

## Команды для настройки:

PC1:

ip 192.168.0.1 /24

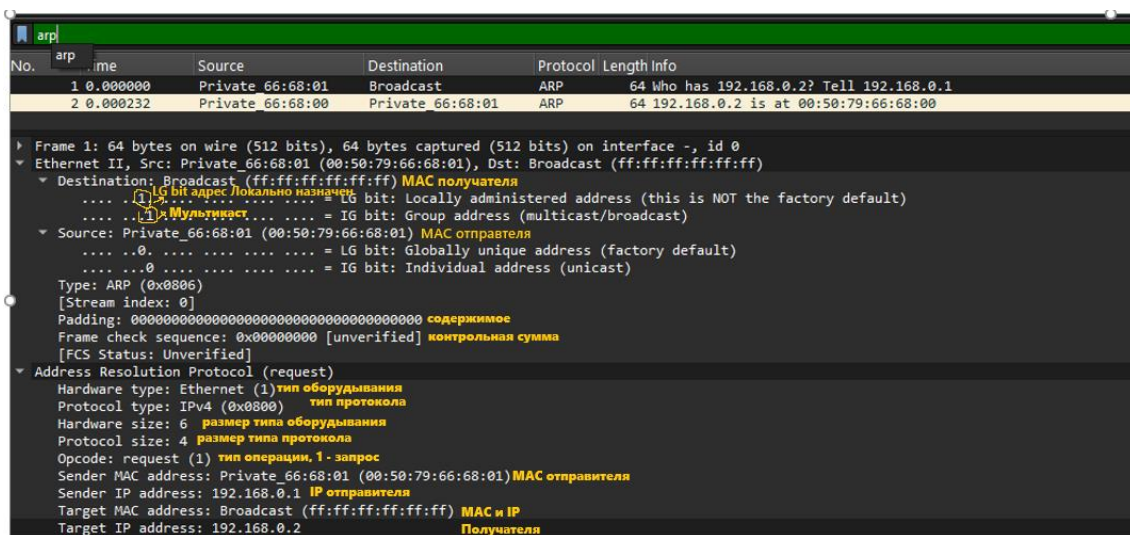
ping 192.168.0.2

PC2:

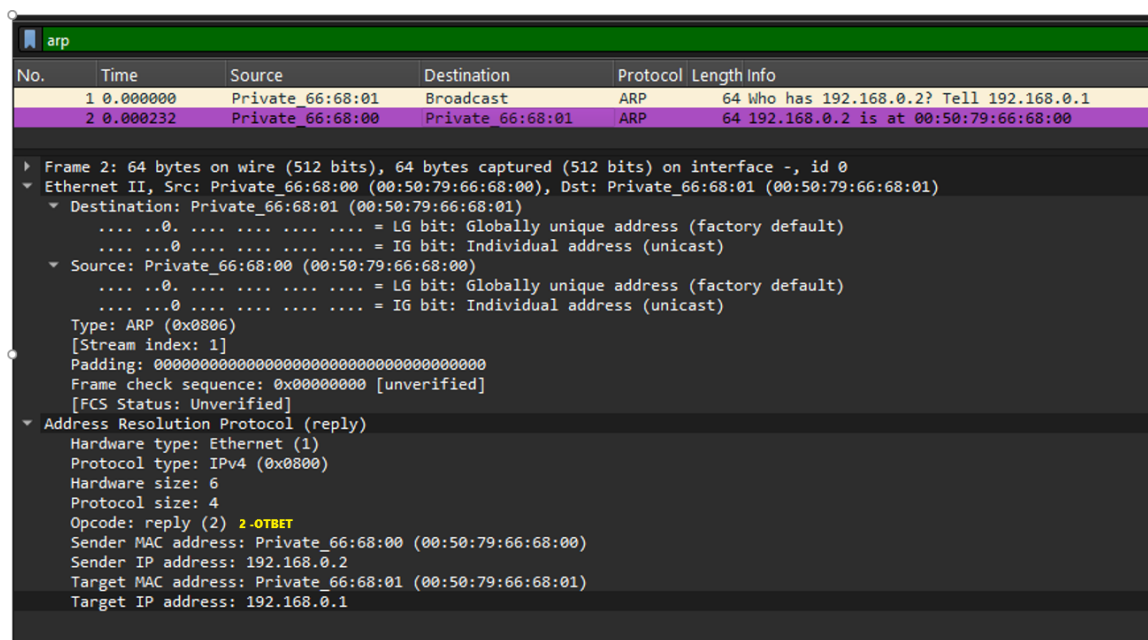
ip 192.168.0.2 /24

ping 192.168.0.1

Запрос Пк1 → Пк2, смотрим связь пк1 – коммутатор



Ответ: Пк2 → Пк1



## Запрос Пк1 → Пк2, смотрим связь пк2 – коммутатор

# arp					
No.	Time	Source	Destination	Protocol	Length Info
1	0.000000	Private 66:68:01	Broadcast	ARP	64 Who has 192.168.0.2? Tell 192.168.0.1
2	0.000151	Private 66:68:00	Private 66:68:01	ARP	64 192.168.0.2 is at 00:50:79:66:68:00

+ Frame 1: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0		0000	ff ff ff ff ff 00 50 79 66 68 01 00 06 00 01	.....P yfh ...
+ Ethernet II, Src: Private_66:68:01 (00:50:79:66:68:01), Dst: Broadcast (ff:ff:ff:ff:ff:ff)		0010	00 00 00 00 01 00 50 79 66 68 01 c0 a8 00 02	.....P yfh ...
+ Destination: Broadcast (ff:ff:ff:ff:ff:ff)		0020	ff ff ff ff ff c0 a8 00 02 00 00 00 00 00 00	.....P yfh ...
+ Source: Private_66:68:01 (00:50:79:66:68:01)		0030	00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Type: ARP (0x0806)				
[Stream index: 0]				
Padding: 00000000000000000000000000000000				
Frame check sequence: 0x00000000 [unverified]				
[FC Status: Unverified]				
+ Address Resolution Protocol (request)				
Hardware type: Ethernet (1)				
Protocol type: IPv4 (0x0800)				
Hardware size: 6				
Protocol size: 4				
Opcode: request (1)				
Sender MAC address: Private_66:68:01 (00:50:79:66:68:01)				
Sender IP address: 192.168.0.1				
Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)				
Target IP address: 192.168.0.2				

## Ответ: Пк2 → Пк1

# arp					
No.	Time	Source	Destination	Protocol	Length Info
1	0.000000	Private 66:68:01	Broadcast	ARP	64 Who has 192.168.0.2? Tell 192.168.0.1
2	0.000151	Private 66:68:00	Private 66:68:01	ARP	64 192.168.0.2 is at 00:50:79:66:68:00

+ Frame 2: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0		0000	00 50 79 66 68 01 00 50 79 66 68 00 08 06 00 01	Pyfh P yfh ...
+ Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: Private_66:68:01 (00:50:79:66:68:01)		0010	00 00 00 00 02 00 50 79 66 68 00 c0 a8 00 02	.....P yfh ...
+ Destination: Private_66:68:01 (00:50:79:66:68:01)		0020	00 50 79 66 68 01 c0 a8 00 01 00 00 00 00 00	.....P yfh ...
+ Source: Private_66:68:00 (00:50:79:66:68:00)		0030	00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Type: ARP (0x0806)				
[Stream index: 1]				
Padding: 00000000000000000000000000000000				
Frame check sequence: 0x00000000 [unverified]				
[FC Status: Unverified]				
+ Address Resolution Protocol (reply)				
Hardware type: Ethernet (1)				
Protocol type: IPv4 (0x0800)				
Hardware size: 6				
Protocol size: 4				
Opcode: reply (2)				
Sender MAC address: Private_66:68:00 (00:50:79:66:68:00)				
Sender IP address: 192.168.0.2				
Target MAC address: Private_66:68:01 (00:50:79:66:68:01)				
Target IP address: 192.168.0.1				

## МАРШРУТИЗАТОР

### Команды для настройки:

Для ПК 3:

```
ip 192.168.0.1 /24 192.168.0.254\
```

Для ПК 4:

```
ip 192.168.1.10 /24 192.168.1.254
```

Для маршрутизатора:

```
enable
```

```
configure terminal
```

```
interface FastEthernet 0/0
```

```
ip address 192.168.0.254 255.255.255.0
```

```
no shutdown
```

```
end
```

```
configure terminal
```

```
interface FastEthernet 1/0
```

```
ip address 192.168.1.254 255.255.255.0
```

```
no shutdown
```

```
exit
```

```
ip route
```

```
ip routing
```

```
exit
```

```
write memory
```

## PC3 – Router

ARP запрос PC3 -> PC4. Отправлен на Router

arp    icmp						
No.	Time	Source	Destination	Protocol	Length	Info
7	17.762157	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x931d, seq=1/256, ttl=63 (request in 6)
9	18.779874	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x941d, seq=2/512, ttl=63 (request in 8)
11	19.797903	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x951d, seq=3/768, ttl=63 (request in 10)
14	20.817434	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x961d, seq=4/1024, ttl=63 (request in 13)
16	21.837422	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x971d, seq=5/1280, ttl=63 (request in 15)
6	17.733356	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x931d, seq=1/256, ttl=64 (reply in 7)
8	18.763086	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x941d, seq=2/512, ttl=64 (reply in 9)
10	19.780489	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x951d, seq=3/768, ttl=64 (reply in 11)
13	20.798890	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x961d, seq=4/1024, ttl=64 (reply in 14)
15	21.818649	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x971d, seq=5/1280, ttl=64 (reply in 16)
4	17.711739	Private 66:68:02	Broadcast	ARP	64	Who has 192.168.0.254? Tell 192.168.0.1
5	17.731977	cc:01:05:a6:00:00	Private 66:68:02	ARP	60	192.168.0.254 is at cc:01:05:a6:00:00

▼ Frame 4: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0	0000	ff ff ff ff ff ff 00 50	79 66 68 02 08 06 00 01	..... P yfh.....
▼ Ethernet II, Src: Private_66:68:02 (00:50:79:66:68:02), Dst: Broadcast (ff:ff:ff:ff:ff:ff)	0010	08 00 06 04 00 01 00 50	79 66 68 02 c0 a8 00 01	..... P yfh.....
▶ Destination: Broadcast (ff:ff:ff:ff:ff:ff)	0020	ff ff ff ff ff ff c0 a8	00 fe 00 00 00 00 00 00	.....
▶ Source: Private_66:68:02 (00:50:79:66:68:02)	0030	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Type: ARP (0x0806)				
[Stream index: 2]				
Padding: 00000000000000000000000000000000				
Frame check sequence: 0x00000000 [unverified]				
[FCS Status: Unverified]				
▼ Address Resolution Protocol (request)				
Hardware type: Ethernet (1)				
Protocol type: IPv4 (0x0800)				
Hardware size: 6				
Protocol size: 4				
Opcode: request (1)				
Sender MAC address: Private_66:68:02 (00:50:79:66:68:02)				
Sender IP address: 192.168.0.1				
Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)				
Target IP address: 192.168.0.254				

Ответ РС4 -> РС3. Пришел с Router

The image shows a Wireshark packet capture of an ARP request. The packet list on the left shows a single packet (No. 1) of type ARP, source 192.168.0.1, destination 192.168.0.1. The packet details on the right show the Ethernet II header and the ARP request structure. The packet bytes on the right show the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x931d, seq=1/256, ttl=63 (request in 6)
2	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x941d, seq=2/512, ttl=63 (request in 8)
3	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x951d, seq=3/768, ttl=63 (request in 10)
4	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x961d, seq=4/1024, ttl=63 (request in 13)
5	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x971d, seq=5/1280, ttl=63 (request in 15)
6	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x931d, seq=1/256, ttl=64 (reply in 7)
7	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x941d, seq=2/512, ttl=64 (reply in 9)
8	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x951d, seq=3/768, ttl=64 (reply in 11)
9	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x961d, seq=4/1024, ttl=64 (reply in 14)
10	0.000000	192.168.0.1	192.168.0.1	ICMP	98	Echo (ping) request id=0x971d, seq=5/1280, ttl=64 (reply in 16)
11	0.000000	Private 66:68:02	Broadcast	ARP	64	Who has 192.168.0.254? Tell 192.168.0.1
12	0.000000	cc:01:05:a6:00:00	Private 66:68:02	ARP	60	192.168.0.254 is at cc:01:05:a6:00:00

Frame 5: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface -, id 0

Ethernet II, Src: cc:01:05:a6:00:00 (cc:01:05:a6:00:00), Dst: Private\_66:68:02 (00:50:79:66:68:02)

Destination: Private\_66:68:02 (00:50:79:66:68:02)

Source: cc:01:05:a6:00:00 (cc:01:05:a6:00:00)

Type: ARP (0x0806)

[Stream index: 3]

Padding: 00000000000000000000000000000000

Address Resolution Protocol (reply)

Hardware type: Ethernet (1)

Protocol type: IPv4 (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: reply (2)

Sender MAC address: cc:01:05:a6:00:00 (cc:01:05:a6:00:00)

Sender IP address: 192.168.0.254

Target MAC address: Private\_66:68:02 (00:50:79:66:68:02)

Target IP address: 192.168.0.1

0000 00 50 79 66 68 02 cc 01 05 a6 00 00 08 06 00 01 -Pyfh-  
 0010 08 00 06 04 00 02 cc 01 05 a6 00 00 c0 a8 00 fe  
 0020 00 50 79 66 68 02 c0 a8 00 01 00 00 00 00 00 -Pyfh-  
 0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00

## PC4 – Router

Запрос РС3 -> РС4. Пришел с Router

```
arp || icmp
No.    Time    Source          Destination      Protocol Length Info
2 7.291048 192.168.0.1     192.168.1.10    ICMP           98 Echo (ping) request id=0x931d, seq=1/256, ttl=63 (reply in 5)
3 7.291119 Private_66:68:03 Broadcast        ARP           64 Who has 192.168.1.254? Tell 192.168.1.10
4 7.301142 cc:01:05:a6:00:10 Private_66:68:03 ARP           60 192.168.1.254 is at cc:01:05:a6:00:10
5 7.301844 192.168.1.10    192.168.0.1     ICMP           98 Echo (ping) reply id=0x931d, seq=1/256, ttl=64 (request in 2)
6 8.318798 192.168.0.1     192.168.1.10    ICMP           98 Echo (ping) request id=0x941d, seq=2/512, ttl=63 (reply in 7)
7 8.318849 192.168.1.10    192.168.0.1     ICMP           98 Echo (ping) reply id=0x941d, seq=2/512, ttl=64 (request in 6)
8 9.336854 192.168.0.1     192.168.1.10    ICMP           98 Echo (ping) request id=0x951d, seq=3/768, ttl=63 (reply in 9)
9 9.336921 192.168.1.10    192.168.0.1     ICMP           98 Echo (ping) reply id=0x951d, seq=3/768, ttl=64 (request in 8)
11 10.356413 192.168.0.1     192.168.1.10    ICMP           98 Echo (ping) request id=0x961d, seq=4/1024, ttl=63 (reply in 12)
12 10.356489 192.168.1.10    192.168.0.1     ICMP           98 Echo (ping) reply id=0x961d, seq=4/1024, ttl=64 (request in 11)
13 11.376348 192.168.0.1     192.168.1.10    ICMP           98 Echo (ping) request id=0x971d, seq=5/1280, ttl=63 (reply in 14)
14 11.376428 192.168.1.10    192.168.0.1     ICMP           98 Echo (ping) reply id=0x971d, seq=5/1280, ttl=64 (request in 13)

Frame 3: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0
Ethernet II, Src: Private_66:68:03 (00:50:79:66:68:03), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  Source: Private_66:68:03 (00:50:79:66:68:03)
    Type: ARP (0x0806)
    [Stream index: 2]
    Padding: 00000000000000000000000000000000
    Frame check sequence: 0x00000000 [unverified]
    [FCS Status: Unverified]
Address Resolution Protocol (request)
  Hardware type: Ethernet (1)
  Protocol type: IPv4 (0x0800)
  Hardware size: 6
  Protocol size: 4
  Opcode: request (1)
  Sender MAC address: Private_66:68:03 (00:50:79:66:68:03)
  Sender IP address: 192.168.1.10
  Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)
  Target IP address: 192.168.1.254
```

ARP ответ PC4 -> PC3. Отправлен на Router

```
arp || icmp
```

No.	Time	Source	Destination	Protocol	Length	Info
2	7.291048	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x931d, seq=1/256, ttl=63 (reply in 5)
3	7.291119	Private 66:68:03	Broadcast	ARP	64	Who has 192.168.1.254? Tell 192.168.1.10
4	7.301142	cc:01:05:a6:00:10	Private 66:68:03	ARP	60	192.168.1.254 is at cc:01:05:a6:00:10
5	7.301844	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x931d, seq=1/256, ttl=64 (request in 2)
6	8.318798	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x941d, seq=2/512, ttl=63 (reply in 7)
7	8.318849	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x941d, seq=2/512, ttl=64 (request in 6)
8	9.336854	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x951d, seq=3/768, ttl=63 (reply in 9)
9	9.336921	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x951d, seq=3/768, ttl=64 (request in 8)
11	10.356413	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x961d, seq=4/1024, ttl=63 (reply in 12)
12	10.356489	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x961d, seq=4/1024, ttl=64 (request in 11)
13	11.376348	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x971d, seq=5/1280, ttl=63 (reply in 14)
14	11.376428	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x971d, seq=5/1280, ttl=64 (request in 13)

```
> Frame 4: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface -, id 0
> Ethernet II, Src: cc:01:05:a6:00:10 (cc:01:05:a6:00:10), Dst: Private_66:68:03 (00:50:79:66:68:03)
  > Destination: Private_66:68:03 (00:50:79:66:68:03)
    > Source: cc:01:05:a6:00:10 (cc:01:05:a6:00:10)
      Type: ARP (0x0806)
        [Stream index: 1]
        Padding: 00000000000000000000000000000000000000000000
> Address Resolution Protocol (reply)
  Hardware type: Ethernet (1)
  Protocol type: IPv4 (0x0800)
  Hardware size: 6
  Protocol size: 4
  Opcode: reply (2)
  Sender MAC address: cc:01:05:a6:00:10 (cc:01:05:a6:00:10)
  Sender IP address: 192.168.1.254
  Target MAC address: Private_66:68:03 (00:50:79:66:68:03)
  Target IP address: 192.168.1.10
```

# Анализ ICMP заголовка

The image displays a Wireshark packet capture of ICMP Echo (ping) traffic. The top pane shows a list of 14 packets, including requests and replies. The bottom pane provides a detailed view of packet 14, an ICMP Echo (ping) reply.

No.	Time	Source	Destination	Protocol	Length	Info
2	7.291048	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x931d, seq=1/256, ttl=63 (reply in 5)
3	7.291119	Private 66:68:03	Broadcast	ARP	64	Who has 192.168.1.254? Tell 192.168.1.10
4	7.301142	cc:01:05:a6:00:10	Private 66:68:03	ARP	60	192.168.1.254 is at cc:01:05:a6:00:10
5	7.301844	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x931d, seq=1/256, ttl=64 (request in 2)
6	8.318798	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x941d, seq=2/512, ttl=63 (reply in 7)
7	8.318849	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x941d, seq=2/512, ttl=64 (request in 6)
8	9.336854	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x951d, seq=3/768, ttl=63 (reply in 9)
9	9.336921	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x951d, seq=3/768, ttl=64 (request in 8)
11	10.356413	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x961d, seq=4/1024, ttl=63 (reply in 12)
12	10.356489	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x961d, seq=4/1024, ttl=64 (request in 11)
13	11.376348	192.168.0.1	192.168.1.10	ICMP	98	Echo (ping) request id=0x971d, seq=5/1280, ttl=63 (reply in 14)
14	11.376428	192.168.1.10	192.168.0.1	ICMP	98	Echo (ping) reply id=0x971d, seq=5/1280, ttl=64 (request in 13)

**Packet 14 Details:**

- 0100 .... = Version: 4
- .... 0101 = Header Length: 20 bytes (5)
- Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
- Total Length: 84
- Identification: 0x1d93 (7571)
- 000. .... = Flags: 0x0
- ...0 0000 0000 0000 = Fragment Offset: 0
- Time to Live: 64
- Protocol: ICMP (1)
- Header Checksum: 0xdaba [validation disabled]
- [Header checksum status: Unverified]
- Source Address: 192.168.1.10 **источник**
- Destination Address: 192.168.0.1 **цель**
- [Stream index: 0]
- Internet Control Message Protocol
  - Type: 0 (Echo (ping) reply) **Тип сообщения**
  - Code: 0 **Код сообщения**
  - Checksum: 0x94ed [correct] **Контрольная сумма**
  - [Checksum Status: Good]
  - Identifier (BE): 37661 (0x931d) **ID в формате big**
  - Identifier (LE): 7571 (0x1d93)
  - Sequence Number (BE): 1 (0x0001) **Номер последовательности big**
  - Sequence Number (LE): 256 (0x0100) **Request frame: 21**
  - [Response time: 21]
- Data (56 bytes)
  - Data: 08090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f202122232425262728292a2b2c2d2e2f303132333435363738393a3b3c3d3e3f
  - [Length: 56]

Терентьев Егор авт-209