMP packet does not have source and destination port numbers?

3. Examine one of the ping request packets sent by your host. 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?

4. Examine the corresponding ping reply packet. 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?

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

6. If ICMP sent UDP packets instead (as in Unix/Linux), would the IP protocol number still be 01 for the probe packets? If not, what would it be?

7. Examine the ICMP echo packet in your screenshot. Is this different from the ICMP ping query packets in the first half of this lab? If yes, how so?

8. Examine the ICMP error packet in your screenshot. It has more fields than the ICMP echo packet. What is included in those fields?

9. Examine the last three ICMP packets received by the source host. How are these packets different from the ICMP error packets? Why are they different?

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?

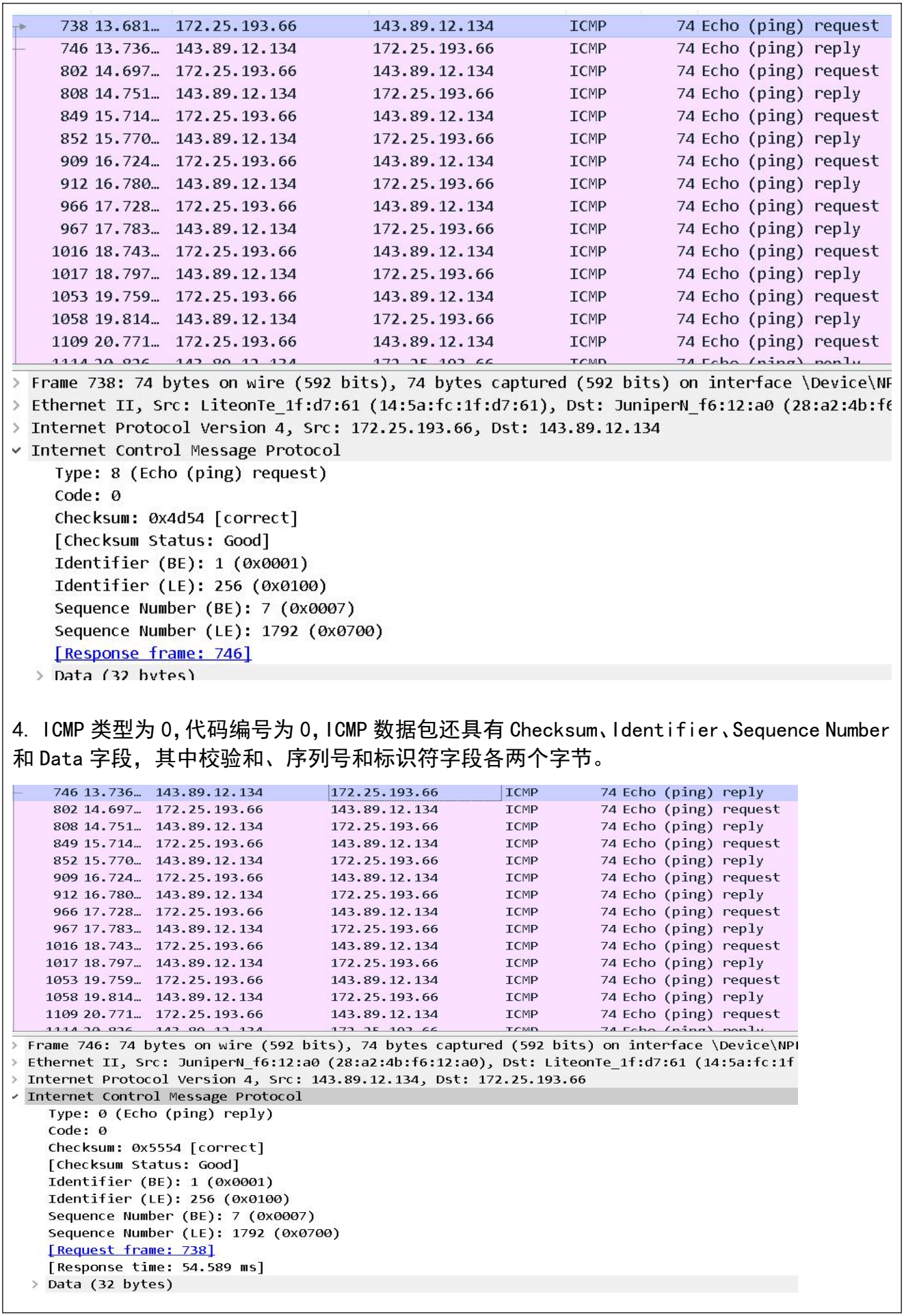
实验步骤：
先在 CMD 命令行中输入 ping -n 10 www.ust.hk 表示向香港科技大学的 Web 服务器发送 10 个查询数据包，之后再输入 tracert www.inria.fr 表示跟踪路由。

1. 本机的 IP 地址为 172.25.193.66，目标主机的 IP 地址为 143.89.12.134。

738	13.681…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
746	13.736…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
802	14.697…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
808	14.751…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
849	15.714…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
852	15.770…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
909	16.724…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
912	16.780…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
966	17.728…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
967	17.783…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
1016	18.743…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
1017	18.797…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
1053	19.759…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request
1058	19.814…	143.89.12.134	172.25.193.66	ICMP	74	Echo (ping) reply
1109	20.771…	172.25.193.66	143.89.12.134	ICMP	74	Echo (ping) request

2. ICMP 包没有源端口号和目的端口号，因为它设计的目的在于主机和路由器之间交换网络层信息，而不是在应用层进程之间交换信息。传输层才有端口号的概念，ICMP 报文仅传送到主机。

3. ICMP 类型为 8，代码编号为 0，ICMP 数据包还具有 Checksum、Identifier、Sequence Number 和 Data 字段，其中校验和、序列号和标识符字段各两个字节。



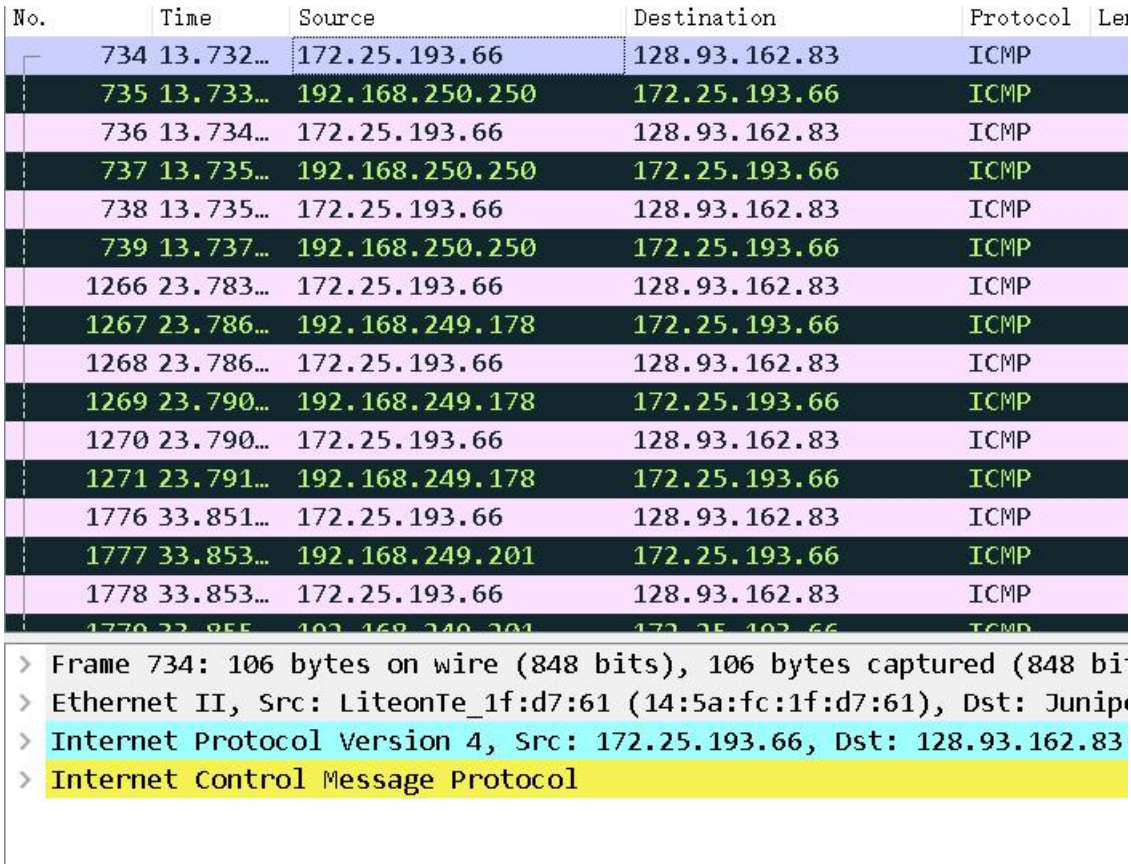
4. ICMP 类型为 0,代码编号为 0,ICMP 数据包还具有 Checksum、Identifier、Sequence Number 和 Data 字段，其中校验和、序列号和标识符字段各两个字节。

```
C:\Windows\system32\cmd.exe
C:\Users\sdu。wzl>tracert www.inria.fr

通过最多 30 个跃点跟踪
到 www.inria.fr [128.93.162.83] 的路由:

  1     1 ms     1 ms     1 ms  192.168.250.250
  2     3 ms     3 ms     1 ms  192.168.249.178
  3     1 ms     1 ms     1 ms  192.168.249.201
  4    11 ms    10 ms    11 ms  58.194.164.65
  5    10 ms    10 ms    10 ms  58.194.164.77
  6     *        *        *     请求超时。
  7    11 ms    11 ms    11 ms  202.194.96.213
  8    11 ms    11 ms    14 ms  101.4.115.33
  9    16 ms    15 ms    16 ms  101.4.116.118
 10    17 ms    17 ms    17 ms  101.4.112.69
 11     *        *       16 ms  101.4.118.214
 12    18 ms    26 ms    17 ms  210.25.189.65
 13    21 ms    18 ms    17 ms  210.25.187.50
 14   253 ms   244 ms   245 ms  orientplus-gw.mx1.lon.uk.geant.net [62.40.125.101]
 15   244 ms   244 ms   244 ms  ae2.mx1.lon2.uk.geant.net [62.40.98.65]
 16   251 ms   251 ms   251 ms  ae8.mx1.par.fr.geant.net [62.40.98.107]
 17   259 ms   260 ms   261 ms  renater-1b1-gw.mx1.par.fr.geant.net [62.40.124.70]
 18     *        *        *     请求超时。
 19     *        *        *     请求超时。
 20     *        *        *     请求超时。
 21   263 ms   264 ms   267 ms  193.55.200.26
 22   287 ms   277 ms   279 ms  xe1-0-6-marseille1-rtr-131.noc.renater.fr [193.51.177.184]
 23   256 ms   257 ms   258 ms  xe-1-1-7-ren-nr-lyon1-rtr-131.noc.renater.fr [193.55.204.111]
 24   256 ms   259 ms   258 ms  et-3-1-7-ren-nr-paris1-rtr-131.noc.renater.fr [193.51.180.166]
 25   279 ms   280 ms   280 ms  te1-1-inria-rtr-021.noc.renater.fr [193.51.177.107]
 26   265 ms   265 ms   270 ms  inria-rocquencourt-gi3-2-inria-rtr-021.noc.renater.fr [193.51.184.177]
 27   275 ms   276 ms   268 ms  unit240-reth1-vfw-ext-dc1.inria.fr [192.93.122.19]
 28   266 ms   265 ms   267 ms  prod-inriafr-cms.inria.fr [128.93.162.83]
```

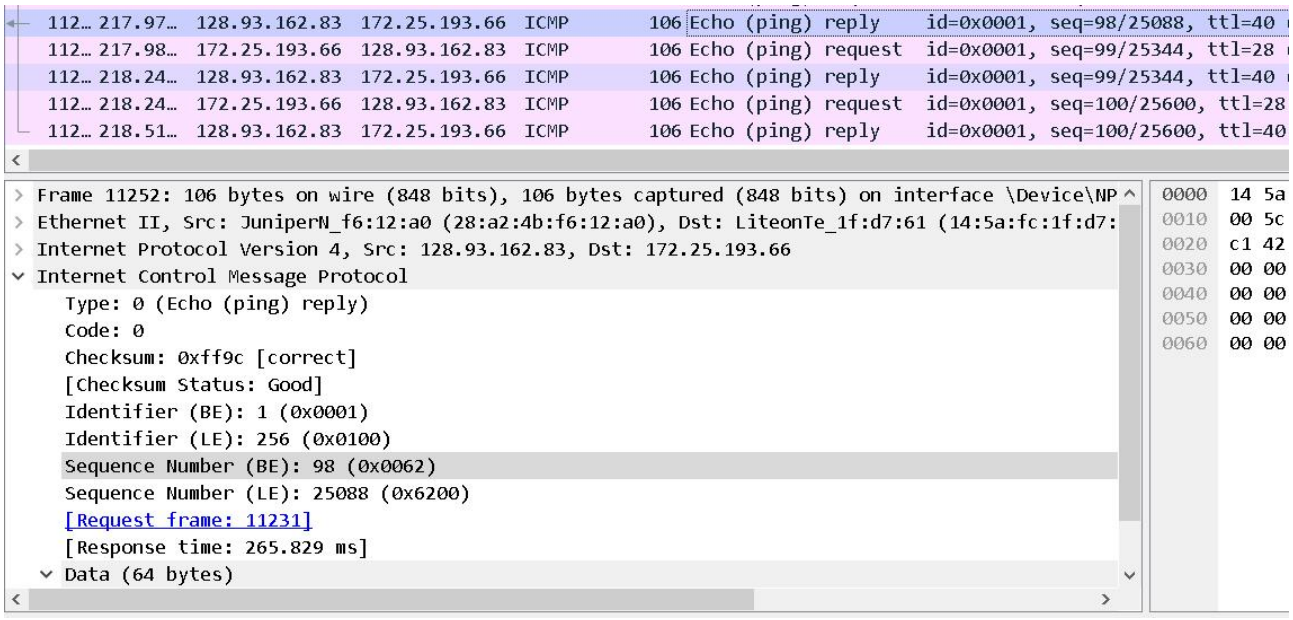
5. 主机 IP 地址是 172.25.193.66，目标 IP 地址是 128.93.162.83。



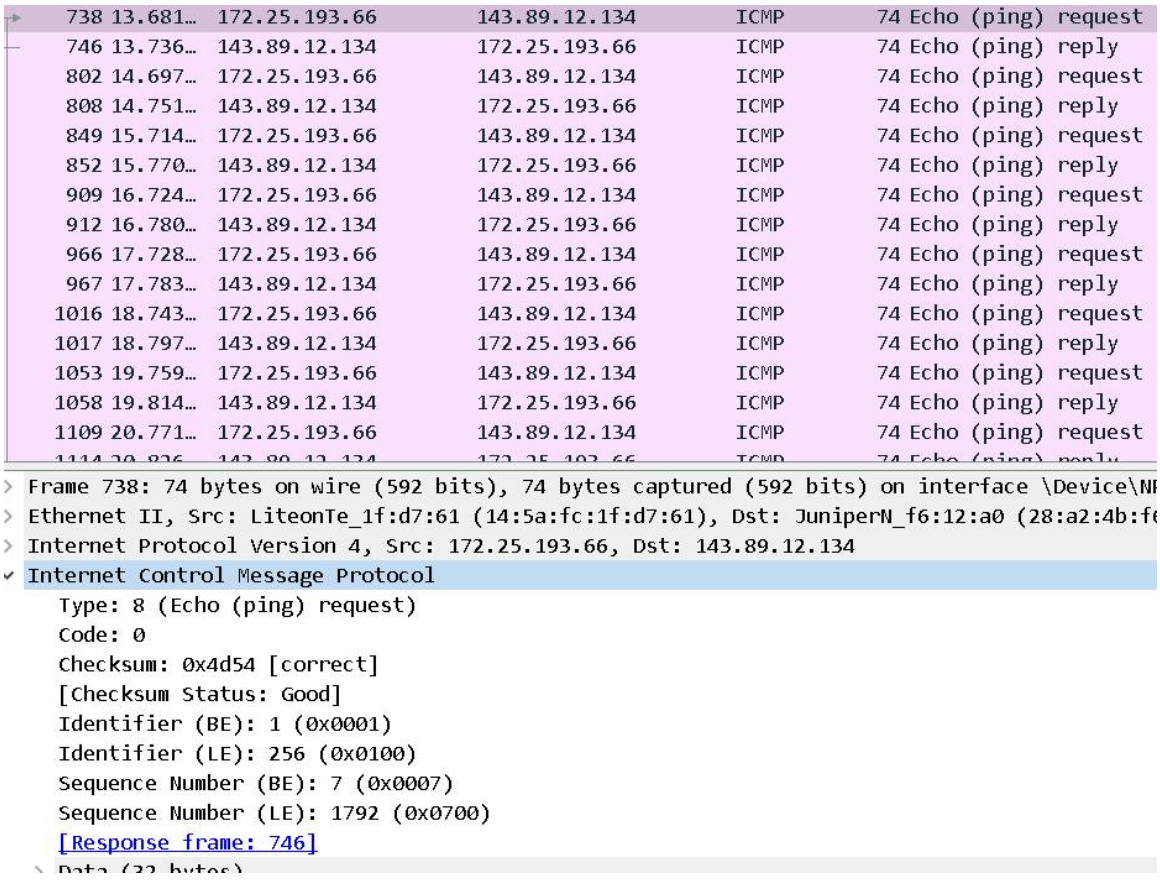
6. 不是，ICMP 如果发送了 UDP 数据包，那么 IP 协议号应为 11（十六进制数），因为 UDP 协议号是 11（十六进制数）。

7. ICMP 响应数据包与 ICMP ping 查询数据包中包含的字段是相同，但响应数据包中的类型是 0，而查询数据包的类型是 8。

ICMP 响应数据包：

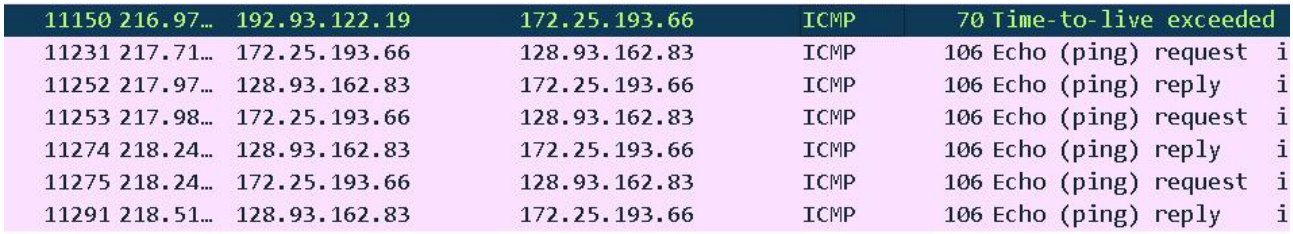


ICMP ping 查询数据包：

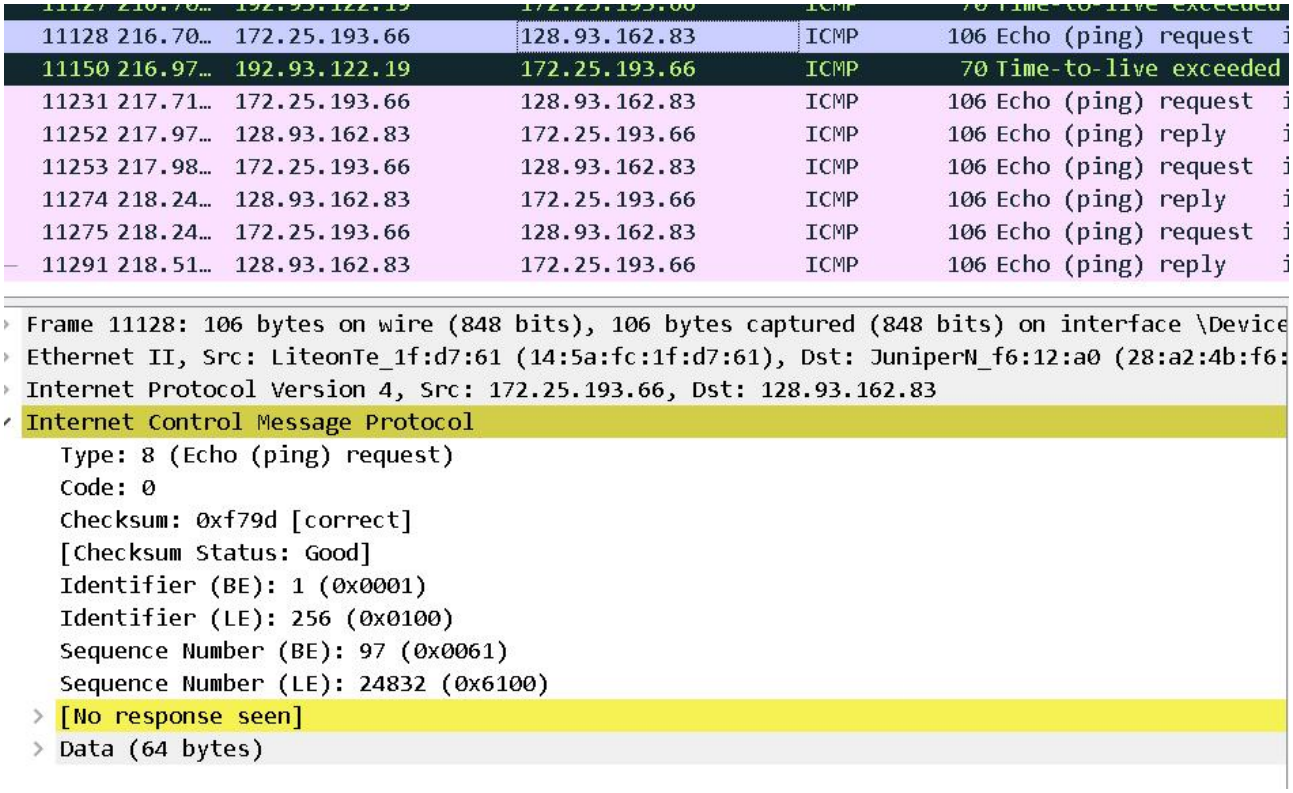


8. 比正常的响应数据包多了 ICMP 请求数据包的内容

错误 ICMP 数据包



原始 ICMP 数据包



9. 最后三个 ICMP 数据包的消息类型是 0，之前错误数据包的类型是 11，这是因为 ICMP 查询数据包的 TTL 是逐渐递增的，最后的 ICMP 的查询数据包的 TTL 已经大于到达目的地的路由跃点数，所以不会被目标主机丢弃。

10.

```
12    18 ms    26 ms    17 ms  210.25.189.65
13    21 ms    18 ms    17 ms  210.25.187.50
14   253 ms   244 ms   245 ms  orientplus-gw.mx1.lon.uk.geant.net [62.40.125.101]
15   244 ms   244 ms   244 ms  ae2.mx1.lon2.uk.geant.net [62.40.98.65]
16   251 ms   251 ms   251 ms  ae8.mx1.par.fr.geant.net [62.40.98.107]
17   259 ms   260 ms   261 ms  renater-lb1-gw.mx1.par.fr.geant.net [62.40.124.70]
```

其中 IP 地址为 210.25.187.50 在北京，IP 地址为 62.40.125.101 在英国伦敦。

结论分析与体会：

通过本次实验，对网络层有了进一步的了解，先是使用 ping 向目标 IP 地址发送数据包，再对路由进行跟踪，通过本实验对 ICMP 数据包有了更清楚的认知。