

1. Wireshark: UDP

No.	Time	Source	Destination	Protocol	Length	Info
10	0.034833254	142.250.74.182	192.168.1.107	UDP	12...	443 → 47531 Len=1250
Frame 10: 1292 bytes on wire (10336 bits), 1292 bytes captured (10336 bits) on interface wlx037453911bd, id 0 Ethernet II, Src: 60:a4:b7:61:23:00 (60:a4:b7:61:23:00), Dst: Tp-LinkT_39:11:bd (d0:37:45:39:11:bd) Internet Protocol Version 4, Src: 142.250.74.182, Dst: 192.168.1.107 User Datagram Protocol, Src Port: 443, Dst Port: 47531						
Source Port: 443 Destination Port: 47531 Length: 1258 Checksum: 0xc305 [unverified] [Checksum Status: Unverified] [Stream index: 0] [Timestamps]						
Data (1250 bytes)						

- 1) UDP-заголовок содержит 4 поля: Source Port, Destination Port, Length, Checksum.
- 2) Длина каждого поля UDP-заголовка - 2 байта.
- 3) Значение поля Length - суммарная длина полей UDP-заголовка + длина Data.
- 4) Так как длина поля Length - 2 байта, то его значение не может превосходить $2^{16} - 1 = 65535$ байт.
- 5) Аналогично, так как длина поля Source Port - 2 байта, то его значение не может превосходить $2^{16} - 1 = 65535$.

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0010 04 fe 00 00 40 00 35 11 a5 2b 8e fa 4a b6 c0 a8@.5.J... 0020 01 6b 01 bb b9 ab 04 ea c3 05 54 f3 0a 88 4e 2e .k.....T...N.						

- 6) Номер протокола для протокола UDP - 17 (десятиричная система), 11 (шестнадцатеричная система).

No.	Time	Source	Destination	Protocol	Length	Info
5904	7.087574801	172.217.130.147	192.168.1.107	UDP	81	443 → 59955 Len=39
5905	7.092787949	192.168.1.107	172.217.130.1...	UDP	75	59955 → 443 Len=33

- 7)

Source Port первого пакета = Destination Port второго пакета, Destination Port первого пакета = Source Port второго пакета.

2. Программирование. Эхо запросы через UDP

A. Серверная часть + Б. Клиентская часть

```
/usr/bin/python3.8 /home/eartser/Learning/comp-networks/lab07/ping/client.py
TEST MESSAGE NUMBER 1
RTT 0.00027680397033691406
Ping 1 2022-04-08 15:26:52.855147
=====
TEST MESSAGE NUMBER 2
RTT 0.00011610984802246094
Ping 2 2022-04-08 15:26:52.855535
=====
TEST MESSAGE NUMBER 3
RTT 0.00010967254638671875
Ping 3 2022-04-08 15:26:52.855683
=====
Request timed out
=====
Request timed out
=====
TEST MESSAGE NUMBER 6
RTT 0.0004982948303222656
Ping 6 2022-04-08 15:26:54.858006
=====
TEST MESSAGE NUMBER 7
RTT 0.0004863739013671875
Ping 7 2022-04-08 15:26:54.858746
=====
TEST MESSAGE NUMBER 8
RTT 0.00048041343688964844
Ping 8 2022-04-08 15:26:54.859452
=====
TEST MESSAGE NUMBER 9
RTT 0.00045871734619140625
Ping 9 2022-04-08 15:26:54.860139
=====
TEST MESSAGE NUMBER 10
RTT 0.00048470497131347656
Ping 10 2022-04-08 15:26:54.860816
=====
Process finished with exit code 0
```

B. Вывод в формате ping

```
/usr/bin/python3.8 /home/eartser/Learning/comp-networks/lab07/ping/ping.py 8080 1
2 packets transmitted, 1 packets received, 50% packet loss, time 1002ms
rtt min/avg/max/mdev = 0.592/0.592/0.592/0.0 ms

3 packets transmitted, 2 packets received, 33% packet loss, time 1003ms
rtt min/avg/max/mdev = 0.449/0.521/0.592/0.071 ms

4 packets transmitted, 3 packets received, 25% packet loss, time 1003ms
rtt min/avg/max/mdev = 0.449/0.513/0.592/0.059 ms

5 packets transmitted, 4 packets received, 20% packet loss, time 1004ms
rtt min/avg/max/mdev = 0.449/0.504/0.592/0.054 ms

6 packets transmitted, 5 packets received, 17% packet loss, time 1005ms
rtt min/avg/max/mdev = 0.449/0.498/0.592/0.05 ms

8 packets transmitted, 6 packets received, 25% packet loss, time 2007ms
rtt min/avg/max/mdev = 0.449/0.515/0.599/0.059 ms

9 packets transmitted, 7 packets received, 22% packet loss, time 2008ms
rtt min/avg/max/mdev = 0.387/0.496/0.599/0.07 ms

10 packets transmitted, 8 packets received, 20% packet loss, time 2008ms
rtt min/avg/max/mdev = 0.348/0.478/0.599/0.082 ms

Process finished with exit code 0
```

3. Задачи

Задача 2

$$t_{\text{передачи}} = \frac{L}{R} = \frac{1500 \text{ байт}}{1 \text{ Гбит/с}} = 0,000012 \text{ с} = 0,012 \text{ мс}.$$

$$\frac{n \cdot t_{\text{передачи}}}{RTT + t_{\text{передачи}}} = 0,98 \Rightarrow n = \frac{0,98 \cdot (RTT + t_{\text{передачи}})}{t_{\text{передачи}}} = \frac{0,98 \cdot (30 \text{ мс} + 0,012 \text{ мс})}{0,012 \text{ мс}} = 2450,98 \approx 2451 \text{ пакет}.$$