

# Лабораторная работа №5

Простые сети в GNS3. Анализ трафика

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## Вводная часть

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Построение простейших моделей сети на базе коммутатора и маршрутизаторов FRR и VyOS в GNS3, анализ трафика посредством Wireshark.

1. Смоделировать простейшую сеть на базе коммутатора в GNS3
2. Проанализировать трафик в GNS3 посредством Wireshark
3. Смоделировать простейшую сеть на базе маршрутизатора FRR в GNS3
4. Смоделировать простейшую сеть на базе маршрутизатора VyOS в GNS3

## Выполнение лабораторной работы

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# Моделирование простейшей сети на базе коммутатора в GNS3

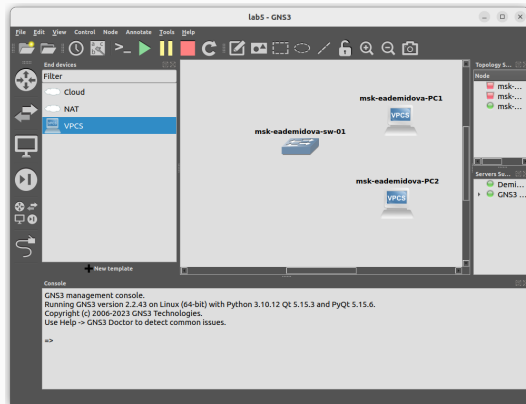


Рис. 1: Добавление устройств и изменение их имен

# Моделирование простейшей сети на базе коммутатора в GNS3

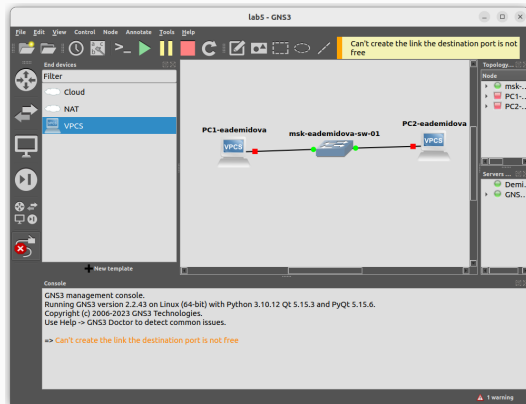
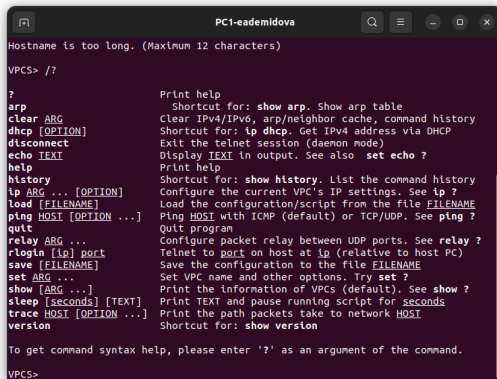


Рис. 2: Соединение VPCS с коммутатором

# Моделирование простейшей сети на базе коммутатора в GNS3



```
PC1-eademidova
Hostname is too long. (Maximum 12 characters)
VPCS> /?

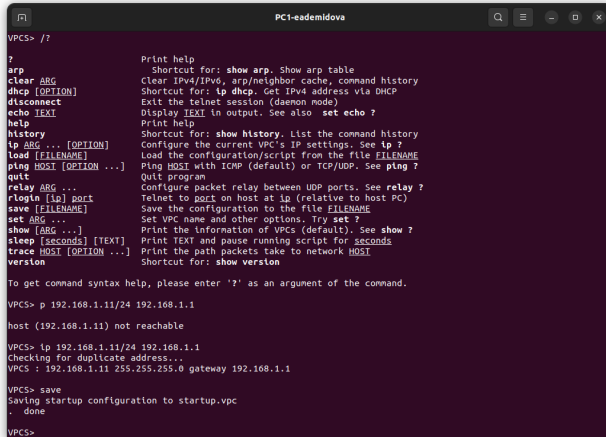
?                Print help
arp              Shortcut for: show arp. Show arp table
clear ARG        Clear IPv4/IPv6, arp/neighbor cache, command history
dhcp [OPTION]    Shortcut for: ip dhcp. Get IPv4 address via DHCP
disconnect       Exit the telnet session (daemon mode)
echo TEXT        Display TEXT in output. See also set echo ?
help             Print help
history          Shortcut for: show history. List the command history
ip ARG ... [OPTION] Configure the current VPC's IP settings. See ip ?
load [FILENAME]  Load the configuration/script from the file FILENAME
ping HOST [OPTION ...] Ping HOST with ICMP (default) or TCP/UDP. See ping ?
quit            Quit program
relay ARG ...    Configure packet relay between UDP ports. See relay ?
rlogin [ip] port Telnet to port on host at ip (relative to host PC)
save [FILENAME]  Save the configuration to the file FILENAME
set ARG ...      Set VPC name and other options. Try set ?
show [ARG ...]   Print the information of VPCs (default). See show ?
sleep [seconds] [TEXT] Print TEXT and pause running script for seconds
trace HOST [OPTION ...] Print the path packets take to network HOST
version          Shortcut for: show version

To get command syntax help, please enter '?' as an argument of the command.
VPCS>
```

Рис. 3: Параметры импорта



# Моделирование простейшей сети на базе коммутатора в GNS3



```
PC1-eademidova
VPCS> /?
?
Print help
arp
Shortcut for: show arp. Show arp table
clear ARG
Clear IPv4/IPv6, arp/neighbor cache, command history
dhcp [OPTION]
Shortcut for: ip dhcp. Get IPv4 address via DHCP
disconnect
Exit the telnet session (daemon mode)
echo TEXT
Display TEXT in output. See also set echo ?
help
Print help
history
Shortcut for: show history. List the command history
ip ARG ... [OPTION]
Configure the current VPC's IP settings. See ip ?
load [FILENAME]
Load the configuration/script from the file FILENAME
ping HOST [OPTION ...]
Ping HOST with ICMP (default) or TCP/UDP. See ping ?
quit
Quit program
relay ARG ...
Configure packet relay between UDP ports. See relay ?
rlogin [ip] port
Telnet to port on host at ip (relative to host PC)
save [FILENAME]
Save the configuration to the file FILENAME
set ARG ...
Set VPC name and other options. Try set ?
show [ARG ...]
Print the information of VPCs (default). See show ?
sleep [seconds] [TEXT]
Print TEXT and pause running script for seconds
trace HOST [OPTION ...]
Print the path packets take to network HOST
version
Shortcut for: show version

To get command syntax help, please enter '?' as an argument of the command.

VPCS> p 192.168.1.11/24 192.168.1.1

host (192.168.1.11) not reachable

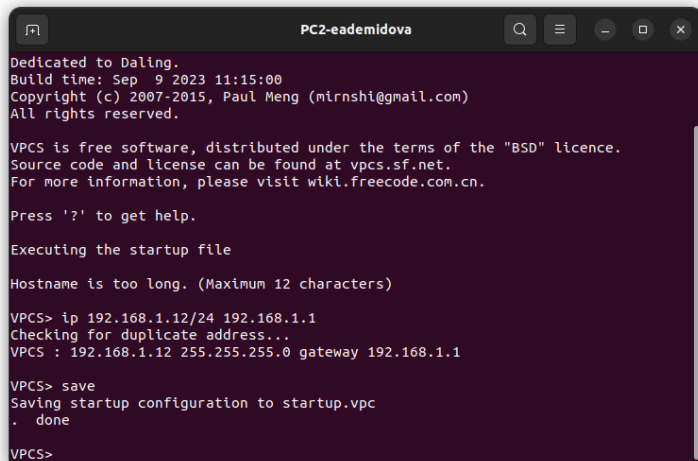
VPCS> ip 192.168.1.11/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.11 255.255.255.0 gateway 192.168.1.1

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS>
```

Рис. 4: Задание IP-адреса PC1-eademidova

## Моделирование простейшей сети на базе коммутатора в GNS3



```
PC2-eademidova
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, 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

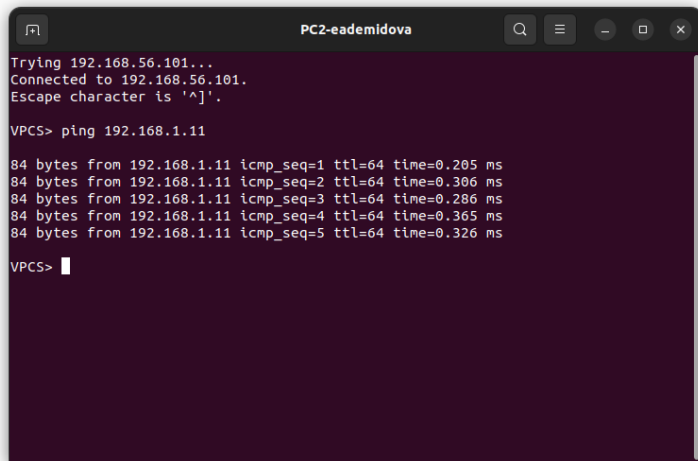
Hostname is too long. (Maximum 12 characters)

VPCS> ip 192.168.1.12/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.12 255.255.255.0 gateway 192.168.1.1

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS>
```

Рис. 5: Задание IP-адреса PC2-eademidova



```
Trying 192.168.56.101...
Connected to 192.168.56.101.
Escape character is '^]'.

VPCS> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=0.205 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=0.306 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=0.286 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=0.365 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=0.326 ms

VPCS> 
```

Рис. 6: Проверка соединения между PC-1 и PC-2

# Анализ трафика в GNS3 посредством Wireshark

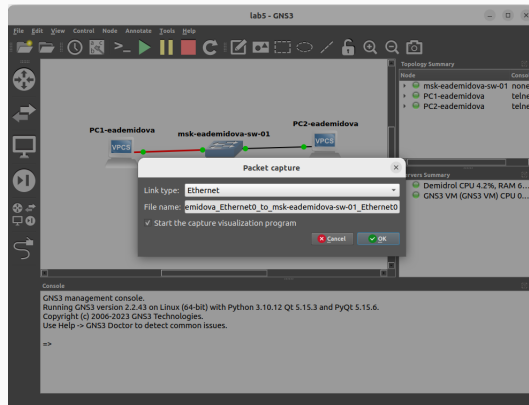


Рис. 7: Запуск анализатора трафика

# Анализ трафика в GNS3 посредством Wireshark

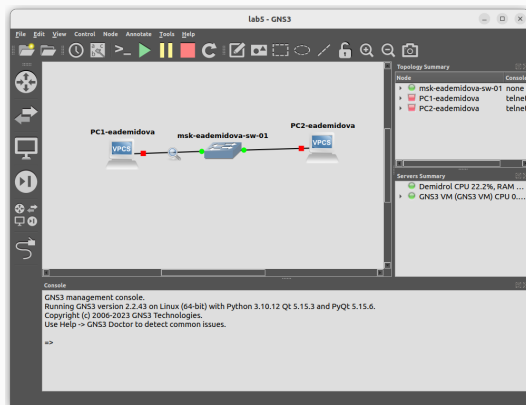


Рис. 8: ARP пакеты

# Анализ трафика в GNS3 посредством Wireshark

Wireshark packet capture showing ARP traffic. The packet list shows several ARP requests and replies. The packet details pane shows the structure of an ARP request packet. The packet bytes pane shows the raw data of the packet.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	11	ff02::2	ICMPv6	62	Router Solicitation
2	0.050142	Private.66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
3	0.051856	Private.66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
4	1.049806	Private.66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
5	1.051804	Private.66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
6	2.049856	Private.66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
7	2.050952	Private.66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
8	257.433273	Private.66:08:01	Broadcast	ARP	64	Who has 192.168.1.11? Tell 192.168.1.12
9	257.433793	Private.66:08:00	Private.66:08:01	ARP	64	192.168.1.11 is at 00:50:79:66:08:00
10	257.434157	192.168.1.12	192.168.1.11	ICMP	98	Echo (ping) request id=0xe7fe, seq=1/256, ttl=64 (reply in 11)
11	257.434256	192.168.1.11	192.168.1.12	ICMP	98	Echo (ping) reply id=0xe7fe, seq=1/256, ttl=64 (request in 10)
12	331.389617	192.168.1.12	192.168.1.11	ECHO	98	Request

Frame 12: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 8

- Interface id: 0 (-)
- Encapsulation type: Ethernet (1)
- Arrival Time: Oct 5, 2023 21:23:45.209079000 MSK
- [Time shift for this packet: 0.000000000 seconds]
- Epoch Time: 1696538225.209079000 seconds
- [Time delta from previous captured frame: 73.946261000 seconds]
- [Time delta from previous displayed frame: 73.946261000 seconds]
- [Time since reference or first frame: 331.389517000 seconds]
- Frame Number: 12
- Frame Length: 98 bytes (784 bits)
- Capture Length: 98 bytes (784 bits)
- [Frame is marked: False]
- [Frame is ignored: False]
- [Protocols in frame: eth.ertype:ip:udp:echo]
- [Coloring Rule Name: UDP]
- [Coloring Rule String: udp]
- Ethernet II, Src: Private.66:08:01 (00:50:79:66:08:01), Dst: Private.66:08:00 (00:50:79:66:08:00)
- Internet Protocol Version 4, Src: 192.168.1.12, Dst: 192.168.1.11
- User Datagram Protocol, Src Port: 13072, Dst Port: 7
- Echo

0000 00 50 79 66 08 00 00 50 79 66 08 01 00 00 45 00 -Pyfh...fh...E-  
0010 00 54 ff 31 00 00 00 11 ff ff c0 a8 01 0c c0 a8 -T 1.8  
0020 01 00 33 1b 00 07 00 40 ad 64 00 50 79 66 01 -3...@ d Pyfh  
0030 00 0f 19 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 -...\*89% 4'()\*+,-  
0050 2e 2f 30 31 32 33 34 35 36 37 38 39 3a 3b 3c 3d -./0123456789:;<=  
0060 3e 3f >?

Рис. 9: ARP пакеты

```
VPCS> ping 192.168.1.11 -1 -c 1  
84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=0.199 ms
```

Рис. 10: Эхо-запрос в ICMP-моде

# Анализ трафика в GNS3 посредством Wireshark

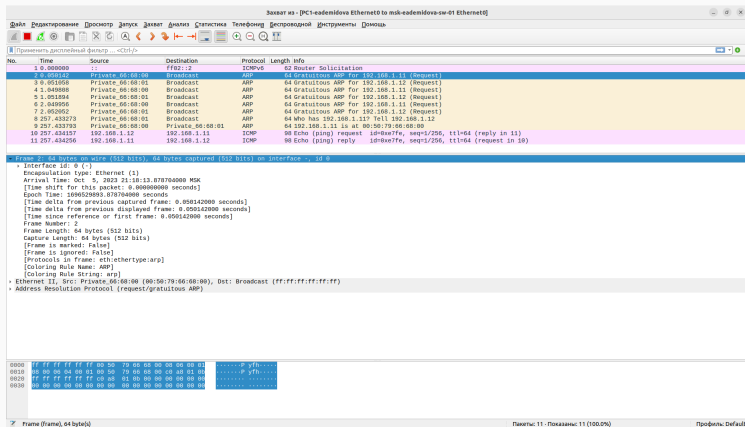
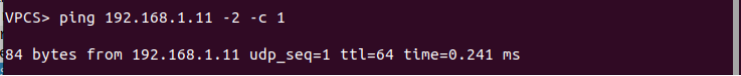


Рис. 11: ICMP пакеты





```
VPCS> ping 192.168.1.11 -2 -c 1  
64 bytes from 192.168.1.11 udp_seq=1 ttl=64 time=0.241 ms
```

Рис. 12: Эхо-запрос в UDP-моде

# Анализ трафика в GNS3 посредством Wireshark

Wireshark packet capture analysis showing UDP traffic. The packet list shows several ARP requests and ICMP echo requests. The selected packet is a UDP echo request from 192.168.1.12 to 192.168.1.11.

No.	Time	Source	Destination	Protocol	Length	Info
2	0.050142	Private:66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
3	0.051950	Private:66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
4	1.049800	Private:66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
5	1.051094	Private:66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
6	2.049950	Private:66:08:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.11 (Request)
7	2.052952	Private:66:08:01	Broadcast	ARP	64	Gratuitous ARP for 192.168.1.12 (Request)
8	257.433793	Private:66:08:01	Broadcast	ARP	64	Who has 192.168.1.11? Tell 192.168.1.12
9	257.433793	Private:66:08:00	Private:66:08:01	ARP	64	192.168.1.11 is at 08:50:79:66:08:00
10	257.434157	192.168.1.12	192.168.1.11	ICMP	98	Echo (ping) request id=0xe7fe, seq=1/256, ttl=64 (reply in 11)
11	257.434250	192.168.1.11	192.168.1.12	ICMP	98	Echo (ping) reply id=0xe7fe, seq=1/256, ttl=64 (request in 10)
12	331.380517	192.168.1.12	192.168.1.11	ECHO	98	Request
13	331.380632	192.168.1.11	192.168.1.12	ECHO	98	Response

Frame 12: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface -, id 0

- Interface id: 0 (-)
- Encapsulation type: Ethernet (1)
- Arrival Time: Oct 5, 2023 21:23:45.209079000 MSK
- [Time shift for this packet: 0.000000000 seconds]
- Epoch Time: 1696530225.209079000 seconds
- [Time delta from previous captured frame: 73.946261000 seconds]
- [Time delta from previous displayed frame: 73.946261000 seconds]
- [Time since reference or first frame: 331.380517000 seconds]
- Frame Number: 12
- 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:udp:echo]
- [Coloring Rule Name: UDP]
- [Coloring Rule String: udp]
- Ethernet II, Src: Private:66:08:01 (08:50:79:66:08:01), Dst: Private:66:08:00 (08:50:79:66:08:00)
- Internet Protocol Version 4, Src: 192.168.1.12, Dst: 192.168.1.11
- User Datagram Protocol, Src Port: 13072, Dst Port: 7
- Echo

0000 00 50 79 66 08 00 00 50 79 66 08 01 00 00 45 00 -Pyfh...E-  
0010 00 54 ff 31 00 00 00 11 ff ff c0 a8 01 0c c0 a8 -T 1.8  
0020 01 00 33 1b 00 07 00 40 ad 64 00 50 79 66 08 01 -3...d Pyfh  
0030 00 0f 19 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 -...\*MSK 4'()\*+,-  
0050 2e 2f 30 31 32 33 34 35 36 37 38 39 3a 3b 3c 3d -./012345 6789:;<=  
0060 3e 3f >?

Wireshark\_C1QUB2.pcapng

Пакеты: 24 - Показаны: 24 (100.0%) - Потеряно: 0 (0.0%)

Профиль: Default

Рис. 13: UDP пакеты

```
VPCS> ping 192.168.1.11 -3 -c 1
:
: Connect  7@192.168.1.11 seq=1 ttl=64 time=1.379 ms
: SendData 7@192.168.1.11 seq=1 ttl=64 time=1.088 ms
: Close    7@192.168.1.11 seq=1 ttl=64 time=2.322 ms
:
```

Рис. 14: Эхо-запрос в TCP-моде

# Анализ трафика в GNS3 посредством Wireshark

Захват из - [PC1-eademi0va Ethernet0 to msk-eademi0va-sw-01 Ethernet0]

Файл Редактирование Просмотр Запуск Захват Анализ Статистика Телефония Беспроводной Инструменты Помощь

Применить дисковый фильтр ... <<Ctrl>

No.	Time	Source	Destination	Protocol	Length	Info
13	331.380632	192.168.1.11	192.168.1.12	ECHO	80	Response
14	435.149190	Private.66:68:01	Broadcast	ARP	64	Who has 192.168.1.11? Tell 192.168.1.12
15	435.149738	Private.66:68:00	Private.66:68:01	ARP	64	192.168.1.11 is at 66:68:79:66:68:00
16	435.149852	192.168.1.12	192.168.1.11	TCP	74	35487 → 7 [SYN] Seq=0 Win=2928 Len=0 MSS=1460 TSval=1696538328 TSecr=0 WS=2
17	435.150149	192.168.1.11	192.168.1.12	TCP	54	7 → 35487 [SYN, ACK] Seq=0 Ack=57 Win=2928 Len=0
18	435.151624	192.168.1.12	192.168.1.11	TCP	66	35487 → 7 [ACK] Seq=1 Ack=57 Win=2928 Len=0 TSval=1696538328 TSecr=0
19	435.151987	192.168.1.12	192.168.1.11	ECHO	122	Request
20	435.152059	192.168.1.11	192.168.1.12	TCP	54	7 → 35487 [ACK] Seq=1 Ack=57 Win=2928 Len=0
21	435.153887	192.168.1.12	192.168.1.11	TCP	66	35487 → 7 [FIN, PSH, ACK] Seq=57 Ack=57 Win=2928 Len=0 TSval=1696538328 TSecr=0
22	435.153176	192.168.1.11	192.168.1.12	TCP	54	7 → 35487 [ACK] Seq=1 Ack=58 Win=2928 Len=0
23	435.153188	192.168.1.11	192.168.1.12	TCP	54	7 → 35487 [FIN, ACK] Seq=1 Ack=58 Win=2928 Len=0
24	435.155652	192.168.1.12	192.168.1.11	TCP	66	35487 → 7 [ACK] Seq=58 Ack=2 Win=2928 Len=0 TSval=1696538328 TSecr=0

Frame 16: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface -, id 0

- Interface id: 0 (-)
- Encapsulation type: Ethernet (1)
- Arrival Time: Oct 5, 2023 21:25:28.978614000 MSK
- [Time shift for this packet: 0.000000000 seconds]
- Epoch Time: 1696538328.978614000 seconds
- [Time delta from previous captured frame: 0.000314000 seconds]
- [Time delta from previous displayed frame: 0.000314000 seconds]
- [Time since reference or first frame: 435.150052000 seconds]
- Frame Number: 16
- Frame Length: 74 bytes (592 bits)
- Capture Length: 74 bytes (592 bits)
- [Frame is marked: False]
- [Frame is ignored: False]
- [Protocols in frame: eth:ethertype:ip:tcp]
- [Coloring Rule Name: TCP SYN/FIN]
- [Coloring Rule String: tcp.flags & 0x02 || tcp.flags.fin == 1]
- Ethernet II, Src: Private.66:68:01 (00:50:79:66:68:01), Dst: Private.66:68:00 (00:50:79:66:68:00)
- Internet Protocol Version 4, Src: 192.168.1.12, Dst: 192.168.1.11
- Transmission Control Protocol, Src Port: 35487, Dst Port: 7, Seq: 8, Len: 8

0000 00 50 79 66 68 00 00 50 79 66 68 01 00 00 45 00 -Pyfh- P yfh--E-

0010 00 3c ff 30 00 00 40 06 ff bb c0 a8 01 0c c0 a8 -<...@> .....

0020 01 00 0a 9f 00 07 15 de 4c 16 00 00 00 00 02 -.....L.....

0030 00 68 6a ff 08 08 02 04 05 b4 01 01 00 0a 05 1e -hj.....e-

0040 ff 00 00 00 00 00 01 03 01 -.....

Всё готово к загрузке или запуску

Пакеты: 24 - Показаны: 24 (100.0%)

Профиль: Default

Рис. 15: TCP пакеты

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3

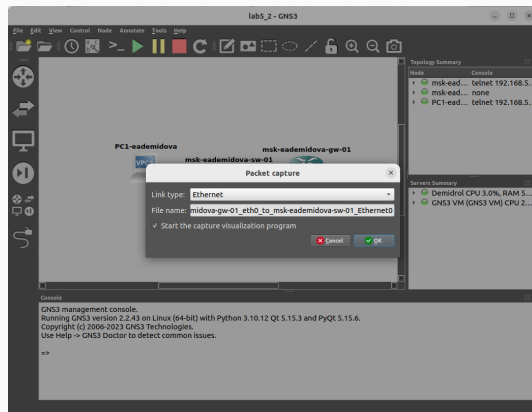


Рис. 16: Захват трафика на соединении между коммутатором и маршрутизатором

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3

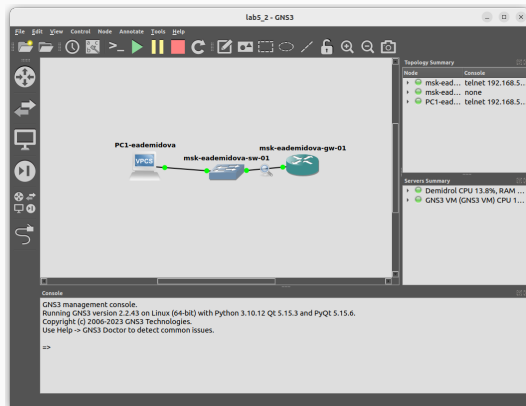
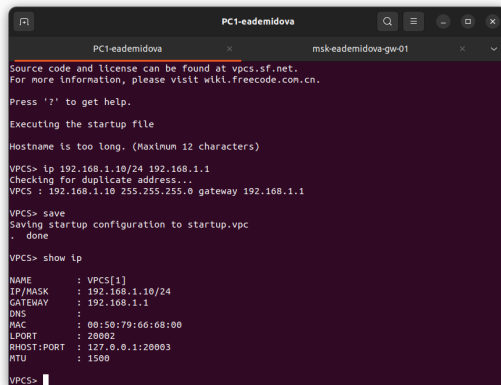


Рис. 17: Запуск всех устройств проекта

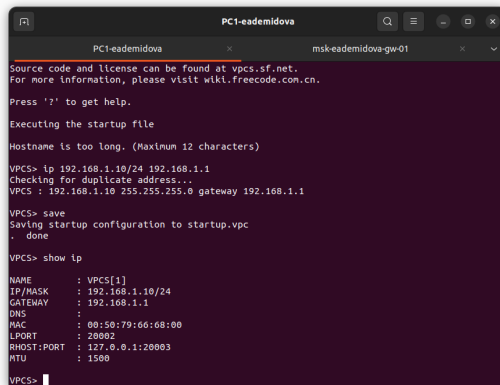
# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3



```
PC1-eademidova
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
Hostname is too long. (Maximum 12 characters)
VPCS> ip 192.168.1.10/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1
VPCS> save
Saving startup configuration to startup.vpc
. done
VPCS> show ip
NAME      : VPCS[1]
IP/MASK   : 192.168.1.10/24
GATEWAY   : 192.168.1.1
DNS       :
MAC       : 00:50:79:66:68:00
LPORT     : 20002
RHOST:PORT : 127.0.0.1:20003
MTU       : 1500
VPCS>
```

Рис. 18: Консоль всех устройств проекта

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3



```
PC1-eademidova
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

Hostname is too long. (Maximum 12 characters)

VPCS> ip 192.168.1.10/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1

VPCS> save
Saving startup configuration to startup.vpc
. done

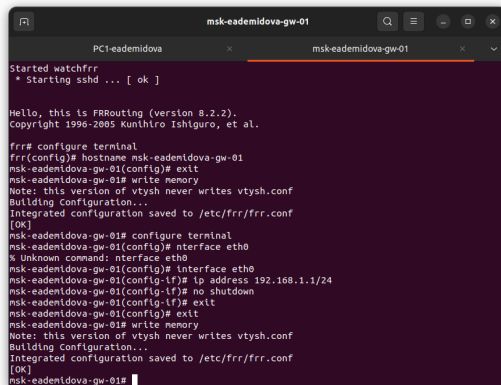
VPCS> show ip
NAME       : VPCS[1]
IP/MASK    : 192.168.1.10/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 20002
RHOST:PORT : 127.0.0.1:20003
MTU        : 1500

VPCS> 
```

Рис. 19: Настройка IP-адресации для интерфейса узла PC-1



# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3



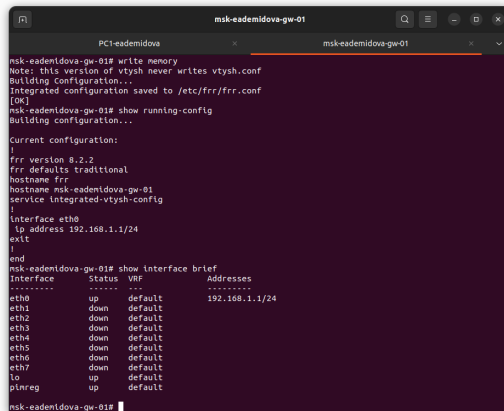
```
msk-eadenidova-gw-01
PC1-eadenidova x msk-eadenidova-gw-01 x
Started watchfrr
* Starting sshd ... [ ok ]

Hello, this is FRRouting (version 8.2.2).
Copyright 1996-2005 Kunihiko Ishiguro, et al.

frr# configure terminal
frr(config)# hostname msk-eadenidova-gw-01
msk-eadenidova-gw-01(config)# exit
msk-eadenidova-gw-01# write memory
Note: this version of vtysh never writes vtysh.conf
Building Configuration...
Integrated configuration saved to /etc/frr/frr.conf
[OK]
msk-eadenidova-gw-01# configure terminal
msk-eadenidova-gw-01(config)# nterface eth0
% Unknown command: nterface eth0
msk-eadenidova-gw-01(config)# interface eth0
msk-eadenidova-gw-01(config-if)# ip address 192.168.1.1/24
msk-eadenidova-gw-01(config-if)# no shutdown
msk-eadenidova-gw-01(config-if)# exit
msk-eadenidova-gw-01(config)# exit
msk-eadenidova-gw-01# write memory
Note: this version of vtysh never writes vtysh.conf
Building Configuration...
Integrated configuration saved to /etc/frr/frr.conf
[OK]
msk-eadenidova-gw-01#
```

Рис. 20: Настройка IP-адресации для интерфейса локальной сети маршрутизатора

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3



The screenshot shows a terminal window titled "msk-eadenidova-gw-01" with two tabs: "PC1-eadenidova" and "msk-eadenidova-gw-01". The active tab shows the following commands and output:

```
msk-eadenidova-gw-01# write memory
Note: this version of vtysh never writes vtysh.conf
Building Configuration...
Integrated configuration saved to /etc/frr/frr.conf
[OK]
msk-eadenidova-gw-01# show running-config
Building configuration...

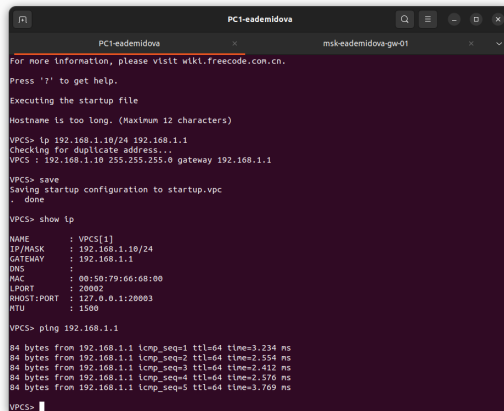
Current configuration:
!
frr version 8.2.2
frr defaults traditional
hostname frr
hostname msk-eadenidova-gw-01
service integrated-vtysh-config
!
interface eth0
 ip address 192.168.1.1/24
exit
!
end
msk-eadenidova-gw-01# show interface brief
```

Interface	Status	VRF	Addresses
eth0	up	default	192.168.1.1/24
eth1	down	default	
eth2	down	default	
eth3	down	default	
eth4	down	default	
eth5	down	default	
eth6	down	default	
eth7	down	default	
lo	up	default	
pinreg	up	default	

```
msk-eadenidova-gw-01#
```

Рис. 21: Проверка конфигурации маршрутизатора и настройки IP-адресации

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3



```
PC1-eademidova
PC1-eademidova
msk-eademidova-gw01

For more information, please visit wiki.freecode.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 192.168.1.10/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> show ip

NAME       : VPCS[1]
IP/MASK    : 192.168.1.10/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:00
LPORT      : 20002
RHOST:PORT : 127.0.0.1:20003
MTU        : 1500

VPCS> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=3.234 ns
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=2.554 ns
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=2.412 ns
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=2.576 ns
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=3.769 ns

VPCS>
```

Рис. 22: Проверка подключения

# Моделирование простейшей сети на базе маршрутизатора FRR в GNS3

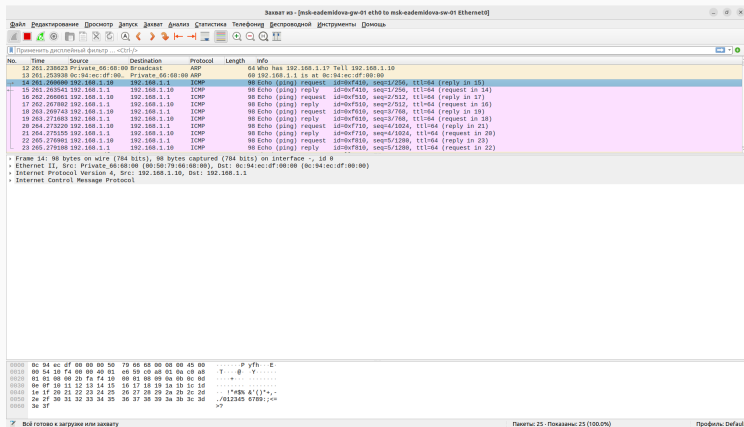


Рис. 23: Анализ информации в Wireshark

# Моделирование простейшей сети на базе маршрутизатора VyOS в GNS3

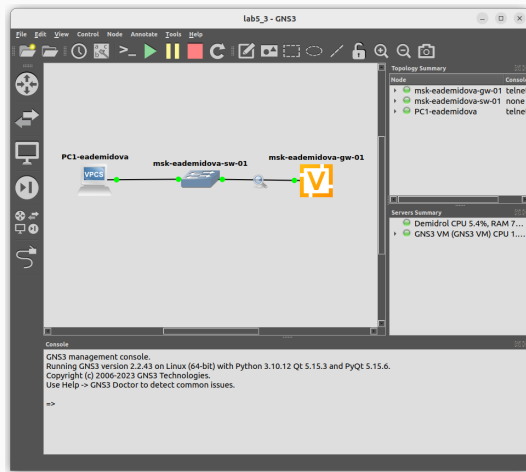
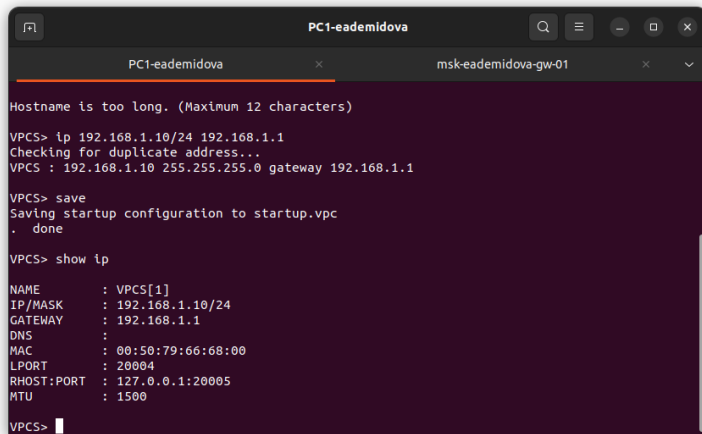


Рис. 24: Захват трафика на соединении между коммутатором и маршрутизатором

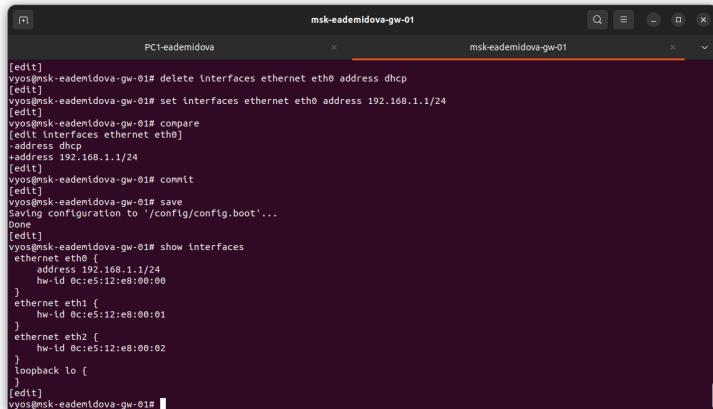
# Моделирование простейшей сети на базе маршрутизатора VyOS в GNS3



```
PC1-eademidova
PC1-eademidova x msk-eademidova-gw-01 x v
Hostname is too long. (Maximum 12 characters)
VPCS> ip 192.168.1.10/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1
VPCS> save
Saving startup configuration to startup.vpc
. done
VPCS> show ip
NAME      : VPCS[1]
IP/MASK    : 192.168.1.10/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 20004
RHOST:PORT : 127.0.0.1:20005
MTU        : 1500
VPCS> 
```

Рис. 25: Настройка IP-адресации для интерфейса узла PC-1

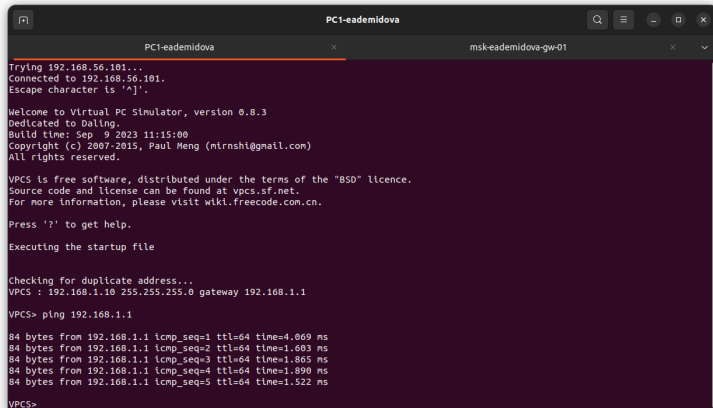
# Моделирование простейшей сети на базе маршрутизатора VyOS в GNS3



```
msk-eademidova-gw-01
PC1-eademidova      x      msk-eademidova-gw-01      x      v
[edit]
vyos@msk-eademidova-gw-01# delete interfaces ethernet eth0 address dhcp
[edit]
vyos@msk-eademidova-gw-01# set interfaces ethernet eth0 address 192.168.1.1/24
[edit]
vyos@msk-eademidova-gw-01# compare
[edit interfaces ethernet eth0]
- address dhcp
+ address 192.168.1.1/24
[edit]
vyos@msk-eademidova-gw-01# commit
[edit]
vyos@msk-eademidova-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@msk-eademidova-gw-01# show interfaces
  ethernet eth0 {
    address 192.168.1.1/24
    hw-id 0c:e5:12:e8:00:00
  }
  ethernet eth1 {
    hw-id 0c:e5:12:e8:00:01
  }
  ethernet eth2 {
    hw-id 0c:e5:12:e8:00:02
  }
  loopback lo {
  }
[edit]
vyos@msk-eademidova-gw-01#
```

Рис. 26: Режим конфигурации маршрутизатора VyOS

# Моделирование простейшей сети на базе маршрутизатора VyOS в GNS3



The image shows a terminal window titled "PC1-eademidova" with two tabs: "PC1-eademidova" and "msk-eademidova-gw-01". The terminal output is as follows:

```
Trying 192.168.56.101...
Connected to 192.168.56.101.
Escape character is '^['.

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, 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

Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1

VPCS> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=4.069 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=1.603 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=1.865 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=1.890 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=1.522 ms

VPCS>
```

Рис. 27: Проверка соединения



# Моделирование простейшей сети на базе маршрутизатора VyOS в GNS3

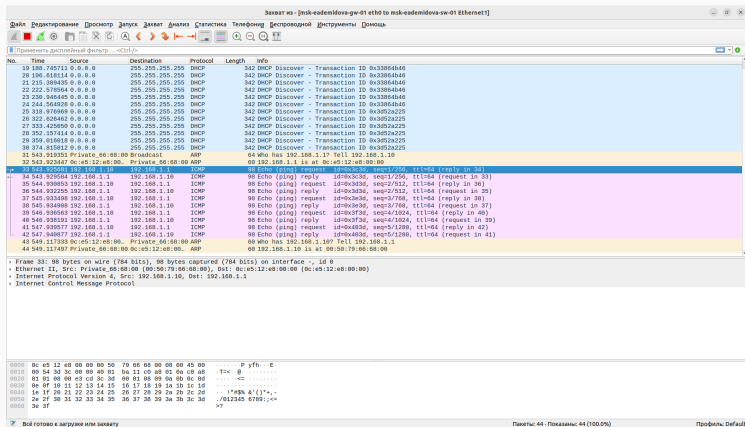


Рис. 28: Анализ трафика Wireshark

## Выводы

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В результате выполнения лабораторной работы были построены простейшие модели сети на базе коммутатора и маршрутизаторов FRR и VyOS в GNS3, а также проанализирован трафик посредством Wireshark.