

Ω Λ ©2009

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® à ® RGOS® à RGNOS® à

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”А “ й’ RGOS®10.2(4) Â

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1.

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注意、说明

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$[\]'$	$[\]$	$\uparrow \sim$	$\exists$	$\downarrow$	$\hat{A}$
$\{x y \dots\}$	$\tilde{y} \text{ ч}$			$\downarrow y$	$\hat{A}$
$[x y \dots]$	$\tilde{y} \text{ ч}$			$\downarrow y$	$a \hat{A}$
$//$	$\downarrow$		$\exists$		$\hat{A}$

3. $\mathcal{A}$

$\mathcal{A}$

$$x \quad a \quad \sim \quad 3 \quad \bar{a} \quad \sim$$

			IOY	
User EXEC ^ ~	"l Â	Ruijie>	exit { Â enable { Â	â
Privileged EXEC ^ ~	IO ~ enable { Â	Ruijie#	disable { Â configure { Â	{ Â É { Â
Global configuration ^ ~	IO ~ configure { Â	Ruijie(co nfig)#	exit { end { Ctrl+C 1 Â interface { Â interface { y 1 Â VLAN vlan vlan_id { Â	{ 1 Â
Interface configuration ^ 1 ~	IO ~ interface { Â	Ruijie(co nfig-if)#	end Ctrl+C 1 Â exit { Â interface { y Â	1 Â
Config-vlan ^ VLAN ~	IO ~ vlan vlan_id { Â	Ruijie(co nfig-vlan)#	end Ctrl+C 1 Â exit { Â	VLAN 1 Â

show configuration 3 4 5

Ruijie# show conf

3 no default

3 no 3 no shutdown 3 no shutdown
 shutdown 3 no shutdown
 3 default 3 default 3 default no
 3 default 3 default 3 default
 no 3 default 3 default
 3 default 3 default

CLI

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Ctrl-P ı

	Space	y ~ Ю y ~ 20
		Â

3 || 4

↓ √ √ || 4 ~ ' 3 ~ 3
 √ √ Â "I ↓ ~ 3 ↓ || 20
 ~ ÿ ↓ √ "I 3 Â
 3 "I || Ю ' 3

π	
"I ↓ y	↓ Ctrl-B
"I	Ctrl-A
"I ↓ ↓ y	↓ ↓ Ctrl-F
"I	Ctrl-E

3 **mac-address-table static** ↓ y
 Â "I y ~ 3 ↓ || 20 Â 3
 ↑ ↓ "A 20 Â 3

```
mac-address-table static 00d0.f800.0c0c vlan 1
interface
$static 00d0.f800.0c0c vlan 1 interface fastEthernet
$static 00d0.f800.0c0c vlan 1 interface fastEthernet 0/1
```

↓ Ctrl-A 3 Â 3 ↑

CLI

Show 3

show 3

~ ↓ 3

3 3'

Ruijie# show <i>any-command</i> begin <i>regular-expression</i>	show 3 ~ y 3 1	3 3'	3

注意:

- 1) 3 **Show** 3
- 2) 3 3 3 3

```

    3 1~ 1L y ' * 3 y 3 Â ~ ... y 1 3
y 3 y 1~ 1 1L 1 1 Â
1 3 3 3 N@i0Q@i|fS •<•®</ q % ÀðÂA7 if 'W -å @
Ю alias ? 1L 1L 1 3 '

```

Ruijie(config)#**alias ?**

```

aaa-gs          AAA server group mode
acl             acl configure mode
bgp             Configure bgp Protocol
config          globle configure mode
.....

```

```

3 1 || ~ 1 y 1^ *~ ~ 3 1LЮ
,

```

**command-alias=original-command*

```

~ EXEC Ю 3 1"s" "show" Â ‡

```


3

说明:

3 11 A

3

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TFTP~
 enable secret
 15

13

13 15

13

13 15

13	
Ruijie(config)# enable password [level level] {password encryption-type encrypted-password}	13 15 13 15 13 15 13 15 13 15
Ruijie(config)# enable secret [level level] {encryption-type encrypted-password}	13 15 13 15 13 15
Ruijie# enable [level] Ruijie# disable [level]	13 15 13 15

13 level 13 15

3

Y 3 4 3 æ

3 Y 4 3

Â

4 10 3 3

3	
Ruijie# configure terminal	
	3 1 Â
	mode 3 CLI
	3 config
	exec Y

Ruijie(config)# **privilege mode [all] {level
level | reset} command-string**

<cr>

Ю reload 3 1 È 3 Й '

Ruijie# **configure terminal**

Ruijie(config)# **privilege exec all reset reload**

Ruijie(config)# **end**

1 ~ 3 '

Ruijie# **disable 1**

Ruijie> **reload ?**

% Unrecognized command.

^ **line~** 4 3

Λ Η ^ TELNET~ 4 3 ~ **line** 4 3 ~

line Ю ЛЮ 3'

3	
Ruijie(config-line)# password password	line 4 3
Ruijie(config-line)# login	Ў line 4 3

说明:

Â ЮУ Ÿ Â **line** 4 3 ~ **line** 4 3

Λ Η lock 3 В~ Л Â В

Π ~ **line** Ю

EXEC Ю lock 3 В '

Π ~

3	
Ruijie(config-line)# lockable	Ў В line Π
Ruijie# lock	В line

Л Н , Л Н ААА Ю Ъ А
Л Ъ Ю З

<pre>Ruijie(config)# username <i>name</i> [password <i>password</i> password <i>encryption-type</i> <i>encrypted password</i>] Ruijie(config)# username <i>name</i></pre>	
--	--

AAA à Radius L μ^{-1} $\sim$ η AAA
 $\hat{A}$

[illegible]

3	
Ruijie# clock set <i>hh:mm:ss month day year</i>	Â

```
Ruijie# clock set 05:54:43 1 30 2008 //
Ruijie# show clock //
05:54:43 CHN-BJ Wed 2008-01-30
```

<http://www.ruijie.com.cn>

```
Ruijie# sh clock //
05:54:43 CHN-BJ Wed 2008-01-30
```

У И а calendar l ü Ю ÷ Â

а И Â

Ю clock update-calendar

3	
Ruijie# clock update-calendar	✓ ✓

```
Ruijie# clock update-calendar
```

U

reload [modifiers] 3 0 ^ scheme ~ ~ Л
 0 Â 0 П 1 Ю(È) ↓ Л
 и Э Â modifiers reload у 3 ~ ↓ Л
 3 П Â ↓ modifiers in à at à cancel Â é Ю'

1. **reload** in *mmm | hhh:mm* [string]

test $\hat{A}$

2. **reload** at *hh:mm month day year* [*string*]

year 11 30 31 1 1 12

```

        Ъ      ъ      3      1      ~
Ю~          ъ      1      а      э      1
        ~      ‡      и      э      1      ~      ё      Âstring
        ↓ Э Â                2005-01-10 14:31~              Э
        ъ~      ↓Л      reload at 08:30 11 1 newdayÂ
        2005-12-10 14:31~                2006-01-01 12:00   ъ~      ↓Л
reload at 12:00 1 1 2006 newyearÂ

```

У Л Ё

Ю Ю 3 У Л Ё'

3	
Ruijie# reload in <i>mmm</i> [<i>reload-reason</i>]	<i>mmm</i> Л reload reload √ <i>reload-reason</i> ()
Ruijie# reload in <i>hhh:mm</i> [<i>reload-reason</i>]	<i>hhh mm</i> Л reload ~ reload √ <i>reload-reason</i> ()

4

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Ruijie(config)# **banner**

Ctrl	Boot	Н	Л	А	Л	А	Л
Ю	Ю	З	Ю	Ю	Ю	Ю	Ю

Э Ю Ю Э Э Л

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```
Ruijie# show mainfile
MainFile name: rgos.bin.
```

[illegible]

Telnet Client Telnet 6
 A Ю 3 B' 8
 telnet 3 3 3 3



1

Telnet Client

3 3 telnet 3 3 3

3	3
Ruijie# telnet host-ip-address	telnet 3 3 3 IP 3 3

Ю Telnet 3 ip
 192.168.65.119'

Ruijie# **telnet** 192.168.65.119 // telnet
 Trying 192.168.65.119 ... Open
 User Access Verification //
 Password:

3 3 3 3
 3 3 3 3

3

Л Н LINE Ю з

з	
Ruijie(config-line)# exec-timeout 20	LINE Э А

Л LINE Ю **no exec-timeout** з LINE Ю
А

```
Ruijie# configure terminal //
Ruijie# line vty 0 // LINE
Ruijie(config-line)# exec-timeout 20 // и 20min
```

LINE Э
А з и А

Л Н LINE Ю з

з	
Ruijie(config-line)# session-timeout 20	LINE Э А

Л LINE Ю **no exec-timeout** з LINE Ю
А

```
Ruijie# configure terminal //
Ruijie(config)# line vty 0 // LINE
Ruijie(config-line)# session-timeout 20 // и 20min
```

з

CLI
з
у
А

з	
Ruijie# execute {[flash:] filename}	у А

```
line_rcms_script.text                               Telnet
configure terminal
line tty 1 16
transport input all
no exec
end

Ruijie# execute flash:line_rcms_script.text
executing script file line_rcms_script.text .....
executing done
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# line vty 1 16
Ruijie(config-line)# transport input all
Ruijie(config-line)# no exec
Ruijie(config-line)# end
```

说明:

LINE ˘ ʝ ʌ LINE Ю̃ é LINE Â

LINE ~ ЛЮ 3'

Â

3	
configure terminal	
Line vty <i>line number</i>	Line
transport input {all ssh telnet none}	Line Ю ↓ Љ
no transport input	LINE Ю a
default transport input	LINE Ю й

~

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CTRL

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~

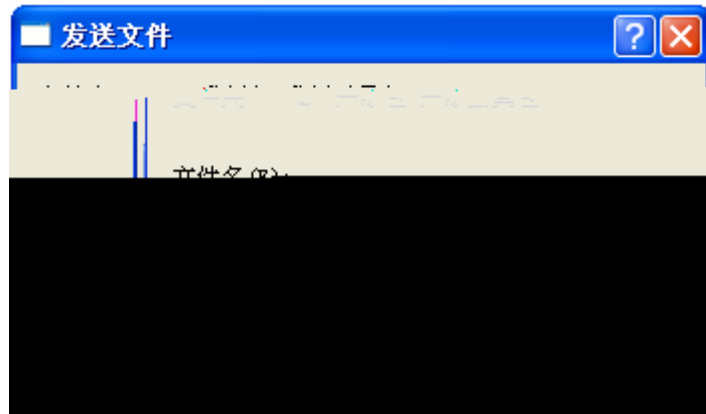
XMODEM

У ü ý Ю ¨ 1 У ü Э ¨ ý Â
 CLI 3 Ю Ю ¨ Ю ¨
 Ю ¨ "l Windows ' l
 Ю Ю 3 Ю ¨ ' l ý Windows ¨
 " ' " ¨ " ¨ 1 ' "



1

" ¨ " ¨ Windows ¨ ý Ю ¨ "Xmodem"
 " ¨ " ¨ Windows ¨ ¨ Ю 1 Â 2 ' "



2

3	
Ruijie# copy xmodem flash:filename	ü ý Ю ¨ l ò filename Â

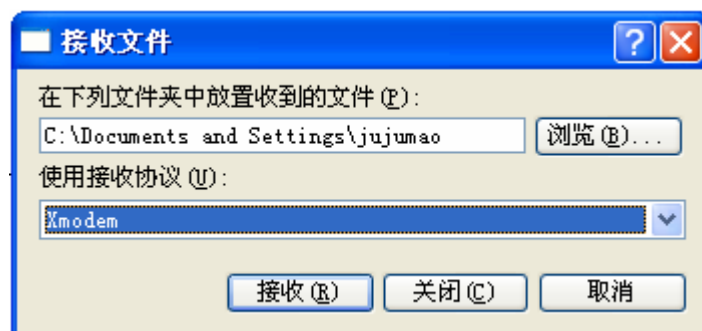
CLI 3 Ю Ю ¨ Э ¨
 Э ¨ "l Windows ' l

Ю 儿Ю 3 Э ' 1 ŷ Windows “ ” ‘ “ ” ˆ 3 ‘



3

” Э ‘ Æ “Xmodem” “ ” ˆ 4 ‘



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3	
Ruijie# copy flash:filename xmodem	ŷ Э ‘ filename ŷ

a Э ˆ ˆ 1 儿 Э tftp xmodem ˆ
‘ ˆ ˆ ˆ ˆ ˆ ˆ

```

      a      y  A
      a  '
1~  A  u  A
2~  u  A  '  y  A  u
   A  '  A
   A  y  A
   y  A

```

注意:

```

      y  y  y  y
A  a  i  A
      show version
      i 6  y  i  a  y  ^
      redundancy force-switchover  i  v  A

```

```

1~  rgos.bin
2~  copy  y  y
3~  y  y  y  y  y  y
   y  y  y  y

```

Upgrade Slave CM MAIN successful!!

Upgrade CM MAIN successful!!

```

1~  y  A
2~  A  u  A  y  y

```

Installing is in process

Do not restart your machine before finish !!!!!!

.....

```

3~  A  y  y

```

Installing process finished

Restart machine operation is permitted now !!!!!!

$$\frac{1}{a} \frac{d}{dt} \left(\frac{1}{a} \right) = -\frac{\dot{a}}{a^2} \neq \frac{\dot{a}}{a} \quad \text{and} \quad \frac{1}{a} \frac{d}{dt} \left(\frac{1}{a} \right) = -\frac{\dot{a}}{a^2} \neq \frac{\dot{a}}{a}$$
 $\mathcal{A} \quad \mathbb{H} \quad \hat{A}$
$$\hat{A} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix} \quad \mathbf{1} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \quad \mathbf{J} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \mathbf{AE} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Ping

```

Ruijie# ping 192.168.5.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.5.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

```

Command	Description
Ruijie# ping [ip] [address [length [ntimes times] [data data] [source source] [timeout seconds]]	Ping the destination IP address. The default is 5 times, 100 bytes, and 2 seconds timeout.

```

Ruijie# ping 192.168.5.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.5.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

```

```

Ruijie# ping 192.168.5.1
Sending 5, 100-byte ICMP Echos to 192.168.5.1, timeout is 2 seconds:
< press Ctrl+C to break >
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

```

```

Ruijie# ping 192.168.5.197 length 1500 ntimes 100 data ffff source 192.168.4.190 timeout 3
Sending 100, 1000-byte ICMP Echos to 192.168.5.197, timeout is 3 seconds:
< press Ctrl+C to break >
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

```

```

Ruijie# ping 192.168.5.197 length 1500 ntimes 100 data ffff source 192.168.4.190 timeout 3
Sending 100, 1000-byte ICMP Echos to 192.168.5.197, timeout is 3 seconds:
< press Ctrl+C to break >
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

```


Success rate is 100 percent (100/100), round-trip min/avg/max
= 2/2/3 ms
Ruijie#

Traceroute

[illegible]

3	π
Ruijie# traceroute [<i>protocol</i>] [<i>destination</i> [probe <i>probe</i>] [t <i>tl</i> <i>minimum</i> <i>maximum</i>] [s <i>ource</i> <i>source</i>] [t <i>imeout</i> <i>seconds</i>]]	√

```

Лю й      Traceroute   ч      ~   У   й      ~   У   й
      а      Â
1"      Traceroute      '
Ruijie# traceroute 61.154.22.36
< press Ctrl+C to break >
Tracing the route to 61.154.22.36

```

1	192.168.12.1	0 msec	0 msec	0 msec
2	192.168.9.2	4 msec	4 msec	4 msec
3	192.168.9.1	8 msec	8 msec	4 msec
4	192.168.0.10	4 msec	28 msec	12 msec
5	202.101.143.130	4 msec	16 msec	8 msec
6	202.101.143.154	12 msec	8 msec	24 msec
7	61.154.22.36	12 msec	8 msec	22 msec

61.154.22.36

2' a Traceroute '

Ruijie# **traceroute** 202.108.37.42

< press Ctrl+C to break >

Tracing the route to 202.108.37.42

1	192.168.12.1	0 msec	0 msec	0 msec
2	192.168.9.2	0 msec	4 msec	4 msec
3	192.168.110.1	16 msec	12 msec	16 msec
4	* * *			
5	61.154.8.129	12 msec	28 msec	12 msec
6	61.154.8.17	8 msec	12 msec	16 msec
7	61.154.8.250	12 msec	12 msec	12 msec
8	218.85.157.222	12 msec	12 msec	12 msec
9	218.85.157.130	16 msec	16 msec	16 msec
10	218.85.157.77	16 msec	48 msec	16 msec
11	202.97.40.65	76 msec	24 msec	24 msec
12	202.97.37.65	32 msec	24 msec	24 msec
13	202.97.38.162	52 msec	52 msec	224 msec
14	202.96.12.38	84 msec	52 msec	52 msec
15	202.106.192.226	88 msec	52 msec	52 msec
16	202.106.192.174	52 msec	52 msec	88 msec
17	210.74.176.158	100 msec	52 msec	84 msec
18	202.108.37.42	48 msec	48 msec	52 msec

ÿ Æ ↓ √ ~ ÿ IP ñ 202.108.37.42 ÿ
 ^ 1 17 ~ 3 4 Â



Б 4 (L3 interface)

ŷ 3 4 1 88 Â

SVI(Switch virtual interface)

SVI 4~ Б 4 Â SVI ↓ √ √ √
 4~ 4 ~ ↓ Â ≠ ↓ √... SVI √ √ 4~
 √ VLAN 4~ ↓ Б VLAN
 Â... √ SVI √ √ ↓ **interface vlan** 4 √ ... SVI
 √ SVI √ IP VLAN Â
 ~ VLAN20 ŷ ↓ Б ~
 VLAN20 ŷ A VLAN30 ŷ B VLAN20

```

    y  l~ y  j~ y  e  y  y  ~  l y 1
    fl A  e  l  l  y 1  e  l~  l  y  j A
    j l  y  ~  l  ч  y  ^  "l  l  l~
    y  ~  j  l  l A  # j l  }  show  }
    l l  e  l  A

```

Aggregate Port e l y 1 Aggregate Port A

SVI e l SVI VLAN VID A

注意:

e l y 0 || (j ^) l y 1
A

l }

j y interface } l A

interface range

4 Å

3

3	
Ruijie(config)# define interface-range <i>macro_name interface-range</i>	1. 定义接口范围 2. 接口名称 3. 接口范围 4. 接口名称 5. 接口范围 6. 接口名称 7. 接口范围 8. 接口名称 9. 接口范围 10. 接口名称 11. 接口范围 12. 接口名称 13. 接口范围 14. 接口名称 15. 接口范围 16. 接口名称 17. 接口范围 18. 接口名称 19. 接口范围 20. 接口名称 21. 接口范围 22. 接口名称 23. 接口范围 24. 接口名称 25. 接口范围 26. 接口名称 27. 接口范围 28. 接口名称 29. 接口范围 30. 接口名称 31. 接口范围 32. 接口名称
Ruijie(config)# interface range macro <i>macro_name</i>	1. 接口范围 2. 接口名称 3. 接口范围 4. 接口名称 5. 接口范围 6. 接口名称 7. 接口范围 8. 接口名称 9. 接口范围 10. 接口名称 11. 接口范围 12. 接口名称 13. 接口范围 14. 接口名称 15. 接口范围 16. 接口名称 17. 接口范围 18. 接口名称 19. 接口范围 20. 接口名称 21. 接口范围 22. 接口名称 23. 接口范围 24. 接口名称 25. 接口范围 26. 接口名称 27. 接口范围 28. 接口名称 29. 接口范围 30. 接口名称 31. 接口范围 32. 接口名称

```

Ruijie# no define interface-range macro_name 3
Ruijie#
Ruijie# define interface-range 3 Ruijie#
Ruijie#
Ruijie# vlan vlan-ID - vlan-ID, VLAN ID 1 4094
Ruijie# fastethernet slot/{ Y port} - { 1 Y port}
Ruijie# gigabitethernet slot/{ Y port} - { 1 Y port}
Ruijie# Aggregate Port Aggregate port 1 - Aggregate port 1, 1 MAX
Ruijie# interface range 1 1 switch port
Ruijie# Aggregate Port SVI
Ruijie# define interface-range 3 Ruijie# fastethernet1/1-4
Ruijie#
Ruijie# configure terminal
Ruijie(config)# define interface-range resource
Ruijie(config)# fastethernet 1/1-4
Ruijie(config)# end
Ruijie#
Ruijie# configure terminal
Ruijie(config)# define interface-range ports1to2N5to7
Ruijie(config)# fastethernet 1/1-2, 1/5-7
Ruijie(config)# end
Ruijie#
Ruijie# ports1to2N5to7
Ruijie#
Ruijie# configure terminal
Ruijie(config)# interface range macro ports1to2N5to7
Ruijie(config-if-range)#

```

Ю ports1to2N5to7

```
Ruijie# configure terminal
Ruijie(config)# no define interface-range ports1to2N5to7
Ruijie# end
```

4.5

4.5.1 配置聚合端口

配置聚合端口（Aggregate Port）是指将多个物理接口（Physical Interface）捆绑成一个逻辑接口（Aggregate Port），从而提高网络的可靠性和带宽。配置步骤如下：

- 进入配置模式：

```
Ruijie# configure terminal
```
- 创建聚合端口：

```
Ruijie(config)# aggregate-port {port-id}
```
- 将物理接口加入聚合端口：

```
Ruijie(config)# aggregate-port {port-id} add {interface}
```
- 配置聚合端口的属性，如速率、模式等。
- 退出配置模式：

```
Ruijie# end
```

命令	说明
Ruijie(config-if)# medium-type { fiber copper }	配置端口的介质类型，fiber 表示光纤，copper 表示铜线。

Ю 4.5.2 配置千兆以太网接口

```
Ruijie# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 1/1
Ruijie(config-if)# medium-type fiber
Ruijie(config-if)# end
```

4.6

4.6.1 配置接口描述

配置接口描述（Description）是指为接口添加描述信息，方便管理员识别和管理。配置步骤如下：

- 进入配置模式：

```
Ruijie# configure terminal
```
- 进入接口配置模式：

```
Ruijie(config)# interface {interface}
```
- 配置接口描述：

```
Ruijie(config-if)# description {string}
```
- 退出配置模式：

```
Ruijie# end
```

命令	说明
Ruijie(config-if)# description string	配置接口的描述字符串，长度不超过 32 个字符。

Ю 4.6.2 配置接口速率

```
Ruijie# config terminal
```



```
Ruijie(config-if)# duplex full
Ruijie(config-if)# flowcontrol off
Ruijie(config-if)# end
```

注意:

IEEE 802.3ab 10GBase-T 标准定义了 Master/Slave 协商机制，在 link up 之前，双方需要进行协商。

4 MTU

MTU (Maximum Transmission Unit) 是指网络接口所能传输的最大数据包大小。MTU 的大小会影响网络性能，特别是在传输大数据包时。MTU 的大小通常由网络设备的硬件和软件决定。MTU 的大小可以在 64~9216 字节之间设置，默认值为 1500 字节。MTU 的大小可以通过以下命令进行配置：

命令	说明
Ruijie(config-if)# Mtu num	配置接口 MTU 大小，Num 为 MTU 大小，范围 <64-9216>

例如，配置 GigabitEthernet 1/1 接口的 MTU 为 64：

```
Ruijie# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 1/1
Ruijie(config-if)# mtu 64
Ruijie(config-if)# end
```

2 4

Y 4

IO Y 4 ~ VLAN 1 4 4 I
 VLAN L I 4 L A
 Y 4 IO r

	Y
Switch port	access port
VLAN	VLAN 1 4094
VLAN~ access port	VLAN 1
Native VLAN~ trunk port	VLAN 1
Y	copper
4	Up
4	
4	
Aggregate port	
4	
4	

Switch Port

access/trunk port

Y Switchport (access/trunk port) 4 IO
 A
 4 4 IO **switchport** 4 3 Switch Port

3	
Ruijie(config-if)# switchport mode {access trunk }	4 5

IO gigabitethernet 1/2 5 access port 5

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 1/2
Ruijie(config-if)# switchport mode access
Ruijie(config-if)# end
```

3	
Ruijie(config-if)# switchport access vlan <i>vlan-id</i>	access port VLAN 5

IO access port gigabitethernet 2/1 5 vlan 5 100 5

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# switchport access vlan 100
Ruijie(config-if)# end
```

trunk port native VLAN

3	
Ruijie(config-if)# switchport trunk native vlan <i>vlan-id</i>	trunk port NATIVE VLAN 5

IO Trunk Port Gigabitethernet 2/1 Native vlan 5 10 5

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# switchport trunk native vlan 10
Ruijie(config-if)# end
```

4 4 5 4 5 1 4
L'

3	
Ruijie(config-if)# switchport port-security	4 4 5

IO Gigabitethernet 2/1 4 5 5

```

Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# switchport port-security
Ruijie(config-if)# end

```

```

Ruijie# show interface gigabitethernet 2/1
Gigabitethernet 2/1 is access port
VLAN 100

```

```

Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# switchport access vlan 100
Ruijie(config-if)# speed auto
Ruijie(config-if)# duplex auto
Ruijie(config-if)# flowcontrol auto
Ruijie(config-if)# switchport port-security
Ruijie(config-if)# end

```

Hybrid 4

↓ 10 100 Hybrid 4

命令	说明
configure terminal	
interface <interface>	1, 10, 100
switchport mode hybrid	1 4 10 hybrid 4
no switchport mode	4
switchport hybrid native vlan id	hybrid 4 VLAN
switchport hybrid allowed vlan [[add] [tagged untagged]] [remove] vlist	4 ±

```

Ruijie# configure terminal
Ruijie(config)# interface g 0/1
Ruijie(config-if)# switchport mode hybrid
Ruijie(config-if)# switchport hybrid native vlan 3
Ruijie(config-if)# switchport hybrid allowed vlan untagged
20-30
Ruijie(config-if)# end

```

```
Ruijie# show running interface g 0/1
```

L2 Aggregate Port

Ÿ	...	L2 Aggregate Port 1	L2 Aggregate Port	Y
Â				
↓ √	√	IO aggregateport	... L2 Aggregate Port	é
	√	Aggregate Port L: Â		

$$\mathcal{N} \quad \quad \quad \mathcal{A} \quad \quad \mathcal{N}$$

Ю ↓ clear } ¼ Æ ¼ Â } ¼
Switch Port,L2 Aggregate port ~ ¼ , ~ Лю и clear }

Ruijie# clear counters <i>[interface-id]</i>	⌘ ⌘
Ruijie# clear interface <i>interface-id</i>	⌘ ⌘

clear counters $\{ \text{show interfaces} \}$

Ю Gigabitethernet 1/1

```
Ruijie# clear counters gigabitethernet 1/1
```


3 配置

SVI

配置 SVI 接口，SVI 接口是三层接口，用于连接不同的网段。配置 SVI 接口的命令如下：

```
Ruijie(config)# interface vlan vlan-id ...
```

配置命令	配置说明
Ruijie(config)# interface vlan <i>vlan-id</i>	SVI 接口名称

配置 SVI 接口的 IP 地址和子网掩码。配置 SVI 接口的 IP 地址的命令如下：

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface vlan 100
Ruijie(config-if)# ip address 192.168.1.1 255.255.255.0
Ruijie(config-if)# end
```

注意：

配置 SVI 接口时，SVI 接口名称必须在 1 到 4094 之间。

配置 SVI 接口的 DHCP 服务。配置 SVI 接口的 DHCP 服务的命令如下：

```
Ruijie(config-if)# ip address dhcp
```

配置命令	配置说明
Ruijie(config-if)# ip address dhcp	DHCP 服务

配置 SVI 接口的 DHCP 服务时，SVI 接口名称必须在 1 到 4094 之间。配置 SVI 接口的 DHCP 服务的命令如下：

```
1~ debug debug-name
2~ debug debug-name dhcp
```

配置命令	配置说明

DHCP

~

3

ЛЮ 3'



Ruijie# show interfaces <i>interface-id</i> status	4	Â	
Ruijie# show interfaces <i>[interface-id]</i> switchport	↓	4 ^	4 ~
	administrative		

Enabled All

Руйе й Gigabitethernet 2/1

Ruijie# **show interfaces gigabitethernet 1/2 description**

Interface	Status	Administrative	Description
-----------	--------	----------------	-------------

gigabitethernet 2/1	down	down	Gi 2/1
---------------------	------	------	--------

Руйе й

Ruijie# **show interfaces gigabitethernet 1/2 counters**

Interface : gigabitethernet 1/2

5 minute input rate ' 9144 bits/sec, 9 packets/sec

5 minute output rate ' 1280 bits/sec, 1 packets/sec

InOctets : 17310045

InUcastPkts : 37488

InMulticastPkts : 28139

InBroadcastPkts : 32472

OutOctets : 1282535

OutUcastPkts : 17284

OutMulticastPkts : 249

OutBroadcastPkts : 336

Undersize packets : 0

Oversize packets : 0

collisions : 0

Fragments : 0

Jabbers : 0

CRC alignment errors : 0

AlignmentErrors : 0

FCSErrors : 0

dropped packet events (due to lack of resources): 0

packets received of length (in octets):

64:46264, 65-127: 47427, 128-255: 3478,

256-511: 658, 512-1023: 18016, 1024-1518: 125

LinkTrap

Руйе й LinkTrap

Руйе й SNMP LinkTrap, а

Руйе й

3

3	
Ruijie(config-if)# [no] snmp trap link-status	trap 11 . 4 link

Ю 4 ñ a 4 Link trap:

Ruijie(config)# **interface gigabitEthernet 1/1**

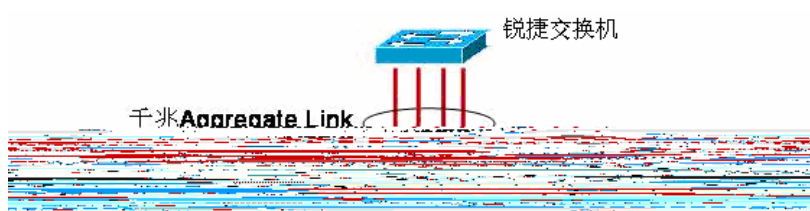
Ruijie(config-if)# **no snmp trap link-status**

Aggregate Port

③ Aggregate Port A

Aggregate Port

й Aggregate Poft лю AP~ Â AP п IEEE802.3ad
 й Aggregate Poft лю AP~ Â AP п IEEE802.3ad
 AP у ё AP у ё || ↑ AP
 ё ё Э в Â AP у ё а
 ч ё Э Â



1 ḥ AP

说明:

S2700

31

 $AP^{\vee}$

AP

8

 $\hat{A}$

AP ↓ Л MAC MAC MAC + MAC
 à IP IP Л ↓ IP + IP
 ↑ AP Â ↓ Л **aggregateport load-balance** ↑
 Â

MAC MAC ↑ AP ↓ ↓
 Â a ↓ MAC ↓ a ↓ ↓ MAC ↓ ÿ ↓ У
 ↓ Â

MAC MAC ↑ AP ↓ ↓
 Â ↓ MAC ↓ ÿ ↓ У ↓ a ↓ MAC
 ↓ ↓ Â

MAC+ MAC MAC MAC
 ↑ AP ↓ Â é a ↓ MAC+ MAC ↓
 ↑ ↓ У AP Â

IP IP IP IP ↑ Â a ↓
 IP IP a ↓ ↓ ↓ IP IP ‡
 ↓ ↓ Â Ъ ↓
 Ю У ‡ || У MAC MAC
 Â

IP + IP IP IP ↑ Â
 Ь Ю У ‡ ||
 У MAC Â é a ↓ IP+ IP ↓ ↑
 ↓ У AP Â

 a ↓ ↓ ↑ ~ Л ≠ ↑
 ↓ Э '↑ Â

Ю ~ У AP б ~ ^ ~
 Э 4 ↓ PC ~ Л й ^ Ю 2 ↓ PC ~
 ↓ MAC MAC й б é ÿ ,
 ~ ‡ й MAC MAC Â

说明:

S2700 ↓ ^ ~
 Â ~ Л ~ У Â
 ↓ IP ↓ ч é a ↓ IP+ IP ↓
 ↓ У AP Â

AP a 1 11 A

1 11 Y a AP ~ AP 11... A

Y 1 11 AP 1 AP 1 3 A

Y 1 y AP ~ 1 11 AP A

:

注意:

Y 1 11 AP 1, a 1 3 , 1 AP.

Aggregate Port

1 Ю Ю 1 11 AP

3	
Ruijie(config-if-range)# port-group <i>port-group-number</i>	1 11 Y AP(AP a ~ 1 11 ... AP) A

1 Ю **no port-group** 3 Y 1 AP A

Ю Y Л 1 0/1 Y AP 5 ' ,

```
Ruijie# configure terminal
Ruijie(config)# interface range gigabitEthernet 0/1
Ruijie(config-if-range)# port-group 5
Ruijie(config-if-range)# end
```

1 Л Ю 3 Ruijie(config)# **interface aggregateport** *n* (*n*
1 AP 1) ... Y AP(AP *n* a) A

Aggregate Port

Ю Ю AP ,

3	
---	--

```
Ruijie(config)#  
aggregateport  
load-balance  
{ src-dst-mac | ip }
```

VLAN

IEEE802.1q VLAN

VLAN ^ Virtual Local Area Network ~ y



1

y y ~ VLAN y IP y Â y ñ
~ ↓ y IP y ↓ y VLAN VLAN
Б ^ Б ~ Â Б ↓ Л SVI 4^ Switch Virtual
Interfaces~ VLAN IP Â SVI ~ 4 4
IP Â

VLAN

IEEE802.1Q VLAN ID
VLAN 1 4094 VLAN ID

VLAN

VLAN ID
VLAN ID
VLAN ID

VLAN ID

VLAN State	Active	Active Inactive
------------	--------	-----------------

... à Y VLAN

Ю ... Y VLAN

?	
Ruijie(config)# vlan <i>vlan-id</i>	Y VLAN ID Â Y VLAN ID ‡ ... Y VLAN VLAN ID ‡ VLAN Â
Ruijie(config)# name <i>vlan-name</i>	^ ↓ ~ ñ VLAN ↓ Y ↓ Â Y ~ ‡ ñ Y ↓ VLAN xxxx Ě xxxx 0 Æ VLAN ID / Â ~ VLAN 0004 VLAN 4 ↓ Â

VLAN ↓ ↓ ~ ↓ **no name** ? ↓ Â

Ю Y ... VLAN 888 ↓ ñ Test888 3

```
Ruijie# configure terminal
Ruijie(config)# vlan 888
Ruijie(config-vlan)# name test888
Ruijie(config-vlan)# end
```

Y VLAN

a VLAN VLAN 1~ Â

Ю Y VLAN

?	
Ruijie(config)# no vlan <i>vlan-id</i>	Y VLAN ID Â

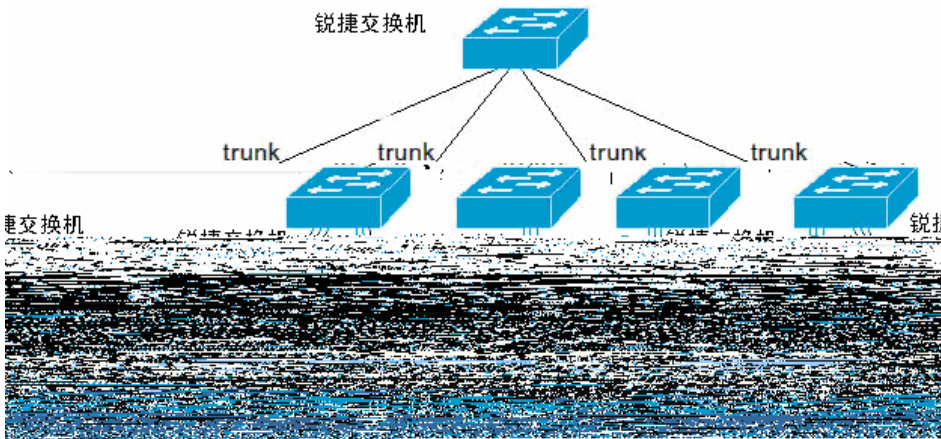
↓ VLAN↑ Access ↓

Y ↑ Y a VLAN × VLAN || ... Â

Ю Y ↑ Y VLAN

Ruijie(config-if)# switchport mode access	将接口加入 VLAN 20 ACCESS 20
Ruijie(config-if)# switchport access vlan <i>vlan-id</i>	将接口加入 VLAN

将 Ethernet 1/10 加入 Access 20 VLAN20



2

Aggregate Port Trunk

Aggregate Port

switchport

Ruijie(config-if)# switchport mode access	y n n Access
Ruijie(config-if)# switchport mode trunk	y n n Trunk

n Trunk n n y Native VLAN n

Native VLAN n n

VLAN ID IEEE 802.1Q PVID Native VLAN VLAN ID n

Trunk n Native VLAN n UNTAG n Trunk

n Native VLAN VLAN 1 n

Trunk n n Trunk n n Native VLAN n

y Trunk n

Trunk n

Trunk n n

--	--

Ruijie(config-if)# switchport mode trunk	将接口模式设置为 Trunk 模式
Ruijie(config-if)# switchport trunk native vlan <i>vlan-id</i>	设置本征 VLAN

将接口模式设置为 Trunk 模式，并设置本征 VLAN 为 1，命令如下：
switchport mode trunk
switchport trunk native vlan 1

配置 Trunk 接口允许通过的 VLAN

将接口模式设置为 Trunk 模式，并设置本征 VLAN 为 1，命令如下：
switchport mode trunk
switchport trunk native vlan 1

配置 Trunk 接口允许通过的 VLAN 列表，命令如下：

命令	说明
Ruijie(config-if)# switchport trunk allowed vlan {all [add remove except] <i>vlan-list</i>}	配置 Trunk 接口允许通过的 VLAN 列表。 1. all ：允许所有 VLAN 通过。 2. add ：在现有允许的 VLAN 列表中添加指定的 VLAN。 3. remove ：从现有允许的 VLAN 列表中移除指定的 VLAN。 4. except ：允许除指定 VLAN 之外的所有 VLAN 通过。 5. <i>vlan-list</i> ：指定的 VLAN 列表，可以是单个 VLAN ID 或 VLAN ID 范围（如 10-20）。

配置 Trunk 接口允许通过的 VLAN 列表，命令如下：
switchport trunk allowed vlan 1,3-4094

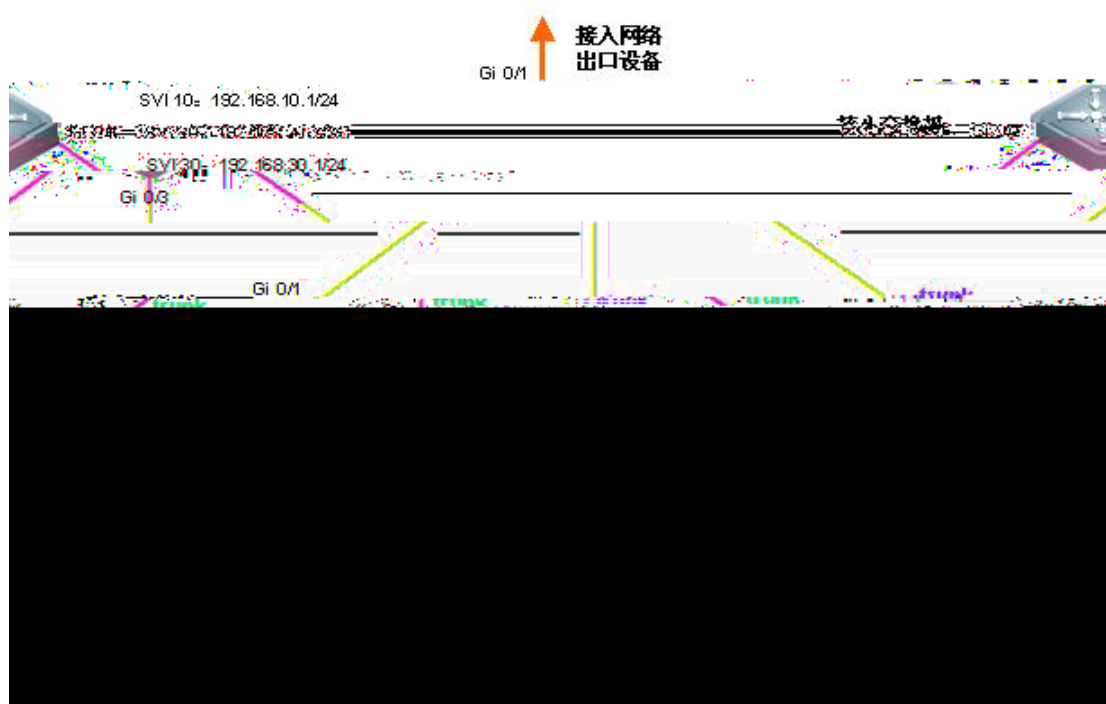
配置 Trunk 接口允许通过的 VLAN 列表，命令如下：

```
Ruijie(config)# interface fastethernet 1/15
Ruijie(config-if)# switchport trunk allowed vlan remove 2
Ruijie(config-if)# end
Ruijie# show interfaces fastethernet 1/15 switchport
Switchport is enabled
Mode is trunk port
Access vlan is 1, Native vlan is 1
Protected is disabled
Vlan lists is
1,3-4094
```



```
VLAN[6] "VLAN0006"  
GigabitEthernet 3/1  
  
Ruijie# show vlan id 1  
VLAN[1] "VLAN0001"  
GigabitEthernet 3/1  
GigabitEthernet 3/2  
GigabitEthernet 3/3  
GigabitEthernet 3/4  
GigabitEthernet 3/5  
GigabitEthernet 3/6  
GigabitEthernet 3/7  
GigabitEthernet 3/8  
GigabitEthernet 3/9  
GigabitEthernet 3/10  
GigabitEthernet 3/11  
GigabitEthernet 3/12
```

VLAN



Э 3 VLAN IP 192.168.10.0/24 à 192.168.20.0/24 à 192.168.30.0/24 3 VLAN 3 IP

- 1) 3 VLAN Ю trunk
- 2) 3 SVI IP
- 3) 3 VLAN Access

1) Э

```

... VLAN

#
Ruijie#configure terminal
# ... VLAN 10
Ruijie(config)#vlan 10
# ... VLAN 20
Ruijie(config-vlan)#vlan 20
# ... VLAN 30
Ruijie(config-vlan)#vlan 30
#
Ruijie(config-vlan)#exit

Ю trunk
vlan

# Gi 0/2-4
Ruijie(config)#interface range GigabitEthernet 0/2-4
# Gi 0/2-4

```

```
#          ⑦          ↴          ↓ vlan ñ 10 à 20
Ruijie(config-if)#switchport trunk allowed vlan add 10,20
#          ↴ Gi 0/3
Ruijie(config-if)#interface GigabitEthernet 0/3
#          vlan ÿ          ↴          ↓ vlan
Ruijie(config-if)#switchport trunk allowed vlan remove 1-4094
#          ⑦          ↴          ↓ vlan ñ 10 à 20 à 30
Ruijie(config-if)#switchport trunk allowed vlan add 10,20,30
#          ↴ Gi 0/4
Ruijie(config-if)#interface GigabitEthernet 0/4
#          vlan ÿ          ↴          ↓ vlan
Ruijie(config-if)#switchport trunk allowed vlan remove 1-4094
#          ⑦          ↴          ↓ vlan ñ 20 à 30
Ruijie(config-if)#switchport trunk allowed vlan add 20,30
#
Ruijie(config-if)#exit
```

```
Gi0/3      enabled  TRUNK   1      1      Disabled  10,20,30

#          ↗ Gi 0/4   vlan

Ruijie#show interface GigabitEthernet 0/4 switchport
Interface Switchport Mode  Access Native Protected VLAN lists
-----
Gi0/4      enabled  TRUNK   1      1      Disabled  20,30

...  SVI ↗      IP

#
Ruijie#configure terminal
# ...  SVI 10
Ruijie(config)#interface vlan 10
#      SVI 10   IP
Ruijie(config-if)#ip address 192.168.10.1 255.255.255.0
# ...  SVI 20
Ruijie(config-if)#interface vlan 20
#      SVI 20   IP
Ruijie(config-if)#ip address 192.168.20.1 255.255.255.0
# ...  SVI 30
Ruijie(config-if)#interface vlan 30
#      SVI 30   IP
Ruijie(config-if)#ip address 192.168.30.1 255.255.255.0
#
Ruijie(config-if)#exit
```

2) Switch A ☹

```
...  VLAN

#
Ruijie#configure terminal
# ...  VLAN 10
Ruijie(config)#vlan 10
# ...  VLAN 20
Ruijie(config-vlan)#vlan 20
#
Ruijie(config-vlan)#exit

    ↗  ↗ VLAN↑      Access ↗

#          ↗      Gi 0/2-12
Ruijie(config)#interface range GigabitEthernet 0/2-12
#          ↗ Gi 0/2-12      ↗ Access ↗
Ruijie(config-if)#switchport mode access
#          ↗ Gi 0/2-12↑      VLAN 10
Ruijie(config-if)#switchport access vlan 10
#          ↗      Gi 0/13-24
```

```
Ruijie(config-if)#interface range GigabitEthernet 0/13-24
#      ↗ Gi 0/13-24      ↘ Access ↗
Ruijie(config-if)#switchport mode access
#      ↗ Gi 0/13-24 ↘      VLAN 20
Ruijie(config-if)#switchport access vlan 20
#
Ruijie(config-if)#exit

          ③              trunk ↗

#      ↗ Gi 0/1
Ruijie(config)#interface GigabitEthernet 0/1
#      ↗ Gi 0/1      ↘ trunk ↗
Ruijie(config-if)#switchport mode trunk
#
Ruijie(config-if)#exit
```

Protocol VLAN

Protocol VLAN

- VLAN ID 1-4094, 0 and 4095 are reserved.
1. VLAN ID 1 is the default VLAN for all switches. It is also the VLAN for the management interface (VLANIF1) of the switch. The PVID of the switch is also VLAN 1 by default.
 2. VLAN ID 4095 is the default VLAN for all switches. It is also the VLAN for the management interface (VLANIF4095) of the switch. The PVID of the switch is also VLAN 4095 by default.
 3. TAG VLAN: A VLAN that is used to carry traffic between switches. It is also the VLAN for the management interface (VLANIF) of the switch. The PVID of the switch is also the TAG VLAN by default.
- Protocol VLAN: A VLAN that is used to carry traffic between switches. It is also the VLAN for the management interface (VLANIF) of the switch. The PVID of the switch is also the Protocol VLAN by default.
- Protocol VLAN: A VLAN that is used to carry traffic between switches. It is also the VLAN for the management interface (VLANIF) of the switch. The PVID of the switch is also the Protocol VLAN by default.
- Protocol VLAN: A VLAN that is used to carry traffic between switches. It is also the VLAN for the management interface (VLANIF) of the switch. The PVID of the switch is also the Protocol VLAN by default.
1. VLAN ID 1 is the default VLAN for all switches. It is also the VLAN for the management interface (VLANIF1) of the switch. The PVID of the switch is also VLAN 1 by default.
 2. VLAN ID 4095 is the default VLAN for all switches. It is also the VLAN for the management interface (VLANIF4095) of the switch. The PVID of the switch is also VLAN 4095 by default.

Protocol VLAN

Protocol VLAN

Ю Protocol VLAN

Ю profile

Ю Ю



2.

Protocol VLAN

↓ 几 几Ю Protocol VLAN

3	
show protocol-vlan	Protocol VLAN

```
Ruijie# show protocol-vlan
ip                mask                vlan
-----
192.168.100.3    255.255.255.0    100
profile          frame-type ether-type    Interfaces|vid
-----
1                ETHERII          EHTER_AARP        gi3/1|101
2                SNAP            ETHER_APPLETALK   gi3/1|1
```


Private VLAN

Private VLAN

Ю Private VLAN

VLAN и VLAN

Ю 3

3	
configure terminal	
vlan vid	VLAN
private-vlan{community isolated primary}	VLAN
no private-vlan{community isolated primary}	√ VLAN
end	VLAN
show vlan private-vlan [type]	VLAN

说明:

802.1Q Vlan é ¨ ¤ a и VLAN VLAN 1 a и
VLAN é Trunk ¤ Uplink ¤ 802.1Q VLAN ¨ ¤ VLAN ¨
√ VLAN ¨ ¤ Private VLAN ACTIVE ¤ ¤

- 1) é Priamry VLAN
- 2) é Secondary VLAN
- 3) Secondary VLAN 6 Primary VLAN

Ю 3 802.1Q VLAN и Private VLAN

```
Ruijie# configure terminal
Ruijie(config)# vlan 303
Ruijie(config-vlan)# private-vlan community
Ruijie(config-vlan)# end
Ruijie# show vlan private-vlan community
VLAN Type Status Routed Interface Associated VLANs
---
303 comm inactive Disabled no association
```

```
Ruijie# configure terminal
Ruijie(config)# vlan 404
Ruijie(config-vlan)# private-vlan isolated
Ruijie(config-vlan)# end
Ruijie# show vlan private-vlan
```

VLAN	Type	Status	Routed	Interface	Associated VLANs
303	comm	inacti	1.434	Td[(VLAN)-103	(Type Status)-6()-6(Routed)-6()-6
300	T(ated)	12.6	(VLANs)]	TJ0 -1.44C(isabl6	(-----)-----)---- ated

说明:

й Primary VLAN VLAN Â

Secondary VLAN Primary VLAN Ъ ¶

↓ √ Ю †

3	
configure terminal	
interface vlan <i>p_vid</i>	Primary VLAN ¶
private-vlan mapping { <i>svlist</i> add <i>svlist</i> remove <i>svlist</i> }	Secondary VLAN Primary VLAN SVI Ъ Â

Sec3Td (r

switchport mode private-vlan host	й γ
no switchport mode	VLAN
End	SVI 1
switchport private-vlan host-association <i>p_vid s_vid</i>	γ 1 6 VLAN
no switchport private-vlan host-association	

Ю'

```

Ruijie# configure terminal
Ruijie(config)# interface gigabitEthernet 0/2
Ruijie(config-if)# switchport mode private-vlan host
Ruijie(config-if)# switchport private-vlan host-association
202 203
Ruijie(config-if)# end
Ruijie#

```

说明:

Primary VLAN Secondary VLAN

γ 1 й VLAN 1

γ 1 й VLAN 1~ 100 3'

3	
configure terminal	
interface <interface>	1 "1, "1~ "1
switchport mode private-vlan promiscuous	й VLAN γ
no switchport mode	1 VLAN
switchport private-vlan mapping <i>p_vid{svlist add svlist remove svlist}</i>	VLAN 1 VLAN~ 1 secondary VLAN
no switchport private-vlan mapping	1 secondary VLAN.

A B 1~ A ì ý ' A 4 ~ ж A
1~ --mac1~ A 1~
mac1~ 1 1 B B Э 1 1 Э ≠
a Â
A 1~ ж mac1~ B
1 1 ý ý a у Â
A è 1 1 mac ì mac1 ж a у B Э
й B 1 1 у 1~
B 1 Э Â

MAC Â || 1~ a ||
1 (a 1~ у) 1~
æ ≠ a Â 1~

MAC Â Л ì 1~ 1~
Â 1~ a у 1~ 1~ 1~
æ ≠ a Â 1~ 1~
у 1~ 1~ MAC ì
б

MAC

MAC

Ю

у	300

注意:

у б у ~ а 2 Â

у

Ю й у

з	
Ruijie(config)# mac-address-table aging-time [0 10-1000000]	у Л ~ æ ~ 10 1000000 ~ й 300 Â й 0 ~ у а у Â

↓ Л Ю з no mac-address-table aging-time
у й Â

注意:

S2700 у й 10 – 630



```

[~] # clear mac-address-table dynamic
[~] # clear mac-address-table dynamic address
mac-address y MAC ' ↓ ∟ { clear
mac-address-table dynamic interface interface-id y ∟
Aggregate Port ∅ || ' ≠ ↓ ∟ { clear mac-address-table
dynamic vlan vlan-id VLAN ∅ || Â
↓ ∟ ∅ { show mac-address-table dynamic
|| i Â

```



```

[~] y ~ MAC ( ) VLAN(
[~] VLAN ) ∟ ( ∟ MAC
↓ ∟ ) Â
[~] y '

```

{	
---	--

mac-addr'

MACg/C2.73452 0.96 2Tc 0.00Bf268

```

Ruijie(config)#
mac-address-table static
mac-add vlan vlan-id
interface interface-id

```

¶ y

3	
Ruijie(config)# mac-address-table filtering <i>mac-addr</i> vlan <i>vlan-id</i>	mac-addr' MAC vlan-id' VLAN

↓ √ ∅ ∅ 3 **no mac-address-table filtering** **mac-addr**
vlan *vlan-id* y Â
∅ VLAN 1 r

MAC

```
Ruijie# show mac-address-table count
Dynamic Address Count : 30
Static Address Count : 0
Filtering Address Count: 0
Total Mac Addresses : 30
Total Mac Address Space Available: 8159
```

у

```
Ruijie# show mac-address-table aging-time
Aging time : 300
```

MAC ↓ у

```
у      Â      MAC      ↓ у      MAC      π      MAC
у      у      MAC      у      ↓      MAC      ↓ у
н      ~      Л SNMP Trap      ч      NMS(      ) Â
у      MAC      π      н      у      (      MAC
)      у      MAC      (у
у
у      )      н      ‡      у      Â
(      Э      )      π      Â й      MAC      ↓ у н
MAC      Â      MAC      ↓ у      π Л
у      MAC      у
у      MAC      у
у      MAC      у      Trap      NMS      1      MAC      ↓ у      Trap
↓ Л      MAC      ↓ у      MAC      ↓ у      Â
MAC
```

MAC $\vdash \hat{A}$ $\vdash \gamma$ a $\vdash \eta$

MAC ↓ y T

$$\hat{A} \quad \text{MAC} \quad \sim \quad \text{MAC} \quad \text{II} \quad \neq$$

MAC

Ruijie(config)# snmp-server host <i>host-addr</i> traps [version {1 2c 3} [auth noauth priv]] <i>community-string</i>	MAC host-addr ' Version' community-string'	NMS IP. Trap. Trap
Ruijie (config)#snmp-server enable traps		Trap
Ruijie(config)# mac-address-table notification	MAC	
Ruijie(config)# mac-address-table notification { interval value history-size value }	interval value ' () 1' 3600 history-size value ' 1' 200	MAC ' 1' 200
Ruijie(config-if)# snmp trap mac-notification { added removed }	MAC added ' removed'	

```

└─┬┐
mac-notification      └─ MAC      └─ Trap      └─ no
mac-address-table notification      MAC      └─
└─┬┐
no snmp trap mac-notification {added |
removed}      └─ MAC      └─

```

Ю	MAC	Л public й	IP
й 192.168.12.54 NMS ч	MAC	Trap н	MAC
й 40 ~	MAC	й 100	
Gigabitethernet 1/3 Э	MAC		

```
Ruijie(config)# snmp-server host 192.168.12.54 traps public
Ruijie(config)# snmp-server enable traps
Ruijie(config)# mac-address-table notification
Ruijie(config)# mac-address-table notification interval 40
Ruijie(config)# mac-address-table notification history-siz
```

e 100

Ruijie(config)# interface gigabitethernet 1/3

Ruijie(config-if)# snmp trap mac-notification added

Ruijie(config-if)# snmp trap mac-notification removed

MAC

MAC

MAC	MAC
Ruijie# show mac-address-table notification	MAC
Ruijie# show mac-address-table notification interface	MAC
Ruijie# show mac-address-table notification history	MAC

MAC

MAC

Ruijie# show mac-address-table notification

MAC Notification Feature : Enabled

Interval(Sec): 2

Maximum History Size : 154

Current History Size : 2

Ruijie# show mac-address-table notification interface

Interface MAC Added Trap MAC Removed Trap

```

-----
Gi1/1          Disabled      Enabled
Gi1/2          Disabled      Disabled
Gi1/3          Enabled       Enabled
Gi1/4          Disabled      Disabled
Gi1/5          Disabled      Disabled
Gi1/6          Disabled      Disabled

```

Ruijie# show mac-address-table notification history

History Index:1

Entry Timestamp: 15091

MAC Changed Message :

Operation VLAN MAC Address Interface

```

-----
Added      1    00d0.f808.3cc9 Gi1/1
Removed    1    00d0.f808.0c0c Gi1/1
History Index:2
Entry Timestamp: 21891

```


Operation	VLAN	MAC Address	Interface
-----------	------	-------------	-----------

```
Added      1      00d0.f80d.1083 Gi1/1
```

--	--

no address bind install 2 1 ^

```

jill@chew_address_bind

```

Total Bind Addresses in System : 2

3.3.3.4 00d0.f811.1117

i

```
Ruijie# show address-bind summary
Total Bind Addresses in System : 0
Max Bind Addresses limit in System : 1000
System Address bind status:SUCCESS
```

```

System Address bind status      b      '  SUCCESS
      { address-bind install    {  π      '  FAIL
      { address-bind install    {  ~      a  ∪
      ∪      ~      a      ∪ ∪      √
      'A      '  Uninstall
      a      Â

```

Ч ҫ Ю Ы Ш Ъ Ы Ш Â Ê

	IPv4	IPv6
Ш	IPv4+MAC	IPv6
	IPv4+MAC	IPv6
	IPv4+MAC	MAC

Ruijie# configure terminal	
Ruijie(config)# address-bind ipv6-mode compatible	ipv6 и
Ruijie(config)# address-bind ipv6-mode loose	ipv6 и
Ruijie(config)# address-bind ipv6-mode strict	ipv6 и ш
Ruijie(config)# no address-bind ipv6-mode	ipv6 и ^ ш ~ Â

```
Ruijie(config)# address-bind ipv6-mode compatible
```

IPV6	DHCP Snooping				MAC+IP
MAC+IP	1	1	1	1	1
IPV6	1	1	1	1	1

	IPv4	↓	↑	IPv6	↓	↑
Ш	↓	↗	↘	↓	↗	↘
	↓	↗	↘	↓	↗	↘
	↓	↗	↘	↓	↗	↘
	↓	↗	↘	↓	↗	↘

IP+MAC IP+MAC IP+MAC IP+MAC

↵

↵ ~ ÿ ~ ↵ Ё ↵ а ~ ↵ Ё ↵ й
↵ ~ ↵ Ё ЁЮ ↵'

↵	
Ruijie# configure terminal	
Ruijie(config)# address-bind uplink <i>intf-id</i>	↵
Ruijie(config)# address-bind install	↵

↵ Ё Ю **no address-bind uplink** *interface-id* ↵ ↵
no address-bind install ↵ ↵ Â

↵

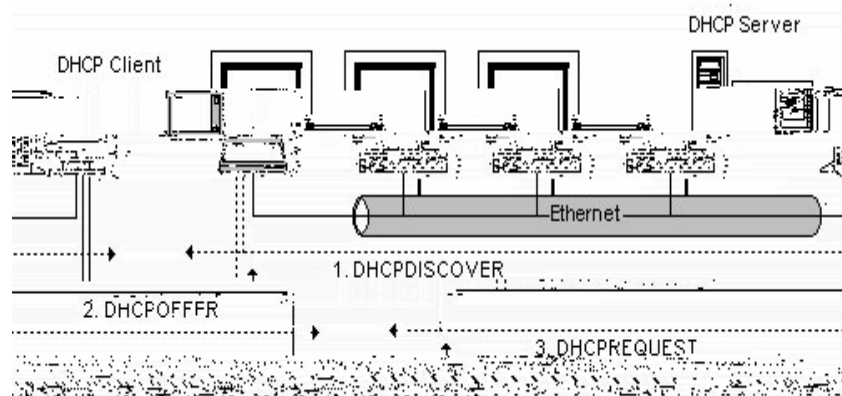
↵ Ё Ю **show address-bind uplink** ↵
↵'

DHCP Snooping

DHCP Snooping

DHCP

DHCP Client 通过 DHCP 服务器获取 IP 地址



1

DHCP Client 发送 DHCP DISCOVER 消息给 DHCP Server

DHCP Server 收到 DHCP DISCOVER 消息后，向 Client 发送 DHCPOFFER 消息

DHCP Client 收到 DHCPOFFER 消息后，向 DHCP Server 发送 DHCP REQUEST 消息

DHCP Server 收到 DHCP REQUEST 消息后，向 Client 发送 DHCP ACK 消息

DHCP Client 收到 DHCP ACK 消息后，开始使用分配的 IP 地址

DHCP Server 收到 DHCP DISCOVER 消息后，向 Client 发送 DHCP NAK 消息

DHCP Client 收到 DHCP NAK 消息后，重新发送 DHCP DISCOVER 消息

DHCP Snooping

DHCP Snooping 功能可以防止非法 DHCP 服务器在网络上发送 DHCP 消息

DHCP Snooping 1 11 ' ~

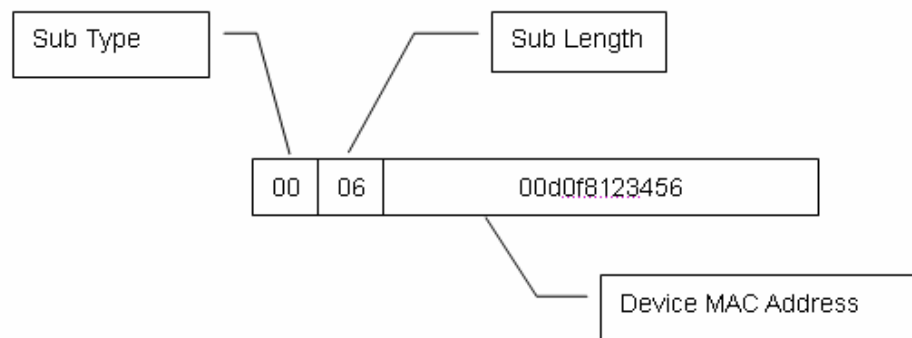
DHCP Snooping Trust 11' DHCP 11 IP ~

11 11 11 11 IP 11 11 11 ~

11 11 11 ~ TRUST 11 UNTRUST 11 11 DHCP

2

Agent Remote ID



3

DHCP Snooping

¶

DHCP snooping ¶ DHCP ~ 1
 (IP à MAC à VLAN à PORT à) DHCP snooping
 Â DHCP snooping ¶ IP ~ ÿ
 ↓ DHCP snooping 1 ↓ IP ~
 rrr"©*6X&5100CMAE0N[3678E1@ÝÁD% ÜÀF\$4¥ n s6Ñ 1fí

й 7 ARP ARP Æ ARP
 ~ 7 7 ARP-CHECK à DAI ~

DHCP Snooping è Y

- 1' DHCP Snooping 6 DHCP Relay Option 82 7 a 7
 DHCP Snooping DHCP Relay Option82 7 Æ
- 2' 7 7 TRUST 7 7 a 7 7 7 Æ
- 3' 7 DHCP Snooping 7 7 DHCP CPU 7 a 7
 Æ ' 1' DHCP a 7
 7 7 7 IP ' 2' 7 7 IP 7 IP
 7 7 a 7 7 7 7 Æ

DHCP Snooping

DHCP Snooping

7 DHCP Snooping 7 7 Æ 7 7 DHCP
 Snooping DHCP Æ

7	
Ruijie# configure terminal	
Ruijie(config)# [no] ip dhcp snooping	DHCP snooping

DHCP Snooping Bootp

7 DHCP Snooping 7 a Bootp Æ 7
 7 DHCP Snooping Bootp 7
 Bootp 7 DHCP Snooping Æ

7	
Ruijie# configure terminal	


```
Ruijie (config)# end
Ruijie#
```

注意:

```
1'      a 6 ||      ǎ  Â      ~  Ÿ  ↓  √
   ||      ↓ IP      Â
2' Bootp      Â      Bootp      6      ~
   3      ↓ Â
```

DHCP snooping information option

10' 11 Â 11 11' DHCP Snooping

配置 DHCP Snooping 并写入 Flash

配置 DHCP Snooping 并写入 Flash

配置命令	说明
Ruijie# configure terminal	
Ruijie(config)# ip dhcp snooping database write-to-flash	将 DHCP snooping 数据库写入 flash

配置 DHCP Snooping 并写入 Flash

```
Ruijie# configure terminal
Ruijie(config)# ip dhcp snooping database write-to-flash
Ruijie(config)# end
```

配置接口信任

配置接口信任

配置命令	说明
Ruijie# configure terminal	
Ruijie(config)# interface fastethernet 0/1	
Ruijie(config-if)# [no] ip dhcp snooping trust	配置接口信任

配置接口信任

```
Ruijie# configure terminal
Ruijie(config)# interface fastethernet 0/1
Ruijie(config-if)# ip dhcp snooping trust
Ruijie(config-if)# end
Ruijie#
```

清除 DHCP Snooping 绑定

清除 DHCP Snooping 绑定

配置命令	说明
Ruijie# clear ip dhcp snooping binding	清除 DHCP snooping 绑定

```

Ruijie# clear ip dhcp snooping binding

```

DHCP snooping 验证

DHCP snooping

```

3 DHCP Snooping 11

```

3	
Ruijie# show ip dhcp snooping	dhcp snooping

```

Ruijie# show ip dhcp snooping

```

```

Switch DHCP snooping status ' ENABLE
Verification of hwaddr field status ' DISABLE
DHCP snooping database write-delay time: 0(not write)
DHCP snooping option 82 status: ENABLE
DHCP snooping Support Bootp bind status: ENABLE
Interface                Trusted
-----                -
FastEthernet0/11         yes

```

DHCP snooping

```

3 DHCP Snooping

```

3	
Ruijie# show ip dhcp snooping binding	DHCP Snooping

```

Ruijie# show ip dhcp snooping binding

```

```

Total number of bindings: 1

MacAddress      IpAddress Lease Type VLAN Interface
-----
00d0.f801.0101 192.168.1.1 - static 1 fastethernet 0/1

```

DHCP snooping

3 DHCP Snooping Â

3	
Ruijie# debug ip dhcp snooping {event packet}	/ DHCP Snooping

Ruijie# **debug ip dhcp snooping event**
Ruijie# **debug ip dhcp snooping packet**

IGMP Snooping

IGMP

IGMP 是 IP 网络中，主机和路由器之间，
Internet 协议族中，用于在 IP 网络中，
主机和路由器之间，传递组播成员关系信息，
和组播地址信息，以及组播流量控制信息的
协议。它定义了主机如何加入或离开组播组，
以及路由器如何管理组播流量。它定义了主机
如何加入或离开组播组，以及路由器如何管理
组播流量。它定义了主机如何加入或离开组播
组，以及路由器如何管理组播流量。

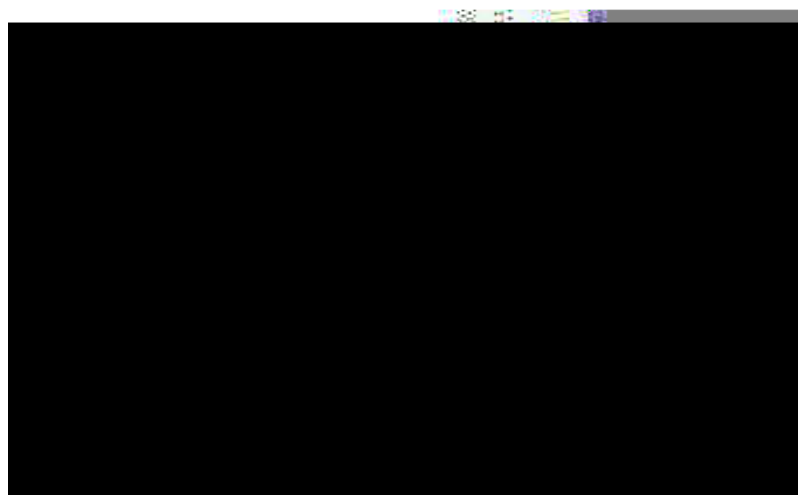
点对多的传播方式



1

IP y IP J y “ŷ” ŷ ŷ ŷ
y IP Â
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1. IGMP Report
 2. IGMP Leave
 3. IGMP Query
 4. IGMP Query
 5. IGMP snooping



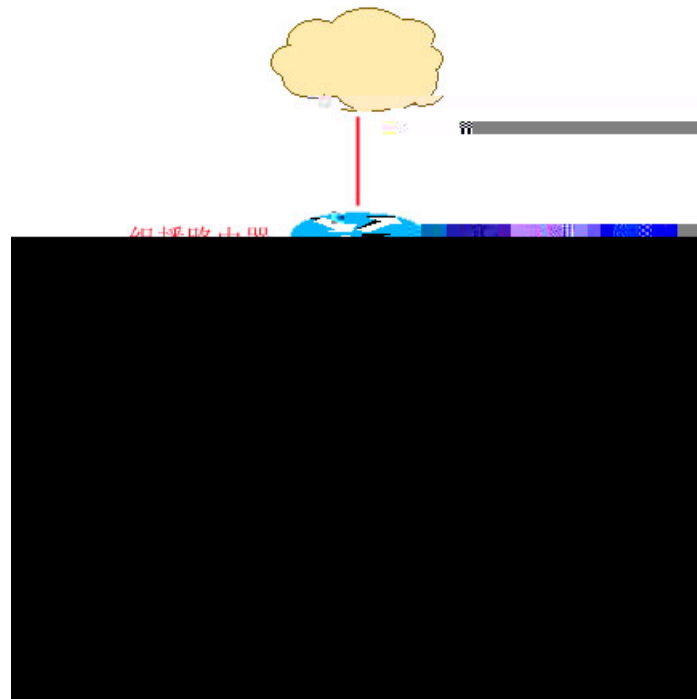
PC

IGMP

snooping

VLAN

Ю



4

IGMP Snooping 在二层网络中，通过监听组播成员的报告，记录组播成员所在的端口，从而在转发组播数据时，只向该端口转发，避免组播数据在二层网络中泛滥。

注意：

1. 组播数据在二层网络中转发时，需要通过组播成员所在的端口转发，否则会导致组播数据在二层网络中泛滥。

2. 组播成员所在的端口可以通过组播成员的报告来记录，也可以通过组播成员所在的端口来记录。

3. 组播成员所在的端口可以通过组播成员的报告来记录，也可以通过组播成员所在的端口来记录。

IGMP Snooping 配置

1. 配置全局 IGMP Snooping

```

<Device># ip igmp snooping
  
```

2. 配置接口 IGMP Snooping

```

<Device># ip igmp snooping vlan <vlan-id>
  
```

3. 配置接口 IGMP Snooping 快速离开

```

<Device># ip igmp snooping fast-leave vlan <vlan-id>
  
```

4. 配置接口 IGMP Snooping 抑制

```

<Device># ip igmp snooping suppress vlan <vlan-id>
  
```

Multicast VLAN
 VLAN

5

↓ VID Multicast VLAN ^ UNTAG ~ ↓

native vlan → Multicast VLAN ~ ↓

~ ↓ a VLAN Â ↓ VID Multicast

VLAN Â SVGL Ю ~ ↓ Multicast

VLAN ~ È ↓ VLAN ↓ Â

IVGL SVGL ч ↓ ∫ ↓ ~ ↓ ∫ ∫ ∫ ∫ ∫ ∫

SVGL ~ ↓ ^ GDA ~ VLAN ↓ ~ È

‡ IVGL Â

γ IGMP Snooping IVGL 6 SVGL ~

~ a ↓ Â

fast-leave

IGMP Leave "a 4 Э 5
IGMP Query 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039

IGMP snooping suppression

IGMP Snooping 1 Query 2 Report 3 IGMP 4 Report 5 Query 6 Snooping 7 Report 8 9 Report 10 IGMP Snooping Suppression. 11 IGMP v3 Report 12 IGMP Snooping Suppression 13 v1 v2 Report 14

15

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

6

IGMP Snooping

1. IGMP Snooping 1

2. 2 3 4

1. 5

2. 6

IGMP Snooping

配置

IGMP Snooping

IGMP Snooping

IGMP Profiles

配置

配置

配置

IVGL

DISABLE

Query

Fast-leave

IGMP Snooping Suppression

IGMP Snooping

IGMP Filtering

IGMP Snooping

IGMP Snooping	DISABLE
配置	配置
配置	
IGMP Profile	配置
SVGL Multicast Vlan	VLAN 1
IGMP Filtering	
IGMP Snooping	

注意:

配置 VLAN 配置 Access 配置 Trunk 配置 AP 配置 IGMP Snooping 配置

```

1 ~ Y private vlan Ю ‡ a igmp snooping Â
Igmp snooping Hash ă ↓ ~ Y
Hash ă Â

```

IGMP Profiles

```

"l Ÿ Y IGMP Profile ~ ↓ ∪ ∞ Y ~ ∞
permit/deny || ~ ∪ ∞ I SVGL L à I
↓ L à I IGMP Filtering L ∞ ∞ Â
Y IGMP Profile Y ∞ ∞ ∞ ∞ ∞
↓ Â
Ю Ю Y Profile'

```

3	
Ruijie(config)# ip igmp profile <i>profile-number</i>	IGMP Profile ~ ↓ Y ∪ ~ ò 1' 65535 Â
Ruijie (config-profile)# permit deny	(↓ ~ permit deny Y ~ deny Â ò ' / ∪Ю range / è Â
Ruijie(config-profile)# range ip <i>multicast-address</i>	∞ ~ ↓ ∞ Â
Ruijie# end	Â

```

è Y IGMP profile' ↓ ∪ no ip igmp profile profile number
Â

```

```

profile Y range' ↓ ∪ no range ip multicast address
Â

```

```

∪Ю Profile '

```

```

Ruijie(config)# ip igmp profile 1
Ruijie(config-profile)# permit
Ruijie(config-profile)# range 224.1.1.1 225.1.1.1
Ruijie(config-profile)# range 226.1.1.1
Ruijie(config-profile)# end
Ruijie# show ip igmp profile 1
IGMP Profile 1
permit
range 224.1.1.1 225.1.1.1
range 226.1.1.1

```


Profile		↕	↕	↕
IO	IO	↕	↕	'
3				

```
Ruijie(config)# ip igmp snooping vlan
vlan-id mrouter interface interface-id profile
profiid
```

```
Ruijie(config)# ip igmp snooping dyn-mr-aging-time 100
Ruijie(config)# end
```

IVGL

Ю Ю IGMP Snooping ò IVGL

Ruijie(config)# ip igmp Snooping ivgl	IGMP Snooping ò IVGL Â
Ruijie(config)# end	Â

Ю IGMP Snooping ò IVGL

```
Ruijie# configure Terminal
Ruijie(config)# IP igmp Snooping ivgl
Ruijie(config)# end
```

DISABLE

Ю Ю IGMP Snooping ò DISABLE

Ruijie(config)# no ip igmp snooping	IGMP Snooping
Ruijie(config)# end	Â

Query

IGMP Query a ò ò
Query ò ò IGMP Report ò ò ò
a "Â ò ò ò ò ò ò 10

Ю Ю Query

Ruijie(config)# ip igmp snooping query-max-response-time seconds	Query ò ò 1-65535 ò 10
Ruijie(config)# end	Â

```
no ip igmp Snooping query-max-response-time 3 1
```

Fast-leave

```
no ip igmp snooping fast-leave 1
```

3	1
Ruijie(config)# ip igmp snooping fast-leave enable	Y fast-leave 1 1
Ruijie(config)# end	1

```
no ip igmp snooping fast-leave enable 3 fast-leave 1 1
```

```

Ruijie# configure Terminal
Ruijie(config)# ip igmp snooping fast-leave enable
Ruijie(config)# end

```

IGMP Snooping Suppression

```
no ip igmp snooping suppression 1
```

Ruijie(config)# ip igmp snooping ivgl	IVGL IGMP Snooping ÿ
Ruijie(config)# ip igmp snooping vlan <i>vlan-id</i> static <i>ip-addr</i> interface <i>interface-id</i>	ÿ ÿ ÿ • <i>vlan-id</i> • <i>ip-addr'</i> • <i>interface-id'</i> vid ÿ ÿ
Ruijie(config)# end	ÿ

```

Ruijie# configure Terminal
Ruijie(config)# ip igmp snooping vlan 1 static 224.1.1.1
interface GigabitEthernet 0/7
Ruijie(config)# end
Ruijie(config)# show ip igmp snooping gda
: M - mrouter
  D - dynamic
  S - static
Address                Member ports
-----
224.1.1.1              GigabitEthernet 0/7(S)

```

Ruijie(config-if)# ip igmp snooping max-groups <i>number</i>	^ ~ 0 - 4294967294
Ruijie(config-if)# end	

IGMP Snooping

IGMP snooping

IGMP Snooping

IGMP Profile

IGMP Filtering

IGMP Snooping

Ruijie# show ip igmp snooping	IGMP Snooping

show ip igmp snooping IGMP Snooping

```
Ruijie# show ip igmp snooping
Igmp-snooping mode      : IVGL
SVGL vlan-id             : 1
SVGL profile number      : 0
Source check port        : Disabled
Query max response time  : 10(Seconds)
```

IGMP snooping

IGMP Snooping

Ruijie# show ip igmp snooping statistics [vlan vlan-id]	IGMP Snooping

```
Ruijie# clear ip igmp snooping statistics
```

IGMP Snooping

```

Ruijie# show ip igmp snooping statistics

```

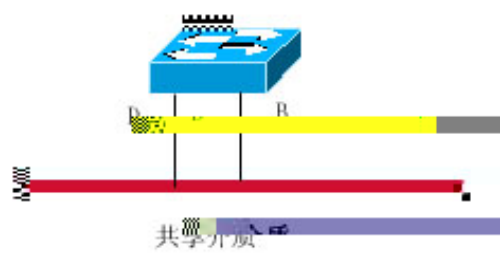
```
Ruijie# show ip igmp snooping statistics
```

GROUP	Interface	Last report time	Last leave time	Last reporter
224.1.1.2	VL1:Gi4/2	0d:0h:0m:7s	----	192.168.9.250
		Report pkts: 1		Leave pkts: 0

```


```


图 1-1-1



1

2

Root bridge



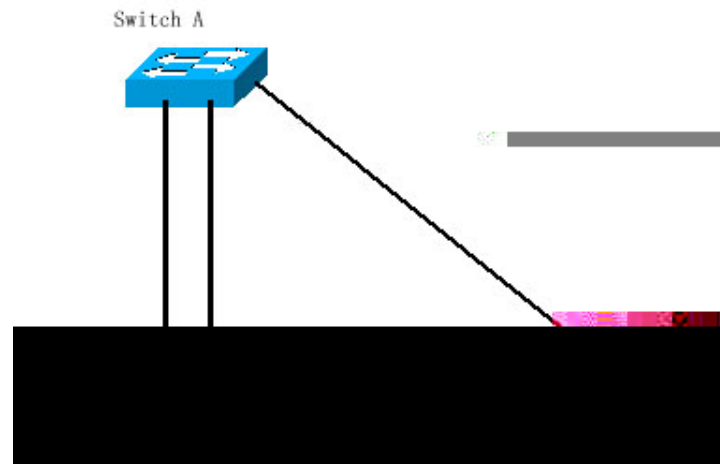
3

图 1-1-2

Port State

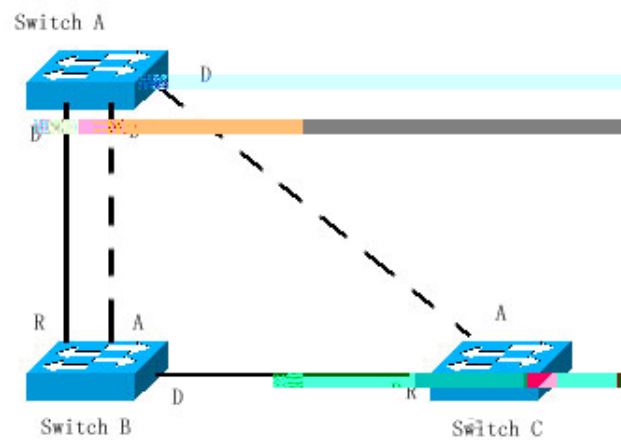
Discarding a

Mac



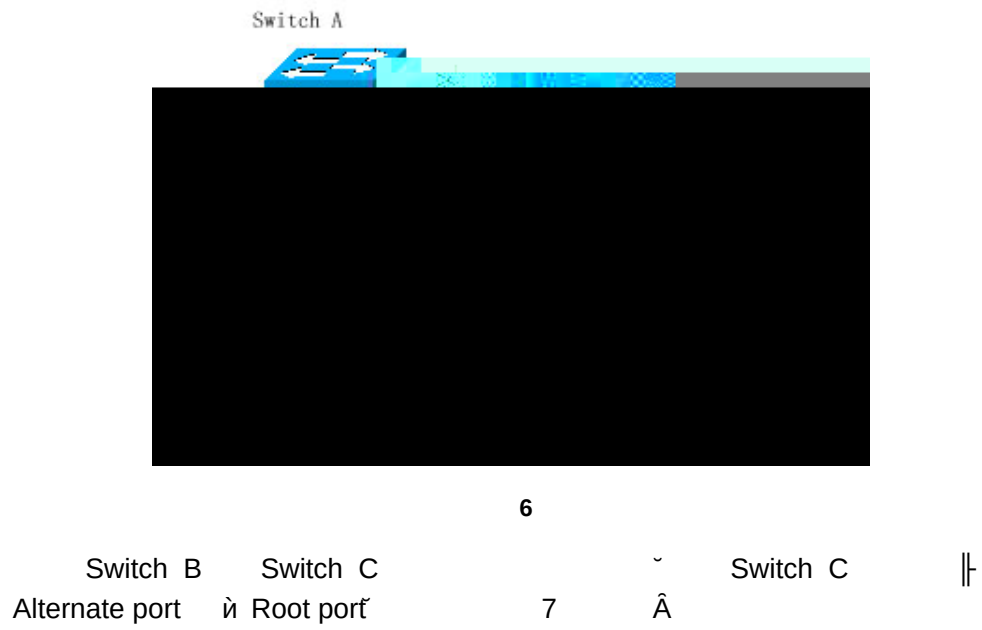
4

Switch A is the Root Bridge. Switch B is the Root Port. Switch C is the Alternate Port. The Path Cost is 5. The Port Role is Root port. The Port Role is Alternate port.

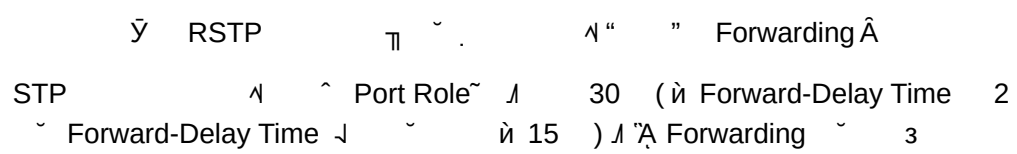


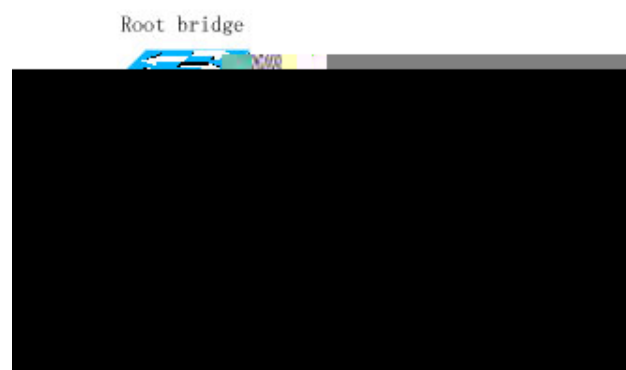
5

Switch A is the Root Bridge. Switch B is the Root Port. Switch C is the Alternate Port. The Path Cost is 5. The Port Role is Root port. The Port Role is Alternate port.

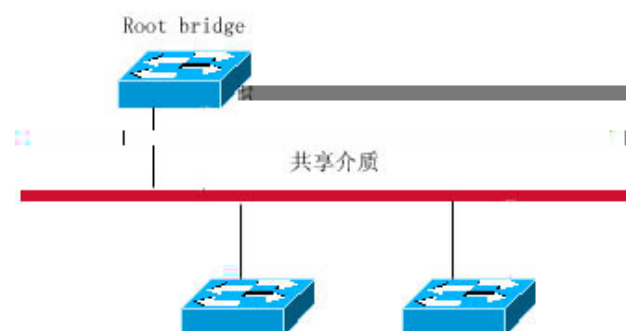


RSTP



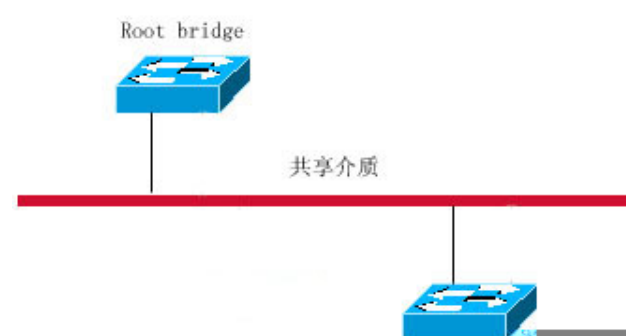


9



10

1 à Ю ì“ ” ~ √†



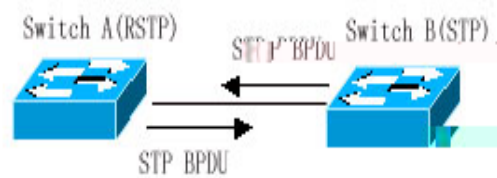
11

RSTP 6 STP

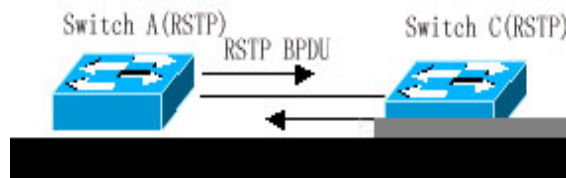
RSTP √ √ 6 STP ~ RSTP BPDU /1

|| 6 STP Forwarding 30 RSTP Forwarding 6 STP
 RSTP 11 A
 1 RSTP STP 12 Switch A
 RSTP Switch B 12 Switch A 6
 STP 11 Switch C
 RSTP Switch A 11 STP BPDU Switch C 11
 6 STP 11 RSTP 11 STP
 æ A
 11 RSTP Protocol-migration 11 RSTP BPDU(
 11 RSTP Switch A 11 RSTP BPDU Switch C
 11 6 RSTP 11 11 RSTP
 13 A

Protocol Migration



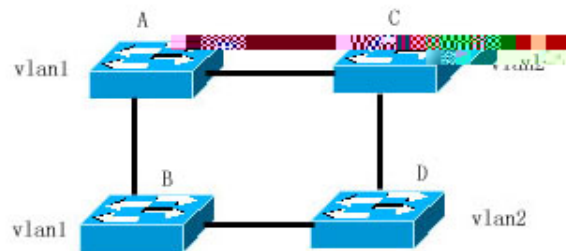
12



13

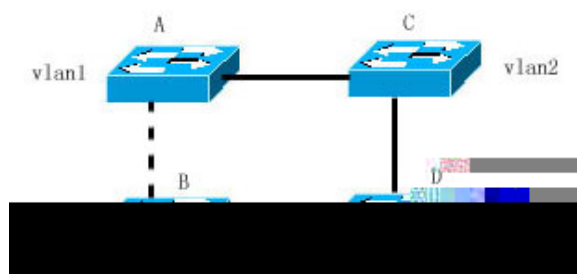
MSTP

MSTP MSTP STP à RSTP 3 1
 11 RSTP FORWARDING A
 6 Vlan 11 11 11
 11 11 11 11 11 11 11 11
 14 11 A à B Vlan1 11 C à D Vlan2 11 A



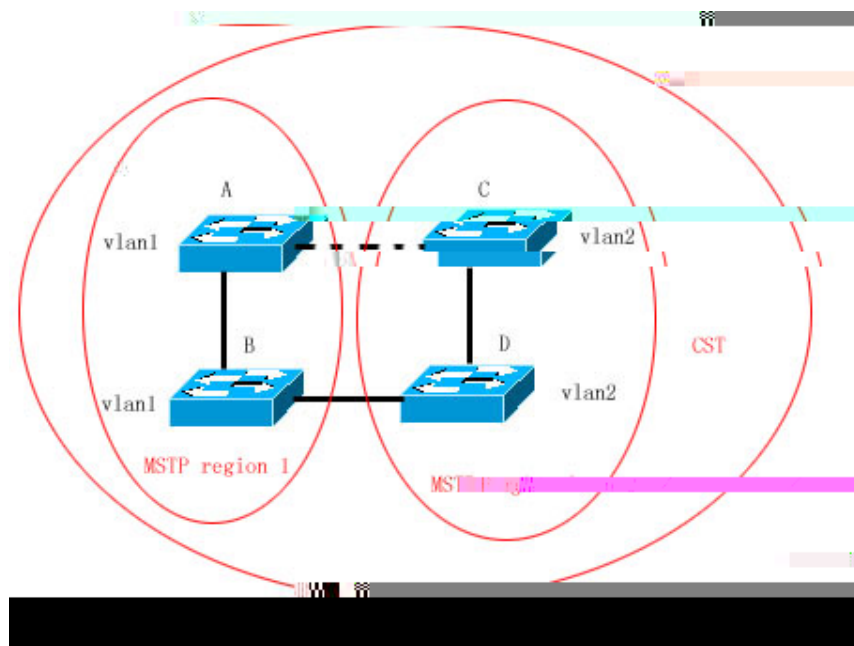
14

A C D B A B
 Ю C D A B DISCARDING 15
 ~ A C D a ð Vlan1 Vlan1 Vlan1 A
 Vlan1 б B Vlan1 A



15

й α ~ MSTP н ~ Vlan ↑
 й У Instance ↓ Instance У ^ MST Region ~
 MST region л У й IST Internal Spanning-tree '
 ~ У ~ б è MST Region "A
 й CST Common Spanning Tree ~ A
 ~ лэ ↓л MSTP ю 16 ' A B
 MSTP Region 1 ~ MSTP Region 1 н ~ л
 DISCARDING ~ ↓ MSTP Region 2 ≠ У A л Region 1
 Region 2 ↑ ч ~ ч л " ~
 У DISCARDING A



16

H, ~ ≠ ∇ Vlan a ∇ Â

† MSTP Region

MSTP Region	MSTP Region	"MST"	"Y"	Â
MST				

MST ↓ ^ Name~' ↓ 32 MSTP
Region Â

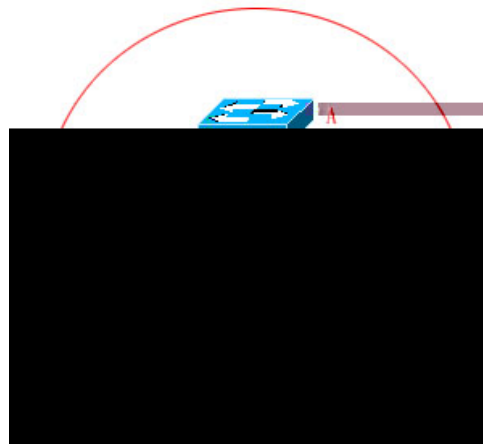
MST Revision Number	Y	16bit	MSTP Region A
---------------------	---	-------	---------------

MST Instance—vlan		Instance id
1	64 Instance 0	65 Instance 1

Vlan	a	Instancê	0	64~	Vlan
Instance 0	MSTI	MST Instance	Y	"Vlan"	
BPDU	MSTI	MSTI	a	CIST	MSTI
Â					

$$\downarrow \quad \text{spanning-tree mst configuration} \quad \downarrow \quad \text{"MST"}$$

MSTP BPDUs	ЛЭ	УЛ	BPDUs	MST
У	й	ЛЭ	ЛУ	MST Region
й	й	У	У	Region
й	й	У	У	Region



18

MSTI 2 Instance 2 ~ 19 C "I ~ ÷ Region Root
 "A è 1 ~ A B DISCARDING Â ~ Instance 2
 "Vlan " ~ 1 B C à A C 1 ~ "Vlan " Â

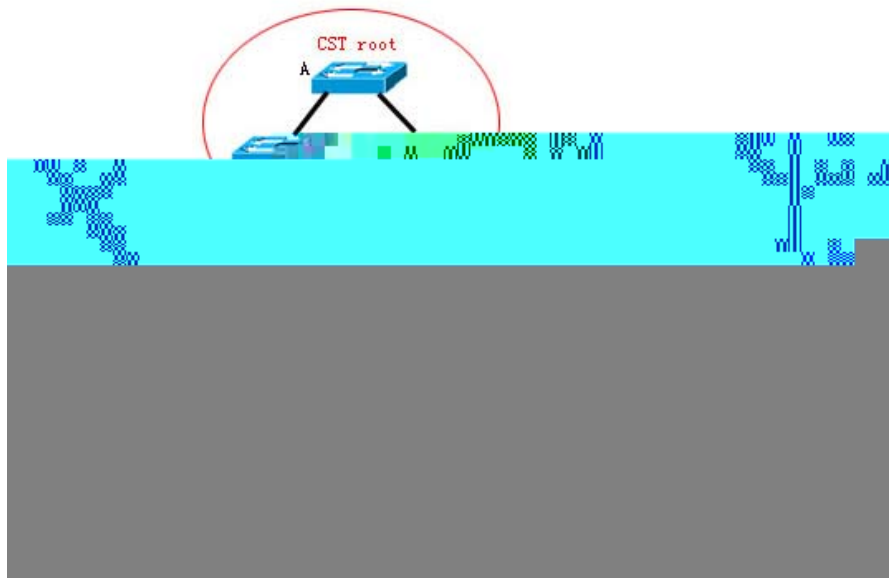
19

MSTP a y 1 Vlan 1
 Vlan MSTP ÷ 1 Path Cost Priority 1
 a Â

MSTP region

^ CST

MSTP region CST 1 1 ee)MSTon ~ a 1 MSTP
 Region #



20

CIST Regional Root a Y Region Bridge ID ¼ ~
 Region CST Root Root Path Cost Â
 ¼ ~ CIST Regional Root Root Port MSTI Port Role ¼ ÿ
 “Master port” ÿ Instance “ ¼ ” Instance
 FORWARDING Â ÿ Region CST Root “
 ¼” ¼ Region Y ¼ ¼!

Hop Count

IST MSTI a Message Age Max Age BPDUs ¼ ~
 IP TTL Hop Count Â
 ¼ ¼ **spanning-tree max-hops** ¼ Â Region ~ ÿ
 Region Root Bridge ~ Y ~ Hop Count 1 ÿ 0 ±
 BPDUs ~ Hops ÿ 0 BPDUs Â
 ÿ Region STP à RSTP ~ MSTP Message Age Max
 Age Â

MSTP RSTP à STP

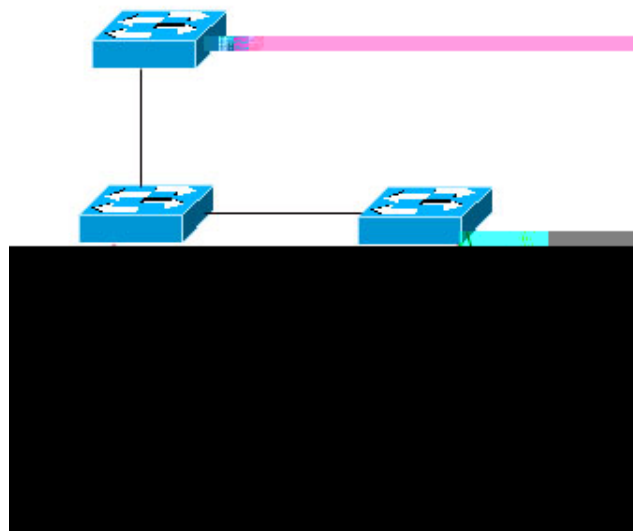
STP ~ MSTP RSTP ¼ STP BPDUs ~
 ¼ “RSTP 6 STP” Â
 RSTP ~ MSTP BPDUs CIST ¼ ~ MSTP a
 ж ¼ RSTP BPDUs ¼

STP RSTP
 Region A

MSTP

Port Fast

Forwarding 30 Forwarding
 Port Fast enable



21

Port Fast Disabled
 BPDUs STP
 Port Fast Operational State Forwarding

(AutoEdge)

AutoEdge

Ó

N

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>

Í

â

注意:

- 1) 在配置 Port Fast 之前，必须先配置 BPDU Guard。
- 2) 在配置 AutoEdge 之前，必须先配置 BPDU Guard。
- 3) 在配置 BPDU Filter 之前，必须先配置 BPDU Guard。
- 4) 在配置 BPDU Guard 之前，必须先配置 BPDU Filter。
- 5) AutoEdge 是 IEEE 802.1D 2004 标准中定义的一个特性，它允许在边缘端口上启用 STP。在配置 AutoEdge 之前，必须先配置 BPDU Guard。

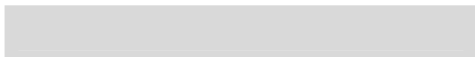
BPDU Guard

BPDU Guard 可以在接口上启用，也可以在全局启用。在全局启用的配置如下：

```
spanning-tree
```

```
portfast default
```


1) ↓ 4 0 Loop Guard



Switch Priority

```

Ruijie# show spanning-tree
          Instance 0
          Bridge ID 4096
          Bridge ID 8192 12288 16384 20480 24576 28672 32768 36864
          Bridge ID 40960 45056 49152 53248 57344 61440 65536 69632
          Bridge ID 73728 77824 81920 86016 90112 94208 98304 102400
          Bridge ID 106496 110592 114688 118784 122880 126976 131072 135168
          Bridge ID 139264 143360 147456 151552 155648 159744 163840 167936
          Bridge ID 172032 176128 180224 184320 188416 192512 196608 200704
          Bridge ID 204736 208832 212928 217024 221120 225216 229312 233408
          Bridge ID 237504 241600 245696 249792 253888 257984 262080 266176
          Bridge ID 270336 274432 278528 282624 286720 290816 294912 299008
          Bridge ID 303104 307200 311296 315392 319488 323584 327680 331776
          Bridge ID 335872 339968 344064 348160 352256 356352 360448 364544
          Bridge ID 368640 372736 376832 380928 385024 389120 393216 397312
          Bridge ID 401408 405504 409600 413696 417792 421888 425984 430080
          Bridge ID 434176 438272 442368 446464 450560 454656 458752 462848
          Bridge ID 466944 471040 475136 479232 483328 487424 491520 495616
          Bridge ID 500000 504096 508192 512288 516384 520480 524576 528672
          Bridge ID 532768 536864 540960 545056 549152 553248 557344 561440
          Bridge ID 565536 569632 573728 577824 581920 586016 590112 594208
          Bridge ID 598304 602400 606496 610592 614688 618784 622880 626976
          Bridge ID 631072 635168 639264 643360 647456 651552 655648 659744
          Bridge ID 663840 667936 672032 676128 680224 684320 688416 692512
          Bridge ID 696608 700704 704792 708888 712984 717080 721176 725272
          Bridge ID 729368 733464 737560 741656 745752 749848 753944 758040
          Bridge ID 762136 766232 770328 774424 778520 782616 786712 790808
          Bridge ID 794904 799000 803096 807192 811288 815384 819480 823576
          Bridge ID 827672 831768 835864 839960 844056 848152 852248 856344
          Bridge ID 860440 864536 868632 872728 876824 880920 885016 889112
          Bridge ID 893208 897304 901400 905496 909592 913688 917784 921880
          Bridge ID 925976 930072 934168 938264 942360 946456 950552 954648
          Bridge ID 958744 962840 966936 971032 975128 979224 983320 987416
          Bridge ID 991512 995608 999704 1003800 1007896 1011992 1016088 1020184
          Bridge ID 1024280 1028376 1032472 1036568 1040664 1044760 1048856 1052952
          Bridge ID 1057048 1061144 1065240 1069336 1073432 1077528 1081624 1085720
          Bridge ID 1089816 1093912 1098008 1102104 1106200 1110296 1114392 1118488
          Bridge ID 1122584 1126680 1130776 1134872 1138968 1143064 1147160 1151256
          Bridge ID 1155352 1159448 1163544 1167640 1171736 1175832 1179928 1184024
          Bridge ID 1188120 1192216 1196312 1200408 1204504 1208600 1212696 1216792
          Bridge ID 1220888 1224984 1229080 1233176 1237272 1241368 1245464 1249560
          Bridge ID 1253656 1257752 1261848 1265944 1270040 1274136 1278232 1282328
          Bridge ID 1286424 1290520 1294616 1298712 1302808 1306904 1311000 1315096
          Bridge ID 1319192 1323288 1327384 1331480 1335576 1339672 1343768 1347864
          Bridge ID 1351960 1356056 1360152 1364248 1368344 1372440 1376536 1380632
          Bridge ID 1384728 1388824 1392920 1397016 1401112 1405208 1409304 1413400
          Bridge ID 1417496 1421592 1425688 1429784 1433880 1437976 1442072 1446168
          Bridge ID 1450264 1454360 1458456 1462552 1466648 1470744 1474840 1478936
          Bridge ID 1483032 1487128 1491224 1495320 1499416 1503512 1507608 1511704
          Bridge ID 1515800 1519896 1523992 1528088 1532184 1536280 1540376 1544472
          Bridge ID 1548568 1552664 1556760 1560856 1564952 1569048 1573144 1577240
          Bridge ID 1581336 1585432 1589528 1593624 1597720 1601816 1605912 1610008
          Bridge ID 1614104 1618200 1622296 1626392 1630488 1634584 1638680 1642776
          Bridge ID 1646872 1650968 1655064 1659160 1663256 1667352 1671448 1675544
          Bridge ID 1679640 1683736 1687832 1691928 1696024 1700120 1704216 1708312
          Bridge ID 1712408 1716504 1720600 1724696 1728792 1732888 1736984 1741080
          Bridge ID 1745176 1749272 1753368 1757464 1761560 1765656 1769752 1773848
          Bridge ID 1777944 1782040 1786136 1790232 1794328 1798424 1802520 1806616
          Bridge ID 1810712 1814808 1818904 1823000 1827096 1831192 1835288 1839384
          Bridge ID 1843480 1847576 1851672 1855768 1859864 1863960 1868056 1872152
          Bridge ID 1876248 1880344 1884440 1888536 1892632 1896728 1900824 1904920
          Bridge ID 1909016 1913112 1917208 1921304 1925400 1929496 1933592 1937688
          Bridge ID 1941784 1945880 1949976 1954072 1958168 1962264 1966360 1970456
          Bridge ID 1974552 1978648 1982744 1986840 1990936 1995032 1999128 2003224
          Bridge ID 2007320 2011416 2015512 2019608 2023704 2027800 2031896 2035992
          Bridge ID 2040088 2044184 2048280 2052376 2056472 2060568 2064664 2068760
          Bridge ID 2072856 2076952 2081048 2085144 2089240 2093336 2097432 2101528
          Bridge ID 2105624 2109720 2113816 2117912 2122008 2126104 2130200 2134296
          Bridge ID 2138392 2142488 2146584 2150680 2154776 2158872 2162968 2167064
          Bridge ID 2171160 2175256 2179352 2183448 2187544 2191640 2195736 2199832
          Bridge ID 2203928 2208024 2212120 2216216 2220312 2224408 2228504 2232600
          Bridge ID 2236696 2240792 2244888 2248984 2253080 2257176 2261272 2265368
          Bridge ID 2269464 2273560 2277656 2281752 2285848 2289944 2294040 2298136
          Bridge ID 2302232 2306328 2310424 2314520 2318616 2322712 2326808 2330904
          Bridge ID 2335000 2339096 2343192 2347288 2351384 2355480 2359576 2363672
          Bridge ID 2367768 2371864 2375960 2380056 2384152 2388248 2392344 2396440
          Bridge ID 2400536 2404632 2408728 2412824 2416920 2421016 2425112 2429208
          Bridge ID 2433304 2437400 2441496 2445592 2449688 2453784 2457880 2461976
          Bridge ID 2466072 2470168 2474264 2478360 2482456 2486552 2490648 2494744
          Bridge ID 2498840 2502936 2507032 2511128 2515224 2519320 2523416 2527512
          Bridge ID 2531608 2535704 2539800 2543896 2547992 2552088 2556184 2560280
          Bridge ID 2564376 2568472 2572568 2576664 2580760 2584856 2588952 2593048
          Bridge ID 2597144 2601240 2605336 2609432 2613528 2617624 2621720 2625816
          Bridge ID 2629912 2634008 2638104 2642200 2646296 2650392 2654488 2658584
          Bridge ID 2662680 2666776 2670872 2674968 2679064 2683160 2687256 2691352
          Bridge ID 2695448 2699544 2703640 2707736 2711832 2715928 2720024 2724120
          Bridge ID 2728216 2732312 2736408 2740504 2744600 2748696 2752792 2756888
          Bridge ID 2760984 2765080 2769176 2773272 2777368 2781464 2785560 2789656
          Bridge ID 2793752 2797848 2801944 2806040 2810136 2814232 2818328 2822424
          Bridge ID 2826520 2830616 2834712 2838808 2842904 2847000 2851096 2855192
          Bridge ID 2859288 2863384 2867480 2871576 2875672 2879768 2883864 2887960
          Bridge ID 2892056 2896152 2900248 2904344 2908440 2912536 2916632 2920728
          Bridge ID 2924824 2928920 2933016 2937112 2941208 2945304 2949400 2953496
          Bridge ID 2957592 2961688 2965784 2969880 2973976 2978072 2982168 2986264
          Bridge ID 2990360 2994456 2998552 3002648 3006744 3010840 3014936 3019032
          Bridge ID 3023128 3027224 3031320 3035416 3039512 3043608 3047704 3051800
          Bridge ID 3055896 3060000 3064096 3068192 3072288 3076384 3080480 3084576
          Bridge ID 3088672 3092768 3096864 3100960 3105056 3109152 3113248 3117344
          Bridge ID 3121440 3125536 3129632 3133728 3137824 3141920 3146016 3150112
          Bridge ID 3154208 3158304 3162400 3166496 3170592 3174688 3178784 3182880
          Bridge ID 3186976 3191072 3195168 3199264 3203360 3207456 3211552 3215648
          Bridge ID 3219744 3223840 3227936 3232032 3236128 3240224 3244320 3248416
          Bridge ID 3252512 3256608 3260704 3264800 3268896 3272992 3277088 3281184
          Bridge ID 3285280 3289376 3293472 3297568 3301664 3305760 3309856 3313952
          Bridge ID 3318048 3322144 3326240 3330336 3334432 3338528 3342624 3346720
          Bridge ID 3350816 3354912 3359008 3363104 3367200 3371296 3375392 3379488
          Bridge ID 3383584 3387680 3391776 3395872 3400000 3404096 3408192 3412288
          Bridge ID 3416384 3420480 3424576 3428672 3432768 3436864 3440960 3445056
          Bridge ID 3449152 3453248 3457344 3461440 3465536 3469632 3473728 3477824
          Bridge ID 3481920 3486016 3490112 3494208 3498304 3502400 3506496 3510592
          Bridge ID 3514688 3518784 3522880 3526976 3531072 3535168 3539264 3543360
          Bridge ID 3547456 3551552 3555648 3559744 3563840 3567936 3572032 3576128
          Bridge ID 3580224 3584320 3588416 3592512 3596608 3600704 3604800 3608896
          Bridge ID 3612992 3617088 3621184 3625280 3629376 3633472 3637568 3641664
          Bridge ID 3645760 3649856 3653952 3658048 3662144 3666240 3670336 3674432
          Bridge ID 3678528 3682624 3686720 3690816 3694912 3699008 3703104 3707200
          Bridge ID 3711296 3715392 3719488 3723584 3727680 3731776 3735872 3739968
          Bridge ID 3744064 3748160 3752256 3756352 3760448 3764544 3768640 3772736
          Bridge ID 3776832 3780928 3785024 3789120 3793216 3797312 3801408 3805504
          Bridge ID 3809600 3813696 3817792 3821888 3825984 3830080 3834176 3838272
          Bridge ID 3842368 3846464 3850560 3854656 3858752 3862848 3866944 3871040
          Bridge ID 3875136 3879232 3883328 3887424 3891520 3895616 3899712 3903808
          Bridge ID 3907904 3912000 3916096 3920192 3924288 3928384 3932480 3936576
          Bridge ID 3940672 3944768 3948864 3952960 3957056 3961152 3965248 3969344
          Bridge ID 3973440 3977536 3981632 3985728 3989824 3993920 3998016 4002112
          Bridge ID 4006208 4010304 4014400 4018496 4022592 4026688 4030784 4034880
          Bridge ID 4038976 4043072 4047168 4051264 4055360 4059456 4063552 4067648
          Bridge ID 4071744 4075840 4079936 4084032 4088128 4092224 4096320 4100416
          Bridge ID 4104512 4108608 4112704 4116800 4120896 4124992 4129088 4133184
          Bridge ID 4137280 4141376 4145472 4149568 4153664 4157760 4161856 4165952
          Bridge ID 4170048 4174144 4178240 4182336 4186432 4190528 4194624 4198720
          Bridge ID 4202816 4206912 4211008 4215104 4219200 4223296 4227392 4231488
          Bridge ID 4235584 4239680 4243776 4247872 4251968 4256064 4260160 4264256
          Bridge ID 4268352 4272448 4276544 4280640 4284736 4288832 4292928 4297024
          Bridge ID 4301120 4305216 4309312 4313408 4317504 4321600 4325696 4329792
          Bridge ID 4333888 4337984 4342080 4346176 4350272 4354368 4358464 4362560
          Bridge ID 4366656 4370752 4374848 4378944 4383040 4387136 4391232 4395328
          Bridge ID 4399424 4403520 4407616 4411712 4415808 4419904 4424000 4428096
          Bridge ID 4432192 4436288 4440384 4444480 4448576 4452672 4456768 4460864
          Bridge ID 4464960 4469056 4473152 4477248 4481344 4485440 4489536 4493632
          Bridge ID 4497728 4501824 4505920 4510016 4514112 4518208 4522304 4526400
          Bridge ID 4530496 4534592 4538688 4542784 4546880 4550976 4555072 4559168
          Bridge ID 4563264 4567360 4571456 4575552 4579648 4583744 4587840 4591936
          Bridge ID 4596032 4600128 4604224 4608320 4612416 4616512 4620608 4624704
          Bridge ID 4628800 4632896 4636992 4641088 4645184 4649280 4653376 4657472
          Bridge ID 4661568 4665664 4669760 4673856 4677952 4682048 4686144 4690240
          Bridge ID 4694336 4698432 4702528 4706624 4710720 4714816 4718912 4723008
          Bridge ID 4727104 4731200 4735296 4739392 4743488 4747584 4751680 4755776
          Bridge ID 4759872 4763968 4768064 4772160 4776256 4780352 4784448 4788544
          Bridge ID 4792640 4796736 4800832 4804928 4809024 4813120 4817216 4821312
          Bridge ID 4825408 4829504 4833600 4837696 4841792 4845888 4850000 4854096
          Bridge ID 4858192 4862288 4866384 4870480 4874576 4878672 4882768 4886864
          Bridge ID 4890960 4895056 4899152 4903248 4907344 4911440 4915536 4919632
          Bridge ID 4923728 4927824 4931920 4936016 4940112 4944208 4948304 4952400
          Bridge ID 4956496 4960592 4964688 4968784 4972880 4976976 4981072 4985168
          Bridge ID 4989264 4993360 4997456 5001552 5005648 5009744 5013840 5017936
          Bridge ID 5022032 5026128 5030224 5034320 5038416 5042512 5046608 5050704
          Bridge ID 5054800 5058896 5062992 5067088 5071184 5075280 5079376 5083472
          Bridge ID 5087568 5091664 5095760 5100000 5104096 5108192 5112288 5116384
          Bridge ID 5120480 5124576 5128672 5132768 5136864 5140960 5145056 5149152
          Bridge ID 5153248 5157344 5161440 5165536 5169632 5173728 5177824 5181920
          Bridge ID 5186016 5190112 5194208 5198304 5202400 5206496 5210592 5214688
          Bridge ID 5218784 5222880 5226976 5231072 5235168 5239264 5243360 5247456
          Bridge ID 5251552 5255648 5259744 5263840 5267936 5272032 5276128 5280224
          Bridge ID 5284320 5288416 5292512 5296608 5300704 5304800 5308896 5312992
          Bridge ID 5317088 5321184 5325280 5329376 5333472 5337568 5341664 5345760
          Bridge ID 5349856 5353952 5358048 5362144 5366240 5370336 5374432 5378528
          Bridge ID 5382624 5386720 5390816 5394912 5399008 5403104 5407200 5411296
          Bridge ID 5415392 5419488 5423584 5427680 5431776 5435872 5439968 5444064
          Bridge ID 5448160 5452256 5456352 5460448 5464544 5468640 5472736 5476832
          Bridge ID 5480928 5485024 5489120 5493216 5497312 5501408 5505504 5509600
          Bridge ID 5513696 5517792 5521888 5525984 5530080 5534176 5538272 5542368
          Bridge ID 5546464 5550560 5554656 5558752 5562848 5566944 5571040 5575136
          Bridge ID 5579232 5583328 5587424 5591520 5595616 5599712 5603808 5607904
          Bridge ID 5612000 5616096 5620192 5624288 5628384 5632480 5636576 5640672
          Bridge ID 5644768 5648864 5652960 5657056 5661152 5665248 5669344 5673440
          Bridge ID 5677536 5681632 5685728 5689824 5693920 5698016 5702112 5706208
          Bridge ID 5710304 5714400 5718496 5722592 5726688 5730784 5734880 5738976
          Bridge ID 5743072 5747168 5751264 5755360 5759456 5763552 5767648 5771744
          Bridge ID 5775840 5779936 5784032 5788128 5792224 5796320 5800416 5804512
          Bridge ID 5808608 5812704 5816800 5820896 5824992 5829088 5833184 5837280
          Bridge ID 5841376 5845472 5849568 5853664 5857760 5861856 5865952 5870048
          Bridge ID 5874144 5878240 5882336 5886432 5890528 5894624 5898720 5902816
          Bridge ID 5906912 5911008 5915104 5919200 5923296 5927392 5931488 5935584
          Bridge ID 5939680 5943776 5947872 5951968 5956064 5960160 5964256 5968352
          Bridge ID 5972448 5976544 5980640 5984736 5988832 5992928 5997024 6001120
          Bridge ID 6005216 6009312 6013408 6017504 6021600 6025696 6029792 6033888
          Bridge ID 6037984 
```

Ruijie# configure terminal	^
Ruijie(config)# interface <i>interface-id</i>	interface interface Aggregate Link ^
Ruijie(config-if)# spanning-tree [<i>mst instance-id</i>] port-priority <i>priority</i>	a ↓ instance a ¶ instance ^ instance 0 ^ <i>instance-id</i> ñ 0 64 <i>priority</i> interface "I ~ ↓ ñ 0 240 16 ñ 128
Ruijie(config-if)# end	^
Ruijie# show spanning-tree [<i>mst instance-id</i>] interface <i>interface-id</i>	^
Ruijie# copy running-config startup-config	^

^ ~ ↓ **no spanning-tree mst *instance-id* port-priority**
^ { ^

^ Path Cost~

^ ^ Root Bridge~ Path Cost Root Port
~ Port Path Cost Root Port ^
Interface ^ The Media Speed~ || ~
~ a ~ ñ Path Cost ^ ↓
Y ^ Ñ a ↓ Instance† a ↓ Instance ↓
^
~ Лю ^

{	
Ruijie# configure terminal	^

Ruijie# show spanning-tree [mst instance-id] interface interface-id	Â
Ruijie# copy running-config startup-config	Â

no spanning-tree mst cost
Â

Path Cost ^ path cost method~

Path Cost ñ IEEE 802.1d IEEE 802.1t
Cost Â IEEE 802.1d IEEE 802.1t a Path Cost
~ 802.1d ^ short~ 1—65535~ ~ 802.1t
^ long~ (1—200,000,000) Â y y Path Cost
Â ñ ^ IEEE 802.1t ~ Â
Ю ч a Path Cost Â

Interface	IEEE 802.1d	short~
-----------	-------------	--------

```

~ ~
~ ~ no spanning-tree pathcost method
~ ~
~ ~

```

Hello Time

```

~ ~ BPDUs ~ ~ ~ 2 ~
~ ~ Hello Time'

```

~	~
Ruijie# configure terminal	~
Ruijie(config)# spanning-tree hello-time seconds	hello_time' ~ ~ 1 10 ~ ~ 2 ~
Ruijie(config)# end	~
Ruijie# show running-config	~
Ruijie# copy running-config startup-config	~

```

~ ~ no spanning-tree hello-time ~
~

```

Forward-Delay Time

```

~ ~ ~ ~ ~ 15 ~
~ ~

```

Max-Age Time

BPDU 20 s

Max-Age Time

Ruijie# configure terminal	
Ruijie(config)# spanning-tree max-age seconds	max age time 6 40 20 s
Ruijie(config)# end	
Ruijie# show running-config	
Ruijie# copy running-config startup-config	

no spanning-tree max-age

注意:

$\text{Hello Time} \rightarrow \text{Forward-Delay Time} \rightarrow \text{Max-Age Time}$
 $\text{Max-Age Time} \leq 2 * (\text{Hello Time} + 1.0 \text{ seconds})$
 $\text{Max-Age Time} \leq 2 * (\text{Forward-Delay} - 1.0 \text{ seconds})$

Tx-Hold-Count

BPDU 3 s

Tx-Hold-Count

Ruijie# configure terminal	
Ruijie(config)# spanning-tree tx-hold-count numbers	BPDU 1 10 3 s
Ruijie(config)# end	
Ruijie# show running-config	


```
Ruijie# copy running-config
startup-config
```

```
^
```

```
^
```

```
~ ↓ no spanning-tree tx-hold-count }
```

nk-type

```
link-type6(une)2( int-to-p)-ot
```

```
^ a “ ” y RSTP ĩ
^ ĩ RSTP ĩ ^ a ~ ^ “~”
|| ~ ↓ ^ link type ĩ point-to-point ↓ ĩ
shared ^ ≠ ↓ ĩ link type ā ^ a “ ” ^
~ ĩЮ ^
```

MSTP Region

√ √ Y MSTP Region

```

Ruijie(config-mst)# instance 1 vlan 10-20
Ruijie(config-mst)# name region1
Ruijie(config-mst)# revision 1
Ruijie(config-mst)# show
Multi spanning tree protocol : Enable Name [region1]
Revision 1
Instance Vlans Mapped
-----
0 1-9,21-4094
1 10-20
-----
Ruijie(config-mst)# exit
Ruijie(config)#

```

注意:

```

      vlan      instance      L      vlan      ... ~ i ‡
      ↑  ↓      ↑  ↓      ↑  ↓      ↑  ↓
      1  2      3  4      5  6      7  8

```

Maximum-Hop Count

```

Maximum-Hop Count      BPDUs      Region      1      2
Instance      1      2
~      100      Maximum-Hop Count

```

命令	说明
Ruijie# configure terminal	进入配置模式
Ruijie(config)# spanning-tree max-hops hop-count	设置最大跳数，默认为 1，范围 1-20
Ruijie(config)# end	退出配置模式
Ruijie# show running-config	显示当前配置
Ruijie# copy running-config startup-config	将当前配置保存到启动配置

```

~ 1 no spanning-tree max-hops 1

```

↵

↵ ↵ ↵ ↵ ↵ BPDUs ↵
 a ↵ MSTI ↵ ↵ 6 è ↵
 ↵ ↵ ↵ ↵

↵	↵
Ruijie# configure terminal	↵
Ruijie(config)# interface <i>interface-id</i>	↵
Ruijie(config-if)# spanning-tree compatible enable	↵
Ruijie(config-if)# end	↵
Ruijie# show running-config	↵
Ruijie# copy running-config startup-config	↵

↵ ↵ ↵ no spanning-tree compatible enable ↵ ↵
 ↵ ↵

MSTP ↵

↵

↵ || π (AutoEdge π) ↵
 è ↵ ↵

Port Fast

Port Fast ↵ ↵ Forwarding ↵ ↵ BPDUs Port Fast
 Operational State disabled ÿ ↵ 6 STP Forwarding ↵
 ↵ ↵ Port Fast

↵	↵
Ruijie# configure terminal	↵
Ruijie(config)# interface <i>interface-id</i>	interface interface ↵ Aggregate Link ↵

1

2

3	4
Ruijie# configure terminal	5
Ruijie(config)# spanning-tree portfast Bpduguard default	6 BPDU guard
Ruijie(config)# interface <i>interface-id</i>	7 interface 8 interface 9 Aggregate Link 10
Ruijie(config-if)# spanning-tree portfast	11 interface portfast 12 bpduguard 13 14

Ruijie(config-if)# **end**

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

BPDU MAC

BPDU MAC ~ ↓ ↓ MAC и MAC BPDU ~
 è BPDU Â
 ↓ ~ ↓ √ √ √ BPDU MAC '

?	
Ruijie# configure terminal	Â
Ruijie(config)# interface <i>Interface-id</i>	interface ~ √ interface √ Aggregate Link Â
Ruijie(config-if)# bpdu src-mac-check <i>H.H.H</i>	bpdu mac Â
Ruijie(config-if)# end	Â
Ruijie# show running-config	Â
Ruijie# copy running-config startup-config	Â

bpdu mac ~ ↓ √ √ √ √ no bpdu
 src-mac-check Â

Root Guard

~ √ √ √ √ ROOT Guard

?	
Ruijie# configure terminal	Â
Ruijie(config)# interface Interface-id	interface ~ √ interface √ Aggregate Link Â
Ruijie(config-if)# spanning-tree guard root	√ ROOT Guard
Ruijie(config-if)# end	Â
Ruijie# show running-config	Â
Ruijie# copy running-config startup-config	Â

Root Guard

Root Guard

 	
Ruijie# configure terminal	
Ruijie(config)# interface Interface-id	 Aggregate Link
Ruijie(config-if)# spanning-tree guard root	 Root Guard
Ruijie# show running-config	
Ruijie# copy running-config startup-config	

Loop Guard

Loop Guard

 	
Ruijie# configure terminal	
Ruijie(config)# spanning-tree Loopguard default	 Loop Guard
Ruijie# show running-config	
Ruijie# copy running-config startup-config	

Loop Guard

 	
Ruijie# configure terminal	
Ruijie(config)# interface Interface-id	 Aggregate Link
Ruijie(config-if)# spanning-tree guard loop	 Loop Guard
Ruijie# show running-config	
Ruijie# copy running-config startup-config	

↖

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3	
Ruijie# configure terminal	Â
Ruijie(config)# interface <i>Interface-id</i>	↖ Â ↙ ↖ ↖ Aggregate Link Â ↖
Ruijie(config-if)# spanning-tree guard none	↖

Ruijie# show spanning-tree pathcost method

pathcost method

MSTP 配置

```
Ruijie(config-if)# exit
Ruijie(config)# vlan 2
Ruijie(config-vlan)# exit
Ruijie(config)# vlan 3
Ruijie(config-vlan)# exit
#           ò MSTP      ~      VLAN 2      Instance 1~      VLAN 3
Instance 2~      MST      1      ò ruijie~      MST Revision Number ò 1~      MST
      ~      ð      Â
Ruijie(config)# spanning-tree mode mstp
Ruijie(config)#
```

```

#           MSTP           VLAN 2           Instance 1           VLAN 3
Instance 2           MST           Ruijie           MST Revision Number 1
^
Ruijie(config)# spanning-tree mode mstp
Ruijie(config)# spanning-tree mst configuration
Ruijie(config-mst)# instance 1 vlan 2
%Warning:you must create vlans before configuring instance-vlan
relationship
Ruijie(config-mst)# instance 2 vlan 3
%Warning:you must create vlans before configuring instance-vlan
relationship
Ruijie(config-mst)# name ruijie
Ruijie(config-mst)# revision 1
Ruijie(config-mst)# exit
Ruijie(config)# spanning-tree
Enable spanning-tree.
#           Instance1           4096
Ruijie(config)# spanning-tree mst 1 priority 4096

```

3) Switch C

```

#           Fa 0/1           Fa 0/2           Trunk ...           VLAN 2           VLAN 3
Ruijie(config)# interface fastEthernet 0/1
Ruijie(config-if)# switchport mode trunk
Ruijie(config-if)# exit
Ruijie(config)# interface fastEthernet 0/2
Ruijie(config-if)# switchport mode trunk
Ruijie(config-if)# exit
Ruijie(config)# vlan 2
Ruijie(config-vlan)# exit
Ruijie(config)# vlan 3
Ruijie(config-vlan)# exit
#           MSTP           VLAN 2           Instance 1           VLAN 3
Instance 2           MST           Ruijie           MST Revision Number 1
^
Ruijie(config)# spanning-tree mode mstp
Ruijie(config)# spanning-tree mst configuration
Ruijie(config-mst)# instance 1 vlan 2
%Warning:you must create vlans before configuring instance-vlan
relationship
Ruijie(config-mst)# instance 2 vlan 3
%Warning:you must create vlans before configuring instance-vlan
relationship
Ruijie(config-mst)# name ruijie
Ruijie(config-mst)# revision 1
Ruijie(config-mst)# exit
Ruijie(config)# spanning-tree

```

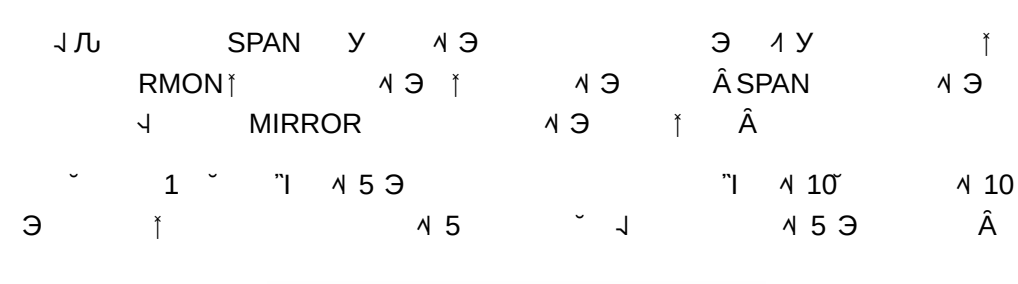
```
Enable spanning-tree.
#          Instance 2
Ruijie(config)# spanning-tree mst 2 priority 4096
#          BPDUGuard  Fa 0/3  Port Fast
Ruijie(config)# spanning-tree portfast bpduguard default
Ruijie(config)# interface fastEthernet 0/3
Ruijie(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected
to a single host. Connecting hubs, bridges to this
interface when portfast is enabled, can cause temporary loops.
Ruijie(config-if)# end
#
Ruijie# show spanning-tree
StpVersion : MSTP
SysStpStatus : ENABLED
MaxAge : 20
HelloTime : 2
ForwardDelay : 15
BridgeMaxAge : 20
BridgeHelloTime : 2
BridgeForwardDelay : 15
MaxHops: 20
TxHoldCount : 3
PathCostMethod : Long
BPDUGuard : enabled
BPDUFilter : Disabled
LoopGuardDef : Disabled
##### mst 0 vlans map : 1, 4-4094
BridgeAddr : 00d0.f82a.aa8e
Priority: 32768
TimeSinceTopologyChange : 0d:0h:19m:44s
TopologyChanges : 1
DesignatedRoot : 1000.00d0.f822.33aa
RootCost : 0
RootPort : 1
CistRegionRoot : 1000.00d0.f822.33aa
CistPathCost : 200000
##### mst 1 vlans map : 2
BridgeAddr : 00d0.f82a.aa8e
Priority: 32768
TimeSinceTopologyChange : 0d:0h:1m:46s
TopologyChanges : 7
DesignatedRoot : 1001.00d0.f834.56f0
RootCost : 200000
RootPort : 2
##### mst 2 vlans map : 3
```

```
BridgeAddr : 00d0.f82a.aa8e
Priority: 4096
TimeSinceTopologyChange : 0d:0h:1m:44s
TopologyChanges : 5
DesignatedRoot : 1002.00d0.f82a.aa8e
RootCost : 0
RootPort : 0
#      ^ Fa 0/1
Ruijie# show spanning-tree interface fastEthernet 0/1
PortAdminPortFast : Disabled
PortOperPortFast : Disabled
PortAdminAutoEdge : Enabled
PortOperAutoEdge : Disabled
PortAdminLinkType : auto
PortOperLinkType : point-to-point
PortBPDUGuard : Disabled
PortBPDUFilter : Disabled
PortGuardmode : None
##### MST 0 vlans mapped :1, 4-4094
PortState : forwarding
PortPriority : 128
PortDesignatedRoot : 1000.00d0.f822.33aa
PortDesignatedCost : 0
PortDesignatedBridge :1000.00d0.f822.33aa
PortDesignatedPort : 8002
PortForwardTransitions : 1
PortAdminPathCost : 200000
PortOperPathCost : 200000
Inconsistent states : normal
PortRole : rootPort
##### MST 1 vlans mapped :2
PortState : discarding
PortPriority : 128
PortDesignatedRoot : 1001.00d0.f834.56f0
PortDesignatedCost : 0
PortDesignatedBridge :8001.00d0.f822.33aa
PortDesignatedPort : 8002
PortForwardTransitions : 5
PortAdminPathCost : 200000
PortOperPathCost : 200000
Inconsistent states : normal
PortRole : alternatePort
##### MST 2 vlans mapped :3
PortState : forwarding
PortPriority : 128
PortDesignatedRoot : 1002.00d0.f82a.aa8e
```

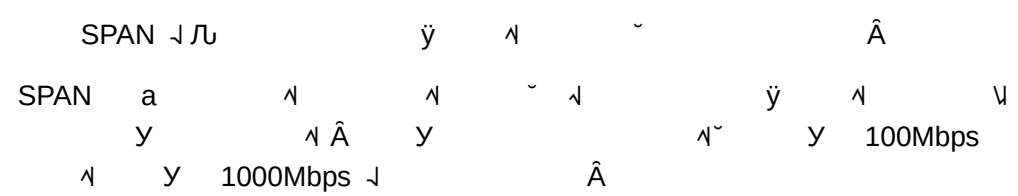
PortDesignatedCost : 0
PortDesignatedBridge :1002.00d0.f82a.aa8e
PortDesignatedPort : 8001
PortForwardTransitions : 1
PortAdminPathCost : 200000
PortOperPathCost : 200000
Inconsistent states : normal
PortRole : designatedPort

SPAN

SPAN



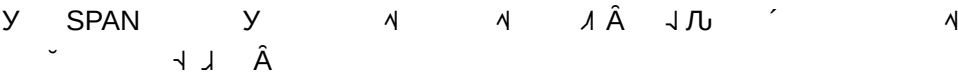
1 SPAN



SPAN

SPAN

SPAN



↓ Y SPAN ~ Switched port AP ↓ ∫ ∫ ∫
∧ Â SPAN a Â
↓ ∫ SPAN Y disabled port ∅ ~ SPAN a ∅ ∫
∧ Â **Show monitor session session number** ∫
SPAN Â Y SPAN ∅ ∫ a ∅
∧ ↓ Â

SPAN ∫ ∫ ∫
' Â ∫ ∅ Ū ∫ Â a ∫

À ÁÛ

À Á switched port à routed port AP Â

SPAN

... Y SPAN 1 1

... Y SPAN 1 (1) 1 (1)

Ruijie(config)# monitor session <i>session_number</i> source interface <i>interface-id</i> [<i>rx</i> <i>tx</i>]	1 1 1 <i>interface-id</i>
Ruijie(config)# monitor session <i>session_number</i> destination interface <i>interface-id</i>	1 1 1 <i>interface-id</i>

SPAN 1 no monitor session *session_number*
 1 SPAN 1 no monitor session all 1
 no monitor session *session_number* **source interface** *interface-id*
 1 no monitor session *session_number* **destination interface** *interface-id*

1 ... Y SPAN 1 1 1 1
 1 1 MIRROR 1 8 Show monitor session
 1

```
Ruijie(config)# no monitor session 1
Ruijie(config)# monitor session 1 source interface
gigabitEthernet 3/1 both
Ruijie(config)# monitor session 1 destination interface
gigabitEthernet 3/8
Ruijie(config)# end
Ruijie# show monitor session 1
sess-num: 1
src-intf:
GigabitEthernet 3/1 frame-type Both
dest-intf:
GigabitEthernet 3/8
```

Y SPAN Y 1

Y Y SPAN 1 1

|--|--|

```
Ruijie(config)# no monitor
session session_number source
interface interface-id [-]
[both | rx | tx]
```

```
interface-id
```

```
1 1
```

```
1 1
```

```
no monitor session session_number source interface interface-id
```

```
1 1 1 SPAN
```

```
1 1
```

```
1 1
```

```
1
```

```
Ruijie(config)# no monitor session 1 source interface
gigabitethernet 1/1 both
```

```
Ruijie(config)# end
```

```
Ruijie# show monitor session 1
```

```
sess-num: 1
```

```
dest-intf:
```

```
GigabitEthernet 3/8
```

SPAN

```
show monitor 1 1 SPAN 1
```

```
show monitor 1 SPAN 1
```

```
Ruijie# show monitor session 1
```

```
sess-num: 1
```

```
src-intf:
```

```
GigabitEthernet 3/1 frame-type Both
```

```
dest-intf:
```

```
GigabitEthernet 3/8
```

IP

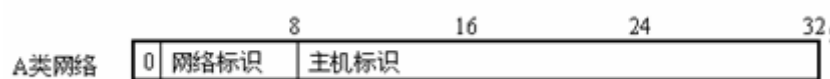
IP

IP 分类

IP 地址由 32 位二进制数组成，通常用十进制表示，每 8 位为一个字节，范围是 0~255。例如 IP 地址 192.168.1.1。

IP 地址分为 A 类、B 类、C 类、D 类和 E 类。A 类地址由 1 字节网络标识和 3 字节主机标识组成。B 类地址由 2 字节网络标识和 2 字节主机标识组成。C 类地址由 3 字节网络标识和 1 字节主机标识组成。D 类地址由 4 字节网络标识组成。E 类地址由 5 字节网络标识组成。

A 类地址：网络标识 1 字节，主机标识 3 字节。范围：1.0.0.0 到 127.255.255.255。



B 类地址：网络标识 2 字节，主机标识 2 字节。范围：128.0.0.0 到 191.255.255.255。



C 类地址：网络标识 3 字节，主机标识 1 字节。范围：192.0.0.0 到 223.255.255.255。



D 类地址：网络标识 4 字节。范围：224.0.0.0 到 239.255.255.255。



说明:

Æ Ì Γ 1111

C	192.168.0.0~192.168.255.255	256 C
---	-----------------------------	-------

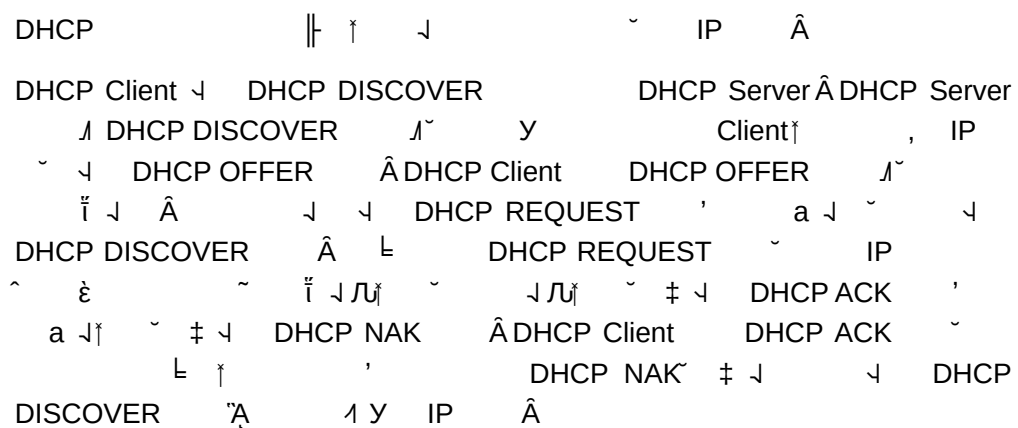
IP à TCP/UDP ¶ 1 è † ~ ¶ RFC 1166 Â

IP L C

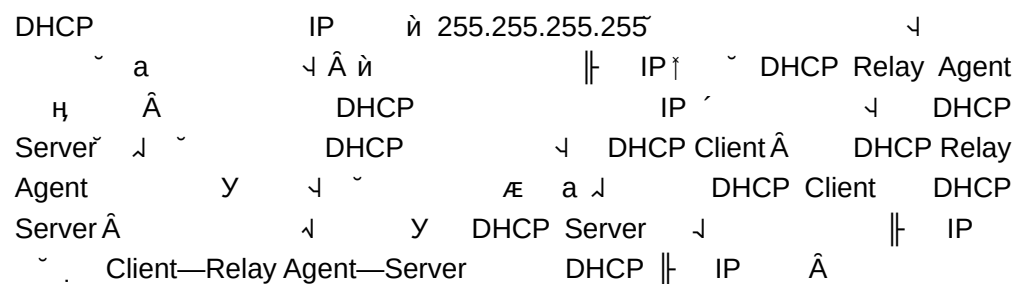
Ruijie# ping <i>ip-address</i> [length <i>bytes</i>] [ntimes <i>times</i>] [timeout <i>seconds</i>]	√
---	---

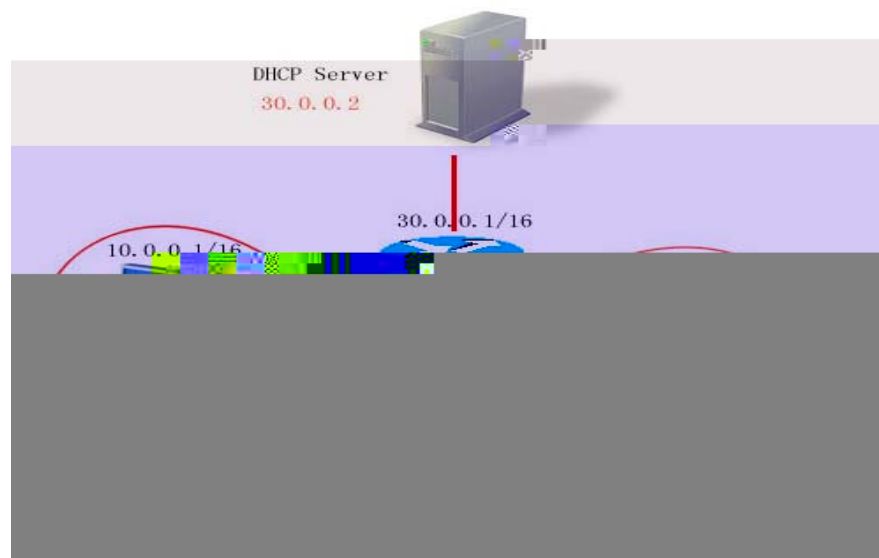
DHCP Relay

DHCP



DHCP Relay Agent



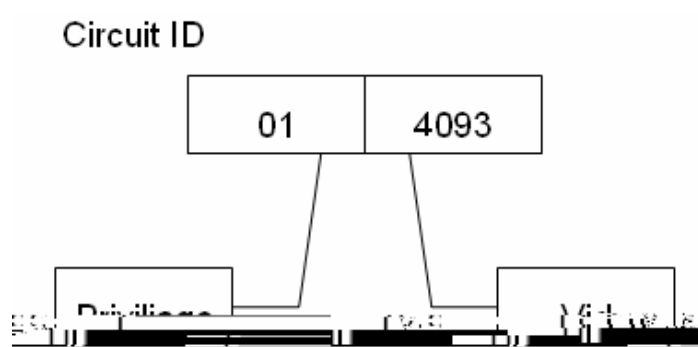


1

VLAN 10	VLAN 20	10.0.0.1/16	20.0.0.1/16	~	DHCP
Server	30.0.0.1/16	Э	30.0.0.2	DHCP Server	10.0.0.1/16
20.0.0.1/16		IP	~	й	Э
Agent	DHCP Server IP	й	30.0.0.2	↓	Л

DHCP Relay Agent Information(option 82)

RFC3046	й	DHCP relay	~	↓	Л	й	У	option
	DHCP client	У	~	й	Л	й	У	option
й	а	↓	IP	RFC3046	й	й	У	option
Л	й	82	≠	option82				



2

2. relay agent information option82' option

3	
---	--

--	--

DHCP server 10.1.1.1 # 10.1.1.6 192.168.1.1

~ ‡ "l 4 DHI57.Tf0 Tc d()Tj-0.0022 Tc 0.2272 Tw -.2272 Tw -.2272 8

DHCP option dot1x

DHCP Relay Agent Information

information option dot1x DHCP relay option dot1x

relay 802.1x

dot1x

DHCP option dot1x

Ruijie(config)# ip dhcp relay information option dot1x	DHCP option dot1x
Ruijie(config)# no ip dhcp relay information option dot1x	DHCP option dot1x

DHCP option 82

ip dhcp relay information option82 DHCP Relay Agent Information DHCP option

option82

DHCP option82

Ruijie(config)# ip dhcp relay information option82	DHCP option82
Ruijie(config)# no ip dhcp relay information option82	DHCP option82

DHCP relay check server-id

ip dhcp relay check server-id DHCP relay server

DHCP SERVER-ID option server

DHCP relay check server-id

Ruijie(config)# ip dhcp relay check server-id	DHCP relay check server-id
Ruijie(config)# no ip dhcp relay check server-id	DHCP relay check server-id

```

 Ruijie(config-if)# ip dhcp relay suppression
DHCP relay suppression

```

Ruijie(config-if)# ip dhcp relay suppression	DHCP relay suppression
Ruijie(config-if)# no ip dhcp relay suppression	DHCP relay suppression

DHCP

```

 Ruijie# configure terminal
 Ruijie(config)# service dhcp // dhcp relay
 Ruijie(config)# ip helper-address 192.18.100.1 //
 Ruijie(config)# ip helper-address 192.18.100.2 //
 Ruijie(config)# interface GigabitEthernet 0/3
 Ruijie(config-if)# ip helper-address 192.18.200.1 //
 Ruijie(config-if)# ip helper-address 192.18.200.2 //
 Ruijie(config-if)# end

```

DHCP relay

```

 Ruijie(config)# ip helper-address 192.18.100.1 //
 Ruijie(config)# ip helper-address 192.18.100.2 //
 Ruijie(config)# interface GigabitEthernet 0/3
 Ruijie(config-if)# ip helper-address 192.18.200.1 //
 Ruijie(config-if)# ip helper-address 192.18.200.2 //
 Ruijie(config-if)# end

```

DHCP option dot1x

1. Ruijie(config)# ip helper-address 192.18.100.1 //
2. Ruijie(config)# ip helper-address 192.18.100.2 //
3. Ruijie(config)# ip helper-address 192.18.100.3 //

4.

DHCP ñ

```
Ruijie(config)# interface gigabitEthernet 0/2
Ruijie(config-if)# ip dhcp snooping trust

#      Gi0/2   ARP      ^
Ruijie(config-if)# ip arp inspection trust
Ruijie(config-if)# exit
```

```
#
Ruijie(dhcp-config)# default-router 10.2.1.1

#      DHCP      ^
Ruijie(dhcp-config)# network 10.2.0.0 255.255.0.0

#      ^  ^      ^ 10.2.0.0/16~
Ruijie(config)# ip route 10.2.0.0 255.255.0.0 10.1.0.1
```


Ruijie(config)# ip Domain-lookup	DNS 1 11
---	----------

no ip domain-lookup 3 DNS 1 11

Ruijie(config)# **ip domain-lookup**

DNS Server

DNS 1 11 DNS 1 11 11 11

DNS 1 11 11 **no ip name-server** [ip-address] 3 11 11
1 **ip-address** 1 1 11 1 11 11

3	
Ruijie(config)# ip name-server ip-address	11 DNS Server IP 11 3 11 DNS Server 11 11 11 Server 11 11 11 Server 11 DNS 11 11 11 6 11 11 11

11 11 IP

11 11 IP 11 11 11 11 IP
11 11 IP 11 11 IP 11 11 IP
11 11 11 11 11 11 11 11

3	
Ruijie(config)# ip host host-name ip-address	11 11 IP

3 **no** 11 11 IP 11

11 11 11

11 11 11 **clear host** **clear host *** 3
11 11 11 11 11

3	
Ruijie# clear host [word]	11 11 11 3 a 11 11 11

1

DNS

3	
Ruijie# show hosts	DNS 1

Ruijie# **show hosts**

DNS name server :

192.168.5.134 static

host	type	address
www.163.com	static	192.168.5.243
www.ruijie.com	dynamic	192.168.5.123

Ping 1 y '

Ruijie# **ping** *www.ietf.org*

Resolving host[*www.ietf.org*]Â Â Â Â Â Â

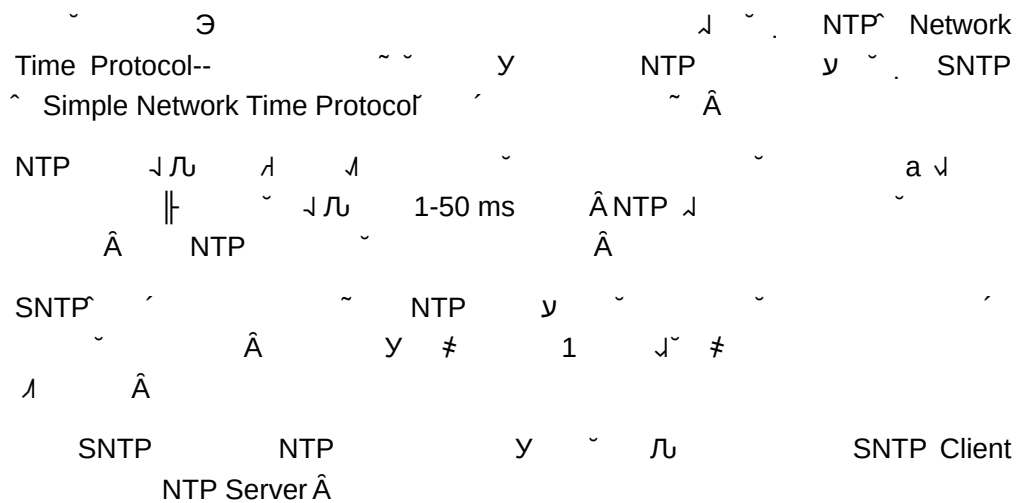
Sending 5,100-byte ICMP Echos to 192.168.5.123,
timeout is 2000 milliseconds.

!!!!!

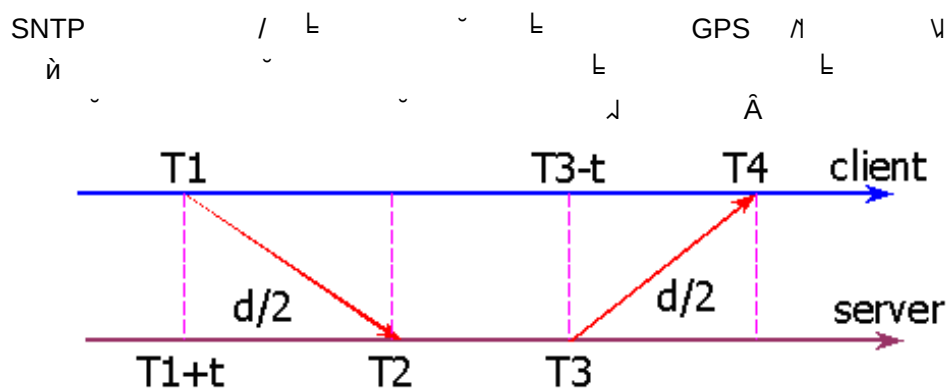
Success rate is 100 percent(5/5)

Minimum = 1ms Maximum = 1ms, Average = 1ms

(SNTP)



SNTP



1

Originate Timestamp	T1	time request sent by client
Receive Timestamp	T2	time request received at server
Transmit Timestamp	T3	time reply sent by server
Destination Timestamp	T4	time reply received at client

T1' (local time at client) is Originate Timestamp'

$T2'$ $\mathbb{E}$ ($\mathcal{L}$ $\mathbb{E}$ $\mathfrak{y}$ $\mathfrak{V}$) $\mathfrak{y}$ Receive
Timestamp'

$T3'$ $\mathbb{E}$ ($\mathcal{L}$ $\mathbb{E}$ $\mathfrak{y}$ $\mathfrak{V}$) $\mathfrak{y}$ Transmit
Timestamp'

$T4'$ ($\mathcal{L}$ $\mathfrak{y}$ $\mathfrak{V}$) $\mathfrak{y}$ Destination
Timestamp'

T $\mathbb{E}$,

d' $\mathfrak{y}$,

$\mathfrak{y}$

$$T2 = T1 + t + d / 2;$$

$\mathcal{L}$

$$T2 - T1 = t + d / 2;$$

$\mathfrak{V}$ $\mathfrak{y}$

$$T4 = T3 - t + d / 2;$$

$\mathcal{L}$

$$T3 - T4 = t - d / 2;$$

$$d = (T4 - T1) - (T3 - T2);$$

$$t = ((T2 - T1) + (T3 - T4)) / 2;$$

t d' SNTP Client $\mathfrak{V}$ $\hat{A}$

$\mathfrak{y}$ $\mathfrak{y}$ $T4 + t$

SNTP

$\mathfrak{y}$ SNTP

SNTP

$\mathfrak{y}$ SNTP $\mathfrak{y}$

SNTP	Disable SNTP $\mathbb{E}$

NTP Server IP	0
SNTP 周期	1800s
时区	+8 小时 东 8 区

SNTP

~ 配置 SNTP

1) 进入配置模式

Ruijie# **config**

2) 配置 SNTP 服务器地址、周期、时区
 Ruijie(config)# **sntp server** **server-ip** **period** **zone**
 Ruijie(config)# **sntp server** 192.43.244.18 1800 +8

Ruijie(config)# **sntp enable**

3)

Ruijie(config)# **End**

4)

Ruijie# **show running-config**

5) 保存配置

Ruijie# **copy running-config startup-config**

SNTP 配置完成，no sntp enable 取消 SNTP

NTP Server

SNTP 服务器 NTP 服务器 周期 时区 SNTP Client

NTP Server 地址 NTP Server 周期 时区

周期 时区 NTP Server 地址

配置 NTP 服务器地址、周期、时区
<http://www.time.edu.cn/> <http://www.ntp.org/>

192.43.244.18(time.nist.gov)

~ 配置 SNTP Server IP

1) 进入配置模式

Ruijie# **config**

- 2) SNTP Server IP 地址
- Ruijie(config)# **sntp server** <ip-addr>
- 3)
- Ruijie(config)# **End**
- 4)
- Ruijie# **show running-config**
- 5) 地址
- Ruijie# **copy running-config startup-config**

SNTP 配置

- SNTP Client 配置 NTP Server 配置
- 1) 地址
 - Ruijie# **config**
 - 2) 地址 间隔 60 -65535 秒
 - 1800 秒
 - Ruijie(config)# **sntp interval** <seconds>
 - 3)
 - Ruijie(config)# **End**
 - 4)
 - Ruijie# **show running-config**
 - 5) 地址
 - Ruijie# **copy running-config startup-config**

配置

- SNTP 配置 (GMT) 地址
- 1) 地址
 - Ruijie# **config**
 - 2) 地址 -23 23 地址 8 地址
 - 地址 -8 8 地址 0 地址 地址 地址

```
Ruijie(config)# clock time-zone <time-zone>
```

```
3~
```

```
Ruijie(config)# End
```

```
4~
```

```
Ruijie# show running-config
```

```
5~
```

```
Ruijie# copy running-config startup-config
```

```
no clock time-zone
```

SNTP

10

1) SNTP

```
Ruijie# show sntp
```

2) show sntp

```
Ruijie# show sntp
```

```
SNTP state           : ENABLE           //SNTP 已
SNTP server           : 192.168.4.12      //NTP Server
SNTP sync interval    : 60               //
Time zone              : +8               //
```

NTP

NTP

Network Time Protocol NTP
LAN
WAN
NTP
UTC
Internet
NTP (Authentication)
SNTP
NTP
SNTP

NTP

NTP
NTP
NTP ID
NTP
NTP
NTP
NTP

NTP

NTP

NTP

ID

1. 在配置 NTP 服务器时，需要指定 NTP 服务器的 ID。
 2. 在配置 NTP 客户端时，需要指定 NTP 服务器的 ID。

配置	配置
ntp trusted-key <i>key-id</i>	NTP ID 1
no ntp trusted-key <i>key-id</i>	NTP ID 1

在配置 NTP 服务器时，需要指定 NTP 服务器的 ID。
 在配置 NTP 客户端时，需要指定 NTP 服务器的 ID。

注意:

在配置 NTP 服务器时，需要指定 NTP 服务器的 ID。

NTP 1

NTP 1 配置 NTP 服务器时，需要指定 NTP 服务器的 ID。
 NTP 1 配置 NTP 客户端时，需要指定 NTP 服务器的 ID。

~ ↓ 上 上 ~ 上 上 上 上

4 NTP

3 上 4 3 NTP 上

上 4 3 NTP 上 上

上 上 上 上 上

注意:

上 上 3 上 IP 上 上 上 上

上 上 上 上

上 上 上 上 上 NTP 上

上	上
interface <i>interface-type number</i>	上
ntp disable	上 NTP 上 上

上 NTP 上 上 上 上 **no ntp disable** 上

NTP

й ю у ё 8
 || ч ю у || й 1 |
 3 Â
 NTP ю лю 3'

3	
---	--

ntp synchronize

↓

SNMP

SNMP

SNMP Simple Network Manger Protocôl 1988
RFC1157

SNMP 3
SNMP 3
SNMP 3

SNMP 3

SNMP

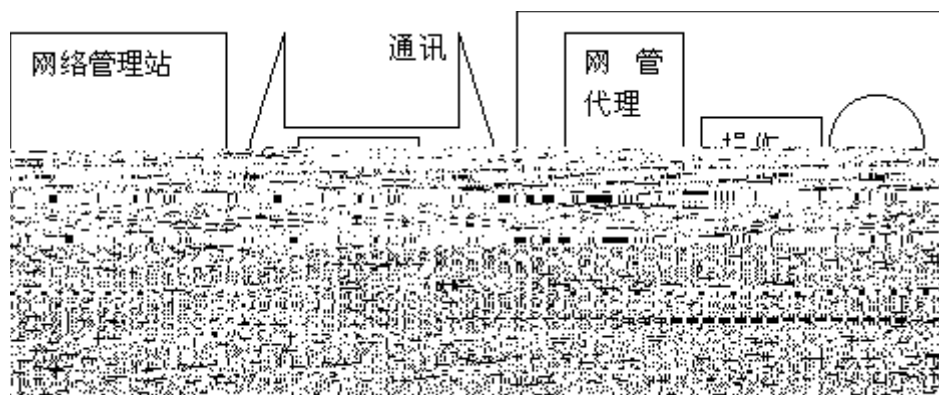
SNMP 3

MIB

SNMP 3
(Network Management System) 3
OpenView 3 CiscoView 3 CiscoWorks 2000
Star View 3

SNMP 3 ^ SNMP Agent 3
NMS 3 NMS 3

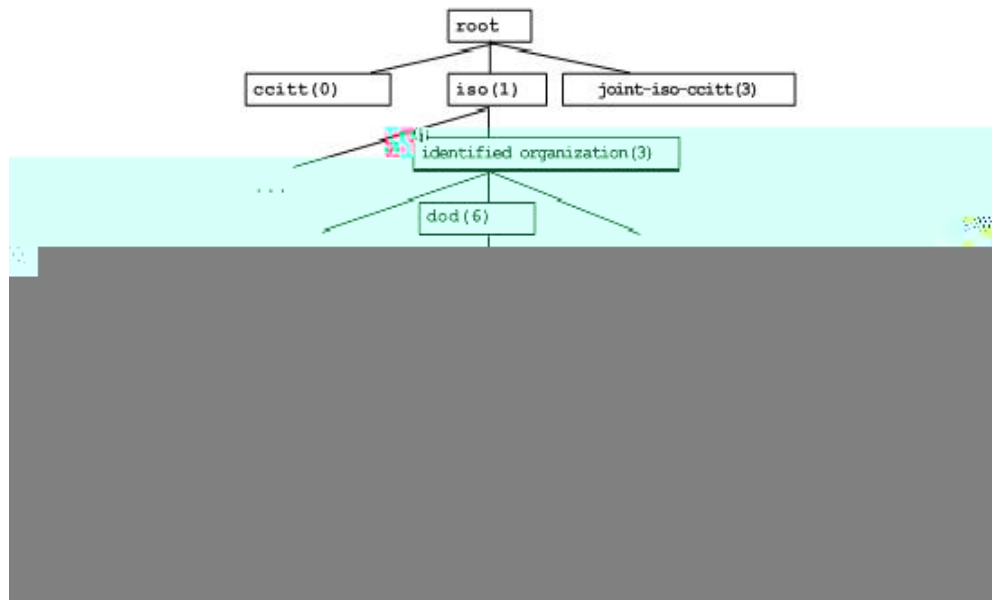
NMS Agent 3 Ю



1 ^ NMS 6 3 ^ Agent

MIB Management Information Base 3 3

The MIB is a collection of objects that are managed by the SNMP agent. The MIB is organized into a hierarchical structure. The root of the MIB is the System Object Identifier (OID) {1.3.6.1.2.1.1}. The MIB is organized into a hierarchical structure. The root of the MIB is the System Object Identifier (OID) {1.3.6.1.2.1.1}. The MIB is organized into a hierarchical structure. The root of the MIB is the System Object Identifier (OID) {1.3.6.1.2.1.1}.



2 MIB

SNMP

SNMP is a protocol for managing network devices. It is organized into three versions: SNMPv1, SNMPv2, and SNMPv3. SNMPv1 is defined in RFC1157. SNMPv2 is defined in RFC1901 and RFC1902. SNMPv3 is defined in RFC2811, RFC2812, and RFC2813.

SNMP

<http://www.ruijie.com.cn>

SNMP

SNMPv1 SNMPv2 (NMS) MIB Æ Æ

ÿ Æ Æ Æ Æ :

Ï (Read-only) Æ MIB Æ

(Read-write) Æ MIB Æ

SNMPv2 Æ SNMPv Æ Æ

SNMPv2C Æ SNMPv3 Æ

ÿ Æ Æ Æ

			Æ	
SNMPv1	noAuthNoPriv	Ï		Ï Æ
SNMPv2c	noAuthNoPriv	Ï		Ï Æ
SNMPv3	noAuthNoPriv	Ï		Ï Æ
SNMPv3	authNoPriv	MD5 SHA		HMAC-MD5 HMAC-SHA
SNMPv3	authPriv	MD5 SHA	DES	HMAC-MD5 HMAC-SHA CBC-DES Æ

SNMP

ÿ ÿ SNMP Æ SNMP Æ ÿ ÿ SNMP

SNMPv3 Æ ÿ ÿ SnmpEngineID Æ

ÿ ÿ OCTET STRING ÿ 5 32 Æ RFC3411 Æ

:

4 Æ IANA Æ HEX Æ

5 Æ

0

1' Æ 4 ÿ Ipv4 Æ

2' Æ 16 ÿ Ipv6 Æ

3' Æ 6 ÿ MAC Æ

4' Æ 27 Æ Æ

5' 16 ~ 27 ~ " Å
 6-127 Å
 128-255 " Å

SNMP

SNMP "l Å Ю ~ SNMP ~

↓ ↓

SNMPv1/SNMPv2C ↓ ^ Community-based ~ ~ SNMP

↓ ↓ ↓ ↓ ↓ Community-String ~ б
 ↓ a SNMP a ~ Å ↓ NMS Agent
 Å

↓ √ ~ ↓ IP NMS ↓ √ ,

↓ √ ↓ ~ ReadOnly ↓ ~ ReadWrite ~

↓ ~ Å
 MIB ,

↓ √ ↓ IP Å a ~ ‡ a
 ↓ IP Å ÷ a ↓ IP ,
 SNMP ↓ Ю Ю {'

{	
Ruijie(config)# snmp-server community <i>string</i> [view <i>view-name</i>] [ro rw] [host <i>host-ip</i>] [<i>num</i>]	↓ Å

↓ √ √ ~ a ↓ ↓ ↓ ~ ↓ √
 a ↓ NMS ~ ↓ ↓ ~ Ю
no snmp-server community { Å

MIB

↓ √

↓ Л ñ У ↓ ↓ ,
 SNMPv3 ~ ↓ Л ñ È ~ ĭ
 à ĭ ¶ ,
 MIB ~ Ю Ю з'

з	
Ruijie(config)# snmp-server view <i>view-name oid-tree {include exclude}</i>	... У MIB ~ Û MIB Â
Ruijie(config)# snmp-server group <i>groupname {v1 v2c v3 {auth noauth priv}} [read readview] [write writeview] [access {num name}]</i>	... У ~ Â

no snmp-server view *view-name* з У ~ **no**
snmp-server view *view-name oid-tree* з У У Â ≠ ↓ Л
no snmp-server group *groupname* з У Â

SNMP

↓ Л ~ Y "I
 ~ NMS ↓ ↓ з Â
 SNMPv3 ~ ↓ Л à ^ MD5 SHA ~ à ↓ з à
 ¶ ^ ↓ DES ~ ¶ ↓ з'
 SNMP ~ Ю Ю з'

з	
Ruijie(config)# snmp-server user <i>username</i> <i>roupname {v1 v2 v3 [encrypted]</i> <i>[auth { md5 sha } auth-password]</i> <i>[priv des56 priv-password] } [access {num name}]</i>	Â

no snmp-server user *username groupname* Â

SNMP Ÿ

Agent Ю ≠ Ÿ || ↓ NMS ↓ ~ Agent Ÿ || ↓
 NMS Ÿ ~ Ю Ю з'

з	
Ruijie(config)# snmp-server host <i>host-addr</i> traps <i>[version {1 2c 3 [auth noauth priv]] community-string [udp-port port-num]</i> <i>[type]</i>	SNMP Ÿ ~ Ÿ ~ SNMPv3 Ю ↓ ~ à ^ SNMPv3 ~

IO IO 3'

3	
---	--

Ruijie(config)#

Ruijie(config)# snmp-server queue-length <i>length</i>	Trap
Ruijie(config)# snmp-server trap-timeout <i>seconds</i>	↓ Trap

SNMP 6

SNMP

й SNMP SNMP у ~ Л Н SNMP
з ~ ↓ Л
Ю

Bad SNMP version errors	SNMP a
Unknown community name	a d
Illegal operation for community name supplied	
Encoding errors	

snmpInNoSuchNames
snmpInBadValues
snmpInReadOnlys
snmpInGenErrs
snmpInTotalReqVars
snmpInTotalSetVars
snmpInGetRequests
snmpInGetNexts
snmpInSetRequests
snmpInGetResponses
snmpInTraps
snmpOutTooBigs
snmpOutNoSuchNames
snmpOutBadValues
snmpOutGenErrs
snmpOutGetRequests
snmpOutGetNexts
snmpOutSetRequests
snmpOutGetResponses
snmpOutTraps
snmpEnableAuthenTraps
snmpSilentDrops
snmpProxyDrops
entPhysicalEntry
entPhysicalEntry.entPhysicalIndex
entPhysicalEntry.entPhysicalDescr
entPhysicalEntry.entPhysicalVendorType
entPhysicalEntry.entPhysicalContainedIn
entPhysicalEntry.entPhysicalClass
entPhysicalEntry.entPhysicalParentRelPos
entPhysicalEntry.entPhysicalName
entPhysicalEntry.entPhysicalHarfpM2ievs
entPhysicalEntry.entPhysicaFirmfpM2ievs
entPhysicalEntry.entPhysicaSoftfpM2ievs
entPhysicalEntry.entPhysicaSerialums
entPhysicalEntry.entPhysicaMfglName
entPhysicalEntry.entPhysicaModealName
entPhysicalEntry.entPhysicaAliaos
entPhysicalEntry.entPhysicaAssetIDe
entPhysicalEntry.entPhysicaIsFRUe
entPhysicalContaislEntry
entPhysicalContaislEntry.entPhysicalhildlIndex
enLastChangeTiame

SNMP

À Ю show snmp user { } SNMP

Ruijie# show snmp user

User name: test
Engine ID: 800013110300000000000000
storage-type: permanent active
Security level: auth priv
Auth protocol: SHA
Priv protocol: DES
Group-name: g1

SNMP

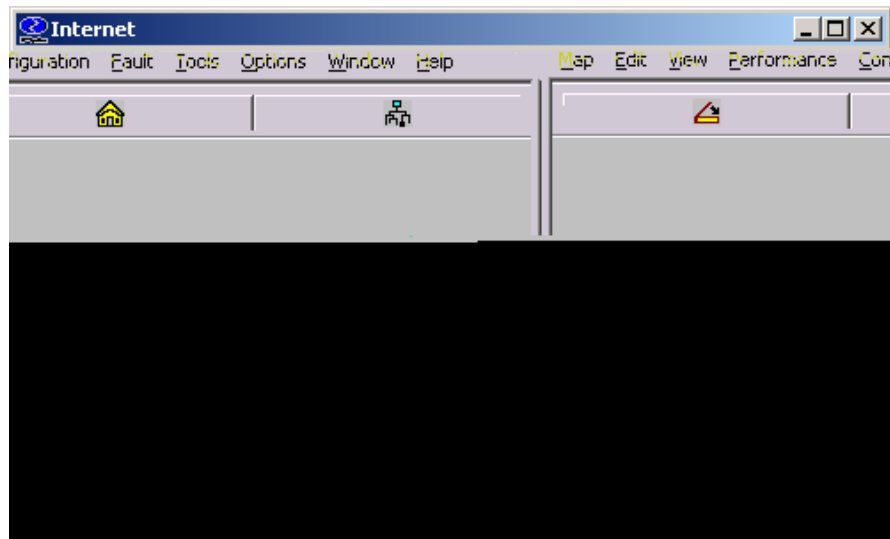
Ю show snmp group { } À

Ruijie# show snmp group

groupname: g1
securityModel: v3
securityLevel:authPriv
readview: default
writeview: default
notifyview:
groupname: public
securityModel: v1
securityLevel:noAuthNog 1 Tf-0.103 Tc 8.4 0 0 0 y03 T8(sec3-780Tf120 T0

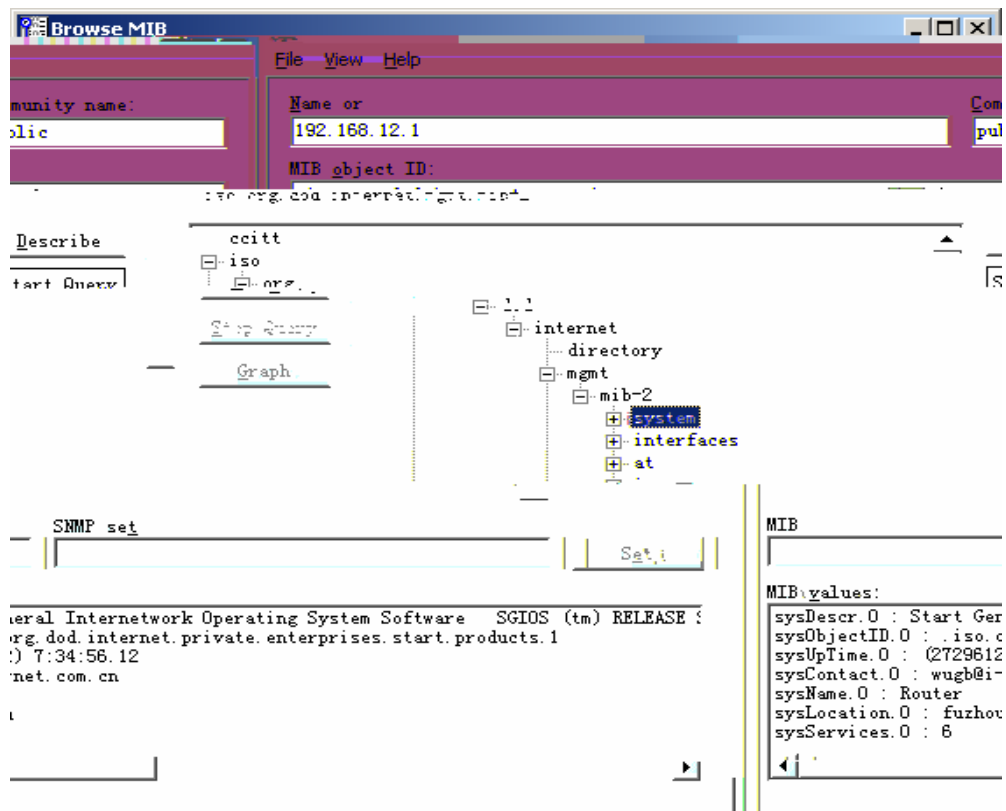

```
Ruijie(config)# snmp-server host 192.168.12.181 public
```

Э ~ SNMP ~ NMS ~
~ Л HP OpenView й ~ Л Н ~ Ю '



6

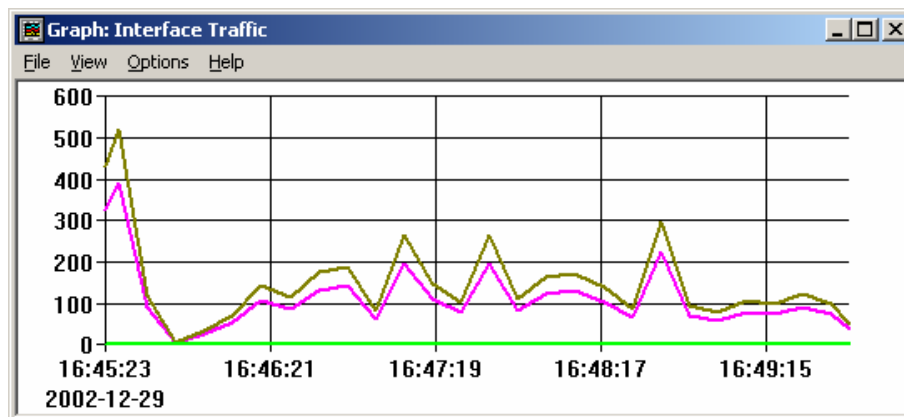
~ Л
TOOL->SNMP MIB Brower ~ Ю ~ HP OpenView
192.168.12.1 ~ Community Name Public ~ Name IP
~ ~ Ю System ~ Start Query ~ MIB
~ ~ ~ MIB Values ~



7 MIB

HP OpenView

SNMP



8

SNMP

SNMP Agent

NMS

NMS
SNMP

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Ю'

```
Ruijie(config)# access-list 1 permit 192.168.12.181
```

```
Ruijie(config)# snmp-server community public R0 1
```

Э ~ ↓ IP ы 192.168.12.181 ъ SNMP
Â

SNMPv3

ЮЮ SNMPv3 ~ ↓ v3user
MIB-2(1.3.6.1.2.1) Ю ↓ Â ы MD5
ы MD5-Auth DES ~ ↓ ы DES-Priv Â ↓
↓ 192.168.65.199 Ю SNMPv3 ↓ Trap Â Trap ↓ ы v3user,
~ ↓ ~ ы MD5
MD5-Auth DES ~ ↓ ы DES-Priv Â

```
Ruijie(config)# snmp-server view v3user view 1.3.6.1.2.1 include
Ruijie (config)# snmp-server group v3usergroup v3 priv read
v3user view write v3user view
```

```
Ruijie (config)# snmp-server user v3user v3usergroup v3 auth  
md5 md5-auth priv des56 des-priv  
Ruijie (config)# snmp-server host 192.168.65.199 traps version  
3 priv v3user
```

RMON Remote Monitoring IETF(Internet Engineering Task
Force Internet ж)
А RMON Э
А
RMON П А
RMON Ч Ъ У Л
П Й З ' Y RMON2 ъ
RMON П А
У RMON Ю RMON1 Ü
Э А
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RMON 1 ˘

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	1																																																																																								

(Alarm) RMON 3 ~ 7 Y
MIB(Management Information Base) ~ MIB

У Э æ У Ю ~ Ч Â У⁺
 ~ У⁺ ↓Л ↓ SNMP Trap Â

У⁺

У⁺ (Event) RMON 9 ~ ā Н У⁺ ~ й
 Н У У SNMP Trap Â

RMON L

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注意:

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1-65535

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Bucket-number


```
Ruijie(config)# rmon event 1 log trap rmon description "ifIn  
NUcastPkts is too much " owner zhangsan
```

rmon

show rmon alarm

```
Ruijie# show rmon alarm  
Alarm : 1  
Interval : 1  
Variable : 1.3.6.1.2.1.4.2.0  
Sample type : absolute  
Last value : 64  
Startup alarm : 3  
Rising threshold : 10  
Falling threshold : 22  
Rising event : 0  
Falling event : 0  
Owner : zhangsan
```

show rmon event

```
Ruijie# show rmon event  
Event : 1  
Description : firstevent  
Event type : log-and-trap  
Community : public  
Last time sent : 0d:0h:0m:0s  
Owner : zhangsan  
Log : 1  
Log time : 0d:0h:37m:47s  
Log description : ipttl  
Log : 2  
Log time : 0d:0h:38m:56s  
Log description : ipttl
```

show rmon history

```
Ruijie# show rmon history  
Entry : 1  
Data source : Gi1/1  
Buckets requested : 65535
```

Buckets granted : 10
Interval : 1
Owner : zhangsan
Sample : 198
Interval start : 0d:0h:15m:0s
DropEvents : 0
Octets : 67988
Pkts : 726
BroadcastPkts : 502
MulticastPkts : 189
CRCAlignErrors : 0
UndersizePkts : 0
OversizePkts : 0
Fragments : 0
Jabbers : 0
Collisions : 0
Utilization : 0

show rmon statistics

```
Ruijie# show rmon statistics
Statistics : 1
Data source : Gi1/1
DropEvents : 0
Octets : 1884085
Pkts : 3096
BroadcastPkts : 161
MulticastPkts : 97
CRCAlignErrors : 0
UndersizePkts : 0
OversizePkts : 1200
Fragments : 0
Jabbers : 0
Collisions : 0
Pkts64Octets : 128
Pkts65to127Octets : 336
Pkts128to255Octets : 229
Pkts256to511Octets : 3
Pkts512to1023Octets : 0
Pkts1024to1518Octets : 1200
Owner : zhangsan
```

注意:

S2700 H ~ show rmon statistics ~
~ A

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LAN

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<http://www.ruijie.com.cn>

J L U A MAC a IP Â

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protect' L̃ A J ^ a A

у ~ Â й Â

restrict' ң ~ J Y Trap Â

shutdown' ң ~ A J J Y Trap Â

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시	시 시 71
	128
	(protect)

4

	Y	Aggregate Port	
	SPAN		



说明:

1 在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

2 在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

3 在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

配置

在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

命令	说明
Ruijie(config-if)# switchport port-security mac-address <i>mac-address</i> [<i>ip-address ip-address</i>]	在配置接口时，通过 <code>port-security mac-address</code> 命令配置 MAC 地址。

在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 0/3
Ruijie(config-if)# switchport mode access
Ruijie(config-if)# switchport port-security
Ruijie(config-if)# switchport port-security mac-address 00d0.f800.073c ip-address 192.168.12.202
Ruijie(config-if)# end
```

配置

在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

在配置接口时，通过 `port-security mac-address` 命令配置 MAC 地址。

命令	说明
----	----

Ruijie(config-if)# switchport port-security aging{static time time }	static 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 Time 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 101 103 105 107 109 111 113 115 117 119 121 123 125 127 129 131 133 135 137 139 141 143 145 147 149 151 153 155 157 159 161 163 165 167 169 171 173 175 177 179 181 183 185 187 189 191 193 195 197 199 201 203 205 207 209 211 213 215 217 219 221 223 225 227 229 231 233 235 237 239 241 243 245 247 249 251 253 255 257 259 261 263 265 267 269 271 273 275 277 279 281 283 285 287 289 291 293 295 297 299 301 303 305 307 309 311 313 315 317 319 321 323 325 327 329 331 333 335 337 339 341 343 345 347 349 351 353 355 357 359 361 363 365 367 369 371 373 375 377 379 381 383 385 387 389 391 393 395 397 399 401 403 405 407 409 411 413 415 417 419 421 423 425 427 429 431 433 435 437 439 441 443 445 447 449 451 453 455 457 459 461 463 465 467 469 471 473 475 477 479 481 483 485 487 489 491 493 495 497 499 501 503 505 507 509 511 513 515 517 519 521 523 525 527 529 531 533 535 537 539 541 543 545 547 549 551 553 555 557 559 561 563 565 567 569 571 573 575 577 579 581 583 585 587 589 591 593 595 597 599 601 603 605 607 609 611 613 615 617 619 621 623 625 627 629 631 633 635 637 639 641 643 645 647 649 651 653 655 657 659 661 663 665 667 669 671 673 675 677 679 681 683 685 687 689 691 693 695 697 699 701 703 705 707 709 711 713 715 717 719 721 723 725 727 729 731 733 735 737 739 741 743 745 747 749 751 753 755 757 759 761 763 765 767 769 771 773 775 777 779 781 783 785 787 789 791 793 795 797 799 801 803 805 807 809 811 813 815 817 819 821 823 825 827 829 831 833 835 837 839 841 843 845 847 849 851 853 855 857 859 861 863 865 867 869 871 873 875 877 879 881 883 885 887 889 891 893 895 897 899 901 903 905 907 909 911 913 915 917 919 921 923 925 927 929 931 933 935 937 939 941 943 945 947 949 951 953 955 957 959 961 963 965 967 969 971 973 975 977 979 981 983 985 987 989 991 993 995 997 999 1001 1003 1005 1007 1009 1011 1013 1015 1017 1019 1021 1023 1025 1027 1029 1031 1033 1035 1037 1039 1041 1043 1045 1047 1049 1051 1053 1055 1057 1059 1061 1063 1065 1067 1069 1071 1073 1075 1077 1079 1081 1083 1085 1087 1089 1091 1093 1095 1097 1099 1101 1103 1105 1107 1109 1111 1113 1115 1117 1119 1121 1123 1125 1127 1129 1131 1133 1135 1137 1139 1141 1143 1145 1147 1149 1151 1153 1155 1157 1159 1161 1163 1165 1167 1169 1171 1173 1175 1177 1179 1181 1183 1185 1187 1189 1191 1193 1195 1197 1199 1201 1203 1205 1207 1209 1211 1213 1215 1217 1219 1221 1223 1225 1227 1229 1231 1233 1235 1237 1239 1241 1243 1245 1247 1249 1251 1253 1255 1257 1259 1261 1263 1265 1267 1269 1271 1273 1275 1277 1279 1281 1283 1285 1287 1289 1291 1293 1295 1297 1299 1301 1303 1305 1307 1309 1311 1313 1315 1317 1319 1321 1323 1325 1327 1329 1331 1333 1335 1337 1339 1341 1343 1345 1347 1349 1351 1353 1355 1357 1359 1361 1363 1365 1367 1369 1371 1373 1375 1377 1379 1381 1383 1385 1387 1389 1391 1393 1395 1397 1399 1401 1403 1405 1407 1409 1411 1413 1415 1417 1419 1421 1423 1425 1427 1429 1431 1433 1435 1437 1439 1441 1443 1445 1447 1449 1451 1453 1455 1457 1459 1461 1463 1465 1467 1469 1471 1473 1475 1477 1479 1481 1483 1485 1487 1489 1491 1493 1495 1497 1499 1501 1503 1505 1507 1509 1511 1513 1515 1517 1519 1521 1523 1525 1527 1529 1531 1533 1535 1537 1539 1541 1543 1545 1547 1549 1551 1553 1555 1557 1559 1561 1563 1565 1567 1569 1571 1573 1575 1577 1579 1581 1583 1585 1587 1589 1591 1593 1595 1597 1599 1601 1603 1605 1607 1609 1611 1613 1615 1617 1619 1621 1623 1625 1627 1629 1631 1633 1635 1637 1639 1641 1643 1645 1647 1649 1651 1653 1655 1657 1659 1661 1663 1665 1667 1669 1671 1673 1675 1677 1679 1681 1683 1685 1687 1689 1691 1693 1695 1697 1699 1701 1703 1705 1707 1709 1711 1713 1715 1717 1719 1721 1723 1725 1727 1729 1731 1733 1735 1737 1739 1741 1743 1745 1747 1749 1751 1753 1755 1757 1759 1761 1763 1765 1767 1769 1771 1773 1775 1777 1779 1781 1783 1785 1787 1789 1791 1793 1795 1797 1799 1801 1803 1805 1807 1809 1811 1813 1815 1817 1819 1821 1823 1825 1827 1829 1831 1833 1835 1837 1839 1841 1843 1845 1847 1849 1851 1853 1855 1857 1859 1861 1863 1865 1867 1869 1871 1873 1875 1877 1879 1881 1883 1885 1887 1889 1891 1893 1895 1897 1899 1901 1903 1905 1907 1909 1911 1913 1915 1917 1919 1921 1923 1925 1927 1929 1931 1933 1935 1937 1939 1941 1943 1945 1947 1949 1951 1953 1955 1957 1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023 2025 2027 2029 2031 2033 2035 2037 2039 2041 2043 2045 2047 2049 2051 2053 2055 2057 2059 2061 2063 2065 2067 2069 2071 2073 2075 2077 2079 2081 2083 2085 2087 2089 2091 2093 2095 2097 2099 2101 2103 2105 2107 2109 2111 2113 2115 2117 2119 2121 2123 2125 2127 2129 2131 2133 2135 2137 2139 2141 2143 2145 2147 2149 2151 2153 2155 2157 2159 2161 2163 2165 2167 2169 2171 2173 2175 2177 2179 2181 2183 2185 2187 2189 2191 2193 2195 2197 2199 2201 2203 2205 2207 2209 2211 2213 2215 2217 2219 2221 2223 2225 2227 2229 2231 2233 2235 2237 2239 2241 2243 2245 2247 2249 2251 2253 2255 2257 2259 2261 2263 2265 2267 2269 2271 2273 2275 2277 2279 2281 2283 2285 2287 2289 2291 2293 2295 2297 2299 2301 2303 2305 2307 2309 2311 2313 2315 2317 2319 2321 2323 2325 2327 2329 2331 2333 2335 2337 2339 2341 2343 2345 2347 2349 2351 2353 2355 2357 2359 2361 2363 2365 2367 2369 2371 2373 2375 2377 2379 2381 2383 2385 2387 2389 2391 2393 2395 2397 2399 2401 2403 2405 2407 2409 2411 2413 2415 2417 2419 2421 2423 2425 2427 2429 2431 2433 2435 2437 2439 2441 2443 2445 2447 2449 2451 2453 2455 2457 2459 2461 2463 2465 2467 2469 2471 2473 2475 2477 2479 2481 2483 2485 2487 2489 2491 2493 2495 2497 2499 2501 2503 2505 2507 2509 2511 2513 2515 2517 2519 2521 2523 2525 2527 2529 2531 2533 2535 2537 2539 2541 2543 2545 2547 2549 2551 2553 2555 2557 2559 2561 2563 2565 2567 2569 2571 2573 2575 2577 2579 2581 2583 2585 2587 2589 2591 2593 2595 2597 2599 2601 2603 2605 2607 2609 2611 2613 2615 2617 2619 2621 2623 2625 2627 2629 2631 2633 2635 2637 2639 2641 2643 2645 2647 2649 2651 2653 2655 2657 2659 2661 2663 2665 2667 2669 2671 2673 2675 2677 2679 2681 2683 2685 2687 2689 2691 2693 2695 2697 2699 2701 2703 2705 2707 2709 2711 2713 2715 2717 2719 2721 2723 2725 2727 2729 2731 2733 2735 2737 2739 2741 2743 2745 2747 2749 2751 2753 2755 2757 2759 2761 2763 2765 2767 2769 2771 2773 2775 2777 2779 2781 2783 2785 2787 2789 2791 2793 2795 2797 2799 2801 2803 2805 2807 2809 2811 2813 2815 2817 2819 2821 2823 2825 2827 2829 2831 2833 2835 2837 2839 2841 2843 2845 2847 2849 2851 2853 2855 2857 2859 2861 2863 2865 2867 2869 2871 2873 2875 2877 2879 2881 2883 2885 2887 2889 2891 2893 2895 2897 2899 2901 2903 2905 2907 2909 2911 2913 2915 2917 2919 2921 2923 2925 2927 2929 2931 2933 2935 2937 2939 2941 2943 2945 2947 2949 2951 2953 2955 2957 2959 2961 2963 2965 2967 2969 2971 2973 2975 2977 2979 2981 2983 2985 2987 2989 2991 2993 2995 2997 2999 3001 3003 3005 3007 3009 3011 3013 3015 3017 3019 3021 3023 3025 3027 3029 3031 3033 3035 3037 3039 3041 3043 3045 3047 3049 3051 3053 3055 3057 3059 3061 3063 3065 3067 3069 3071 3073 3075 3077 3079 3081 3083 3085 3087 3089 3091 3093 3095 3097 3099 3101 3103 3105 3107 3109 3111 3113 3115 3117 3119 3121 3123 3125 3127 3129 3131 3133 3135 3137 3139 3141 3143 3145 3147 3149 3151 3153 3155 3157 3159 3161 3163 3165 3167 3169 3171 3173 3175 3177 3179 3181 3183 3185 3187 3189 3191 3193 3195 3197 3199 3201 3203 3205 3207 3209 3211 3213 3215 3217 3219 3221 3223 3225 3227 3229 3231 3233 3235 3237 3239 3241 3243 3245 3247 3249 3251 3253 3255 3257 3259 3261 3263 3265 3267 3269 3271 3273 3275 3277 3279 3281 3283 3285 3287 3289 3291 3293 3295 3297 3299 3301 3303 3305 3307 3309 3311 3313 3315 3317 3319 3321 3323 3325 3327 3329 3331 3333 3335 3337 3339 3341 3343 3345 3347 3349 3351 3353 3355 3357 3359 3361 3363 3365 3367 3369 3371 3373 3375 3377 3379 3381 3383 3385 3387 3389 3391 3393 3395 3397 3399 3401 3403 3405 3407 3409 3411 3413 3415 3417 3419 3421 3423 3425 3427 3429 3431 3433 3435 3437 3439 3441 3443 3445 3447 3449 3451 3453 3455 3457 3459 3461 3463 3465 3467 3469 3471 3473 3475 3477 3479 3481 3483 3485 3487 3489 3491 3493 3495 3497 3499 3501 3503 3505 3507 3509 3511 3513 3515 3517 3519 3521 3523 3525 3527 3529 3531 3533 3535 3537 3539 3541 3543 3545 3547 3549 3551 3553 3555 3557 3559 3561 3563 3565 3567 3569 3571 3573 3575 3577 3579 3581 3583 3585 3587 3589 3591 3593 3595 3597 3599 3601 3603 3605 3607 3609 3611 3613 3615 3617 3619 3621
---	--

Violation mode:Shutdown
 Maximum MAC Addresses:8
 Total MAC Addresses:0
 Configured MAC Addresses:0
 Aging time : 8 mins
 SecureStatic address aging : Enabled

Ю

Ruijie# **show port-security address**

Vlan	Mac Address	IP Address	Type	Port	Remaining	Age(mins)
1	00d0.f800.073c	192.168.12.202	Configured	Gi0/3	8	
1	00d0.f800.3cc9	192.168.12.5	Configured	Gi0/1	7	

≠ ↓ √ √ √ √ √ √ √ Ю √ gigabitstethernet 0/3 ∅

Ruijie# **show port-security address interface gigabitethernet 0/3**

Vlan	Mac Address	IP Address	Type	Port	Remaining	Age(mins)
1	00d0.f800.073c	192.168.12.202	Configured	Gi0/3	8	

Ю

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Ruijie# **show port-security**

Secure Port	MaxSecureAddr(count)	CurrentAddr(count)	Security Action
-------------	----------------------	--------------------	-----------------

Gi0/1	128	1	Restrict
Gi0/2	128	0	Restrict
Gi0/3	8	1	Protect

ARP-CHECK

ARP ^ ARP-CHECK~ √ ∅ MAC+IP √ √
 DHCP Snooping √ √
 ARP ARP √ IP √
 ~ ~ √
 ARP-CHECK √ √ √ √ √ √ √
 Ю √ √ √ ARP √ √ √
 ~ ‡ √ arp √

1. 配置 ARP 表项
2. 配置 ARP 表项
3. 配置 ARP 表项

ARP-CHECK

配置 ARP-CHECK

命令	说明
Ruijie# configure terminal	
Ruijie(config)# interface interface-id	配置接口
Ruijie(config-if)# arp-check	启用 ARP 检查
Ruijie(config-if)# no arp-check	禁用 ARP 检查
Ruijie(config-if)# arp-check auto	自动配置 ARP 检查

```

Ruijie#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface fastEthernet 0/5
Ruijie(config-if)# switchport port-security
Ruijie(config-if)# switchport port-security mac-address
00d0.f822.33ab ip-address 192.168.2.5
Ruijie(config-if)# no arp-check

```

说明:

1.	ARP-CHECK	π	ARP	ң	a ↓	a ↓	
	S2700	ң	ARP	л	MAC	Sender Ip	Â

802.1X

Authentication'

ч 4' 4 4^ controlled Port~ 4
4^ uncontrolled Port~ 4 4
' 4 4 4Л 4
4 4 3 4Л
Е ~ Л Е 6 4 4 ы 4

802.1X



3

1. 802.1X 802.1x windowXp
Star-supplіcant è IEEE802.1x Â
 2. IEEE 802.1x
 3. У М М RADIUS Е й Е
 1. б Radius Server М М Э М М М М М
б Е М М М Э М
 2. б М й М М М М
Â
 1. М 802.1x М М М М М М
М а è Â М М
 2. Radius Server Э М а М
Э М
 3. М М М
- В à 802.1x й

802.1X

802.1X
802.1X
6 RADIUS SERVER
802.1X
/ Y
/ N supplicant
↓ QUIET

Server-timeout
y || 802.1X
802.1X
IP
↓
N IO ↓ y

L
1
6 IP
N
N VLAN || 1
3 L 1

EAPOL TAG

802.1x

Ю 802.1x У

Authentication	DISABLE
Accounting	DISABLE
* (Radius Server) * IP (ServerIp) * UDP * (Key)	* *1812 *
* (Accounting Server) * IP * UDP	* *1813
	~ ~
re-authentication	
reauth_period	3600
И	10
	3
	3
	3
	5
Ю	

802.1X Y

802.1x Ю
 802.1x Ю
 "I IP radius server Ю
 а 1X
 Aggregate Port а 1X
 У 1x
 cpu

6 RADIUS SERVER ~~~~~ 10 ~~~~~

Итого: 6 Server ~ Ю

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3	
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```

!
username ruijie password 0 starnet
!
radius-server host 192.168.217.64
radius-server key 7 072d172e071c2211
!
!
!
dot1x authentication authen
!
interface VLAN 1
 ip address 192.168.217.222 255.255.255.0
 no shutdown
!
!
line con 0
line vty 0 4
!
end

```

802.1x RADIUS "I Radius Server IP ~
 6 Radius Server Â Radius Server 1~
 7 Â Radius Server 6 3 Y Â

I Y 1

802.1x Ю~ Y 1 ~ ‡ 1 й 1 1~
 1 Ю ~ ~ 1 1 Ю 1 Ю
 Â
 Ю~ Ю Y 1 Â

3	
configure terminal	
interface <i>interface</i>	1 ,

```
Ruijie# configure terminal
Ruijie(config)# interface f 1/1
Ruijie(config-if)# dot1x port-control auto
Ruijie(config)# end
```

À l'heure de la mise en œuvre, les équipes ont constaté que les protocoles de sécurité étaient trop rigides et ne permettaient pas d'adapter les mesures de sécurité aux besoins spécifiques de chaque projet. Elles ont donc décidé de mettre en place des protocoles de sécurité plus souples et adaptés aux besoins de chaque projet.

注意:

[illegible]

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у ∩ ∩ Ê ∩
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}	
configure terminal	
dot1x re-authentication	no
dot1x timeout re-authperiod <i>seconds</i>	
End	
Write	
show dot1x	dot1x

no dot1x re-authentication	no dot1x timeout re-authperiod	no dot1x re-authperiod
лю	лю	лю

```

Ruijie(config)# dot1x timeout re-authperiod 1000
Ruijie(config)# end
Ruijie# show dot1x
802.1X Status:          Disabled
Authentication Mode:    EAP-MD5
Authenticated User Number: 0
Re-authen Enabled:      Enabled
Re-authen Period:       1000 sec
Quiet Timer Period:     10 sec
Tx Timer Period:        3 sec
Supplicant Timeout:     3 sec
Server Timeout:         5 sec
Re-authen Max:          3 times
Maximum Request:        3 times
Filter Non-RG Supp:     Disabled
Client Oline Probe:     Disabled
Eapol Tag Enable:       Disabled
Authorization Mode:      Disabled

```

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/ ^ supplicant ¶

^ supplicant ¶ ñ 802.1X ~ ¶
 è Y 802.1X (WindowsXP 802.1X
 ¶) ‡ ¶ Â
 ¶ Ñ ~ ^ supplicant ¶ 802.1X ~
 supplicant a ¶ è 802.1X Â ¶
 Â
 ¶ ¶ à ¶ '

¶	
configure terminal	
dot1x private-supplicant-only	¶
end	
write	
show dot1x	dot1x

¶¶ ^ supplicant ¶ '

```

Ruijie# configure terminal
Ruijie(config)# dot1x private-supplicant-only

```



```
Ruijie(config)# end
Ruijie# show dot1x
802.1X Status:      enable
Authentication Mode: eap-md5
Total User Number:  0(exclude dynamic user)
Authed User Number: 0(exclude dynamic user)
Dynamic User Number: 0
Re-authen Enabled:  enable
Re-authen Period:   2 sec
Quiet Timer Period:  10 sec
Tx Timer Period:     3 sec
Supplicant Timeout:  3 sec
Server Timeout:      5 sec
Re-authen Max:       3 times
Maximum Request:     3 times
Private supplicant only: enable
Client Online Probe: disable
Eapol Tag Enable:    disable
Authorization Mode:   disable
```

no dot1x private-supplicant-only

↓ QUIET

Quiet Period 10 Quiet Period

configure terminal	
dot1x timeout quiet-period seconds	Quiet Period
end	
write	

show dot1x dot1x

Ruijie(config)# **end**

↓ EAP-request/identity 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271 1272 1273 1274 1275 1276 1277 1278 1279 1280 1281 1282 1283 1284 1285 1286 1287 1288 1289 1290 1291 1292 1293 1294 1295 1296 1297 1298 1299 1300 1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360 1361 1362 1363 1364 1365 1366 1367 1368 1369 1370 1371 1372 1373 1374 1375 1376 1377 1378 1379 1380 1381 1382 1383 1384 1385 1386 1387 1388 1389 1390 1391 1392 1393 1394 1395 1396 1397 1398 1399 1400 1401 1402 1403 1404 1405 1406 1407 1408 1409 1410 1411 1412 1413 1414 1415 1416 1417 1418 1419 1420 1421 1422 1423 1424 1425 1426 1427 1428 1429 1430 1431 1432 1433 1434 1435 1436 1437 1438 1439 1440 1441 1442 1443 1444 1445 1446 1447 1448 1449 1450 1451 1452 1453 1454 1455 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911

й 5 ' "

```
Ruijie# configure terminal
Ruijie(config)# dot1x max-req 5
Ruijie(config)# end
```

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{	
configure terminal	
dot1x reauth-max <i>count</i>	
end	
write	

show dot1x	dot1x
------------	-------

注意:

radius	802.1X	aaa authentication dot1x default group radius none
radius	802.1X	radius
802.1X	5	radius
802.1X	802.1X	radius
radius	*	802.1X server-timeout

ÿ || 4 802.1x

802.1x
linkdown linkup
802.1x WindowsXP 802.1x EAP-request/identity

3	
configure terminal	
dot1x auto-req	ÿ Å Å Å

end	
write	
show dot1x	dot1x

[illegible]

3	
configure terminal	
dot1x auto-req packet-num <i>num</i>	$\begin{aligned} & \text{ } \ddot{y} \parallel \downarrow \text{ num } 802.1x \\ & \text{ , } \text{ num } \dot{\eta} \sigma \ddot{\ddot{z}} \\ & \downarrow \quad \hat{A} \quad \sigma \quad \sim \end{aligned}$
end	
write	
show dot1x auto-req	

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}	
configure terminal	
dot1x auto-req req-interval <i>interval</i>	✓
end	
write	
show dot1x auto-req	

Ю

3	
configure terminal	

dot1x auto-req user-detect	^ Â 4
end	¶

1. Radius Server 和 Radius Client
 2. IP
 3. UDP
 4. 802.1x

1. Radius Server 和 Radius Client
 2. IP
 3. UDP
 4. 802.1x

3	
---	--

configure terminal

AAA

¢

aaa group server radius gs

¢

exit

¢

dot1x accounting

802.1X

end

no aaa accounting network

3

```
Ruijie(config)# end
Ruijie# write memory
Ruijie# show running-config
```

注意:

- 1) 6 Radius Server 6 ↓
 - 2) AAA IO
 - 3) 802.1X ↓
 - 4) 802.1x π IO
 - 5) Radius Server
 - 6) ↓ AAA L IO ≠, 3 **aaa domain enable**
~ **dot1x accounting** 3 a
Â É 1 I ↓ AAA L L Â
- ↓ π ~ NAS 3 ↓ ~ NAS
↓ Radius Server ↓ ~ Radius Server 3 ↓ 1
NAS
NAS

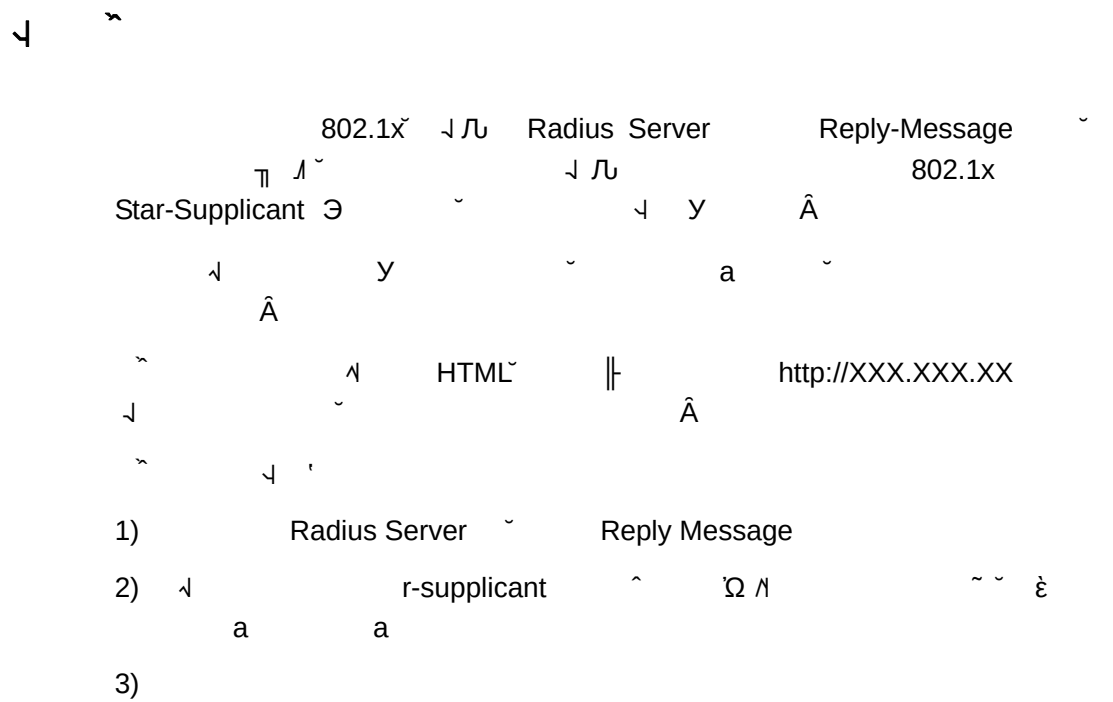
ЛЮ	й	н	п	'		
й		1 è	л	~	802.1x	п
			g	U'		

SUPPLICANT	'	IP	IP	SUPPLICANT	PC	IP
IP	IP	IP	IP	IP	IP	IP
IP	IP	IP	IP	IP	IP	IP
IP	IP	IP	IP	IP	IP	IP

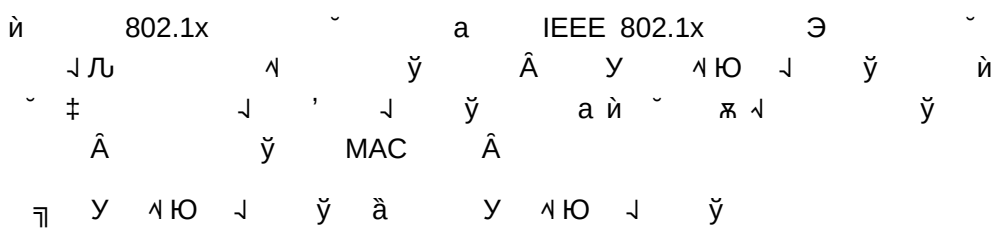
```
aaa authorization ip-auth-mode radius-server
!
Ruijie# write memory
```

注意:

	499	IP	IP+MAC	arp-check	498	IP
--	-----	----	--------	-----------	-----	----



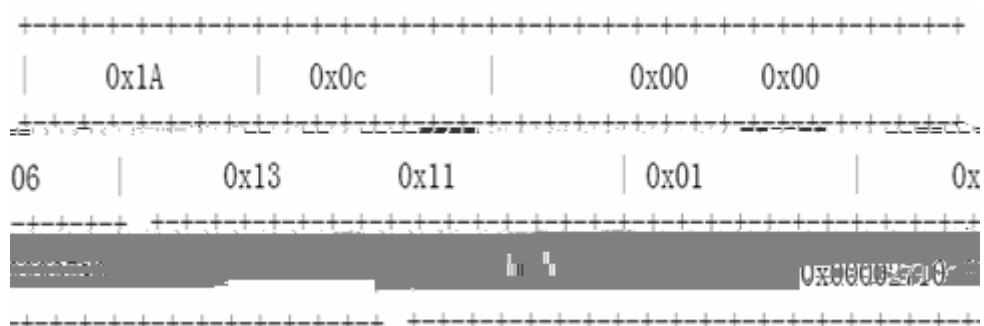
1 Ю ↓ ŷ



configure terminal	
dot1x auth-address-table address mac-addr interface interface	↓ ŷ

end	
write	
show running-config	

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0x00002710	10M	10000kbsp	16

Diagram illustrating network authentication protocols:

- 802.1X
- EAP-MD5
- CHAP
- PAP
- RADIUS SERVER

The diagram shows connections between these components, likely representing a central RADIUS server connected to multiple clients or access points.

```

802.1X Status:      Disabled
Authentication Mode: CHAP
Authenticated User Number: 0
Re-authen Enabled:  Disabled
Re-authen Period:   3600 sec
Quiet Timer Period:  10 sec
Tx Timer Period:     3 sec
Supplicant Timeout:  3 sec
Server Timeout:      5 sec
Re-authen Max:       3 times
Maximum Request:     3 times
Filter Non-RG Supp:  Disabled
Client Oline Probe:  Disabled
Eapol Tag Enable:    Disabled
Authorization Mode:   Group Server

```

⌋

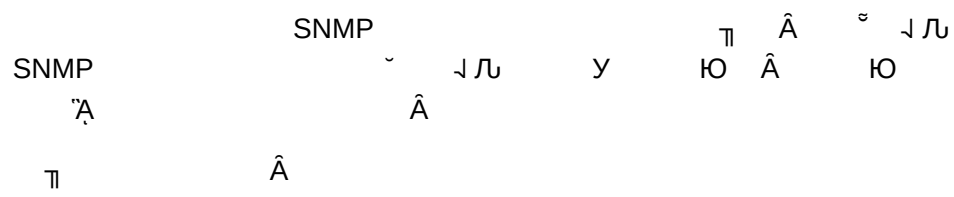
```

^      802.1x      ~  ↓  ⌋      ⌋  ^  ŷ  ⌋  ^  ⌋
^      ⌋  ⌋      ⌋  ⌋  ⌋      ⌋  ^
      ⌋  ⌋      ⌋  ^

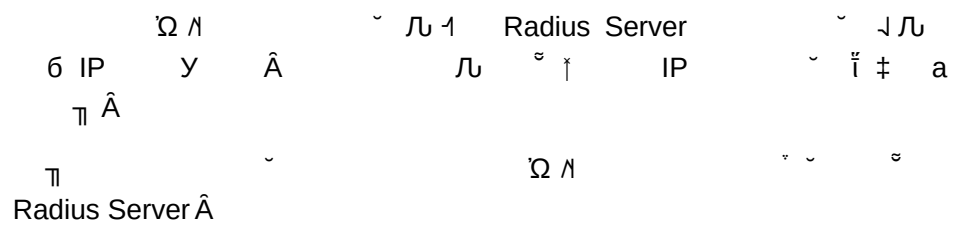
```

⌋	
configure terminal	
aaa new-model	aaa
aaa group server radius <i>gs-name</i>	⌋
server sever	⌋
server server-backup	⌋
end	
write	servho-BāB

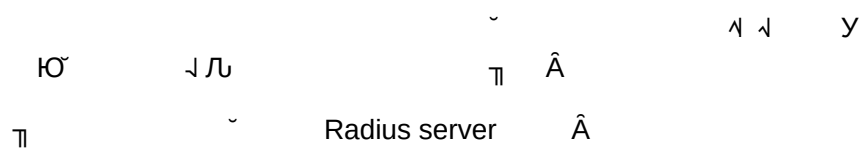
1



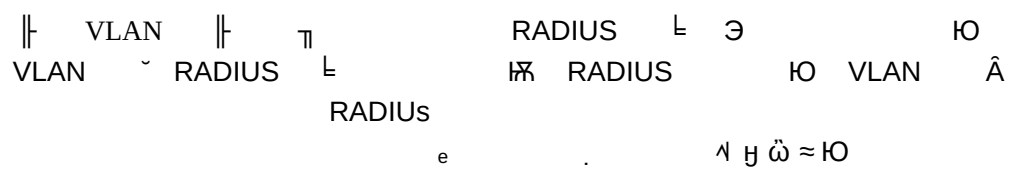
6 IP



4



802.1X 4 || VLAN ||



	№	Имя	РADIUS сервер	РADIUS группа	Имя VLAN
64	Имя	Tunnel-Type			
65	Имя	Tunnel-Medium-Type			
81	Имя	Tunnel-Private-Group-ID			

Имя Имя Имя

Tunnel-Type=VLAN (13)

Tunnel-Medium-Type=802.1Q

Tunnel-Private-Group-ID=VLANID(Имя)

Имя

802.1X

interface <i>interface_id</i>	↖
dot1x dynamic-vlan enable	↖ VLAN ↖ ↖

注意:

Interval

1. 配置命令

2. 配置说明

命令	说明
configure terminal	
dot1x client-probe enable	启用客户端探测
dot1x probe-timer interval interval	Hello Interval
dot1x probe-timer alive interval	Alive Interval
end	
write	
show dot1x	

EAPOL TAG

IEEE 802.1x EAPOL 报文在 VLAN TAG 的 Trunk Port 上发送。

配置命令

1. 配置命令

2. 配置说明

EAPOL TAG 报文

命令	说明
configure terminal	
dot1x eapol-tag	EAPOL TAG 报文
end	
write	
show dot1x	

1. 配置命令

2. 配置说明

IEEE 802.1x 认证过程中，认证服务器（AS）通过 EAPOL 报文与认证客户端（AC）进行通信。认证服务器（AS）通过 EAPOL 报文向认证客户端（AC）发送 EAP 报文。认证客户端（AC）通过 EAPOL 报文向认证服务器（AS）发送 EAP 报文。

}	
configure terminal	
interface <interface-id>	^
dot1x port-control auto	√ Π
dot1x port-control-mode {mac-based port-based}	√
End	
Write	
show dot1x port-control	^ 802.1X

Ю N

```
Ruijie(config)# dot1x port-control-mode port-base
```

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3	
configure terminal	
dot1x stationarity enable	4
end	
Write	

$$\downarrow \cup \quad \downarrow \quad \downarrow \quad \hat{A} \quad \downarrow$$

802.1X

```
Ruijie# sh radius server
Server IP:      192.168.5.11
Accounting Port: 1813
Authen Port:    1812
Server State:   Ready
```

```

      802.1X
      show dot1x
```

```

      802.1x

Ruijie# show dot1x
802.1X Status:      Disabled
Authentication Mode: EAP-MD5
Authed User Number: 0
Re-authen Enabled:  Disabled
Re-authen Period:   3600 sec
Quiet Timer Period:  10 sec
Tx Timer Period:     3 sec
Supplicant Timeout:  3 sec
Server Timeout:      5 sec
Re-authen Max:       3 times
Maximum Request:     3 times
Filter Non-RG Supp:  Disabled
Client Oline Probe:  Disabled
Eapol Tag Enable:    Disabled
Authorization Mode:   Disabled
```

↓

```

      802.1x
      dot1x
      interface
```

configure terminal	
dot1x auth-address-table address mac-addr interface interface	↓ ǎ

end	
write	
show dot1x auth-address-table	↓ ỹ

no dot1x auth-address-table address 3 ↓ ỹ Â

Ruijie# show dot1x auth-address-table
interface:g3/1

mac addr: 00D0.F800.0001

↓ ỹ Â

3	
show dot1x summary	

↓ ỹ

Ruijie# show dot1x summary

ID	MAC	Interface	VLAN	Auth-State	Backend-State
Port-Status					

1	00d0f8000001	Gi3/1		1	Authenticated
Authed					IDLE

1x

3	
show dot1x probe-timer	1x

↓ ỹ 1x :

Ruijie# show dot1x probe-timer
Hello Interval: 20 Seconds
Hello Alive: 250 Seconds

802.1x ё Y

1. IP ~ 10000 Â
2. IP Ю ~ ё ^ 1 IP
 ~ M ~ ё ~ ± 1 IP
 Ю a П ~ П Â
 ~ IP Ю Y 1 Л Â
3. 1 Э П Ю
 1 a ~ 3 **switchport mode trunk**
 1 ACCESS Ю a 1 Access VLAN
 1 TRUNK Ю a 1 Allowed VLAN 1 Native VLAN
4. VLAN П Ю
 VLAN a
 VLAN a ~ 3 private-vlan primary Â
5. 1 Y 1 Ю
 Y Ю 1 VLAN 1 VLAN 1 Y Ю
 1 VLAN
 1 Ю 1 VLAN Y Ю 1 VLAN
 1 Ю 1 VLAN 1 Y Y ~ 1 ±
 ,
 Y 1 Ю 1 VLAN б Э Ю 1
 VLAN 1 ~ 1 ± Â
7. 0 Ю IPV6 1 IP 1
 DISABLE ~ 1 0 GSN 1 Ю 1
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	у	Ю	л	ю	А	а	Ѧ	Ѧ

configure terminal	
aaa authentication login default group radius local	<pre> Y ~ è l' default L J Â Û ~ J J Â ì Â </pre>

3	
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A 5

$$\hat{\alpha} = \hat{\alpha}(\hat{\beta}, \hat{\gamma}) = \hat{\alpha}(\hat{\beta}, \hat{\gamma})$$

Ю. И. Елизаров (НАС) у
Д. Л. НАС и

AAA	E	A	U	U	Login	U	A a
ā		Login	U	U	aaa authentication login		3

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3	
configure	terminal
aaa new-model	Ü AAA Â
aaa authentication login {default list-name} method1 [method2...]	𐀀 Y ~ 𐀀 ~ 3 Â

end	
show running-config	

✕ Login ~ ↓ 儿Ю з'

✕	
configure terminal	
aaa new-model	AAA
aaa authentication login {default list-name} local	✕
end	
show aaa method-list	
configure terminal	
line vty line-num	
login authentication {default list-name}	
end	
show running-config	

RADIUS Login

RADIUS 儿 Login ~ "I RADIUS 儿 Â
RADIUS 儿 ~ Ю' é 儿Ю з'

✕	
configure terminal	
aaa new-model	AAA
radius-server host ip-address [auth-port port] [acct-port port]	RADIUS 儿
end	
show radius server	RADIUS 儿

RADIUS 儿 1~ RADIUS 儿 ~ 6
RADIUS 儿 儿 RADIUS 儿
~ 1 I RADIUS 儿 Â
↓ 儿 RADIUS 儿 ~ Ю 儿Ю
з'

✕	
---	--

configure terminal	
aaa new-model	AAA
aaa authentication login {default list-name} group radius	✕ RADIUS
end	
show aaa method-list	
configure terminal	
line vty line-num	
login authentication {default list-name}	
end	
show running-config	

AAA Enable

AAA Enable
 Telnet
 (NAS)
 CLI
 0~15
 show privilege
 enable
 AAA Enable
 Ю ЛЮ

configure terminal	
aaa new-model	AAA

aaa authentication enable default

~ ↑ ~ ‡ ↑ ~ a ~ ‡ ~ Â ~ ↑

注意:

CLI Login ^ none ~
↓ Â ~ Enable ~ a "Â ↓ ~
6 Login ↓ ↓ ↓ ~
CLI Login ~ Login

☑	Enable	✓	↓	ルロ	3'
---	--------	---	---	----	----

R

PPP

AAA

PPP

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NAS

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PPP

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PPP

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AAA PPP

AAA PPP

h64 55J 01.48 22 088 M 54503.82 55J 01.48 22 088 M 5402 Tc 24.377 0 Td ((ISDN).1103DAA

	~ 10 1 Â
dot1x authentication <i>list-name</i>	802.1x Â
IEEE802.1x é 1 1 802.1x 1 Â	

```

Ruijie(config)# aaa new-model
Ruijie(config)# username Ruijie password starnet
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key test
Ruijie(config)# aaa authentication login test group radius local
Ruijie(config)# line vty 0
Ruijie(config-line)# login authentication test
Ruijie(config-line)# end
Ruijie# show running-config
!
aaa new-model
!
!
aaa authentication login test group radius local
username Ruijie password 0 starnet
!
radius-server host 192.168.217.64
radius-server key 7 093b100133
!
line con 0
line vty 0
login authentication test
line vty 1 4
!
!

```

LE Ю

1. $\mathbb{E}$ Ю
 2. $\mathbb{E}$ $\mathbb{E}$ $\hat{A}$ $\sim$ AAA π $\hat{A}$ $\dagger$ IP
 3. $\hat{}$ Login~ $\sim$ ж "I $\sim$
 4. $\mathbb{E}$ $\sim$ $\mathbb{E}$ $\mathbb{E}_H$ $\hat{A}$ $\downarrow \mathbb{L}$ ч $\uparrow$ $\sim$
 5. $\mathbb{E}$ a $\sim$ $\mathbb{E}$ ' $\downarrow$
 6. $\downarrow \downarrow \mathbb{L}$ $\hat{A}$ ' y $\mathbb{E}$ ж
 7. $\sim$ й none' $\mathbb{L}$ $\mathbb{E}$
 8. $\mathfrak{A}$ $\mathfrak{E}$ $\downarrow \mathbb{L}$ a $\downarrow \sim$ a
 9. $\hat{A}$ Ю'

```
Ruijie(config)# aaa new-model
Ruijie(config)# username Ruijie password starnet
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key test
Ruijie(config)# aaa authentication login test group radius local
Ruijie(config)# aaa authentication login terms none
Ruijie(config)# line tty 1 4
Ruijie(config-line)# login authentication terms
Ruijie(config-line)# exit
Ruijie(config)# line tty 5 16
Ruijie(config-line)# login authentication test
Ruijie(config-line)# exit
Ruijie(config)# line vty 0 4
Ruijie(config-line)# login authentication test
Ruijie(config-line)# end
Ruijie# show running-config
!
aaa new-model
!
!
aaa authentication login test group radius local
aaa authentication login terms none
username Ruijie password 0 starnet
!
radius-server host 192.168.217.64
radius-server key 7 093b100133
!
line con 0
line aux 0
line tty 1 4
login authentication terms
line tty 5 16
login authentication test
```


vty

 $\mathcal{L} \mathcal{L}^{\vee}$

Exec

Command $\{ \sim$

Network $\hat{\sim}$

Exec

[illegible]

У ААА ~ Ю ЛЮ з'

3	
configure terminal	
aaa new-model	AAA
aaa authorization exec 'p*ü	

	Â
authorization exec {default list-name}	Â

list-name ...
 method Â ERROR
 FAIL() ± a Â
 none Â
 RADIUS (TIMEOUT) Exec
aaa authorization exec default group radius none

local	Exec
none	a Exec
group radius	RADIUS Exec
group tacacs+	TACACS+ Exec

AAA Exec Â

注意:

Exec Login
 Exec Â
 Exec a Â
 Exec Login

authorization exec {default list-name}	
end	
show running-config	

Exec

```

Ruijie# configure terminal
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key test
Ruijie(config)# username ruijie password ruijie
Ruijie(config)# username ruijie privilege 6
Ruijie(config)# aaa authentication login mlist1 local
Ruijie(config)# aaa authorization exec mlist2 group radius local
Ruijie(config)# line vty 0 4
Ruijie(config-line)# login authentication mlist1
Ruijie(config-line)# authorization exec mlist2
Ruijie(config)# end
Ruijie# show running-config
aaa new-model
!
aaa authentication login mlist1 local
!
aaa authorization exec mlist2 group radius local
!
username ruijie password ruijie
username ruijie privilege 6
!
radius-server host 192.168.217.64
radius-server key 7 093b100133
!
line con 0
line vty 0 4
  authorization exec mlist2
  login authentication mlist1
!
end

```

AAA Network

说明:

3 11 TACACS+ 5 13 TACACS+ LÂ

[illegible]

AAA Exec

Exec NAS CLI CLI

$\hat{A}$ NAS CLI $\hat{A}$ CLI

$\hat{A}$ Start CLI $\hat{A}$ Stop

注意:

NAS Login $\sim$ none $\neq$ a Exec $\hat{A}$ Exec $\hat{A}$
 Stop $\hat{A}$ Start $\neq$ a

AAA Exec Ю ЛЮ 3'

3	
configure terminal	
aaa new-model	ú AAA Â


```
aaa accounting exec {default | list-name}  
start-stop method1 [method2...]
```

```
line vty line-num
```

```
accounting exec {default
```

AAA

AAA

AAA

AAA

AAA Exec

show running-config	
---------------------	--

Exec

Ю	Exec	Â	VTY	0~4 Э	Login
3	Exec	Â È	Login	3	Exec
RADIUSÂ	RADIUS	È	192.168.217.64	7	testÂ
1 192.168.217.64	1 192.168.217.64	Â	Ю		

```

Ruijie# config
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key test
Ruijie(config)# username ruijie password ruijie
Ruijie(config)# aaa authentication login auth local
Ruijie(config)# aaa accounting exec acct start-stop group radius
Ruijie(config)# line vty 0 4
Ruijie(config-line)# login authentication auth
Ruijie(config-line)# accounting exec acct
Ruijie(config)# end
Ruijie# show running-config
!
aaa new-model
!
aaa accounting exec acct start-stop group radius
aaa authentication login auth local
!
username ruijie password ruijie
!
radius-server host 192.168.217.64
radius-server key 7 093b100133
!
line con 0
line vty 0 4
    accounting exec acct
    login authentication auth
!
end

```

AAA Network

Network 1
 à IP à 1 À Network 1 RADIUS À

说明:

RADIUS 1 a 1 RADIUS 1 1 y À
 1 1 H a 1 1 y À

AAA Network 1 Ю 1yЮ 3'

3	
configure terminal	
aaa new-model	Û AAA À
aaa accounting network {default list-name} start-stop method1 [method2...]	1y 1y 3 À

list-name 1 ... 1 1
method À ERROR ~ ~
 1 è , FAIL() 1 a è
 À 1 1 1 1
none 1 1 y À

Network

```

Ruijie# config
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key test
Ruijie(config)# aaa accounting network acct start-stop group
radius
Ruijie(config)# end
Ruijie# show running-config
!
aaa new-model
!
aaa accounting network acct start-stop group radius
!
username Ruijie password 0 starnet
username Ruijie privilege 6
!
radius-server host 192.168.217.64
radius-server key 7 093b100133

```

AAA

<code>show aaa user { id all }</code>	AAA
---	-----

VRF AAA

Virtual Private Networks (VPNs) are used to separate traffic from different users or applications. In a VRF, traffic is isolated and forwarded based on the VRF table. AAA is used to authenticate and authorize users and applications.

<code>show vrf</code>	
-----------------------	--

AAA

AAA

AAA

注意:

AAA IEEE802.1x IEEE802.1x
802.1x

说明:

ЛЮ

AAA

configure terminal	
aaa new-model	Ü AAA £

说明:

1. 在 AAA 域下配置域名称。
a. 配置域名称。
2. 配置域名称。
3. 配置域名称。

在 AAA 域下配置域名称。

配置命令	配置说明
show aaa domain [domain-name]	查看 AAA 域配置。

在 AAA 域下配置域名称。

1. 在 AAA 域下配置域名称。
2. 在 AAA 域下配置域名称。
3. 在 AAA 域下配置域名称。
4. 在 AAA 域下配置域名称。
5. 在 AAA 域下配置域名称。

1 AAA 2

1 AAA 2

```
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.197.154
Ruijie(config)# radius-server key test
Ruijie(config)# aaa authentication dot1x default group radius
Ruijie(config)# aaa domain domain.com
Ruijie(config-aaa-domain)# authentication dot1x default
Ruijie(config-aaa-domain)# username-format without-domain
```

```
3      1~ radius 2 3 a1~ 802.1x
~      1 1 a1@domain.com~ "A
1      Ю'
```

```
Ruijie#show aaa domain domain.com
```

```
=====Domain domain.com=====
```

State: Active

Username format: Without-domain

Access limit: No limit

802.1X Access statistic: 0

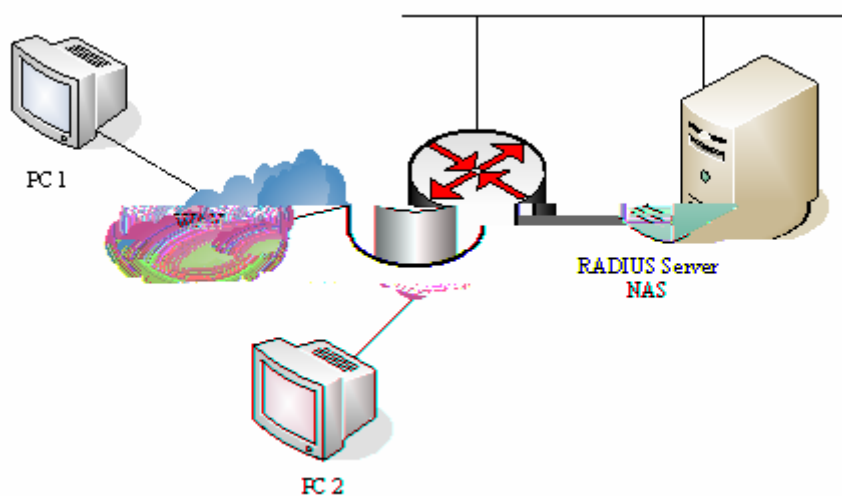
Selected method list:

authentication dot1x default

RADIUS

RADIUS

RADIUS (Remote Authentication Dial-In User Service) is a protocol for authenticating, authorizing, and accounting (AAA) network users. It is commonly used in network environments where users connect via modems or other dial-in methods. RADIUS is implemented in various operating systems, including UNIX and Windows 2000. The protocol involves a Network Access Server (NAS) and a RADIUS Server. The NAS sends requests to the RADIUS Server, which responds with either an ACCEPT, REJECT, or CHALLENGE message. The NAS then sends an ACCEPT message back to the RADIUS Server. The RADIUS Server also sends an ACCEPT message back to the NAS. The RADIUS Server also sends an ACCEPT message back to the NAS. The RADIUS Server also sends an ACCEPT message back to the NAS.



1. RADIUS

RADIUS 配置

```

# 配置 RADIUS 认证
aaa authentication
aaa authentication
# 配置 RADIUS 服务器
radius-server host
radius-server
radius

```

1. 配置 RADIUS 认证

配置命令	配置说明
configure terminal	
radius-server host <i>ip-addr</i>	IP 地址为 <i>ip-addr</i> RADIUS 服务器的 IP 地址

2. 配置 RADIUS 认证

配置命令	配置说明
configure terminal	
radius-server host <i>ip-addr</i> auth-port <i>port</i>	IP 地址为 <i>ip-addr</i> RADIUS 服务器的 IP 地址 认证端口为 <i>port</i>
radius-server host <i>ip-addr</i> acct-port <i>port</i>	IP 地址为 <i>ip-addr</i> RADIUS 服务器的 IP 地址 计费端口为 <i>port</i>

3. 配置 RADIUS 计费

配置命令	配置说明
configure terminal	

ID	⌈	TYPE
1	max down-rate	1
2	qos	2
3	user ip	3
4	vlan id	4
5	version to client	5
6	net ip	6
7	user name	7
8	password	8
9	file-diractory	9
10	file-count	10
11	file-name-0	11
12	file-name-1	12
13	file-name-2	13
14	file-name-3	14
15	file-name-4	15
16	max up-rate	16
17	version to server	17
18	flux-max-high32	18
19	flux-max-low32	19
20	proxy-avoid	20
21	dailup-avoid	21
22	ip privilege	22
23	login privilege	42
24	limit to user number	50

ID		TYPE
----	--	------

ч п а й у л

3	user ip	3
4	vlan id	4
5	version to client	5
6	net ip	6
7	user name	7
8	password	8
9	file-diractory	9
10	file-count	10
11	file-name-0	11
12	file-name-1	12
13	file-name-2	13
14	file-name-3	14
15	file-name-4	15
16	max up-rate	75
17	version to server	17
18	flux-max-high32	18
19	flux-max-low32	19
20	proxy-avoid	20
21	dailup-avoid	21
22	ip privilige	22
23	login privilige	42
24	limit to user number	50

Ruijie# **configure**

Ruijie(config)# **radius attribute 24 vendor-type 67**

Ruijie(config)# **show radius vendor-specific**

id	vendor-specific	type-value

1	max down-rate	76
2	qos	77
3	user ip	3
4	vlan id	4
5	version to client	5
6	net ip	6
7	user name	7
8	password	8
9	file-diractory	9
10	file-count	10
11	file-name-0	11
12	file-name-1	12
13	file-name-2	13
14	file-name-3	14
15	file-name-4	15
16	max up-rate	75
17	version to server	17
18	flux-max-high32	18

Server IP: 192.168.12.219

Accounting Port: 1646

Authen Port: 1645

Server State: Ready

Ruijie# **configure terminal**

Ruijie(config)# **line vty 0**

Ruijie(config-line)# **login authentication test**

Ruijie(config-line)# **end**

Ruijie# **show running-config**

!

aaa ne

!

!

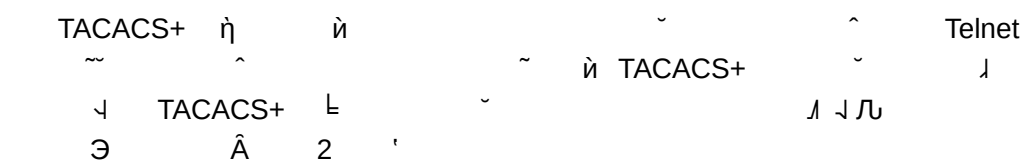
TACACS+ TACACS RFC 1492 Terminal Access Controller Access Control System Client-Server

4	8	16	24	32 bit
Major	Minor	Packet type	Sequence no.	Flags
Session ID				
Length				

1

Major Version — ý

TACACS+



2

Ю Л ã TACACS+



3

↓ Лў й Ъ ǀ ' ǀ

1. ǀ'

1~ Â

2~ TACACS+ Л~ ↓ TACACS+ Ё ↓ Â

```

3~ TACACS+  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54  55  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90  91  92  93  94  95  96  97  98  99  100
4~ TACACS+
5~
6~ TACACS+
7~ TACACS+
8~ TACACS+
9~
10~ TACACS+
11~ TACACS+
2.
1~ TACACS+
2~ TACACS+
3~ TACACS+
3.
1~ TACACS+
2~ TACACS+
3~
4~ TACACS+
5~ TACACS+

```

TACACS+ 1

```

aaa new-mode
tacacs-server host
tacacs-server key
tacacs-server timeout
aaa authentication
aaa authorization

```

AAA authorization configuration

AAA accounting configuration

AAA accounting configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

AAA configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

TACACS+ configuration

tacacs-server host configuration

configure terminal	

tacacs-server host 0.0.0.0 937d (IP) string

й TACACS+ Е ' М ~ ‡ Е ~
TACACS+ М Â

TACACS+ М

TACACS+ М ~ ЛЮ з'

з	
configure terminal	Â
tacacs-server key string	TACACS+ Е М ~ М ~ ‡ Â

注意:

TACACS+ М Â з Э М TACACS+
Е Э М у Â

AAA Е

Э AAA Е ~ ↓Л у Е Ÿ †
~ Login ~ Â
Е ↓Л Ů Е ~ Е Ÿ ¶ "Л ~ Л
Е Ÿ Â Е ¶ Е ~ † "¶ ~ Л ¶
Е й у Е ~ у Е ~ Ю
у Е Â
AAA Е ~ ЛЮ з'

з	
configure terminal	Â
tacacs-server host ip-address [port integer] [timeout integer] [key string]	TACACS+ Е Ÿ ~ Л TACACS+ Е Ÿ Е Â

aaa group server {radius tacacs+} <i>group-name</i>	AAA ^ RADIUS TACACS+~ { AAA ' TACACS+ tacacs+
server <i>ip-address</i>	TACACS+ ' tacacs-server host

TACACS+

[illegible]

TACACS+

```

Ruijie(config)# line vty 0 4
Ruijie(config-line)# login authentication test

Ruijie#show running-config
!
aaa new-model
!
aaa authentication login test group tacacs+
!
tacacs-server host 192.168.12.219
tacacs-server key aaa
!
line con 0
line vty 0 4
login authentication test
!

```

Enable TACACS+

1. "I 0 aaa"


```

Ruijie# configure terminal
Ruijie(config)# aaa new-model

```
2. "1 tacacs+ server"


```

Ruijie(config)# tacacs-server host 192.168.12.219
Ruijie(config)# tacacs-server host 192.168.12.218
Ruijie(config)# tacacs-server host 192.168.12.217
Ruijie(config)# tacacs-server key aaa

```
3. tacacs+ server group "y"


```

Ruijie(config)#aaa group server tacacs+ tacgroup1
Ruijie(config-gs-tacacs)#server 192.168.12.219
Ruijie(config-gs-tacacs)#server 192.168.12.218

```
4. "1 tacgroup1"


```

Ruijie(config)# aaa authentication enable default group tacgroup1

Ruijie#show running-config
!
aaa new-model
!

```

```
!  
aaa group server tacacs+ tacgroup1  
server 192.168.12.219  
server 192.168.12.218  
!  
aaa authentication enable default group tacgroup1  
!  
!  
tacacs-server host 192.168.12.219  
tacacs-server host 192.168.12.218  
tacacs-server host 192.168.12.217  
tacacs-server key aaa  
!  
line con 0  
line vty 0 4  
!
```

Exec TACACS+ '

```
1. "l 0 aaa  
Ruijie# configure terminal  
Ruijie(config)# aaa new-model  
  
2. 1 tacacs+ server '  
Ruijie(config)# tacacs-server host 192.168.12.219  
Ruijie(config)# tacacs-server key aaa  
  
3. 1 tacacs+ '  
Ruijie(config)# aaa authorization exec test group tacacs+  
  
4. 1 0 :  
Ruijie(config)# line vty 0 4  
Ruijie(config-line)#authorization exec test  
  
1 0 tacacs+ 0 A  
Ruijie#show running-config  
!  
aaa new-model  
!  
!  
aaa authorization exec test group tacacs+  
!  
tacacs-server host 192.168.12.219  
tacacs-server key aaa
```


SSH 1

SSH 2

SSH Secure Shell 1 SSH 2 Telnet
6 Telnet a 1
SSH 2
1 2
a 1 IP 2 1 2

SSH

	SSH1	SSH2
1	RSA	RSA 2 DSA
	RSA 2 1 2	KEX_DH_GEX_SHA1 KEX_DH_GRP1_SHA1 KEX_DH_GRP14_SHA1
1	DES 2 3DES 2 Blowfish	DES 2 3DES 2 AES-128 2 AES-192 2 AES-256
	1 2	1 2
	a	MD5 2 SHA1 2 SHA1-96 2 MD5-96
1	NONE 1 2	NONE 1 2

SSH

注意:

1 SSH 2 SSHv1 6 SSHv2 2 a SSH
2

SSH

SSH

SSH 1	
SSH	^ 1 2~
SSH	120s
SSH	3

1. SSH ~ Â
~ ' ^ Telnet ↓ 几 ~
2. ↓ (Username) 6 (Password) Â
a ↓ ~ ↓ ↓ 几 ~ Â

SSH Server

SSH Server SSH Server
SSH Server enable service ssh-server 3 ~ ↓ SSH ~ SSH
Server 5 ENABLE Â

3	
configure terminal	
enable service ssh-server	SSH Server
crypto key generate {rsa dsa}	

注意:

~ a 3 [no] crypto key generate' 3 crypto key
zeroize 3 Â

SSH Server

SSH Server SSH Server SSH no enable service ssh-server
SSH Server SSH Server SSH DISABLE

configure terminal	
no enable service ssh-server	SSH Server

SSH server

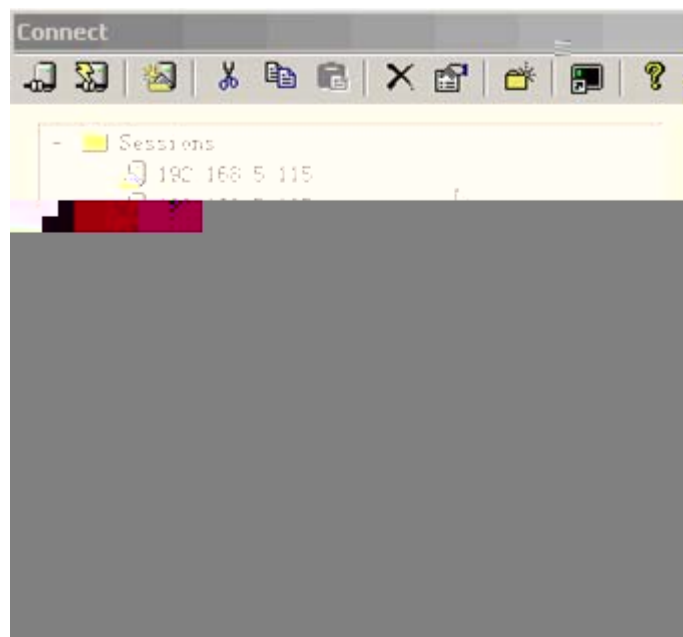
SSH Server 1 2 SSH SSH

configure terminal	
ip ssh version {1 2}	SSH
no ip ssh version	SSH SSHv1 6 SSHv2

3	
configure terminal	
ip ssh authentication-retries <i>retry times</i>	SSH 0-5~
no ip ssh authentication-retries	SSH 3 ~

' 3 3 4 [SSH 3 4 "A] A

SSH



2

Connect • ỹ ~ Ю ' .



3

ỹ 192.168.5.245 ~ ĩ Ē √ ~

Accept & Save √ 3 ~ Accept Once(√ √ Y)

Ю ~ Ю ' .

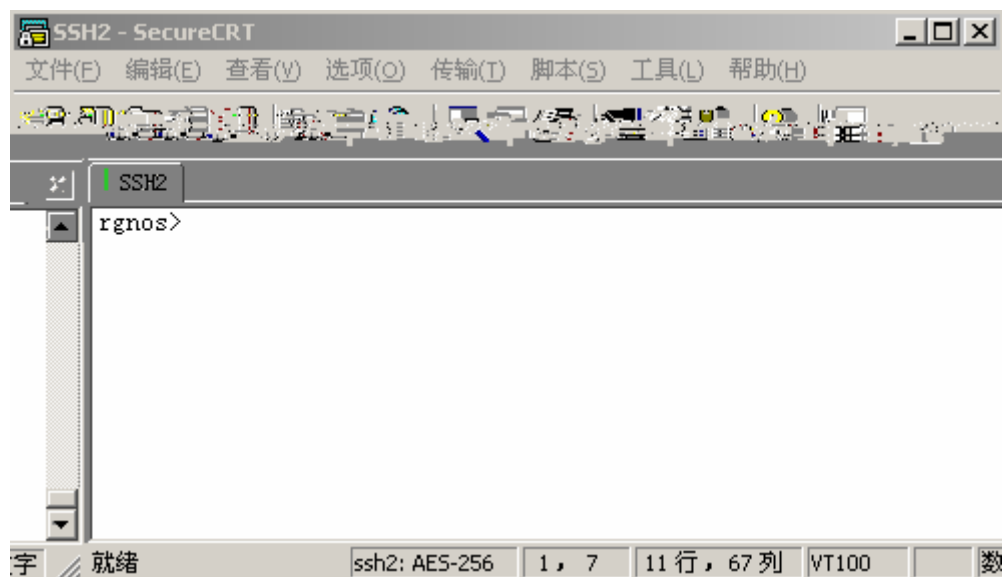


Telnet

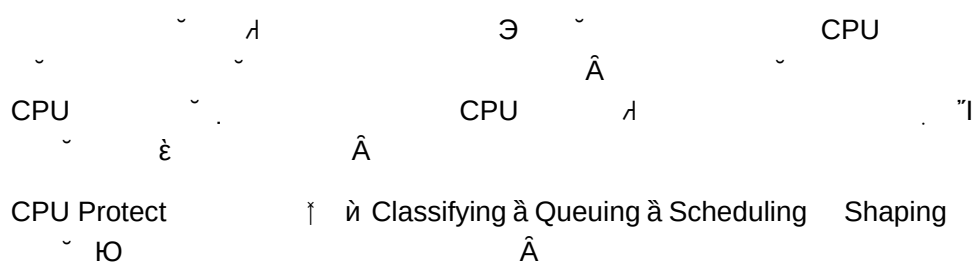
↓ 几

Telnet Y

Â IO



CPU



Classifying

Classifying CPU L2 to L3

BPDU	MAC 01-80-C2-00-00-00
ARP	ARP request
IGMP	IPV4 IGMP V1/V2/V3
802.1X	MAC 01-80-C2-00-00-03
GVRP	MAC 01-80-C2-00-00-21
DHCP	DHCP
Error_TTL	IPV4 TTL = 0 1
Unicast	MAC ARP reply, snmp telnet http
Multicast	IGMP
Broadcast	DHCP
Other	CPU

Queuing

Queuing CPU 8

IGMP	3
dot1x	3
GVRP	3
DHCP	2
Error_TTL	0
Unicast	4
Multicast	1
Broadcast	0
error_ttl	0
co-operate	6
other	0

2)

	(kbps)
7	100000
6	1000
5	1000
4	1000
3	1000
2	1000
1	1000
0	1000
CPU	100000

Ю

Ю

Ruijie(config)# cpu-protect type { bpdu arp igmp dot1x gvrp dhcp unicast multicast broadcast error_ttl other } traffic-class traffic-class-num	<i>traffic-class-num</i> 0 7

no cpu-protect type { bpdu | arp | igmp | dot1x | gvrp | dhcp | unicast | multicast | broadcast | error_ttl | other } traffic-class

配置

```
Ruijie(config)# cpu-protect type bpdu traffic-class 7
Ruijie(config)# end
Ruijie # show cpu-protect type bpdu
%*****packet type      traffic-class*****
                bpdu          7
```

查看 bpdu 7

配置

配置	说明
Ruijie(config)# cpu-protect traffic-class id <i>id_num bandwidth bandwidth_value</i>	^ kbps id_num 1 0 7 bandwidth-value 1 1 0 1000000(kbps)
Ruijie(config)# cpu-protect traffic-class all bandwidth bandwidth_value	^ kbps bandwidth-value 1 1 0 1000000(kbps)

配置 no cpu-protect traffic-class

配置 7 312(kbps)

```
Ruijie#configure terminal
Ruijie(config)# cpu-protect traffic-class id 7 bandwidth 312
Ruijie(config)#end
Ruijie# show cpu-protect traffic-class id 7
%*****traffic class      bandwidth(kbps)*****
                7          312
```

CPU 配置

配置 CPU 配置

配置	说明
Ruijie(config)# cpu-protect cpu bandwidth bandwidth_value	CPU 1 ^ kbps bandwidth-value 1 0 1000000(kbps) 1

配置 no cpu-protect cpu 配置 cpu 1

Включить CPU защиту с порогом 2000 kbps

```
Ruijie#configure terminal
```

```
Ruijie(config)#cpu-protect cpu bandwidth 2000
```

```
Ruijie(config)#end
```

```
Ruijie#show cpu-protect cpu
```

```
%cpu port bandwidth: 2000(kpbs)
```

✓

Включить защиту от DoS

Команда	Значение
Ruijie(config)# cpu-protect mac-address storm-control enable <i>value</i>	value с порогом 2000 51200(kbps) и 2000

0

0

CPU 1

Ю Ю 3 CPU 1 '

3	
Ruijie# show cpu-protect cpu	CPU 1 Â

ЮЮ CPU 1 '

```
Ruijie# show cpu-protect cpu
%cpu port bandwidth: 100000(kbps)
```

~

Ю Ю 3 ~ '

3	
Ruijie# show cpu-protect mac-address storm-control	~ Â

ЮЮ CPU 1 '

```
Ruijie# show cpu-protect mac-address storm-control
%MAC address storm control state: enable
%MAC address storm control rate: 2000(address/second)
```

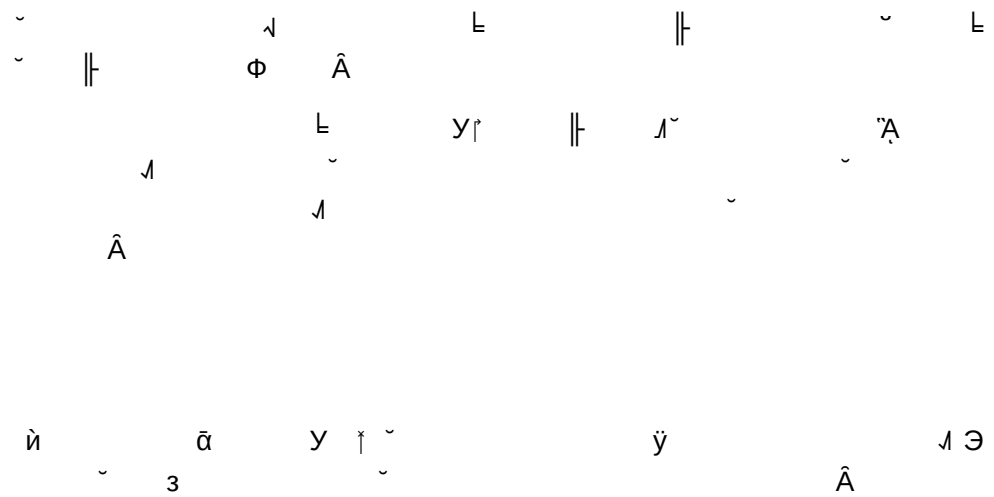
✓ RG Secur

- 2) ^ RG Security Agent~
- 3) ^ RG Restore System~
- 4) ^ RG Security Switch~

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GSN

Ю GSN

3	
configure terminal	
[no] security gsn enable	GSN

Ю GSN 71

```
Ruijie# configure terminal
Ruijie(config)# security gsn enable
```

↓ SMP server

Â SMP Server IP 71 ↓ SMP Server

3	
Configure terminal	

interface interface	↙
[no] security address-bind enable	↙ 0

说明:

↙ GSN ↙ 3 ↙ 802.1x ↙ IP ↙ 1

↙ 1

GSN

smp server

↙ 1 ↙ 0 smp sverver

3	
show smp-server	smp server

```
Ruijie# show smp-server
SMP-Server IP:192.168.217.220
```

security event interval

↙ 1 ↙ 0 policy-map

3	
show security event interval	Y

```
Ruijie# show security event interval
Event sending interval(Seconds):5
```


|| ARP

DAI

DAI Dynamic ARP Inspection, 1 2 || ARP 2
ARP 1 2 a 1 arp 2

ARP

MACC), B ARP (IPA, MACC). A B
 ↓ C ↓ A à B y Â C I
 ↓ Â ↓ 1 y . ↓ Â

DAI ARP

DAI ↓ ARP ↓ Â ÿ Лю
 DAI II VLAN ↓ Э в ARP
 y DHCP в ARP
 ↓ Â
 Â

ARP ï ↓ DHCP snooping binding ~ é
 è DHCP snooping ï Â

↓

Э y ↓ ARP ~ ÿ ↓
 DAI ~ ÿ ARP ' ÿ
 ARP ~ ш DAI Â
 y ñ
 ↓ γ ↓ ÿ γ ↓ ÿ
 ↓ Â yU!m{AëE<5x,AÖÂBt ARP

1

3 Y 1 3 Y 1 Y SVI 1 A
 Ю Y 1 a 1 A
 1 1 ARP Y 1 1 DHCP
 snooping ARP 1
 1 1 1 Ю 1

3	
Ruijie(config-if)# ip arp inspection trust	1 1
Ruijie(config-if)# no ip arp inspection trust	1 a 1

1 ARP

3 Y 1 3 Y 1 Y SVI 1 A
 Ю Y 1 ARP 1 15 ARP
 A 1 a 1 A
 1 1 ARP 1 1 a
 Y A
 1 1 **show ip arp inspection interface** 1 1 1 A
 1 ARP 1 1 Ю 1

3	
Ruijie(config-if)# ip arp inspection limit-rate { <1-2048> none}	1 ARP 1 1 Æ' / none' a
Ruijie(config-if)# no ip arp inspection limit-rate	

注意:

S2700 1 1 DAI CPU 1 CPP 1 DAI
 CPP 1 Ю CPP 1 1 A

DHCP snooping database

ê DHCP Snooping Ì Â

DHCP Snooping database ÷ ARP

DAI

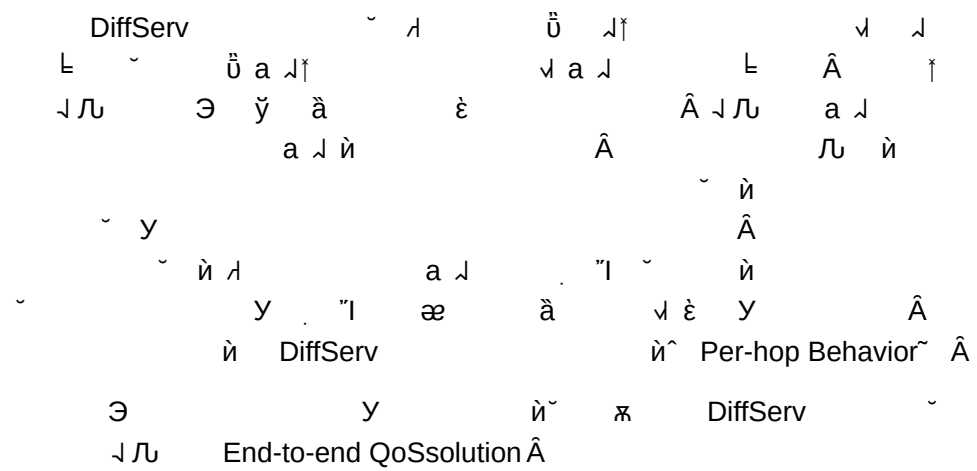
VLAN ĩ Ů DAI ¶

À VLAN Ů ~

ARP

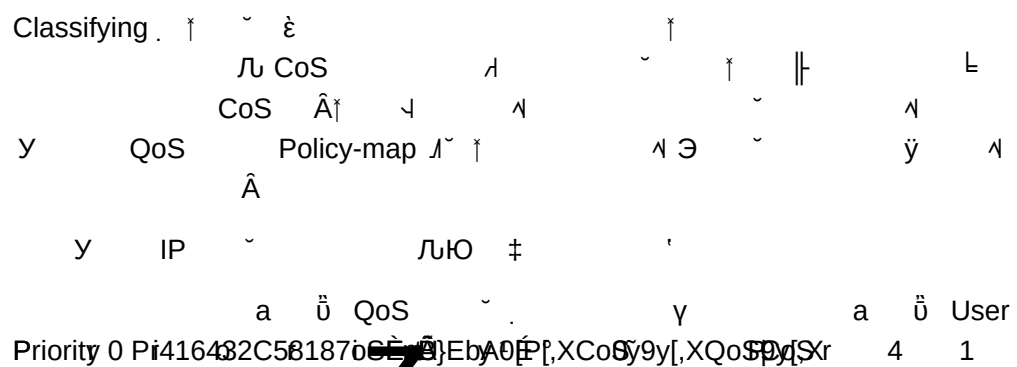
QOS

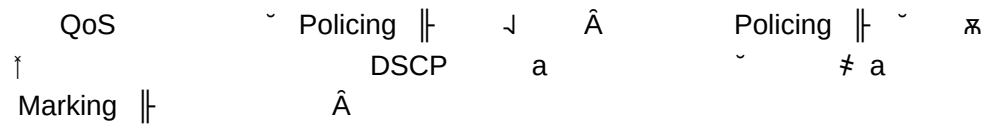
QOS



QOS

Classifying





Marking

Marking. ~ Classifying Policing

Cos

CoS	0	1	2	3	4	5	6	7
	1	2	3	4	5	6	7	8

CoS to DSCP

CoS	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

IP-Precedence to DSCP

IP-Precedence	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

DSCP to CoS

DSCP	0	8	16	24	32	40	48	56
CoS	0	1	2	3	4	5	6	7

4 Qos

Ю 4 Qos a

3	
configure terminal	
interface interface	4
mls qos trust {cos dscp}	4 Qos cos dscp
no mls qos trust	4 Qos

Ю 3 4 interface GigabitEthernet 0/4 5 DSCP

```
Ruijie(config)# interface gigabitEthernet 0/4
Ruijie(config-if)# mls qos trust dscp
Ruijie(config-if)# end
Ruijie# show mls qos interface g0/4
Interface: GigabitEthernet 0/4
Attached input policy-map:
Default COS: trust dscp
Default COS: 0
Ruijie#
```

配置 CoS

配置 CoS 的默认值

命令	说明
configure terminal	
interface interface	进入接口配置模式
mls qos cos default-cos	配置接口的默认 CoS 值，默认值为 0
no mls qos cos	取消配置 CoS

配置接口 g0/4 的默认 CoS 值为 6

```
Ruijie# configure terminal
Ruijie(config)# interface g 0/4
Ruijie(config-if)# mls qos cos 6
Ruijie(config-if)# end
Ruijie# show mls qos interface g 0/4
Interface: GigabitEthernet 0/4
Attached input policy-map:
Default COS: trust dscp
Default COS: 6
Ruijie#
```

配置 WRR、SP、DRR 的默认值

配置 WRR 的默认值

命令	说明
configure terminal	
mls qos scheduler {sp wrr DRR}	配置接口的调度器，默认值为 wrr
no mls qos scheduler	取消配置 wrr

~ 配置

~

SP

```
Ruijie# configure terminal
Ruijie(config)# mls qos scheduler sp
Ruijie(config)# end
Ruijie# show mls qos scheduler
Global Multi-Layer Switching scheduling
Strict Priority
Ruijie#
```

~ 配置

配置

~

配置	
configure terminal	
{wrr-queue drr-queue} bandwidth weight1...weightn	weight1...weightn 配置 ~ ~ QOS
no {wrr-queue drr-queue} bandwidth	no

45

56

67

78

Cos-Map

↓
QOS

Cos-Map

↖
Cos-Map

3	
configure terminal	

5 6
6 7
7 8

CoS-to-DSCP Map

CoS-to-DSCP Map CoS DSCP , ↓ ∪ ∪ ∪
CoS-to-DSCP Map ,CoS-to-DSCP Map
QOS

?	
configure terminal	
mls qos map cos-dscp dscp1...dscp8 no mls qos map cos-dscp	CoS-to-DSCP Map ,dscp1...dscp8 CoS 0 7 DSCP ,DSCP ↓ H a ↓ a ↓

Ю ' .

```
Ruijie# configure terminal
Ruijie(config)# mls qos map cos-dscp 56 48 46 40 34 32 26 24
Ruijie(config)# end
Ruijie# show mls qos maps cos-dscp
cos dscp
---
0 56
1 48
2 46
3 40
4 34
5 32
6 26
7 24
```

DSCP-to-CoS Map

DSCP-to-CoS DSCP CoS ~ ∪ ∪

DSCP-to-CoS Map QOS , ↓ ∪ ∪ ∪
DSCP-to-CoS Map :

?	
---	--

configure terminal	
mls qos map dscp-cos dscp-list to cos	DSCP to COS Map dscp-list DSCP DSCP DSCP DSCP a ↓ a ↓ cos DSCP CoS 0 7
no mls qos map dscp-cos	

~ 0 6 DSCP 0 32 56 6

```

Ruijie# configure terminal
Ruijie(config)# mls qos map dscp-cos 0 32 56 to 6
Ruijie(config)# show mls qos maps dscp-cos
dscp cos      dscp cos      dscp cos      dscp cos
-----
0 6          1 0          2 0          3 0
4 0          5 0          6 0          7 0
8 1          9 1         10 1         11 1
12 1         13 1         14 1         15 1
16 2         17 2         18 2         19 2
20 2         21 2         22 2         23 2
24 3         25 3         26 3         27 3
28 3         29 3         30 3         31 3
32 6         33 4         34 4         35 4
36 4         37 4         38 4         39 4
40 5         41 5         42 5         43 5
44 5         45 5         46 5         47 5
48 6         49 6         50 6         51 6
52 6         53 6         54 6         55 6
56 6         57 7         58 7         59 7
60 7         61 7         62 7         63 7

```

rate-limit output <i>bps burst-size</i>	输入速率限制 输出速率限制 bps (kbps) burst-size (Kbyte)
no rate-limit	不限制

说明:

S2700 支持在接口上配置速率限制。配置速率限制时，需要指定输入速率限制和输出速率限制。速率限制的单位为 bps 或 kbps。速率限制的单位为 Kbyte 时，需要指定 burst-size。速率限制的单位为 Kbyte 时，需要指定 burst-size。

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitEthernet 0/4
Ruijie(config-if)# rate-limit input 100 100
Ruijie(config-if)# end
Ruijie#
```

buffer

接口支持 buffer 管理。支持 802.3x flow-control 和 QoS 管理。

配置命令	说明
configure terminal	
buffer management { fc qos }	buffer 管理 FC 802.3xflow-control QoS QoS
no buffer management	

```
Ruijie# configure terminal
Ruijie(config)# buffer management qos
Ruijie(config)# end
Ruijie# show buffer management
%current port's buffer management mode: qos
```

QOS

class-map

↓ 儿 儿Ю class-map

}	
show class-map [<i>class-name</i>]	class map

```
Ruijie#  
Ruijie# show class-map  
Class Map cc  
Match access-group 1  
Ruijie#
```

policy-map

↓ 儿 儿Ю Policy-map

}

```
Ruijie# show mls qos interface gigabitEthernet 0/4
Interface: GigabitEthernet 0/4
Attached input policy-map: pp
Default COS: trust dscp
Default COS: 6
Ruijie#show mls qos interface policers
Interface: GigabitEthernet 0/4
Attached input policy-map: pp
Ruijie#
```

mls qos queueing

↓ 几 几Ю qos

3	
show mls qos queueing	QoS CoS-to-queue map wrr weight

Ю

```
Ruijie# show mls qos queueing
Cos-queue map:
cos qid
--- ---
0 1
1 2
2 1
3 4
4 1
5 1
6 1
7 1
wrr bandwidth weights:
qid weights
--- -----
0 1
1 2
2 3
3 4
4 5
5 6
6 7
7 8
```

mls qos scheduler

↓Л ЛЮ QOS

20	2	21	2	22	2	23	2
24	3	25	3	26	3	27	3
28	3	29	3	30	3	31	3
32	6	33	4	34	4	35	4
36	4	37	4	38	4	39	4
40	5	41	5	42	5	43	5
44	5	45	5	46	5	47	5
48	6	49	6	50	6	51	6
52	6	53	6	54	6	55	6
56	6	57	7	58	7	59	7
60	7	61	7	62	7	63	7

mls qos rate-limit

↓ 升 升 Ю 升

}	
show mls qos rate-limit [interface interface]	[升]

```
Ruijie# show mls qos rate-limit
Interface: GigabitEthernet 0/4
rate limit input bps = 100 burst = 100
```

buffer

↓ 升 升 Ю buffer

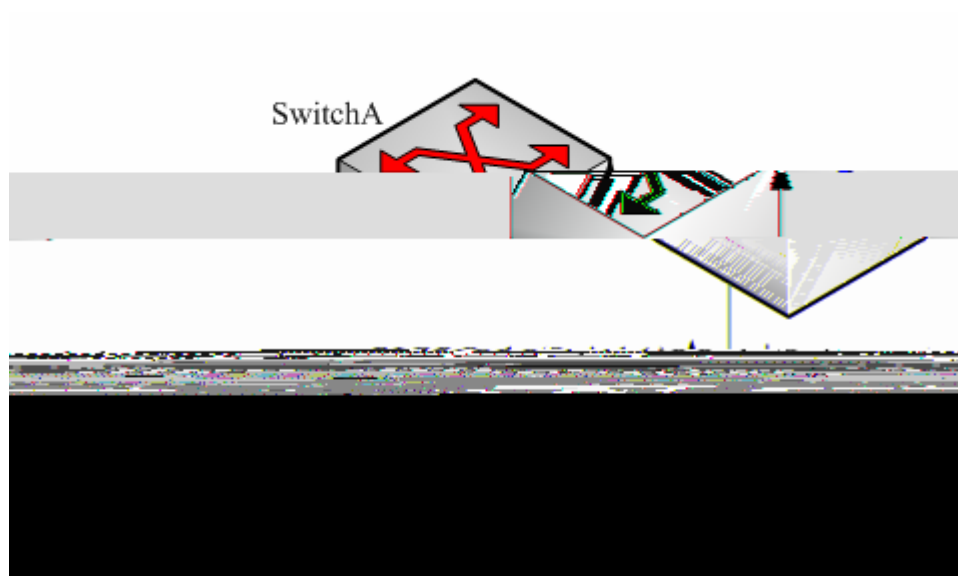
}	
show buffer management	buffer

```
Ruijie# show buffer management
%current port's buffer management mode: qos
```


说明:

RLDP 3 a y ũ RLDP Å 4 Å 4 Å RLDP

ḡ



2

RLDP 3 a y ũ RLDP Å 4 Å 4 Å RLDP

[illegible]

Ч Л
 Ч РLDP Л У
 Ж й Ч Л А ъ Э ю Ч Л Э ü / Л
 А

说明:

RLDP 是 一种 网络 协议， 用于 在 网络 中 进行 数据 传输。 它 是 一种 基于 网络 的 数据 传输 协议， 用于 在 网络 中 进行 数据 传输。 它 是 一种 基于 网络 的 数据 传输 协议， 用于 在 网络 中 进行 数据 传输。

RLDP

RLDP 是一种 网络 协议， 用于 在 网络 中 进行 数据 传输。 它 是 一种 基于 网络 的 数据 传输 协议， 用于 在 网络 中 进行 数据 传输。 它 是 一种 基于 网络 的 数据 传输 协议， 用于 在 网络 中 进行 数据 传输。

RLDP

RLDP	DISABLE
RLDP	DISABLE
	2S
	3

注意:

RLDP 4 (AP)

Ruijie(config-if)# rldp port { unidirection-detect bidirection-detect loop-detect } { warning shutdown-svi shutdown-port block }	RLDP
Ruijie(config-if)# end	

RLDP

GigabitEthernet 0/5

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitEthernet 0/5
Ruijie(config-if)# rldp port unidirection-detect shutdown-svi
Ruijie(config-if)# rldp port bidirection-detect warning
Ruijie(config-if)# rldp port loop-detect block
Ruijie(config-if)# end
Ruijie# show rldp interface gigabitEthernet 0/5 -28(state TdR&D.TdRLDT:-&-2
```

RLDP

RLDP 11 11 RLDP Probe 11
11 11 RLDP 11

RLDP

Ruijie# rldp reset	RLDP

说明:

errdisable recover shutdown-port
errdisable recover interval
errdisable recover interval
detect-interval* detect-max
interval

RLDP

RLDP
RLDP
RLDP

RLDP

RLDP

Ruijie# show rldp	RLDP rldp

show rldp
Ruijie# show rldp
rldp state : enable
rldp hello interval : 2
rldp max hello : 3
rldp local bridge : 00d0.f8a6.0134

```
-----  
interface GigabitEthernet 0/1  
port state:normal  
neighbor bridge : 00d0.f800.41b0
```

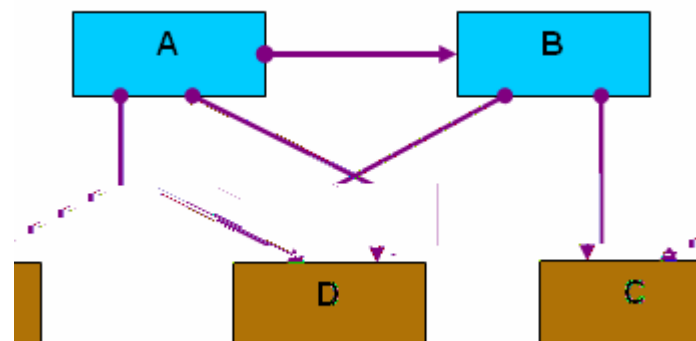

TPP

TPP

TPP(Topology Protection Protocol) 是用于保护网络拓扑的协议。它通过监测网络拓扑的变化，当检测到拓扑变化时，CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。CPU 会监测网络拓扑的变化，当检测到拓扑变化时，CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。

TPP

TPP 协议与 MSTP 和 VRRP 协议密切相关。MSTP 协议用于防止网络环路，VRRP 协议用于提供冗余的网关。CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。



1

当网络拓扑发生变化时，CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。CPU 会启动 TPP 协议，防止网络拓扑的变化导致网络中断。

D B CPU A a C D y

TPP

TPP CPU A a C D y

说明:

TPP CPU A a C D y

no

--	--

Ruijie> enable

7

3 Ю'

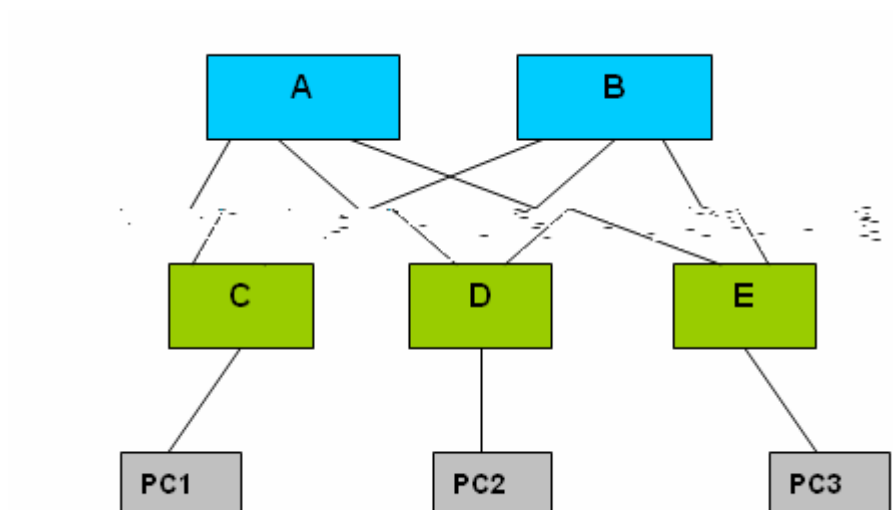
4

—

3

V

६



2

$$\begin{array}{ccccccc}
 A \ddot{a} B \, \grave{y} \, b & & \sim & C \grave{a} D & E \, \grave{y} \, \gamma & & \hat{A} \\
 b & & A \ddot{a} B & \gamma & C \grave{a} D & E & \grave{u} \, \text{MSTP}^* \, \downarrow \, \text{ч} \, \downarrow \, b \\
 \grave{u} \, \text{VRRP} & & \hat{A} & & \pi & \text{MSTP} & \text{VRRP} & & \pi & \sim \\
 \downarrow & a & & \hat{A} & & & & & & \\
 b & & A \ddot{a} B & & & & \pi & \sim & \downarrow & \downarrow \\
 \pi & \hat{A} & \downarrow \, \downarrow \, \gamma & & C \grave{a} D & E & & & \pi & \hat{A}
 \end{array}$$

TPP

↓	TPP	Ю'
TPP	↓	

TTP 1

Ю Ю 3 TTP 1

3	
Ruijie# show tpp	TPP 1 A

```
Ruijie #show ttp
ttp state          : enable
ttp local bridge   : 00d0.f822.35ad
-----
```



у ч || Э
 Flash и ||
 Л 1 у Â
 Flash Э Л
 Â
 || Л 1 Л
 а и 'l
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у

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||



3 а 1 1 4096 Â
 1 Л 1 а Â

注意:

flash Э а 128M
 ÿ || 1 Ю
 Â
 1 || у
 dir

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3

R561e# 6id#directroy

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directory

Ruijie# dir <i>directory</i>	Â
-------------------------------------	---

лю

Ruijie# **dir**
Ruijie# **dir** ../bak

у

лю ю з л у

з	
Ruijie# makefs dev <i>devname</i> fs <i>fs_name</i>	й л й <i>fs_name</i> у л й dev Â

лю у dev ю у

命令 说明

命令	说明
Ruijie# pwd	

▼

命令 说明

命令	说明
Ruijie# del filename	

命令 说明

Ruijie# **del mnt/large.c**

命令 说明

命令	说明
Red-Giant# rmdir directoryname	

命令 说明

配置	命令
Ruijie(config)# logging on	
Ruijie(config)# no logging on	

注意:

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↓ . Â

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Â
a ↓ ~ Ю ЛЮ
з'

配置	命令
Ruijie(config)# logging buffered [buffer-size level]	щ ш
Ruijie# terminal monitor	VTY (Telnet) Э Â
Ruijie(config)# logging host	Sever ↓ Э Syslog
Ruijie(config)# logging file flash:filename [max-file-size] [level]	FLASH Э

Logging Bufferе щ ш Â щ ш ~
щ ш Л Л~ Â щ ш
з show logging Â щ ш
з clear logging Â

Terminal Monitor VTY(Telnet (Telnet) Э Â
Logging Host Syslog Server ~ Л Л
5 Syslog Server Â ↓ ↑ Syslog Server Â

注意:

↓ Syslog Server

↓ Syslog Server

Logging File Flash' FLASH ~ ^ J a ^
J J Â ^ J ñ ñ TXT ^ J J Â
More Flash' Filename 3 J L Flash ^

注意:

FLASH $\hat{A}$ FLASH FLASH FLASH FLASH $\hat{A}$

U

Э Ғ Ү Ю ЛЮ 3'

3	
Ruijie(config)# service timestamps <i>message-type</i> [uptime datetime]	U
Ruijie(config)# no service timestamps <i>message-type</i>	

Log		Debug		Log		Debug	
0	6	0	6	0	6	0	6

0

1

Ю а 1 Â 1 3
Ю 1Ю 3'

3	
Ruijie(config)# no service sysname	1 1 Â
Ruijie(config)# service sysname	1 1 Â

0

11

Ю 11 Â 11
Ю 1Ю 3'

3	
Ruijie(config)# no logging count	Â 11
Ruijie(config)# logging count	11 Â

0

11

Ю а 11 Â 11 11
Ю 1Ю 3'

3	
Ruijie(config)# no service sequence-numbers	1 11 Â
Ruijie(config)# service sequence-numbers	1 11 Â

а 1 3 11 11 а 1 3
ш Â
Ю 1Ю 3'

3	
---	--

Ruijie(config)# logging console <i>level</i>	↓ ⊗
Ruijie(config)# logging monitor <i>level</i>	⊗ VTY ⊗ (telnet ⊗)
Ruijie(config)# logging buffered <i>[buffer-size level]</i>	↯ ⊗
Ruijie(config)# logging file flash:filename	A'⊗]SJ⊗

Система Syslog Server. Имя хоста: 192.168.1.1

Команда	Описание
Ruijie(config)# logging facility <i>facility-type</i>	
Ruijie(config)# no logging facility <i>facility-type</i>	Отменяет настройку

Список кодов и имен facilities:

Numerical Code	Facility
0	kernel messages
1	user-level messages
2	mail system
3	system daemons
4	security/authorization messages
5	messages generated internally by syslogd
6	line printer subsystem
7	network news subsystem
8	UUCP subsystem
9	clock daemon
10	security/authorization messages
11	FTP daemon
12	NTP subsystem
13	log audit
	log alert
15	clock daemon
	local use 0 (local0)
1	local use 1 (local1)
1	local use 2 (local2)
1	local use 3 (local3)
2	local use 4 (local4)
2	local use 5 (local5)
2	local use 6 (local6)
2	local use 7 (local7)

Имя хоста: 192.168.1.1

Ю` ч Syslog Server й ч л ~ ч
 Л { Å
 ↓Л Log IP ~ ≠ ↓Л Log л Å
 ~ Ю ЛЮ {'

{	
Ruijie(config)# logging source interface <i>interface-type interface-number</i>	л
Ruijie(config)# logging source ip <i>A.B.C.D</i>	ip

↓ LOG

Ю` б ~ Л ч {~ а LOG Å
 / LOG ~ { LOG Å
 Ю ЛЮ {'

{	
Ruijie(config)# logging userinfo	/ LOG '
Ruijie(config)# logging userinfo command-log	{ ~ ч LOG

й ~ Ю ЛЮ {'

{	
Ruijie# show logging	щ џ ~ Л ч
Ruijie# show logging count	л
Ruijie# clear logging	щ џ
Ruijie# more flash:filename	FLASH ~

注意:

show logging count 3 1 Y
A

配置 Y 0 1 Y 0

```
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.200.42 255.255.255.0
Ruijie(config-if)# exit
Ruijie(config)# service sequence-numbers // 0 1
Ruijie(config)# service timestamps debug datetime // 0 debug
Ruijie(config)# service timestamps log datetime // 0 log

Ruijie(config)# logging 192.168.200.2 // syslog server
Ruijie(config)# logging trap debugging //
                                     4 syslog server

Ruijie(config)# end
```

WEB

WEB

WEB

WEB IE ~ Â

√

WEB WEB L WEB 4 | Â WEB L 3 ~ WEB ~ WEB IE Â

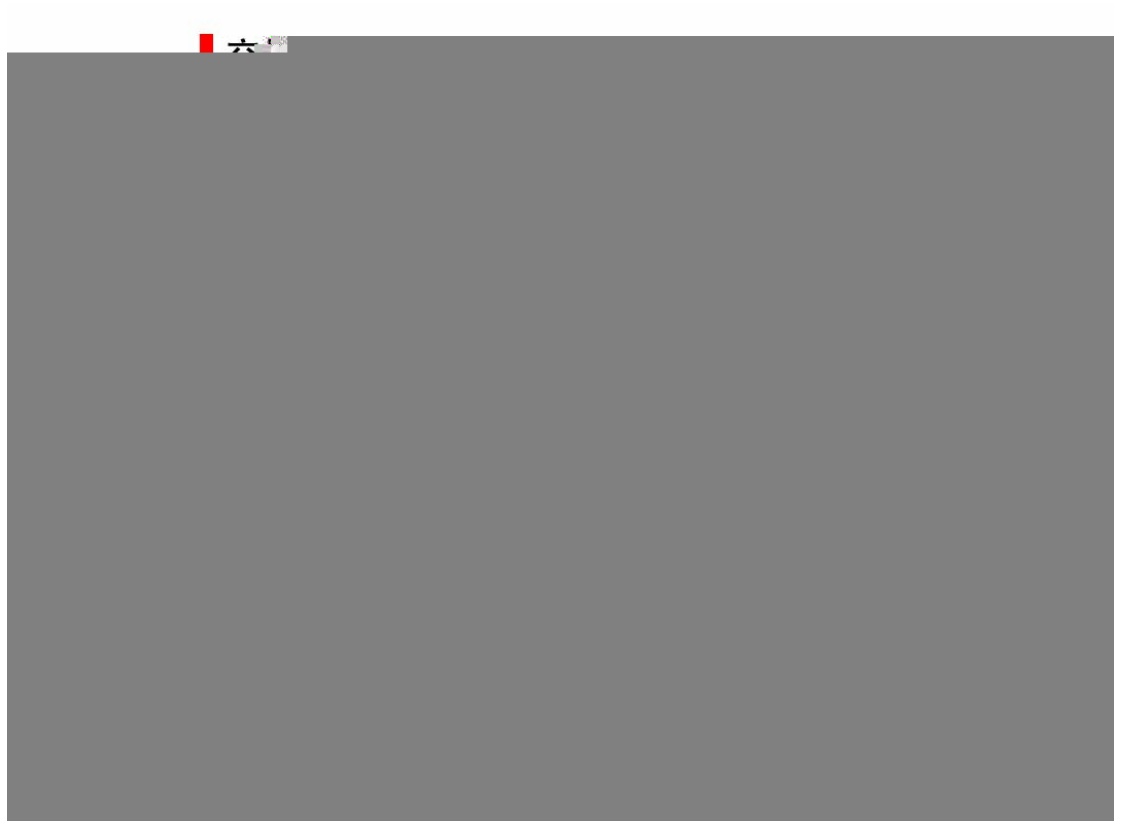
Ю WEB Â	
т	
WEB L	

说明:

WEB L Ю I WEB ñ L
Â WEB Enable ~ ‡ a J
Enable Â
S2724G WEB L ñ ~ IP ñ 192.168.1.200 J /
ñ' admin/admin Â

WEB

IP 地址为 http://192.168.1.200, 用户名



1

用户名 密码

连接到 192.168.195.200

Level 15 Access

用户名 (U):

密码 (P):

☐ 记住我的密码 (R)

确定 取消

交换 WEB 管理平台



3 WEB

说明:

WEB Enable 管理 a 平台

IP

IP 地址 管理

VLAN	

1~ VLAN

VLAN管理指定VLAN

说明：VLAN是虚拟局域网（Virtual Local Area Network）的简称，它是在一个物理网络上划分出来的逻辑网络，实现同VLAN下的用户可以进行二层通讯，不同VLAN下的用户无法进行二层通讯。

	VLAN ID	VLAN 名称	状态
☐	1	VLAN0001	STATIC
☐	2	VLAN0002	STATIC

新建

全选

删除

修改

6 VLAN

1. **Ввод данных:** Пользователь вводит IP-адрес и маску.

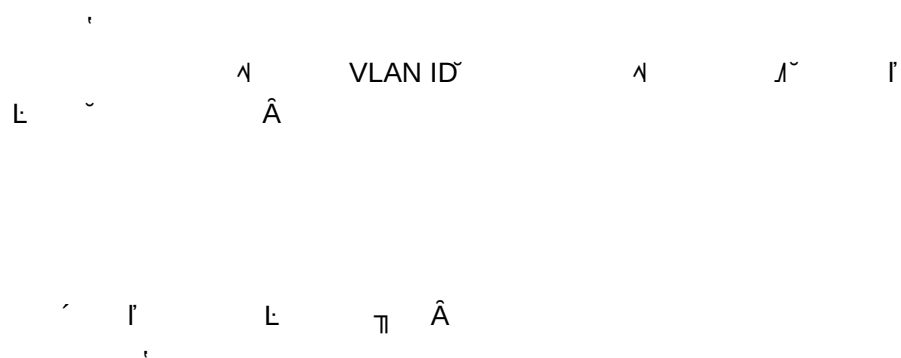
交换机端口分为两种模式：

Access：该模式的端口只属于一个VLAN，只传输该VLAN的报文，一般用于与终端直连。

Trunk：该模式的端口可以属于多个VLAN，可传输多个VLAN的报文，一般用于与其它交换机互连。

注意：当端口模式为“Trunk”时将允许所有VLAN访问，指定的VLAN将成为Trunk口

9 VLAN



网关设置

说明：网关相当于一个网络连接到另一个网络的“关口”，交换机无法转发的数据包就交给网关处理以便能完成数据包的转发过程。如果网关配置错误，可能导致PC与设备的连接中断，WEB功能将无法正常使用。

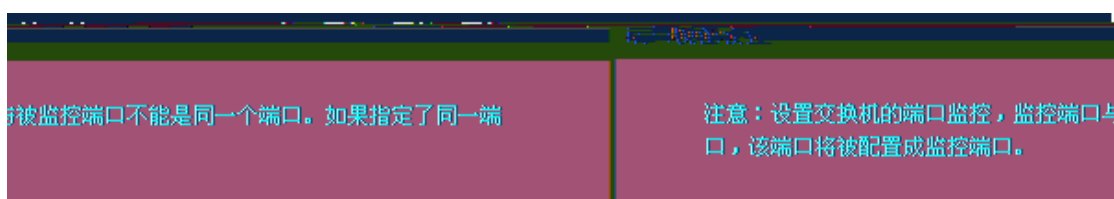
网关IP地址：

10

~ + ~
~ IP ~ ~ IP ~
~ ~ ~
~ ~ ~

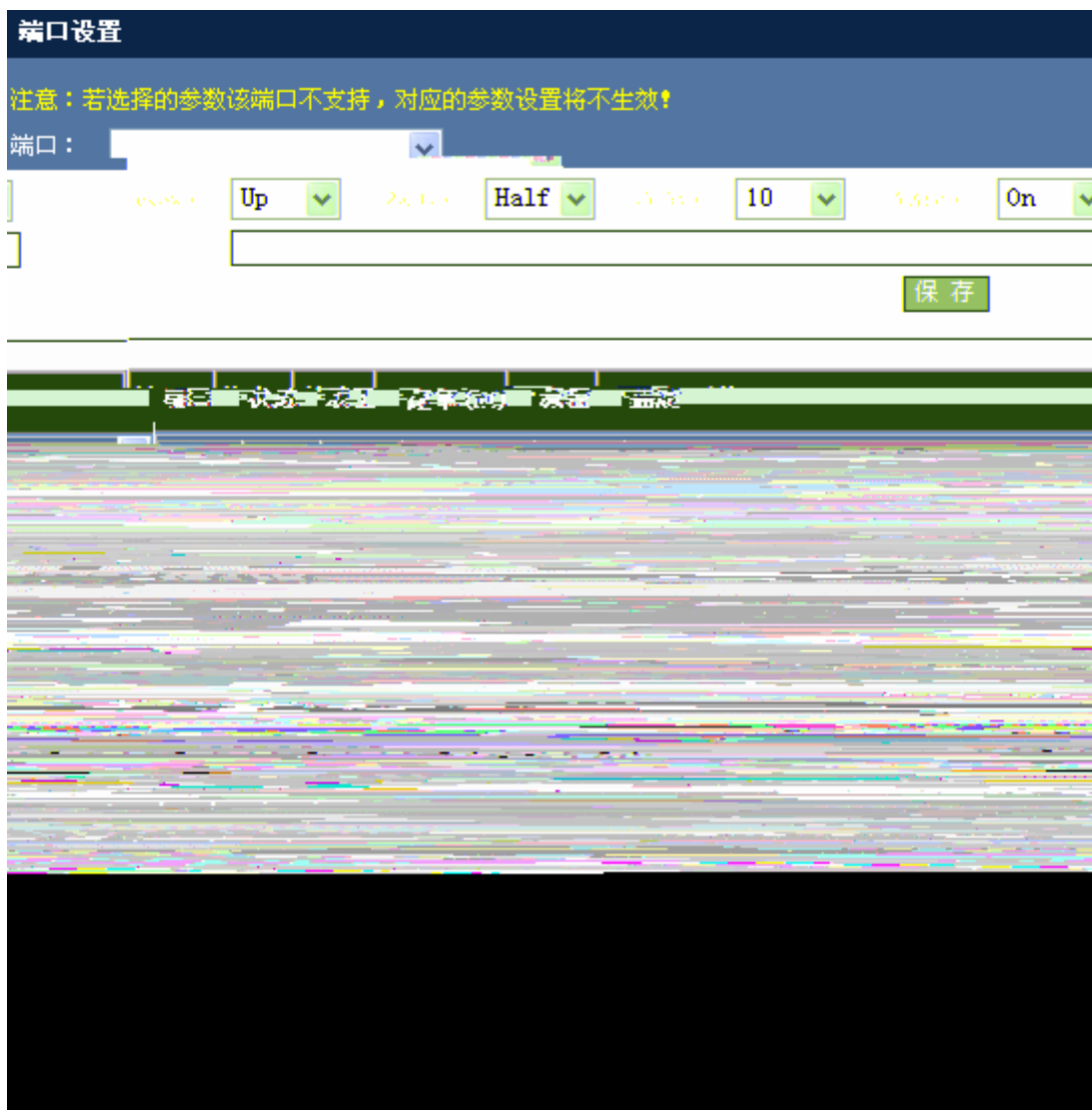
~

~ ~ ~ ~ ~
~ ~ ~ ~ ~



4

1. *Journal of the American Medical Association*, 2000; 283: 2689-2695.



15

^ ^ ^ ^ ^ ^ ^ ^
 ^ ^ ^ ^ ^ ^ ^ ^

DHCP

DHCP DHCP DHCP DHCP
 DHCP DHCP DHCP DHCP

DHCP 中继设置

说明：DHCP中继可以实现不同子网之间的IP分配，相当于一个中转站，它将收到的客户端请求报文转发给指定的DHCP服务器，并将收到的服务器响应报文转发给DHCP客户端。

- ☐ 开启DHCP中继
- ☒ 关闭DHCP中继

保存

DHCP服务器设置

DHCP服务器： 0.0.0.0

保存

DHCP服务器

16 DHCP

- 1) $\hat{u} / \text{DHCP}$
 $\hat{A} / \text{DHCP} \quad \pi \quad \sim \quad \cdot \quad \wedge \quad \Gamma \quad \perp$
- 2) $\text{DHCP} \quad \perp$
 $\text{DHCP} \quad \perp \quad \wedge \quad \Gamma \quad \perp \quad \hat{A} \quad \pi \quad \wedge$
 $\text{IO} \quad \hat{A} \quad \text{DHCP} \quad \perp \quad \sim \quad \wedge \quad \Gamma$
 $\perp \quad \hat{A}$

DHCP Snooping

DHCP Snooping
 DHCP Snooping

DHCP Snooping 设置

说明：DHCP Snooping就是DHCP窥探，通过对Client和服务器之间的DHCP交互报文进行窥探，实现对用户的监控，同时DHCP Snooping起到一个DHCP 报文过滤的功能，通过合理的配置实现对非法服务器的过滤。

17 DHCP Snooping

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IGMP Snooping

IGMP Snooping 是二层设备上的一个功能，它通过监听组播流量，记录组播成员所在的端口，从而防止组播流量在二层网络中泛滥。

IGMP Snooping 设置

说明：在二层 (Layer2) 设备下，组播帧是作为广播转发的，这样容易造成组播流风暴，浪费网络带宽。IGMP Snooping 的作用便是记录哪个端口需要组播帧，就只往相应端口转发组播帧，从而达到节省网络带宽的作用。

18 IGMP Snooping

IGMP Snooping 是二层设备上的一个功能，它通过监听组播流量，记录组播成员所在的端口，从而防止组播流量在二层网络中泛滥。

STP

STP (Spanning Tree Protocol) 是网络中用于防止环路的一种协议。它通过阻塞多余的链路，确保网络中只存在一条从根桥到每个端口的路径。

STP 设置

说明：STP 通过有选择性地阻塞网络中的多余链路，保证网络中无环路产生；若网络出现故障导致链路失效，又能提供相应的链路备份，保证网络稳定运行。

☐ 打开 STP 功能

☒ 关闭 STP 功能

保存

ARP

配置 ARP 表项

防网关ARP欺骗

说明：在二层交换机上，默认情况下ARP报文是在本VLAN内广播的，这就给针对网关的ARP欺骗提供了机会。因此我们可以在二层交换机上配置防网关ARP欺骗来防止针对网关的ARP欺骗。配置后，可以在端口上检查arp报文的源地址，且可以配置防网关ARP欺骗，防网关ARP欺骗。

21 ARP

配置 ARP 表项

ARP

配置 ARP 表项

防ARP欺骗

说明：用户可设置端口、IP地址、MAC地址绑定作为安全地址，当开启端口安全功能，端口只允许源地址为这些安全地址的IP报文通过。

端口/MAC/IP 绑定：

端口：GigabitEthernet 0/15

IP：0.0.0.0

MAC：0000.0000.0000

保存

端口自动学习到的地址：

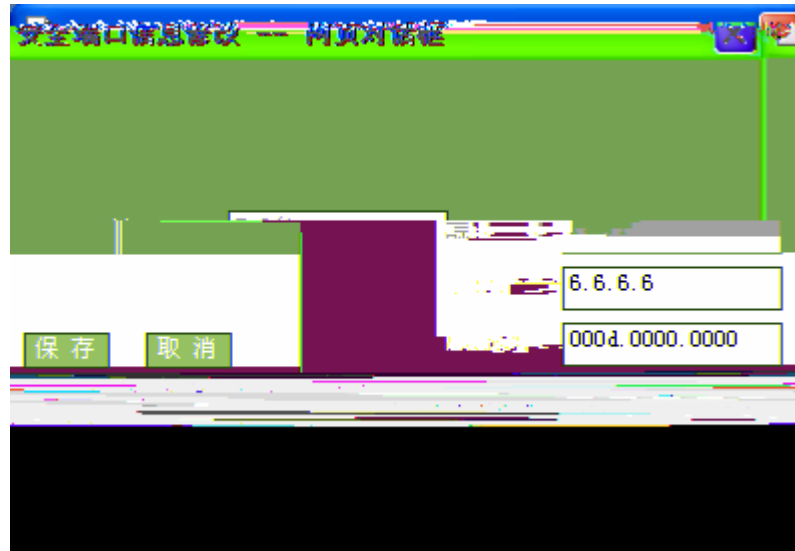
0000.5e00.0147
0000.5e00.01c3
000f.1f4c.d35a
0011.11eb.6f8a
0016.761b.4b47

22 ARP

1) 端口/MAC/IP

端口/MAC/IP 绑定：端口：GigabitEthernet 0/15
IP：0.0.0.0
MAC：0000.0000.0000

3) 安全端口消息接收——网页浏览



23

安全端口消息接收——网页浏览

APR

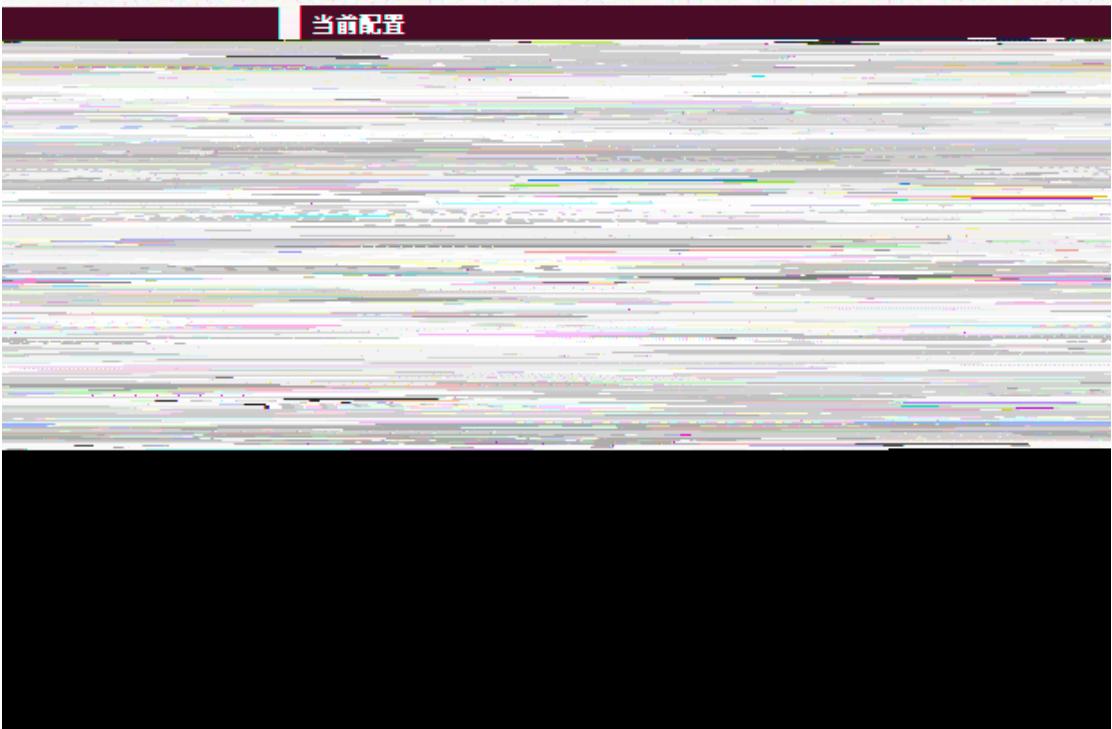
安全端口消息接收——网页浏览



24 ARP

安全端口消息接收——网页浏览

系统信息	
设备型号：	S2924G
主机名：	Ruijie
软件版本：	RGOS 10.2(4), Release(55222), Web Version:10.2.55222
硬件版本：	1.0
MAC地址：	00d0f8f80fc4



4

4 7 4 E 7 A

端口状态					
down	1	Unknown	Unknown	copper	FastEthernet 0/1

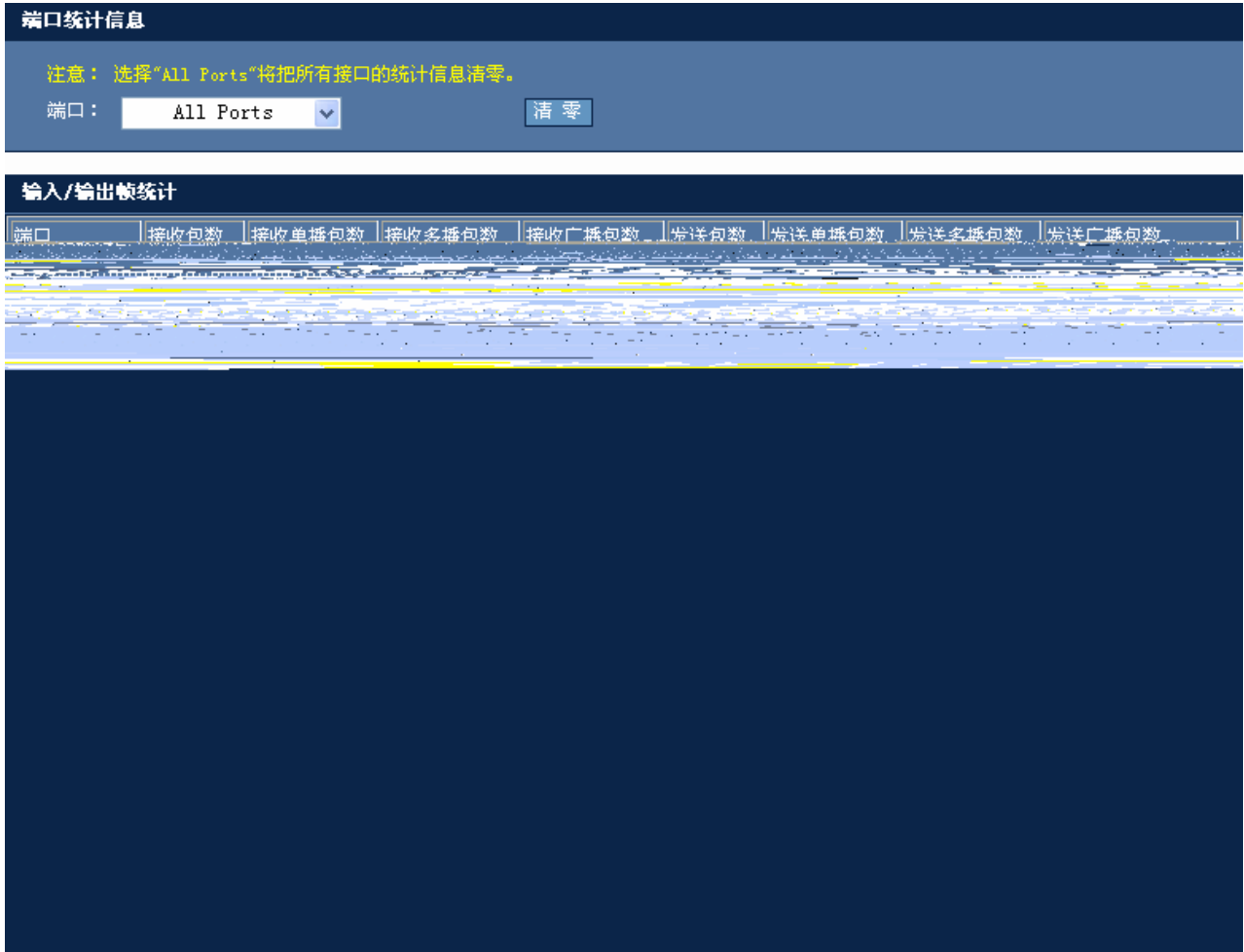
4

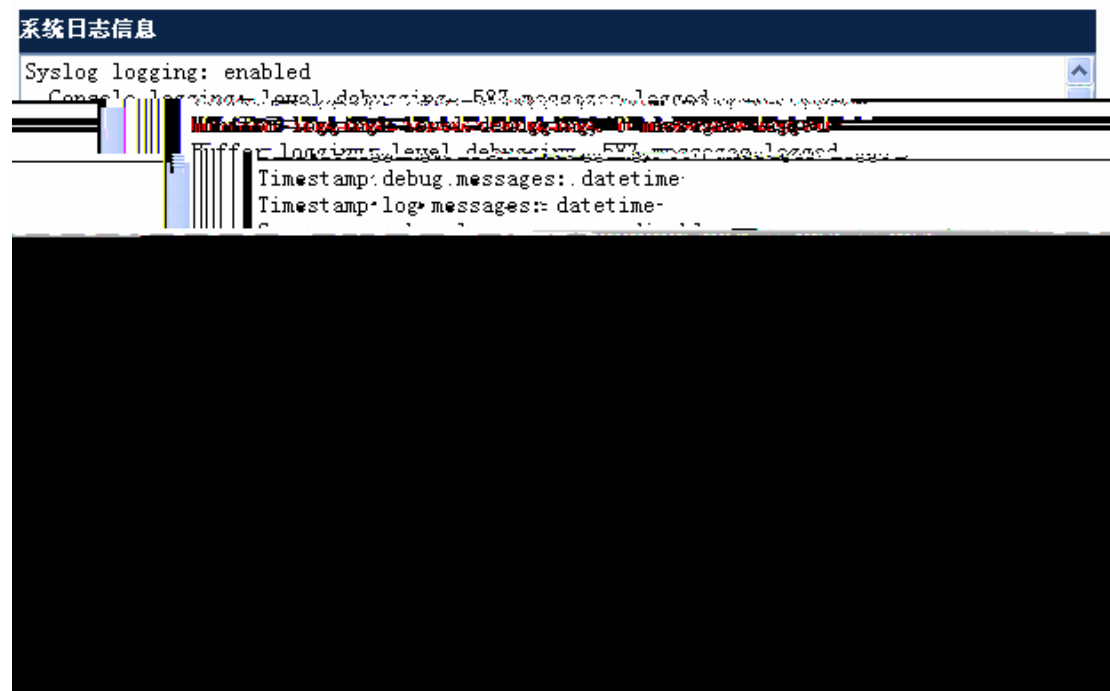
4 7 4 E 7 A

端口运行状态	
端 口	带宽占用
FastEthernet 0/1	0%
FastEthernet 0/2	0%
FastEthernet 0/3	0%
FastEthernet 0/4	0%
FastEthernet 0/5	0%
FastEthernet 0/6	0%
FastEthernet 0/7	0%
FastEthernet 0/8	0%
FastEthernet 0/9	0%
FastEthernet 0/10	0%

刷新

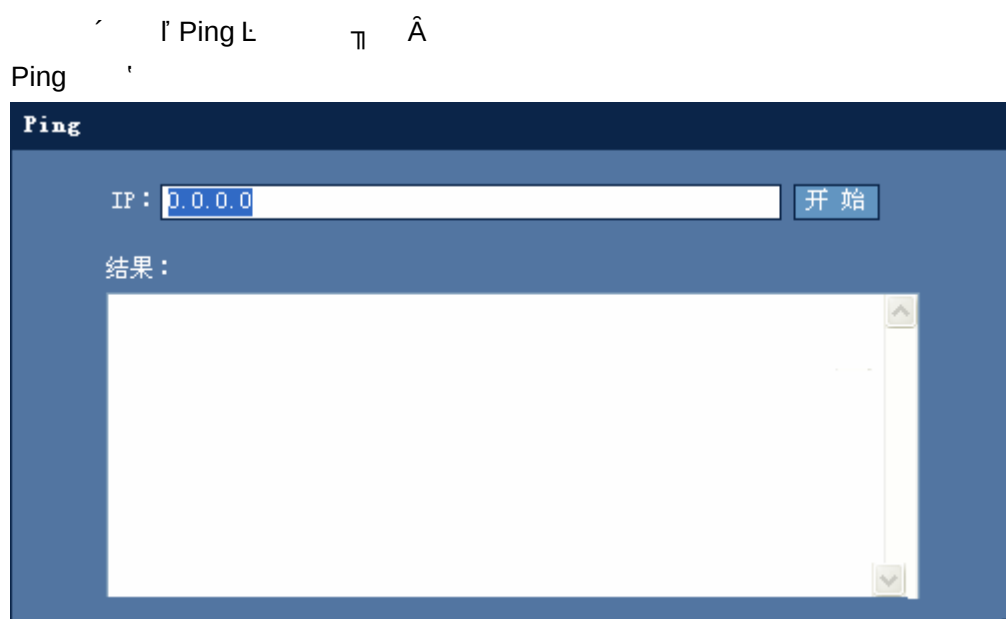
4





30

Ping



31 Ping

Ping 1 IP 1 1 L ~ IP a ~

用户管理		
☐	序号	用户名
☐	1	admin

33

' #!G!Vp?U;!G&#!A!G!B%FM6G!5BAE

/

导入/导出配置

注意：请确认TFTP服务器已启用！

TFTP服务器IP地址：

TFTP服务器文件名：

文件传输信息：

文件名	大小	上传时间	操作
-----	----	------	----

38 /

config.text TFTP IP TFTP

WEB

WEB端口设置

注意：修改WEB端口后，请用新端口重新登录。如果要使用80端口，请直接单击“使用默认端口”。

指定WEB端口： (1025-65535)

39 WEB

À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö ÷ ø ù ú û ü ý þ ÿ

<http://192.168.1.1:8080> <http://192.168.1.1>

WEB 设置

S2724G 3 Local 1

WEB Local Enable
1~ WEB 1
1~ Local
1~
a. config
Ruijie#configure

```
no service password-encryption
!
enable password admin          //WEB      Enable
enable service web-server      // 0 WEB  L
!
....
.....
!
interface VLAN 1
 ip address 192.168.100.1 255.255.255.0  //      IP
 no shutdown
!
!
line con 0
line vty 0 4
 login
!
!
end
```