

МИНОБРНАУКИ РОССИИ
САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ
ЭЛЕКТРОТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
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ОТЧЕТ
по лабораторной работе №6
по дисциплине «Сети и телекоммуникации»
Тема: СОЗДАНИЕ ВИРТУАЛЬНЫХ ЛОКАЛЬНЫХ СЕТЕЙ VLAN

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Санкт-Петербург

2022

Цель работы.

Целью работы является изучение процессов создания и настройки виртуальных локальных сетей VLAN.

Задание.

1. Настроить VLAN между Ub1 и Ub3. VLAN ID, IP-адреса и маски подсети использовать согласно указанным ниже вариантам. Проверить выполнение ping между ПК, объяснить результат.

2. На машинах Ub1 и Ub3 запустить скрипты task2-v*.sh (предоставляет преподаватель), исправить ошибку в настройке сетевых адаптеров, после чего продемонстрировать успешный эхо-запрос от одного ПК к другому и обратно.

3. На трех ПК (Ub1, Ub3, UbR) запустить скрипт task3-v*.sh (предоставляет преподаватель), организовать подключение Ub1 к Ub3 и обратно через UbR, настроить UbR таким образом, чтобы эхо-запрос успешно проходил с Ub1 на Ub3.

4. На трех ПК запустить скрипт task4-v*.sh (предоставляет преподаватель). В данной задаче сеть настроена с ошибками. Необходимо исправить ошибку и показать выполнение эхо-запроса от Ub1 до Ub3.

1. Вариант 13: Ub1: vlan id: 112, ip 12.13.14.15, netmask 255.255.255.128;
Ub3: vlan id: 112, ip 12.13.14.120, netmask 255.255.255.128.

Выполнение работы.

1. Между узлами с указанными данными был настроен VLAN.

```
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto enp0s3.112
iface enp0s3.112 inet static
address 12.13.14.15
netmask 255.255.255.128
vlan_raw_device enp0s3
```

Настройки сетевых интерфейсов Ub1.

```
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto enp0s3.112
iface enp0s3.112 inet static
address 12.13.14.120
netmask 255.255.255.128
vlan_raw_device enp0s3
```

Настройки сетевых интерфейсов Ub3.

```
lyubava@ubuntu:~$ ping 12.13.14.120
PING 12.13.14.120 (12.13.14.120) 56(84) bytes of data.
64 bytes from 12.13.14.120: icmp_seq=1 ttl=64 time=0.491 ms
64 bytes from 12.13.14.120: icmp_seq=2 ttl=64 time=0.755 ms
64 bytes from 12.13.14.120: icmp_seq=3 ttl=64 time=0.770 ms
64 bytes from 12.13.14.120: icmp_seq=4 ttl=64 time=0.737 ms
64 bytes from 12.13.14.120: icmp_seq=5 ttl=64 time=0.834 ms
64 bytes from 12.13.14.120: icmp_seq=6 ttl=64 time=0.730 ms
^C
--- 12.13.14.120 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5000ms
rtt min/avg/max/mdev = 0.491/0.719/0.834/0.110 ms
lyubava@ubuntu:~$ _
```

Результат команды ping с Ub1 на Ub3.

```
lyubava@ubuntu:~$ ping 12.13.14.15
PING 12.13.14.15 (12.13.14.15) 56(84) bytes of data.
64 bytes from 12.13.14.15: icmp_seq=1 ttl=64 time=0.890 ms
64 bytes from 12.13.14.15: icmp_seq=2 ttl=64 time=0.782 ms
64 bytes from 12.13.14.15: icmp_seq=3 ttl=64 time=0.768 ms
^C
```

Результат команды ping с Ub3 на Ub1.

Echo-запрос от одного узла к другому доходит успешно, так как настройки VLAN на обоих узлах имеет одинаковый ID, а IP адреса узлов находятся в одной подсети и имеют одинаковую маску.

2. На машинах Ub1 и Ub3 были запущены скрипты task2-v13.sh.

Были исправлены следующие ошибки в настройках сетевых адаптеров:

Ошибка	Исправление
iface enp0s3 inet static	iface vlan22 inet static
vlan-raw-device eth	vlan_raw_device enp0s3
iface eth0 inet static	iface vlan22 inet static
vlan-raw-device enp0s3	vlan_raw_device enp0s3

```
Клон Ub1 [Работает] - Oracle VM VirtualBox
Файл  Машина  Вид  Ввод  Устройства  Справка

64 bytes from 12.43.15.19: icmp_seq=12 ttl=64 time=0.027 ms
64 bytes from 12.43.15.19: icmp_seq=13 ttl=64 time=0.025 ms
64 bytes from 12.43.15.19: icmp_seq=14 ttl=64 time=0.026 ms
64 bytes from 12.43.15.19: icmp_seq=15 ttl=64 time=0.026 ms
64 bytes from 12.43.15.19: icmp_seq=16 ttl=64 time=0.026 ms
64 bytes from 12.43.15.19: icmp_seq=17 ttl=64 time=0.027 ms
64 bytes from 12.43.15.19: icmp_seq=18 ttl=64 time=0.030 ms
64 bytes from 12.43.15.19: icmp_seq=19 ttl=64 time=0.024 ms
64 bytes from 12.43.15.19: icmp_seq=20 ttl=64 time=0.030 ms
64 bytes from 12.43.15.19: icmp_seq=21 ttl=64 time=0.043 ms
64 bytes from 12.43.15.19: icmp_seq=22 ttl=64 time=0.037 ms
64 bytes from 12.43.15.19: icmp_seq=23 ttl=64 time=0.036 ms
^C
--- 12.43.15.19 ping statistics ---
23 packets transmitted, 23 received, 0% packet loss, time 21999ms
rtt min/avg/max/mdev = 0.022/0.031/0.052/0.010 ms
lyubava@ubuntu:~$ ping 12.43.60.254
PING 12.43.60.254 (12.43.60.254) 56(84) bytes of data.
64 bytes from 12.43.60.254: icmp_seq=1 ttl=64 time=0.904 ms
64 bytes from 12.43.60.254: icmp_seq=2 ttl=64 time=0.688 ms
64 bytes from 12.43.60.254: icmp_seq=3 ttl=64 time=0.913 ms
64 bytes from 12.43.60.254: icmp_seq=4 ttl=64 time=0.808 ms
64 bytes from 12.43.60.254: icmp_seq=5 ttl=64 time=0.760 ms
64 bytes from 12.43.60.254: icmp_seq=6 ttl=64 time=0.808 ms
64 bytes from 12.43.60.254: icmp_seq=7 ttl=64 time=0.954 ms
64 bytes from 12.43.60.254: icmp_seq=8 ttl=64 time=0.821 ms
64 bytes from 12.43.60.254: icmp_seq=9 ttl=64 time=0.840 ms
64 bytes from 12.43.60.254: icmp_seq=10 ttl=64 time=0.799 ms
64 bytes from 12.43.60.254: icmp_seq=11 ttl=64 time=0.705 ms
64 bytes from 12.43.60.254: icmp_seq=12 ttl=64 time=0.818 ms
64 bytes from 12.43.60.254: icmp_seq=13 ttl=64 time=0.810 ms
64 bytes from 12.43.60.254: icmp_seq=14 ttl=64 time=0.743 ms
^C
--- 12.43.60.254 ping statistics ---
14 packets transmitted, 14 received, 0% packet loss, time 13019ms
rtt min/avg/max/mdev = 0.688/0.812/0.954/0.075 ms
```

Результат успешного эхо-запроса от Ub1 к Ub3.

```
lyubava@ubuntu:~$ ping 12.43.15.19
PING 12.43.15.19 (12.43.15.19) 56(84) bytes of data.
64 bytes from 12.43.15.19: icmp_seq=1 ttl=64 time=0.550 ms
64 bytes from 12.43.15.19: icmp_seq=2 ttl=64 time=0.795 ms
64 bytes from 12.43.15.19: icmp_seq=3 ttl=64 time=0.289 ms
64 bytes from 12.43.15.19: icmp_seq=4 ttl=64 time=0.587 ms
64 bytes from 12.43.15.19: icmp_seq=5 ttl=64 time=0.731 ms
64 bytes from 12.43.15.19: icmp_seq=6 ttl=64 time=0.659 ms
64 bytes from 12.43.15.19: icmp_seq=7 ttl=64 time=0.812 ms
64 bytes from 12.43.15.19: icmp_seq=8 ttl=64 time=0.329 ms
64 bytes from 12.43.15.19: icmp_seq=9 ttl=64 time=0.525 ms
^C
--- 12.43.15.19 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8004ms
rtt min/avg/max/mdev = 0.289/0.586/0.812/0.177 ms
lyubava@ubuntu:~$ ^C
```

Результат успешного эхо-запроса от Ub3 к Ub1.

3. На трех ПК (Ub1, Ub3, UbR) был запущен скрипт task3-v13.sh.

Организовано подключение Ub1 к Ub3 и обратно через UbR. UbR настроен таким образом, чтобы эхо-запрос успешно проходил с Ub1 на Ub3.

Настройки сетевых адаптеров:

```

auto enp0s3
iface enp0s3 inet dhcp
auto lo
iface lo inet loopback
auto vlan113
iface vlan113 inet static
address 100.1.56.17
netmask 255.254.0.0
vlan_raw_device enp0s3
gateway 100.1.56.18

```


Ub1

```

auto enp0s3
iface enp0s3 inet dhcp
auto lo
iface lo inet loopback
auto vlan133
iface vlan133 inet static
address 99.12.44.15
netmask 255.254.0.0
vlan_raw_device enp0s3
gateway 99.12.44.16

```

Ub3

 Клон UbR [Работает] - Oracle

Файл Машина Вид В

```

auto enp0s3
iface enp0s3 inet dhcp
auto enp0s8
iface enp0s8 inet dhcp
auto lo
iface lo inet loopback

auto vlan113
iface vlan113 inet static
address 100.1.56.18
netmask 255.254.0.0
vlan_raw_device enp0s3

auto vlan133
iface vlan133 inet static
address 99.12.44.16
netmask 255.254.0.0
vlan_raw_device enp0s8

```

UbR

```
Клон Ub1 [Работает] - Oracle VM VirtualBox
Файл  Машина  Вид  Ввод  Устройства  Справка

vlan113  Link encap:Ethernet  HWaddr 08:00:27:d1:fa:94
         inet addr:100.1.56.17  Bcast:100.1.255.255  Mask:255.254.0.0
         inet6 addr: fe80::a00:27ff:fed1:fa94/64 Scope:Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:23 errors:0 dropped:0 overruns:0 frame:0
         TX packets:31 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:1818 (1.8 KB)  TX bytes:2734 (2.7 KB)

lyubava@ubuntu:~$ ping 99.12.44.15
PING 99.12.44.15 (99.12.44.15) 56(84) bytes of data.
64 bytes from 99.12.44.15: icmp_seq=1 ttl=63 time=0.830 ms
64 bytes from 99.12.44.15: icmp_seq=2 ttl=63 time=1.61 ms
64 bytes from 99.12.44.15: icmp_seq=3 ttl=63 time=1.62 ms
64 bytes from 99.12.44.15: icmp_seq=4 ttl=63 time=1.51 ms
64 bytes from 99.12.44.15: icmp_seq=5 ttl=63 time=1.05 ms
64 bytes from 99.12.44.15: icmp_seq=6 ttl=63 time=1.49 ms
64 bytes from 99.12.44.15: icmp_seq=7 ttl=63 time=1.85 ms
64 bytes from 99.12.44.15: icmp_seq=8 ttl=63 time=1.50 ms
64 bytes from 99.12.44.15: icmp_seq=9 ttl=63 time=1.67 ms
64 bytes from 99.12.44.15: icmp_seq=10 ttl=63 time=1.45 ms
64 bytes from 99.12.44.15: icmp_seq=11 ttl=63 time=1.09 ms
64 bytes from 99.12.44.15: icmp_seq=12 ttl=63 time=1.56 ms
64 bytes from 99.12.44.15: icmp_seq=13 ttl=63 time=1.48 ms
64 bytes from 99.12.44.15: icmp_seq=14 ttl=63 time=1.58 ms
64 bytes from 99.12.44.15: icmp_seq=15 ttl=63 time=0.538 ms
64 bytes from 99.12.44.15: icmp_seq=16 ttl=63 time=1.45 ms
64 bytes from 99.12.44.15: icmp_seq=17 ttl=63 time=1.50 ms
64 bytes from 99.12.44.15: icmp_seq=18 ttl=63 time=1.36 ms
64 bytes from 99.12.44.15: icmp_seq=19 ttl=63 time=1.46 ms
64 bytes from 99.12.44.15: icmp_seq=20 ttl=63 time=1.56 ms
^C
--- 99.12.44.15 ping statistics ---
20 packets transmitted, 20 received, 0% packet loss, time 19026ms
rtt min/avg/max/mdev = 0.538/1.412/1.851/0.301 ms
lyubava@ubuntu:~$
```

Результат успешного эхо-запроса от Ub1 к Ub3.

```
vlan133  Link encap:Ethernet  HWaddr 08:00:27:05:b4:b4
         inet addr:99.12.44.15  Bcast:99.13.255.255  Mask:255.254.0.0
         inet6 addr: fe80::a00:27ff:fe05:b4b4/64 Scope:Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:0 errors:0 dropped:0 overruns:0 frame:0
         TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:0 (0.0 B)  TX bytes:648 (648.0 B)

lyubava@ubuntu:~$ ping 100.1.56.17
PING 100.1.56.17 (100.1.56.17) 56(84) bytes of data.
64 bytes from 100.1.56.17: icmp_seq=1 ttl=63 time=0.678 ms
64 bytes from 100.1.56.17: icmp_seq=2 ttl=63 time=1.49 ms
64 bytes from 100.1.56.17: icmp_seq=3 ttl=63 time=1.77 ms
64 bytes from 100.1.56.17: icmp_seq=4 ttl=63 time=1.58 ms
64 bytes from 100.1.56.17: icmp_seq=5 ttl=63 time=1.28 ms
64 bytes from 100.1.56.17: icmp_seq=6 ttl=63 time=0.941 ms
64 bytes from 100.1.56.17: icmp_seq=7 ttl=63 time=1.28 ms
64 bytes from 100.1.56.17: icmp_seq=8 ttl=63 time=1.52 ms
^C
--- 100.1.56.17 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7009ms
rtt min/avg/max/mdev = 0.678/1.321/1.775/0.336 ms
lyubava@ubuntu:~$ _
```

Результат успешного эхо-запроса от Ub3 к Ub1.

4. На трех ПК был запущен скрипт task4-v13.sh.

Были исправлены следующие ошибки в настройках сетевых адаптеров:

	Ошибка	Исправление
Ub1	eface vlan12 inet static	iface vlan12 inet static
	Добавлено:	gateway 1.2.3.55
Ub3	eface vlan23 inet static	iface vlan22 inet static
	netmask 255.254.128.0	netmask 255.255.128.0
	Добавлено:	gateway 11.1.29.31
UbR	vlan-raw-device enp0s8	vlan_raw_device enp0s8

Настройки сетевых адаптеров:

```
auto enp0s3 iface enp0s3 inet dhcp
auto lo inet loopback

auto vlan12
iface vlan12 inet static
address 1.2.3.4
netmask 255.254.0.0
vlan_raw_device enp0s3
gateway 1.2.3.55
~
~
```

Ub1

```
auto enp0s3
iface enp0s3 inet dhcp
auto lo
iface lo inet loopback

auto vlan22
iface vlan22 inet static
address 11.1.29.3
netmask 255.255.128.0
vlan_raw_device enp0s3
gateway 11.1.29.31
~
~
~
```

Ub3

```

auto enp0s3
iface enp0s3 inet dhcp
auto enp0s8
iface enp0s8 inet dhcp
auto lo
iface lo inet loopback

auto vlan12
iface vlan12 inet static
address 1.2.3.55
netmask 255.254.0.0
vlan_raw_device enp0s3
}
auto vlan22
iface vlan22 inet static
address 11.1.29.31
netmask 255.255.128.0
vlan_raw_device enp0s8
}

```

UbR

```

vlan12    Link encap:Ethernet  HWaddr 08:00:27:d1:fa:94
          inet addr:1.2.3.4  Bcast:1.3.255.255  Mask:255.254.0.0
          inet6 addr: fe80::a00:27ff:fed1:fa94/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:1152 (1.1 KB)

lyubava@ubuntu:~$ ping 11.1.29.3
PING 11.1.29.3 (11.1.29.3) 56(84) bytes of data.
64 bytes from 11.1.29.3: icmp_seq=1 ttl=63 time=1.01 ms
64 bytes from 11.1.29.3: icmp_seq=2 ttl=63 time=0.536 ms
64 bytes from 11.1.29.3: icmp_seq=3 ttl=63 time=0.621 ms
64 bytes from 11.1.29.3: icmp_seq=4 ttl=63 time=0.778 ms
64 bytes from 11.1.29.3: icmp_seq=5 ttl=63 time=0.340 ms
64 bytes from 11.1.29.3: icmp_seq=6 ttl=63 time=0.433 ms
64 bytes from 11.1.29.3: icmp_seq=7 ttl=63 time=0.468 ms
64 bytes from 11.1.29.3: icmp_seq=8 ttl=63 time=0.423 ms
64 bytes from 11.1.29.3: icmp_seq=9 ttl=63 time=1.37 ms
64 bytes from 11.1.29.3: icmp_seq=10 ttl=63 time=1.42 ms
^C
--- 11.1.29.3 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9003ms
rtt min/avg/max/mdev = 0.340/0.741/1.429/0.379 ms
lyubava@ubuntu:~$

```

Результат успешного эхо-запроса от Ub1 к Ub3.


```

vlan22    Link encap:Ethernet  HWaddr 08:00:27:05:b4:b4
          inet addr:11.1.29.3  Bcast:11.1.127.255  Mask:255.255.128.0
          inet6 addr: fe80::a00:27ff:fe05:b4b4/64  Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:648 (648.0 B)

lyubava@ubuntu:~$ ping 11.1.29.31
PING 11.1.29.31 (11.1.29.31) 56(84) bytes of data.
64 bytes from 11.1.29.31: icmp_seq=1 ttl=64 time=0.423 ms
64 bytes from 11.1.29.31: icmp_seq=2 ttl=64 time=1.00 ms
64 bytes from 11.1.29.31: icmp_seq=3 ttl=64 time=0.965 ms
^C
--- 11.1.29.31 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 0.423/0.796/1.001/0.265 ms
lyubava@ubuntu:~$ ping 1.2.3.4
PING 1.2.3.4 (1.2.3.4) 56(84) bytes of data.
64 bytes from 1.2.3.4: icmp_seq=1 ttl=63 time=0.398 ms
64 bytes from 1.2.3.4: icmp_seq=2 ttl=63 time=0.924 ms
64 bytes from 1.2.3.4: icmp_seq=3 ttl=63 time=0.440 ms
64 bytes from 1.2.3.4: icmp_seq=4 ttl=63 time=0.451 ms
64 bytes from 1.2.3.4: icmp_seq=5 ttl=63 time=0.496 ms
64 bytes from 1.2.3.4: icmp_seq=6 ttl=63 time=0.275 ms
64 bytes from 1.2.3.4: icmp_seq=7 ttl=63 time=0.576 ms
64 bytes from 1.2.3.4: icmp_seq=8 ttl=63 time=0.376 ms
64 bytes from 1.2.3.4: icmp_seq=9 ttl=63 time=0.514 ms
64 bytes from 1.2.3.4: icmp_seq=10 ttl=63 time=0.491 ms
^C
--- 1.2.3.4 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9002ms
rtt min/avg/max/mdev = 0.275/0.494/0.924/0.163 ms
lyubava@ubuntu:~$ _

```

Результат успешного эхо-запроса от Ub3 к Ub1.

Вывод.

Были изучены процессы создания и настройки виртуальных локальных сетей VLAN.