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ОТЧЕТ ПО ПРАКТИЧЕСКОЙ РАБОТЕ

по дисциплине «Технологии передачи данных»

Лабораторная работа №11

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ХОД РАБОТЫ

Теоретическая часть

В рамках данного шага работы необходимо на представленных топологиях определить корневые мосты и роли портов (Рисунок 1 -3).

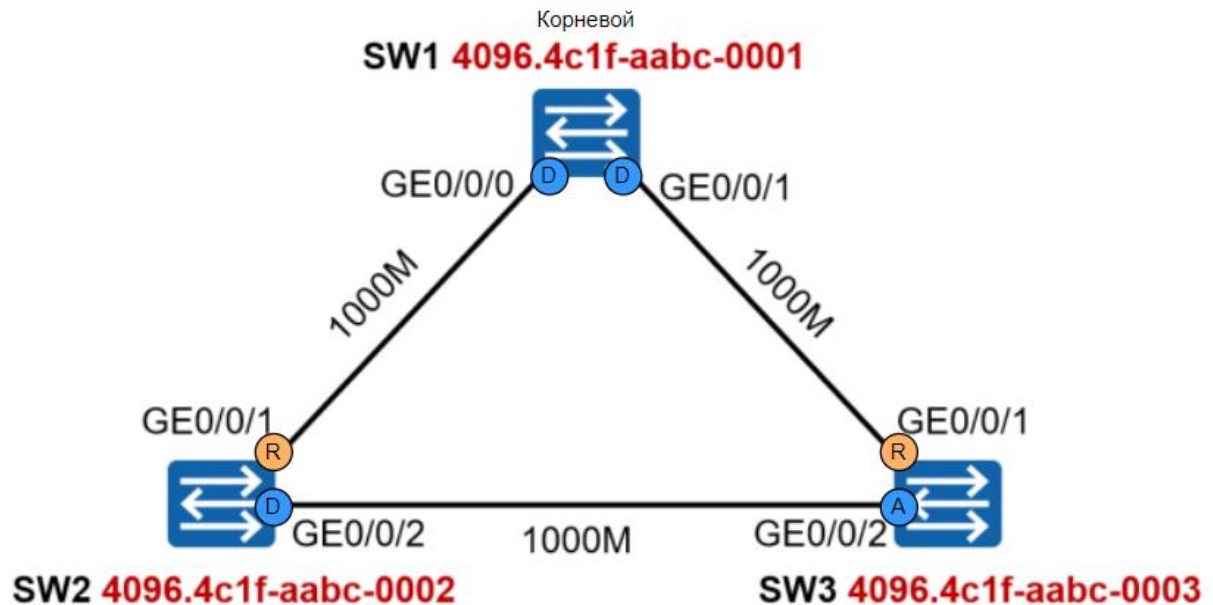


Рисунок 1 – Топология сети

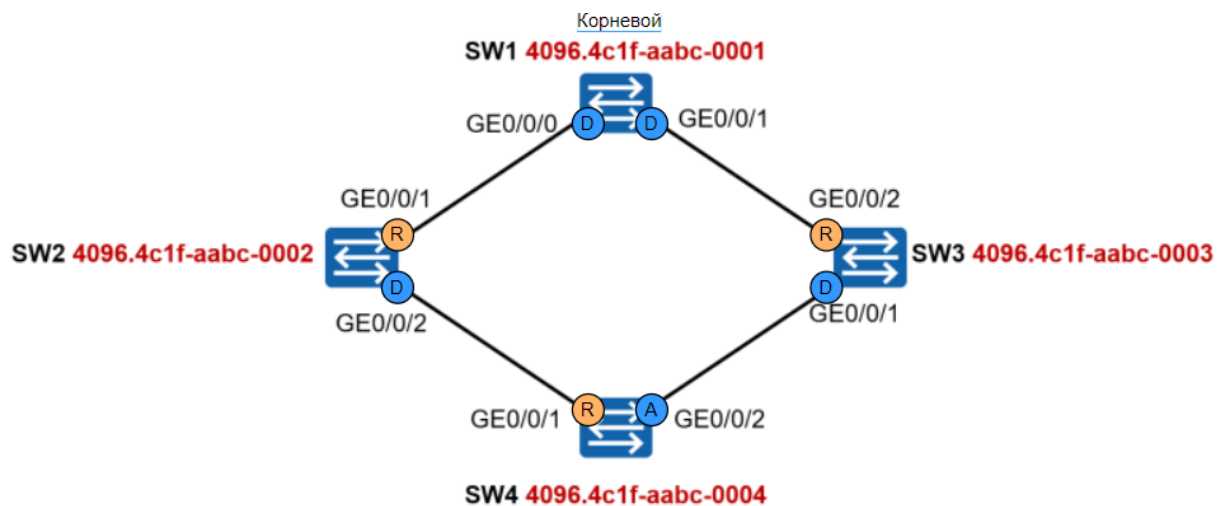


Рисунок 2 – Топология сети

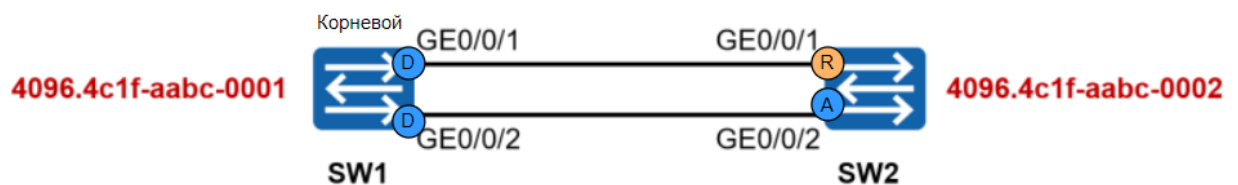


Рисунок 3 – Топология сети

Практическая часть

В рамках данного шага представлена топология сети с резервными каналами, повышающими сетевую доступность (Рисунок 4).

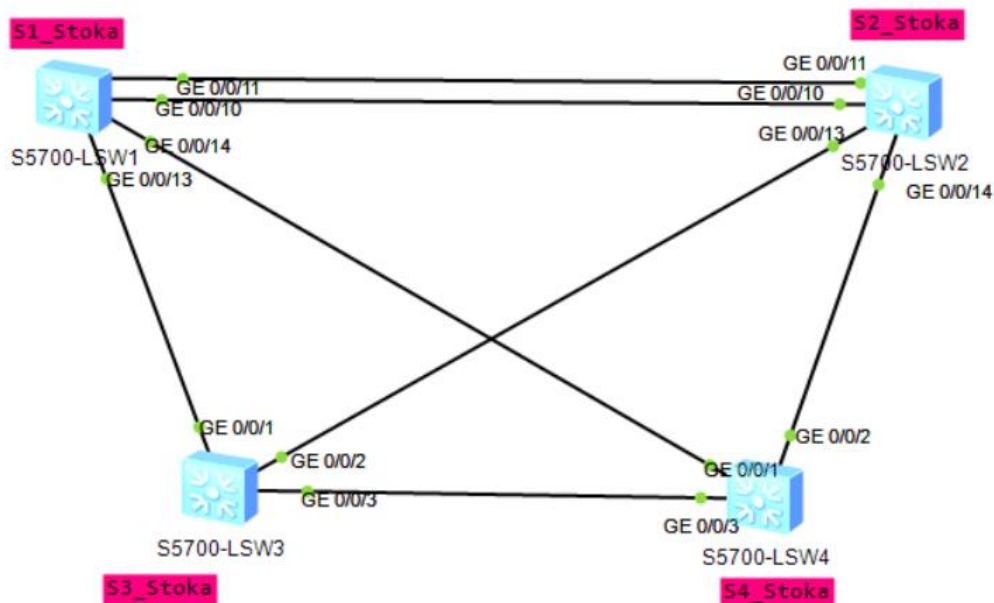


Рисунок 4 – Топология сети

Далее проводится включение протокола stp и выбор мода stp. Ниже представлена конфигурация с определением корневого моста и ролей портов (Рисунок 5).

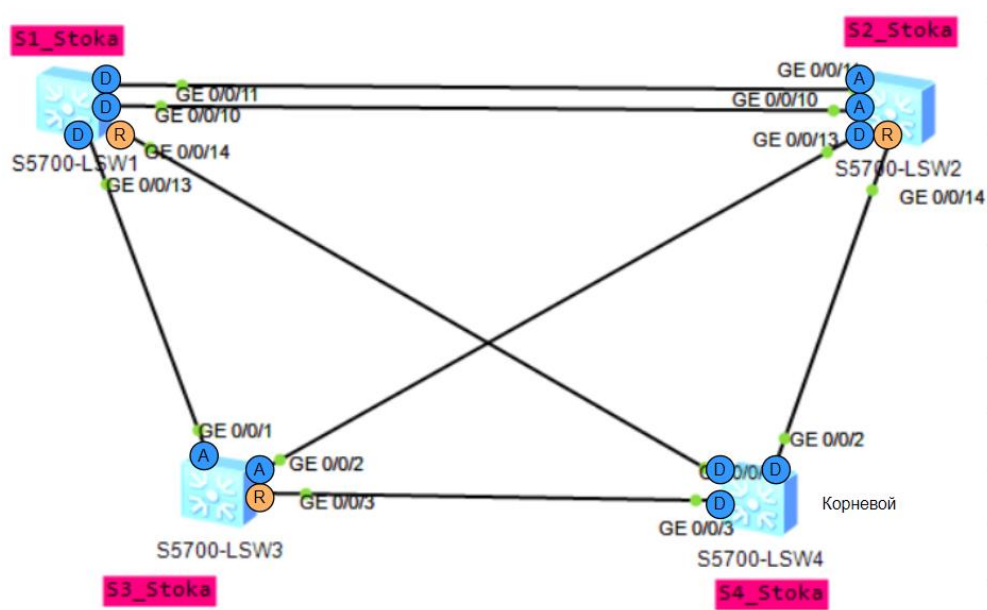


Рисунок 5 – Топология сети

После чего происходит изменение корневого моста (S1_Stoka) и установка резервного (S2_Stoka), соответственно в связи с этими изменениями также изменяются и роли портов (Рисунок 6).

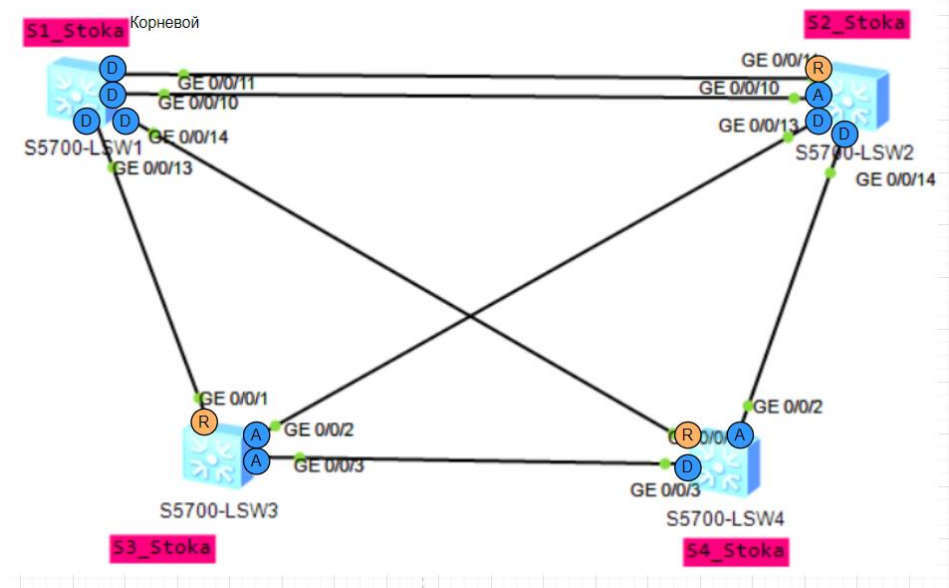


Рисунок 6 – Топология сети

Дальше меняется стоимость пути коммутатора S4_Stoka, для изменения на нем корневого порта (Рисунок 7).

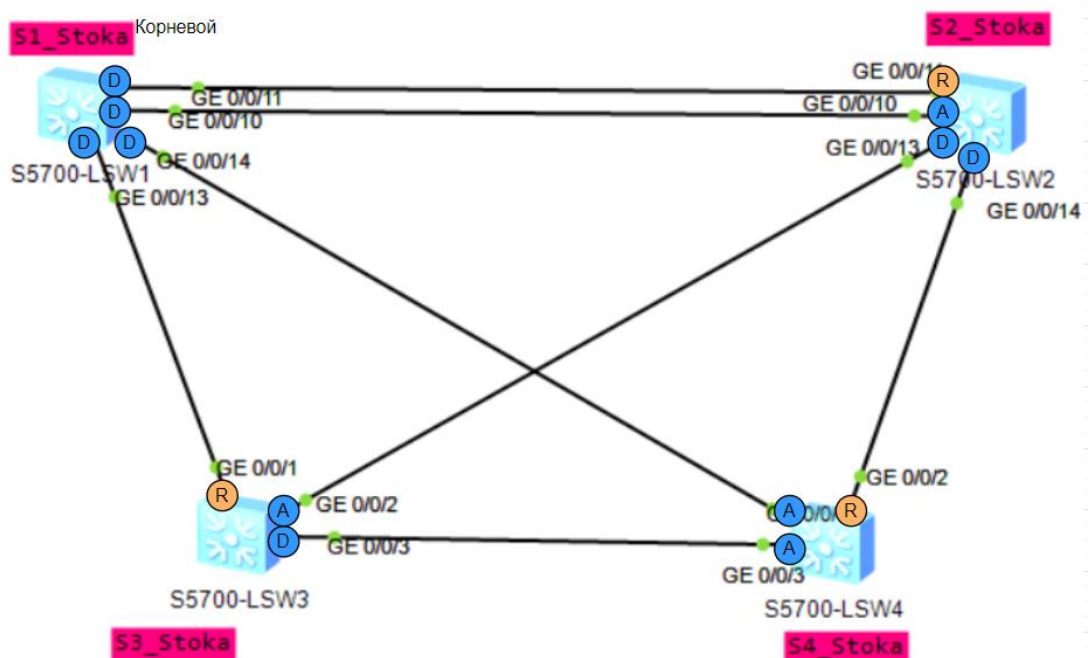


Рисунок 7 – Топология сети

Далее представлены конфигурации stp для используемых портов каждого коммутатора (Листинг 1 - 4).

Листинг 1 – Конфигурация коммутатора S1_Stoka

```
-----[CIST Global Info][Mode STP]-----
CIST Bridge           :0       .4c1f-cc59-18e9
Config Times          :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times          :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC        :0       .4c1f-cc59-18e9 / 0
CIST RegRoot/IRPC     :0       .4c1f-cc59-18e9 / 0
CIST RootPortId       :0.0
BPDU-Protection        :Disabled
CIST Root Type        :Primary root
TC or TCN received    :177
TC count per hello    :0
STP Converge Mode     :Normal
Time since last TC    :0 days 0h:10m:13s
Number of TC          :26
Last TC occurred      :GigabitEthernet0/0/10
----[Port10(GigabitEthernet0/0/10)][FORWARDING]----
Port Protocol         :Enabled
Port Role             :Designated Port
Port Priority          :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :0.4c1f-cc59-18e9 / 128.10
Port Edged            :Config=default / Active=disabled
Point-to-point        :Config=auto / Active=true
Transit Limit         :147 packets/hello-time
Protection Type       :None
Port STP Mode         :STP
Port Protocol Type    :Config=auto / Active=dot1s
BPDU Encapsulation    :Config=stp / Active=stp
PortTimes             :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send        :91
TC or TCN received    :55
BPDU Sent             :2420
                    TCN: 0, Config: 2420, RST: 0, MST: 0
BPDU Received         :215
                    TCN: 4, Config: 211, RST: 0, MST: 0
----[Port11(GigabitEthernet0/0/11)][FORWARDING]----
Port Protocol         :Enabled
Port Role             :Designated Port
Port Priority          :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :0.4c1f-cc59-18e9 / 128.11
Port Edged            :Config=default / Active=disabled
Point-to-point        :Config=auto / Active=true
Transit Limit         :147 packets/hello-time
Protection Type       :None
Port STP Mode         :STP
Port Protocol Type    :Config=auto / Active=dot1s
BPDU Encapsulation    :Config=stp / Active=stp
PortTimes             :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send        :86
TC or TCN received    :51
BPDU Sent             :2422
                    TCN: 0, Config: 2422, RST: 0, MST: 0
BPDU Received         :213
                    TCN: 0, Config: 213, RST: 0, MST: 0
BPDU Received         :213
                    TCN: 0, Config: 213, RST: 0, MST: 0
----[Port13(GigabitEthernet0/0/13)][FORWARDING]----
```

Продолжение Листинга 1

```
Port Protocol      :Enabled
Port Role          :Designated Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :0.4clf-cc59-18e9 / 128.13
Port Edged         :Config=default / Active=disabled
Point-to-point     :Config=auto / Active=true
Transit Limit      :147 packets/hello-time
Protection Type    :None
Port STP Mode      :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes          :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send     :34
TC or TCN received :0
BPDU Sent          :738
                  TCN: 0, Config: 738, RST: 0, MST: 0
BPDU Received      :0
                  TCN: 0, Config: 0, RST: 0, MST: 0
----[Port14(GigabitEthernet0/0/14)][FORWARDING]----
Port Protocol      :Enabled
Port Role          :Designated Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :0.4clf-cc59-18e9 / 128.14
Port Edged         :Config=default / Active=disabled
Point-to-point     :Config=auto / Active=true
Transit Limit      :147 packets/hello-time
Protection Type    :None
Port STP Mode      :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes          :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send     :142
TC or TCN received :1
BPDU Sent          :2640
                  TCN: 0, Config: 2640, RST: 0, MST: 0
BPDU Received      :3
                  TCN: 1, Config: 2, RST: 0, MST: 0
```

Листинг 2 – Конфигурация коммутатора S2_Stoka

```
-----[CIST Global Info][Mode STP]-----
CIST Bridge        :4096 .4clf-cc42-77e8
Config Times       :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times       :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC     :0 .4clf-cc59-18e9 / 20000
CIST RegRoot/IRPC  :4096 .4clf-cc42-77e8 / 0
CIST RootPortId    :128.10
BPDU-Protection    :Disabled
CIST Root Type     :Secondary root
TC or TCN received :280
TC count per hello :0
STP Converge Mode  :Normal
Time since last TC :0 days 0h:0m:41s
Number of TC       :30
Last TC occurred   :GigabitEthernet0/0/10
----[Port10(GigabitEthernet0/0/10)][FORWARDING]----
Port Protocol      :Enabled
Port Role          :Root Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :0.4clf-cc59-18e9 / 128.10
```

Продолжение Листинга 2

```
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send :55
TC or TCN received :91
BPDU Sent :206
TCN: 4, Config: 202, RST: 0, MST: 0
BPDU Received :2521
TCN: 0, Config: 2521, RST: 0, MST: 0
----[Port11(GigabitEthernet0/0/11)][DISCARDING]----
Port Protocol :Enabled
Port Role :Alternate Port
Port Priority :128
Port Cost(Dot1T ) :Config=auto / Active=20000
Designated Bridge/Port :0.4clf-cc59-18e9 / 128.11
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send :51
TC or TCN received :86
BPDU Sent :202
TCN: 0, Config: 202, RST: 0, MST: 0
BPDU Received :2518
TCN: 0, Config: 2518, RST: 0, MST: 0
----[Port13(GigabitEthernet0/0/13)][FORWARDING]----
Port Protocol :Enabled
Port Role :Designated Port
Port Priority :128
Port Cost(Dot1T ) :Config=auto / Active=20000
Designated Bridge/Port :4096.4clf-cc42-77e8 / 128.13
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send :34
TC or TCN received :0
BPDU Sent :199
TCN: 0, Config: 199, RST: 0, MST: 0
BPDU Received :0
TCN: 0, Config: 0, RST: 0, MST: 0
----[Port14(GigabitEthernet0/0/14)][FORWARDING]----
Port Protocol :Enabled
Port Role :Designated Port
Port Priority :128
Port Cost(Dot1T ) :Config=auto / Active=20000
Designated Bridge/Port :4096.4clf-cc42-77e8 / 128.14
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
```


Продолжение Листинга 2

```
Protection Type      :None
Port STP Mode        :STP
Port Protocol Type   :Config=auto / Active=dot1s
BPDU Encapsulation   :Config=stp / Active=stp
PortTimes            :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send       :177
TC or TCN received   :3
BPDU Sent            :2728
                    TCN: 0, Config: 2728, RST: 0, MST: 0
BPDU Received        :4
                    TCN: 3, Config: 1, RST: 0, MST: 0
```

Листинг 3 – Конфигурация коммутатора S3_Stoka

```
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :32768.4c1f-cc1e-4866
Config Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC       :0 .4c1f-cc59-18e9 / 20000
CIST RegRoot/IRPC    :32768.4c1f-cc1e-4866 / 0
CIST RootPortId      :128.1
BPDU-Protection      :Disabled
TC or TCN received   :222
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:9m:13s
Number of TC         :23
Last TC occurred     :GigabitEthernet0/0/1
----[Port1(GigabitEthernet0/0/1)][FORWARDING]----
Port Protocol        :Enabled
Port Role            :Root Port
Port Priority         :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :0.4c1f-cc59-18e9 / 128.13
Port Edged           :Config=default / Active=disabled
Point-to-point       :Config=auto / Active=true
Transit Limit        :147 packets/hello-time
Protection Type      :None
Port STP Mode        :STP
Port Protocol Type   :Config=auto / Active=dot1s
BPDU Encapsulation   :Config=stp / Active=stp
PortTimes            :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send       :35
TC or TCN received   :87
BPDU Sent            :183
                    TCN: 1, Config: 182, RST: 0, MST: 0
BPDU Received        :2594
                    TCN: 0, Config: 2594, RST: 0, MST: 0
----[Port2(GigabitEthernet0/0/2)][DISCARDING]----
Port Protocol        :Enabled
Port Role            :Alternate Port
Port Priority         :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :4096.4c1f-cc42-77e8 / 128.13
Port Edged           :Config=default / Active=disabled
Point-to-point       :Config=auto / Active=true
Transit Limit        :147 packets/hello-time
Protection Type      :None
Port STP Mode        :STP
Port Protocol Type   :Config=auto / Active=dot1s
BPDU Encapsulation   :Config=stp / Active=stp
PortTimes            :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send       :35
```

Продолжение Листинга 3

```
TC or TCN received :121
BPDU Sent :194
      TCN: 0, Config: 194, RST: 0, MST: 0
BPDU Received :2585
      TCN: 1, Config: 2584, RST: 0, MST: 0
----[Port3(GigabitEthernet0/0/3)][FORWARDING]----
Port Protocol :Enabled
Port Role :Designated Port
Port Priority :128
Port Cost(Dot1T ) :Config=auto / Active=20000
Designated Bridge/Port :32768.4c1f-cc1e-4866 / 128.3
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 20
TC or TCN send :68
TC or TCN received :0
BPDU Sent :985
      TCN: 0, Config: 985, RST: 0, MST: 0
BPDU Received :0
      TCN: 0, Config: 0, RST: 0, MST: 0
```

Листинг 4 – Конфигурация коммутатора S4_Stoka

```
-----[CIST Global Info][Mode STP]-----
CIST Bridge :32768.4c1f-cc72-7504
Config Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC :0 .4c1f-cc59-18e9 / 40000
CIST RegRoot/IRPC :32768.4c1f-cc72-7504 / 0
CIST RootPortId :128.2
BPDU-Protection :Disabled
TC or TCN received :545
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:2m:43s
Number of TC :25
Last TC occurred :GigabitEthernet0/0/2
----[Port1(GigabitEthernet0/0/1)][DISCARDING]----
Port Protocol :Enabled
Port Role :Alternate Port
Port Priority :128
Port Cost(Dot1T ) :Config=2000000000 / Active=2000000000
Designated Bridge/Port :0.4c1f-cc59-18e9 / 128.14
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
Port STP Mode :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send :1
TC or TCN received :136
BPDU Sent :3
      TCN: 1, Config: 2, RST: 0, MST: 0
BPDU Received :2873
      TCN: 0, Config: 2873, RST: 0, MST: 0
----[Port2(GigabitEthernet0/0/2)][FORWARDING]----
```

Продолжение Листинга 4

```
Port Protocol      :Enabled
Port Role          :Root Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :4096.4clf-cc42-77e8 / 128.14
Port Edged         :Config=default / Active=disabled
Point-to-point     :Config=auto / Active=true
Transit Limit      :147 packets/hello-time
Protection Type    :None
Port STP Mode      :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes          :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send     :3
TC or TCN received :172
BPDU Sent          :4
                  TCN: 3, Config: 1, RST: 0, MST: 0
BPDU Received      :2875
                  TCN: 0, Config: 2875, RST: 0, MST: 0
----[Port3(GigabitEthernet0/0/3)][DISCARDING]----
Port Protocol      :Enabled
Port Role          :Alternate Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :32768.4clf-ccle-4866 / 128.3
Port Edged         :Config=default / Active=disabled
Point-to-point     :Config=auto / Active=true
Transit Limit      :147 packets/hello-time
Protection Type    :None
Port STP Mode      :STP
Port Protocol Type :Config=auto / Active=dot1s
BPDU Encapsulation :Config=stp / Active=stp
PortTimes          :Hello 2s MaxAge 20s FwDly 15s RemHop 0
TC or TCN send     :1
TC or TCN received :167
BPDU Sent          :3
                  TCN: 1, Config: 2, RST: 0, MST: 0
BPDU Received      :2875
                  TCN: 0, Config: 2875, RST: 0, MST: 0
```

ЗАКЛЮЧЕНИЕ

В ходе данной практической работы был создан прототипы сети в программном обеспечении eNSP с настройкой протокола связующего дерева `stp`, получены навыки в установлении корневых мостов, ролей портов.

СПИСОК ИСТОЧНИКОВ

1. Олифер В.Г., Олифер В.А. Компьютерные сети. - 2-е изд. - Санкт-Петербург: Питер, 2021. - 1008 с.