Лабораторная работа №9

Использование протокола STP. Агрегирование каналов

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Информация

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Цель работы

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

Задание

- 1. Сформировать резервное соединение между коммутаторами msk-donskayasw-1 и msk-donskaya-sw-3.
- 2. Настроить балансировку нагрузки между резервными соединениями.
- 3. Настроить режим Portfast на тех интерфейсах коммутаторов, к которым подключены серверы.
- 4. Изучить отказоустойчивость резервного соединения.
- 5. Сформировать и настроить агрегированное соединение интерфейсов Fa0/20 Fa0/23 между коммутаторами msk-donskaya-sw-1 и msk-donskaya-sw-4.
- 6. При выполнении работы необходимо учитывать соглашение об именовании.

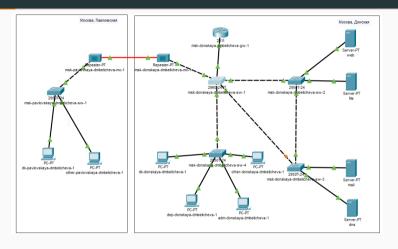


Рис. 1: Логическая схема локальной сети с резервным соединением

```
msk-donskaya-dmbelicheva-sw-3>en
Password:
msk-donskaya-dmbelicheva-sw-3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-sw-3(config)#int g0/2
msk-donskaya-dmbelicheva-sw-3(config-if)#switchport mode trunk
msk-donskaya-dmbelicheva-sw-3(config-if)#^Z
msk-donskaya-dmbelicheva-sw-33(config-if)#^Z
```

Рис. 2: Настройка trunk-порта на интерфейсе Gig0/2 коммутатора msk-donskaya-sw-3

```
C:\>ping www.donskava.rudn.ru
Pinging 10.128.0.2 with 32 bytes of data:
Reply from 10.128.0.2: bytes=32 time=20ms TTL=127
Reply from 10.128.0.2: bytes=32 time=22ms TTL=127
Reply from 10.128.0.2: bytes=32 time=1ms TTL=127
Reply from 10.128.0.2: bytes=32 time<1ms TTL=127
Ping statistics for 10.128.0.2:
    Packets: Sent = 4. Received = 4. Lost = 0 (0% loss).
Approximate round trip times in milli-seconds:
   Minimum = 0ms, Maximum = 22ms, Average = 10ms
C:\>ping mail.donskava.rudn.ru
Pinging 10.128.0.4 with 32 bytes of data:
Reply from 10.128.0.4: bytes=32 time=10ms 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
Ping statistics for 10.128.0.4:
    Packets: Sent = 4. Received = 4. Lost = 0 (0% loss).
Approximate round trip times in milli-seconds:
    Minimum = 0ms. Maximum = 10ms. Average = 2ms.
```

Рис. 3: Пингование сервера mail и web

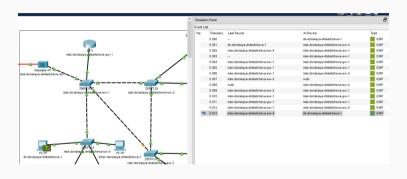


Рис. 4: Режим симуляции движения пакетов ІСМР

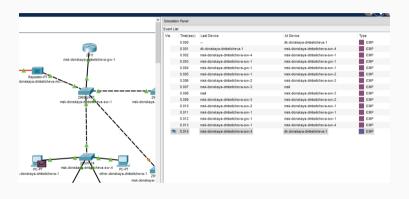


Рис. 5: Режим симуляции движения пакетов ІСМР

```
msk-donskava-dmbelicheva-sw-2#show spanning-tree vlan 3
VLAN0003
 Spanning tree enabled protocol ieee
 Root ID
          Priority 32771
           Address
                    0000.0C2E.ED0E
           This bridge is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 Bridge ID Priority 32771 (priority 32768 sys-id-ext 3)
           Address 0000.0C2E.ED0E
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 20
Interface
               Role Sts Cost
                            Prio.Nbr Type
Fa0/2
             Desg FWD 19
                          128.2 P2p
Fa0/1
             Desa FWD 19
                          128.1 P2p
                               128.25 P2p
Gi0/1
             Desa FWD 4
Gi0/2
              Desa FWD 4
                              128.26
                                       P2p
msk-donskava-dmbelicheva-sw-2#
```

Рис. 6: Просмотр состояния протокола STP для vlan 3

```
msk-donskava-dmbelicheva-sw-l>en
Dageword:
msk-donskava-dmbelicheva-sw-l#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskava-dmbelicheva-sw-l(config)#spanning-tree vlan 3 root primary
msk-donskava-dmbelicheva-sw-1(config)#^Z
msk-donskava-dmbelicheva-sw-l#
%SYS-5-CONFIG_I: Configured from console by console
msk-donskava-dmbelicheva-sw-l#wr m
Building configuration ...
(OK)
msk-donskava-dmbelicheva-sw-l#show spanning-tree vlan 3
MLTMOOOS
  Spanning tree enabled protocol ieee
 Root ID
           Priority
                      24579
            Address
                      0001 C9AS 79E6
            This bridge is the root
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 Bridge ID Priority 24579 (priority 24576 sys-id-ext 3)
            Address 0001 C9A8 79E6
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
            Aging Time 20
Interface
              Role Sts Cost Prio.Nbr Type
F=0/1
         Desg FWD 19 128.1 Shr
       Desg FWD 4 128.26 P2p
Desg FWD 19 128.23 P2p
Desg FWD 4 128.25 P2p
Gi 0 / 2
Fa0/23
Gi0/1
       Desa FWD 19
Fa0/24
                                  128.24 P2p
```

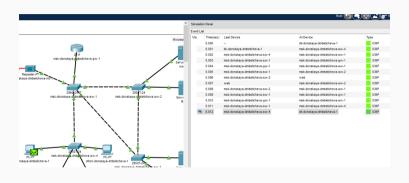


Рис. 8: Режим симуляции движения пакетов ICMP к серверу web

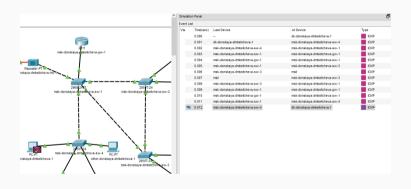


Рис. 9: Режим симуляции движения пакетов ICMP к серверу mail

msk-donskaya-dmbelicheva-sw-2\$conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-sw-2(config)\$int f0/1
msk-donskaya-dmbelicheva-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-dmbelicheva-sw-2(config-if)#int f0/2
msk-donskaya-dmbelicheva-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 FastEthernet0/2 but will only have effect when the interface is in a non-trunking mode.

Рис. 10: Настройка режима Portfast

```
C:\>ping -n 1000 mail.donskava.rudn.ru
Pinging 10.128.0.4 with 32 bytes of data:
Reply from 10.128.0.4: bytes=32 time=15ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time<lms 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<lms 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
Penly from 10 120 0 4: butes=22 time/lms TTI=127
```

Рис. 11: Пингование mail.donskaya.rudn.ru

```
msk-donskaya-dmbelicheva-sw-3$conf t
Enter configuration commands, one per line. End with CNTL/2.
msk-donskaya-dmbelicheva-sw-3(config)$int g0/2
msk-donskaya-dmbelicheva-sw-3(config-if)$shutdown

msk-donskaya-dmbelicheva-sw-3(config-if)$
$LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
```

Рис. 12: Разрыв соединения

```
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
Request timed out.
Reply from 10.128.0.4: bytes=32 time=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
```

Рис. 13: Время восстановления соединения

```
msk-donskaya-dmbelicheva-sw-1>en
Password:
msk-donskaya-dmbelicheva-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-sw-1(config)#spanning-tree mode rapid-pvst
msk-donskaya-dmbelicheva-sw-1(config)#^Z
msk-donskaya-dmbelicheva-sw-1#
&CYS-S-CONFIG I: Configured from console by console
```

Рис. 14: Режим работы по протоколу Rapid PVST+

```
Pinging 10.128.0.4 with 32 bytes of data:

Reply from 10.128.0.4: bytes=32 time=30ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms 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=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms 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. 15: Пингование mail.donskaya.rudn.ru

```
msk-donskaya-dmbelicheva-sw-3$conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-dmbelicheva-sw-3(config)#int g0/2
msk-donskaya-dmbelicheva-sw-3(config-if)#shutdown
msk-donskaya-dmbelicheva-sw-3(config-if)#shutdown
msk-donskaya-dmbelicheva-sw-3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to down
msk-donskaya-dmbelicheva-sw-3(config-if)#no shutdown
msk-donskaya-dmbelicheva-sw-3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up
```

Рис. 16: Разрыв соединения

```
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=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Request timed out.
Reply from 10.128.0.4: bytes=32 time=11ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Reply from 10.128.0.4: bytes=32 time=23ms TTL=127
Reply from 10.128.0.4: bytes=32 time=10ms TTL=127
Reply from 10.128.0.4: bytes=32 time<1ms TTL=127
Donly from 10 129 0 4: hutar-22 time/lms TTI-127
```

Рис. 17: Время восстановления соединения

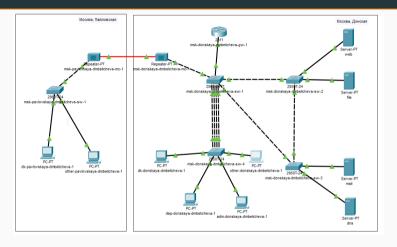


Рис. 18: Логическая схема локальной сети с агрегированным соединением

```
msk-donskaya-dmbelicheva-sw-l>en
Password:
msk-donskaya-dmbelicheva-sw-l$conf t
Enter configuration commands, one per line. End with CNTL/2.
msk-donskaya-dmbelicheva-sw-l(config)$int f0/23
msk-donskaya-dmbelicheva-sw-l(config-if)$no switchport mode trunk
$CND-4-NATIVE VLAN MISMATCH: Native VLAN mismatch discovered on FastEthernet0/20 (1)
```

Рис. 19: Настройка агрегирования каналов на msk-donskaya-dmbelicheva-sw-1

```
msk-donskava-dmbelicheva-sv-1(config)fint range f0/20 - 23
msk-donskaya-dmbelicheva-sv-1(config-if-range)#channel-group 1 mode on
*CDP-4-NATIVE VIAN MISSATCH: Native VIAN missatch discovered on FastEthernet0/20 (1)
acro-4-matrix with Higgsich: Native VLAN mismatch discovered on FestSthernet0/21 (1).
with makedonakayardebalichayarayara FaanEsharmas(/21 (104)
 SCHOOLSCHITTER WINE HISPETCH: Native WINE stematch discovered on TastSchernato(22 (1)
 with msk-donskava-dmbelicheva-sv-4 FastEthernet0/22 (104)
 msk-donskaya-dmbelicheva-sv-l(config-if-range)#
 *LINE-6-CHANGED: Interface Port-channell, changed state to up
 $LINESPOTO-6-UFDOMS: Line protocol on Interface Fort-channell, changed state to up
MEC-5-CAMBOT MUNICES: Fe0/23 is not compatible with Fe0/20 and will be suspended (dup
mode of Ta0/23 is on Ta0/201s off
ARCHITECTURE REPORTED - Pariety to non-comparing with Pariety and will be supported idea.
mode of Fa0/22 is on. Fa0/21is off )
 ASC-6-CAMMOT BUBBLES: Fa0/33 is not compatible with Fa0/33 and will be suspended (dto
mode of Fa0/22 is on, Fa0/22is off )
 *LINESGOTO-6-USDOWN: Line protocol on Interface FastEthernet0/23, changed state to down
 mak-donakaya-debalichaya-ay-1(config-if-rance)finterface mort-channel 1
mak-donakaya-dobalichaya-ay-1(config-11-14)
ACDP-4-NATIVE VIAM MISSATCH: Native VIAM missatch discovered on FastEthernet0/20 (1).
 with msk-donskaya-dmbelicheva-sw-4 FastEthernet0/20 (104)
ACCUSATING THE STREET, Marries Wild streets discovered on Party between (1) (1)
with msk-donskava-debalishava-sw-4 FastEthernet0/20 (104)
*CDP-4-WATTVE VIAN HISMATCH: Native VIAN mismatch discovered on FastEthernet0/22 (1).
with mak-donakava-debelicheva-sv-4 FassEsbernes0/20 (104).
*CDF-4-WATIVE_VLAM_HISMATCH: Native VLAM mismatch discovered on FastSthernet0/20 (1),
 *CDP-4-WATIVE_VLAM HISMATCH: Hative VLAM mismatch discovered on FastEthernet0/21 (1),
with mak-donakava-debalishava-aw-d FastEtharnat0/21 (104)
ACDE-4-WATTUE VIAM MISSATCH: Maxive VIAM mismatch discovered on FastEthernet0/30 (1).
with msk-donskava-dmbelicheva-sv-4 FastEthernet0/21 (104).
 ACDP-4-NATIVE_VLAM_HISMATCH: Hasive VLAM mismatch discovered on FastEthernet0/20 (1),
 with makedonakaua-dahalichara-ared FassEnharman(/22 /104)
 ACTE A STATUTE STAN METHOD CO. Maning STAN planes of discovered on Park Schools (2) (2)
with msh-donskava-debalichava-sw-1 FastEtharnat0/22 (104).
ACDE-4-MATTVE VIAM MISSATCH: Native VIAM missatch discovered on EastEthernet0/22 (1).
with msk-donskaya-dmbelicheva-sw-4 FastEthernet0/22 (104).
A lebigrooms command: "a"
msk-donskava-dmbelicheva-sw-l(config-if)fswitchport mode trunk
```

Рис. 20: Настройка агрегирования каналов на msk-donskaya-dmbelicheva-sw-1

Выводы

В результате выполнения лабораторной работы я изучила возможности протокола STP и его модификаций по обеспечению отказоустойчивости сети, агрегированию интерфейсов и перераспределению нагрузки между ними.