МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное бюджетное образовательное
учреждение высшего образования
«Вятский государственный университет»
(ФГБОУ ВО «ВятГУ»)
Институт математики и информационных систем
Факультет автоматики и вычислительной техники
Кафедра электронных вычислительных машин

«Сети ЭВМ и средства телекоммуникации»
Отчёт по лабораторной работе №9

Выполнил студент группы ИВТб-4301-04-00 _____/Самылов Д.Л.
Проверил преподаватель _____/Клюкин В.Л.

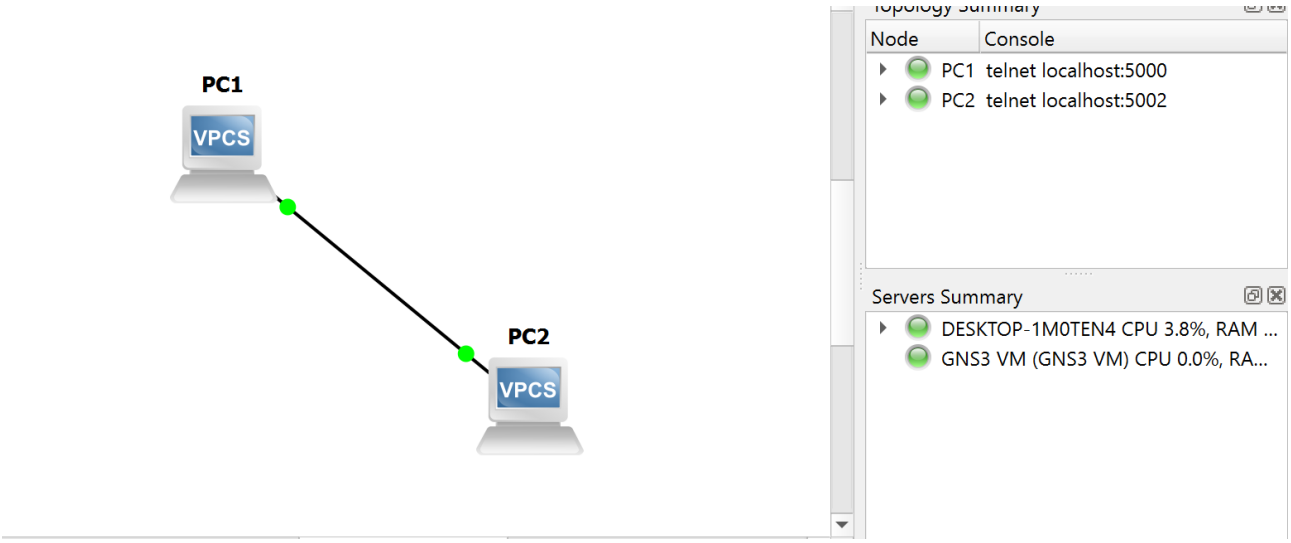
Киров 2025

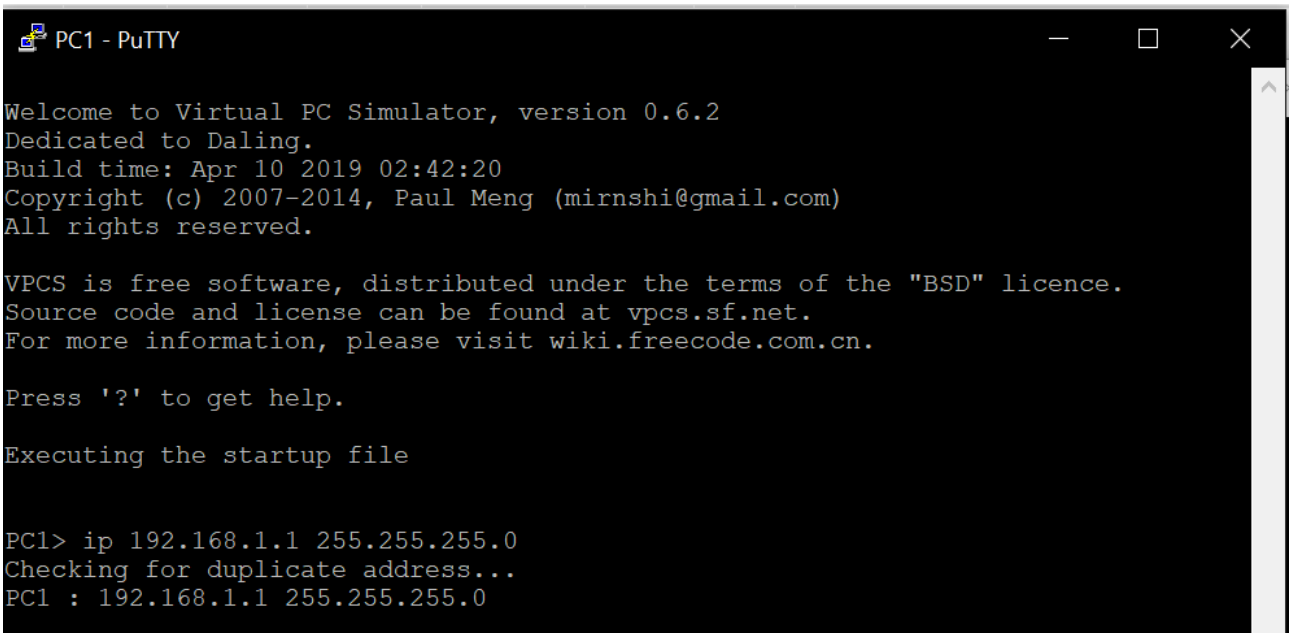
1 Цель работы

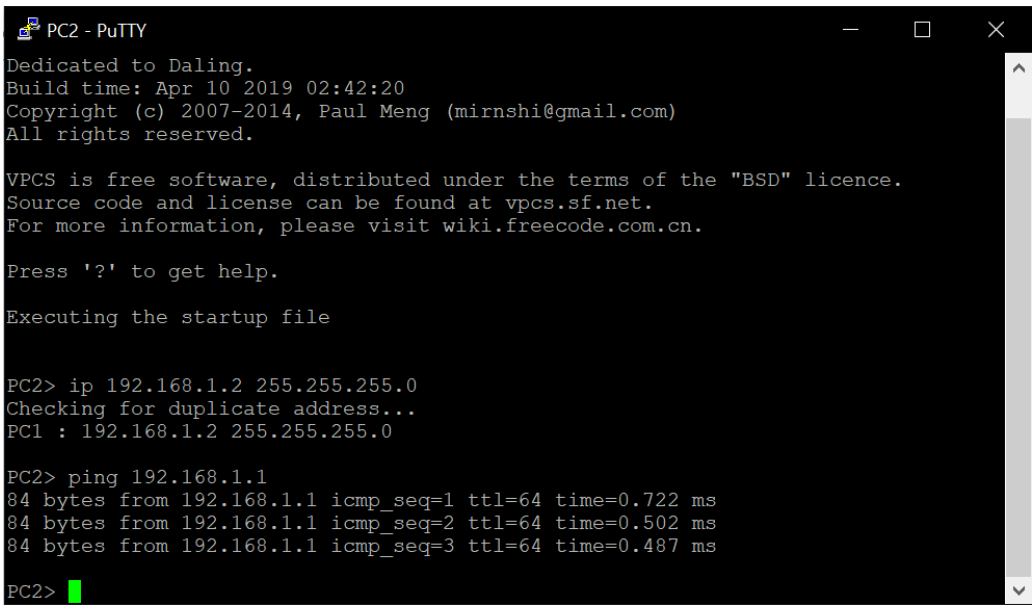
Получение базовых навыков построения простых сетей типа компьютер/компьютер, компьютер/концентратор, компьютер/коммутатор с использованием инструментов GNS3(Graphica Network Simulator), Wireshark, PuTTY и VirtualBox.

2 Выполнение лабораторной работы

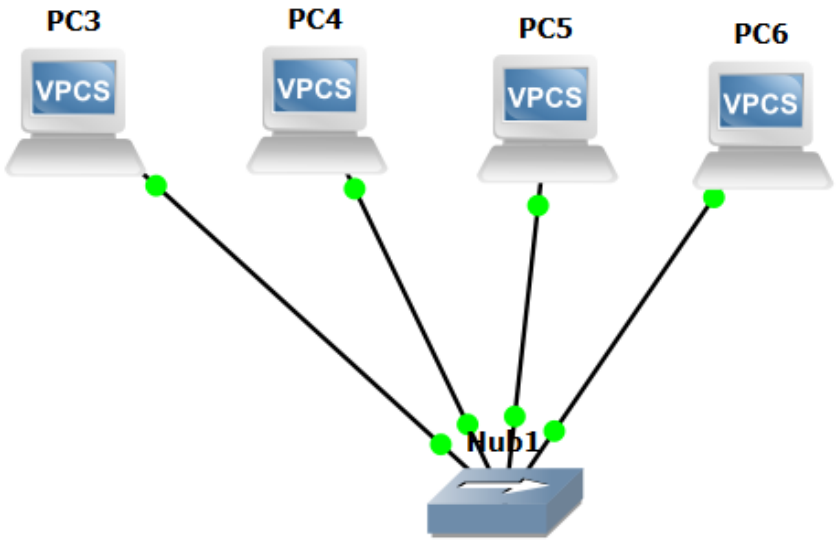
2.1 Задание 1

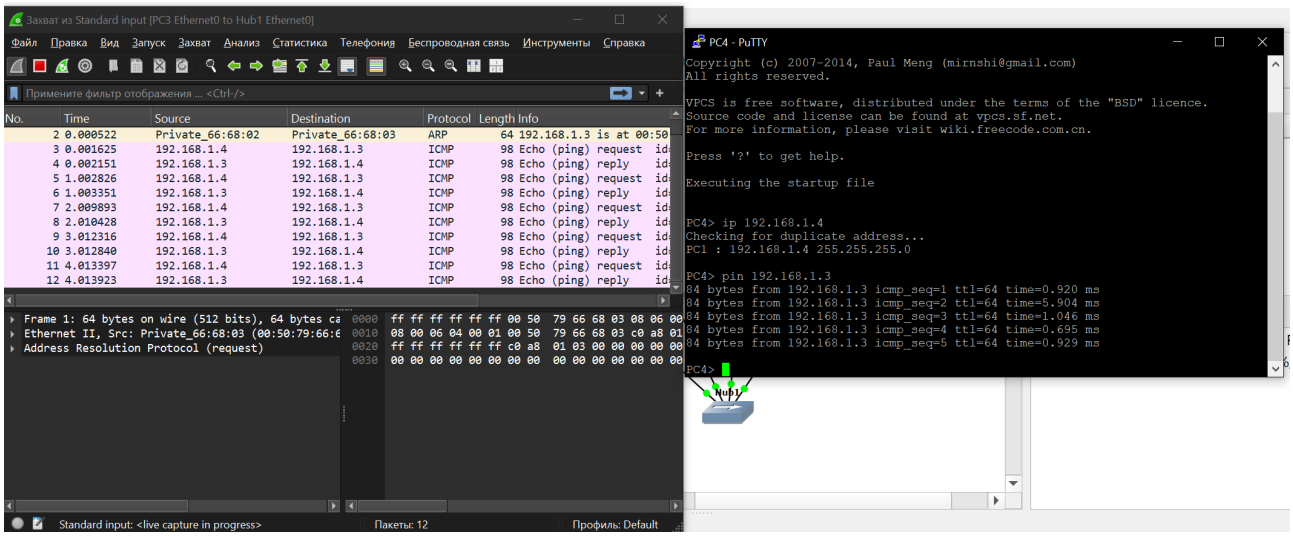


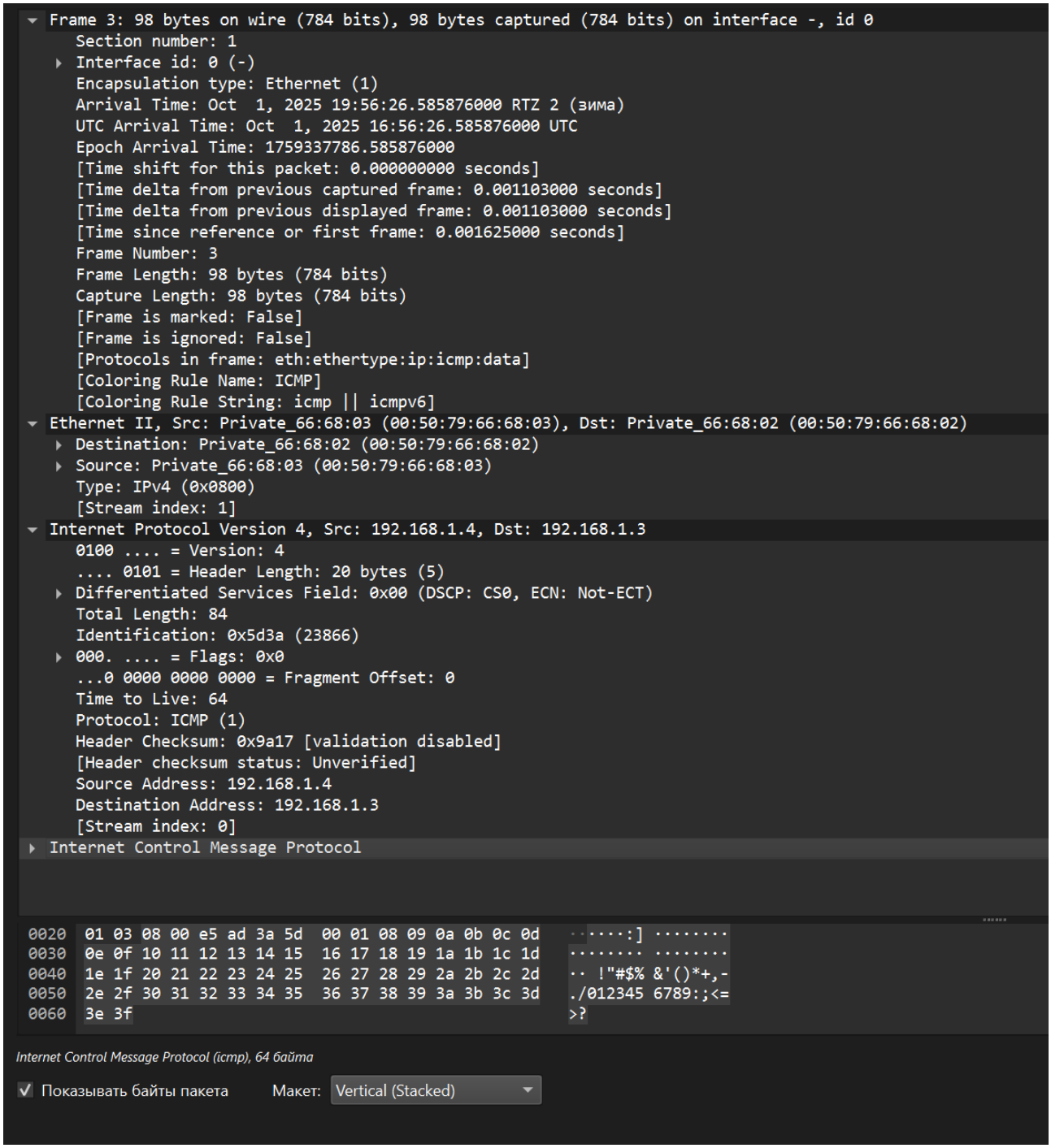


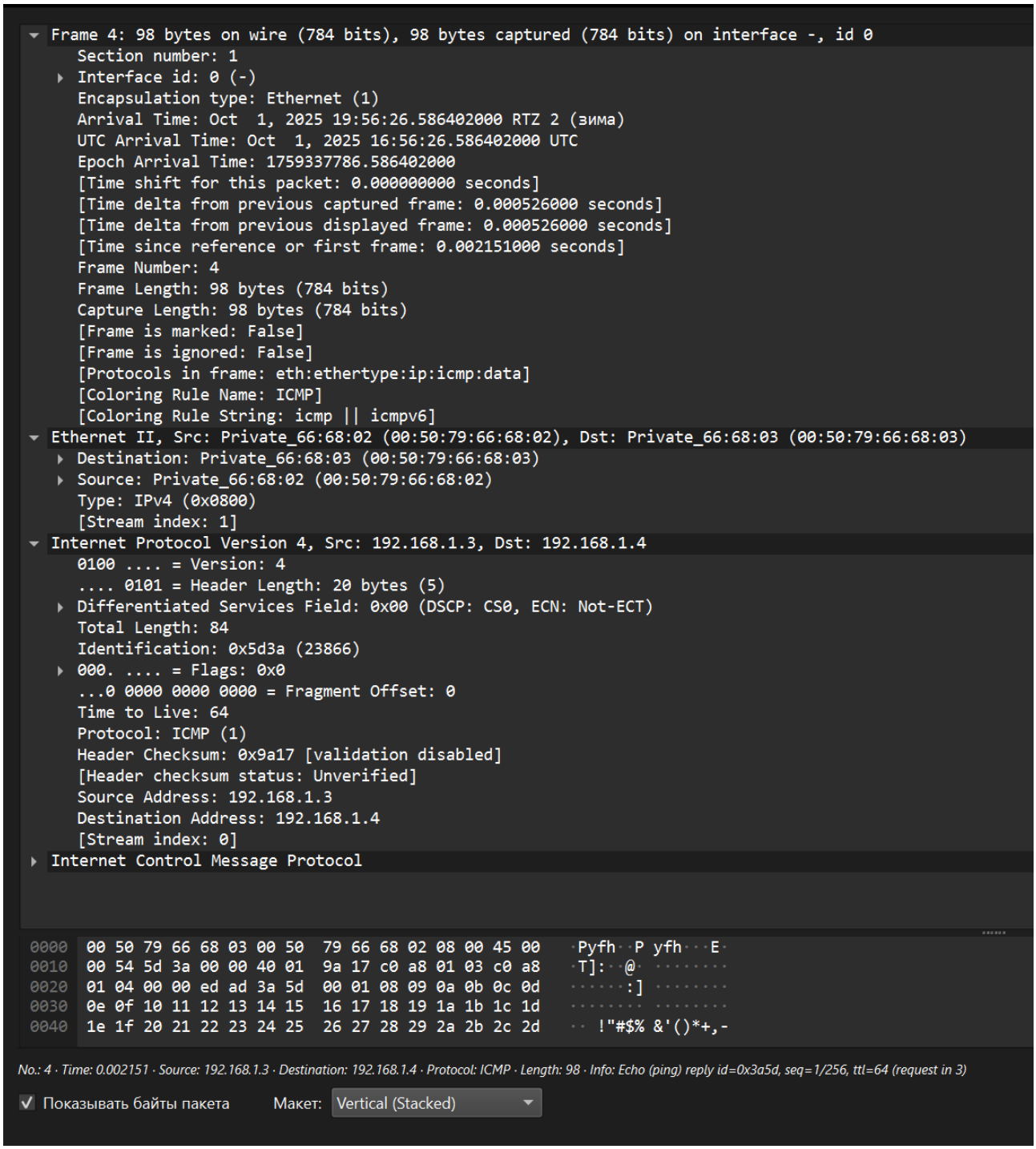

PC2 - PuTTY
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.
VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.
Press '?' to get help.
Executing the startup file
PC2> ip 192.168.1.2 255.255.255.0
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0
PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=0.722 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=0.502 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=0.487 ms
PC2>

2.2 Задание 2

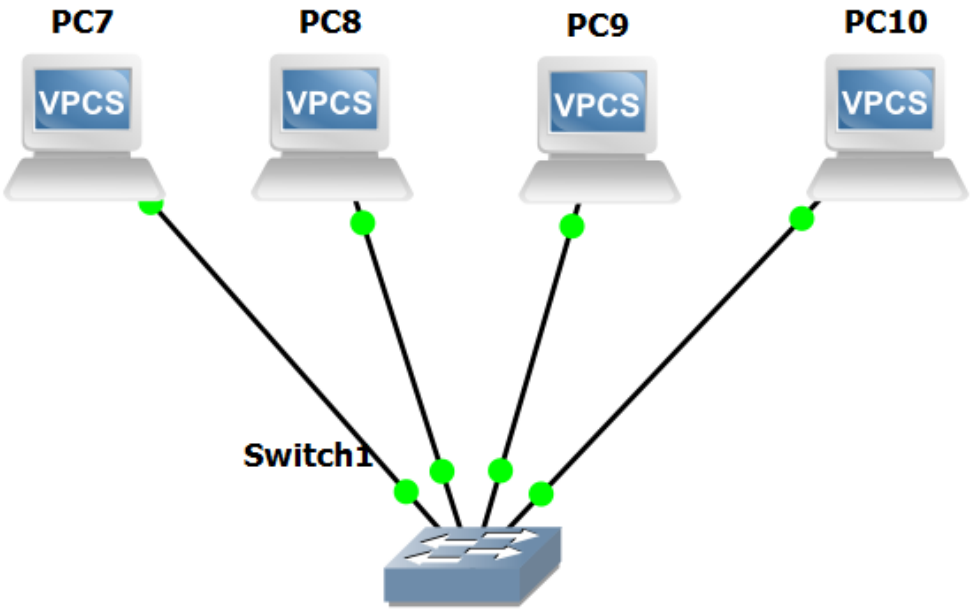

PC3
PC4
PC5
PC6
VPCS
VPCS
VPCS
VPCS
Nub1

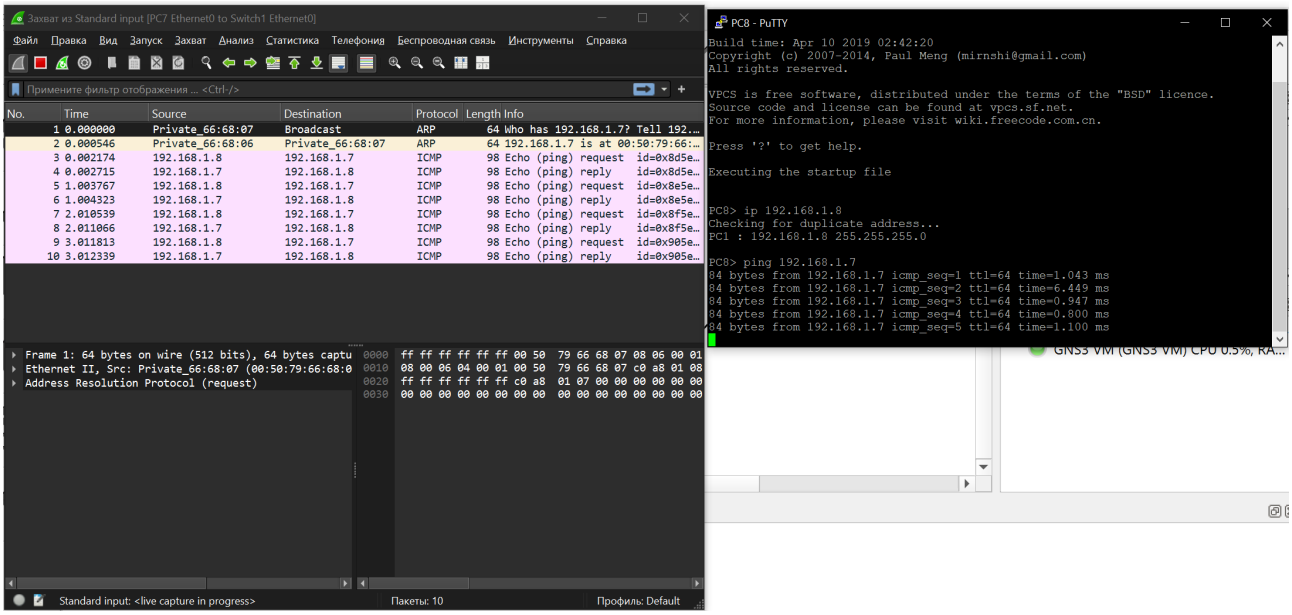

Захват из Standard input [PC3 Ethernet0 to Hub1 Ethernet0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
Примените фильтр отображения ... <Ctrl-/>
No. Time Source Destination Protocol Length Info
2 0.000522 Private_66:68:02 Private_66:68:03 ARP 64 192.168.1.3 is at 00:50
3 0.001625 192.168.1.4 192.168.1.3 ICMP 98 Echo (ping) request id
4 0.002151 192.168.1.3 192.168.1.4 ICMP 98 Echo (ping) reply id
5 1.002826 192.168.1.4 192.168.1.3 ICMP 98 Echo (ping) request id
6 1.003351 192.168.1.3 192.168.1.4 ICMP 98 Echo (ping) reply id
7 2.009893 192.168.1.4 192.168.1.3 ICMP 98 Echo (ping) request id
8 2.010428 192.168.1.3 192.168.1.4 ICMP 98 Echo (ping) reply id
9 3.012316 192.168.1.4 192.168.1.3 ICMP 98 Echo (ping) request id
10 3.012840 192.168.1.3 192.168.1.4 ICMP 98 Echo (ping) reply id
11 4.013397 192.168.1.4 192.168.1.3 ICMP 98 Echo (ping) request id
12 4.013923 192.168.1.3 192.168.1.4 ICMP 98 Echo (ping) reply id
Frame 1: 64 bytes on wire (512 bits), 64 bytes ca
Ethernet II, Src: Private_66:68:03 (00:50:79:66:6
Address Resolution Protocol (request)
0000 ff ff ff ff ff ff 00 50 79 66 68 03 08 06 00
0010 08 00 06 04 00 01 00 50 79 66 68 03 c0 a8 01
0020 ff ff ff ff ff ff c0 a8 01 03 00 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Standard input: <live capture in progress>
Пакеты: 12
Профиль: Default
PC4 - PuTTY
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.
VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.
Press '?' to get help.
Executing the startup file
PC4> ip 192.168.1.4
Checking for duplicate address...
PC1 : 192.168.1.4 255.255.255.0
PC4> pin 192.168.1.3
84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=0.920 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=5.904 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=1.046 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=0.695 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=0.929 ms
PC4>
Hub1


Frame 3: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 0
Section number: 1
Interface id: 0 (-)
Encapsulation type: Ethernet (1)
Arrival Time: Oct 1, 2025 19:56:26.585876000 RTZ 2 (зима)
UTC Arrival Time: Oct 1, 2025 16:56:26.585876000 UTC
Epoch Arrival Time: 1759337786.585876000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 0.001103000 seconds]
[Time delta from previous displayed frame: 0.001103000 seconds]
[Time since reference or first frame: 0.001625000 seconds]
Frame Number: 3
Frame Length: 98 bytes (784 bits)
Capture Length: 98 bytes (784 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:icmp:data]
[Coloring Rule Name: ICMP]
[Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: Private_66:68:03 (00:50:79:66:68:03), Dst: Private_66:68:02 (00:50:79:66:68:02)
Destination: Private_66:68:02 (00:50:79:66:68:02)
Source: Private_66:68:03 (00:50:79:66:68:03)
Type: IPv4 (0x0800)
[Stream index: 1]
Internet Protocol Version 4, Src: 192.168.1.4, Dst: 192.168.1.3
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 84
Identification: 0x5d3a (23866)
000. .... = Flags: 0x0
...0 0000 0000 0000 = Fragment Offset: 0
Time to Live: 64
Protocol: ICMP (1)
Header Checksum: 0x9a17 [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.4
Destination Address: 192.168.1.3
[Stream index: 0]
Internet Control Message Protocol
0020 01 03 08 00 e5 ad 3a 5d 00 01 08 09 0a 0b 0c 0d ····:] ····
0030 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d ····
0040 1e 1f 20 21 22 23 24 25 26 27 28 29 2a 2b 2c 2d ·· !"#$% &'()*+,-
0050 2e 2f 30 31 32 33 34 35 36 37 38 39 3a 3b 3c 3d ./012345 6789:;<=
0060 3e 3f >?
Internet Control Message Protocol (icmp), 64 байта
Показывать байты пакета
Макет:
Vertical (Stacked)


Frame 4: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 0
Section number: 1
Interface id: 0 (-)
Encapsulation type: Ethernet (1)
Arrival Time: Oct 1, 2025 19:56:26.586402000 RTZ 2 (зима)
UTC Arrival Time: Oct 1, 2025 16:56:26.586402000 UTC
Epoch Arrival Time: 1759337786.586402000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 0.000526000 seconds]
[Time delta from previous displayed frame: 0.000526000 seconds]
[Time since reference or first frame: 0.002151000 seconds]
Frame Number: 4
Frame Length: 98 bytes (784 bits)
Capture Length: 98 bytes (784 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:icmp:data]
[Coloring Rule Name: ICMP]
[Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: Private_66:68:02 (00:50:79:66:68:02), Dst: Private_66:68:03 (00:50:79:66:68:03)
Destination: Private_66:68:03 (00:50:79:66:68:03)
Source: Private_66:68:02 (00:50:79:66:68:02)
Type: IPv4 (0x0800)
[Stream index: 1]
Internet Protocol Version 4, Src: 192.168.1.3, Dst: 192.168.1.4
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 84
Identification: 0x5d3a (23866)
000. .... = Flags: 0x0
...0 0000 0000 0000 = Fragment Offset: 0
Time to Live: 64
Protocol: ICMP (1)
Header Checksum: 0x9a17 [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.3
Destination Address: 192.168.1.4
[Stream index: 0]
Internet Control Message Protocol
0000 00 50 79 66 68 03 00 50 79 66 68 02 08 00 45 00 ·Pyfh··P yfh···E·
0010 00 54 5d 3a 00 00 40 01 9a 17 c0 a8 01 03 c0 a8 ·T]:··@· ····
0020 01 04 00 00 ed ad 3a 5d 00 01 08 09 0a 0b 0c 0d ·····:] ····
0030 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d ····· ····
0040 1e 1f 20 21 22 23 24 25 26 27 28 29 2a 2b 2c 2d ·· !"#$% &'()*+,-
No.: 4 · Time: 0.002151 · Source: 192.168.1.3 · Destination: 192.168.1.4 · Protocol: ICMP · Length: 98 · Info: Echo (ping) reply id=0x3a5d, seq=1/256, ttl=64 (request in 3)
Показывать байты пакета
Макет:
Vertical (Stacked)

2.3 Задание 3


PC7
PC8
PC9
PC10
VPCS
VPCS
VPCS
VPCS
Switch1


Захват из Standard input [PC7 Ethernet0 to Switch1 Ethernet0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
Примените фильтр отображения ... <Ctrl-/>
No. Time Source Destination Protocol Length Info
1 0.000000 Private_66:68:07 Broadcast ARP 64 Who has 192.168.1.7? Tell 192...
2 0.000546 Private_66:68:06 Private_66:68:07 ARP 64 192.168.1.7 is at 00:50:79:66:...
3 0.002174 192.168.1.8 192.168.1.7 ICMP 98 Echo (ping) request id=0x8d5e...
4 0.002715 192.168.1.7 192.168.1.8 ICMP 98 Echo (ping) reply id=0x8d5e...
5 1.003767 192.168.1.8 192.168.1.7 ICMP 98 Echo (ping) request id=0x8e5e...
6 1.004323 192.168.1.7 192.168.1.8 ICMP 98 Echo (ping) reply id=0x8e5e...
7 2.010539 192.168.1.8 192.168.1.7 ICMP 98 Echo (ping) request id=0x8f5e...
8 2.011066 192.168.1.7 192.168.1.8 ICMP 98 Echo (ping) reply id=0x8f5e...
9 3.011813 192.168.1.8 192.168.1.7 ICMP 98 Echo (ping) request id=0x905e...
10 3.012339 192.168.1.7 192.168.1.8 ICMP 98 Echo (ping) reply id=0x905e...
Frame 1: 64 bytes on wire (512 bits), 64 bytes captu
Ethernet II, Src: Private_66:68:07 (00:50:79:66:68:0
Address Resolution Protocol (request)
0000 ff ff ff ff ff ff 00 50 79 66 68 07 08 06 00 01
0010 08 00 06 04 00 01 00 50 79 66 68 07 c0 a8 01 08
0020 ff ff ff ff ff ff c0 a8 01 07 00 00 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Standard input: <live capture in progress>
Пакеты: 10
Профиль: Default
PC8 - PuTTY
Build time: Apr 10 2019 02:42:20
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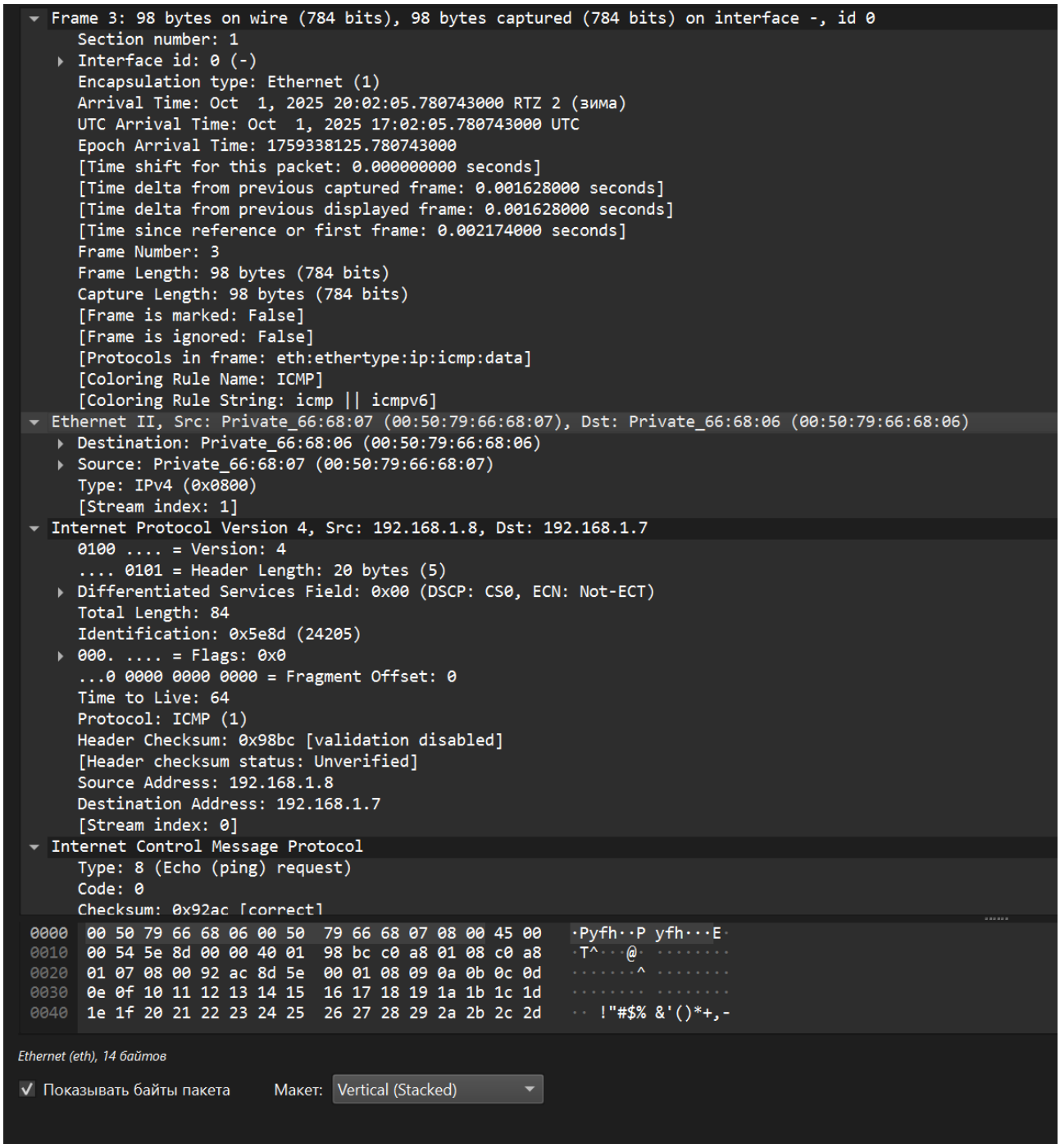
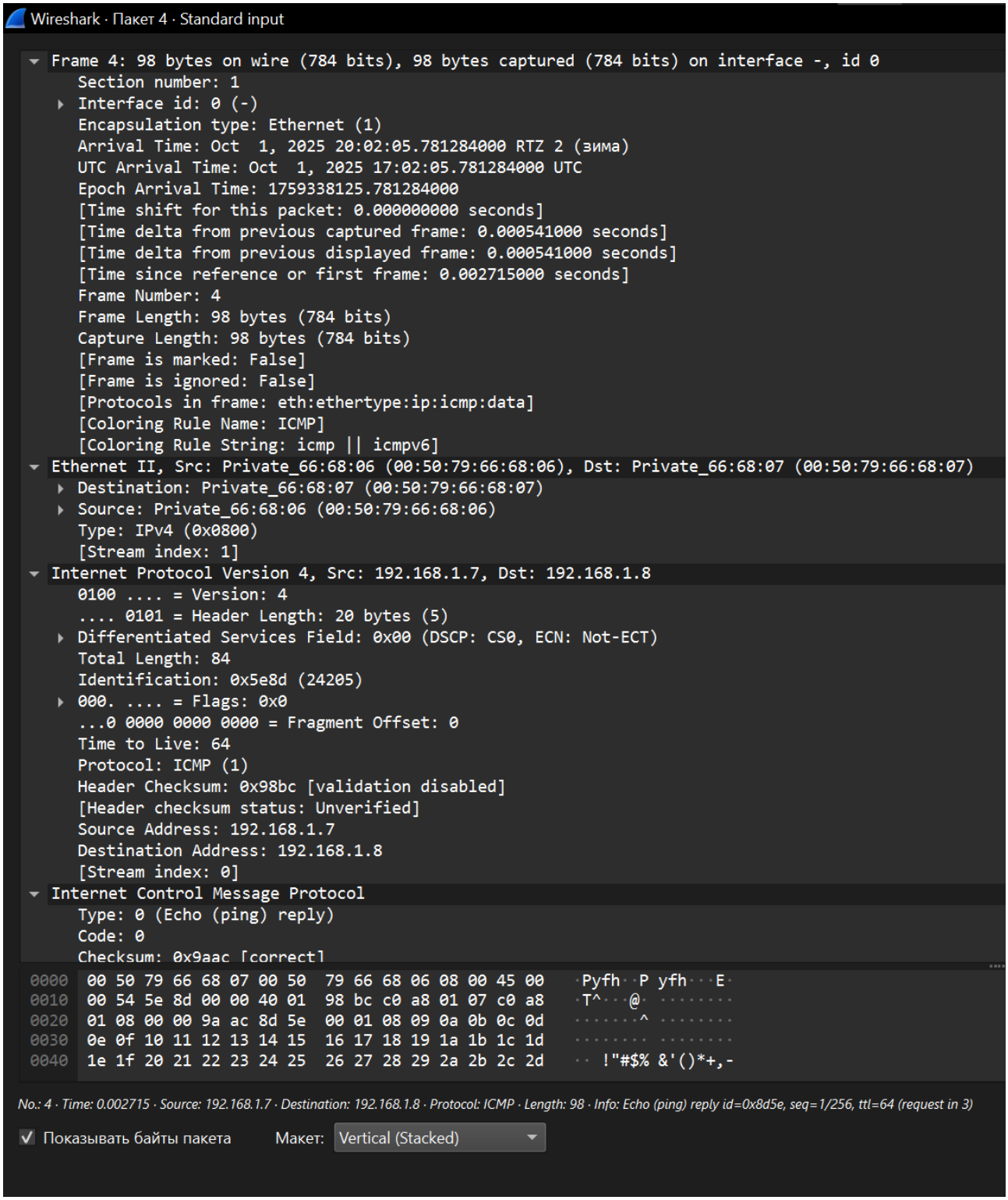
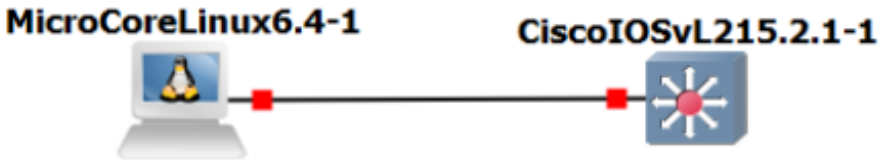
All rights reserved.
VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.
Press '?' to get help.
Executing the startup file
PC8> ip 192.168.1.8
Checking for duplicate address...
PC1 : 192.168.1.8 255.255.255.0
PC8> ping 192.168.1.7
84 bytes from 192.168.1.7 icmp_seq=1 ttl=64 time=1.043 ms
84 bytes from 192.168.1.7 icmp_seq=2 ttl=64 time=6.449 ms
84 bytes from 192.168.1.7 icmp_seq=3 ttl=64 time=0.947 ms
84 bytes from 192.168.1.7 icmp_seq=4 ttl=64 time=0.800 ms
84 bytes from 192.168.1.7 icmp_seq=5 ttl=64 time=1.100 ms

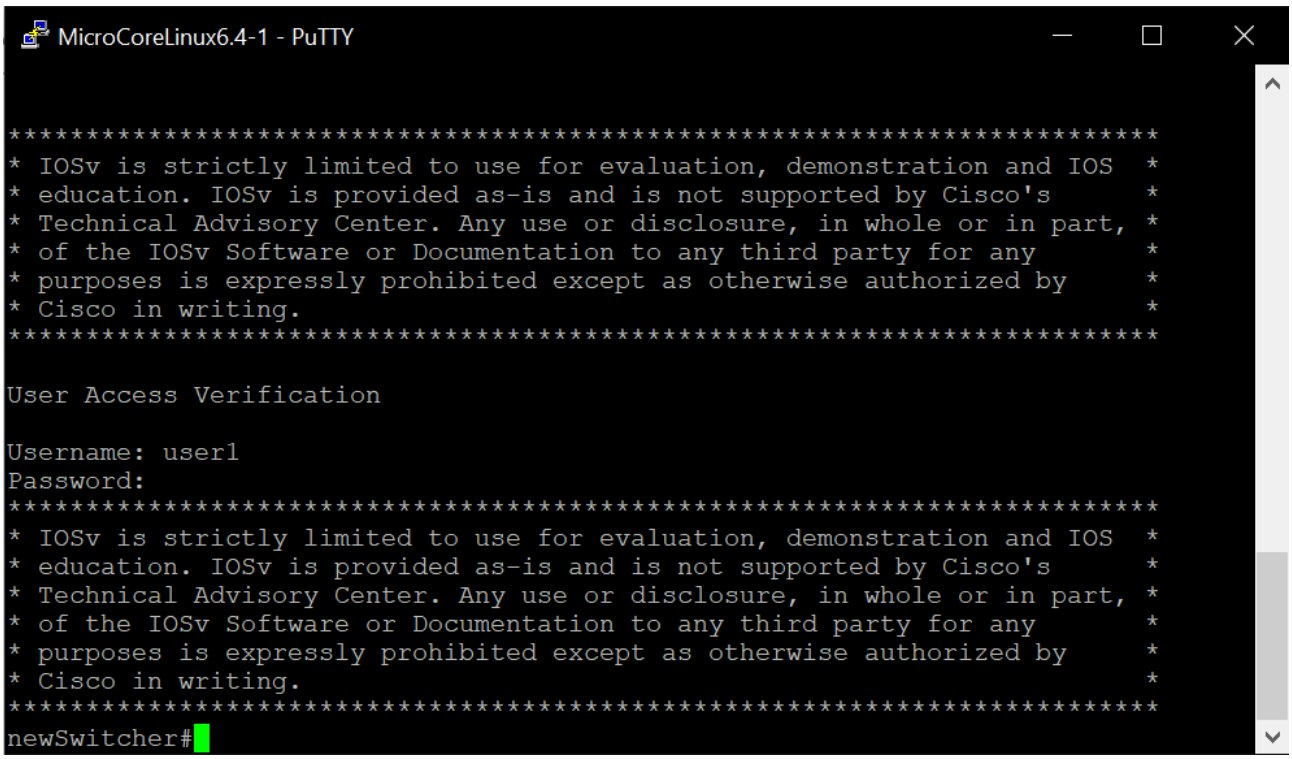

Frame 3: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 0
Section number: 1
Interface id: 0 (-)
Encapsulation type: Ethernet (1)
Arrival Time: Oct 1, 2025 20:02:05.780743000 RTZ 2 (зима)
UTC Arrival Time: Oct 1, 2025 17:02:05.780743000 UTC
Epoch Arrival Time: 1759338125.780743000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 0.001628000 seconds]
[Time delta from previous displayed frame: 0.001628000 seconds]
[Time since reference or first frame: 0.002174000 seconds]
Frame Number: 3
Frame Length: 98 bytes (784 bits)
Capture Length: 98 bytes (784 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:icmp:data]
[Coloring Rule Name: ICMP]
[Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: Private_66:68:07 (00:50:79:66:68:07), Dst: Private_66:68:06 (00:50:79:66:68:06)
Destination: Private_66:68:06 (00:50:79:66:68:06)
Source: Private_66:68:07 (00:50:79:66:68:07)
Type: IPv4 (0x0800)
[Stream index: 1]
Internet Protocol Version 4, Src: 192.168.1.8, Dst: 192.168.1.7
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 84
Identification: 0x5e8d (24205)
000. .... = Flags: 0x0
...0 0000 0000 0000 = Fragment Offset: 0
Time to Live: 64
Protocol: ICMP (1)
Header Checksum: 0x98bc [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.8
Destination Address: 192.168.1.7
[Stream index: 0]
Internet Control Message Protocol
Type: 8 (Echo (ping) request)
Code: 0
Checksum: 0x92ac [correct]
0000 00 50 79 66 68 06 00 50 79 66 68 07 08 00 45 00 ·Pyfh··P yfh···E·
0010 00 54 5e 8d 00 00 40 01 98 bc c0 a8 01 08 c0 a8 ·T^···@· ····
0020 01 07 08 00 92 ac 8d 5e 00 01 08 09 0a 0b 0c 0d ·····^ ····
0030 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d ····
0040 1e 1f 20 21 22 23 24 25 26 27 28 29 2a 2b 2c 2d ·· !"#$% &'()*+,-
Ethernet (eth), 14 байтов
Показывать байты пакета
Макет:
Vertical (Stacked)


Wireshark · Пакет 4 · Standard input
Frame 4: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 0
Section number: 1
Interface id: 0 (-)
Encapsulation type: Ethernet (1)
Arrival Time: Oct 1, 2025 20:02:05.781284000 RTZ 2 (зима)
UTC Arrival Time: Oct 1, 2025 17:02:05.781284000 UTC
Epoch Arrival Time: 1759338125.781284000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 0.000541000 seconds]
[Time delta from previous displayed frame: 0.000541000 seconds]
[Time since reference or first frame: 0.002715000 seconds]
Frame Number: 4
Frame Length: 98 bytes (784 bits)
Capture Length: 98 bytes (784 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:icmp:data]
[Coloring Rule Name: ICMP]
[Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: Private_66:68:06 (00:50:79:66:68:06), Dst: Private_66:68:07 (00:50:79:66:68:07)
Destination: Private_66:68:07 (00:50:79:66:68:07)
Source: Private_66:68:06 (00:50:79:66:68:06)
Type: IPv4 (0x0800)
[Stream index: 1]
Internet Protocol Version 4, Src: 192.168.1.7, Dst: 192.168.1.8
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 84
Identification: 0x5e8d (24205)
000. .... = Flags: 0x0
...0 0000 0000 0000 = Fragment Offset: 0
Time to Live: 64
Protocol: ICMP (1)
Header Checksum: 0x98bc [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.7
Destination Address: 192.168.1.8
[Stream index: 0]
Internet Control Message Protocol
Type: 0 (Echo (ping) reply)
Code: 0
Checksum: 0x9aac [correct]
0000 00 50 79 66 68 07 00 50 79 66 68 06 08 00 45 00 ·Pyfh··P yfh···E·
0010 00 54 5e 8d 00 00 40 01 98 bc c0 a8 01 07 c0 a8 ·T^···@· ····
0020 01 08 00 00 9a ac 8d 5e 00 01 08 09 0a 0b 0c 0d ·····^ ····
0030 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d ····
0040 1e 1f 20 21 22 23 24 25 26 27 28 29 2a 2b 2c 2d ·· !"#$% &'()*+,-
No.: 4 · Time: 0.002715 · Source: 192.168.1.7 · Destination: 192.168.1.8 · Protocol: ICMP · Length: 98 · Info: Echo (ping) reply id=0x8d5e, seq=1/256, ttl=64 (request in 3)
Показывать байты пакета
Макет:
Vertical (Stacked)

2.4 Задание 4




```
CiscoIOSvL215.2.1-1 - PuTTY
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Tue 19-Jun-18 06:06 by mmen
**************************************************************************
* IOSv is strictly limited to use for evaluation, demonstration and IOS  *
* education. IOSv is provided as-is and is not supported by Cisco's      *
* Technical Advisory Center. Any use or disclosure, in whole or in part, *
* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**************************************************************************
Switch>enable
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#username user1 privilege 15 password 123
Switch(config)#service password-encryption
Switch(config)#enable secret 123
Switch(config)#hostname newSwitcher
newSwitcher(config)#line console 0
newSwitcher(config-line)#login local
newSwitcher(config-line)#line vty 0 4
newSwitcher(config-line)#login local
newSwitcher(config-line)#transport input telnet
newSwitcher(config-line)#
```



3 Выводы по работе

В данной лабораторной работе были получены базовые навыки подключения типов: компьютер/компьютер, компьютер/концентратор, компьютер/коммутато с использованием инструментов GNS3(Graphical Network Simulator), Wireshark, PuTTY и VirtualBox.

Так же рассмотрена базовая настройка сетевого оборудования(коммутатора) и подключаемого ПК.

Полученные практические навыки базовой настройки сети будут необходимы при дальнейшем изучении дисциплины «Сети ЭВМ и средства телекоммуникации».