РОССИЙСКИЙ УНИВЕРСИТЕТ ДРУЖБЫ НАРОДОВ

Факультет физико-математических и естественных наук

ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ №5: ПРОСТЫЕ СЕТИ В GNS3. АНАЛИЗ ТРАФИКА

дисциплина: Сетевые технологии

Студент: Талебу Тенке Франк Устон

Группа: НФИбд-02-23

МОСКВА

2025 г.

Цель работы

Построить простейшие модели сетей на базе коммутатора и маршрутизаторов FRR и VyOS в GNS3, проанализировать трафик посредством Wireshark.

Задание

1. Смоделировать простейшую сеть на базе коммутатора в GNS3;

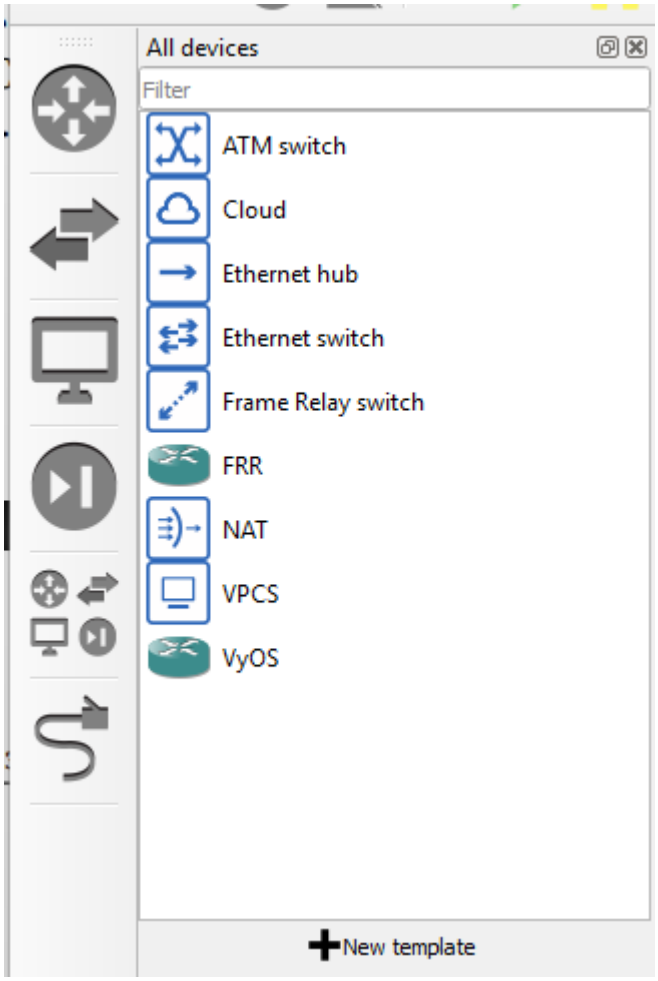
2. Проанализировать трафик в GNS3 посредством Wireshark;

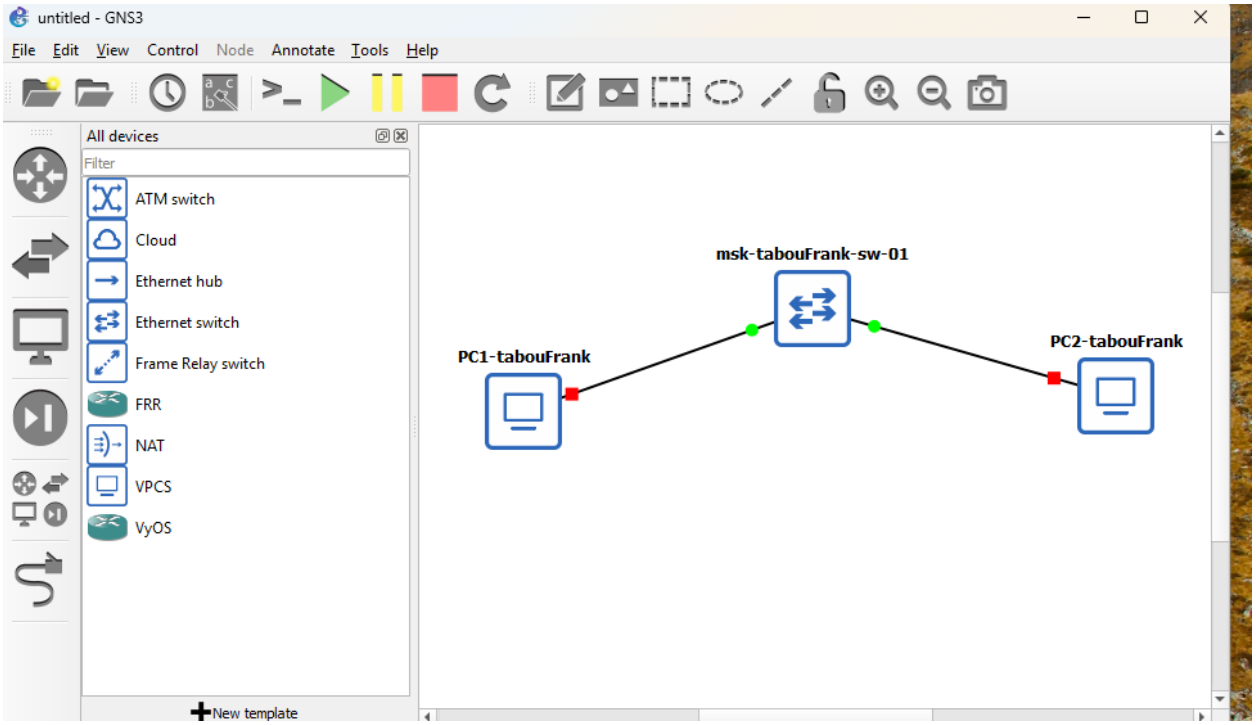
3. Смоделировать простейшую сеть на базе маршрутизатора FRR в GNS3;

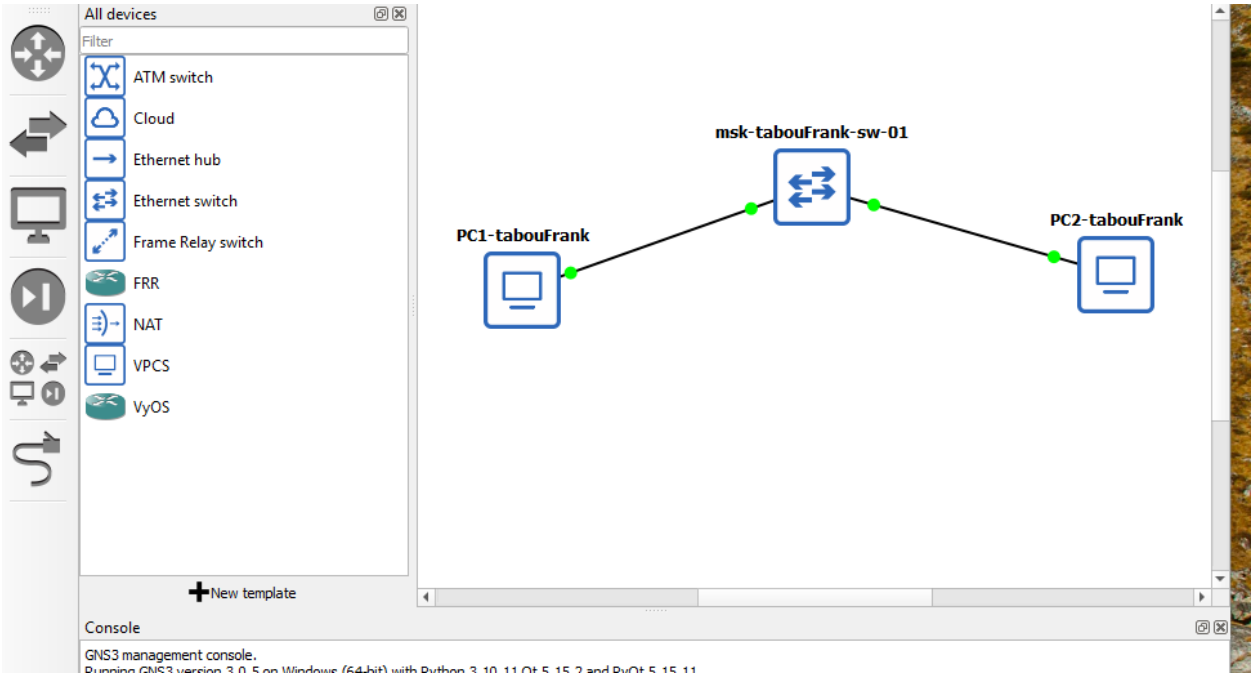
4. Смоделировать простейшую сеть на базе маршрутизатора VyOS в GNS3.

Задание

5.3.1.2. Порядок выполнения работы 1. Запустите GNS3 VM и GNS3. Создайте новый проект. 2. В рабочей области GNS3 разместите коммутатор Ethernet и два VPCS.Щёлкнув на устройстве правой кнопкой мыши выберете в меню Configure . Измените название устройства, включив в имя устройства имя учётной записи выполняющего работу студента. Коммутатору присвойте название msk-user-sw-01, где вместо user укажите имя вашей учётной записи. Соедините VPCS с коммутатором. Отобразите обозначение интерфейсов соединения




untitled - GNS3
File Edit View Control Node Annotate Tools Help
All devices
Filter
ATM switch
Cloud
Ethernet hub
Ethernet switch
Frame Relay switch
FRR
NAT
VPCS
VyOS
New template
msk-tabouFrank-sw-01
PC1-tabouFrank
PC2-tabouFrank


All devices
Filter
ATM switch
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msk-tabouFrank-sw-01
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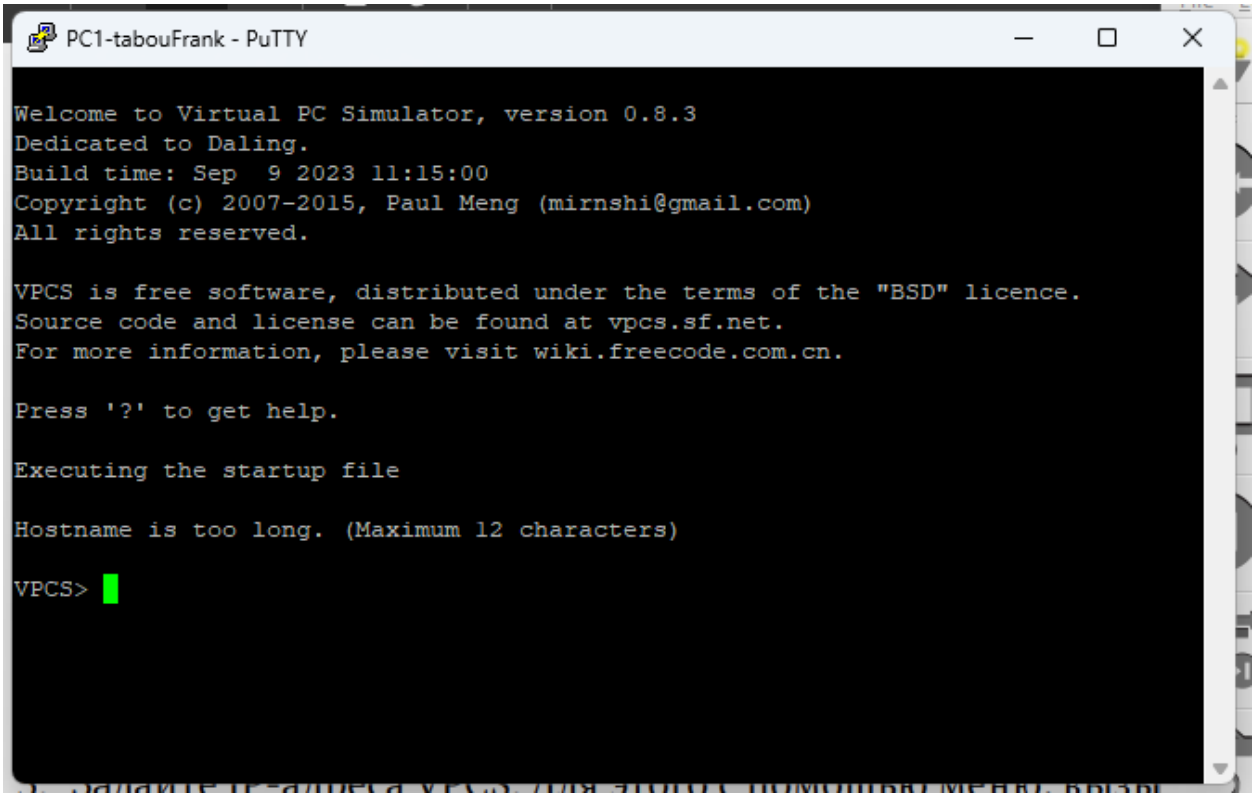
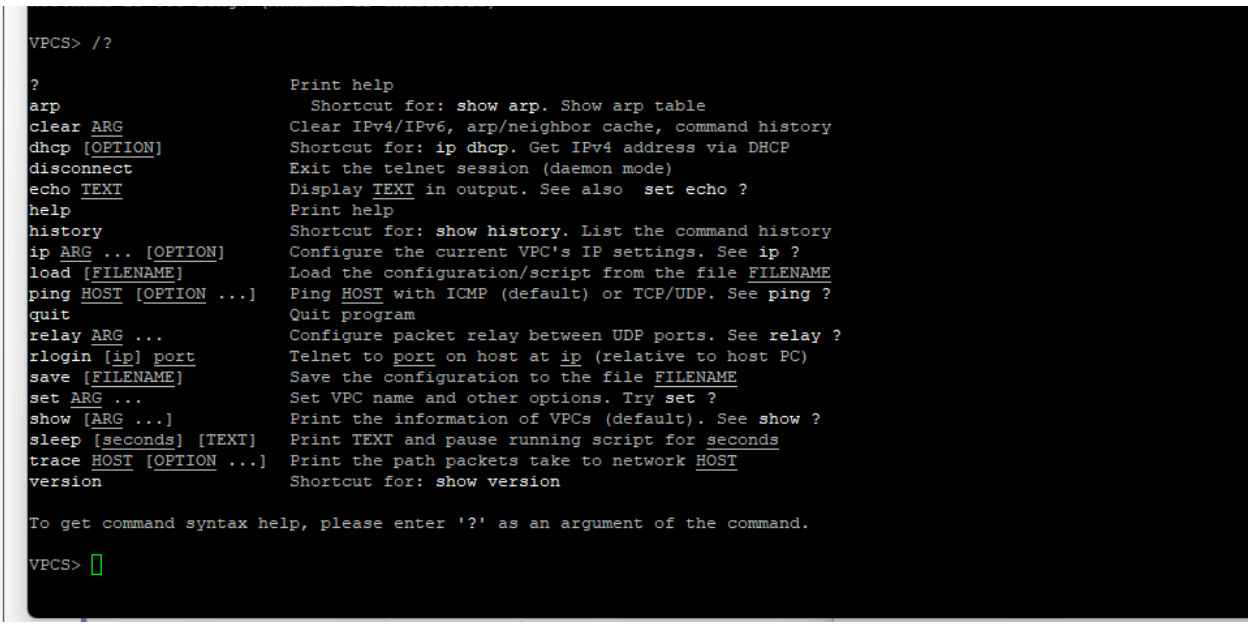
Console
GNS3 management console.


PC1-tabouFrank - PuTTY
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
Hostname is too long. (Maximum 12 characters)
VPCS>


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>

```
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>
```

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

VPCS>
```

```
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>
```

```
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)
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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> 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>
```
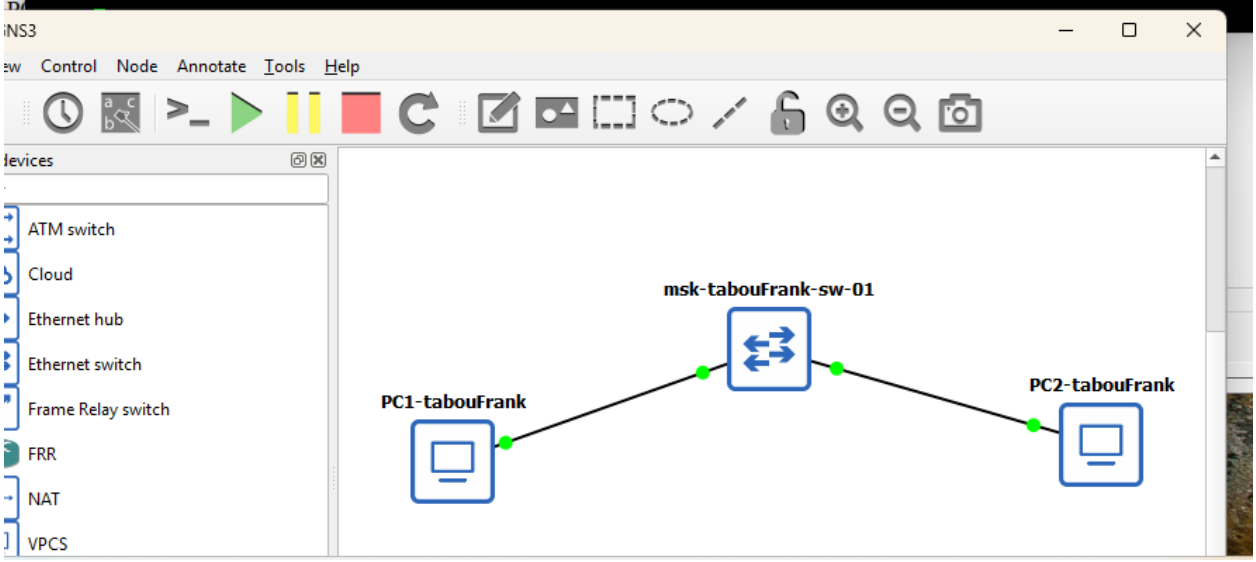
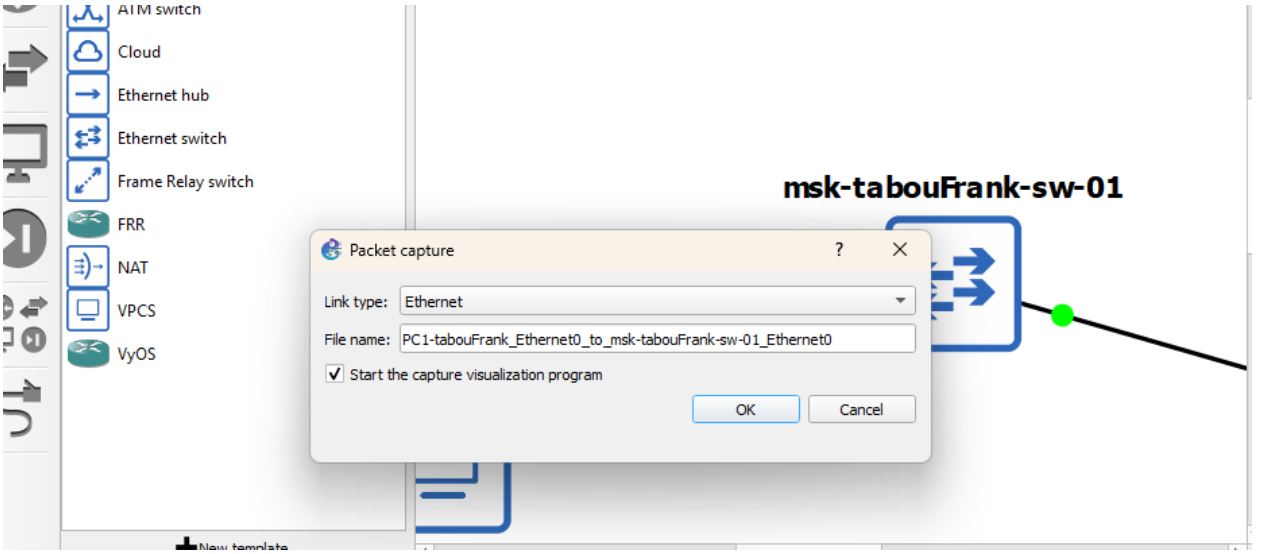
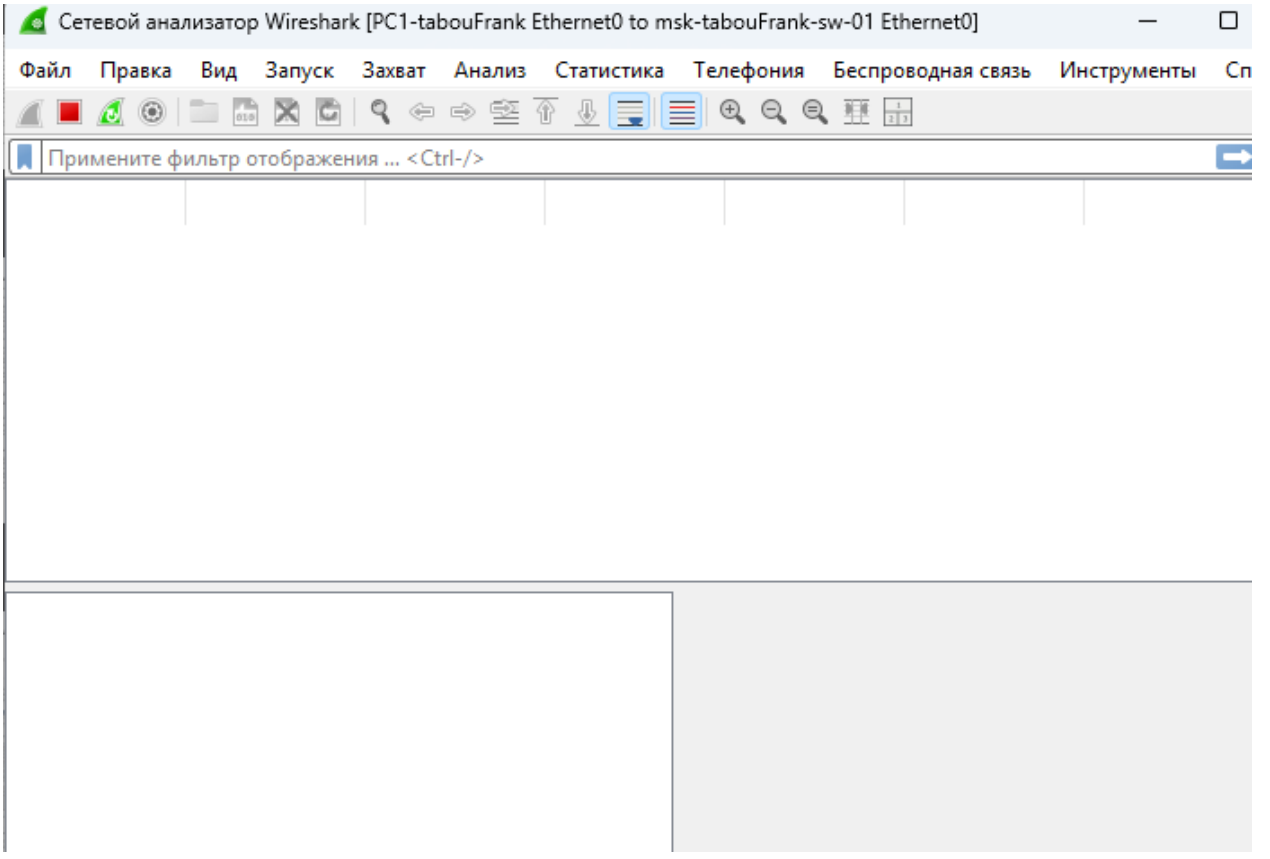
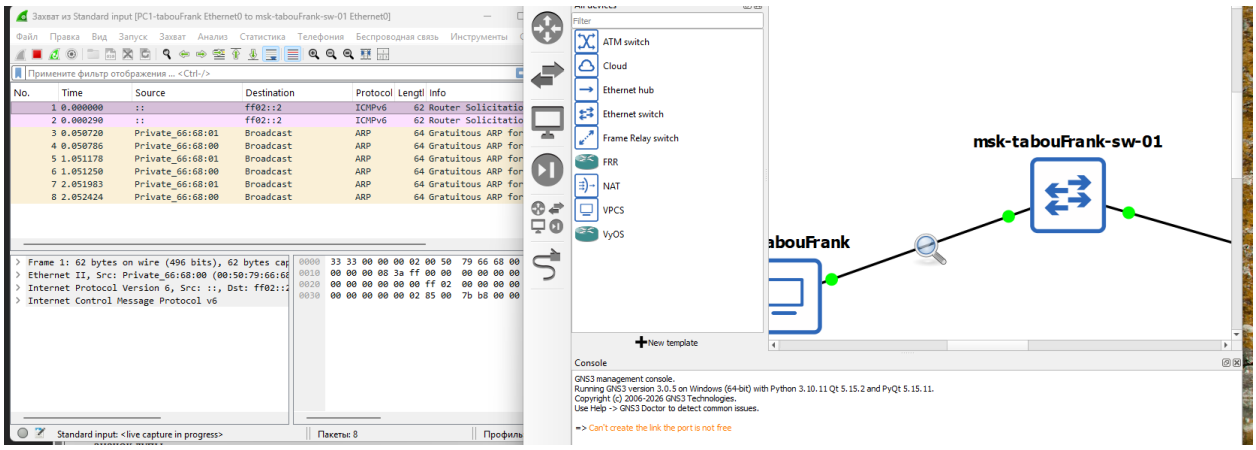

```
VPCS> ping

ping HOST [OPTION ...]
  Ping the network HOST. HOST can be an ip address or name
    Options:
     -1              ICMP mode, default
     -2              UDP mode
     -3              TCP mode
     -c count        Packet count, default 5
     -D              Set the Don't Fragment bit
     -f FLAG         Tcp header FLAG |C|E|U|A|P|R|S|F|
                              bits |7 6 5 4 3 2 1 0|
     -i ms           Wait ms milliseconds between sending each packet
     -l size         Data size
     -P protocol     Use IP protocol in ping packets
                       1 - ICMP (default), 17 - UDP, 6 - TCP
     -p port         Destination port
     -s port         Source port
     -T ttl          Set ttl, default 64
     -t              Send packets until interrupted by Ctrl+C
     -w ms           Wait ms milliseconds to receive the response

  Notes: 1. Using names requires DNS to be set.
         2. Use Ctrl+C to stop the command.
```

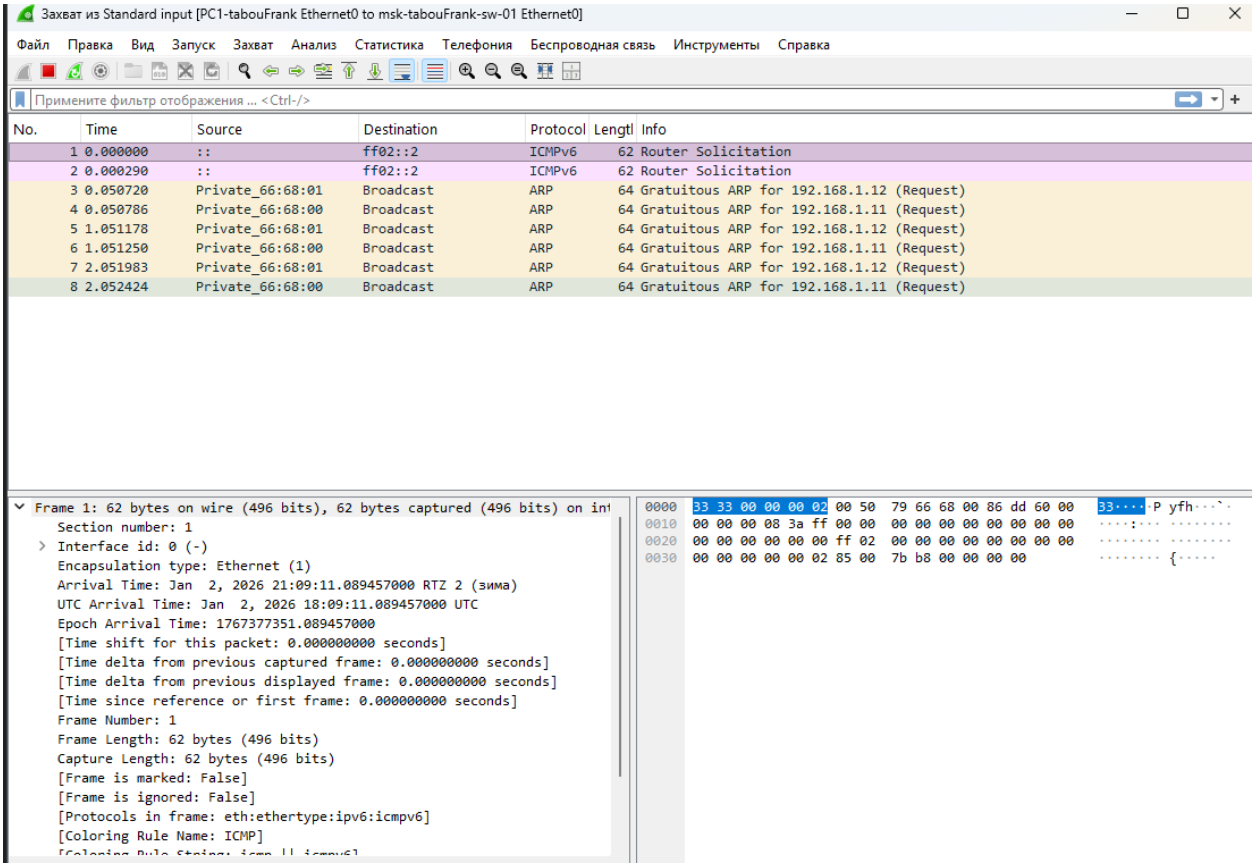


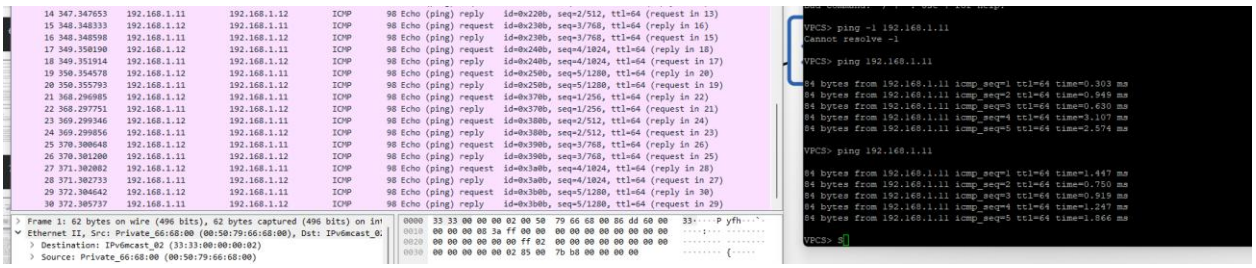
```
VPCS> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=2.815 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=2.968 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=1.948 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=1.397 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=1.327 ms

VPCS>
```





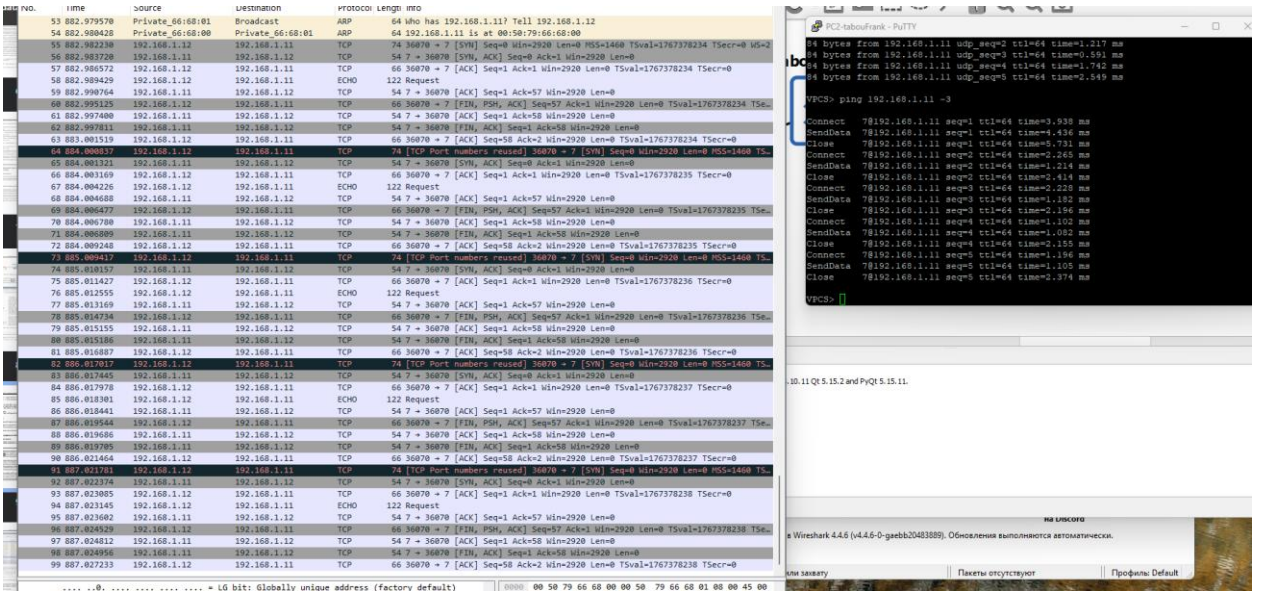

msk-tabouFrank-sw-01
ATM switch
Cloud
Ethernet hub
Ethernet switch
Frame Relay switch
FRR
NAT
VPCS
VyOS
New template
Console
GNS3 management console.
Running GNS3 version 3.0.5 on Windows (64-bit) with Python 3.10.11 Qt 5.15.2 and PyQt 5.15.11.
Copyright (c) 2006-2026 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.
=> Can't create the link the port is not free

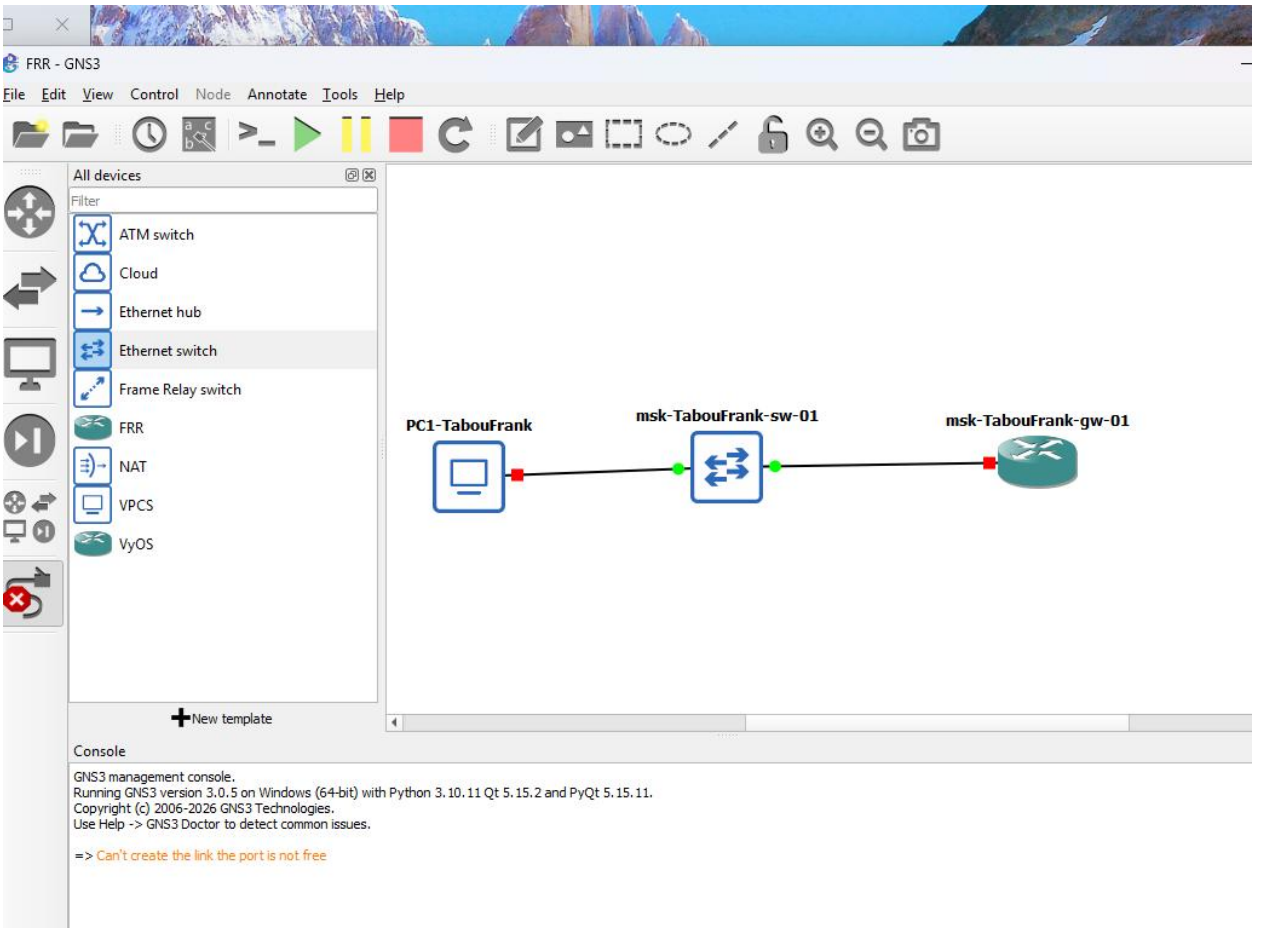

Захват из Standard input [PC1-tabouFrank Ethernet0 to msk-tabouFrank-sw-01 Ethernet0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
Примените фильтр отображения ... <Ctrl-/>
No. Time Source Destination Protocol Lengtl Info
1 0.000000 :: ff02::2 ICMPv6 62 Router Solicitation
2 0.000290 :: ff02::2 ICMPv6 62 Router Solicitation
3 0.050720 Private_66:68:01 Broadcast ARP 64 Gratuitous ARP for 192.168.1.12 (Request)
4 0.050786 Private_66:68:00 Broadcast ARP 64 Gratuitous ARP for 192.168.1.11 (Request)
5 1.051178 Private_66:68:01 Broadcast ARP 64 Gratuitous ARP for 192.168.1.12 (Request)
6 1.051250 Private_66:68:00 Broadcast ARP 64 Gratuitous ARP for 192.168.1.11 (Request)
7 2.051983 Private_66:68:01 Broadcast ARP 64 Gratuitous ARP for 192.168.1.12 (Request)
8 2.052424 Private_66:68:00 Broadcast ARP 64 Gratuitous ARP for 192.168.1.11 (Request)
Frame 1: 62 bytes on wire (496 bits), 62 bytes captured (496 bits) on int
Section number: 1
Interface id: 0 (-)
Encapsulation type: Ethernet (1)
Arrival Time: Jan 2, 2026 21:09:11.089457000 RTZ 2 (зима)
UTC Arrival Time: Jan 2, 2026 18:09:11.089457000 UTC
Epoch Arrival Time: 1767377351.089457000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 0.000000000 seconds]
[Time delta from previous displayed frame: 0.000000000 seconds]
[Time since reference or first frame: 0.000000000 seconds]
Frame Number: 1
Frame Length: 62 bytes (496 bits)
Capture Length: 62 bytes (496 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ipv6:icmpv6]
[Coloring Rule Name: ICMP]
0000 33 33 00 00 00 02 00 50 79 66 68 00 86 dd 60 00
0010 00 00 00 08 3a ff 00 00 00 00 00 00 00 00 00 00
0020 00 00 00 00 00 00 ff 02 00 00 00 00 00 00 00 00
0030 00 00 00 00 00 02 85 00 7b b8 00 00 00 00



```
Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: IPv6mcast_02 (33:33:00:00:00:02)
  Destination: IPv6mcast_02 (33:33:00:00:00:02)
      .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the f…
      .... ...1 .... .... .... .... = IG bit: Group address (multicast/broadcast)
  Source: Private_66:68:00 (00:50:79:66:68:00)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv6 (0x86dd)
    [Stream index: 0]
```

```
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: Private_66:68:01 (00:50:79:66:68:01)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
    [Stream index: 4]
Internet Protocol Version 4, Src: 192.168.1.12, Dst: 192.168.1.11
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
      0000 00.. = Differentiated Services Codepoint: Default (0)
      .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
    Identification: 0x0cc5 (3269)
  000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 64
    Protocol: UDP (17)
    Header Checksum: 0xea6c [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.12
    Destination Address: 192.168.1.11
    [Stream index: 0]
User Datagram Protocol, Src Port: 6310, Dst Port: 7
    Source Port: 6310
    Destination Port: 7
    Length: 64
    Checksum: 0xc7ce [unverified]
    [Checksum Status: Unverified]
    [Stream index: 0]
    [Stream Packet Number: 9]
  [Timestamps]
```




FRR - GNS3
File Edit View Control Node Annotate Tools Help
All devices
Filter
ATM switch
Cloud
Ethernet hub
Ethernet switch
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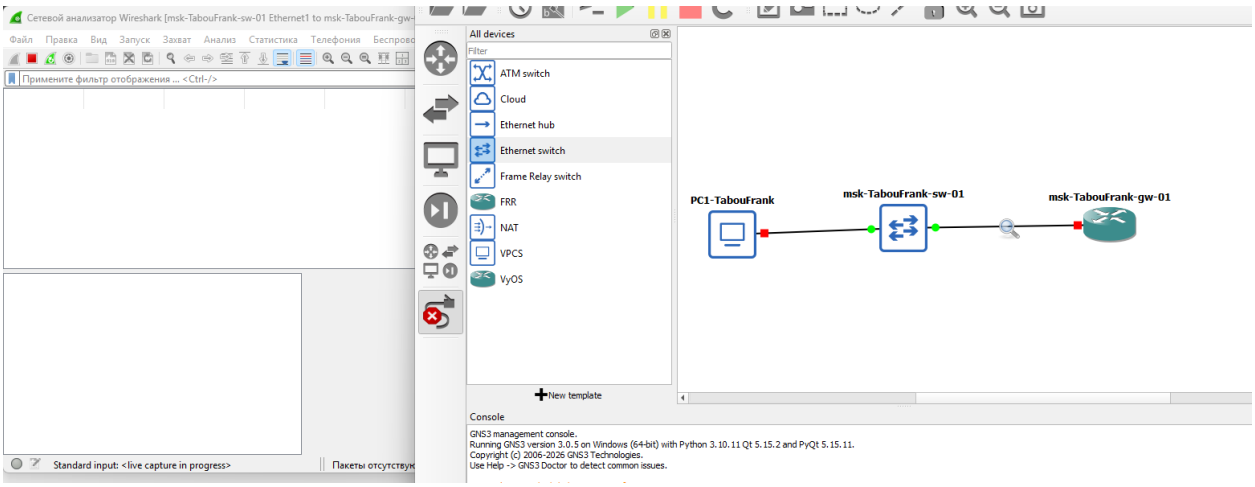
=> Can't create the link the port is not free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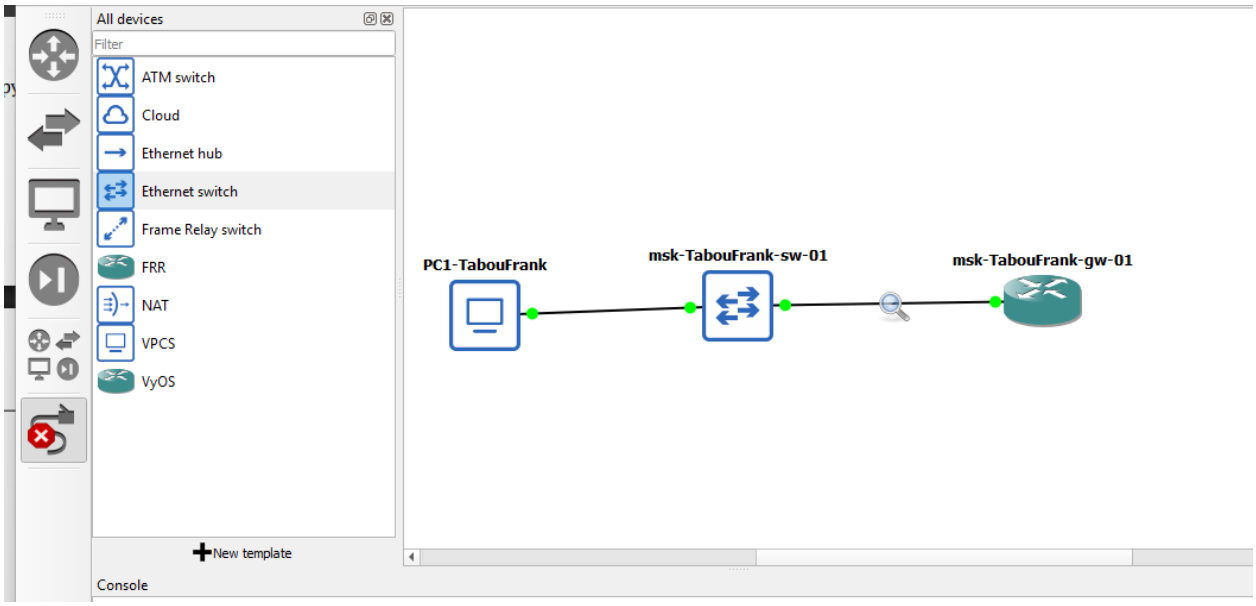
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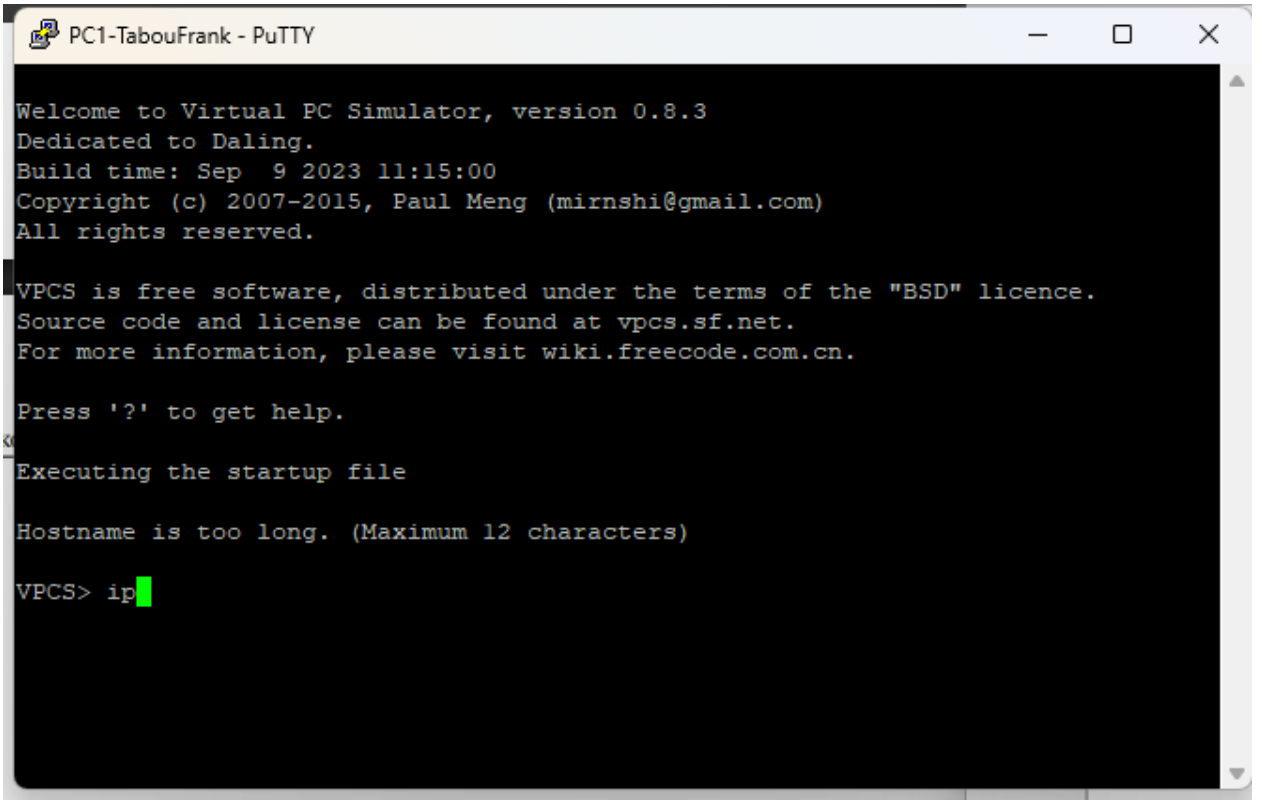
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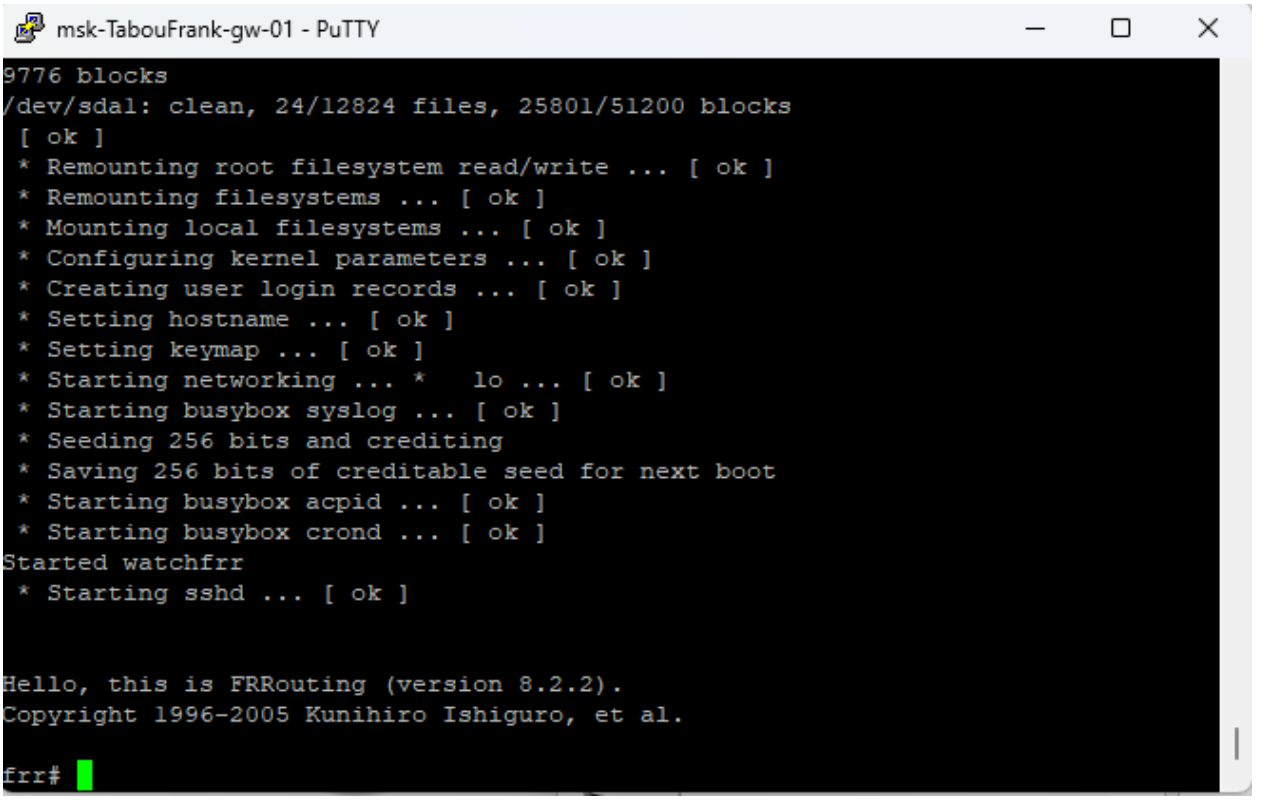
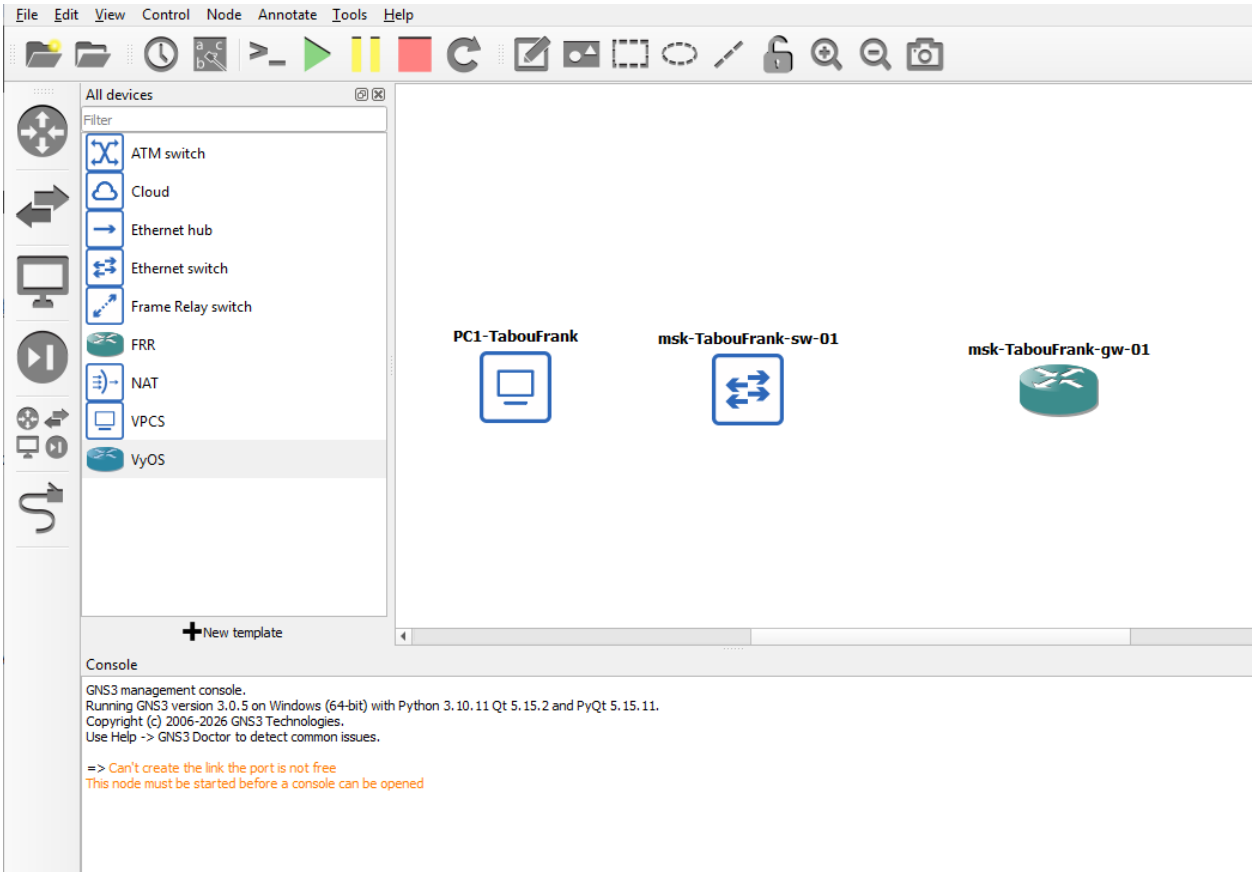
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.
VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.
Press '?' to get help.
Executing the startup file
Hostname is too long. (Maximum 12 characters)
VPCS> ip


msk-TabouFrank-gw-01 - PuTTY
9776 blocks
/dev/sda1: clean, 24/12824 files, 25801/51200 blocks
[ok]
* Remounting root filesystem read/write ... [ok]
* Remounting filesystems ... [ok]
* Mounting local filesystems ... [ok]
* Configuring kernel parameters ... [ok]
* Creating user login records ... [ok]
* Setting hostname ... [ok]
* Setting keymap ... [ok]
* Starting networking ... * lo ... [ok]
* Starting busybox syslog ... [ok]
* Seeding 256 bits and crediting
* Saving 256 bits of creditable seed for next boot
* Starting busybox acpid ... [ok]
* Starting busybox crond ... [ok]
Started watchfrr
* Starting sshd ... [ok]
Hello, this is FRRouting (version 8.2.2).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
frr#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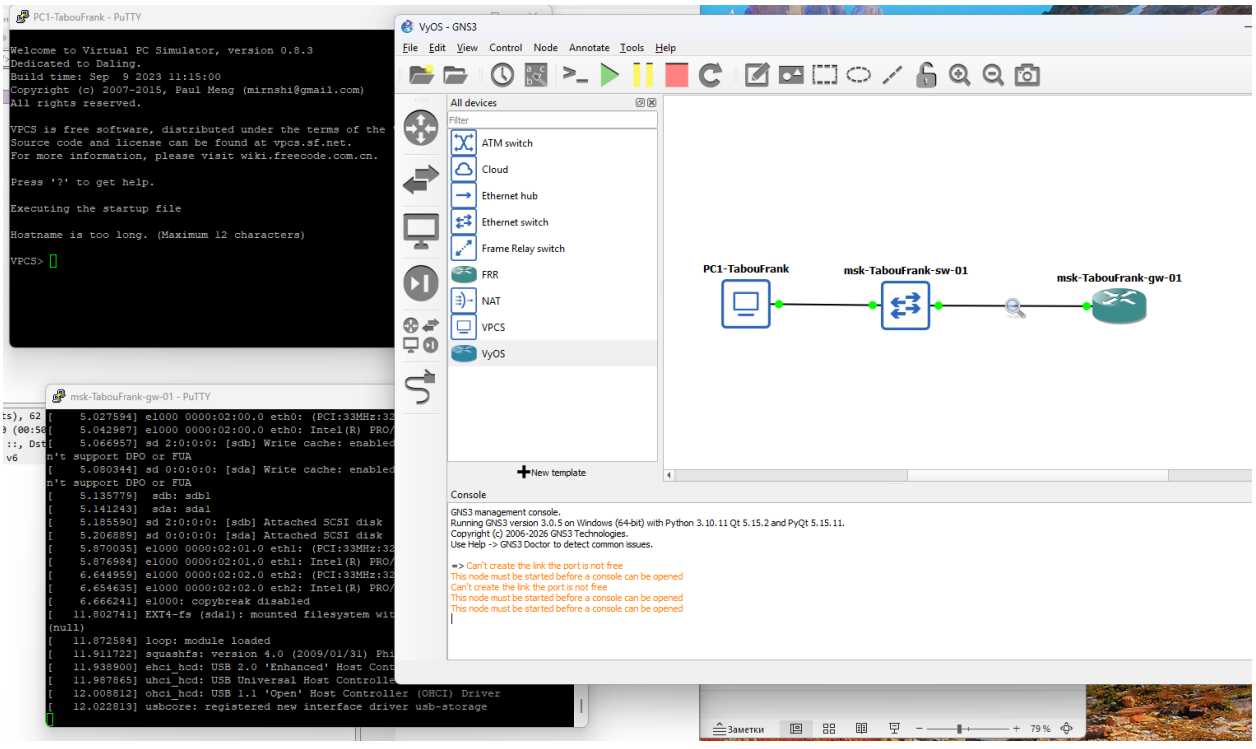
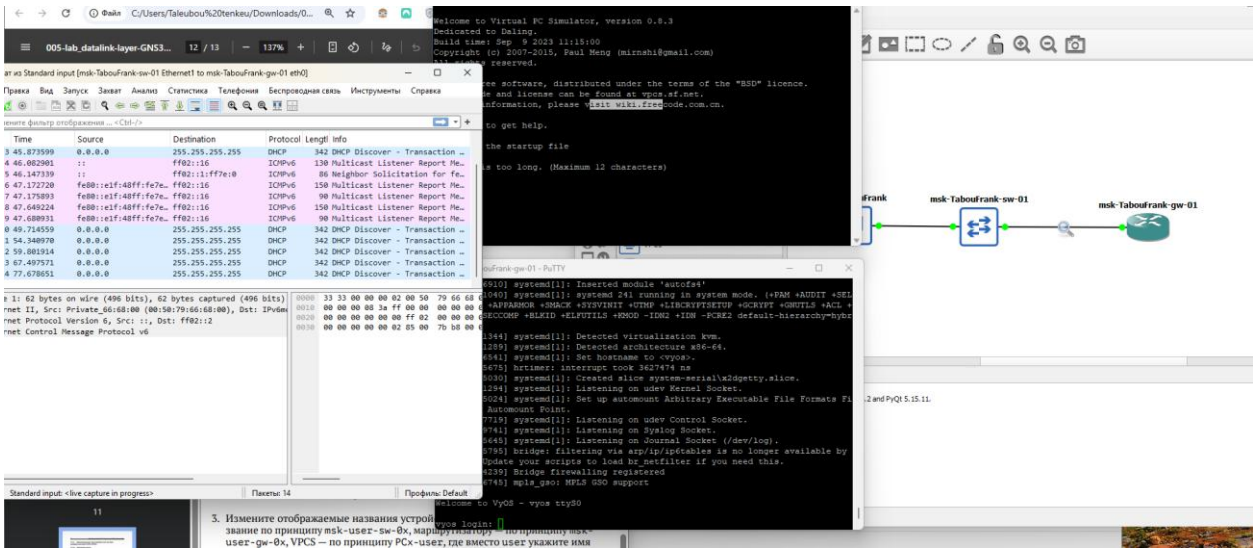
Copyright (c) 2006-2026 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.
=> Can't create the link the port is not free
This node must be started before a console can be opened


PC1-TabouFrank - PuTTY
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
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>
msk-TabouFrank-gw-01 - PuTTY
VyOS - GNS3
File Edit View Control Node Annotate Tools Help
All devices
ATM switch
Cloud
Ethernet hub
Ethernet switch
Frame Relay switch
FRR
NAT
VPCS
VyOS
New template
PC1-TabouFrank
msk-TabouFrank-sw-01
msk-TabouFrank-gw-01
Console
GNS3 management console.
Running GNS3 version 3.0.5 on Windows (64-bit) with Python 3.10.11 Qt 5.15.2 and PyQt 5.15.11.
Copyright (c) 2006-2026 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.
=> Can't create the link the port is not free
This node must be started before a console can be opened
Can't create the link the port is not free
This node must be started before a console can be opened
This node must be started before a console can be opened



PC1-TabouFrank - PuTTY

```
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
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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 192.168.1.10/24 192.168.1.1
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>
```
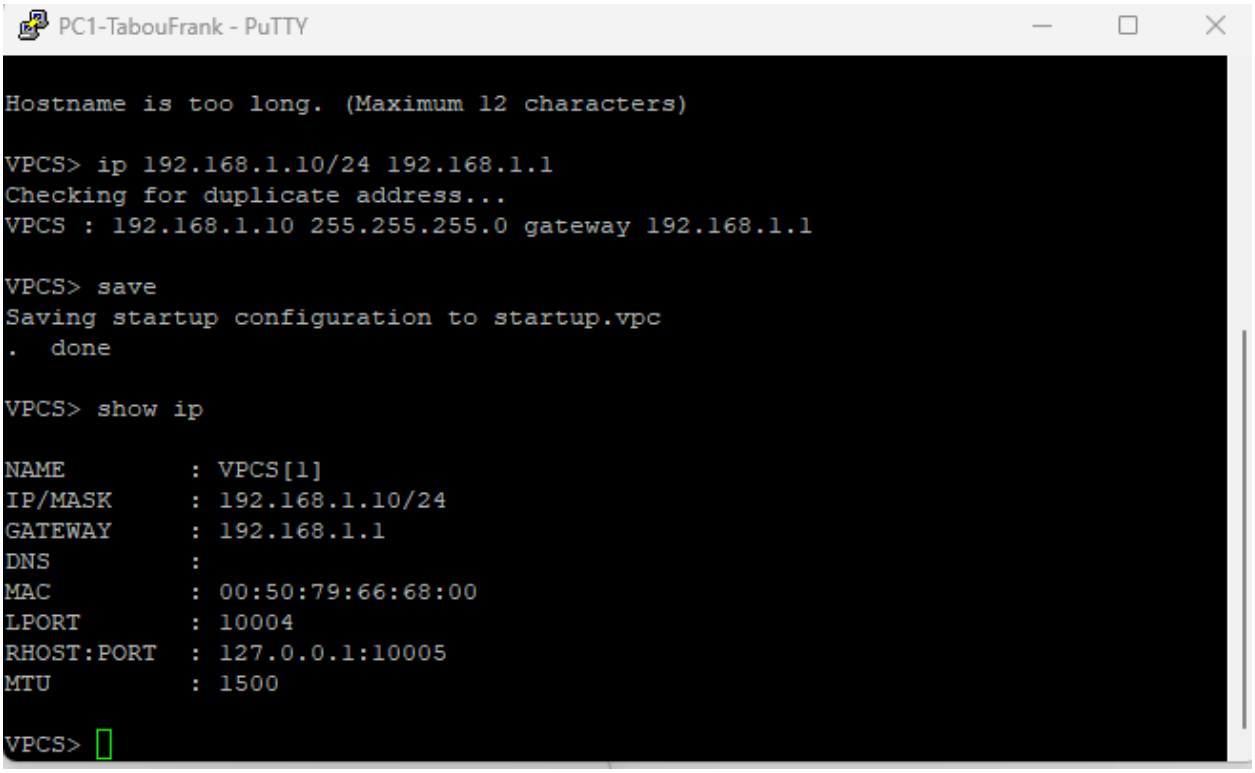
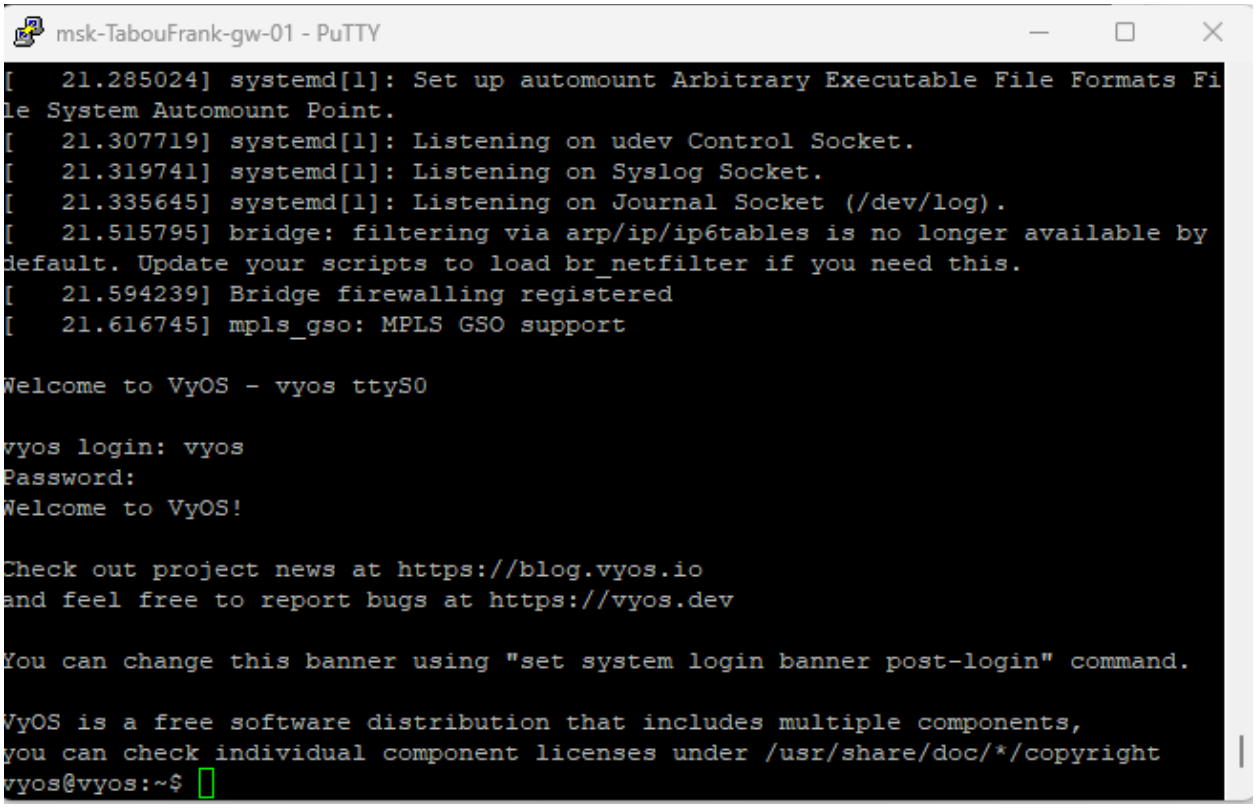
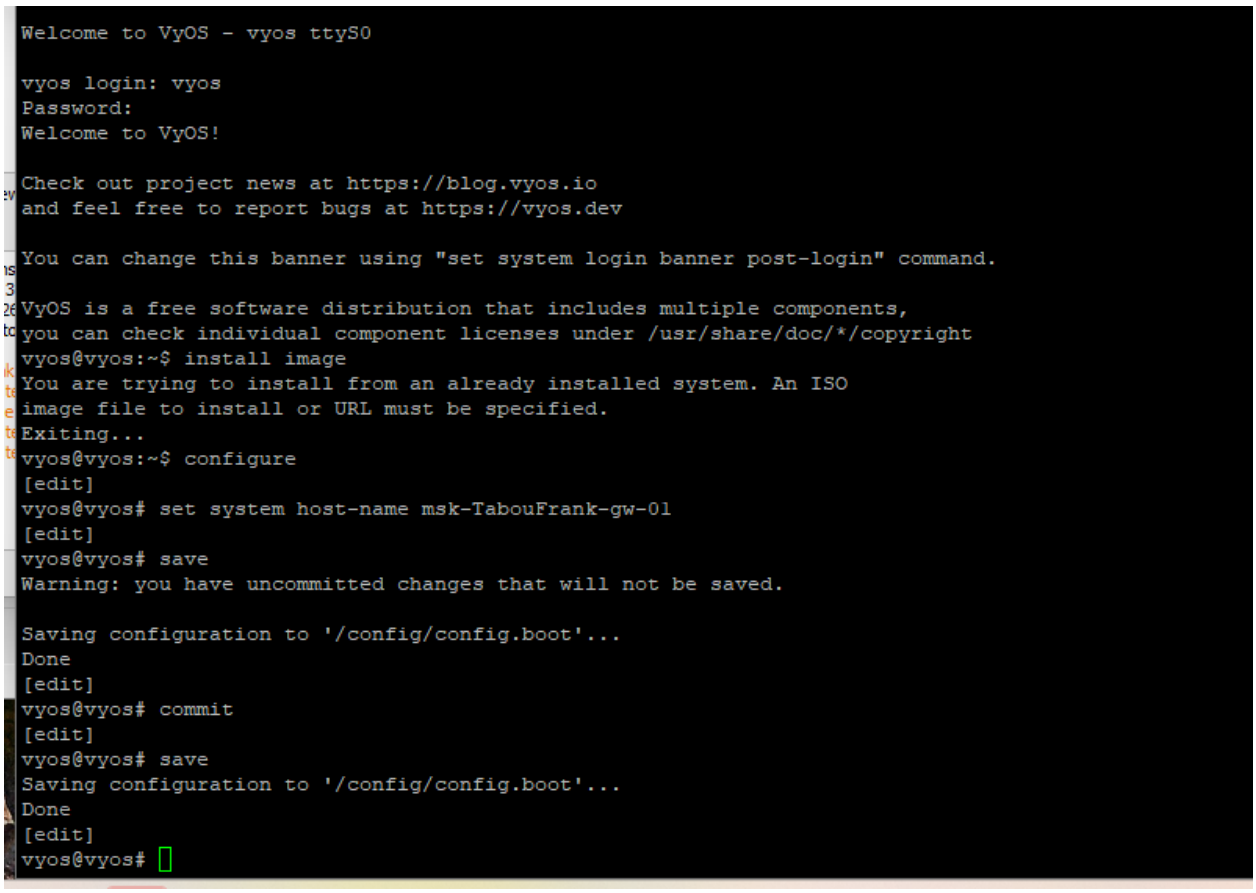
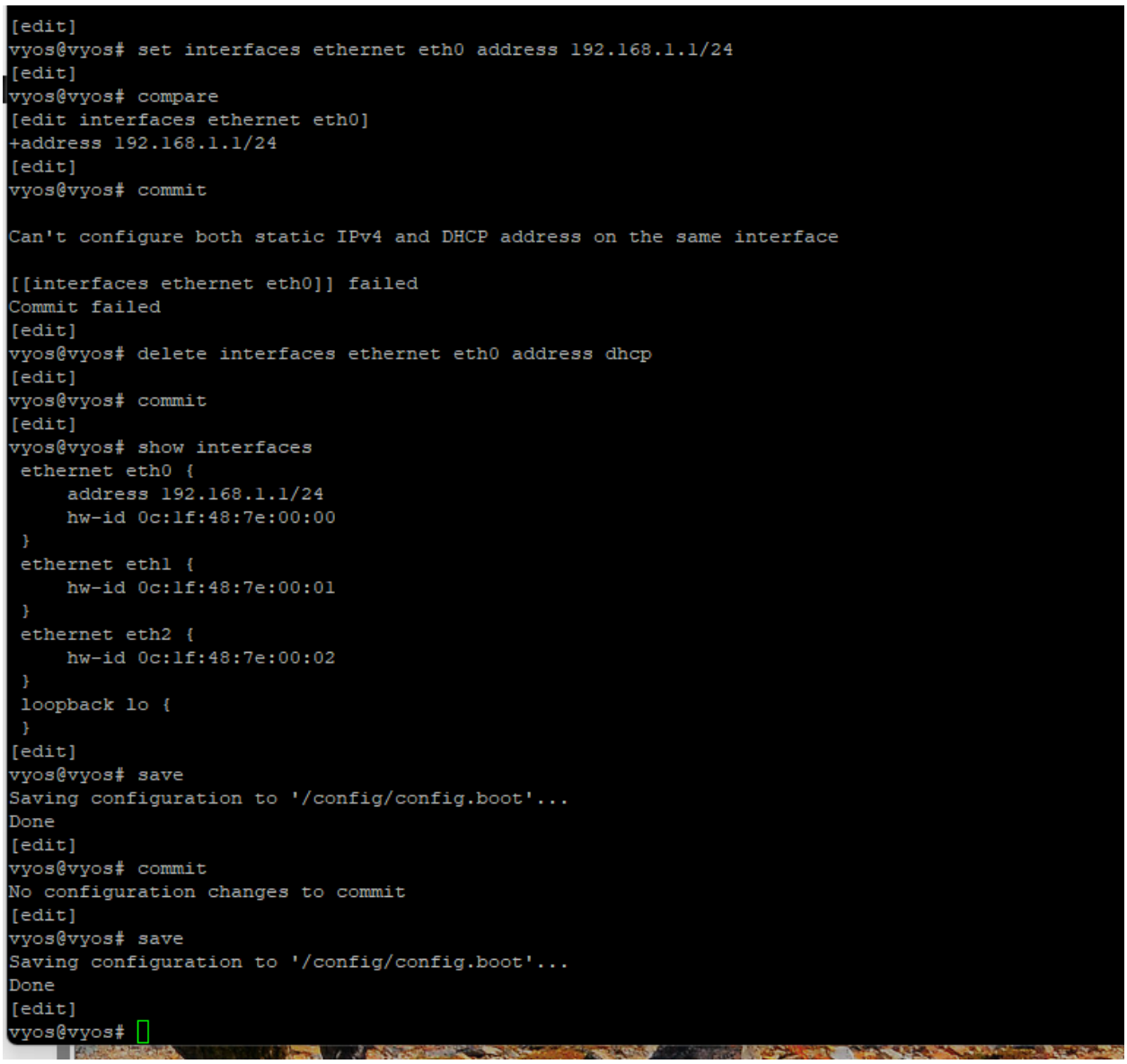
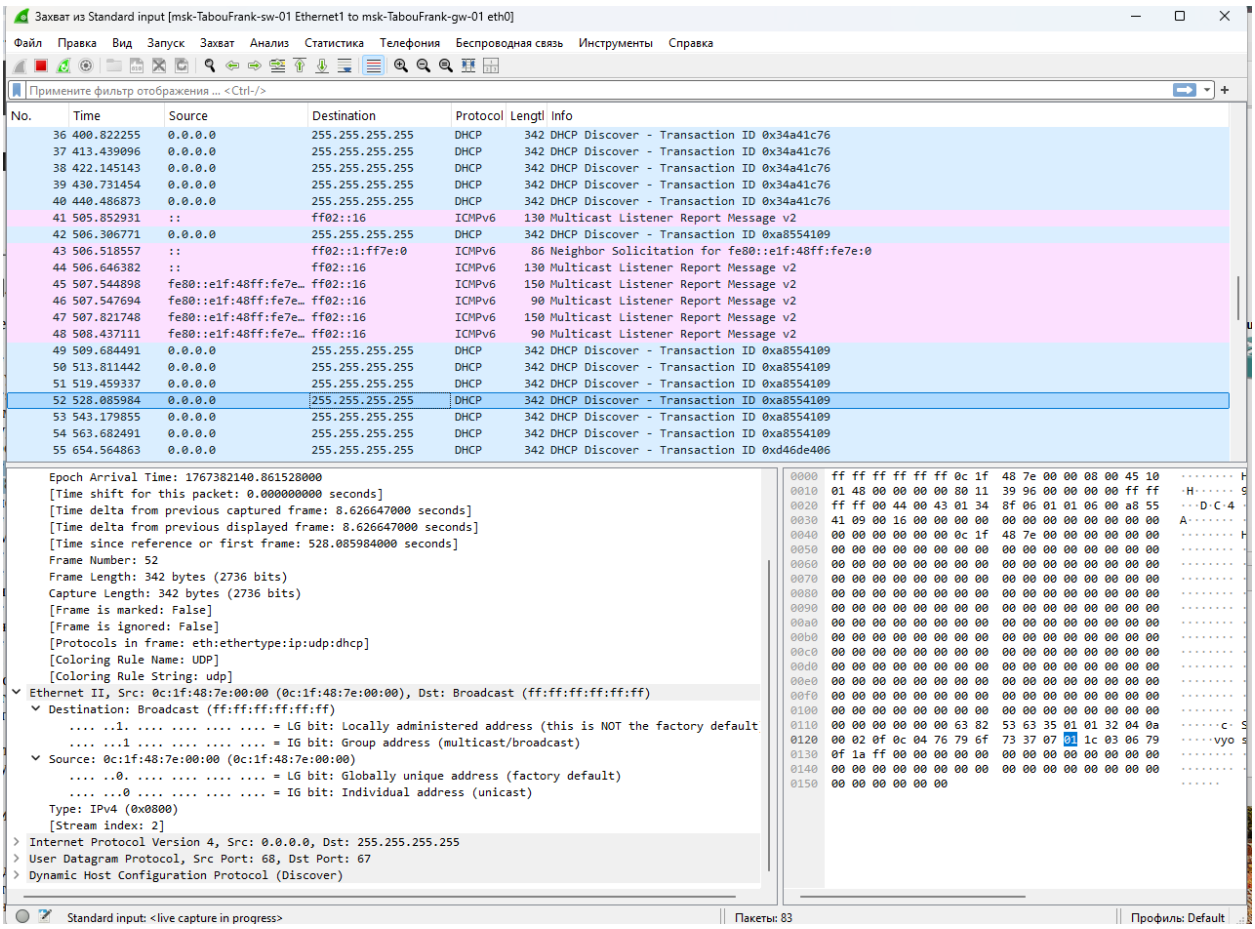
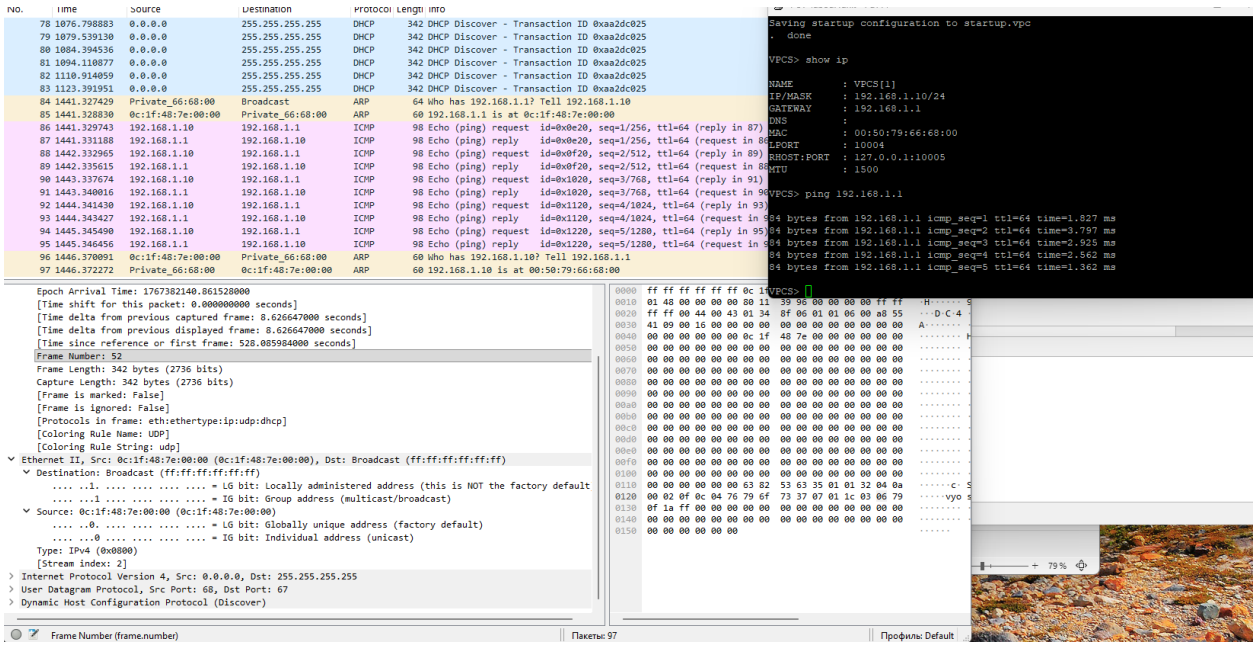


PC1-TabouFrank - PuTTY
Hostname is too long. (Maximum 12 characters)
VPCS> ip 192.168.1.10/24 192.168.1.1
Checking for duplicate address...
VPCS : 192.168.1.10 255.255.255.0 gateway 192.168.1.1
VPCS> save
Saving startup configuration to startup.vpc
. done
VPCS> show ip
NAME : VPCS[1]
IP/MASK : 192.168.1.10/24
GATEWAY : 192.168.1.1
DNS :
MAC : 00:50:79:66:68:00
LPORT : 10004
RHOST:PORT : 127.0.0.1:10005
MTU : 1500
VPCS>


msk-TabouFrank-gw-01 - PuTTY
[21.285024] systemd[1]: Set up automount Arbitrary Executable File Formats File System Automount Point.
[21.307719] systemd[1]: Listening on udev Control Socket.
[21.319741] systemd[1]: Listening on Syslog Socket.
[21.335645] systemd[1]: Listening on Journal Socket (/dev/log).
[21.515795] bridge: filtering via arp/ip/ip6tables is no longer available by default. Update your scripts to load br_netfilter if you need this.
[21.594239] Bridge firewalling registered
[21.616745] mpls_gso: MPLS GSO support
Welcome to VyOS - vyos ttyS0
vyos login: vyos
Password:
Welcome to VyOS!
Check out project news at https://blog.vyos.io
and feel free to report bugs at https://vyos.dev
You can change this banner using "set system login banner post-login" command.
VyOS is a free software distribution that includes multiple components,
you can check individual component licenses under /usr/share/doc/*/copyright
vyos@vyos:~$


Welcome to VyOS - vyos ttyS0
vyos login: vyos
Password:
Welcome to VyOS!
Check out project news at https://blog.vyos.io
and feel free to report bugs at https://vyos.dev
You can change this banner using "set system login banner post-login" command.
VyOS is a free software distribution that includes multiple components,
you can check individual component licenses under /usr/share/doc/*/copyright
vyos@vyos:~$ install image
You are trying to install from an already installed system. An ISO
image file to install or URL must be specified.
Exiting...
vyos@vyos:~$ configure
[edit]
vyos@vyos# set system host-name msk-TabouFrank-gw-01
[edit]
vyos@vyos# save
Warning: you have uncommitted changes that will not be saved.
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos# commit
[edit]
vyos@vyos# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos#


[edit]
vyos@vyos# set interfaces ethernet eth0 address 192.168.1.1/24
[edit]
vyos@vyos# compare
[edit interfaces ethernet eth0]
+address 192.168.1.1/24
[edit]
vyos@vyos# commit
Can't configure both static IPv4 and DHCP address on the same interface
[[interfaces ethernet eth0]] failed
Commit failed
[edit]
vyos@vyos# delete interfaces ethernet eth0 address dhcp
[edit]
vyos@vyos# commit
[edit]
vyos@vyos# show interfaces
ethernet eth0 {
address 192.168.1.1/24
hw-id 0c:1f:48:7e:00:00
}
ethernet eth1 {
hw-id 0c:1f:48:7e:00:01
}
ethernet eth2 {
hw-id 0c:1f:48:7e:00:02
}
loopback lo {
}
[edit]
vyos@vyos# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos# commit
No configuration changes to commit
[edit]
vyos@vyos# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos#


Захват из Standard input [msk-TabouFrank-sw-01 Ethernet1 to msk-TabouFrank-gw-01 eth0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
Standard input: <live capture in progress>
Пакеты: 83
Профиль: Default


Frame Number (frame.number)
Пакеты: 97
Профиль: Default

Выводы:

В ходе выполнения лабораторной работы были последовательно смоделированы простейшие сети в GNS3 с использованием коммутатора, маршрутизаторов FRR и VyOS. Были освоены навыки настройки IP-адресации, проверки связности сети, а также анализа сетевого трафика с применением Wireshark. Полученные результаты наглядно демонстрируют принципы работы протоколов ARP, ICMP, UDP и TCP в локальных сетях.