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ФАКУЛЬТЕТ **ИНФОРМАТИКА И СИСТЕМЫ УПРАВЛЕНИЯ**

КАФЕДРА_ **КОМПЬЮТЕРНЫЕ СИСТЕМЫ И СЕТИ (ИУ6)**

НАПРАВЛЕНИЕ ПОДГОТОВКИ **09.03.03 Прикладная информатика**

О Т Ч Е Т

по лабораторной работе № 3

Название: Конфигурирование STP и RSTP

Дисциплина: Сети и телекоммуникации

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КОНФИГУРИРОВАНИЕ STP

Цели:

1. Включение и отключение STP
2. Изменение режима STP, используемого коммутатором
3. Изменение приоритета моста для контроля выбора корневого моста
4. Изменение приоритета порта для контроля выбора корневого порта и назначенного порта
5. Изменение затраты порта для контроля выбора корневого порта и назначенного порта
6. Конфигурирование граничного порта

Топология:

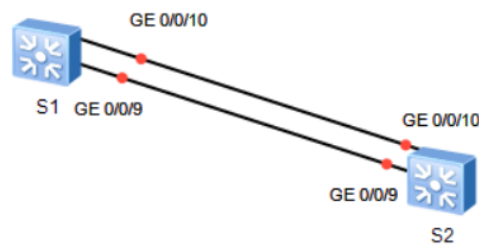


Рисунок 1 – Топология сети

Задание 1.1: Настройка STP и проверка конфигурации STP.

Необходимо отключить интерфейсы нескольких портов для корректной работы.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S1
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]shutdown
[S1-GigabitEthernet0/0/1]quit
[S1]interface GigabitEthernet 0/0/2
[S1-GigabitEthernet0/0/2]shutdown
[S1-GigabitEthernet0/0/2]quit
[S1]interface GigabitEthernet 0/0/3
```

```
[S1-GigabitEthernet0/0/3]shutdown
[S1-GigabitEthernet0/0/3]quit
[S1]interface GigabitEthernet 0/0/13
[S1-GigabitEthernet0/0/13]shutdown
[S1-GigabitEthernet0/0/13]quit
[S1]interface GigabitEthernet 0/0/14
[S1-GigabitEthernet0/0/14]shutdown
[S1-GigabitEthernet0/0/14]quit
```

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S2
[S2]interface GigabitEthernet 0/0/1
[S2-GigabitEthernet0/0/1]shutdown
[S2-GigabitEthernet0/0/1]quit
[S2]interface GigabitEthernet 0/0/2
[S2-GigabitEthernet0/0/2]shutdown
[S2-GigabitEthernet0/0/2]quit
[S2]interface GigabitEthernet 0/0/3
[S2-GigabitEthernet0/0/3]shutdown
[S2-GigabitEthernet0/0/3]quit
[S2]interface GigabitEthernet 0/0/6
[S2-GigabitEthernet0/0/6]shutdown
[S2-GigabitEthernet0/0/6]quit
[S2]interface GigabitEthernet 0/0/7
[S2-GigabitEthernet0/0/7]shutdown
[S2-GigabitEthernet0/0/7]quit
```

Создаем локальную сеть, включаем STP, устанавливаем S1 в качестве корневого.

```
[S1]stp enable
[S1]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[S1]stp root primary
```

```
[S2]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[S2]stp root secondary
```

Посмотрим краткую информацию об STP.

```
[S1]display stp brief
```

MSTID	Port	Role	STP State	Protection
0	GigabitEthernet0/0/9	DESI	FORWARDING	NONE
0	GigabitEthernet0/0/10	DESI	LEARNING	NONE

```
[S2]display stp brief
```

MSTID	Port	Role	STP State	Protection
0	GigabitEthernet0/0/9	ROOT	FORWARDING	NONE

0	GigabitEthernet0/0/10	ALTE	DISCARDING	NONE
---	-----------------------	------	------------	------

Посмотрим статус порта.

```
[S1]display stp interface GigabitEthernet 0/0/10
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :0      .4c1f-ccc4-4240
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-ccc4-4240 / 0
CIST RegRoot/IRPC    :0      .4c1f-ccc4-4240 / 0
CIST RootPortId      :0.0
BPDU-Protection      :Disabled
CIST Root Type       :Primary root
TC or TCN received   :40
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:0m:25s
Number of TC         :10
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-ccc4-4240 / 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       :17
TC or TCN received   :0
BPDU Sent            :39
                    TCN: 0, Config: 39, RST: 0, MST: 0
BPDU Received        :0
                    TCN: 0, Config: 0, RST: 0, MST: 0
```

```
[S2]display stp interface GigabitEthernet 0/0/10
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :4096 .4c1f-ccbc-4c54
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-ccc4-4240 / 20000
CIST RegRoot/IRPC    :4096 .4c1f-ccbc-4c54 / 0
CIST RootPortId      :128.9
BPDU-Protection      :Disabled
CIST Root Type       :Secondary root
TC or TCN received   :139
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:3m:19s
Number of TC         :10
Last TC occurred     :GigabitEthernet0/0/9
```

```

----[Port10(GigabitEthernet0/0/10)][DISCARDING]----
Port Protocol      :Enabled
Port Role          :Alternate Port
Port Priority       :128
Port Cost(Dot1T )  :Config=auto / Active=20000
Designated Bridge/Port :0.4c1f-ccc4-4240 / 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 0
TC or TCN send     :0
TC or TCN received :47
BPDU Sent          :2
                  TCN: 0, Config: 2, RST: 0, MST: 0
BPDU Received      :167
                  TCN: 0, Config: 167, RST: 0, MST: 0

```

Задание 1.2: Контроль выбора корневого моста.

Посмотрим информацию о корневом мосте.

```

[S1]display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge       :0 .4c1f-ccc4-4240
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-ccc4-4240 / 0
CIST RegRoot/IRPC :0 .4c1f-ccc4-4240 / 0
CIST RootPortId   :0.0
BPDU-Protection   :Disabled
CIST Root Type    :Primary root
TC or TCN received :40
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:4m:48s

```

```

[S2]display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge       :4096 .4c1f-ccbc-4c54
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-ccc4-4240 / 20000
CIST RegRoot/IRPC :4096 .4c1f-ccbc-4c54 / 0
CIST RootPortId   :128.9
BPDU-Protection   :Disabled
CIST Root Type    :Secondary root
TC or TCN received :139
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:6m:15s

```

Настроим S2 в качестве корневого моста и S1 в качестве резервного моста, используя значения приоритета.

```
[S1]undo stp root
[S1]stp priority 8192
```

```
[S2]undo stp root
[S2]stp priority 4096
```

Посмотрим информацию о новом мосте. S2 стал новым корневым мостом.

```
[S1]display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge      :8192 .4c1f-ccc4-4240
Config Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC   :4096 .4c1f-ccbc-4c54 / 20000
CIST RegRoot/IRPC :8192 .4c1f-ccc4-4240 / 0
CIST RootPortId  :128.9
BPDU-Protection  :Disabled
TC or TCN received :84
TC count per hello :1
STP Converge Mode :Normal
Time since last TC :0 days 0h:0m:22s
```

```
[S2]display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge      :4096 .4c1f-ccbc-4c54
Config Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC   :4096 .4c1f-ccbc-4c54 / 0
CIST RegRoot/IRPC :4096 .4c1f-ccbc-4c54 / 0
CIST RootPortId  :0.0
BPDU-Protection  :Disabled
TC or TCN received :139
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:1m:2s
```

Отключим интерфейсы GigabitEthernet 0/0/9 и GigabitEthernet 0/0/10 на S2 для изоляции S2, чтобы корневым стал мост S1.

```
[S2]interface GigabitEthernet 0/0/9
[S2-GigabitEthernet0/0/9]shutdown
[S2-GigabitEthernet0/0/9]quit
[S2]interface GigabitEthernet 0/0/10
[S2-GigabitEthernet0/0/10]shutdown
```

Обратно включим интерфейсы, которые были отключены на S2. S2 стал снова корневым мостом.

```
<S1>display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge :8192 .4c1f-ccc4-4240
Config Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC :4096 .4c1f-ccbc-4c54 / 20000
CIST RegRoot/IRPC :8192 .4c1f-ccc4-4240 / 0
CIST RootPortId :128.9
BPDU-Protection :Disabled
TC or TCN received :104
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:11m:18s
```

Задание 1.3: контроль выбора корневого порта.

Посмотрим роли интерфейсов. Информация показывает, что G0/0/9 является корневым портом, а G0/0/10 является альтернативным портом.

```
<S1>display stp brief
MSTID Port Role STP State Protection
0 GigabitEthernet0/0/9 ROOT FORWARDING NONE
0 GigabitEthernet0/0/10 ALTE DISCARDING NONE
```

Изменим приоритеты портов, чтобы интерфейс порта G0/0/10 стал корневым портом, а G0/0/9 стал альтернативным портом.

```
[S2]interface GigabitEthernet 0/0/9
[S2-GigabitEthernet0/0/9]stp port priority 32
[S2-GigabitEthernet0/0/9]quit
[S2]interface GigabitEthernet 0/0/10
[S2-GigabitEthernet0/0/10]stp port priority 16
```

Приоритеты портов изменяются на S2.

```
[S2]display stp interface GigabitEthernet 0/0/9
-----[CIST Global Info][Mode STP]-----
CIST Bridge :4096 .4c1f-ccbc-4c54
Config Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC :4096 .4c1f-ccbc-4c54 / 0
CIST RegRoot/IRPC :4096 .4c1f-ccbc-4c54 / 0
CIST RootPortId :0.0
BPDU-Protection :Disabled
TC or TCN received :147
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:0m:3s
Number of TC :19
Last TC occurred :GigabitEthernet0/0/10
```

```

----[Port9(GigabitEthernet0/0/9)][FORWARDING]----
Port Protocol      :Enabled
Port Role          :Designated Port
Port Priority       :32

```

```

[S2]display stp interface GigabitEthernet 0/0/10
-----[CIST Global Info][Mode STP]-----
CIST Bridge        :4096 .4c1f-ccbc-4c54
Config Times       :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times       :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC     :4096 .4c1f-ccbc-4c54 / 0
CIST RegRoot/IRPC  :4096 .4c1f-ccbc-4c54 / 0
CIST RootPortId    :0.0
BPDU-Protection    :Disabled
TC or TCN received :147
TC count per hello :0
STP Converge Mode  :Normal
Time since last TC  :0 days 0h:1m:20s
Number of TC       :19
Last TC occurred   :GigabitEthernet0/0/10
----[Port10(GigabitEthernet0/0/10)][FORWARDING]----
Port Protocol      :Enabled
Port Role          :Designated Port
Port Priority       :16

```

Посмотрим роли интерфейсов на S1. G0/0/10 на S1 стал корневым портом, а G0/0/9 стал альтернативным портом.

```

<S1>display stp brief
MSTID Port                Role STP State Protection
0      GigabitEthernet0/0/9 ALTE DISCARDING NONE
0      GigabitEthernet0/0/10 ROOT FORWARDING  NONE

```

Выключим G0/0/10 на S1 и посмотрим роли портов. G0/0/9 стал корневым портом.

```

[S1]interface GigabitEthernet 0/0/10
[S1-GigabitEthernet0/0/10]shutdown

```

```

<S1>display stp brief
MSTID Port                Role STP State Protection
0      GigabitEthernet0/0/9 ROOT FORWARDING  NONE

```

Возобновим приоритеты по умолчанию G0/0/9 и G0/0/10 на S2 и повторно включим интерфейсы, которые были отключены на S1.

```

[S2]interface GigabitEthernet 0/0/9
[S2-GigabitEthernet0/0/9]undo stp port priority
[S2-GigabitEthernet0/0/9]quit
[S2]interface GigabitEthernet 0/0/10
[S2-GigabitEthernet0/0/10]undo stp port priority

```

```

[S1]interface GigabitEthernet 0/0/10

```



```
[S1-GigabitEthernet0/0/10]undo shutdown
```

Посмотрим роли интерфейсов. Видим, что значение G0/0/9 и G0/0/10 по умолчанию – 20000.

```
<S1>display stp brief
```

MSTID	Port	Role	STP State	Protection
0	GigabitEthernet0/0/9	ROOT	FORWARDING	NONE
0	GigabitEthernet0/0/10	ALTE	DISCARDING	NONE

```
[S1]display stp interface GigabitEthernet 0/0/9
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :8192 .4c1f-ccc4-4240
Config Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC       :4096 .4c1f-ccbc-4c54 / 20000
CIST RegRoot/IRPC    :8192 .4c1f-ccc4-4240 / 0
CIST RootPortId      :128.9
BPDU-Protection      :Disabled
TC or TCN received   :289
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:0m:26s
Number of TC         :24
Last TC occurred     :GigabitEthernet0/0/9
----[Port9(GigabitEthernet0/0/9)] [FORWARDING]----
Port Protocol        :Enabled
Port Role            :Root Port
Port Priority         :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :4096.4c1f-ccbc-4c54 / 128.9
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   :107
BPDU Sent            :4
TCN: 3, Config: 1, RST: 0, MST: 0
BPDU Received        :504
TCN: 0, Config: 504, RST: 0, MST: 0
```

```
[S1]display stp interface GigabitEthernet 0/0/10
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :8192 .4c1f-ccc4-4240
Config Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC       :4096 .4c1f-ccbc-4c54 / 20000
CIST RegRoot/IRPC    :8192 .4c1f-ccc4-4240 / 0
```

```

CIST RootPortId      :128.9
BPDU-Protection      :Disabled
TC or TCN received   :296
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:1m:54s
Number of TC         :24
Last TC occurred     :GigabitEthernet0/0/9
----[Port10(GigabitEthernet0/0/10)] [DISCARDING]----
Port Protocol        :Enabled
Port Role            :Alternate Port
Port Priority         :128
Port Cost(Dot1T )    :Config=auto / Active=20000
Designated Bridge/Port :4096.4c1f-ccbc-4c54 / 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 0
TC or TCN send       :0
TC or TCN received   :33
BPDU Sent            :1
                    TCN: 0, Config: 1, RST: 0, MST: 0
BPDU Received        :102
                    TCN: 0, Config: 102, RST: 0, MST: 0

```

Изменим значение G0/0/9 на 200000 на S1.

```

[S1]interface GigabitEthernet 0/0/9
[S1-GigabitEthernet0/0/9]stp cost 200000

```

```

<S1>display stp interface GigabitEthernet 0/0/9
-----[CIST Global Info][Mode STP]-----
CIST Bridge          :8192 .4c1f-ccc4-4240
Config Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times         :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC       :4096 .4c1f-ccbc-4c54 / 20000
CIST RegRoot/IRPC    :8192 .4c1f-ccc4-4240 / 0
CIST RootPortId      :128.10
BPDU-Protection      :Disabled
TC or TCN received   :332
TC count per hello   :0
STP Converge Mode    :Normal
Time since last TC   :0 days 0h:0m:7s
Number of TC         :26
Last TC occurred     :GigabitEthernet0/0/10
----[Port9(GigabitEthernet0/0/9)] [DISCARDING]----
Port Protocol        :Enabled
Port Role            :Alternate Port
Port Priority         :128
Port Cost(Dot1T )    :Config=200000 / Active=200000
Designated Bridge/Port :4096.4c1f-ccbc-4c54 / 128.9
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      :124
BPDU Sent               :4
                        TCN: 3, Config: 1, RST: 0, MST: 0
BPDU Received           :615
                        TCN: 0, Config: 615, RST: 0, MST: 0

```

G0/0/10 стал корневым портом.

```

<S1>display stp brief
MSTID  Port                               Role  STP State  Protection
  0     GigabitEthernet0/0/9             ALTE  DISCARDING  NONE
  0     GigabitEthernet0/0/10            ROOT  FORWARDING  NONE

```

Окончательная конфигурация.

```

<S1>display current-configuration
#
sysname S1
#
stp mode stp
stp instance 0 priority 8192
#
cluster enable
ntdp enable
ndp enable
#
drop illegal-mac alarm
#
diffserv domain default
#
drop-profile default
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password simple admin
 local-user admin service-type http
#
interface Vlanif1
#
interface MEth0/0/1
#
interface GigabitEthernet0/0/1
 shutdown
#
interface GigabitEthernet0/0/2
 shutdown
#
interface GigabitEthernet0/0/3
 shutdown
#
interface GigabitEthernet0/0/4
#

```

```
interface GigabitEthernet0/0/5
#
interface GigabitEthernet0/0/6
#
interface GigabitEthernet0/0/7
#
interface GigabitEthernet0/0/8
#
interface GigabitEthernet0/0/9
  stp instance 0 cost 200000
#
interface GigabitEthernet0/0/10
#
interface GigabitEthernet0/0/11
#
interface GigabitEthernet0/0/12
#
interface GigabitEthernet0/0/13
  shutdown
#
interface GigabitEthernet0/0/14
  shutdown
#
interface GigabitEthernet0/0/15
#
interface GigabitEthernet0/0/16
#
interface GigabitEthernet0/0/17
#
interface GigabitEthernet0/0/18
#
interface GigabitEthernet0/0/19
#
interface GigabitEthernet0/0/20
#
interface GigabitEthernet0/0/21
#
interface GigabitEthernet0/0/22
#
interface GigabitEthernet0/0/23
#
interface GigabitEthernet0/0/24
#
interface NULL0
#
user-interface con 0
user-interface vty 0 4
#
return
```

```
<S2>display current-configuration
#
sysname S2
#
stp mode stp
stp instance 0 priority 4096
#
cluster enable
ntdp enable
ndp enable
```

```

#
drop illegal-mac alarm
#
diffserv domain default
#
drop-profile default
#
aaa
  authentication-scheme default
  authorization-scheme default
  accounting-scheme default
  domain default
  domain default_admin
  local-user admin password simple admin
  local-user admin service-type http
#
interface Vlanif1
#
interface MEth0/0/1
#
interface GigabitEthernet0/0/1
  shutdown
#
interface GigabitEthernet0/0/2
  shutdown
#
interface GigabitEthernet0/0/3
  shutdown
#
interface GigabitEthernet0/0/4
#
interface GigabitEthernet0/0/5
#
interface GigabitEthernet0/0/6
  shutdown
#
interface GigabitEthernet0/0/7
  shutdown
#
interface GigabitEthernet0/0/8
#
interface GigabitEthernet0/0/9
#
interface GigabitEthernet0/0/10
#
interface GigabitEthernet0/0/11
#
interface GigabitEthernet0/0/12
#
interface GigabitEthernet0/0/13
#
interface GigabitEthernet0/0/14
#
interface GigabitEthernet0/0/15
#
interface GigabitEthernet0/0/16
#
interface GigabitEthernet0/0/17
#
interface GigabitEthernet0/0/18
#
interface GigabitEthernet0/0/19
#

```

```
interface GigabitEthernet0/0/20
#
interface GigabitEthernet0/0/21
#
interface GigabitEthernet0/0/22
#
interface GigabitEthernet0/0/23
#
interface GigabitEthernet0/0/24
#
interface NULL0
#
user-interface con 0
user-interface vty 0 4
#
return
```

КОНФИГУРИРОВАНИЕ RSTP

Цели:

1. Включение и отключение RSTP
2. Настройка граничного порта
3. Настройка защиты RSTP BPDU
4. Настройка защиты от петли RSTP

Топология:

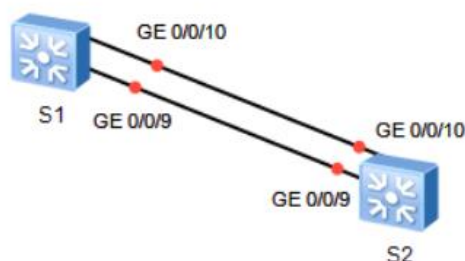


Рисунок 1 – Топология сети

Задание 2.1: Подготовка среды.

Отключаем нерелевантные интерфейсы.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S1
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]shutdown
[S1-GigabitEthernet0/0/1]quit
[S1]interface GigabitEthernet 0/0/2
[S1-GigabitEthernet0/0/2]shutdown
[S1-GigabitEthernet0/0/2]quit
[S1]interface GigabitEthernet 0/0/3
[S1-GigabitEthernet0/0/3]shutdown
[S1-GigabitEthernet0/0/3]quit
[S1]interface GigabitEthernet 0/0/13
[S1-GigabitEthernet0/0/13]shutdown
[S1-GigabitEthernet0/0/13]quit
[S1]interface GigabitEthernet 0/0/14
[S1-GigabitEthernet0/0/14]shutdown
[S1-GigabitEthernet0/0/14]quit
```

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S2
```

```
[S2]interface GigabitEthernet 0/0/1
[S2-GigabitEthernet0/0/1]shutdown
[S2-GigabitEthernet0/0/1]quit
[S2]interface GigabitEthernet 0/0/2
[S2-GigabitEthernet0/0/2]shutdown
[S2-GigabitEthernet0/0/2]quit
[S2]interface GigabitEthernet 0/0/3
[S2-GigabitEthernet0/0/3]shutdown
[S2-GigabitEthernet0/0/3]quit
[S2]interface GigabitEthernet 0/0/6
[S2-GigabitEthernet0/0/6]shutdown
[S2-GigabitEthernet0/0/6]quit
[S2]interface GigabitEthernet 0/0/7
[S2-GigabitEthernet0/0/7]shutdown
[S2-GigabitEthernet0/0/7]quit
```

Задание 2.3: Настройка RSTP и проверка конфигурации RSTP.

Настроим S1 и S2 для использования RSTP в качестве протокола связующего дерева.

```
[S1]stp mode rstp
Info: This operation may take a few seconds. Please wait for a moment...done.
```

```
[S2]stp mode rstp
Info: This operation may take a few seconds. Please wait for a moment...done.
```

Посмотрим краткую информацию о RSTP.

```
[S1]display stp
-----[CIST Global Info][Mode RSTP]-----
CIST Bridge      :32768.4c1f-cc64-589d
Config Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC   :32768.4c1f-cc1a-3c34 / 20000
CIST RegRoot/IRPC :32768.4c1f-cc64-589d / 0
CIST RootPortId  :128.9
BPDU-Protection  :Disabled
TC or TCN received :13
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:0m:13s
```

```
[S2]display stp
-----[CIST Global Info][Mode RSTP]-----
CIST Bridge      :32768.4c1f-cc1a-3c34
Config Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC   :32768.4c1f-cc1a-3c34 / 0
CIST RegRoot/IRPC :32768.4c1f-cc1a-3c34 / 0
CIST RootPortId  :0.0
BPDU-Protection  :Disabled
TC or TCN received :3
```



```
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:0m:49s
```

Задание 2.4: Конфигурирование граничного порта.

Настроим порты, подключенные к пользовательским терминалам, как граничные порты. Граничный порт может перейти в состояние пересылки без участия в расчете RSTP. Интерфейс GigabitEthernet 0/0/1 на S1 и S2 подключается к маршрутизатору и может быть настроен как граничные порты.

```
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]undo shutdown
[S1-GigabitEthernet0/0/1]stp edged-port enable
```

```
[S2]interface GigabitEthernet 0/0/1
[S2-GigabitEthernet0/0/1]undo shutdown
[S2-GigabitEthernet0/0/1]stp edged-port enable
```

Задание 2.5: Конфигурирование защиты BPDU.

Граничные порты напрямую подключаются к пользовательскому терминалу и не будут получать BPDU. Злоумышленники могут отправить псевдо-BPDU для атаки на коммутационное устройство. Если граничные порты получают BPDU, коммутационное устройство настраивает их в качестве портов, не являющихся граничными, и запускает новый расчет связующего дерева. Затем происходит нестабильность сети. Защита BPDU может использоваться для защиты коммутационных устройств от вредоносных атак.

Настроим защиту BPDU на S1 и S2.

```
[S1]stp bpdu-protection
```

```
[S2]stp bpdu-protection
```

Задание 2.6: Конфигурирование защиты от петель.

В сети, работающей по протоколу RSTP, коммутационное устройство поддерживает статус корневого порта и статус альтернативных портов, получая

BPDU от восходящего коммутационного устройства. Если коммутационное устройство не может получить BPDU от восходящего устройства из-за перегрузки канала или сбоя однонаправленного канала, коммутационное устройство повторно выбирает корневой порт. Исходный корневой порт становится назначенным портом, а исходные порты сброса переходят в состояние пересылки. Это переключение может вызвать сетевые петли, которые могут быть уменьшены путем конфигурирования защиты от петель.

Настроим защиту от петель как на корневом, так и на альтернативном порту.

```
[S2]interfaceGigabitEthernet 0/0/9
[S2-GigabitEthernet0/0/9]stp loop-protection
[S2-GigabitEthernet0/0/9]quit
[S2]interface GigabitEthernet 0/0/10
[S2-GigabitEthernet0/0/10]stp loop-protection
```

Окончательная конфигурация.

```
<S1>display current-configuration
#
sysname S1
#
stp mode rstp
stp bpdu-protection
#
cluster enable
ntdp enable
ndp enable
#
drop illegal-mac alarm
#
diffserv domain default
#
drop-profile default
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password simple admin
 local-user admin service-type http
#
interface Vlanif1
#
interface MEth0/0/1
#
interface GigabitEthernet0/0/1
 stp edged-port enable
```

```

#
interface GigabitEthernet0/0/2
 shutdown
#
interface GigabitEthernet0/0/3
 shutdown
#
interface GigabitEthernet0/0/4
#
interface GigabitEthernet0/0/5
#
interface GigabitEthernet0/0/6
#
interface GigabitEthernet0/0/7
#
interface GigabitEthernet0/0/8
#
interface GigabitEthernet0/0/9
#
interface GigabitEthernet0/0/10
#
interface GigabitEthernet0/0/11
#
interface GigabitEthernet0/0/12
#
interface GigabitEthernet0/0/13
 shutdown
#
interface GigabitEthernet0/0/14
 shutdown
#
interface GigabitEthernet0/0/15
#
interface GigabitEthernet0/0/16
#
interface GigabitEthernet0/0/17
#
interface GigabitEthernet0/0/18
#
interface GigabitEthernet0/0/19
#
interface GigabitEthernet0/0/20
#
interface GigabitEthernet0/0/21
#
interface GigabitEthernet0/0/22
#
interface GigabitEthernet0/0/23
#
interface GigabitEthernet0/0/24
#
interface NULL0
#
user-interface con 0
user-interface vty 0 4
<S2>display current-configuration
#
sysname S2
#
stp mode rstp
stp bpdu-protection
#
cluster enable

```

```
ntdp enable
ndp enable
#
drop illegal-mac alarm
#
diffserv domain default
#
drop-profile default
#
aaa
  authentication-scheme default
  authorization-scheme default
  accounting-scheme default
  domain default
  domain default_admin
  local-user admin password simple admin
  local-user admin service-type http
#
interface Vlanif1
#
interface MEth0/0/1
#
interface GigabitEthernet0/0/1
  stp edged-port enable
#
interface GigabitEthernet0/0/2
  shutdown
#
interface GigabitEthernet0/0/3
  shutdown
#
interface GigabitEthernet0/0/4
#
interface GigabitEthernet0/0/5
#
interface GigabitEthernet0/0/6
  shutdown
#
interface GigabitEthernet0/0/7
  shutdown
#
interface GigabitEthernet0/0/8
#
interface GigabitEthernet0/0/9
  stp loop-protection
#
interface GigabitEthernet0/0/10
  stp loop-protection
#
interface GigabitEthernet0/0/11
#
interface GigabitEthernet0/0/12
#
interface GigabitEthernet0/0/13
#
interface GigabitEthernet0/0/14
#
interface GigabitEthernet0/0/15
#
interface GigabitEthernet0/0/16
#
interface GigabitEthernet0/0/17
#
```

```
interface GigabitEthernet0/0/18
#
interface GigabitEthernet0/0/19
#
interface GigabitEthernet0/0/20
#
interface GigabitEthernet0/0/21
#
interface GigabitEthernet0/0/22
#
interface GigabitEthernet0/0/23
#
interface GigabitEthernet0/0/24
#
interface NULL0
#
user-interface con 0
user-interface vty 0 4
#
return
```

Вывод: в ходе лабораторной работы научились работа с STP: включать, выключать, изменять режим, изменять приоритеты мостов и затраты портов. Также, научились работать с RSTP: включать и отключать, настраивать граничные порты, защиту BPDU и защиту от петель.