РОССИЙСКИЙ УНИВЕРСИТЕТ ДРУЖБЫ НАРОДОВ

Факультет физико-математических и естественных наук

Кафедра прикладной информатики и теории вероятностей

ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ № 9

Использование протокола STP. Агрегирование каналов

дисциплина: Администрирование локальных сетей

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МОСКВА

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ЦЕЛЬ РАБОТЫ

Изучение возможностей протокола STP и его модификаций по обеспечению отказоустойчивости сети, агрегированию интерфейсов и перераспределению нагрузки между ними.

ХОД РАБОТЫ

1. Сформируйте резервное соединение между коммутаторами msk-donskayasw-1 и msk-donskaya-sw-3, настроив все нужные порты(Рис. 1-4).

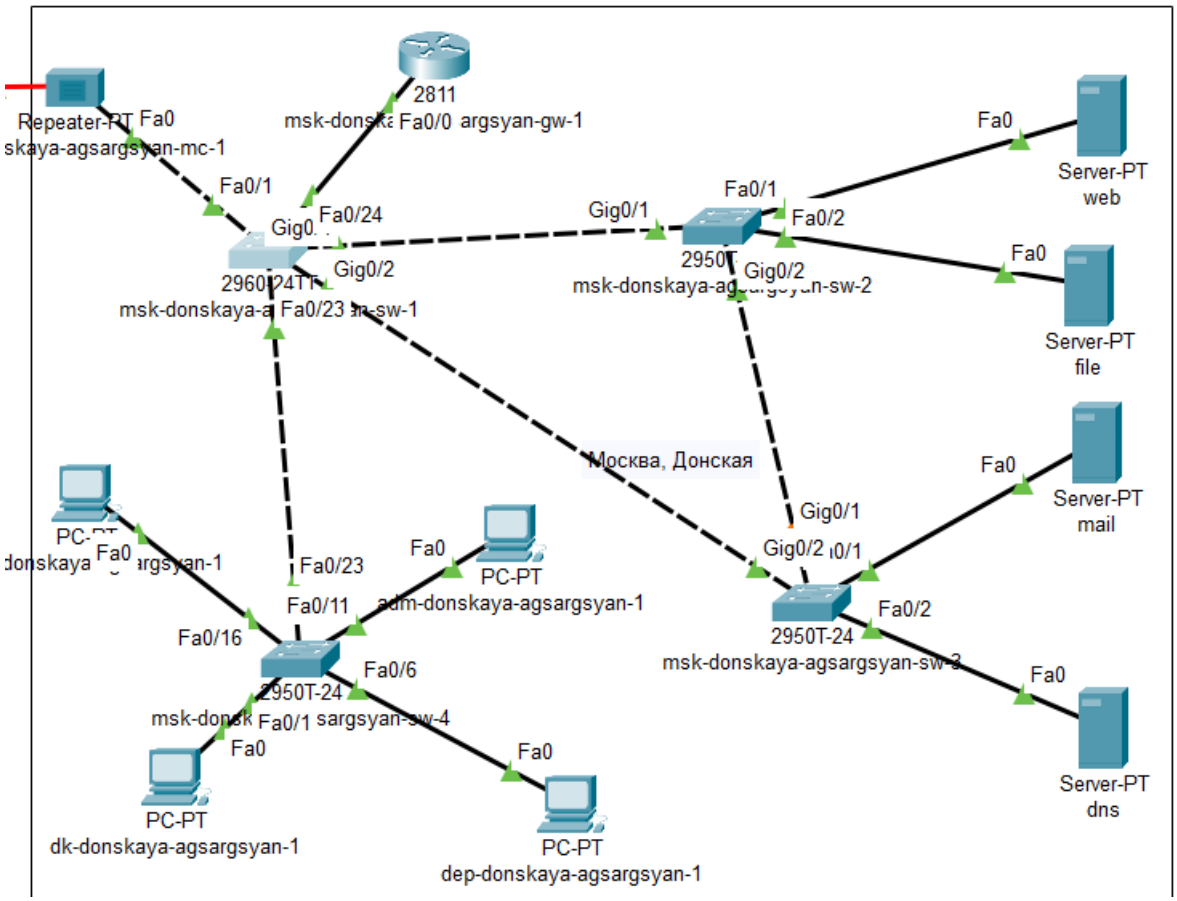

Рис. 1

```
msk-donskaya-agsargsyan-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-1(config)#int f0/23
msk-donskaya-agsargsyan-sw-1(config-if)#switchport mode trunk

msk-donskaya-agsargsyan-sw-1(config-if)#
```

Рис. 2

```
msk-donskaya-agsargsyan-sw-4#en
msk-donskaya-agsargsyan-sw-4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-4(config)#int f0/23
msk-donskaya-agsargsyan-sw-4(config-if)#switchport mode trunk

msk-donskaya-agsargsyan-sw-4(config-if)#
```

Рис. 3

```
msk-donskaya-agsargsyan-3>en
Password:
msk-donskaya-agsargsyan-3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-3(config)#int g0/2
msk-donskaya-agsargsyan-3(config-if)#switchport mode trunk
msk-donskaya-agsargsyan-3(config-if)#
msk-donskaya-agsargsyan-3#
```

Рис. 4

2. 2. С оконечного устройства dk-donskaya-1 пропинговал серверы mail и web (Рис. 5).

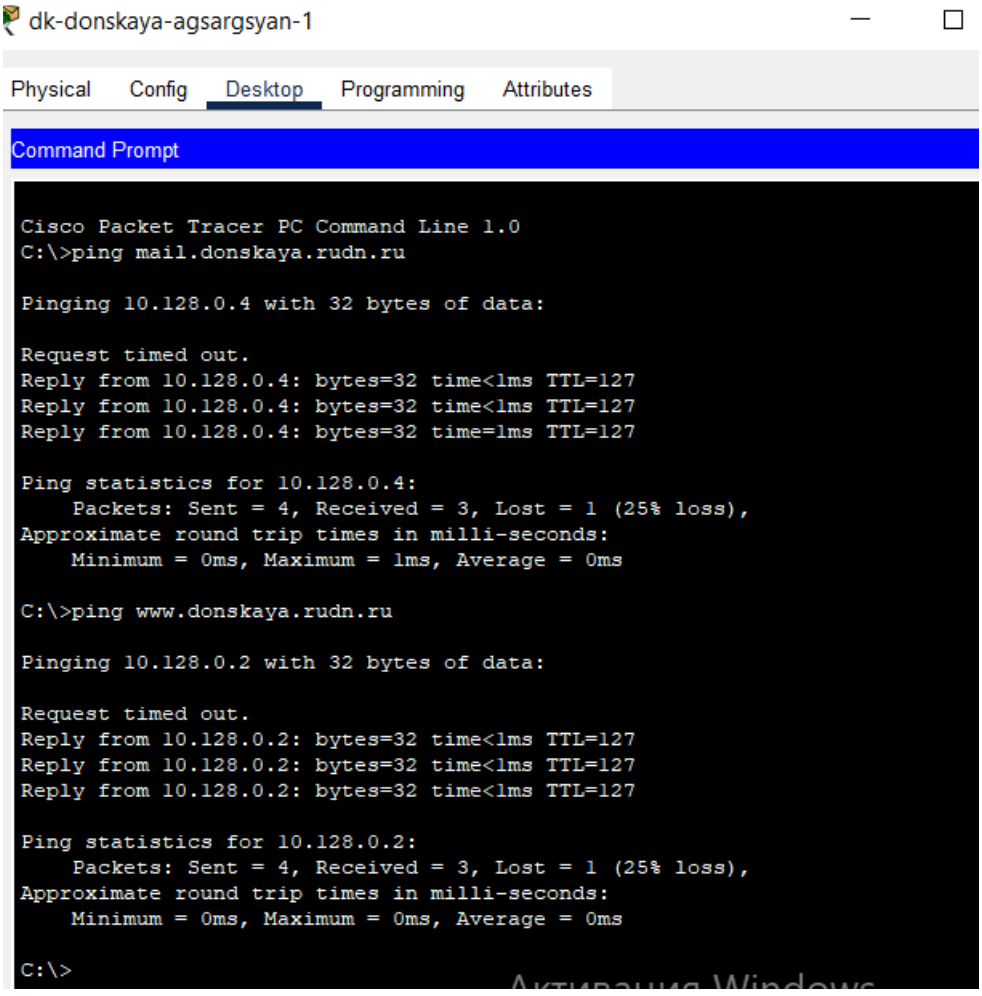

Рис. 5

3. В качестве корневого коммутатора STP настроил коммутатор msk-donskaya-sw-1, теперь пакеты ICMP пойдут от хоста dk-donskaya-1 до mail через коммутаторы msk-donskaya-sw-1 и msk-donskaya-sw-3, а от хоста dk-donskaya-1 до web через

коммутаторы msk-donskaya-sw-1 и msk-donskaya-sw-2. (Рис. 6-8).

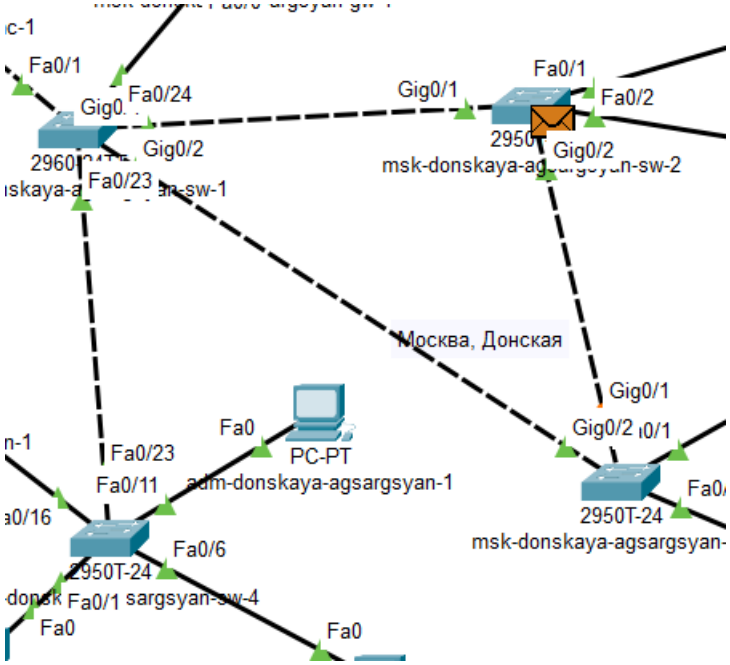

Рис. 6

```
[OK]
msk-donskaya-agsargsyan-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-1(config)#spanning-tree vlan 3 root primary
msk-donskaya-agsargsyan-sw-1(config)#
```

Рис. 7

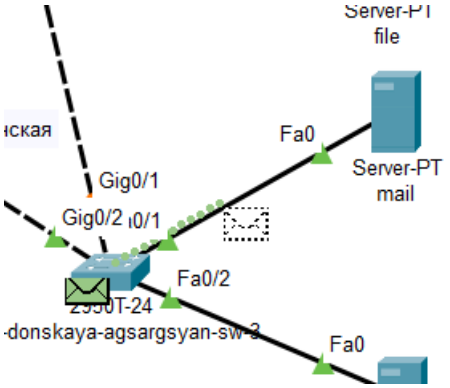

Рис. 8

4. .Настроил режим Portfast на тех интерфейсах коммутаторов, к которым подключены серверы (Рис. 9-10).

```
msk-donskaya-agsargsyan-sw-2#msk-donskaya-agsargsyan-sw-2#en
msk-donskaya-agsargsyan-sw-2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-2(config)#int f0/1
msk-donskaya-agsargsyan-sw-2(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface  when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet0/1 but will only
have effect when the interface is in a non-trunking mode.
msk-donskaya-agsargsyan-sw-2(config-if)#exit
msk-donskaya-agsargsyan-sw-2(config)#int f0/2
msk-donskaya-agsargsyan-sw-2(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface  when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
```

Рис. 9

```
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-3(config)#int f0/1
msk-donskaya-agsargsyan-3(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface  when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet0/1 but will only
have effect when the interface is in a non-trunking mode.
msk-donskaya-agsargsyan-3(config-if)#exit
msk-donskaya-agsargsyan-3(config)#int f0/2
msk-donskaya-agsargsyan-3(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface  when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet0/2 but will only
have effect when the interface is in a non-trunking mode.
msk-donskaya-agsargsyan-3(config-if)#exit
msk-donskaya-agsargsyan-3(config)#exit
msk-donskaya-agsargsyan-3#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-agsargsyan-3#wr mem
Building configuration...
[OK]
msk-donskaya-agsargsyan-3#
```

Рис. 10

5. Изучил отказоустойчивость протокола STP и время восстановления соединения при переключении на резервное соединение, отключив и сново включив интерфейс g0/2 на 3 коммутаторе (Рис. 11).

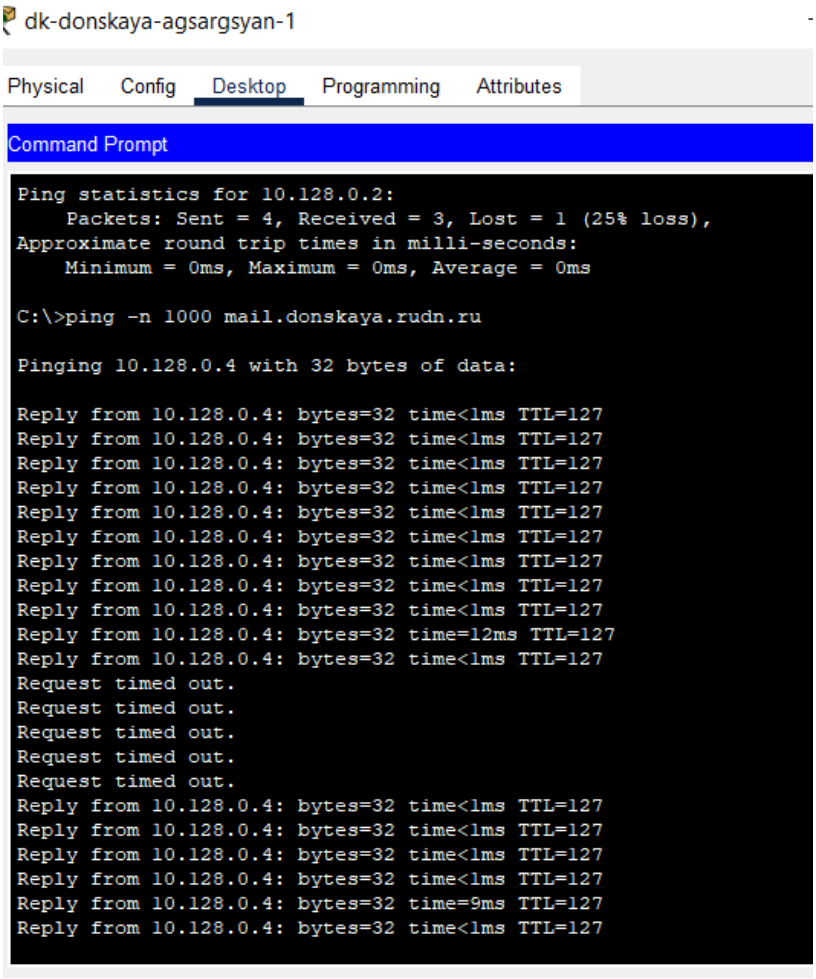

Рис. 11

6. . Переключил коммутаторы режим работы по протоколу Rapid PVST+ (Рис. 12-16).

```
Password:
msk-donskaya-agsargsyan-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-1(config)#spanning-tree mode rapid-pvst
msk-donskaya-agsargsyan-sw-1(config)#
```

Рис. 12

```
msk-donskaya-agsargsyan-sw-2#
msk-donskaya-agsargsyan-sw-2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-2(config)#spanning-tree mode rapid-pvst
msk-donskaya-agsargsyan-sw-2(config)#
```

Рис. 13

```
msk-donskaya-agsargsyan-3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-3(config)#spanning-tree mode rapid-pvst
msk-donskaya-agsargsyan-3(config)#
```

Рис. 14

```
msk-donskaya-agsargsyan-sw-4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-4(config)#spanning-tree mode rapid-pvst
msk-donskaya-agsargsyan-sw-4(config)#
```

Рис. 15

```
msk-pavlovskaya-agsargsyan-sw-1(config)#spanning-tree mode rapid-pvst
msk-pavlovskaya-agsargsyan-sw-1(config)#
```

Рис. 16

7. Изучил отказоустойчивость протокола Rapid PVST+ и время восстановления соединения при переключении на резервное соединение, процесс не прервался (Рис. 17).

```
^C
C:\>ping -n 1000 mail.donskaya.rudn.ru

Pinging 10.128.0.4 with 32 bytes of data:

Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=2ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=12ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
```

Рис. 17

8. Сформируйте агрегированное соединение интерфейсов Fa0/20 – Fa0/23 между коммутаторами msk-donskaya-sw-1 и msk-donskaya-sw-4 и настроил агрегирование каналов (Рис. 18-20).

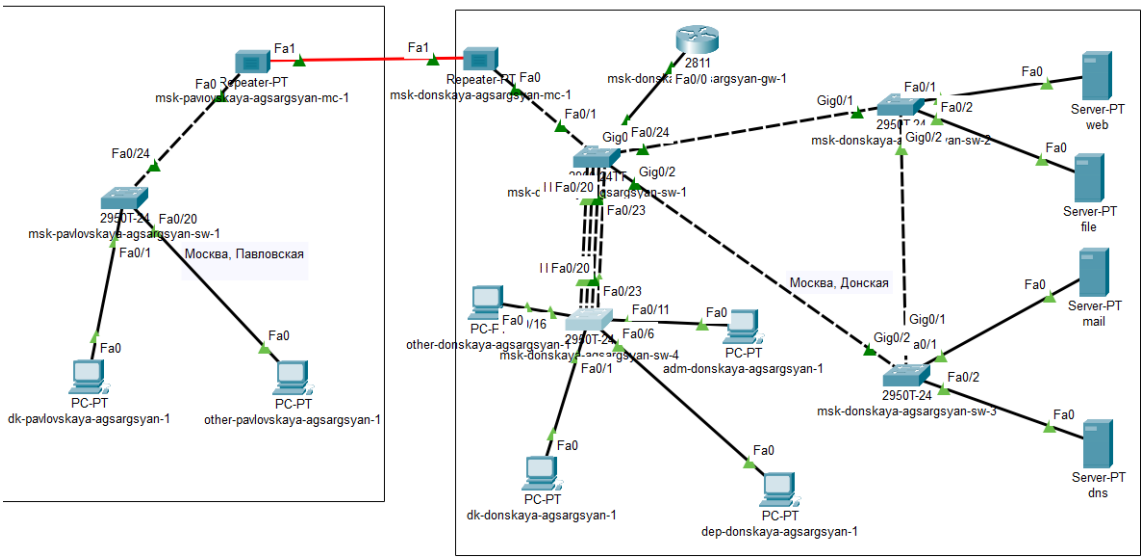

Рис. 18

```
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-agsargsyan-sw-1#en
msk-donskaya-agsargsyan-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-1(config)#interface range f0/20 - 23
msk-donskaya-agsargsyan-sw-1(config-if-range)#channel-group 1 mode on
msk-donskaya-agsargsyan-sw-1(config-if-range)#
Creating a port-channel interface Port-channel 1

%LINK-5-CHANGED: Interface Port-channel1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/20 and will be suspended (dtp mode of Fa0/23 is on, Fa0/20is off )

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/21 and will be suspended (dtp mode of Fa0/23 is on, Fa0/21is off )

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/22 and will be suspended (dtp mode of Fa0/23 is on, Fa0/22is off )

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to down

msk-donskaya-agsargsyan-sw-1(config-if-range)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/20 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/20 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/21 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/20 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/22 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/20 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/20 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/21 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/21 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/21 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/22 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/21 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/20 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/22 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/21 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/22 (104).

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/22 (1), with msk-donskaya-agsargsyan-sw-4 FastEthernet0/22 (104).

msk-donskaya-agsargsyan-sw-1(config-if-range)#exit
msk-donskaya-agsargsyan-sw-1(config)#interface port-channel 1
msk-donskaya-agsargsyan-sw-1(config-if)#switchport mode trunk

msk-donskaya-agsargsyan-sw-1(config-if)#
```

Рис. 19

```
msk-donskaya-agsargsyan-sw-4#en
msk-donskaya-agsargsyan-sw-4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-donskaya-agsargsyan-sw-4(config)#interface range f0/20 - 23
msk-donskaya-agsargsyan-sw-4(config-if-range)#no switchport access vlan 104
msk-donskaya-agsargsyan-sw-4(config-if-range)#exit
msk-donskaya-agsargsyan-sw-4(config)#
msk-donskaya-agsargsyan-sw-4(config)#interface range f0/20 - 23
msk-donskaya-agsargsyan-sw-4(config-if-range)#channel group 1 mode on
% Ambiguous command: "channel group 1 mode on"
msk-donskaya-agsargsyan-sw-4(config-if-range)#channel-group 1 mode on
msk-donskaya-agsargsyan-sw-4(config-if-range)#
Creating a port-channel interface Port-channel 1

%LINK-5-CHANGED: Interface Port-channel1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/20 and will be suspended (dtp mode of Fa0/23 is on, Fa0/20is off )

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/21 and will be suspended (dtp mode of Fa0/23 is on, Fa0/21is off )

%EC-5-CANNOT_BUNDLE2: Fa0/23 is not compatible with Fa0/22 and will be suspended (dtp mode of Fa0/23 is on, Fa0/22is off )

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan2, changed state to down

msk-donskaya-agsargsyan-sw-4(config-if-range)#%SPANTREE-2-RECV_PVID_ERR: Received 802.1Q BPDU on non trunk Port-channel1 VLAN1.

%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking Port-channel1 on VLAN0001. Inconsistent port type.


msk-donskaya-agsargsyan-sw-4(config-if-range)#exit
msk-donskaya-agsargsyan-sw-4(config)#interface port-channel 1
msk-donskaya-agsargsyan-sw-4(config-if)#switchport mode trunk

msk-donskaya-agsargsyan-sw-4(config-if)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking Port-channel1 on VLAN0001. Port consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking Port-channel1 on VLAN0001. Port consistency restored.


msk-donskaya-agsargsyan-sw-4(config-if)#
msk-donskaya-agsargsyan-sw-4#
%SYS-5-CONFIG_I: Configured from console by console

msk-donskaya-agsargsyan-sw-4#wr mem
Building configuration...
[OK]
msk-donskaya-agsargsyan-sw-4#
```

Рис. 20

9. Обновил схему l1 (Рис. 21).

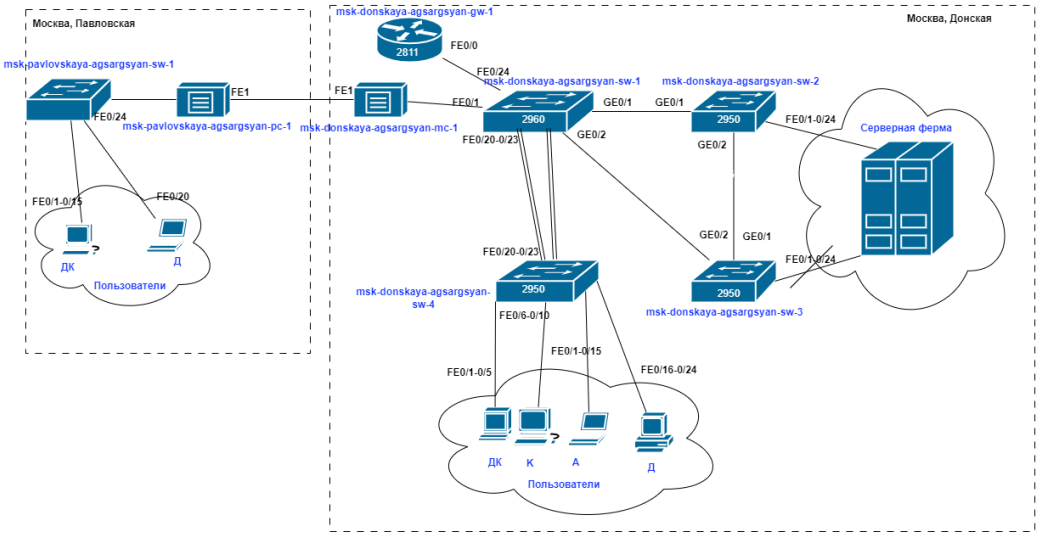

Рис. 21

ОТВЕТЫ НА КОНТРОЛЬНЫЕ ВОПРОСЫ

1. Какую информацию можно получить, воспользовавшись командой определения состояния протокола STP для VLAN (на корневом и не на корневом устройстве)? Приведите примеры вывода подобной информации на устройствах.

VLAN… // Номер VLAN

STP … // Тип протокола

Root ID/Bridge ID // Ближайший коммутатор/Текущий коммутатор

Priority … // Приоритет

Address … // MAC-адрес

Cost … // «Затраты» до этого коммутатора

Port … // Порт

Hello Time … Max Age … Forward Delay … Aging Time … // Время работы STP // Свойства портов

2. При помощи какой команды можно узнать, в каком режиме, STP или Rapid PVST+, работает устройство? Приведите примеры вывода подобной информации на устройствах.

show ru или sh ru

3. Для чего и в каких случаях нужно настраивать режим Portfast?

Portfast позволяет сразу включать выделенные порты, поскольку они не подключены к коммутаторам и не участвуют во включении STP.

4. В чем состоит принцип работы агрегированного интерфейса? Для чего он используется?

Агрегированный канал объединяет параллельные каналы для увеличения пропускной способности, а также не теряет соединение при обрыве одного из каналов,

перенаправляя трафик.

5. В чём принципиальные отличия при использовании протоколов LACP (Link Aggregation Control Protocol), PAgP (Port Aggregation Protocol) и статического агрегирования без использования протоколов?

LACP общий стандарт IEEE

PAgP — локальный протокол Cisco. Для них обязательна настройка сторон (активная, пассивная, авто).

При статическом агрегировании коммутатор обрабатывает данные как с магистрали, даже если она не настроена на другой стороне.

6. При помощи каких команд можно узнать состояние агрегированного канала EtherChannel?

show etherchannel или sh etcherchannel

ИТОГОВЫЕ КОНФИГУРАЦИИ

1. **msk-donskaya-agsargsyan-sw-1**

```
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname msk-donskaya-agsargsyan-sw-1
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
ip domain-name donskaya.rudn.edu
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
spanning-tree vlan 3 priority 24576
```

```
!
interface Port-channel1
 switchport mode trunk
!
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
```

```
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/21
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/22
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/23
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/24
 switchport mode trunk
!
interface GigabitEthernet0/1
 switchport mode trunk
!
interface GigabitEthernet0/2
 switchport mode trunk
!
interface Vlan1
 no ip address
```

```
 shutdown
!
interface Vlan2
 ip address 10.128.1.2 255.255.255.0
!
ip default-gateway 10.128.1.1
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 password 7 0822455D0A16
 login
 transport input ssh
line vty 5 15
 login
!
!
!
!
end
```

2. **msk-donskaya-agsargsyan-sw-2**

```
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname msk-donskaya-agsargsyan-sw-2
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
```

```
!
!
!
ip domain-name donskaya.rudn.edu
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 3
 switchport mode access
 spanning-tree portfast
!
interface FastEthernet0/2
 switchport access vlan 3
 switchport mode access
 spanning-tree portfast
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
```

```
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
 switchport mode trunk
!
interface GigabitEthernet0/2
```

```
 switchport mode trunk
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan2
 ip address 10.128.1.3 255.255.255.0
!
ip default-gateway 10.128.1.1
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 password 7 0822455D0A16
 login
 transport input ssh
line vty 5 15
 login
!
!
!
!
end
```

3. **msk-donskaya-agsargsyan-sw-3**

```
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
```

```
!
hostname msk-donskaya-agsargsyan-3
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
ip domain-name donskaya.rudn.edu
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 3
 switchport mode access
 spanning-tree portfast
!
interface FastEthernet0/2
 switchport access vlan 3
 spanning-tree portfast
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
```

```
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
```

```
 switchport mode trunk
!
interface GigabitEthernet0/2
 switchport mode trunk
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan2
 ip address 10.128.1.4 255.255.255.0
!
ip default-gateway 10.128.1.1
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 password 7 0822455D0A16
 login
 transport input ssh
line vty 5 15
 login
!
!
!
!
end
```

4. **msk-donskaya-agsargsyan-sw-4**

```
!
```

```
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname msk-donskaya-agsargsyan-sw-4
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
ip domain-name donskaya.rudn.edu
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
interface Port-channel1
 switchport mode trunk
!
interface FastEthernet0/1
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/2
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 101
 switchport mode access
!
```

```
interface FastEthernet0/4
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/5
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/6
 switchport access vlan 102
 switchport mode access
!
interface FastEthernet0/7
 switchport access vlan 102
 switchport mode access
!
interface FastEthernet0/8
 switchport access vlan 102
 switchport mode access
!
interface FastEthernet0/9
 switchport access vlan 102
 switchport mode access
!
interface FastEthernet0/10
 switchport access vlan 102
 switchport mode access
!
interface FastEthernet0/11
 switchport access vlan 103
 switchport mode access
!
interface FastEthernet0/12
 switchport access vlan 103
 switchport mode access
```

```
!
interface FastEthernet0/13
 switchport access vlan 103
 switchport mode access
!
interface FastEthernet0/14
 switchport access vlan 103
 switchport mode access
!
interface FastEthernet0/15
 switchport access vlan 103
 switchport mode access
!
interface FastEthernet0/16
 switchport access vlan 104
 switchport mode access
!
interface FastEthernet0/17
 switchport access vlan 104
 switchport mode access
!
interface FastEthernet0/18
 switchport access vlan 104
 switchport mode access
!
interface FastEthernet0/19
 switchport access vlan 104
 switchport mode access
!
interface FastEthernet0/20
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/21
 switchport mode trunk
```

```
 channel-group 1 mode on
!
interface FastEthernet0/22
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/23
 switchport mode trunk
 channel-group 1 mode on
!
interface FastEthernet0/24
 switchport access vlan 104
 switchport mode access
!
interface GigabitEthernet0/1
 switchport mode trunk
!
interface GigabitEthernet0/2
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan2
 ip address 10.128.1.5 255.255.255.0
!
ip default-gateway 10.128.1.1
!
!
!
!
line con 0
!
line vty 0 4
 password 7 0822455D0A16
```

```
 login
 transport input ssh
line vty 5 15
 login
!
!
!
!
end
```

5. **msk-pavlovskaya-agsargsyan-sw-1**

```
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname msk-pavlovskaya-agsargsyan-sw-1
!
enable secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
ip domain-name pavlovskaya.rudn.edu
!
username admin secret 5 $1$mERr$hx5rVt7rPNoS4wqbXKX7m0
!
!
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 101
 switchport mode access
!
```

```
interface FastEthernet0/2
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/4
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/5
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/6
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/7
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/8
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/9
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/10
 switchport access vlan 101
 switchport mode access
```

```
!
interface FastEthernet0/11
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/12
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/13
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/14
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/15
 switchport access vlan 101
 switchport mode access
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
 switchport access vlan 104
 switchport mode access
!
interface FastEthernet0/21
!
```

```
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
 switchport mode trunk
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
 no ip address
 shutdown
!
interface Vlan2
 ip address 10.128.1.6 255.255.255.0
!
ip default-gateway 10.128.1.1
!
!
!
!
line con 0
 password 7 0822455D0A16
 login
!
line vty 0 4
 password 7 0822455D0A16
 login
 transport input ssh
line vty 5 15
 login
!
!
```

!

!

end

ВЫВОД

Я Изучил возможности протокола STP и его модификаций по обеспечению отказоустойчивости сети, агрегированию интерфейсов и перераспределению нагрузки между ними.