

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

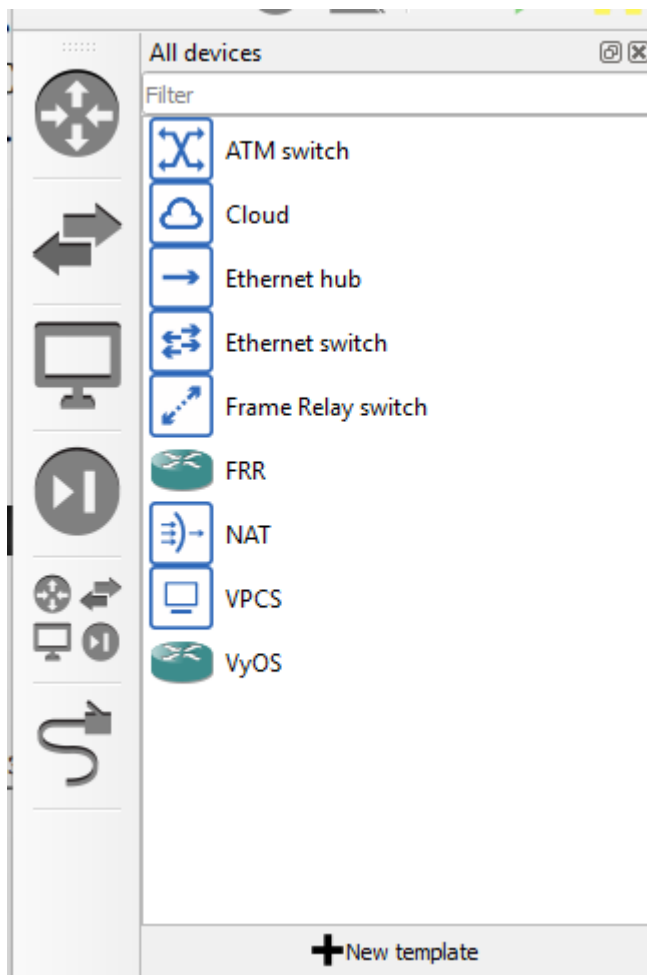
Построить простейшие модели сетей на базе коммутатора и маршрутизаторов FRR и VyOS в GNS3, проанализировать трафик посредством Wireshark.

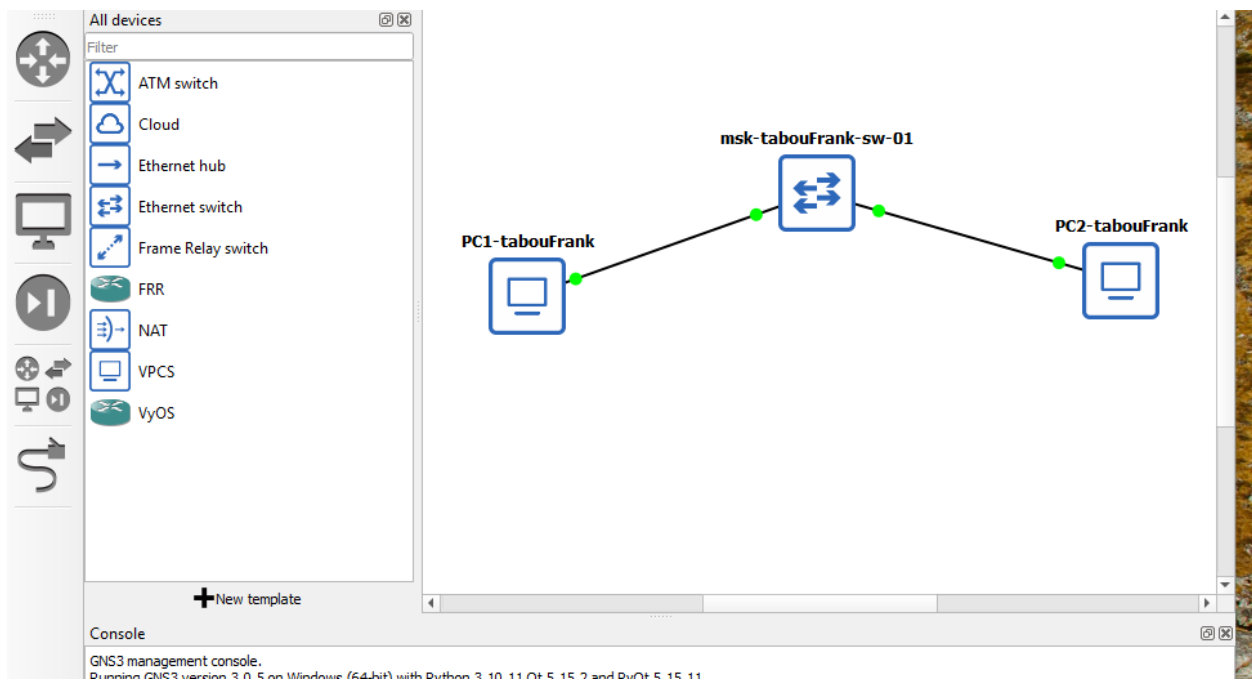
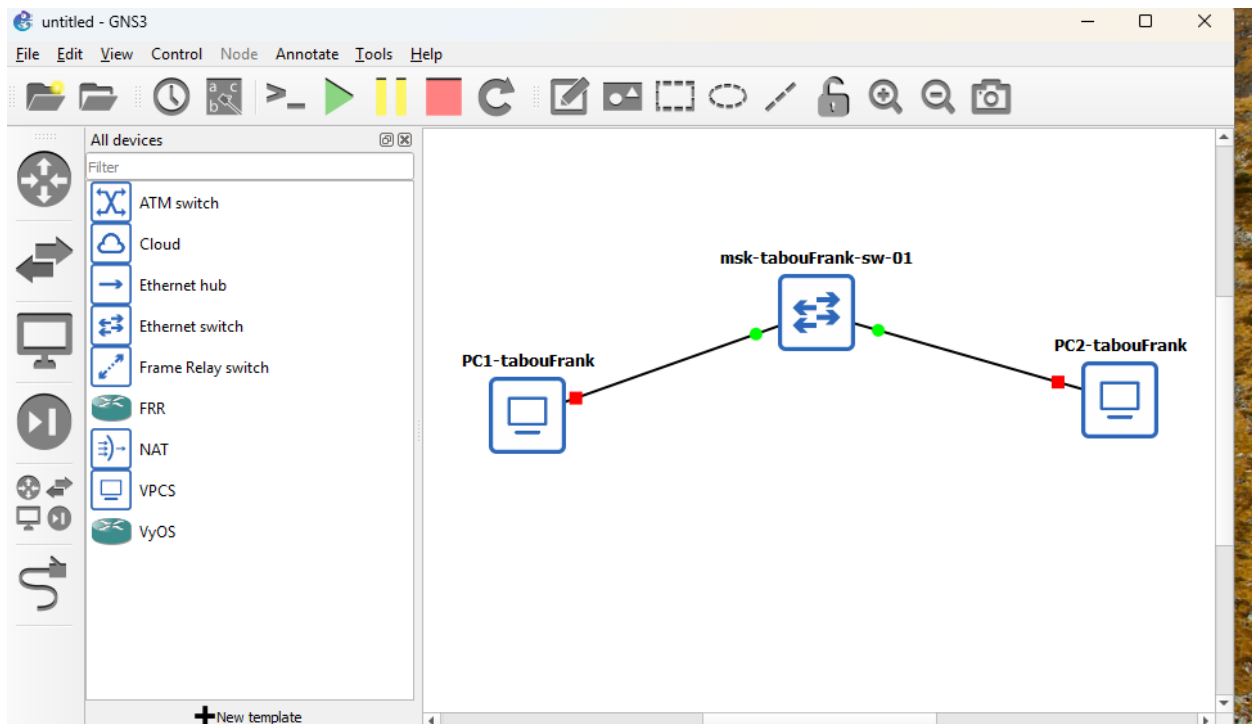
Задание

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 выберите 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. Отобразьте обозначение интерфейсов соединения





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

```

VPCS> /?

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clear ARG        Clear IPv4/IPv6, arp/neighbor cache, command history
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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
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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> 

```

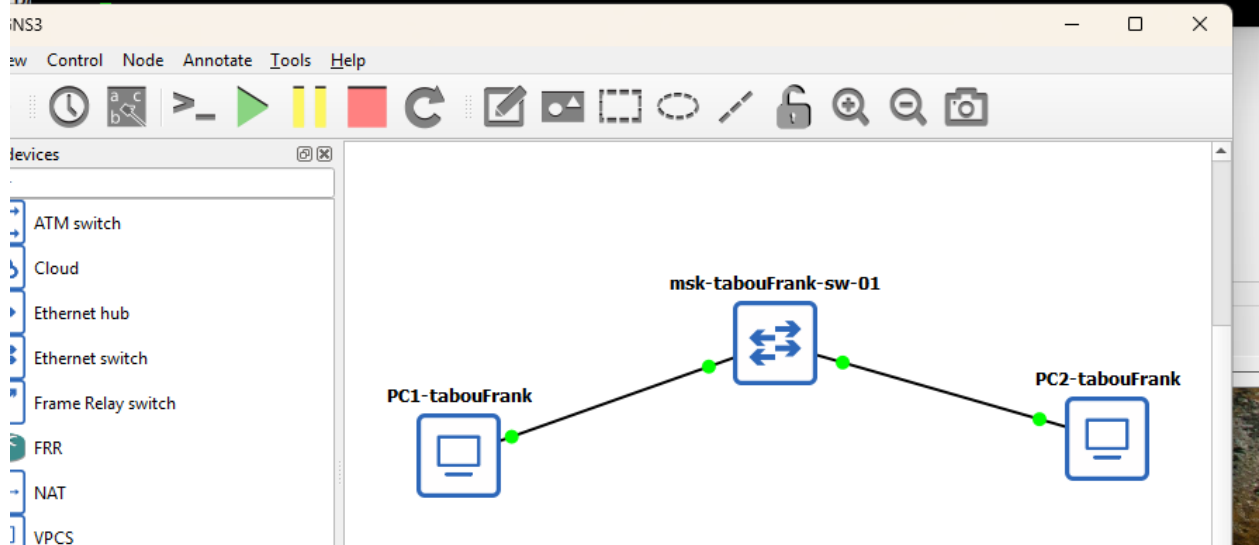
```

VPCS> ping

ping HOST [OPTION ...]
Ping the network HOST. HOST can be an ip address or name
Options:
  -i ms      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.

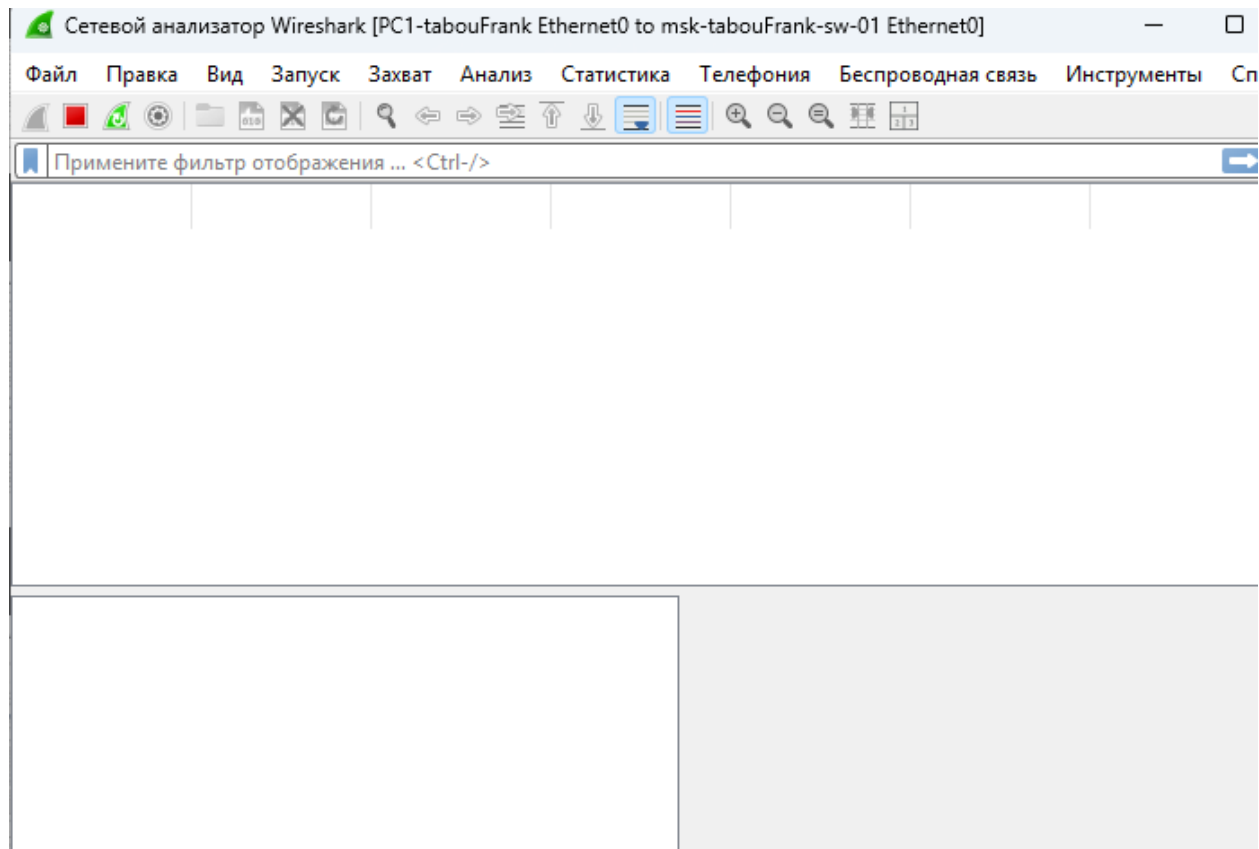
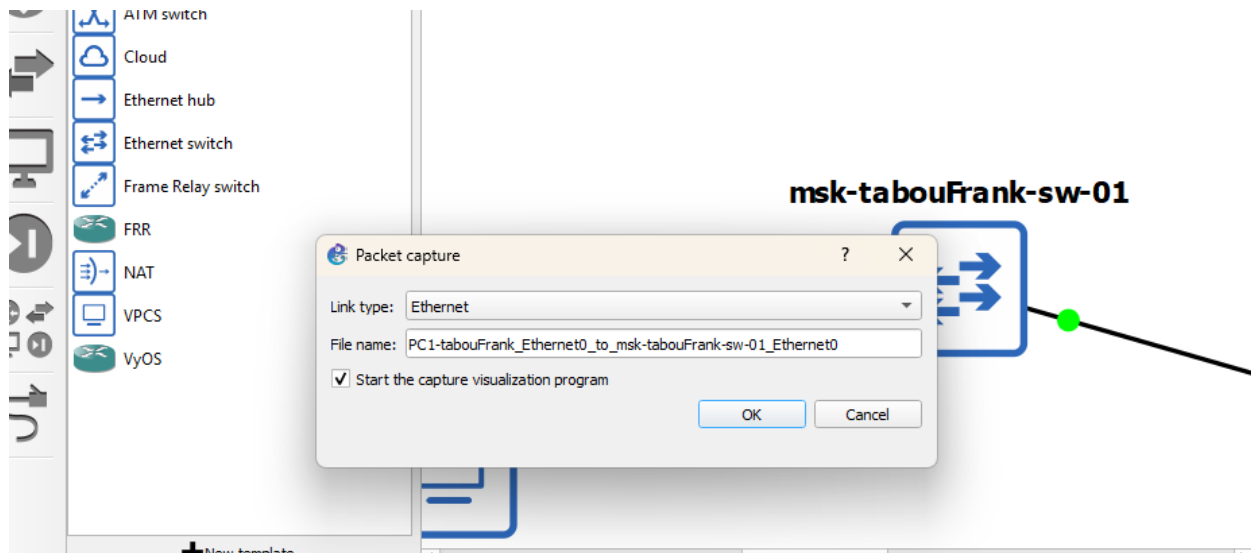
```



```
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> █
```



14	347.347653	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x230b, seq=2/512, ttl=64 (request in 13)
15	348.348333	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x230b, seq=3/768, ttl=64 (reply in 16)
16	348.348598	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x230b, seq=3/768, ttl=64 (request in 15)
17	349.350190	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x240b, seq=4/1024, ttl=64 (reply in 18)
18	349.351014	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x240b, seq=4/1024, ttl=64 (request in 17)
19	350.354578	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x250b, seq=5/1280, ttl=64 (reply in 20)
20	350.355793	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x250b, seq=5/1280, ttl=64 (request in 19)
21	360.296085	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x370b, seq=1/256, ttl=64 (reply in 22)
22	360.297751	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x370b, seq=1/256, ttl=64 (request in 21)
23	369.299346	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x380b, seq=2/512, ttl=64 (reply in 24)
24	369.299856	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x380b, seq=2/512, ttl=64 (request in 23)
25	370.300048	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x390b, seq=3/768, ttl=64 (reply in 26)
26	370.301208	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x390b, seq=3/768, ttl=64 (request in 25)
27	371.302082	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x3a0b, seq=4/1024, ttl=64 (reply in 28)
28	371.302733	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x3a0b, seq=4/1024, ttl=64 (request in 27)
29	372.304642	192.168.1.12	192.168.1.11	IOP	90	Echo (ping) request	id=0x3b0b, seq=5/1280, ttl=64 (reply in 30)
30	372.305737	192.168.1.11	192.168.1.12	IOP	90	Echo (ping) reply	id=0x3b0b, seq=5/1280, ttl=64 (request in 29)

Frame 1: 62 bytes on wire (496 bits), 62 bytes captured (496 bits) on interface
 Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: IPv6mcast_02
 Destination: IPv6mcast_02 (33:33:00:00:00:02)
 Source: Private_66:68:00 (00:50:79:66:68:00)

```

VPCS> ping -i 192.168.1.11
Cannot resolve -1
VPCS> ping 192.168.1.11
64 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=0.303 ms
64 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=0.349 ms
64 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=0.630 ms
64 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=3.107 ms
64 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=2.574 ms
VPCS> ping 192.168.1.11
64 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=1.447 ms
64 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=0.750 ms
64 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=0.919 ms
64 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=0.297 ms
64 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=1.866 ms
VPCS>
  
```

```

▼ 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]
  
```

Line No.	Time	Source	Destination	Protocol	Length	Info
53	882.979570	Private 66:08:01	Broadcast	ARP	64	Who has 192.168.1.11? Tell 192.168.1.12
54	882.980428	Private 66:08:00	Private 66:08:01	ARP	64	192.168.1.11 is at 00:50:79:66:08:00
55	882.980429	192.168.1.12	192.168.1.11	TCP	74	36870 → 7 [SYN] Seq=0 Win=2920 Len=0 MSS=1460 TSval=1767378234 TSecr=0
56	882.983729	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [SYN, ACK] Seq=0 Ack=1 Win=2920 Len=0
57	882.986572	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=1 Ack=1 Win=2920 Len=0 TSval=1767378234 TSecr=0
58	882.989429	192.168.1.12	192.168.1.11	ECHO	122	Request
59	882.990764	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=57 Win=2920 Len=0
60	882.995125	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [FIN, PUSH, ACK] Seq=57 Ack=1 Win=2920 Len=0 TSval=1767378234 TSecr=0
61	882.997400	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=58 Win=2920 Len=0
62	882.999811	192.168.1.12	192.168.1.11	TCP	54	7 → 36870 [FIN, ACK] Seq=1 Ack=58 Win=2920 Len=0
63	883.001519	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=58 Ack=2 Win=2920 Len=0 TSval=1767378234 TSecr=0
64	884.000837	192.168.1.12	192.168.1.11	TCP	74	[TCP Port numbers reused] 36870 → 7 [SYN] Seq=0 Win=2920 Len=0 MSS=1460 TSval=1767378234 TSecr=0
65	884.001321	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [SYN, ACK] Seq=0 Ack=1 Win=2920 Len=0
66	884.001659	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=1 Ack=1 Win=2920 Len=0 TSval=1767378235 TSecr=0
67	884.004226	192.168.1.12	192.168.1.11	ECHO	122	Request
68	884.004688	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=57 Win=2920 Len=0
69	884.006477	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [FIN, PUSH, ACK] Seq=57 Ack=1 Win=2920 Len=0 TSval=1767378235 TSecr=0
70	884.006780	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=58 Win=2920 Len=0
71	884.008889	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [FIN, ACK] Seq=1 Ack=58 Win=2920 Len=0
72	884.009248	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=58 Ack=2 Win=2920 Len=0 TSval=1767378235 TSecr=0
73	885.001157	192.168.1.12	192.168.1.11	TCP	74	[TCP Port numbers reused] 36870 → 7 [SYN] Seq=0 Win=2920 Len=0 MSS=1460 TSval=1767378235 TSecr=0
74	885.001517	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [SYN, ACK] Seq=0 Ack=1 Win=2920 Len=0
75	885.011427	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=1 Ack=1 Win=2920 Len=0 TSval=1767378236 TSecr=0
76	885.012555	192.168.1.12	192.168.1.11	ECHO	122	Request
77	885.013169	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=1 Win=2920 Len=0
78	885.014734	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [FIN, PUSH, ACK] Seq=57 Ack=1 Win=2920 Len=0 TSval=1767378236 TSecr=0
79	885.015155	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=58 Win=2920 Len=0
80	885.015186	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [FIN, ACK] Seq=1 Ack=58 Win=2920 Len=0
81	885.016887	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=58 Ack=3 Win=2920 Len=0 TSval=1767378236 TSecr=0
82	886.017017	192.168.1.12	192.168.1.11	TCP	74	[TCP Port numbers reused] 36870 → 7 [SYN] Seq=0 Win=2920 Len=0 MSS=1460 TSval=1767378237 TSecr=0
83	886.017445	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [SYN, ACK] Seq=0 Ack=1 Win=2920 Len=0
84	886.017978	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=1 Ack=1 Win=2920 Len=0 TSval=1767378237 TSecr=0
85	886.018181	192.168.1.12	192.168.1.11	ECHO	122	Request
86	886.018441	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=57 Win=2920 Len=0
87	886.019544	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [FIN, PUSH, ACK] Seq=57 Ack=1 Win=2920 Len=0 TSval=1767378237 TSecr=0
88	886.019686	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=58 Win=2920 Len=0
89	886.020098	192.168.1.12	192.168.1.11	TCP	54	7 → 36870 [FIN, ACK] Seq=1 Ack=58 Win=2920 Len=0
90	886.021464	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=58 Ack=2 Win=2920 Len=0 TSval=1767378237 TSecr=0
91	887.021781	192.168.1.12	192.168.1.11	TCP	74	[TCP Port numbers reused] 36870 → 7 [SYN] Seq=0 Win=2920 Len=0 MSS=1460 TSval=1767378238 TSecr=0
92	887.022274	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [SYN, ACK] Seq=0 Ack=1 Win=2920 Len=0
93	887.023055	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=1 Ack=1 Win=2920 Len=0 TSval=1767378238 TSecr=0
94	887.023145	192.168.1.12	192.168.1.11	ECHO	122	Request
95	887.023682	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=57 Win=2920 Len=0
96	887.024429	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [FIN, PUSH, ACK] Seq=57 Ack=1 Win=2920 Len=0 TSval=1767378238 TSecr=0
97	887.024812	192.168.1.11	192.168.1.12	TCP	54	7 → 36870 [ACK] Seq=1 Ack=58 Win=2920 Len=0
98	887.024956	192.168.1.12	192.168.1.12	TCP	54	7 → 36870 [FIN, ACK] Seq=1 Ack=58 Win=2920 Len=0
99	887.027233	192.168.1.12	192.168.1.11	TCP	66	36870 → 7 [ACK] Seq=58 Ack=2 Win=2920 Len=0 TSval=1767378238 TSecr=0

```

PC1-taboufrank - PuTTY
84 bytes from 192.168.1.11: udp_seq=2 ttl=64 time=0.217 ms
84 bytes from 192.168.1.11: udp_seq=3 ttl=64 time=0.591 ms
84 bytes from 192.168.1.11: udp_seq=4 ttl=64 time=1.742 ms
84 bytes from 192.168.1.11: udp_seq=5 ttl=64 time=0.549 ms

VPCS> ping 192.168.1.11 -3

Connect 78192.168.1.11 seq=1 ttl=64 time=3.938 ms
SendData 78192.168.1.11 seq=1 ttl=64 time=4.436 ms
Close 78192.168.1.11 seq=1 ttl=64 time=0.731 ms
Connect 78192.168.1.11 seq=2 ttl=64 time=2.265 ms
SendData 78192.168.1.11 seq=2 ttl=64 time=1.214 ms
Close 78192.168.1.11 seq=2 ttl=64 time=2.444 ms
Connect 78192.168.1.11 seq=3 ttl=64 time=2.226 ms
SendData 78192.168.1.11 seq=3 ttl=64 time=1.182 ms
Close 78192.168.1.11 seq=3 ttl=64 time=2.186 ms
Connect 78192.168.1.11 seq=4 ttl=64 time=1.102 ms
SendData 78192.168.1.11 seq=4 ttl=64 time=1.082 ms
Close 78192.168.1.11 seq=4 ttl=64 time=2.155 ms
Connect 78192.168.1.11 seq=5 ttl=64 time=1.186 ms
SendData 78192.168.1.11 seq=5 ttl=64 time=1.105 ms
Close 78192.168.1.11 seq=5 ttl=64 time=2.374 ms

VPCS>

```

FRR - 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

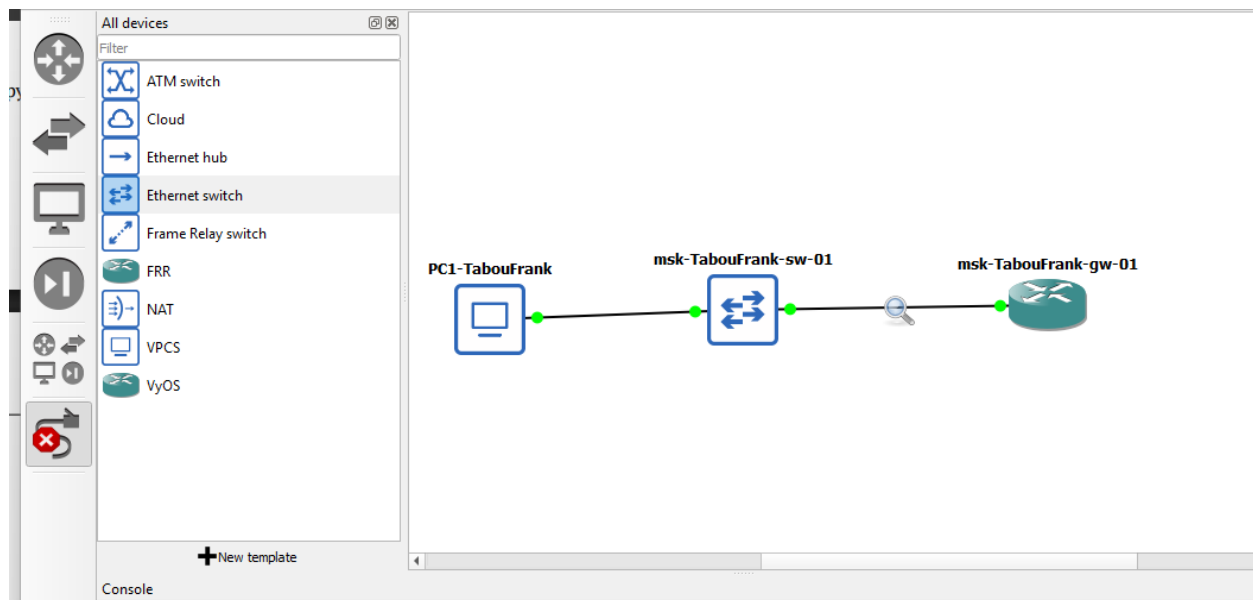
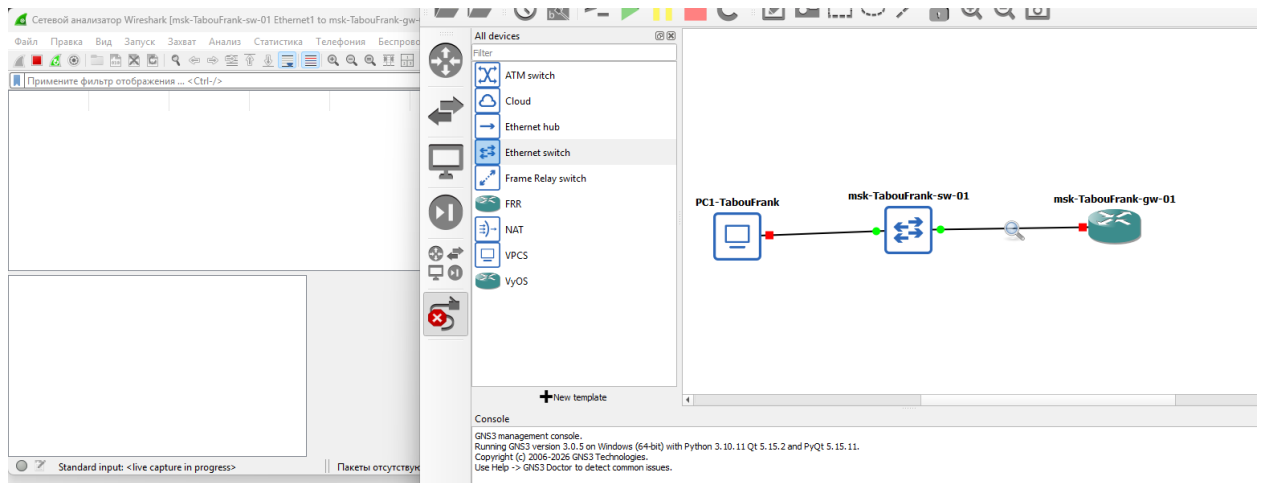
Console

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

```

graph LR
    PC1[PC1-TabouFrank] --- SW[msk-TabouFrank-sw-01]
    SW --- GW[msk-TabouFrank-gw-01]
  
```



```
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)

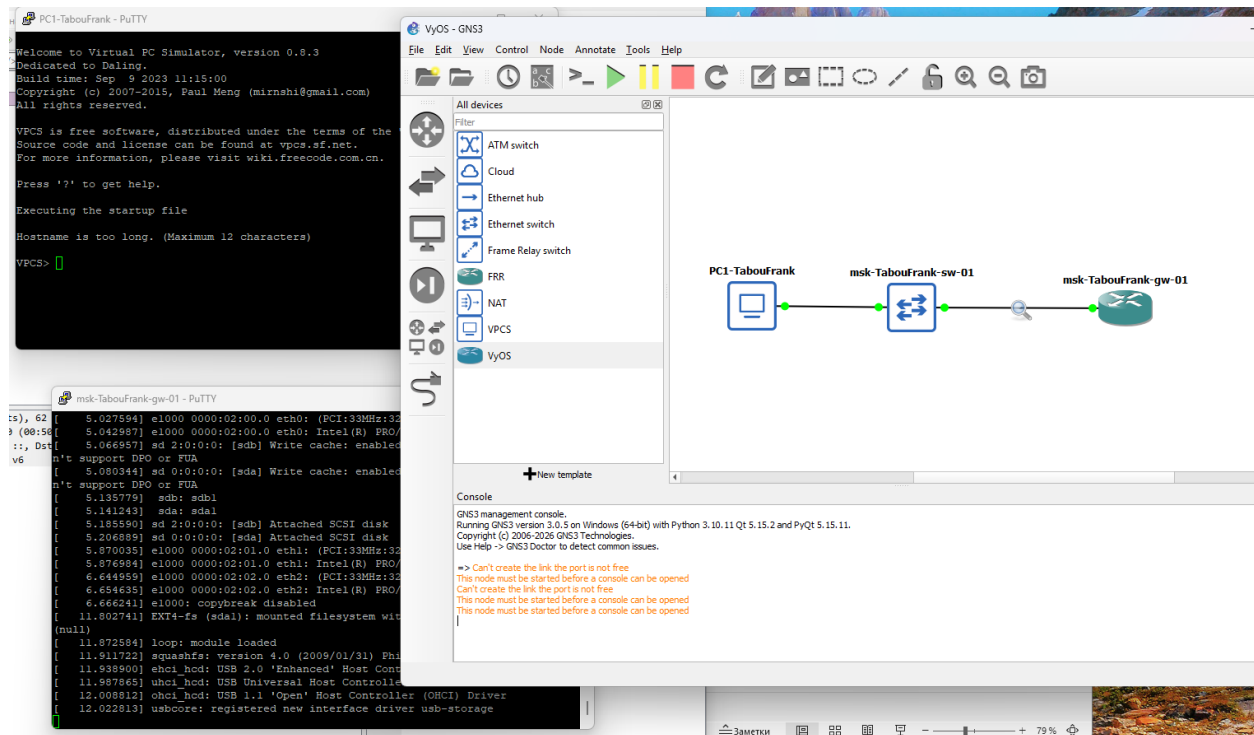
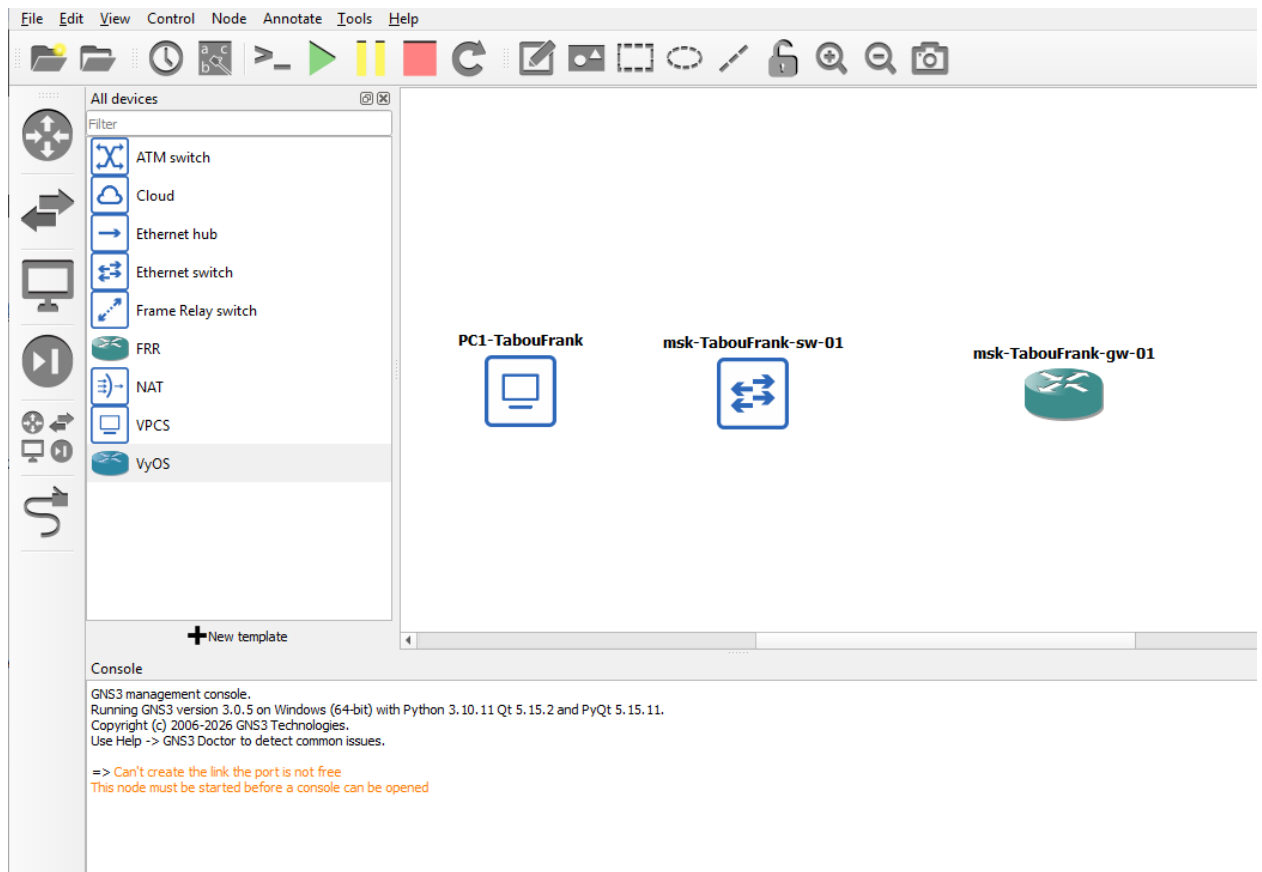
VPCS> ip
```

```
msk-TabouFrank-gw-01 - PuTTY

9776 blocks
/dev/sdal: 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#
```




```
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

Примените фильтр отображения ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
36	400.822255	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x34a41c76
37	413.439896	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x34a41c76
38	422.145143	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x34a41c76
39	430.731454	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x34a41c76
40	440.486873	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x34a41c76
41	505.852931	::	ff02::16	ICMPv6	130	Multicast Listener Report Message v2
42	506.306771	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
43	506.518557	::	ff02::1:ff7e:0	ICMPv6	86	Neighbor Solicitation for fe80::e1f:48ff:fe7e:0
44	506.646382	::	ff02::16	ICMPv6	130	Multicast Listener Report Message v2
45	507.544898	fe80::e1f:48ff:fe7e::	ff02::16	ICMPv6	150	Multicast Listener Report Message v2
46	507.547694	fe80::e1f:48ff:fe7e::	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
47	507.821748	fe80::e1f:48ff:fe7e::	ff02::16	ICMPv6	150	Multicast Listener Report Message v2
48	508.437111	fe80::e1f:48ff:fe7e::	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
49	509.684491	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
50	513.811442	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
51	519.459337	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
52	528.085984	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
53	543.179855	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
54	563.682491	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa8554109
55	654.564863	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xd46de406

Epoch Arrival Time: 1767382140.861528000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 8.626647000 seconds]
[Time delta from previous displayed frame: 8.626647000 seconds]
[Time since reference or first frame: 528.085984000 seconds]
Frame Number: 52
Frame Length: 342 bytes (2736 bits)
Capture Length: 342 bytes (2736 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:udp:dhcp]
[Coloring Rule Name: UDP]
[Coloring Rule String: udp]

Ethernet II, Src: 0c:1f:48:7e:00:00 (0c:1f:48:7e:00:00), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

Destination: Broadcast (ff:ff:ff:ff:ff:ff)

Source: 0c:1f:48:7e:00:00 (0c:1f:48:7e:00:00)

Type: IPv4 (0x0800)

[Stream index: 2]

Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255

User Datagram Protocol, Src Port: 68, Dst Port: 67

Dynamic Host Configuration Protocol (Discover)

Standard input: <live capture in progress>

Пакеты: 83

Профиль: Default

No.	Time	Source	Destination	Protocol	Length	Info
78	1076.798883	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
79	1079.539130	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
80	1084.394536	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
81	1094.110877	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
82	1110.914059	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
83	1123.391951	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa2dc025
84	1441.327429	Private 66:68:00	Broadcast	ARP	64	Who has 192.168.1.1? Tell 192.168.1.10
85	1441.328830	0c:1f:48:7e:00:00	Private 66:68:00	ARP	60	192.168.1.1 is at 0c:1f:48:7e:00:00
86	1441.329743	192.168.1.10	192.168.1.1	ICMP	98	Echo (ping) request id=0xe20, seq=1/256, ttl=64 (reply in 87)
87	1441.331188	192.168.1.1	192.168.1.10	ICMP	98	Echo (ping) reply id=0xe20, seq=1/256, ttl=64 (request in 86)
88	1442.332965	192.168.1.10	192.168.1.1	ICMP	98	Echo (ping) request id=0xf20, seq=2/512, ttl=64 (reply in 89)
89	1442.335615	192.168.1.1	192.168.1.10	ICMP	98	Echo (ping) reply id=0xf20, seq=2/512, ttl=64 (request in 88)
90	1443.337674	192.168.1.10	192.168.1.1	ICMP	98	Echo (ping) request id=0x1020, seq=3/768, ttl=64 (reply in 91)
91	1443.340816	192.168.1.1	192.168.1.10	ICMP	98	Echo (ping) reply id=0x1020, seq=3/768, ttl=64 (request in 90)
92	1444.341430	192.168.1.10	192.168.1.1	ICMP	98	Echo (ping) request id=0x1120, seq=4/1024, ttl=64 (reply in 93)
93	1444.343427	192.168.1.1	192.168.1.10	ICMP	98	Echo (ping) reply id=0x1120, seq=4/1024, ttl=64 (request in 92)
94	1445.345400	192.168.1.10	192.168.1.1	ICMP	98	Echo (ping) request id=0x1220, seq=5/1280, ttl=64 (reply in 95)
95	1445.346456	192.168.1.1	192.168.1.10	ICMP	98	Echo (ping) reply id=0x1220, seq=5/1280, ttl=64 (request in 94)
96	1446.370891	0c:1f:48:7e:00:00	Private 66:68:00	ARP	60	Who has 192.168.1.10? Tell 192.168.1.1
97	1446.372272	Private 66:68:00	0c:1f:48:7e:00:00	ARP	60	192.168.1.10 is at 0c:1f:48:7e:00:00

Epoch Arrival Time: 1767382140.861528000
[Time shift for this packet: 0.000000000 seconds]
[Time delta from previous captured frame: 8.626647000 seconds]
[Time delta from previous displayed frame: 8.626647000 seconds]
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Frame Number: 52
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[Frame is marked: False]
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[Protocols in frame: eth:ethertype:ip:udp:dhcp]
[Coloring Rule Name: UDP]
[Coloring Rule String: udp]

Ethernet II, Src: 0c:1f:48:7e:00:00 (0c:1f:48:7e:00:00), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

Destination: Broadcast (ff:ff:ff:ff:ff:ff)

Source: 0c:1f:48:7e:00:00 (0c:1f:48:7e:00:00)

Type: IPv4 (0x0800)

[Stream index: 2]

Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255

User Datagram Protocol, Src Port: 68, Dst Port: 67

Dynamic Host Configuration Protocol (Discover)

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.