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ФАКУЛЬТЕТ ИНФОРМАТИКА И СИСТЕМЫ УПРАВЛЕНИЯ
КАФЕДРА КОМПЬЮТЕРНЫЕ СИСТЕМЫ И СЕТИ (ИУ6)
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Дисциплина: Сети и телекоммуникации

Название лабораторной работы: Сетевой доступ и средства
обеспечения безопасности соединения.

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Цель работы - Научиться работать с свитчерами, включать и выключать STP, а также изменять приоритет портов. Научиться настраивать RSTP, RSTP BPDU protection и RSTP loop protection.

Ход работы:

- 1.) Я отключил ненужные интерфейсы от свитчеров. (Рисунок 1).

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S1
[S1]interface G
[S1]interface GigabitEthernet
Oct  3 2021 23:07:12-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 4, the ch
ange loop count is 0, and the maximum number of records is 4095.
      ^
Error:Incomplete command found at '^' position.
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]shutdown
[S1-GigabitEthernet0/0/1]quit
[S1]
Oct  3 2021 23:07:42-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 5, the ch
ange loop count is 0, and the maximum number of records is 4095.
Oct  3 2021 23:07:46-08:00 S1 %%01PHY/1/PHY(1)[51]:    GigabitEthernet0/0/9: cha
nge status to down
Oct  3 2021 23:07:47-08:00 S1 %%01PHY/1/PHY(1)[52]:    GigabitEthernet0/0/9: cha
nge status to up
[S1]interface GigabitEthernet 0/0/2
[S1-GigabitEthernet0/0/2]shutdown
[S1-GigabitEthernet0/0/2]quit
[S1]
Oct  3 2021 23:08:12-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 6, the ch
ange loop count is 0, and the maximum number of records is 4095.
[S1]interface GigabitEthernet 0/0/3
[S1-GigabitEthernet0/0/3]shutdown
[S1-GigabitEthernet0/0/3]quit
[S1]interface GigabitEthernet 0/0/14
Oct  3 2021 23:08:32-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 7, the ch
ange loop count is 0, and the maximum number of records is 4095.
[S1-GigabitEthernet0/0/14]shutdown
[S1-GigabitEthernet0/0/14]
Oct  3 2021 23:08:42-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 8, the ch
ange loop count is 0, and the maximum number of records is 4095.
[S1-GigabitEthernet0/0/14]quit
```

Рисунок 1 – Вывод консоли при отключении интерфейсов

2.) Включил STP на свитчерах, один сделал первичным, другой вторичным. (Рисунок 2)

The image shows two terminal windows side-by-side. The left window is for switch S2 (LSW6) and the right window is for switch S1 (LSW5). Both windows show the configuration of STP on GigabitEthernet interfaces 0/0/6, 0/0/7, and 0/0/14. The configuration includes setting the STP mode to 'stp', the root to 'root se' (secondary) on S2 and 'root primary' on S1, and displaying the STP brief. The STP brief shows the MSTID, Port, Role (ROOT or DESI), STP State (FORWARDING), and Protection (NONE).

```
[S2-GigabitEthernet0/0/6]quit
[S2]interface GigabitEthernet 0/0/7
[S2-GigabitEthernet0/0/7]shutdown
[S2-GigabitEthernet0/0/7]quit
[S2]
Oct 3 2021 23:16:22-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 9, the change loop count is 0, and the maximum number of records is 4095.
[S2]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[S2]stp root se
Oct 3 2021 23:17:02-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 10, the change loop count is 0, and the maximum number of records is 4095.
[S2]stp root secondary
Oct 3 2021 23:17:42-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 11, the change loop count is 0, and the maximum number of records is 4095.
[S2]stp root secondary
[S2]display stp brief
MSTID Port Role STP State Protection
0 GigabitEthernet0/0/9 ROOT FORWARDING NONE
0 GigabitEthernet0/0/10 ALTE DISCARDING NONE
[S2]

[S1-GigabitEthernet0/0/14]shutdown
[S1-GigabitEthernet0/0/14]quit
[S1]
Oct 3 2021 23:08:42-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 8, the change loop count is 0, and the maximum number of records is 4095.
[S1]stp mode stp
Info: This operation may take a few seconds. Please wait for a moment...done.
[S1]
Oct 3 2021 23:17:02-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 9, the change loop count is 0, and the maximum number of records is 4095.
[S1]stp root primary
[S1]
Oct 3 2021 23:17:12-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 10, the change loop count is 0, and the maximum number of records is 4095.
[S1]display stp brief
MSTID Port Role STP State Protection
0 GigabitEthernet0/0/9 DESI FORWARDING NONE
0 GigabitEthernet0/0/10 DESI FORWARDING NONE
[S1]
```

Рисунок 2 – Настройка stp на свитчерах

3.) Настроил bridges с помощью priority values. (Рисунок 3).

The image shows a terminal window for switch S1 (LSW5) where the STP priority is set to 8192. The output shows the STP configuration details, including the CIST Bridge ID, Config Times, Active Times, CIST Root/ERPC, CIST RegRoot/IRPC, CIST RootPortId, BPDU-Protection, TC or TCN received, TC count per hello, STP Converge Mode, and Time since last TC.

```
[S1]stp priority 8192
[S1]
Oct 3 2021 23:26:53-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2.191.3.1 configurations have been changed. The current change number is 12, the change loop count is 0, and the maximum number of records is 4095.
[S1]display stp
-----[CIST Global Info][Mode STP]-----
CIST Bridge :8192 .4clf-cc16-1e44
Config Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC :4096 .4clf-ccd2-1622 / 20000
CIST RegRoot/IRPC :8192 .4clf-cc16-1e44 / 0
CIST RootPortId :128.9
BPDU-Protection :Disabled
TC or TCN received :5
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:9m:31s
```

Рисунок 3 – Выставление приоритетов для мостов

4.) Изменил приоритет портов на втором свитчере. (Рисунок 4)

```
Oct 3 2021 23:44:04-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.191.3.1 configurations have been changed. The current change number is 14, the change loop count is 0, and the maximum number of records is 4095.stp port priority
^
Error: Unrecognized command found at '^' position.
[s2]interface GigabitEthernet 0/0/10
[s2-GigabitEthernet0/0/10]stp port priority 16
[s2-GigabitEthernet0/0/10]q
[s2]
Oct 3 2021 23:44:34-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.191.3.1 configurations have been changed. The current change number is 15, the change loop count is 0, and the maximum number of records is 4095.
[s2]display stp interface GigabitEthernet 0/0/9
-----[CIST Global Info][Mode STP]-----
CIST Bridge :4096 .4clf-ccd2-1622
Config Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC :4096 .4clf-ccd2-1622 / 0
CIST RegRoot/IRPC :4096 .4clf-ccd2-1622 / 0
CIST RootPortId :0.0
BPDU-Protection :Disabled
TC or TCN received :45
TC count per hello :0
STP Converge Mode :Normal
Time since last TC :0 days 0h:1m:8s
Number of TC :8
Last TC occurred :GigabitEthernet0/0/9
----[Port9(GigabitEthernet0/0/9)][FORWARDING]----
Port Protocol :Enabled
Port Role :Designated Port
Port Priority :32
Port Cost(Dot1T) :Config=auto / Active=20000
Designated Bridge/Port :4096.4clf-ccd2-1622 / 32.9
Port Edged :Config=default / Active=disabled
Point-to-point :Config=auto / Active=true
Transit Limit :147 packets/hello-time
Protection Type :None
---- More ----
```

Рисунок 4 – Изменение приоритета портов на втором свитчере (приоритет обозначен стрелкой)

5.) Изменил cost G0/0/9 на 200000 и вывел информацию. (Рисунки 5-6).

```
[S1]interface GigabitEthernet 0/0/9
[S1-GigabitEthernet0/0/9]stp cost 200000
[S1-GigabitEthernet0/0/9]quit
[S1]q
<S1>
Oct 3 2021 23:50:04-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 13, the c
hange loop count is 0, and the maximum number of records is 4095.
<S1>display stp interface GigabitEthernet 0/0/9
-----[CIST Global Info][Mode STP]-----
CIST Bridge      :8192 .4clf-ccl6-1e44
Config Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times     :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC   :4096 .4clf-ccd2-1622 / 20000
CIST RegRoot/IRPC :8192 .4clf-ccl6-1e44 / 0
CIST RootPortId  :128.10
BPDU-Protection  :Disabled
TC or TCN received :214
TC count per hello :2
STP Converge Mode :Normal
Time since last TC :0 days 0h:1m:31s
Number of TC      :16
Last TC occurred  :GigabitEthernet0/0/9
----[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 :4096.4clf-ccd2-1622 / 128.9
Port Edged       :Config=default / Active=disabled
Point-to-point   :Config=auto / Active=true
Transit Limit    :147 packets/hello-time
```

Рисунок 5 – Параметр Port Cost выставлен на 200000

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

Рисунок 6 – Вывод состояния портов

6.) Установил Rstp на оба свитчера и вывели информацию (Рисунок 1).

```
[S1]stp mode rstp
Info: This operation may take a few seconds. Please wait for a moment...done
[S1]
Oct  4 2021 00:34:56-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.191.3.1 configurations have been changed. The current change number is 16, change loop count is 0, and the maximum number of records is 4095.
[S1]display stp
-----[CIST Global Info][Mode RSTP]-----
CIST Bridge           :32768.4clf-cc16-1e44
Config Times          :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
Active Times          :Hello 2s MaxAge 20s FwDly 15s MaxHop 20
CIST Root/ERPC        :32768.4clf-cc16-1e44 / 0
CIST RegRoot/IRPC     :32768.4clf-cc16-1e44 / 0
CIST RootPortId       :0.0
BPDU-Protection       :Disabled
TC or TCN received    :255
TC count per hello    :0
STP Converge Mode     :Normal
Time since last TC    :0 days 0h:2m:21s
Number of TC          :22
```

Рисунок 7 – Установленный Rstp

7.) Настроил порты для свитчеров (то же самое для второго свитчера) (Рисунок 2).

```
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]undo shutdown
[S1-GigabitEthernet0/0/1]stp edge
Oct  4 2021 00:39:46-08:00 S1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.2191.3.1 configurations have been changed. The current change number is 17, the change loop count is 0, and the maximum number of records is 4095.
      ^
Error:Incomplete command found at '^' position.
[S1-GigabitEthernet0/0/1]stp edged-port enable
```

Рисунок 8 – Настроенные порты

8.) Настроил BPDU защиту для свитчеров. (Тот же процесс для второго свитчера) (Рисунок 3).

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

MSTID	Port	Role	STP State	Protection
0	GigabitEthernet0/0/1	DESI	FORWARDING	BPDU
0	GigabitEthernet0/0/9	DESI	FORWARDING	NONE
0	GigabitEthernet0/0/10	DESI	FORWARDING	NONE

```
[S1]
```

Рисунок 9 – Настроенная BPDU защита

9.) Настроил loop-protection для второго свитчера. (Рисунок 4).

```
[s2]interface GigabitEthernet 0/0/9
[s2-GigabitEthernet0/0/9]stp loop-protection
[s2-GigabitEthernet0/0/9]quit
Oct  4 2021 01:22:47-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 24, the c
hange loop count is 0, and the maximum number of records is 4095.
[s2]interface GigabitEthernet 0/0/10
[s2-GigabitEthernet0/0/10]stp loop-protection
[s2-GigabitEthernet0/0/10]quit
[s2]stp
Oct  4 2021 01:23:07-08:00 s2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 25, the c
hange loop count is 0, and the maximum number of records is 4095. brief
^
Error: Unrecognized command found at '^' position.
[s2]stp brief
^
Error: Unrecognized command found at '^' position.
[s2]display stp brief
```

MSTID	Port	Role	STP State	Protection
0	GigabitEthernet0/0/1	DESI	FORWARDING	BPDU
0	GigabitEthernet0/0/9	ROOT	FORWARDING	LOOP
0	GigabitEthernet0/0/10	ALTE	DISCARDING	LOOP

Рисунок 10 – LoopProtection

Итоговая конфигурация представлена на рисунках 5-7:

```
<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
```

Рисунок 11 – S1


```

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
#

```

Рисунок 12 – S2

```

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
#

```

Рисунок 13 – S3

Вывод: Я научился работать со свитчерами, включать и выключать STP, а также изменять приоритет портов. Я научился настраивать RSTP, RSTP BPDU protection и RSTP loop protection.