

Федеральное государственное бюджетное образовательное учреждение
высшего образования
Сибирский государственный университет телекоммуникаций и информатики

Практическая работа №8.
“Сетевые мосты. Протокол STP”

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1. Вам предоставлена подсеть 10.10.N.0/24, где N — это Ваш порядковый номер в списке журнала преподавателя. Разделите полученный диапазон адресов на 2 равные подсети. Настройте все сетевые интерфейсы маршрутизаторов и виртуальных машин в соответствии с выбранной схемой адресации так, чтобы они использовали адреса из одной подсети. Какие интерфейсы пингуются?

Подсеть 10.10.1.0/24

1 Подсеть: 10.10.1.0/25(10.10.1.1-10.10.1.127)

2 Подсеть: 10.10.1.128/25(10.10.1.129-10.10.1.255)

```
valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:1a:4e:02 brd ff:ff:ff:ff:ff:ff
    inet 10.10.1.1/25 brd 10.10.1.127 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fd00:2004:12:1:a00:27ff:fe1a:4e02/64 scope global deprecated mngtmpaddr dynamic
        valid_lft 6sec preferred_lft 0sec
    inet6 fe80::a00:27ff:fe1a:4e02/64 scope link
        valid_lft forever preferred_lft forever
user@astra:~$
```

```
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS      NETWORK      INTERFACE
0 10.10.1.3/25  10.10.1.0    ether3
1 10.10.1.4/25  10.10.1.0    ether4
2 10.10.1.5/25  10.10.1.0    ether5
```

```
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS      NETWORK      INTERFACE
0 10.10.1.6/25  10.10.1.0    ether1
1 10.10.1.7/25  10.10.1.0    ether2
```

```
valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:57:c6:d2 brd ff:ff:ff:ff:ff:ff
    inet 10.10.1.9/25 brd 10.10.1.127 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fd00:2004:12:2:a00:27ff:fe57:c6d2/64 scope global dynamic mngtmpaddr
        valid_lft 2591982sec preferred_lft 604782sec
    inet6 fe80::a00:27ff:fe57:c6d2/64 scope link
        valid_lft forever preferred_lft forever
```

VirtualBox Host-Only Ethernet Adapter #5	10.10.1.2/25	Выключен
VirtualBox Host-Only Ethernet Adapter #6	10.10.1.8/25	Выключен
VirtualBox Host-Only Ethernet Adapter #7	10.10.1.10/25	Выключен

```

0 10.10.1.1                                     timeout
sent=1 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.2
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.2                                     timeout
sent=1 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.3
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.3                                     timeout
sent=1 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.4
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.4                                     timeout
1 10.10.1.4                                     timeout
sent=2 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.5
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.5                                     timeout
sent=1 received=0 packet-loss=100%

[admin@MikroTik] > _

```

```

[admin@MikroTik] > ping 10.10.1.8
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.8                                     timeout
1 10.10.1.8                                     timeout
sent=2 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.9
SEQ HOST                                     SIZE TTL TIME          STATUS
0 10.10.1.9                                     timeout
1 10.10.1.9                                     timeout
sent=2 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.10
SEQ HOST                                    SIZE TTL TIME          STATUS
0 10.10.1.10                                    timeout
1 10.10.1.10                                    timeout
sent=2 received=0 packet-loss=100%

```

2. На маршрутизаторе mikrotik-01 объедините интерфейсы в сетевой мост. Какие интерфейсы теперь пингуются?

```

[admin@MikroTik] > /interface print
Flags: R - RUNNING; S - SLAVE
Columns: NAME, TYPE, ACTUAL-MTU, L2MTU, MAC-ADDRESS
#  NAME      TYPE      ACTUAL-MTU  L2MTU  MAC-ADDRESS
0  RS ether3   ether      1500      1500    08:00:27:61:2F:02
1  RS ether4   ether      1500      1500    08:00:27:12:33:16
2  RS ether5   ether      1500      1500    08:00:27:70:9E:2B
3  R  bridge1  bridge     1500      65535   08:00:27:61:2F:02
4  R  lo        loopback   65536     65536   00:00:00:00:00:00
[admin@MikroTik] > /interface bridge port print
Flags: D - DYNAMIC
Columns: INTERFACE, BRIDGE, HW, PVID, PRIORITY, HORIZON
#  INTERFACE  BRIDGE  HW  PVID  PRIORITY  HORIZON
0  all        bridge1 yes  1     0x80      none
1  D ether3    bridge1 yes  1     0x80      none
2  D ether4    bridge1 yes  1     0x80      none
3  D ether5    bridge1 yes  1     0x80      none
[admin@MikroTik] > _

```

```
numbers: 1
    interface: ether3
        status: in-bridge
    port-number: 1
        role: root-port
    edge-port: no
edge-port-discovery: yes
point-to-point-port: yes
    external-fdb: no
    sending-rstp: no
    learning: yes
    forwarding: yes
    actual-path-cost: 20000
    root-path-cost: 20000
    designated-bridge: 0x8000.08:00:27:4F:33:D6
    designated-cost: 0
    designated-port-number: 1
-- [Q quit|D dump|C-z pause]
```

```
[admin@MikroTik] > /interface bridge port monitor
numbers: 2
    interface: ether4
        status: in-bridge
    port-number: 2
        role: alternate-port
    edge-port: no
edge-port-discovery: yes
point-to-point-port: yes
    external-fdb: no
    sending-rstp: no
    learning: no
    forwarding: no
    actual-path-cost: 20000
    root-path-cost: 20000
    designated-bridge: 0x8000.08:00:27:4F:33:D6
    designated-cost: 0
    designated-port-number: 2
-- [Q quit|D dump|C-z pause]
```

```
[admin@MikroTik] > /interface bridge port monitor
numbers: 3
    interface: ether5
        status: in-bridge
    port-number: 3
        role: designated-port
    edge-port: yes
edge-port-discovery: yes
point-to-point-port: yes
    external-fdb: no
    sending-rstp: yes
    learning: yes
    forwarding: yes
    actual-path-cost: 20000
-- [Q quit|D dump|C-z pause]
```

```

[admin@MikroTik] > ping 10.10.1.1
  SEQ HOST                SIZE TTL TIME                STATUS
    0 10.10.1.1            56  64 4ms999us
    1 10.10.1.1            56  64 1ms238us
    2 10.10.1.1            56  64 1ms199us
  sent=3 received=3 packet-loss=0% min-rtt=1ms199us avg-rtt=2ms478us
  max-rtt=4ms999us

[admin@MikroTik] > ping 10.10.1.6
  SEQ HOST                SIZE TTL TIME                STATUS
    0 10.10.1.6            56  64 1ms238us
    1 10.10.1.6            56  64 1ms199us
  sent=2 received=0 packet-loss=100%

[admin@MikroTik] > ping 10.10.1.7
  SEQ HOST                SIZE TTL TIME                STATUS
    0 10.10.1.7            56  64 1ms238us
    1 10.10.1.7            56  64 1ms199us
    2 10.10.1.7            56  64 1ms199us
    3 10.10.1.11           84  64 85ms839us host unre...
  sent=4 received=0 packet-loss=100%

```

3. Используя wireshark покажите какой трафик доходит до host-машины в сети vboxnet-2.

Используя wireshark покажите какой трафик доходит до host-машины в сети vboxnet-2.

305	203.640...	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x9fee50a0
306	205.177...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
307	207.184...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
308	208.837...	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x9fee50a0
309	209.183...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
310	210.781...	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x9fee50a0
311	211.186...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
312	213.197...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
313	215.204...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
314	217.201...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
315	217.469...	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x9fee50a0
316	218.814...	10.10.1.11	255.255.255.255	MNDP	240	5678 → 5678 Len=198
317	218.814...	PCSSystemtec_12:33:16	CDP/VTP/DTP/PA...	CDP	132	Device ID: MikroTik Port ID: bridge1/ether4
318	218.814...	PCSSystemtec_12:33:16	LLDP_Multicast	LLDP	263	MA/08:00:27:12:33:16 IN/ether4 121 SysN=MikroTik Sy
319	219.205...	PCSSystemtec_12:33:16	Spanning-tree...	STP	60	RST. Root = 32768/0/08:00:27:61:2f:02 Cost = 0 Po
320	219.749...	fe80::a00:27ff:fe4f:33d6	ff02::1	MNDP	212	5678 → 5678 Len=150
321	219.751...	10.10.1.6	255.255.255.255	MNDP	192	5678 → 5678 Len=150
322	219.751...	fe80::a00:27ff:febe:c82b	ff02::1	MNDP	232	5678 → 5678 Len=170
323	219.751...	PCSSystemtec_4f:33:d6	CDP/VTP/DTP/PA...	CDP	124	Device ID: MikroTik Port ID: ether1
324	219.752...	10.10.1.7	255.255.255.255	MNDP	212	5678 → 5678 Len=170
325	219.752...	PCSSystemtec_be:c8:2b	CDP/VTP/DTP/PA...	CDP	124	Device ID: MikroTik Port ID: ether2
326	219.753...	PCSSystemtec_be:c8:2b	LLDP_Multicast	LLDP	187	MA/08:00:27:4f:33:d6 IN/ether2 121 SysN=MikroTik Sy

4. На хост машине запустите Wireshark. На маршрутизаторе mikrotik-02 объедините интерфейсы в сетевой мост с включением протокола STP. Какие порты в каком статусе? Поясните почему такие статусы стали у портов? Покажите в захваченном потоке Wireshark покажите и объясните пакеты, относящиеся к протоколу STP.

Создание сетевого моста, но уже с включенным протоколом STP(Для предотвращения возникновения петель в сети)

```

[admin@MikroTik] > /interface bridge port monitor
numbers: 0

        interface: ether1
        status: in-bridge
        port-number: 1
        role: designated-port
        edge-port: no
        edge-port-discovery: yes
        point-to-point-port: yes
        external-fdb: no
        sending-rstp: no
        learning: yes
        forwarding: yes
        actual-path-cost: 20000
-- [Q quit]D dump[C-z pause]

```

```

[admin@MikroTik] > /interface bridge port monitor
numbers: 1

        interface: ether2
        status: in-bridge
        port-number: 2
        role: designated-port
        edge-port: no
        edge-port-discovery: yes
        point-to-point-port: yes
        external-fdb: no
        sending-rstp: no
        learning: yes
        forwarding: yes
        actual-path-cost: 20000
-- [Q quit]D dump[C-z pause]

```

No.	Time	Source	Destination	Protocol	Length	Info
5806	2838.97.	fe80::7abc:f9e9:91bf:8e06	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5807	2838.98.	10.10.1.10	224.0.0.22	IGMPv3	60	Membership Report / Join group 224.0.0.252 for
5808	2838.98.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5809	2838.98.	fe80::a1ae:b527:5333:1983	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5810	2839.06.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5811	2839.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5812	2841.31.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5813	2841.67.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5814	2841.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5815	2842.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5816	2843.08.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5817	2844.44.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5818	2844.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5819	2845.49.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5820	2845.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5821	2847.55.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5822	2847.69.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5823	2848.47.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5824	2849.47.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5825	2849.69.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5826	2851.70.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5827	2853.70.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5828	2854.97.	fe80::e7e2:3483:3695:a9aa	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5829	2854.98.	fe80::7abc:f9e9:91bf:8e06	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5830	2854.98.	fe80::a1ae:b527:5333:1983	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5831	2855.07.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5832	2855.47.	fe80::e7e2:3483:3695:a9aa	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5833	2855.47.	fe80::7abc:f9e9:91bf:8e06	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5834	2855.47.	fe80::a1ae:b527:5333:1983	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
5835	2855.69.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5836	2855.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5837	2856.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5838	2857.71.	PCSSystemtec_bac8:2b	Spanning-tree-> STP	60	Conf. Root = 32768/0/00:00:27:4f:33:d6 Cost =	
5839	2857.97.	fe80::a1ae:b527:5333:1983	ff02::1:ffaf:3..	ICMPv6	86	Neighbor Solicitation for fe80::a00:27ff:fe4f:3
5840	2858.00.	10.10.1.11	255.255.255.255	NDP	220	5678 + 5678 Len=178
5841	2858.00.	PCSSystemtec_61:2f:02	CDP/VTP/DTP/PA..	CDP	132	Device ID: MikroTik Port ID: bridge1/ether3

Frame 5826: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
IEEE 802.3 Ethernet
Logical-Link Control
Spanning Tree Protocol
Protocol Identifier: Spanning Tree Protocol (0x0000)
Protocol Version Identifier: Spanning Tree (0)
BPDU Type: Configuration (0x00)
BPDU Flags: 0x00
Root Identifier: 32768 / 0 / 00:00:27:4f:33:d6
Root Path Cost: 0
Bridge Identifier: 32768 / 0 / 00:00:27:4f:33:d6
Bridge Priority: 32768
Bridge System ID Extension: 0
Bridge System ID: PCSSystemtec_Af:33:d6 (00:00:27:4f:33:d6)
Port Identifier: 0x8002
Message Age: 0
Max Age: 20
Hello Time: 2
Forward Delay: 15

Ethernet
1518
Destination
1518

В данном пакете присутствует информация об идентификаторе порта, через который отправляется кадр и информация о стоимости до корневого коммутатора.