Сетевые технологии

Лабораторная работа №3

Метвалли Ахмед Фарг Набеех

3 октября 2025

Российский университет дружбы народов, Москва, Россия

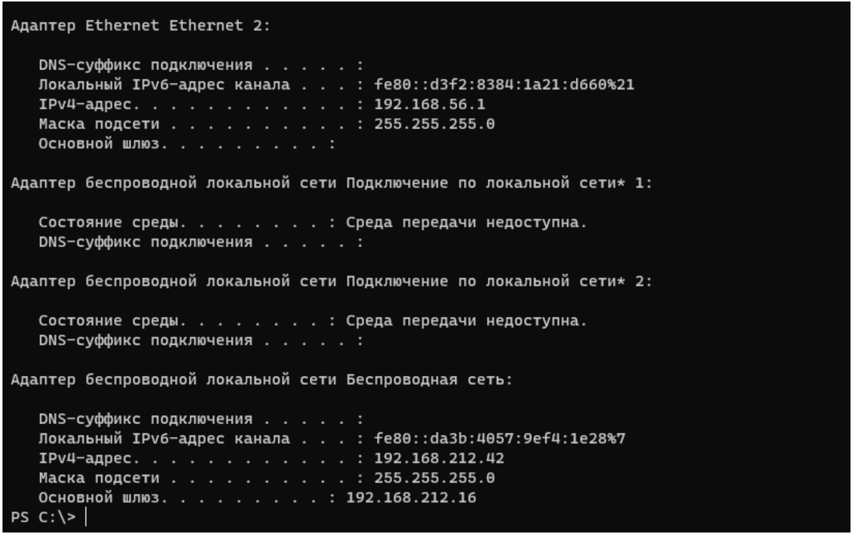
Цели и задачи работы

Цель лабораторной работы

Изучить работу Wireshark и провести анализ кадров Ethernet, пакетов ICMP/ARP, а также транспортных протоколов TCP, UDP, QUIC.

Выполнение лабораторной работы

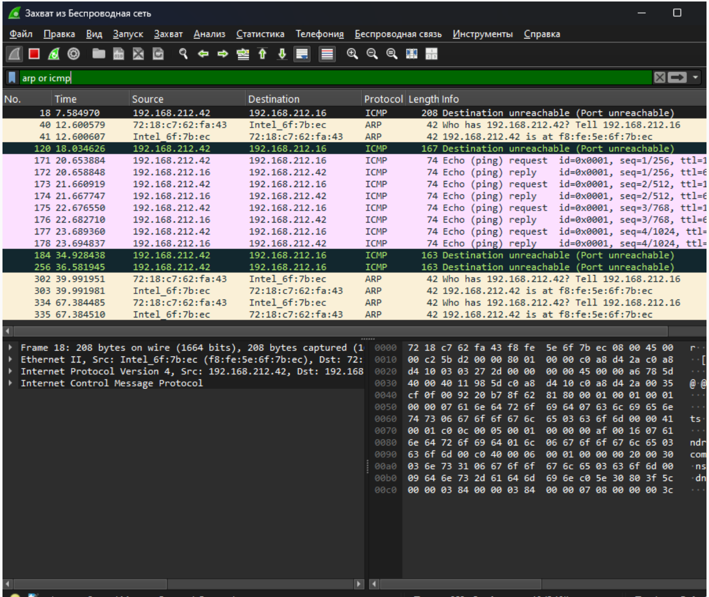
Анализ кадров канального уровня



```
Адаптер Ethernet Ethernet 2:

   DNS-суффикс подключения . . . . . :
   Локальный IPv6-адрес канала . . . : fe80::d3f2:8384:1a21:d660%21
   IPv4-адрес. . . . . . . . . . . . : 192.168.56.1
   Маска подсети . . . . . . . . . . : 255.255.255.0
   Основной шлюз. . . . . . . . . :

Адаптер беспроводной локальной сети Подключение по локальной сети* 1:

   Состояние среды. . . . . . . . : Среда передачи недоступна.
   DNS-суффикс подключения . . . . . :

Адаптер беспроводной локальной сети Подключение по локальной сети* 2:

   Состояние среды. . . . . . . . : Среда передачи недоступна.
   DNS-суффикс подключения . . . . . :

Адаптер беспроводной локальной сети Беспроводная сеть:

   DNS-суффикс подключения . . . . . :
   Локальный IPv6-адрес канала . . . : fe80::da3b:4057:9ef4:1e28%7
   IPv4-адрес. . . . . . . . . . . . : 192.168.212.42
   Маска подсети . . . . . . . . . . : 255.255.255.0
   Основной шлюз. . . . . . . . . : 192.168.212.16
PS C:\>
```

Рис. 1: Результат ipconfig

Ping и фильтрация трафика



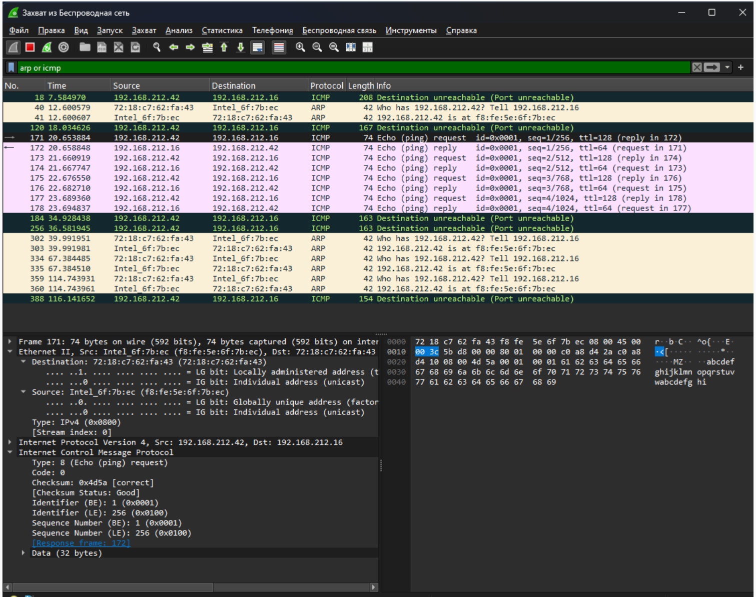
arp or icmp

```
No.  Time         Source             Destination        Protocol Length Info
  18 7.584970     192.168.212.42     192.168.212.16     ICMP     208 Destination unreachable (Port unreachable)
  40 12.600579    72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
  41 12.600607    Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 120 18.034626    192.168.212.42     192.168.212.16     ICMP     167 Destination unreachable (Port unreachable)
 171 20.653884    192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=1/256, ttl=1
 172 20.658848    192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=6
 173 21.660919    192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=2/512, ttl=1
 174 21.667747    192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=2/512, ttl=6
 175 22.676550    192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=3/768, ttl=1
 176 22.682710    192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=3/768, ttl=6
 177 23.689360    192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=4/1024, ttl=
 178 23.694837    192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=4/1024, ttl=
 184 34.928438    192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
 256 36.581945    192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
 302 39.991951    72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
 303 39.991981    Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 334 67.384485    72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
 335 67.384510    Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
```

```
▸ Frame 18: 208 bytes on wire (1664 bits), 208 bytes captured (1
▸ Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:
▸ Internet Protocol Version 4, Src: 192.168.212.42, Dst: 192.168
▸ Internet Control Message Protocol
```

```
0000  72 18 c7 62 fa 43 f8 fe  5e 6f 7b ec 08 00 45 00   r··
0010  00 c2 5b d2 00 00 80 01  00 00 c0 a8 d4 2a c0 a8   ··[
0020  d4 10 03 03 27 2d 00 00  00 00 45 00 00 a6 78 5d   ···
0030  40 00 40 11 98 5d c0 a8  d4 10 c0 a8 d4 2a 00 35   @·@
0040  cf 0f 00 92 20 b7 8f 62  81 80 00 01 00 01 00 01   ···
0050  00 00 07 61 6e 64 72 6f  69 64 07 63 6c 69 65 6e   ···
0060  74 73 06 67 6f 6f 67 6c  65 03 63 6f 6d 00 00 41   ts·
0070  00 01 c0 0c 00 05 00 01  00 00 00 af 00 16 07 61   ···
0080  6e 64 72 6f 69 64 01 6c  06 67 6f 6f 67 6c 65 03   ndr
0090  63 6f 6d 00 c0 40 00 06  00 01 00 00 00 20 00 30   com
00a0  03 6e 73 31 06 67 6f 6f  67 6c 65 03 63 6f 6d 00   ·ns
00b0  09 64 6e 73 2d 61 64 6d  69 6e c0 5e 30 80 3f 5c   ·dn
00c0  00 00 03 84 00 00 03 84  00 00 07 08 00 00 00 3c   ···
```

ICMP запрос



Захват из Беспроводная сеть
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

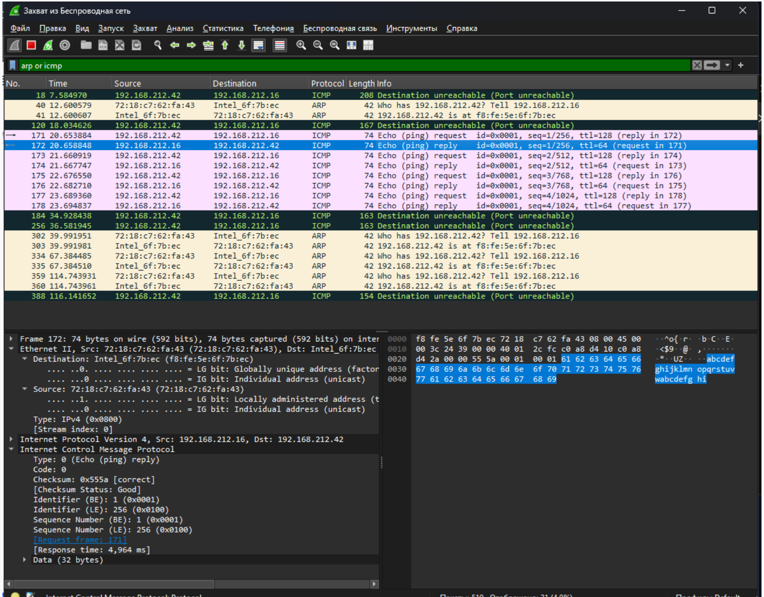
arp or icmp

```
No.  Time        Source             Destination        Protocol Length Info
  18 7.584970    192.168.212.42     192.168.212.16     ICMP     208 Destination unreachable (Port unreachable)
  40 12.600579   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
  41 12.600607   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 120 18.034626   192.168.212.42     192.168.212.16     ICMP     167 Destination unreachable (Port unreachable)
 171 20.653884   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=1/256, ttl=128 (reply in 172)
 172 20.658848   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=64 (request in 171)
 173 21.660919   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=2/512, ttl=128 (reply in 174)
 174 21.667747   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=2/512, ttl=64 (request in 173)
 175 22.676550   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=3/768, ttl=128 (reply in 176)
 176 22.682710   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=3/768, ttl=64 (request in 175)
 177 23.689360   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=4/1024, ttl=128 (reply in 178)
 178 23.694837   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=4/1024, ttl=64 (request in 177)
 184 34.928438   192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
 256 36.581945   192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
 302 39.991951   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
 303 39.991981   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 334 67.384485   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
 335 67.384510   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 359 114.743931  72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
 360 114.743961  Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
 388 116.141652  192.168.212.42     192.168.212.16     ICMP     154 Destination unreachable (Port unreachable)
```

```
Frame 171: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on inter
Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:18:c7:62:fa:43
  Destination: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
    .... ..1. .... .... .... .... = LG bit: Locally administered address (t
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factor
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
  [Stream index: 0]
Internet Protocol Version 4, Src: 192.168.212.42, Dst: 192.168.212.16
Internet Control Message Protocol
  Type: 8 (Echo (ping) request)
  Code: 0
  Checksum: 0x4d5a [correct]
  [Checksum Status: Good]
  Identifier (BE): 1 (0x0001)
  Identifier (LE): 256 (0x0100)
  Sequence Number (BE): 1 (0x0001)
  Sequence Number (LE): 256 (0x0100)
  [Response frame: 172]
  Data (32 bytes)
```

```
0000  72 18 c7 62 fa 43 f8 fe  5e 6f 7b ec 08 00 45 00   r··b·C·· ^o{···E·
0010  00 3c 5b d8 00 00 80 01  00 00 c0 a8 d4 2a c0 a8   ·<[····· ·····*··
0020  d4 10 08 00 4d 5a 00 01  00 01 61 62 63 64 65 66   ····MZ·· ··abcdef
0030  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
0040  77 61 62 63 64 65 66 67  68 69                     wabcdefg hi
```

ICMP ответ



arp or icmp

```
No.    Time        Source             Destination        Protocol Length Info
    18 7.584970    192.168.212.42     192.168.212.16     ICMP     208 Destination unreachable (Port unreachable)
    40 12.600579   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
    41 12.600607   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
   120 18.034626   192.168.212.42     192.168.212.16     ICMP     167 Destination unreachable (Port unreachable)
   171 20.653884   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=1/256, ttl=128 (reply in 172)
   172 20.658848   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=64 (request in 171)
   173 21.660919   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=2/512, ttl=128 (reply in 174)
   174 21.667747   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=2/512, ttl=64 (request in 173)
   175 22.676550   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=3/768, ttl=128 (reply in 176)
   176 22.682710   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=3/768, ttl=64 (request in 175)
   177 23.689360   192.168.212.42     192.168.212.16     ICMP      74 Echo (ping) request  id=0x0001, seq=4/1024, ttl=128 (reply in 178)
   178 23.694837   192.168.212.16     192.168.212.42     ICMP      74 Echo (ping) reply    id=0x0001, seq=4/1024, ttl=64 (request in 177)
   184 34.928438   192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
   256 36.581945   192.168.212.42     192.168.212.16     ICMP     163 Destination unreachable (Port unreachable)
   302 39.991951   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
   303 39.991981   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
   334 67.384485   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
   335 67.384510   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
   359 114.743931  72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP       42 Who has 192.168.212.42? Tell 192.168.212.16
   360 114.743961  Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP       42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
   388 116.141652  192.168.212.42     192.168.212.16     ICMP     154 Destination unreachable (Port unreachable)
```

```
> Frame 172: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on inter
v Ethernet II, Src: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43), Dst: Intel_6f:7b:ec
  v Destination: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factor
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  v Source: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
      .... ..1. .... .... .... .... = LG bit: Locally administered address (t
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
    [Stream index: 0]
> Internet Protocol Version 4, Src: 192.168.212.16, Dst: 192.168.212.42
v Internet Control Message Protocol
    Type: 0 (Echo (ping) reply)
    Code: 0
    Checksum: 0x555a [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 1 (0x0001)
    Sequence Number (LE): 256 (0x0100)
    [Request frame: 171]
    [Response time: 4,964 ms]
  > Data (32 bytes)
```

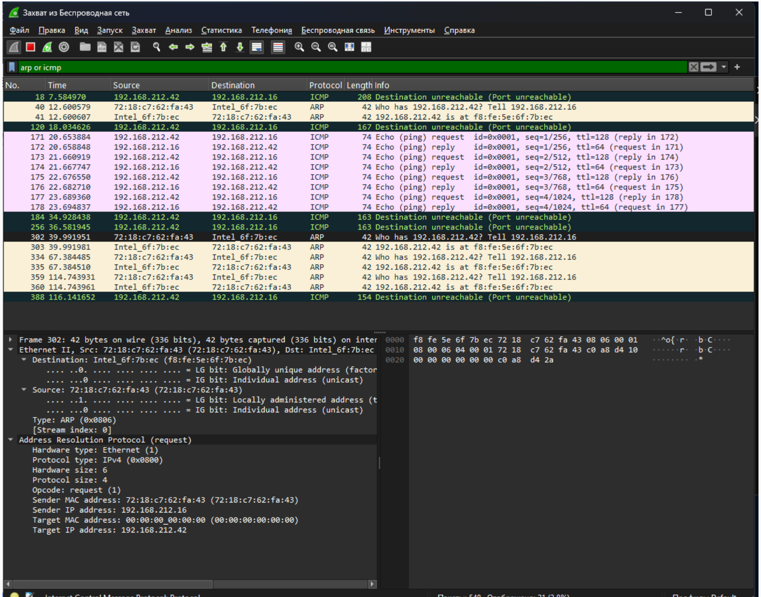
```
0000  f8 fe 5e 6f 7b ec 72 18  c7 62 fa 43 08 00 45 00   ··^o{·r· ·b·C··E·
0010  00 3c 24 39 00 00 40 01  2c fc c0 a8 d4 10 c0 a8   ·<$9··@· ,·······
0020  d4 2a 00 00 55 5a 00 01  00 01 61 62 63 64 65 66   ·*··UZ·· ··abcdef
0030  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
0040  77 61 62 63 64 65 66 67  68 69                     wabcdefg hi
```

Internet Control Message Protocol: Protocol

Пакеты: 510 · Отображено: 21 (4.0%)

Профиль: Default

ARP-запрос



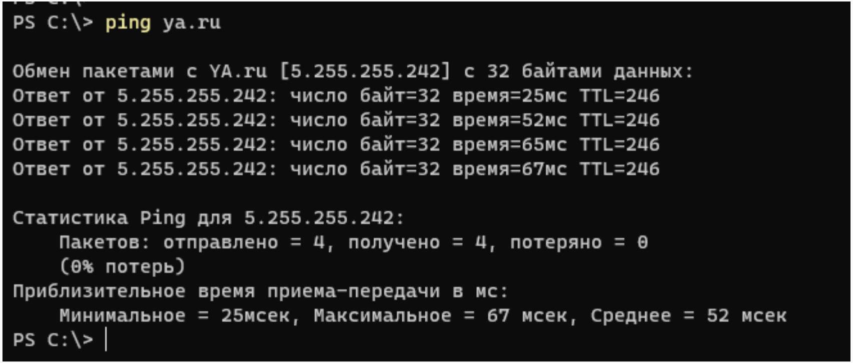
```
arp or icmp
```

```
No.   Time        Source             Destination        Protocol Length Info
   18 7.584970    192.168.212.42     192.168.212.16     ICMP      208 Destination unreachable (Port unreachable)
   40 12.600579   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP        42 Who has 192.168.212.42? Tell 192.168.212.16
   41 12.600607   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP        42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
  120 18.034626   192.168.212.42     192.168.212.16     ICMP      167 Destination unreachable (Port unreachable)
  171 20.653884   192.168.212.42     192.168.212.16     ICMP       74 Echo (ping) request  id=0x0001, seq=1/256, ttl=128 (reply in 172)
  172 20.658848   192.168.212.16     192.168.212.42     ICMP       74 Echo (ping) reply    id=0x0001, seq=1/256, ttl=64 (request in 171)
  173 21.660919   192.168.212.42     192.168.212.16     ICMP       74 Echo (ping) request  id=0x0001, seq=2/512, ttl=128 (reply in 174)
  174 21.667747   192.168.212.16     192.168.212.42     ICMP       74 Echo (ping) reply    id=0x0001, seq=2/512, ttl=64 (request in 173)
  175 22.676550   192.168.212.42     192.168.212.16     ICMP       74 Echo (ping) request  id=0x0001, seq=3/768, ttl=128 (reply in 176)
  176 22.682710   192.168.212.16     192.168.212.42     ICMP       74 Echo (ping) reply    id=0x0001, seq=3/768, ttl=64 (request in 175)
  177 23.689360   192.168.212.42     192.168.212.16     ICMP       74 Echo (ping) request  id=0x0001, seq=4/1024, ttl=128 (reply in 178)
  178 23.694837   192.168.212.16     192.168.212.42     ICMP       74 Echo (ping) reply    id=0x0001, seq=4/1024, ttl=64 (request in 177)
  184 34.928438   192.168.212.42     192.168.212.16     ICMP      163 Destination unreachable (Port unreachable)
  256 36.581945   192.168.212.42     192.168.212.16     ICMP      163 Destination unreachable (Port unreachable)
  302 39.991951   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP        42 Who has 192.168.212.42? Tell 192.168.212.16
  303 39.991981   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP        42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
  334 67.384485   72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP        42 Who has 192.168.212.42? Tell 192.168.212.16
  335 67.384510   Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP        42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
  359 114.743931  72:18:c7:62:fa:43  Intel_6f:7b:ec     ARP        42 Who has 192.168.212.42? Tell 192.168.212.16
  360 114.743961  Intel_6f:7b:ec     72:18:c7:62:fa:43  ARP        42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
  388 116.141652  192.168.212.42     192.168.212.16     ICMP      154 Destination unreachable (Port unreachable)
```

```
Frame 302: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on inter
Ethernet II, Src: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43), Dst: Intel_6f:7b:ec
  Destination: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factor
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
    .... ..1. .... .... .... .... = LG bit: Locally administered address (t
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Type: ARP (0x0806)
  [Stream index: 0]
Address Resolution Protocol (request)
  Hardware type: Ethernet (1)
  Protocol type: IPv4 (0x0800)
  Hardware size: 6
  Protocol size: 4
  Opcode: request (1)
  Sender MAC address: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
  Sender IP address: 192.168.212.16
  Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
  Target IP address: 192.168.212.42
```

```
0000  f8 fe 5e 6f 7b ec 72 18  c7 62 fa 43 08 06 00 01   ··^o{·r· ·b·C····
0010  08 00 06 04 00 01 72 18  c7 62 fa 43 c0 a8 d4 10   ······r· ·b·C····
0020  00 00 00 00 00 00 c0 a8  d4 2a                     ········ ·*
```

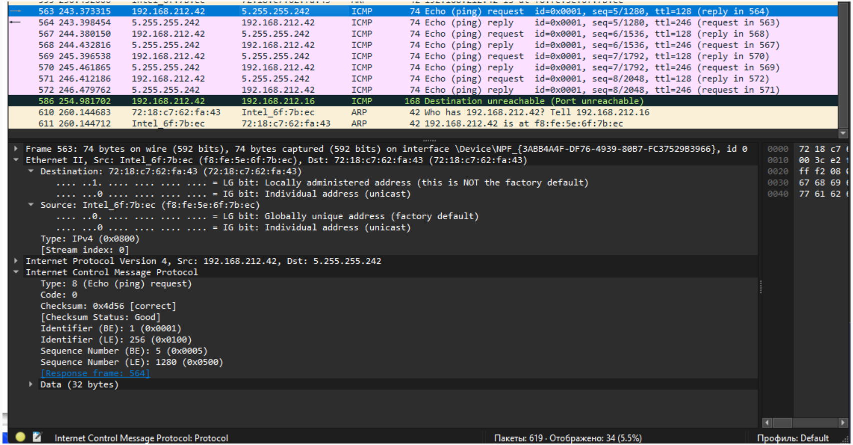
Ping внешнего узла



```
PS C:\> ping ya.ru

Обмен пакетами с YA.ru [5.255.255.242] с 32 байтами данных:
Ответ от 5.255.255.242: число байт=32 время=25мс TTL=246
Ответ от 5.255.255.242: число байт=32 время=52мс TTL=246
Ответ от 5.255.255.242: число байт=32 время=65мс TTL=246
Ответ от 5.255.255.242: число байт=32 время=67мс TTL=246

Статистика Ping для 5.255.255.242:
    Пакетов: отправлено = 4, получено = 4, потеряно = 0
    (0% потерь)
Приблизительное время приема-передачи в мс:
    Минимальное = 25мсек, Максимальное = 67 мсек, Среднее = 52 мсек
PS C:\>
```

Рис. 6: Ping ya.ru

Анализ ICMP при ping



```
563 243.373315  192.168.212.42    5.255.255.242     ICMP    74 Echo (ping) request  id=0x0001, seq=5/1280, ttl=128 (reply in 564)
564 243.398454  5.255.255.242     192.168.212.42    ICMP    74 Echo (ping) reply    id=0x0001, seq=5/1280, ttl=246 (request in 563)
567 244.380150  192.168.212.42    5.255.255.242     ICMP    74 Echo (ping) request  id=0x0001, seq=6/1536, ttl=128 (reply in 568)
568 244.432816  5.255.255.242     192.168.212.42    ICMP    74 Echo (ping) reply    id=0x0001, seq=6/1536, ttl=246 (request in 567)
569 245.396538  192.168.212.42    5.255.255.242     ICMP    74 Echo (ping) request  id=0x0001, seq=7/1792, ttl=128 (reply in 570)
570 245.461865  5.255.255.242     192.168.212.42    ICMP    74 Echo (ping) reply    id=0x0001, seq=7/1792, ttl=246 (request in 569)
571 246.412186  192.168.212.42    5.255.255.242     ICMP    74 Echo (ping) request  id=0x0001, seq=8/2048, ttl=128 (reply in 572)
572 246.479762  5.255.255.242     192.168.212.42    ICMP    74 Echo (ping) reply    id=0x0001, seq=8/2048, ttl=246 (request in 571)
586 254.981702  192.168.212.42    192.168.212.16    ICMP   168 Destination unreachable (Port unreachable)
610 260.144683  72:18:c7:62:fa:43 Intel_6f:7b:ec    ARP     42 Who has 192.168.212.42? Tell 192.168.212.16
611 260.144712  Intel_6f:7b:ec    72:18:c7:62:fa:43 ARP     42 192.168.212.42 is at f8:fe:5e:6f:7b:ec
```

```
Frame 563: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966}, id 0
Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
  Destination: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
    .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory default)
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
  [Stream index: 0]
Internet Protocol Version 4, Src: 192.168.212.42, Dst: 5.255.255.242
Internet Control Message Protocol
  Type: 8 (Echo (ping) request)
  Code: 0
  Checksum: 0x4d56 [correct]
  [Checksum Status: Good]
  Identifier (BE): 1 (0x0001)
  Identifier (LE): 256 (0x0100)
  Sequence Number (BE): 5 (0x0005)
  Sequence Number (LE): 1280 (0x0500)
  [Response frame: 564]
  Data (32 bytes)
```

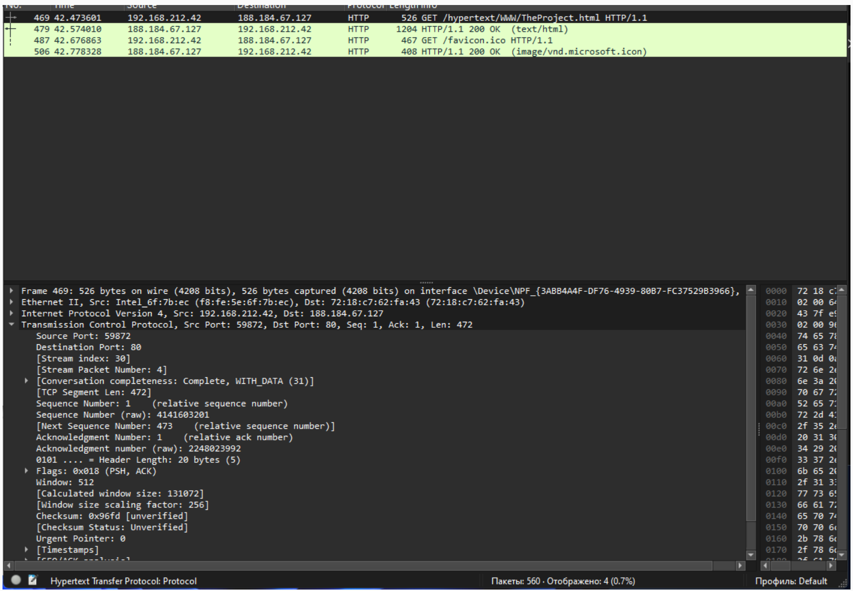
```
0000  72 18 c7
0010  00 3c e2
0020  ff f2 08
0030  67 68 69
0040  77 61 62
```

Internet Control Message Protocol: Protocol | Пакеты: 619 · Отображено: 34 (5.5%) | Профиль: Default

Рис. 7: ICMP при ping ya.ru

Анализ транспортного уровня

HTTP-запрос



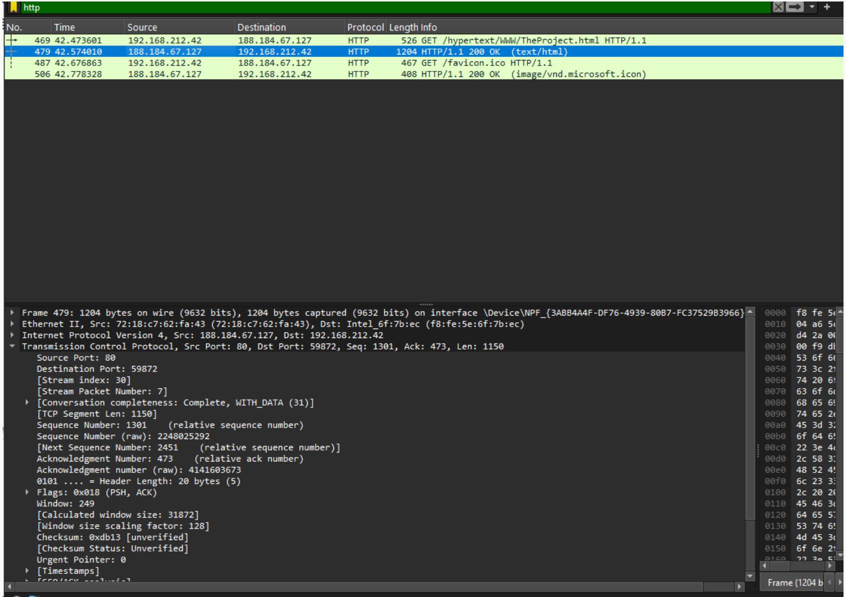
```
No.  Time        Source           Destination      Protocol Length Info
469 42.473601   192.168.212.42   188.184.67.127   HTTP      526 GET /hypertext/WWW/TheProject.html HTTP/1.1
479 42.574010   188.184.67.127   192.168.212.42   HTTP     1204 HTTP/1.1 200 OK  (text/html)
487 42.676863   192.168.212.42   188.184.67.127   HTTP      467 GET /favicon.ico HTTP/1.1
506 42.778328   188.184.67.127   192.168.212.42   HTTP      408 HTTP/1.1 200 OK  (image/vnd.microsoft.icon)
```

```
▸ Frame 469: 526 bytes on wire (4208 bits), 526 bytes captured (4208 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966},
▸ Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
▸ Internet Protocol Version 4, Src: 192.168.212.42, Dst: 188.184.67.127
▾ Transmission Control Protocol, Src Port: 59872, Dst Port: 80, Seq: 1, Ack: 1, Len: 472
    Source Port: 59872
    Destination Port: 80
    [Stream index: 30]
    [Stream Packet Number: 4]
  ▸ [Conversation completeness: Complete, WITH_DATA (31)]
    [TCP Segment Len: 472]
    Sequence Number: 1    (relative sequence number)
    Sequence Number (raw): 4141603201
    [Next Sequence Number: 473    (relative sequence number)]
    Acknowledgment Number: 1    (relative ack number)
    Acknowledgment number (raw): 2248023992
    0101 .... = Header Length: 20 bytes (5)
  ▸ Flags: 0x018 (PSH, ACK)
    Window: 512
    [Calculated window size: 131072]
    [Window size scaling factor: 256]
    Checksum: 0x96fd [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
  ▸ [Timestamps]
  ▸ [SEQ/ACK analysis]
```

```
0000  72 18
0010  02 00
0020  43 7f
0030  02 00
0040  74 65
0050  65 63
0060  31 0d
0070  72 6e
0080  6e 3a
0090  70 67
00a0  52 65
00b0  72 2d
00c0  2f 35
00d0  20 31
00e0  34 29
00f0  33 37
0100  6b 65
0110  2f 31
0120  77 73
0130  66 61
0140  65 70
0150  70 70
0160  2b 78
0170  2f 78
```

Hypertext Transfer Protocol: Protocol   Пакеты: 560 · Отображено: 4 (0.7%)   Профиль: Default

HTTP-ответ



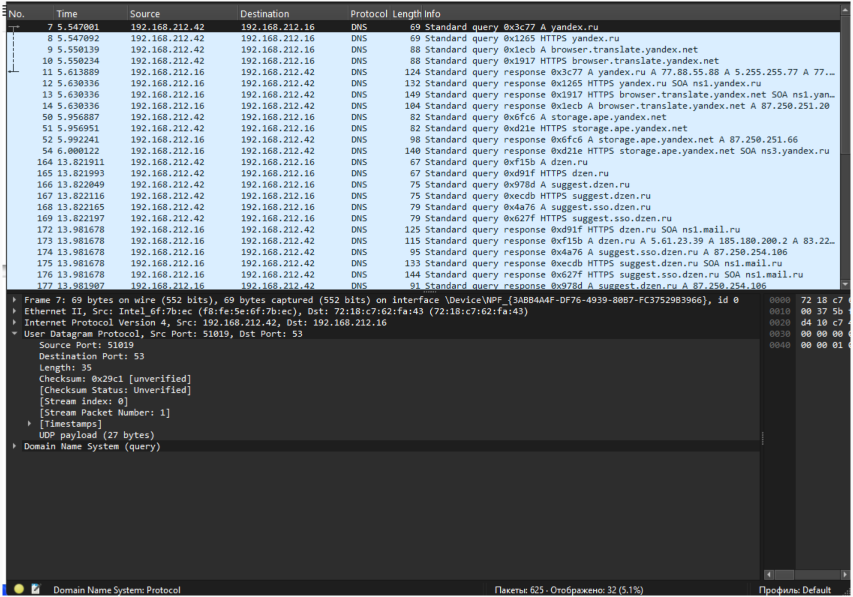
http

```
No.    Time       Source          Destination     Protocol Length Info
   469 42.473601  192.168.212.42  188.184.67.127  HTTP      526 GET /hypertext/WWW/TheProject.html HTTP/1.1
   479 42.574010  188.184.67.127  192.168.212.42  HTTP     1204 HTTP/1.1 200 OK  (text/html)
   487 42.676863  192.168.212.42  188.184.67.127  HTTP      467 GET /favicon.ico HTTP/1.1
   506 42.778328  188.184.67.127  192.168.212.42  HTTP      408 HTTP/1.1 200 OK  (image/vnd.microsoft.icon)
```

```
Frame 479: 1204 bytes on wire (9632 bits), 1204 bytes captured (9632 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966}
Ethernet II, Src: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43), Dst: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
Internet Protocol Version 4, Src: 188.184.67.127, Dst: 192.168.212.42
Transmission Control Protocol, Src Port: 80, Dst Port: 59872, Seq: 1301, Ack: 473, Len: 1150
    Source Port: 80
    Destination Port: 59872
    [Stream index: 30]
    [Stream Packet Number: 7]
    [Conversation completeness: Complete, WITH_DATA (31)]
    [TCP Segment Len: 1150]
    Sequence Number: 1301    (relative sequence number)
    Sequence Number (raw): 2248025292
    [Next Sequence Number: 2451    (relative sequence number)]
    Acknowledgment Number: 473    (relative ack number)
    Acknowledgment number (raw): 4141603673
    0101 .... = Header Length: 20 bytes (5)
    Flags: 0x018 (PSH, ACK)
    Window: 249
    [Calculated window size: 31872]
    [Window size scaling factor: 128]
    Checksum: 0xdb13 [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
    [Timestamps]
```

```
0000  f8 fe
0010  04 a6
0020  d4 2a
0030  00 f9
0040  53 6f
0050  73 3c
0060  74 20
0070  63 6f
0080  68 65
0090  74 65
00a0  45 3d
00b0  6f 64
00c0  22 3e
00d0  2c 58
00e0  48 52
00f0  6c 23
0100  2c 20
0110  45 46
0120  64 65
0130  53 74
0140  4d 45
0150  6f 6e
```

DNS-запросы



```
No.   Time        Source          Destination     Protocol Length Info
    7 5.547001    192.168.212.42  192.168.212.16  DNS       69 Standard query 0x3c77 A yandex.ru
    8 5.547092    192.168.212.42  192.168.212.16  DNS       69 Standard query 0x1265 HTTPS yandex.ru
    9 5.550139    192.168.212.42  192.168.212.16  DNS       88 Standard query 0x1ecb A browser.translate.yandex.net
   10 5.550234    192.168.212.42  192.168.212.16  DNS       88 Standard query 0x1917 HTTPS browser.translate.yandex.net
   11 5.613889    192.168.212.16  192.168.212.42  DNS      124 Standard query response 0x3c77 A yandex.ru A 77.88.55.88 A 5.255.255.77 A 77.…
   12 5.630336    192.168.212.16  192.168.212.42  DNS      132 Standard query response 0x1265 HTTPS yandex.ru SOA ns1.yandex.ru
   13 5.630336    192.168.212.16  192.168.212.42  DNS      149 Standard query response 0x1917 HTTPS browser.translate.yandex.net SOA ns1.yan…
   14 5.630336    192.168.212.16  192.168.212.42  DNS      104 Standard query response 0x1ecb A browser.translate.yandex.net A 87.250.251.20
   50 5.956887    192.168.212.42  192.168.212.16  DNS       82 Standard query 0x6fc6 A storage.ape.yandex.net
   51 5.956951    192.168.212.42  192.168.212.16  DNS       82 Standard query 0xd21e HTTPS storage.ape.yandex.net
   52 5.992241    192.168.212.16  192.168.212.42  DNS       98 Standard query response 0x6fc6 A storage.ape.yandex.net A 87.250.251.66
   54 6.000122    192.168.212.16  192.168.212.42  DNS      140 Standard query response 0xd21e HTTPS storage.ape.yandex.net SOA ns3.yandex.ru
  164 13.821911   192.168.212.42  192.168.212.16  DNS       67 Standard query 0xf15b A dzen.ru
  165 13.821993   192.168.212.42  192.168.212.16  DNS       67 Standard query 0xd91f HTTPS dzen.ru
  166 13.822049   192.168.212.42  192.168.212.16  DNS       75 Standard query 0x978d A suggest.dzen.ru
  167 13.822116   192.168.212.42  192.168.212.16  DNS       75 Standard query 0xecdb HTTPS suggest.dzen.ru
  168 13.822165   192.168.212.42  192.168.212.16  DNS       79 Standard query 0x4a76 A suggest.sso.dzen.ru
  169 13.822197   192.168.212.42  192.168.212.16  DNS       79 Standard query 0x627f HTTPS suggest.sso.dzen.ru
  172 13.981678   192.168.212.16  192.168.212.42  DNS      125 Standard query response 0xd91f HTTPS dzen.ru SOA ns1.mail.ru
  173 13.981678   192.168.212.16  192.168.212.42  DNS      115 Standard query response 0xf15b A dzen.ru A 5.61.23.39 A 185.180.200.2 A 83.22…
  174 13.981678   192.168.212.16  192.168.212.42  DNS       95 Standard query response 0x4a76 A suggest.sso.dzen.ru A 87.250.254.106
  175 13.981678   192.168.212.16  192.168.212.42  DNS      133 Standard query response 0xecdb HTTPS suggest.dzen.ru SOA ns1.mail.ru
  176 13.981678   192.168.212.16  192.168.212.42  DNS      144 Standard query response 0x627f HTTPS suggest.sso.dzen.ru SOA ns1.mail.ru
  177 13.981907   192.168.212.16  192.168.212.42  DNS       91 Standard query response 0x978d A suggest.dzen.ru A 87.250.254.106
```

```
▸ Frame 7: 69 bytes on wire (552 bits), 69 bytes captured (552 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966}, id 0
▸ Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
▸ Internet Protocol Version 4, Src: 192.168.212.42, Dst: 192.168.212.16
▾ User Datagram Protocol, Src Port: 51019, Dst Port: 53
    Source Port: 51019
    Destination Port: 53
    Length: 35
    Checksum: 0x29c1 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 0]
    [Stream Packet Number: 1]
  ▸ [Timestamps]
    UDP payload (27 bytes)
▸ Domain Name System (query)
```

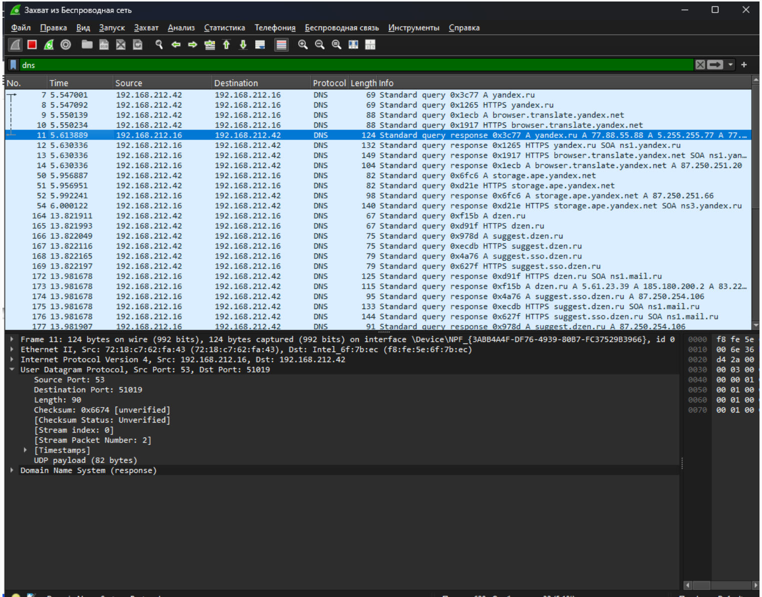
```
0000  72 18 c7
0010  00 37 5b
0020  d4 10 c7
0030  00 00 00
0040  00 00 01
```

Domain Name System: Protocol

Пакеты: 625 · Отображено: 32 (5.1%)

Профиль: Default

DNS-ответы


Захват из Беспроводная сеть
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

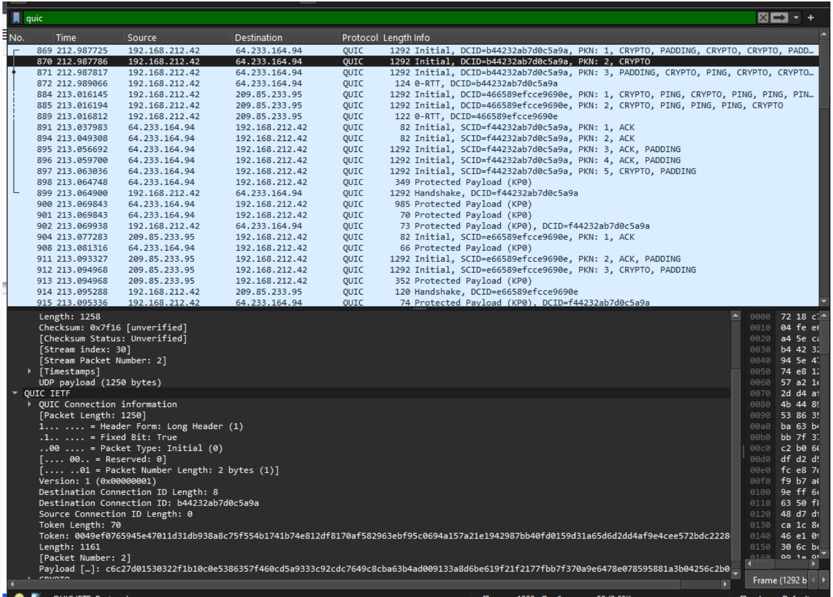
```
dns
```

```
No.  Time         Source          Destination     Protocol Length Info
   7 5.547001     192.168.212.42  192.168.212.16  DNS       69 Standard query 0x3c77 A yandex.ru
   8 5.547092     192.168.212.42  192.168.212.16  DNS       69 Standard query 0x1265 HTTPS yandex.ru
   9 5.550139     192.168.212.42  192.168.212.16  DNS       88 Standard query 0x1ecb A browser.translate.yandex.net
  10 5.550234     192.168.212.42  192.168.212.16  DNS       88 Standard query 0x1917 HTTPS browser.translate.yandex.net
  11 5.613889     192.168.212.16  192.168.212.42  DNS      124 Standard query response 0x3c77 A yandex.ru A 77.88.55.88 A 5.255.255.77 A 77.…
  12 5.630336     192.168.212.16  192.168.212.42  DNS      132 Standard query response 0x1265 HTTPS yandex.ru SOA ns1.yandex.ru
  13 5.630336     192.168.212.16  192.168.212.42  DNS      149 Standard query response 0x1917 HTTPS browser.translate.yandex.net SOA ns1.yan…
  14 5.630336     192.168.212.16  192.168.212.42  DNS      104 Standard query response 0x1ecb A browser.translate.yandex.net A 87.250.251.20
  50 5.956887     192.168.212.42  192.168.212.16  DNS       82 Standard query 0x6fc6 A storage.ape.yandex.net
  51 5.956951     192.168.212.42  192.168.212.16  DNS       82 Standard query 0xd21e HTTPS storage.ape.yandex.net
  52 5.992241     192.168.212.16  192.168.212.42  DNS       98 Standard query response 0x6fc6 A storage.ape.yandex.net A 87.250.251.66
  54 6.000122     192.168.212.16  192.168.212.42  DNS      140 Standard query response 0xd21e HTTPS storage.ape.yandex.net SOA ns3.yandex.ru
 164 13.821911    192.168.212.42  192.168.212.16  DNS       67 Standard query 0xf15b A dzen.ru
 165 13.821993    192.168.212.42  192.168.212.16  DNS       67 Standard query 0xd91f HTTPS dzen.ru
 166 13.822049    192.168.212.42  192.168.212.16  DNS       75 Standard query 0x978d A suggest.dzen.ru
 167 13.822116    192.168.212.42  192.168.212.16  DNS       75 Standard query 0xecdb HTTPS suggest.dzen.ru
 168 13.822165    192.168.212.42  192.168.212.16  DNS       79 Standard query 0x4a76 A suggest.sso.dzen.ru
 169 13.822197    192.168.212.42  192.168.212.16  DNS       79 Standard query 0x627f HTTPS suggest.sso.dzen.ru
 172 13.981678    192.168.212.16  192.168.212.42  DNS      125 Standard query response 0xd91f HTTPS dzen.ru SOA ns1.mail.ru
 173 13.981678    192.168.212.16  192.168.212.42  DNS      115 Standard query response 0xf15b A dzen.ru A 5.61.23.39 A 185.180.200.2 A 83.22…
 174 13.981678    192.168.212.16  192.168.212.42  DNS       95 Standard query response 0x4a76 A suggest.sso.dzen.ru A 87.250.254.106
 175 13.981678    192.168.212.16  192.168.212.42  DNS      133 Standard query response 0xecdb HTTPS suggest.dzen.ru SOA ns1.mail.ru
 176 13.981678    192.168.212.16  192.168.212.42  DNS      144 Standard query response 0x627f HTTPS suggest.sso.dzen.ru SOA ns1.mail.ru
 177 13.981907    192.168.212.16  192.168.212.42  DNS       91 Standard query response 0x978d A suggest.dzen.ru A 87.250.254.106
```

```
▸ Frame 11: 124 bytes on wire (992 bits), 124 bytes captured (992 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966}, id 0
▸ Ethernet II, Src: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43), Dst: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec)
▸ Internet Protocol Version 4, Src: 192.168.212.16, Dst: 192.168.212.42
▾ User Datagram Protocol, Src Port: 53, Dst Port: 51019
    Source Port: 53
    Destination Port: 51019
    Length: 90
    Checksum: 0x6674 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 0]
    [Stream Packet Number: 2]
  ▸ [Timestamps]
    UDP payload (82 bytes)
▸ Domain Name System (response)
```

```
0000  f8 fe 5e
0010  00 6e 36
0020  d4 2a 00
0030  00 03 00
0040  00 00 01
0050  00 01 00
0060  00 01 00
0070  00 01 00
```

QUIC Initial



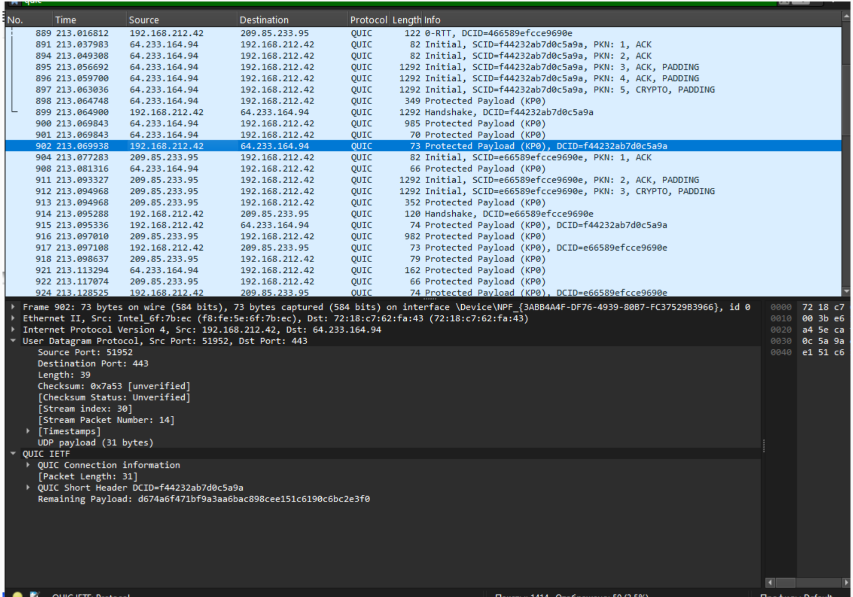
```
quic
```

```
No.  Time        Source          Destination     Protocol Length Info
 869 212.987725  192.168.212.42  64.233.164.94   QUIC     1292 Initial, DCID=b44232ab7d0c5a9a, PKN: 1, CRYPTO, PADDING, CRYPTO, CRYPTO, PADD…
 870 212.987786  192.168.212.42  64.233.164.94   QUIC     1292 Initial, DCID=b44232ab7d0c5a9a, PKN: 2, CRYPTO
 871 212.987817  192.168.212.42  64.233.164.94   QUIC     1292 Initial, DCID=b44232ab7d0c5a9a, PKN: 3, PADDING, CRYPTO, PING, CRYPTO, CRYPTO…
 872 212.989066  192.168.212.42  64.233.164.94   QUIC      124 0-RTT, DCID=b44232ab7d0c5a9a
 884 213.016145  192.168.212.42  209.85.233.95   QUIC     1292 Initial, DCID=466589efcce9690e, PKN: 1, CRYPTO, PING, CRYPTO, PING, PING, PIN…
 885 213.016194  192.168.212.42  209.85.233.95   QUIC     1292 Initial, DCID=466589efcce9690e, PKN: 2, CRYPTO, PING, PING, PING, CRYPTO
 889 213.016812  192.168.212.42  209.85.233.95   QUIC      122 0-RTT, DCID=466589efcce9690e
 891 213.037983  64.233.164.94   192.168.212.42  QUIC       82 Initial, SCID=f44232ab7d0c5a9a, PKN: 1, ACK
 894 213.049308  64.233.164.94   192.168.212.42  QUIC       82 Initial, SCID=f44232ab7d0c5a9a, PKN: 2, ACK
 895 213.056692  64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 3, ACK, PADDING
 896 213.059700  64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 4, ACK, PADDING
 897 213.063036  64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 5, CRYPTO, PADDING
 898 213.064748  64.233.164.94   192.168.212.42  QUIC      349 Protected Payload (KP0)
 899 213.064900  192.168.212.42  64.233.164.94   QUIC     1292 Handshake, DCID=f44232ab7d0c5a9a
 900 213.069843  64.233.164.94   192.168.212.42  QUIC      985 Protected Payload (KP0)
 901 213.069843  64.233.164.94   192.168.212.42  QUIC       70 Protected Payload (KP0)
 902 213.069938  192.168.212.42  64.233.164.94   QUIC       73 Protected Payload (KP0), DCID=f44232ab7d0c5a9a
 904 213.077283  209.85.233.95   192.168.212.42  QUIC       82 Initial, SCID=e66589efcce9690e, PKN: 1, ACK
 908 213.081316  64.233.164.94   192.168.212.42  QUIC       66 Protected Payload (KP0)
 911 213.093327  209.85.233.95   192.168.212.42  QUIC     1292 Initial, SCID=e66589efcce9690e, PKN: 2, ACK, PADDING
 912 213.094968  209.85.233.95   192.168.212.42  QUIC     1292 Initial, SCID=e66589efcce9690e, PKN: 3, CRYPTO, PADDING
 913 213.094968  209.85.233.95   192.168.212.42  QUIC      352 Protected Payload (KP0)
 914 213.095288  192.168.212.42  209.85.233.95   QUIC      120 Handshake, DCID=e66589efcce9690e
 915 213.095336  192.168.212.42  64.233.164.94   QUIC       74 Protected Payload (KP0), DCID=f44232ab7d0c5a9a
```

```
      Length: 1258
      Checksum: 0x7f16 [unverified]
      [Checksum Status: Unverified]
      [Stream index: 30]
      [Stream Packet Number: 2]
    › [Timestamps]
      UDP payload (1250 bytes)
  ⌄ QUIC IETF
    › QUIC Connection information
      [Packet Length: 1250]
      1... .... = Header Form: Long Header (1)
      .1.. .... = Fixed Bit: True
      ..00 .... = Packet Type: Initial (0)
      [.... 00.. = Reserved: 0]
      [.... ..01 = Packet Number Length: 2 bytes (1)]
      Version: 1 (0x00000001)
      Destination Connection ID Length: 8
      Destination Connection ID: b44232ab7d0c5a9a
      Source Connection ID Length: 0
      Token Length: 70
      Token: 0049ef0765945e47011d31db938a8c75f554b1741b74e812df8170af582963ebf95c0694a157a21e1942987bb40fd0159d31a65d6d2dd4af9e4cee572bdc2228
      Length: 1161
      [Packet Number: 2]
      Payload […]: c6c27d01530322f1b10c0e5386357f460cd5a9333c92cdc7649c8cba63b4ad009133a8d6be619f21f2177fbb7f370a9e6478e078595881a3b04256c2b0
```

```
0000  72 18
0010  04 fe
0020  a4 5e
0030  b4 42
0040  94 5e
0050  74 e8
0060  57 a2
0070  2d d4
0080  4b 44
0090  53 86
00a0  ba 63
00b0  bb 7f
00c0  c2 b0
00d0  df d2
00e0  fc e8
00f0  f9 b7
0100  9e ff
0110  63 50
0120  48 d7
0130  ca 1c
0140  46 e1
0150  30 6c
```

QUIC Payload



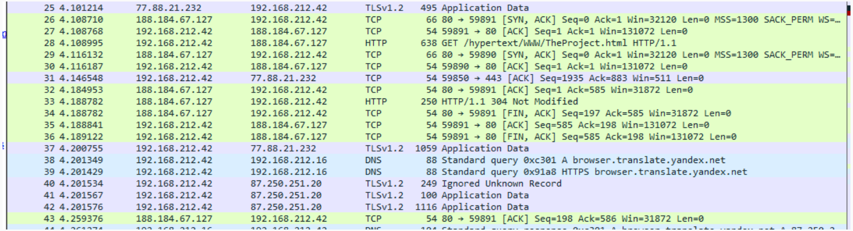
```
No.   Time       Source          Destination     Protocol Length Info
  889 213.016812 192.168.212.42  209.85.233.95   QUIC      122 0-RTT, DCID=466589efcce9690e
  891 213.037983 64.233.164.94   192.168.212.42  QUIC       82 Initial, SCID=f44232ab7d0c5a9a, PKN: 1, ACK
  894 213.049308 64.233.164.94   192.168.212.42  QUIC       82 Initial, SCID=f44232ab7d0c5a9a, PKN: 2, ACK
  895 213.056692 64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 3, ACK, PADDING
  896 213.059700 64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 4, ACK, PADDING
  897 213.063036 64.233.164.94   192.168.212.42  QUIC     1292 Initial, SCID=f44232ab7d0c5a9a, PKN: 5, CRYPTO, PADDING
  898 213.064748 64.233.164.94   192.168.212.42  QUIC      349 Protected Payload (KP0)
  899 213.064900 192.168.212.42  64.233.164.94   QUIC     1292 Handshake, DCID=f44232ab7d0c5a9a
  900 213.069843 64.233.164.94   192.168.212.42  QUIC      985 Protected Payload (KP0)
  901 213.069843 64.233.164.94   192.168.212.42  QUIC       70 Protected Payload (KP0)
  902 213.069938 192.168.212.42  64.233.164.94   QUIC       73 Protected Payload (KP0), DCID=f44232ab7d0c5a9a
  904 213.077283 209.85.233.95   192.168.212.42  QUIC       82 Initial, SCID=e66589efcce9690e, PKN: 1, ACK
  908 213.081316 64.233.164.94   192.168.212.42  QUIC       66 Protected Payload (KP0)
  911 213.093327 209.85.233.95   192.168.212.42  QUIC     1292 Initial, SCID=e66589efcce9690e, PKN: 2, ACK, PADDING
  912 213.094968 209.85.233.95   192.168.212.42  QUIC     1292 Initial, SCID=e66589efcce9690e, PKN: 3, CRYPTO, PADDING
  913 213.094968 209.85.233.95   192.168.212.42  QUIC      352 Protected Payload (KP0)
  914 213.095288 192.168.212.42  209.85.233.95   QUIC      120 Handshake, DCID=e66589efcce9690e
  915 213.095336 192.168.212.42  64.233.164.94   QUIC       74 Protected Payload (KP0), DCID=f44232ab7d0c5a9a
  916 213.097010 209.85.233.95   192.168.212.42  QUIC      982 Protected Payload (KP0)
  917 213.097108 192.168.212.42  209.85.233.95   QUIC       73 Protected Payload (KP0), DCID=e66589efcce9690e
  918 213.098637 209.85.233.95   192.168.212.42  QUIC       79 Protected Payload (KP0)
  921 213.113294 64.233.164.94   192.168.212.42  QUIC      162 Protected Payload (KP0)
  922 213.117074 209.85.233.95   192.168.212.42  QUIC       66 Protected Payload (KP0)
  924 213.128525 192.168.212.42  209.85.233.95   QUIC       74 Protected Payload (KP0), DCID=e66589efcce9690e
```

```
> Frame 902: 73 bytes on wire (584 bits), 73 bytes captured (584 bits) on interface \Device\NPF_{3ABB4A4F-DF76-4939-80B7-FC37529B3966}, id 0
> Ethernet II, Src: Intel_6f:7b:ec (f8:fe:5e:6f:7b:ec), Dst: 72:18:c7:62:fa:43 (72:18:c7:62:fa:43)
> Internet Protocol Version 4, Src: 192.168.212.42, Dst: 64.233.164.94
v User Datagram Protocol, Src Port: 51952, Dst Port: 443
    Source Port: 51952
    Destination Port: 443
    Length: 39
    Checksum: 0x7a53 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 30]
    [Stream Packet Number: 14]
  > [Timestamps]
    UDP payload (31 bytes)
v QUIC IETF
  > QUIC Connection information
    [Packet Length: 31]
  > QUIC Short Header DCID=f44232ab7d0c5a9a
    Remaining Payload: d674a6f471bf9a3aa6bac898cee151c6190c6bc2e3f0
```

```
0000  72 18 c7
0010  00 3b e6
0020  a4 5e ca
0030  0c 5a 9a
0040  e1 51 c6
```

TCP Handshake

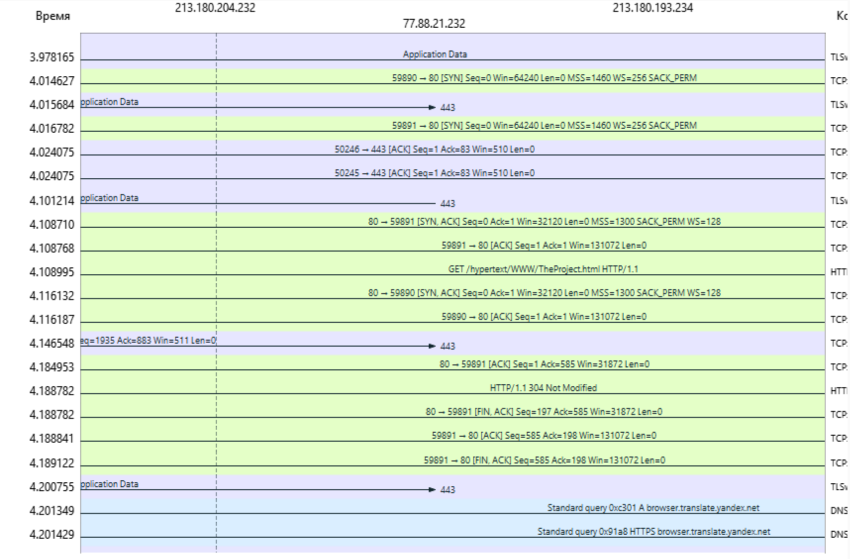
Трёхстороннее рукопожатие



```
25 4.101214   77.88.21.232     192.168.212.42   TLSv1.2   495 Application Data
26 4.108710   188.184.67.127   192.168.212.42   TCP        66 80 → 59891 [SYN, ACK] Seq=0 Ack=1 Win=32120 Len=0 MSS=1300 SACK_PERM WS=…
27 4.108768   192.168.212.42   188.184.67.127   TCP        54 59891 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0
28 4.108995   192.168.212.42   188.184.67.127   HTTP      638 GET /hypertext/WWW/TheProject.html HTTP/1.1
29 4.116132   188.184.67.127   192.168.212.42   TCP        66 80 → 59890 [SYN, ACK] Seq=0 Ack=1 Win=32120 Len=0 MSS=1300 SACK_PERM WS=…
30 4.116187   192.168.212.42   188.184.67.127   TCP        54 59890 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0
31 4.146548   192.168.212.42   77.88.21.232     TCP        54 59850 → 443 [ACK] Seq=1935 Ack=883 Win=511 Len=0
32 4.184953   188.184.67.127   192.168.212.42   TCP        54 80 → 59891 [ACK] Seq=1 Ack=585 Win=31872 Len=0
33 4.188782   188.184.67.127   192.168.212.42   HTTP      250 HTTP/1.1 304 Not Modified
34 4.188782   188.184.67.127   192.168.212.42   TCP        54 80 → 59891 [FIN, ACK] Seq=197 Ack=585 Win=31872 Len=0
35 4.188841   192.168.212.42   188.184.67.127   TCP        54 59891 → 80 [ACK] Seq=585 Ack=198 Win=131072 Len=0
36 4.189122   192.168.212.42   188.184.67.127   TCP        54 59891 → 80 [FIN, ACK] Seq=585 Ack=198 Win=131072 Len=0
37 4.200755   192.168.212.42   77.88.21.232     TLSv1.2  1059 Application Data
38 4.201349   192.168.212.42   192.168.212.16   DNS        88 Standard query 0xc301 A browser.translate.yandex.net
39 4.201429   192.168.212.42   192.168.212.16   DNS        88 Standard query 0x91a8 HTTPS browser.translate.yandex.net
40 4.201534   192.168.212.42   87.250.251.20    TLSv1.2   249 Ignored Unknown Record
41 4.201567   192.168.212.42   87.250.251.20    TLSv1.2   100 Application Data
42 4.201576   192.168.212.42   87.250.251.20    TLSv1.2  1116 Application Data
43 4.259376   188.184.67.127   192.168.212.42   TCP        54 80 → 59891 [ACK] Seq=198 Ack=586 Win=31872 Len=0
44 4.261274   192.168.212.16   192.168.212.42   DNS       104 Standard query response 0xc301 A browser.translate.yandex.net A 87.250.2
```

Рис. 14: TCP Handshake

График потока TCP



213.180.204.232

77.88.21.232

213.180.193.234

Время		Kc
3.978165	Application Data	TLSv
4.014627	59890 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM	TCP:
4.015684	pplication Data 443	TLSv
4.016782	59891 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM	TCP:
4.024075	50246 → 443 [ACK] Seq=1 Ack=83 Win=510 Len=0	TCP:
4.024075	50245 → 443 [ACK] Seq=1 Ack=83 Win=510 Len=0	TCP:
4.101214	pplication Data 443	TLSv
4.108710	80 → 59891 [SYN, ACK] Seq=0 Ack=1 Win=32120 Len=0 MSS=1300 SACK_PERM WS=128	TCP:
4.108768	59891 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0	TCP:
4.108995	GET /hypertext/WWW/TheProject.html HTTP/1.1	HTTI
4.116132	80 → 59890 [SYN, ACK] Seq=0 Ack=1 Win=32120 Len=0 MSS=1300 SACK_PERM WS=128	TCP:
4.116187	59890 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0	TCP:
4.146548	eq=1935 Ack=883 Win=511 Len=0 443	TCP:
4.184953	80 → 59891 [ACK] Seq=1 Ack=585 Win=31872 Len=0	TCP:
4.188782	HTTP/1.1 304 Not Modified	HTTI
4.188782	80 → 59891 [FIN, ACK] Seq=197 Ack=585 Win=31872 Len=0	TCP:
4.188841	59891 → 80 [ACK] Seq=585 Ack=198 Win=131072 Len=0	TCP:
4.189122	59891 → 80 [FIN, ACK] Seq=585 Ack=198 Win=131072 Len=0	TCP:
4.200755	pplication Data 443	TLSv
4.201349	Standard query 0xc301 A browser.translate.yandex.net	DNS
4.201429	Standard query 0x91a8 HTTPS browser.translate.yandex.net	DNS

Выводы по работе

Вывод

В ходе работы были проанализированы кадры Ethernet, пакеты ARP и ICMP, протоколы транспортного уровня (HTTP, DNS, QUIC), а также процесс установления соединения TCP. Wireshark подтвердил корректность работы сетевых протоколов и позволил отследить их взаимодействие.