Ä

RG-S3750 "

صر

RGOS 10.2(4)

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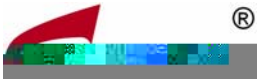

à à RGOS® àRGNOS® à

à

à 锐捷®

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' Courier New ˇ ˇ 5 ʌ ˇ
Â ÿ ˇ ╗ Â

2. Ђ ђ

Ђ ђ Arial ĭ é Ђ Ю'

' Ђ ђ ^ Ђ ђ a ɹ ǂ ˜ ╗ Â

' Ђ ђ ʅ ^ Ђ ђ ђ ǂ ˜

[ ] ' [ ] ˇ ћ Ъ ҳ ۷ Â

{ x | y | ... }' ÿ ч ۷ У Â

[x | y | ...]' ÿ ч ۷ У a Â

//' ۷ ù Â

3. ۷

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Ђ Ю'

~ à ˆ à Y Â

& à à à ˈl

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1) ¨Ą ˚ ۸ ص ۷ ۷ a ˇ ۷ ң ҏ ۸ ص

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Ъυ ϟ

Ъυ ϟ ˘ ϡ Л Ъυ ϟ Â

ў ↑ ЛЪЮ '

- Ъυ ϟ
- ╠
- Ъυ ϟ
- Ъυ ϟ **no Ո default**
- CLI
- ϶ ϡ Ъυ ϟ
-
- CLI Ո
- CLI

Ъυ ϟ

Ъu ҙ			Ю У	
User EXEC ˆ ˜	¨I Â	Ruijie>	**exit** Ъu ҙ Â ˘	ãà **enable** Ъu ҙ Â Ń

╟

ↄ Лυ ҕ Ъυ ҳ Ю /ſ ^ ?˜ " Ъυ ҳ Ъυ ҳ Â ≠
ↄ Лυ " ↄ Ъυ ҳ Ъυ ҳ ↰ Â Ю '

Ъυ ҳ	
Help	ҕ Ъυ ҳ Ю ╟ Â
abbreviated-command-entry?	ↄ Ъυ ҳ Â ' Ruijie# **di**? dir disable
abbreviated-command-entry<Tab>	Ъυ ҳ Â ' Ruijie# **show conf<Tab>** Ruijie# **show configuration**
?	" Ъυ ҳ Ю У Â ' Ruijie# **show ?**
command keyword ?	" Ю У ↓ Â ' Ruijie(config)# **snmp-server community ?** WORD SNMP community string

---

~

Ъυ ҳ˘ ſ word/string Ո Ю˘ . ″І ҭ
˘ Ո έ ╖ Â '

Ruijie(config)#aaa domain ?
WORD Specific domain configure
default Default domain configure
enable Domain enable configure

˘ aaa domain d Ъυ ҳ˘ . ″І ҭ defaultˇ Ъυ ҳ
aaa domain default Â

Ъυ ҳ

Ъυ ҳ˘ ↰ Ъυ ҳ У ſ ˘ ↰ ſ ⁞
ر У Ъυ ҳ . ↓ Â

show configuration Ђ ғ ↓ Л Ђ

```
Ruijie# show conf
```

Ђ ғ no Ո default

ΰ ψ Ђ ғ **no** Â ˘ **no** ╗ ˘
б Ђ ғ ↓ Â ↙ Ђ ғ **no shutdown** ↙ Ђ ғ **shutdown** ↓ ˘ . ↙ Â a **no**
Â

Ђ ғ **default** ˘ Ђ ғ **default** Ђ ғ й Â
Ђ ғ ╗ ˘ ҷ ҽ Ю **default** Ո **no**
↓ Â ↑ Ђ ғ ╗ ˘ ҽ Ю **default**
Ո **no** ↓ Â **default** Ђ ғ ╗ ˘ ↓
й Â

CLI

Ю " ҽ CLI ↓ ↑ Â

CLI '

	Ѳ ѭ	↙ ╠
% Ambiguous command: "show c"	˘ ⋮ ر У Ђ ғ Â	Ђ ғ ˘ ↓ ѭ ´ У ⁄ Â ↓ Â
% Incomplete command.	Ђ ғ ↓ ↰ Â	Ђ ғ ˘ Ӓ У ⁄ Â ↓ ↓ ↰ Â
% Invalid input detected at ‘^’ marker.	Ђ ғ ˘ ⁄ ^ ^ ~ Ң ´ Æ Â	ҽ ҽ ѕѕ ҽ Ђ ғ Ю У ⁄ ˘ Ђ ғ Â

٦ ↙ Ђ ғ

Ђ ғ Â ҽ з Ђ ғ ˉ

Ѣ Â

ÿ Ъ ѧ Ъ ъ Ъ ъ˘ Ю '

Ctrl-P Э ѧ	ѫ Ъ ѧ Ъ ъ ѭ У Ъ ъ Â ÿ У ˘ ѧ Л Ъ Â
Ctrl-N Ю ѧ	ѫ Ctrl-P Э ѧ ѧ˘ ѫ Ъ ѧ Ъ ъ ѭ Ѡ У Ъ ъ Â ѧ Л Ъ Â

ѫ Ъ ъ ѧ Ѣ ╗ Â ↑ '

ѯ

ѯ Ъ ъ ╟ ∧

Ю " '

╗		
ѫ ╟ ˝І Â	Ctrl-B ѧ	˝І Ѣ У Â
	Ctrl-F ѧ ѧ	˝І Ѣ ѧ У Â
	Ctrl-A	˝І Ѣ Ъ ъ Â
	Ctrl-E	˝І Ѣ Ъ ъ Â
ѓ Â	Backspace	ѓ ˝І У Â
	Delete	ѓ ˝І ѫ Â
╟ У У Â	Return	ѫ Ѡ ѧ Э ╟ У ˘ Ю У ˘ ѫ Â
	Space	ѫ ѧ Э ╟ У ˘ Ю У ˘ ѫ Â

Ъυ ҳ ╟ ∧

ↃЛυ ╖ ╟ ∧ ˘ ´ Ъυ ҳ˘ Ъυ ҳ
Лυ Â ″I ↓ ˘ Ъυ ҳ ↓ ╟ 20
˘ Ÿ ↓Лυ ″I ‹ѧ› ⁄ф ‹ѧ› Ъυ ҳ Â

Ъυ ҳ ″I ╟ Ю '

╖	
″I ↓ ‹ѧ› У	↓ Ctrl-B
″I ‹ѧ›	Ctrl-A
″I ↓ ↓ ⁄ф У	↓ ↓ Ctrl-F
″I ╟†	Ctrl-E

Ъυ ҳ **mac-address-table static** ↓ У
Â ″I У ˘ Ъυ ҳ ↓ ╟ 20 Â Ъυ ҳ ⁄ф
† /ˆ $˜ ҳ Â ↓ ↓ ╟ 20 Â

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

↓Лυ Ctrl-A ‹ѧ› Ъυ ҳ Â Ъυ ҳ †
/ˆ $˜ ҳ '

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

~

80 Â

ħυ ϗ	
Ruijie# **show** *any-command* **| begin** *regular-expression*	ϡ show ħυ ϗ ˘ У ↑ ΰ ЛЬ ⊣ ЛЬ ⊿ Â

⋮ ⅄ ҳ Ъυ ҳ Ъυ ҳ ⋒ ≗ Ъυ ҳ ˘ ≗
Ю˝ **alias ?** ⅃Л " ⋒ ⅃Л ⋮ ⅄ Ъυ ҳ '

```
Ruijie(config)#alias ?
aaa-gs              AAA server group mode
acl                 acl configure mode
bgp                 Configure bgp Protocol
config              globle configure mode
......
```

Ъυ ҳ ⋮ ⅄ ╠ ˘ ≗ ⋮ ⅄ ⋒ У /ˆ *˜ ˘ з ЛЮ
'

**command-alias=original-command*

˘ ≗ EXEC Ю˝ Ъυ ҳ ⋮ ⅄ ”s” ”show” Â ‡ ”s?” ⅃Л
⅄ ’s’ Ո ⋮ ⅄ ╠ '

```
Ruijie#s?
*s=show  show  start-chat  start-terminal-service
```

⋮ ⅄ ҳ Ъυ ҳ a У ´ ˘ ‡ /ⅈ Ъυ ҳ ↑ Â ˘ ≗
EXEC Ю ⋮ ⅄ ”sv” ҳ Ъυ ҳ ”show version”ˇ ‡'

```
Ruijie#s?
*s=show  *sv=″show version″ show  start-chat
start-terminal-service
```

⋮ ⅄ ÿ Ъυ ҳ У ˘ ⋒ a Â Э ˘
”

CLI

ѫ CLI ɱ˘ У PC Ո Â ŭ ╟ ˘
ѫ ˚ Ո ˚ ⎤ ע ע ⅃ Л CLI Â ѫ ⅁
⅁^ Console˜ ˘ ѝ ^ Outband˜ Â ѫ
ע˘ ⅃ Л Telnet Ո Â ч
⅃ Л Ъυ Ъυ ϗ Â

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CLI ъ ҳ ˧ ˇ ʌ ê ъ ҳ Ì Â

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TFTP

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ǀ ’ ħυ ϗ ت У ˘ ‡ ˩ Л υ ħυ ϗ ç
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˩ Л υ Юħυϗħυϗ '

ħυ ϗ	
Ruijie# **configure terminal**	
Ruijie(config)# **privilege mode** [**all**] {**level** *level* | **reset**} *command-string*	ħυ ϗ ǀ , ǐ Â mode · ħυ ϗ CLI ħυ ϗ ˘ ' **config** ’ **exec** ħυ ϗ ˘ **interface** ٧ Â all · ħυ ϗ ħυ ϗ ˘ ˩ ٸ ˩ ǀ Â

PñÔ€ãa37ÔBÑSG@Td566F514E302C8>T561D70f-0

<cr>

Ю reload ћu ч ѓ ѐ ћu ч й '

```
Ruijie# configure terminal
Ruijie(config)# privilege exec all reset reload
Ruijie(config)# end
```

1 ˘ ћu ч ‘

```
Ruijie# disable 1
Ruijie> reload ?
% Unrecognized command.
```

^ line˜ ѓ ч

ѓ н ц ^ TELNET˜ ѓ ч ˘ **line** ѓ ч ˘ ж **line** Ю ЛьЮћu ч'

ћu ч	
Ruijie(config-line)# **password** *password*	**line** ѓ ч
Ruijie(config-line)# **login**	ў **line** ѓ ч

&

˘ **line** ѓ ч˘ ˘ **line** ѓ ч

Â ж Ю у ў Â

ѓ н ц **lock** ћu ч в˘ Лu Â в

Т ˘ ж **line** Ю Т ˘ ж

EXEC Ю˜ **lock** ћu ч в '

ћu ч	
Ruijie(config-line)# **lockable**	ў в **line** Т
Ruijie# **lock**	в ґ **line**

8

ɱ У ѫ ʌ ʒ 8 Â
ʌ ʒ Ո ѫ ˘ ŭ AAA ˘ ‡ ѭ
˘ ѭ ɻ Л У Ł ɣ ɻ Ո
˘ ɱ – RADIUS Ł ɣ ɻ
Ո 8 Â

– RADIUS Ł ɣ ɻ Ո 8˘ a Ạ
ѫ ˘ ╗ ʎ ɻ RADIUS Ł
ɣ Э ˘ Ł ɣ У ɻ à à Ո
˘ Ո 8 ˘ Â

ѫ

ʌ ң ҕ ѫ ѫ ˘ ў AAA Ю
" ѫ ’ Л ɻ AAA Ю ѫ Â
ɻ ˘ ѭ Ю é ЛЬЮЬ ʒ'

Ь ʒ	
Ruijie(config)# **username** *name* [**password** *password* | **password** *encryption-type encrypted password*]	╗ ʌ ʒ ɻ
Ruijie(config)# **username** *name* [**privilege** *level*]	ѝ ⁞ˆ ɻ ~

˘ ѭ Ю é ЛЬЮЬ ʒ'

Ь ʒ	
Ruijie(config-line)# **login local**	AAA Ю ѫ
Ruijie(config-line)# **login authentication** {**default** | *list-name*}	AAA Ю AAA Â AAA " ˘ ↑ Radius à ѫ à Â

&

AAA à Radius L AAA σ ή

Ю

Ю **show clock** Ъ

Ю

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

calendar a

Ю **clock update-calendar** Ъ

Â

Ъ	
Ruijie# **clock update-calendar**	

ЮЪ

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

Ў

reload [modifiers]Ъ Ў , scheme Л

Ў Â Ў Ю( ) Л

Э Â modifers **reload** Ъ Л

Ъ Â Л modifiers **in** à **at** à **cancel** Â Ю

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

mmm *hhh:mm* *string*

Л Ў Â Л Ў Â

10 Ў Л Ў Л **reload in** *10 test* Â

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

Ў Â Â

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ѝ ˘ ˩Лυ ѝ У ˩ ɻ (System Name)
Â ɻ ѝ CLI ƱʒƱ ˘ ‡ ɻ ˆ ɻ
32 ˘ ‡ ˩ è ɱ 32 ˜ ѝ ƱʒƱ ˘
ɻ ˩ у ˩ у Â ЮˇЛυ έ ɻ ѝ ɻ ˘
”S2924G” à ”R2692” Â

ɻ

˄ ң ɒ ЮƱʒƱ ɻ '

ƱʒƱ	
Ruijie(Config)# **hostname** *name*	ɻ ˘ ɻ ˩ ˘ a 255 Â

˩Лυ ɷ ЮƱ **no hostname** ɻ Æ ÂЮ ɻ RGNOS˝

```
Ruijie# configure terminal                    //
Ruijie(config)#
```

ˇ ⅃ ˆ У Â ⅃ Л∪
ˆ Â ⅃ Л∪… ч ﺻﺮ ^ banner˜ ' Ո
Â ˆ ˇ ˇ
"I ﺟﻢ Э Â ¯ ˇ ⅃ Л∪ ⅃ У ﻭ ^
˜ Â ﺟﻢ ⅄˘ ў
. У Â Ю˘ Ո Ƙ Â

⅃ Л∪… ↑ ΰ У ˇ ˇ
Â ⅃ Л∪ Л∪Ю Ћ ҳ '

Ћ ҳ	

(message of the day) Â c ˆ ˇ
ˆ ⅃ Л∪ ('&') Â ˆ ⅄˘
Ruijie(config)# ⅄ ﻫﻰ ˇ ﺟﻢ ⅃ Л∪ ˇ ﺟﻢ ˆ
banner motd *c* ﻫﻰ ˇ ˇ
message c ˆ ⅄ Ÿ ˇ ‡ Â
ˇ a ﻭˆ ˇ
a 255 ﺝ ğ 9A‘ SWŸ P ă A’5B!£ IEî-¹hE-Âåæ•` ^®|

Ruijie(config)# **banner login** *c message c*	Â *c* ¦ ˘ ¦ ˩ Л Ц (’&’) Â ¦ Л ˘ Л ھ ˘ ج ˩ Л Ц ˘ ج ¦ ھ ˘ ¦ Л Ÿ ˘ ‡ Â ˘ a ѝ¦ ˘ a 255 Â

˩ Л Ц ج Ю **no banner login** ¦ Â

Ю У ˘ (#) ѝ¦ ˘

ѝ “Access for authorized users only. Please enter your password.”

Ю

```
Ruijie(config)# banner login #                    //   ¦
Enter TEXT message.  End with the character '#'.
Access for authorized users only. Please enter your password.
#                                                 //   ¦
Ruijie(config)#
```

ج ˘ Ю У

ÛN`= ´æÂÅÛm@?ì ( ½eÖ‰ `1 RlÅ" A0

à

Ihu ҳ	
Ruijie# **show version**	à

Ihu ҳ	
Ruijie# **show version devices**	ɱń
Ruijie# **show version slots**	ɱń Ո

ŭ ╟ ў ɻ

show mainfile Ihu ҳ ŭ ╟ ў ɻ

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

8 ⅄

8 ⅄

ss Ю˘ ⅃Л Л∪Ю∪ ҳ 8 ⅄ '

∪ ҳ	
Ruijie(config-line)# **speed** *speed*	8 ⅄ ˘ ´ Æ bps Â ∧˘ ⅄ и 9600 à 19200 à 38400 à 57600 à 115200

1 في

Telnet Client

ـا ЛU Э telnet ћU ع ˆ Э ٧'

ћU ع	
Ruijie# **telnet** *host-ip-address*	**telnet** ˆ ˘ ـا ЛU ў ـا IP فخ سم Â

ЮO **Telnet** ˘ ip فخ سم

192.168.65.119'

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

ـا ЛU ˘ 8 ^ ↑ ـا
˘ ЛU ـا ˆ ~˘ ˘
˘ Â

ɱ ـا ˘ جم ˘ ˘ ـ ٧
Â

Λ н р LINE Ю hu ҳ '

hu ҳ	

LINE

Ruijie(config-line)# **exec-timeout** *20*

Ruijie# **execute** {[**flash:**] *filename*}	У Â

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
```

Ruijie(Config)#

LINE

˜ Â

Ъυ ҂	
configure terminal	
Line vty *line number*	Line
transport input {**all** | **ssh** | **telnet** | **none**}	Line Ю ┘Л˘ ˜
no transport input	LINE Ю a ˜
default transport input	LINE Ю ˜ ѝ

Line Ю 8 "

LINE Ю 8ˇ ┘Л˘ Ъυ ҂ Â Юˇ Line Ю 8 " Â ˇ Â

Ъυ ҂	
configure terminal	
Line vty *line number*	Line
access-class *access-list-number* {**in | out**}	Line Ю 8 "
no access-class *access-list-number* {**in |out**}	┘ Line Ю 8 "

˘ ћ Ђ ҳ Ю ў CTRL ˘ ˚
Э ЛЮ ˘ ч ' У TFTP ˜ ∧ ˘ ˘ ∧ У
Xmodem ˜ ∧ ˘ Â

ў ЛЂЮ ѝ ˘ ˚

¸ TFTP ˜ ˚

¸ XMODEM ˜ ˚

TFTP ˜ ˚

У ў ў Ю ˚ ∫ ˘ ∧ У ў Э ˚ ∫ ў Â

ћ CLI Ђ ҳ Ю˘ Ю Ю ' Ю ґѝ˘ ”І ћ ѕ ў TFTP Server ˚ ' Л Ю ˚ ћ
' Л ∫ ˘ ћ Ю ЛЂЮЂ ҳ Ю ˚ ˘
Location ‡ ´ TFTP Server IP ф ѕ Â

Ђ ҳ	
Ruijie# **copy tftp:** *//location/ filename* **flash:** *filename*	Ю ў URL ˚ *filename*∫ Â

XMODEM ˜ ˚

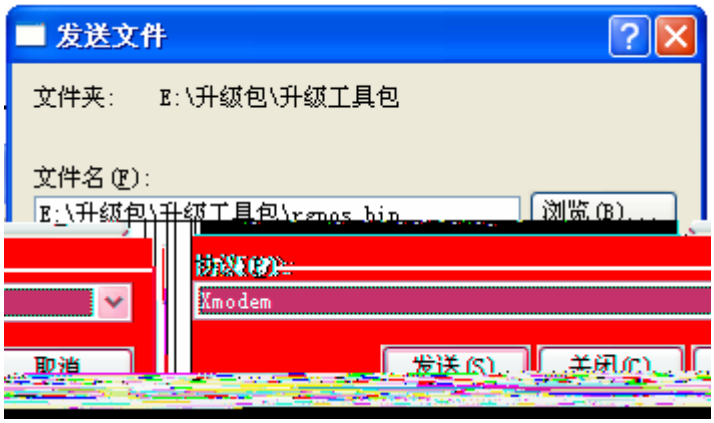
У ÿ ў Ю ˚ ĺ ˇ ㄴ У ÿ Э ˚ ĺ ў Â

ج CLI ћu ҂ Ю˘ Ю ˚ Ю '

Ю ɱ˘ ˝I Windows ĺ ' ㄴ ج
Ю ЛъЮћu ҂Ю ˚ ' ㄴ ج ѕш ў Windows ˇ “
” ´ “ㄴ ˚ ”Ш ˇ في 1 '

في 1

ج ˚ ㄵ ѕш ў Ю ˚ ˇ ˜ “Xmodem”ᵡ
“ㄴ ᵡ ‡ Windows ㄴ Лъㄱ ↑ Â في 2 '



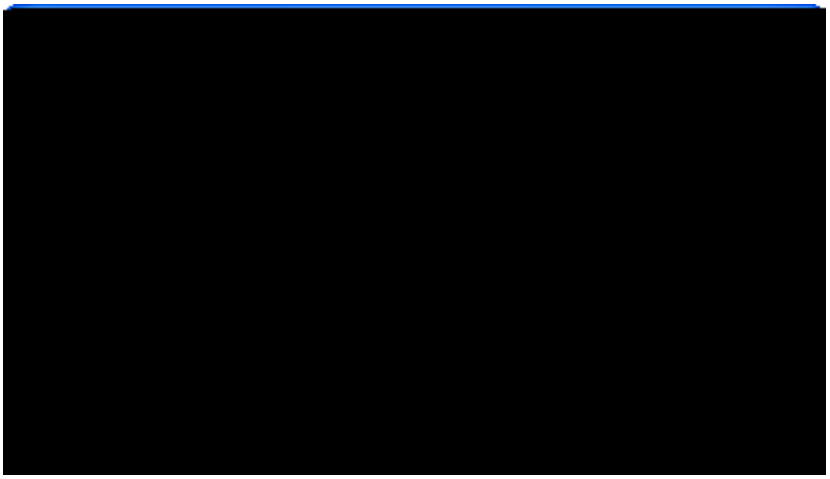
في 2

ћu ҂	
Ruijie# **copy xmodem flash**:*filename*	ÿ ў Ю ˚ ĺ ћu ㄵ ѝ *filename* Â

ج CLI ћu ҂ Ю˘ Ю ˚ Э '

Э ɱ˘ ˝I Windows ĺ ' ㄴ ج

Ю ЛьЮЬu ҂ Э ˚ ’ ﻝ ﺝ ﺱ ў Windows ˘ “
” ´ “ ˚ ”╖ Â ﻲ 3 ’



ﻲ 3

ﺝ Э ˚ Æ ˘ ~ “Xmodem”˜ “
”˜ у ﺱ ˚ ﻝ ˘ “ ”ﻝ
˚ Â ﻲ 4 ’

ﻲ 4

Ьu ҂	

Ω ˘ ˘ a Ω ӯ Â

˘ ˚ ҷ Ω Э ˘ ╟ a ⊿'

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2˜ ↑ ӧ ˘ ´ Ѫ ⊣ Ь´ ˘ У ˘ ˚
˘ Â ˝ ˘ ˘ Æ Â Ⱶ Ѧ ӧ ╟ ˘
╟ ⊿ ╥ ӧ ╟ ˘ ´ Ω Ь´ ˘ Â

╟ ˘ ╥ ' ў У ╥ ˘ ҷ ÿ ˘
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a У ˘ ´ ˘ ˚ Ⴆ˘ ˘ ˘ Ѫ
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Â ˘ ´ ´ ⊿ ⅈ ˘ Â ҷ ˘
ⅿ a ⊿ ˘ ї ‡ ⊿ ˘ Â
ҷ ˘ ⅿ˘ ⊿ **show version** ´ Ω ˚
ї б ˘ У ˘ ї ˘ a ў ⅈ ^
' **redundancy force-switchover**˜ ˘ ї ‡ ˘ ھ Ⴆ Â

˘ ˚ ˘ '
›

1˜ ˘ ˚ ˚ ⊿ и **rgnos.bin**

2˜ Э **copy** ћ ҳ˘ ˚ Ю ⅈ Э

3˜ Э ҷ ÿ ˘ ў ÿ ў ˘ ╥˘ ╥
Ю '

```
Upgrade Slave CM MAIN successful!!
Upgrade CM MAIN successful!!
```

1˜ У Æ

2˜ Ѧ ӧ ╟ ⊿˘ ˘ ˚ ˘ ⅈ Ю '

```
Installing is in process ......
Do not restart your machine before finish !!!!!!
......
```

3˜ ҷ ˘ ⊿˘ ⅈ Ю '

```
Installing process finished ......
Restart machine operation is permited now !!!!!!
```

4˜ ˘ ̈ Ꮧ ╟ Æ˘ Ю '

```
System restarting, for reason 'Upgrade product !'.
```

5˜ Ȁ ȕ ╟ Ꮧ˘ ˘ ˘ Ꮧ ╗ ´ ˘
̈ ˘ 5 Ո 6 ˘ a 7 ˘ Ⴗ
Ꭺ '

```
System load main program from install package ......
```

ÿ ˘ ̈ ╗ ÿ

6˜ ÿ Ꮧ˘ ╟ ˘ ╗ ȕ ╟˘ ÿ ὲ
ᱬ ᛐ Ю '

```
A new card is found in slot [1].
System is doing version synchronization checking ......
Current software version in slot [1] is synchronous.
System needn't to do version synchronization for this card ......
```

Ю '

```
System is doing version synchronization checking ......
Card in slot [3] need to do version synchronization ......
```

ὲ .

```
Version synchronization begain ......
Keep power on, don't draw out the card and don't restart your
machine before finished !!!!!!
```

ὲ .

```
Transmission is OK, now, card in slot [3] need restart ...
Software installation of card in slot [3] is in process ......
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!
Software installation of card in slot [3] has finished
successfully ......
The version synchronization of card in slot [3] get finished
successfully.
```

Э ч У ˘ ´ Ⴗ a Ȁ ╟ ˘ ˘ Ꮧ У
´ ˘ ╟ ˘ ˘ Ꮧ ˘ Â

ÿ Ո У ᱬ Э Â

ᱬ У Ո ˘ ˘ Ⴗ
Â

~

æ ˘ ╟ ˘ ˘ a ŭ ˘ y ˘ Ł
a Æ ˘ ≠ a è æ Â

&

æ ﾍ ╟ ˘ Â

˘ ˚ ˘ ¦
¸
˘ ﾍ Э 1 ˙ 7 ˊ ﾉ Æ ﾉ
Â

έ

Ping

ὴ ˘ Echo ˜ ˘ ˜ ↑ ↓ У
↑ ↑˘ ھى فذ سم ˘فذ سم Л
Echo ˜ ˘ ↓Л ὰ Ո ↓ ˘ ¯ RGOS
Ping έ˘ ↓Л ╠ ὰ Æ Â

Ping ħυ ϟ ﻩ Ո Ю˘ ﻩ Ю˘ ↓
ﷺ Ping ╗ ˘ ﻩ Ю˘ ↓Л Ping ╗ Â

ħυ ϟ	
Ruijie# **ping** [*ip*] [*address* [**length** *length*] [**ntimes** *times*] [**data** *data*][**source** *source*] [**timeout** *seconds*]]	**Ping'** έ

Ping ╗ ˘ ↓Лﻩ Ո Ю ˘ 5
ὴ 100Byte ↑ ↓ ˆ IP سم ˘فذ ﻩ ˆ ὴ 2 ˜ ˘
↑ б ↑ ϧ ˆ ˆ a ˘ ↓ Ὼ ˆ ϧ
˜˘ ‡ ¦ ! Ľ Л' ↑ б ↑ a ϧ ˘ ‡ ¦ C Ľ Л'
˘ ‡ ¦ . Ľ Л Â Л У ÂЛЮ ὴ ping
'

```
Ruijie# ping 192.168.5.1
Sending 5, 100-byte ICMP Echoes 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
```

Ping ╗ ˘ ↓ ﻩ Ю Âﻩ Ping ˘ ↓Л ↓
↑ ὰ ὰ Â Ո Ping ╗ У ˘ Л ≠ У
˘ ЛЮ ὴ У Ping '

```
Ruijie# ping 192.168.5.197 length 1500 ntimes 100 data ffff source
192.168.4.190 timeout 3
Sending 100, 1000-byte ICMP Echoes 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

Traceroute Ъυ ϗ˘ ϟΛυ ↑ ÿ ѫفڅسم ˆفڅسم
Â **Traceroute** Ъυ ϗ ў ˘ ϶ϩ ϟ ˘ سم
Æ ϟ Æ Â

‡ ˘ У ↑ У ˘ ↑ TTL ѫ
˝ 1 Â TTL ѫ й 0 ˘ ↑˘ ھى У فڅسم
a ϟ ↑ فڅسم Â ‡˘ Traceroute Ъυ ϗ '
˝I فڅسم ϟ У TTL й 1 ↑˘ У ھى У ICMP
˘ Λυ ↑ a ϟ ˘ ϩϪ й TTL ˘ Λ ↑ TTL ѫ ╗ 1
Λ ϟ ˘ ϟ γ ھى TTL ˘ У Ю ϟ˘ ˆ
ˆ فڅسم˘ У ھى ICMP TTL فڅسم˘ Ю
ÿ فڅسم ˆفڅسم˘ IP ↑ ϒ Â

Traceroute Ъυ ϗ ϟΛυ ϶ϩ Ո Ю ˘ έ Ъυ ϗ
Ю'

Ъυ ϗ	╗
Ruijie# **traceroute** [*protocol*] [*destination* [**probe** *probe*] [**ttl** *minimum maximum*] [**source** *source*] [**timeout** *seconds*]]	↑ ϟ

ΛυЮ ѝ Traceroute ч ˘ У ѝ ˘ У ѝ ϶ϩ
a 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
```

ÿ Э ϟΛυ سم ˆ ˘ ÿ فڅسم IP فڅسم й 61.154.22.36 ў ˘
↑ ف ^ 1¨ 6˜ ˘ ϟ ˆ ˘
ˆ ˘ Â

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 Э ˘ ↑ ل Л ف سم ˆ ˘ ÿ ˆ 1˙ فخسم 17˜ ˘ IP ز فخسم 4 ى 202.108.37.42 Â ў

¸ VID й 0 Tagged

Untagged

Access Port a TAG ˘ й TAG ╗ VLAN TAG Â ㄱ ㎛˘ ㅓ ╗ TAG˘ Ą ㄱ Â

Tagged

Access ㅓ ㅣ TAG ˘ ЛЬЮ ˚ '

¸ TAG VID˚ VLAN ID˜ б VLAN ID ㅕ ˘ ˘ ㅊ ㄱ ㅓ TAG ㅅ ㄱ Â

¸ TAG VID˚ VLAN ID˜ й 0 ˘ Â ㅊ TAG ˘ VID 0 ⋮ . ”I Â

¸ TAG VID˚ VLAN ID˜ б VLAN ID a ㅕ з a й 0 ˘ Â

Trunk Port

Trunk port ㄱ ЛЬ VLAN˘ Ո ㄱ VLAN ˘ У ˘ ≠ ㄱ ЛЬ Â

VLAN

ㅉ й Trunk Port ㄱ ЛЬ VLAN˘ ЛЬ У Native vlan й VLAN Â Ю Trunk port VLAN ˘ й ˚ ˘ ˚ ˘ ㄱ VLAN ㄱ " ⁸ Trunk port ف VLAN Â

~

Trunk ㅓ native vlan Ո Trunk ㅓ native vlan й У ˘ Ї ‡ ㅓ ㄱ ㄱ Â

б ㄱ

Trunk port ㄱ Untagged Ո ㅓ VLAN تن tagged Â Trunk Port ㄱ Native vlan TAG ˘ ㄱ Native vlan a TAG Â

Untagged

Trunk port ㅣ a IEEE802.1Q TAG, ㅙ ㅊ ㅓ Native VLAN Â

Tagged

Trunk port ٲ TAG ˘ ЛЬЮ ˚ '

¸ Trunk Port ٲ TAG VID Trunk port Native vlan ˘ ' ج ٦ ˘ ٧ TAG ٨ Ą ٦ Â

¸ Trunk Port ٲ TAG VID a Trunk port Native vlaň VID ٸ VLAN ID ˘ ' ٦ ˘ ٧ TAG Â

¸ Trunk Port ٲ TAG VID a Trunk port Native vlaň з VID ٸ a VLAN ID ˘ Â

&

Untagged Ethernet ˘ PC ´ ٦ Л Ь ⁞ ' TAG ٦ ע ج MAC فخ سم Ω MAC فخ سم ٨˘ ╗ Э 4bytes VLAN ˘ ≠ VLAN TAG Â

Hybrid ٸ

Hybrid ص ٸ ٦ Л Ь VLAN˘ ٦ Л Ь Ω ٦ VLAN ˘ ٦ Л Ь ˘ ≠ ٦ Л Ь Â Hybrid ٸ Ω Trunk ٸ a ٨ ج Hybrid ٸ ٦ Л Ь VLAN ٦ a ˘ Trunk ٸ ٦ VLAN ٦ a , ' Hybrid ٸ ╗ VLAN ج Â

L2 Aggregate Port

Aggregate port ˜ ٸ ٨ Â ٦ Л Ь ج У У ´ ˘ й У Aggregate Port˜ ЛЬЮ AP ˜ Â

ץ AP У Switch port˜ ٦ Л Ь ٸ ٨ ╗ ˘ Â ˘ L2 Aggregate port ٦ ج L2 Aggregate port ˜ ٸ Э ˘ AP У ˜ ˘ L2 Aggregate port ╠ Э ٲ è ˜ Э˘ ٦ Â

~

L2 Aggregate Port ˜ ٸ ص ٦ Л Ь й Access port Trunk Port˜ ٦ У AP ˜ ٸ й ٦ У ص˘ ѫ Access Port˜ ѫ Trunk port Â

Ь ٸ (L3 interface)

ў Ь ٸ ص ٦ ⅏ ٦ˈ й ЛЬЮ ΰ ص

¸ SVI (Switch virtual interface)

ﻍ У γ ﻧ Switch port ﻝ ﻯ Routed port, ﻝ Routed portﺡ IP ﺳﻫ
ﻓﺥ Â ˘ **no switchport** ﻧ ﻩ ﻍ ˘ ﻧ
Ů˘ ﺓ ﻧ γ Â

~

У ﻧ L2 Aggregate Port ˜ ﻧ ˘ a **switchport/ no switchport** ﻩ ﻍ ﺍ Â

L3 Aggregate Port

L3 Aggregate port ﻝ L2 Aggregate Port У ˘ ≠ ˜ ﻧ
У Э ﻝ ﻧ Â ﻧ ﻯ ﻝ ﺻ Ь ﻧ Â Ь
˘ AP ﻯ Ь ﻧ˘ ﻝ У ﻝ
ﻯ У ˘ У Â ˘ L3 Aggregate
port ﻟ ﻝ ﺟ L3 Aggregate port ˜ ﻧ Э ˘ AP
У ˜ ﻝ˘ L3 Aggregate port ╟ Э ﺍ è
˜ Э˘ ﻝ Â

L3 Aggregate port a έ γ ╗ Â ﻝ **no switchport** У
˜ γ ﻧ L2 Aggregate port ﻝ ﻯ L3 Aggregate Port˘ Routed
Port ╗ L3 Aggregate port˘ ﻝ L3 Aggregate Portﺡ IP ﻓﺥ ﺳﻫ

Â

ﻧ

ﻧ ˘ ˊ ˘ ˘

ﻧ ﻝ ‡

Switch Port˘ è ﻝ ч ﺡ ' ﻝ˘ ﻧ ﺟ Э ﻝ Â
ﻧ ﺟ ﻝ ﻯ 2˘ ﻧ ﺟ Э ﻝ ﻯ 3˘ ‡ ﻧ ﻧ ﻝ ﻯ
2/3 Â ﻝ ÿ 0˙ Â ﻝ ‡ ' ˘
ÿ ﻣ ﻝ˘ ÿ ﻝ˘ ÿ Э Ю У "˘ ﻝ ÿ 1
╗ Â Э ﻧ ﻝ ÿ 1˙ Э ﻧ ˘ ﻝ ÿ ﺍ ﻝ Â
ﻝ Л Ū ص ˘ ﻧ ↑ ч Ū ^ ˝ I ﻧ Ո ﻧ ~ ˘
Ū ˘ ﻝ ﻧ ﻝ Â ≠ ﻝ Л Ū ﻩ ﻍ **show** ﻩ ﻍ
Л Ū ﻉ Э ﻧ Â

Aggregate Port˝ è ٸ تن ù 1˙ Aggregate Port Â

SVI˝ è ٸ SVI VLAN VID Â

~

Э ٸ ش ù Ơ˝ ╟ (٦ ج ´) ٸ ÿ 1 Â

ٸ ԋ ٹ

٦ ج Ю **interface** ԋ ٹ ٸ Â

ԋ ٹ	
Ruijie(config)# **interface** ٧ *ID*	ج Ю **interface** ԋ ٹ˘ ٸ Â ≠ ٦ Л ج Ю **interface range interface range macro** ԋ ٹ У تن ٸ Â ԋ ج У تن ٸ ٦ صر Ո ٤ ٦

Ю Gigabitethernet 2/1 ٸ '

```
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)#
```

ج ٸ Ю ٦ ٸ Â

interface range ԋ ٹ

У تن ٸ

٦ Л Ю **interface range** ԋ ٹ ٦ ٸ Â

interface range ˘ تن ٸ Â

ԻՍ ֏	

Ruijie(config)# **interface range**
{*port-range* | **macro** *macro_name*}

ใบ ๆ	

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

ٸ Ӯ صر

ٸˇ ٯ Ло Ӯ صر Â ٯ Ло è У Ӯ Â У
Ӯ صرˇ ٸ à à ٯ à Ӯ
صر ˇ ٯ Ӯ صرˇ Ӯ صر ˇ ٯ
Ло Â

ћυ ٶ ٸ ٸ Â Aggregate Port Ո SVI ٸ a Ӯ صر
Â

ћυ ٶ ٸ Ӯ ٸ Â

ѝ Aggregate Port ˜ ٸ ٸˇ è Ӯ صر У ˇ ї ‡ ╗ ׀ AP
Â Aggregate Port ˜ ٸ ٸ صر a ٯ Â

ћυ ٶ	
Ruijie(config-if)# **medium-type** { **fiber** | **copper** }	ٸ Ӯ صر

Ю ٸ Gigabitethernet 1/1 Ӯ صر'

```
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
```

ٸ Ո

ѝ ╠ в У ٸ ╗ ˇ ٯ Ло ѝ У ٸ У ж ل
ٸˇ ≠ ٸ (Description) Â ٯ Ло Ѽ Ж
ٸ é ل ˇ ˇ Gigabitethernet 1/1 ׀ А ж ˇ
ٯ Ло ٸ ѝ ľ Port for User A Ŀ Â

ћυ ٶ	
Ruijie(config-if)# **description** *string*	ٸ ˇ 32 Â

Ю ٸ Gigabitethernet 1/1 '

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

```
Ruijie(config-if)# description PortForUser A
Ruijie(config-if)# end
```

ㅊ Ю˘ ㄴ ㅓ Â ㄴ Л∪ ㅓ

У ㅓ Â У ㅓ˘ ‡ ㅓ Э a Ո ㄱ ˘

ㅓ ㅓ ╖ Â ≠ ㄴ Л∪

У ㅓ Â ㅓ ч ' Up Ո Down˘ ㅓ

˘ ㅓ ὶ down˘ ĭ ‡ ὶ up Â

ħυ ϛ	
Ruijie(config-if)# **shutdown**	У ㅓ

Ю ㅓ Gigabitethernet 1/2'

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitethernet 1/2
Ruijie(config-if)# shutdown
Ruijie(config-if)# end
```

ㅓ ˘ ㄱ ˘ ﻩ ȯ א ㅓ

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

~

IEEE ˘ ¯ ”I ﻧ ˜ ك ﻧ Master Slave .

S3750 " ˘ Ո تجى ﻧ a ˘ ï تجى ﻧ Â

S3750 " ˘ ˜ ك ¯ ”I ` ﻧ Â

ﻧ MTU

ﻧ ǎ ﻝ ˘ ﻝ ¦ Л ˘ ﻯ jumbo Â ﻝ Л ﻧ MTU ⁸ ﻧ ﻝ Â

MTU ˘ a ↑ Л Â

ﻧ MTU ﻧ جھ Â a MTU Â ﻧ ¦ ˘ MTU Ư Â

MTU تن ﻯ 64~9216 ˘ ﻯ 4 ˘ ﻯ 1500 Â

ƕ ʒ ﻧ ﻧ Â SVI ﻧ a MTU Â

ƕ ʒ

γ ٸ

ЮO γ ٸ ˘ VLAN ٦ ٸ ٸ ľ
VLAN Ŀ Ո ľ ѫ ٸ ⁸ Ŀ Â

γ ٸ ЮO '

	γ
Switch port	access port
VLAN تن	VLAN 1 4094
VLANˆ access port ~	VLAN 1
Native VLANˆ trunk port ~	VLAN 1
ӯ صر	copper
ٸ	Up
ٸ	
	ك ~
٦	ك ~
	ك ~
Aggregate port	
⁸	
ٸ	
ٸ	

Switch Port

access/trunk port

ў Switchport (access/trunk port) ٦ ЮO
Â

٦ ج ٸ ЮO **switchport** è Ԋ ҷ Switch Port
'

Ԋ ҷ	

Ruijie(config-if)# **switchport mode** {**access** | **trunk** }	ㅓ Â

Ю gigabitethernet 1/2 ѝ access port Â

```
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
```

ћU ҙ	
Ruijie(config-if)# **switchport access vlan** *vlan-id*	access port VLAN Â

Ю access port gigabitethernet 2/1 vlan ѝ 100 Â

```
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

ћU ҙ	
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	trunk port NATIVE VLAN Â

Ю Trunk Port Gigabitethernet 2/1 Natguref503.58 359.48 0.t4nf0 Ɪc 0 Tw 13.669

f i - g i f n o c (e i j 0 3 R

```
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# switchport port-security
Ruijie(config-if)# end
```

ฯ ˘ ฦ ˘ ฯ ľ ฯ ˘ ฦ ˘ Ŀ Â

Ю Gigabitethernet 2/1 ŷ access porť VLAN ŷ 100
˘ ฦ ˘ ŷ ˜ ك ˘ ฯ '

```
Ruijie#
```

L2 Aggregate Port

ў … L2 Aggregate Port ㅓ Ո L2 Aggregate Port У Â

ㅓ Л Ъ ㅓ Ю **aggregateport** … L2 Aggregate Portў é ㅓ ľ Aggregate Port Ŀ Â

ㅓ Æ ㅓ

Ъ Ю ㅓ **clear** Ъ ҷ ㅓ Æ ㅓ Â Ъ ҷ ㅓ Switch Port,L2 Aggregrate port ˜ ㅓ ,Routed port,L3 Aggregate port ˜ ㅓ ˇ ЛЮ ѝ clear Ъ ҷ'

Ъ ҷ	
Ruijie# **clear counters** [*interface-id*]	ㅓ Â
Ruijie# **clear interrface** *interface-id*	ㅓ ˚ Æ

ㅓ ㅓ Л Ъ ҷ **show interfaces** ˇ Ъ Ю **clear counters** Ъ ҷˇ ㅓ Л Ъ ㅓ Â a ㅓˇ ‡ L2 ㅓ Ы Â

Ю Gigabitethernet 1/1 Ы'

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

Ь ㅓ

Ь ㅓ'

Ъ ҷ	
Ruijie(config-if)# **no switchport**	ㅓ Shut Down з Ь Â Ъ ҷ ㅓ Switch Port Ո L2 Aggregrate port Â
Ruijie(config-if)# **ip address** *ip_address subnet_mask* {[**secondary**|**tertiary**|**quartus**][**broadcast**]}	IP ѫ ف Ո Â

ĩ У Ь ㅓ IP ѫ ف ㅓ Л Ъ ㅓ **no ip address** Ъ ҷ Â

У L2 Aggregate Port ˜ ㅓˇ a **no switchport** Â

Ю У γ ٸ Routed Portˇ з ٸ† IP فخ سم'

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 2/1
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 192.20.135.21 255.255.255.0
Ruijie(config-if)# no shutdown
Ruijie(config-if)# end
```

SVI

ў … SVI ٦ Ո SVI

~

У ٸ L2 Aggregate Port ˜ ٸ ˇ a **switchport/ no switchport** ħυ ҳ ˛ Â

Ю У γ ٸ Routed Portˇ з ٸ˛ IP فخ سم'

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface fastethernet 1/6
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 192.168.1.1 255.255.255.0
Ruijie(config-if)# no shutdown
Ruijie(config-if)# end
```

L3 Aggregate Port

… L3 Aggregate Port ٦ Ո L3 Aggregate Port У Â

ل جم ٸ Ю **no switchport** L2 Aggregate Port у ѝ L3 Aggregate Port:

ħυ ҳ	
Ruijie(config-if)# **no switchport**	ٸ Shut Down Ь Â
Ruijie(config-if)# **ip address** *ip_address subnet_mask*	IP فخ سم Ո Â

Ю … L3 Aggregate Portˇ з ٸ˛ IP فخ سم'

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface aggregateport 2
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 192.168.1.1 255.255.255.0
Ruijie(config-if)# no shutdown
Ruijie(config-if)# end
```

ﻫ ﻫ صر ﻝ ﻉ ﻉ

╗	ƶ 3 ﻫ ﻉ	╗ ˘ ap
	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
ﻫ	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
dot1x	a 3 ﻫ’ ﻝ 3 ﻫ ﻯ˘ ’ ﻉ 2 ﻫ˘ ﻱ Â	a ap’ ╗ ap ﻯ˘ ﻫ Э dot1x ’ ﻯ˘ ﻉ ’
ﻫ	a 3 ﻫ’ ﻝ 3 ﻫ˘ ’ 2 ﻫ˘ ﻱ Â	a ap’ ╗ ﻯ ˘ ap ﻯ’ ﻉ ﻫ ╗ ap ﻱ Â
	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
arp check	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
Ip فخ سم	a 2 ﻫ’ ﻝ 2 ﻫ˘ ip ’ 3 ﻫ˘ ﻱ ip فخ سم’	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â
shutdown	a ﻝ	╗ AP˘ AP ’ AP˘ ﻉ ﻫ Â

2 ﻫ a ╗ 3 ap˘ 3 ﻫ a ╗ 2 ap’ 2 ﻫ˘ 3 ﻫ˘ 2 ap˘ 3 ap Ո SVI a ﻉ’

ﻫ Ո

ﻫ ˘ Â ﻝ جم Ю **show** ԋ ڑ ﻝ ﻫ Â جم Ю ﻝ ЛЬЮԋ ڑ ﻫ ‘

ԋ ڑ	
Ruijie# **show interfaces** [*interface-id*]	ﻫ Ո Â
Ruijie# **show interfaces** *interface-id* **status**	ﻫ Â
Ruijie# **show interfaces** [*interface-id*] **switchport**	ﻝ ﻫ ˆ ﻫ ˜ administrative Ո operational Â
Ruijie# **show interfaces** [*interface-id*] **description**	ﻫ Ո ﻫ Â

```
FlowControlAdminStatus : Autonego
FlowControlOperStatus  : Disabled
Priority    : 0
```

ЛЬЮ ㅓ GigabitEthernet 1/1 ㅓ '

```
Ruijie# show interfaces gigabitEthernet 1/1 switchport
Interface  Switchport Mode     Access    Native    Protected
VLAN lists
---------- ---------- --------- --------- --------- ---------
------------
gigabitethernet 1/1       Enabled   Access      1          1
Enabled   All
```

ЛЬЮ й ㅓ Gigabitethernet 2/1 ㅓ '

```
Ruijie# show interfaces gigabitethernet 1/2 description
Interface         Status    Administrative   Description
------------  ---------      -----------   ----------------
gigabitethernet 2/1     down       down        Gi 2/1
```

ЛЬЮ й ㅓ

```
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

ㅊ ㅓ Л∪ ㅆ ㅓ ĭ ㅓ ㅓ LinkTrapˇ ㄲ ˇ
ㅓ ㅓ Link ㅓ ㅛˇ SNMP ㅓ LinkTrap, ㅓ ‡ a ㅓ Â Юˇ ㄲ
Â

ћ∪ ҂

ћ∪ ҂	
Ruijie(config-if)# [**no**] **snmp trap link-status**	ㅓ ㅓ link trap ㄲ .

Ю ㅓ ѝ a ㅓ Link trap:

```
Ruijie(config)# interface gigabitEthernet 1/1
Ruijie(config-if)# no snmp trap link-status
```

Aggregate Port

جھ Э Aggregate Port Â

Aggregate Port

ل Л Ъ جھ У У ˘
ѝ Aggregate Poîrt ЛЪЮ AP˜ Â AP ╖ Л IEEE802.3ad
˘ ل Л Ъ ˘ ل Â

AP У ˜ ˘ ˜ ╟أسم ˛ AP
è ˜ Э Ы Â AP У ˜ ˛ ˘ a
ل˛ è ˜ Э Â

AP صر ή 1 غي

AP ل Л Ъ MAC سم فخ à MAC سم فخ˘ MAC سم فخ + MAC سم
فخ à IP سم فخ˘ IP سم فخ Л Ъ ل IP سم فخ + IP سم فخ سم كا
ˆ ˛ AP ˜ Â ل Л Ъ **aggregateport load-balance** ˆ

Â

MAC فخ سم MAC فخ سم ĭ ĭ AP ﻝ ˜
Â a ﻝ MAC ˇ ﻟ ˜ a ﻝˇ ﻝ MAC ˇ ÿ ﻝ У
˜ ﻟ Â

MAC فخ سم MAC فخ سم ĭ ĭ AP ﻝ
˜ Â ﻝ MAC ˇ ÿ ﻝ У ˜ ﻟˇ a ﻝ MAC
ˇ ÿ a ﻝ ˜ ﻟ Â

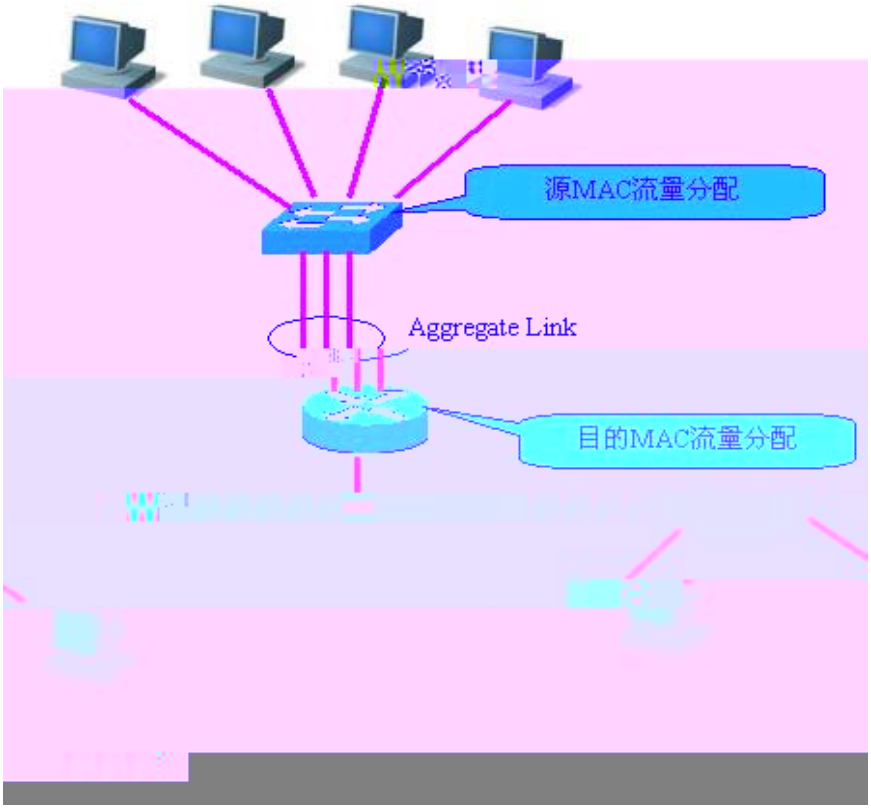
MAC+ MAC فخ سم MAC Ո MAC فخ سم
ĭ ĭ AP ﻝ ˜ Â ɛ a ﻝ MAC+ MAC فخ سم ﻝ
ĭ ĭ ﻝ У AP ˜ Â

IP فخ سم IP فخ سم IP IP ĭ Â a ﻝ
IP IP a ﻝ ˜ ﻟˇ ﻝ IP IP ‡
ﻝ ˜ ﻟ Â Ь ˇ جم
Ю ĭ γ ˇ ‡ ╟ γ MAC فخ سم MAC فخ سم
Â

IP فخ سم + IP فخ سم IP Ո IP ĭ Â
Ь ˇ جم Ю ĭ γ ˇ ‡ ╟
γ MAC فخ سم Â ɛ a ﻝ IP+ IP فخ سم ﻝ ĭ
ĭ ﻝ У AP ˜ Â

a ﻝ ﻯ ĭ ˇ Л∪ ĭسم ﻩ كا
ĭ ﻯ Э˘ ˈI ĭ ¯ Â

جم Юفي ˇ У AP б Ы ˇ ^ في
Э 4 ﻯ PC ˜ Л∪ Ы й ˇ ^ في Ю 2 ﻯ PC ˜
Ы ﻟ MAC MAC فخ سمˇ й Ы б è ў
è ĭ ˇ й MAC فخ سم ’ جم
ˇ ‡ й MAC فخ سم Â



في 2 AP في

Aggregate Port

Aggregate Port

AP Ю '

γ AP ٨	
Ь AP ٨	
	MAC فخ سم ĵ Â Â

Aggregate Port

AP ˜ ٨ ٨ У Â

γ ∧ ∧ ╗ γ AP˘ Ь ∧ ∧ ╗ Ь AP Â

AP a ∧ ╖ Â

∧ ╗ У a ج AP ˘ AP ╟… Â

У ∧ ╗ AP˘ ∧ AP ∨ Ϛ Â

У ∧ ÿ AP ⁻ ˘ ‡ ∧ ὶ è ╗ AP ɲ Â

~

У ∧ ╗ AP ⅄ , a ج ∧ Э , ⁻ ∧ AP.

Aggregate Port

ج ∧ Ю˘ Ю ∧ ╗ AP'

Ьυ Ϛ	
Ruijie(config-if-range)# **port-group** *port-group-number*	∧ ╗ У AP(**gate Port** AP a ج˘ ‡ ∠ … AP) ץ ضذ 0 .

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

Aggregate Port

جھ ЮЎ ЮО AP '

ћu ҷ	
	AP ˘ ' **dst-mac'** MAC فخ سم ˆ Â جھ AP ﻫ ˘ MAC فخ سم ﻟ ˆ ﻟ ˘ ˘ MAC a ﻟ ˆ ˆ a ﻟ ˘ **src-mac'** MAC فخ سم ˆ Â جھ AP ﻫ ˘ a ﻟ MAC فخ سم ˆ ˆ a ﻟ ˘ ˘ ﻟ MAC فخ سم ﻟ [illegible] **ip'** IP б O AR [illegible]

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

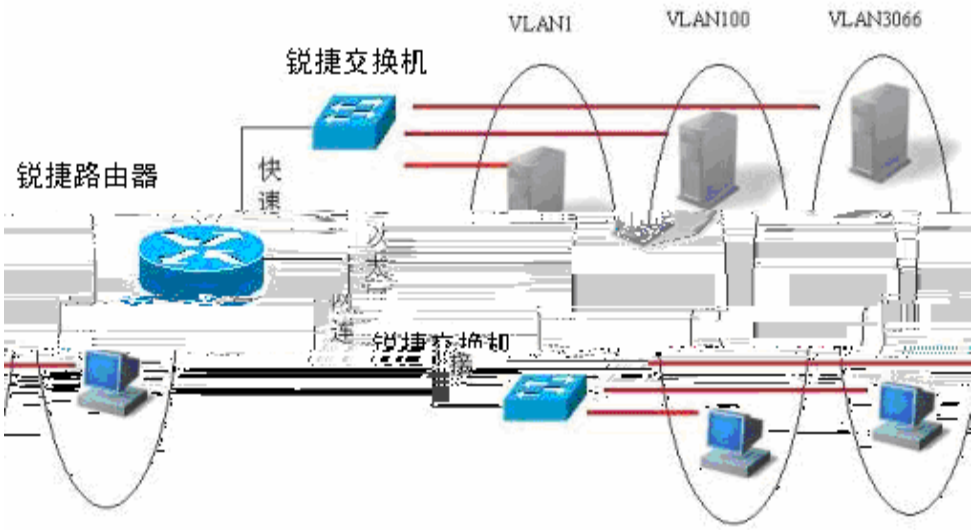
```
Ruijie# show aggregateport load-balance
Load-balance : Source MAC address

Ruijie#show aggregateport 1 summary

AggregatePort MaxPorts SwitchPort Mode   Ports
------------- -------- ---------- ------
Ag1           8        Enabled    ACCESS
```

VLAN

IEEE802.1q VLAN

VLAN ﷺ ˆ Virtual Local Area Network˜ ˘ ﺝ У
Э , ˚ Â ISO ﺹ γ Â VLAN , ˚
a ﻝ ﻣ Æ ⁸ Â VLAN Ռ ﻝ ˘
Æ ⁸˘ Ռ ﷺ У Â γ ´ à Ռ
ﺝ У VLAN ﻟ à ˘ a è VLAN Â Л˘ У
ﻣ ў Ռ è a ﺝ ﻝ У VLAN ў ˘ ‡ У
Ь ˘ Ю في Â

ﻝ Л Ъ У ﻣ Ҍ и У VLAN ˜ ˘ ˚ ﻣ
У ˚ ˘ з ﻝ Л Ъ VLAN Â ╗ à˚ Ռ
˘ a ÿ Э Â



في 1

Ռ У У ˘ VLAN Ռ У IP ﺝ У Â У ﻩ ﺹ
˘ ﺝ ﻝ У IP ў ﻝ У VLAN˝ VLAN
Ь ˆ Ь ˜ Â Ь ﻝ Л Ъ SVI ﻣˆ Switch Virtual
Interfaces˜ VLAN IP Â SVI ˘ ﻣ ﻟ
IP ´ Â

VLAN

VLAN State	Active	Active˘ Inactive

… à У VLAN

ج ЮЎ ┘Л… У VLAN'

ћυ ҂	
Ruijie(config)# **vlan** *vlan-id*	У VLAN ID Â У VLAN ID˘ ‡ … У VLAN˘ ج VLAN ID˘ ‡ VLAN Â
Ruijie(config)# **name** *vlan-name*	^ ┘ ~ и VLAN ┤ У ┘ Â У ˘ ‡ ╠ и У ┘ VLAN xxxx˘ è xxxx 0 نې Æ VLAN ID Л Â ˘ VLAN 0004 VLAN 4 ┘ Â

VLAN ┘ ھ ┘ ˘ ┤ **no name** ћυ ҂ ┘ Â

ЮО У … VLAN 888˘ ћυ ┘ и Test888˘ з ˚ '

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

╕ У VLAN

a ╕ VLAN˙ VLAN 1˜ Â

ج ЮЎ У VLAN'

ћυ ҂	
Ruijie(config)# **no vlan** *vlan-id*	У VLAN ID˘ ╕ Â

┘ VLAN┤ Access ┤

У ┤┤ У a ج VLAN˘ ѫ VLAN ╠ … Â

ج ЮЎ У ┤┤ У VLAN'

Ю ҷ	
Ruijie(config-if)# **switchport mode access**	Ю ӣ VLAN ӯ ҳ ACCESS ӣ ~
Ruijie(config-if)# **switchport access vlan** *vlan-id*	ӣ ҷ У VLAN

Ю Ethernet 1/10 ѝ Access ӣ ҕ VLAN20ґ

```
Ruijie# configure terminal
Ruijie(config)# interface fastethernet 1/10
Ruijie(config-if)# switchport mode access
Ruijie(config-if)# switchport access vlan 20
Ruijie(config-if)# end
```

Ю ї ‘

```
Ruijie(config)# show interfaces gigabitEthernet 3/1 switchport
Switchport is enabled
Mode is access port
Acsess vlan is 1,Native vlan is 1
Protected is disabled
Vlan lists is ALL
```

VLAN Trunks

Trunking

У Trunk У Л Ӌ ӣ Ո ѐ ^ Ы ~ ˘ У Trunk ӈ Л VLAN Â

Trunk 802.1Q Â Юفي У Trunk Â

Ħυ ϗ	
Ruijie(config-if)# **switchport mode trunk**	Ħ Ϟ صر ϳ Trunk Ϟ
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	Ϟ Ϟ У Native VLAN

У Trunk Ϟ Trunk Æ ˘ **no switchport trunk** Ϟ Ħυ ϗ Â

Ħ Trunk Ϟ ϟ VLAN "

У Trunk Ϟ ϟ Ո VLAN ˆ 1 ˙ 4094 ˜ Â ˘ ≠ ϟ Ո Trunk Ϟ ϟ VLAN " ⁸ VLAN a Trunk Ϟ Â

ϡ ЮЎ ϟ Ո У Trunk Ϟ ϟ VLAN " Â

Ħυ ϗ	
Ruijie(config-if)# **switchport trunk allowed vlan** {**all** | [**add** | **remove** | **except**] } *vlan-list*	ˆ ϟ ˜ Trunk Ϟ ϟ VLAN " Â Ϟ *vlan-list* ϟ Ո У VLAN ˇ ≠ ϟ Ո У " VLAN ˇ Ո VLAN ID ˘ Ո VLAN ID ˘ - /Ϟ Â ' 10–20 Â **all** ΰ Ħ ϟ VLAN " ↑ ΰ VLAN ˇ **add** VLAN " ╗ ϟ VLAN " ' **remove** VLAN " ÿ ϟ VLAN " ╕ ' **except** " VLAN " VLAN ╗ ϟ VLAN " '

Trunk ϟ VLAN " й ϟ VLAN ˘ **no switchport trunk allowed vlan** Ϟ Ħυ ϗ Â

Ю У VLAN 2 ÿ Ϟ 1/15 '

```
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
Acsess vlan is 1,Native vlan is 1
Protected is disabled
Vlan lists is
```

1,3-4094

Native VLAN

У Trunk ٨ ٦ TAG UNTAG 802.1Q Â è UNTAG Native VLAN Â Native VLAN VLAN 1 Â

ج Ю ٦ Л υ й У Trunk ٨ Native VLAN Â

ħ υ ٩	
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	Native VLAN

Trunk Native VLAN " ھ VLAN 1 **no switchport trunk native vlan** ٨ ħ υ ٩ Â

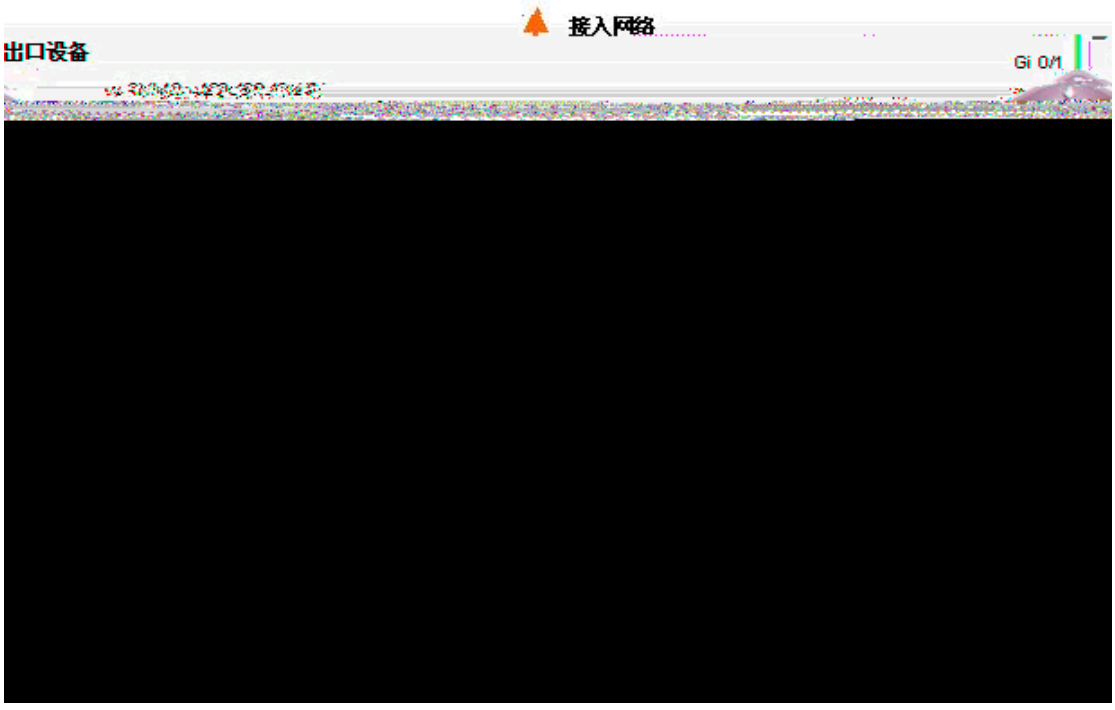
У Native VLAN VLAN ID ج Trunk ٨ ٦ ˘ ╟ Ω ٧ TAG Â

У ٨ Native VLAN й У a ج VLAN ˘ a VLAN " Ω ٧ VLAN Â Ċ

```
GigabitEthernet 3/11
GigabitEthernet 3/12
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 ف ي ˘ , ↑ и VLAN 10 à VLAN 20 à VLAN 30 Л ↓
2 ' 3 VLAN IP

```
#       ╗      ∧      ┘ vlan ℓ 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
#       ╗      ∧      ┘ vlan ℓ 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
#       ╗      ∧      ┘ vlan ℓ 20 à 30
Ruijie(config-if)#switchport trunk allowed vlan add 20,30
#   ﻫ
Ruijie(config-if)#exit
```

Â ﺟ Э vlan

```
#      vlan   ˘  ↑   vlan id à ﻝ  à   à ↑     ∧

Ruijie#show vlan

VLAN  Name      Statusssssssssssssssss989( )Tj/TT2 1 Tf-0.0001 T401 Tj/TT2 1 Tss
```

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

```
#       ٨ 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
```

Â ... SVI ٨˜ IP فخ سم

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

2. Switch A Э

a) ... VLAN

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

b) ьй ٨ VLAN¦ Access ٨

```
#       ٨  تن Gi 0/2-12
Ruijie(config)#interface range GigabitEthernet 0/2-12
#     ٨ Gi 0/2-12      ь Access ٨
Ruijie(config-if)#switchport mode access
#     ٨ Gi 0/2-12¦       VLAN 10
Ruijie(config-if)#switchport access vlan 10
#       ٨  تن Gi 0/13-24
```

```
Ruijie(config-if)#interface range GigabitEthernet 0/13-24
#     ٨ Gi 0/13-24     ٭ Access ٨
Ruijie(config-if)#switchport mode access
#     ٨ Gi 0/13-24¶      VLAN 20
Ruijie(config-if)#switchport access vlan 20
#   ٱھ
Ruijie(config-if)#exit
```

c) Э trunk ٨

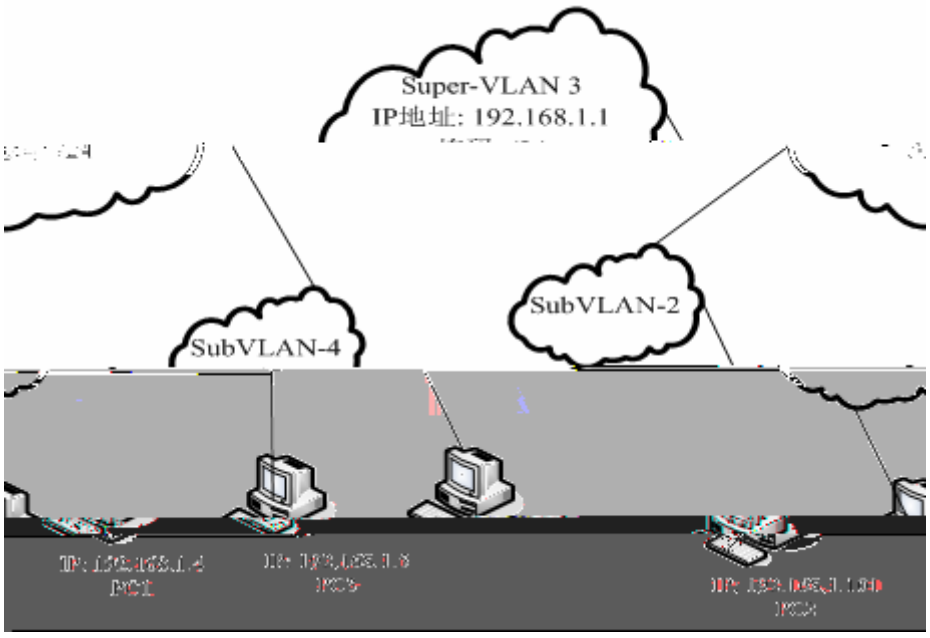
```
#       ٨ Gi 0/1
Ruijie(config)#interface GigabitEthernet 0/1
#         ٨ Gi 0/1    ٭ trunk ٨
Ruijie(config-if)#switchport mode trunk
#   ٱھ
Ruijie(config-if)#exit
```

Super VLAN

Super VLAN

Super VLAN VLAN , Super VLAN VLAN(Sub VLAN) Sub VLAN Super VLAN Sub VLAN Sub VLAN Super VLAN IP VLAN IP Sub VLAN Sub VLAN ARP ARP ARP Super VLAN Sub VLAN ARP

Super VLAN IP Sub VLAN Super VLAN IP



1

Sub-VLAN

Sub VLAN2 Sub VLAN4 Super VLAN3 Super VLAN3 IP

Super VLAN ٨

Sub VLAN Þ , ¨I … SuperVLAN Þ ٨ Â

SuperVLAN SVI ٭ ٨

ج Ю Ю " Â

Þυ ٹ	
Ruijie# **configure**	
Ruijie(config)# **interface vlan** *vlan-id*	SVI
Ruijie(config-vlan)# **ip address** *ip mask*	٨ IP فخ سم
Ruijie(config-vlan)# **end**	ھ
Ruijie# **show run**	ɱ ٨

VLAN ٹ ARP ٦

٦ Л Ю Þυ ٹ VLAN ٹ ARP ٦ ˘ ÿ SubVLAN Â Ю ٦ Â

ج Ю Ю " Â

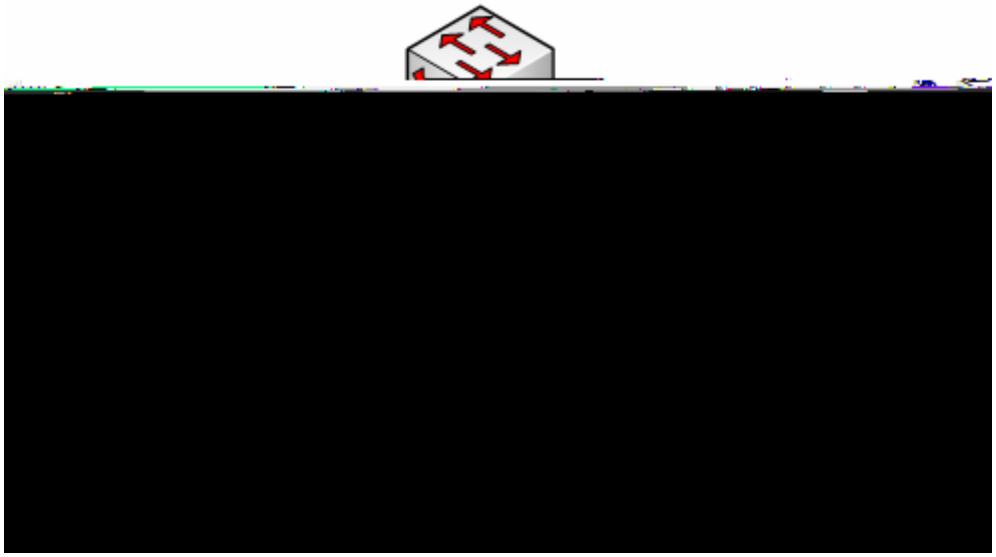
Þυ ٹ	
Ruijie# **configure**	
Ruijie(config)# **vlan** *vlan-id*	VLAN
Ruijie(config-vlan)# **proxy-arp**	VLAN ARP ٹ ٦
Ruijie(config-vlan)# **end**	ھ
Ruijie# **show run**	ɱ ٨

no proxy-arp Vlan ٹ ARP ٦ Â

supervlan

٦ Л Ю Þυ ٹ SuperVLAN

Þυ ٹ	
Ruijie# **show supervlan**	supervlan



2 في

Э في SuperVLAN ˘ SubVLAN2 Ո SubVLAN4 ў ⅃ Ո
˘ è Ю' ^ ⅃ " ĵ ~

```
vlan 1

vlan 2
```

SubVLAN 2 Ю IP فخ سم

```
subvlan-address-range 192.168.1.1 192.168.1.100
!
vlan 3
supervlan
subvlan 2,4
!
vlan 4
```

SubVLAN 4 Ю IP فخ سم

```
subvlan-address-range 192.168.1.101 192.168.1.254
!
interface FastEthernet 0/23
```

й SubVLAN2 ╗ ˜ ⅄

```
switchport access vlan 2
!
interface GigabitEthernet 0/25
```

й SubVLAN4 ╗ ˜ ⅄

Protocol VLAN

Protocol VLAN

ʌ ˆ ˘ VLAN ˆ ˘ ˌ У У
VLAN˘ ЛЬЮ Ь ˩ '

1. VLAN ID ˆ UNTAG Priority ˜ ˘ ﷺ
ʌ VLAN ˆ ˘ ╗ TAG Â 0ßt[#ßÁa4WßNVlO ˆ UNTAG Priority ˜ ˘

Protocol VLAN

Protocol VLAN

Protocol VLAN

profile

configure terminal profile rame-type **ypA**

2. æ Profile ˘ ˝Ì Profile˘ Ą Profile
3. a ˩ ң ҏ Profile a ˩˘ S3750 7 profile Â

profile

˩ Л Ю :

Ьυ ҳ	
configure terminal	
interface [˄ *ID*]	˄
protocol-vlan profile *id* vlan *vid*	profile ˆ ˄
no protocol-vlan profile	˄ Э profile
no protocol-vlan profile *id*	˄ Э profile
end	˄

Ю profile 1 Ո profile 2 ˆ 3 GE ˄ 1,VLAN ˆ й VLAN 101 Ո 102:

```
Ruijie# configure terminal
Ruijie(config)# interface gi 3/1
Ruijie(config-if)# protocol-vlan profile 1 vlan 101
Ruijie(config-if)# protocol-vlan profile 2 vlan 102
Ruijie(config-if)# end
Ruijie# show protocol-vlan profile
profile          frame-type  ether-type     Interfaces|vid
-------      ---------   ----------     --------------
1            ETHERII     EHTER_AARP     gi3/1|101
2            SNAP         ETHER_APPLETALK  gi3/1|102
```

&

˄ Э ˩ Л profile

˩ profile æ a ˩ ˄ Э ˩ Л a ˩ vid

a ˩ " ң ҏ ˩ Л VID a ˩˘ S3750 " ˩ Л 4094 VLAN Â

Protocol VLAN

ㄴЛъ ЛъЮ Protocol VLAN

ђυ ҳ	
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

ЮЎ Private VLAN

VLAN й VLAN

ЮЋu ҳ

Ћu ҳ	
configure terminal	
vlan *vid*	VLAN
private-vlan{**community	isolated	primary**}	VLAN ص
no private-vlan{**community**	**isolated**	**primary**}	۷ VLAN
end	VLAN
show vlan private-vlan [*type*]	VLAN

&

ج 802.1Q Vlan é ˜ ۷ a й VLANЎ VLAN 1 a й VLANЎ é Trunk ۷ Uplink ۷ 802.1Q VLAN ˇ ˝I VLAN ÿ ۦ VLAN " ╕ ˇ У Private VLAN ACTIVE ЛЬЮ ˚ '

1) é Priamry VLAN

2) é Secondary VLAN

3) Secondary VLAN б Primary VLAN

```
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  inactive  Disabled             no association
404 isol  inactive  Disabled             no association
```

Secondary VLAN ∩ Primary VLAN

ЮO Secondary VLAN ∩ Primary VLAN

&

ж й Primary VLAN VLAN Â

Secondary VLAN Ո Primary VLAN Ь ٨

٦ Л Ю '

Ьυ ٩	
configure terminal	
interface vlan *p_vid*	Primary VLAN ٨
private-vlan mapping {*svlist* | **add** *svlist* | **remove** *svlist*}	Secondary VLAN ↑ Primary VLAN SVI Ь Â
end	٨

Ю Secondary VLAN '

```
Ruijie# configure terminal
Ruijie(config)# interface vlan 202
Ruijie(config-if)# private-vlan mapping add 303-307,309,440
Ruijie(config-if)# end
Ruijie#
```

&

Primary VLAN Ո Secondary VLAN Â

γ ٨ й VLAN ў ٨

ЛЮ γ ٨ й VLAN ў ٨ (Host Port)'

switchport mode private-vlan host	й γ
no switchport mode	VLAN

Ю '

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitEthernet 0/2
Ruijie(config-if)# switchport mode private-vlan promiscuous
Ruijie(config-if)# switchport private-vlan mapping 202 add 203
Ruijie(config-if)# end
Ruijie#
```

&

Primary VLAN Ո Secondary VLAN

Private VLAN

private VLAN

ۍ Ո ՈЮ Private VLAN '

```
Ruijie(config-vlan)#private-vlan primary
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 100
Ruijie(config-vlan)#private-vlan community
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 101
Ruijie(config-vlan)#private-vlan isolated
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 99
Ruijie(config-vlan)#private-vlan association 100,101
Ruijie(config-vlan)#exit
```

ٰ 0 1 0 2 Community VLAN 100, ٰ 0/3 Isolated VLAN 101, ٰ 0/4 Promiscuous Port

```
Ruijie(config)#interface gigabitEthernet 0/1
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
100
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/2
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
100
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/3
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
101
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/4
Ruijie(config-if)#switchport mode trunk
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/5
Ruijie(config-if)#switchport mode private-vlan promiscuous
Ruijie(config-if)#switchport private-vlan mapping 99 add
100-101
Ruijie(config-if)#show vlan private-vlan
VLAN    Type              Status      Routed      Ports
Associated VLANs
----- ---------- -------- -------- -------------------------
99       primary       active     Disabled  Gi0/4,  Gi0/5
100-101
100  community  active  Disabled Gi0/1, Gi0/2, Gi0/4      99
101  isolated   active  Disabled Gi0/3, Gi0/4            99
```

´ Ѧ Ь Э Private VLAN

ج Private VLAN Ь Э˘ ٦ Л ѝ Private VLAN У G!5Bр

```
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 99
Ruijie(config-vlan)#private-vlan primary
Ruijie(config-vlan)#private-vlan association 100,101
Ruijie(config-vlan)#exit
```

ฺ ỏ 1 Ո ỏ 2 Community VLAN 100ˇ ฺ 0/3 Isolated VLAN 101ˇ ฺ 0/4 ข Promiscuous Port Â

```
Ruijie(config)#interface gigabitEthernet 0/1
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
100
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/2
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
100
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/3
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
101
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/4
Ruijie(config-if)#switchport mode private-vlan promiscuous
Ruijie(config-if)#switchport private-vlan mapping 99 add
100-101
Ruijie(config-if)#exit
```

SeTj d9wian A403 Tm [(Private VLA)-7(N)]8g

802.1Q tunneling

802.1Q tunneling

ـا ك ك VLAN ـا VLAN ID
Â ـا ـا ـك VLAN ـتن ـا ـا ـا ـا ـا ـا ـا
ك ـا ـجـ ـا Â ـا VLAN ـتن
ـ ـ ـ VLAN ـا 802.1Q ـ 4096 Â

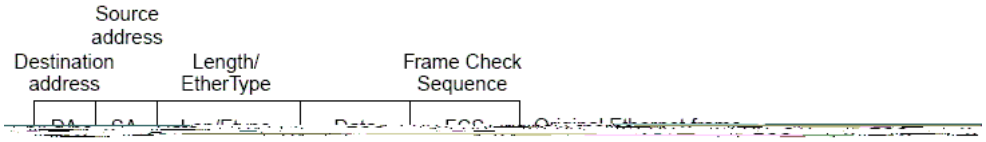
IEEE 802.1Q Tunneling( )ـ ـ ـك ـا ـا ـا VLAN(ـك VLAN)
VLAN Â VLAN
ـك ـا VLAN ـا ـ ـجـ ـك ـ Â
ـا Tag VLAN ـتن ـا IEEE 802.1Q Tunneling( )
ـا ـ ـا (Tunnel Port) Â ـ ـا ـا ـا VLAN
ـ ـ VLAN Â ـ ـا ـك VLAN ـجـ
ـك ـك VLAN ـا Tag ـ ـا ـك VLAN ـجـ
Â

ÿ è ـا TRUNK ـا 802.1Q TAG ـ ـك
ـا Â ـ ـك ـ (Asymmetric
Link) ـ ـ ـا ـا Trunk Port ـا ـا ـا Tunnel Port Â ـا
Tunnel Port ç ـا VLAN Â Ю ـفي

1 ـفي

ÿ Trunk Port ـ ـك ـا ـا
Vlan ID IEEE 802.1Q Tag Â ـ ـا ـا ـ ـ ـا
802.1Q Tag (ـ ـك Tag) Ü ـا ـا VLAN ID VLAN ID

a ل Â TAG جه Â ؤ ك ـا
Ə ل Tag ّ Tag VID ّ Tag ‡
VID Â Юفي ل Tag ╕ '



2 في

ل Tag ÿ Tunnel Port ˘ ك ـا Tag ٧ّ ل هى ٧
802.1Q ˘ VLAN Â

Untagged ʻUntagged
Æ u Tag Ո
VLAN ٨ (Access VLAN) Â ـها Tag . Tunnel port
. ″I (˘ ий 0) Â

في ˘ A ç VLAN 30ّ B ç VLAN 40 Â
ɣ ¨ Tagّ ий ل Tagّ ـا ك Tag ↑ ŭ
ag ↑ ŭ ٧ VLAN ˘ VLAN 100 Â
VID 100ّ Tag VID a
ؤ Â ل ЛЮ؟ è VLAN تنّ
ـا ك Â

802.1Q tunneling

↑ ЛЮЮ '

- 802.1Q Tunneling
- 802.1Q Tunneling ´
- 802.1Q Tunneling 8
- У 802.1Q Tunneling ٨
- У Uplink ٨
- ـا ك Tag TPID

¸ Tag . ″I ⁸

802.1Q tunneling

ЮЎ 802.1Q ╖ '

802.1Q tunneling ´

802.1Q ˘ Ո 802.1Q У (Asymmetric Link)Ў ж У VLAN Â ⅄ Native VLAN Ո Â

Native Vlan ' ج У 802.1Q ˘ 802.1Q Trunk ∀ У ∀ Â ج ㄴ ك ˘ ⅃ 802.1Q Trunk, Trunk ∀ Â TRUNK ˘ Э TRUNK ∀ Native VLAN б Tunnel port ACCESS VLAN a ⅄Ў ﭫ й Vid й Native VLAN ÿ Trunk ∀ ㄱ ˘ Tag Ω Â

' ﭫ й 802.1Q Tunneling ∀ ╖ 4 ㄴك VLAN TagЎ ÿ 1518 ╖ⁱ 1522 Â

Uplink ∀' Up-link ∀ è ㄴك Э ∀ Â Э ﻓﻲ 1 ㄴك Trunk PortsЎ Uplink ∀ è У Trunk ∀Ў a ⅄ ˘ ÿ Uplink ∀ Tag Â ÿ Trunk Port ˘ Native VLAN ㄱ ˘ ‡ a tag Â

Tag . ″I ⁸' ج ㄱ TAG ЮЎ Tag(Tag) . ″I ⁸ ⁱ Tag(ㄴك Tag) Â

802.1Q tunneling ⁸

802.1Q tunneling Ю ⁸'

¸ ∀ a й Tunnel Port

¸ Ap ∀ ⅃Л Tunnel Port

¸ й Tunnel ∀ a Ѧ ŭ 802.1x ╖ Â

¸ й Tunnel ∀ Э a ŭ Â

¸ й Tunnel ∀ Э a ╖ STP Â

¸ й Tunnel ∀ Э a ŭ GVRP Â

¸ й Tunnel ∀ System-guard Â

У 802.1Q tunneling ٨

æ Ю Interface ћu ҳ ٨ Â Ю Tunnel Port '

ћu ҳ	
configure terminal	
interface <*interface*>	٨
switchport access vlan <*vid*>	Access VLAN Â Access VLAN a ⊿
switchport mode dot1q-tunnel	٨ 802.1Q Tunnel
end	٨
show running-config	

&

٨ a ѝ Tunnel Portˇ ѝ Tunnel ٨ System-guardˇ a ў GVRPˇ a ╗ STP ˘ a ў ˘ a ў 802.1x Â

Ю У 802.1q Tunneling ٨ '

```
Ruijie(config)# interface fastEthernet 0/1
Ruijie(config-if)# switchport access vlan 22
Ruijie(config-if)# switchport mode dot1q-tunnel
Ruijie(config)# end
```

У uplink ٨

æ Ю **Interface** ћu ҳ ٨ Â Ю Tunnel Port '

ћu ҳ	
configure terminal	
interface <*interface*>	٨
switchport mode uplink	٨ ѝ uplink ٨
end	٨

Ю У ٨ '

```
Ruijie(config)# interface gigabitEthernet 0/1
```

```
Ruijie(config-if)# switchport mode up-link
Ruijie(config)# end
```

ㄴك Tag TPID

ᄒ Ю Interface ћu ҙ ᄭ Â Ю
'

ћu ҙ	
configure terminal	
interface <*interface*>	ᄭ
frame-tag tpid <*tpid*>	tag TPID Â ᄊ 0x9100 Â ᄎ frame-tag tpid 9100 Â 16 ᄋ Â
end	ᄭ
show frame-tag tpid	ᄭ tpid " Â

Ю TPID '

```
Ruijie(config)# interface gigabitethernet 0/1
Ruijie(config-if)# frame-tag tpid 9100
Ruijie(config)# end
Ruijie# show frame-tag tpid interface gigabitethernet 0/1
Port   tpid
------- -------------
Gi0/1  0x9100
```

Tag . ″l ᄋ

ᄒ Ю **Interface** ћu ҙ ᄭ Â Ю
'

ћu ҙ	
configure terminal	
interface <*interface*>	ᄭ
inner-priority-trust enable	ᄋ tag(tag) priority ᄭ tag priority (ㄴك tag) Â
end	ᄭ
show inner-priority-trust	Tag . ″l ᄋ Â

Ю Tag . ″I 8 '

```
Ruijie(config)# interface gigabitethernet 0/1
Ruijie(config-if)# inner-priority-trust enable
Ruijie(config)# end
Ruijie# show inner-priority-trust interface gigabitethernet 0/1
Port   inner-priority-trust
------   -------------------
Gi0/1  enable
```

MAC

, جم Ю, فخ سم , 3 فخ سم ل ע
a Â Ю:

A Ո B ىچ ٨, A ى ў . A Ո B ر ل .
, A Ո B فخ سم , ٨ ً فخ سم a ر .
ل B Э У mac1+vid1+Bport فخ سم , جم A Э .
فخ سم ≠ ٱ فخ سم . فخ سم .

mac1 (pc) ÿ B Bport ٱ A Aport ,
mac1+vid1 فخ سم ً , A فخ سم , з ٧ ″I a جم
mac1+vid1 فخ سم , Л Ъ ٱ فخ سم , ىچ ٨ ٧ ٱ B, B
ل mac1+vid1 فخ سم جم , B mac1+vid1+Aport فخ سم
mac1+vid1+Bport فخ سم . 8 فخ سم mac1+vid1+Bport فخ سم
ٱ , B ٱ mac1+vid1+Aport فخ سم . يج , .
ע , فخ سم mac1+vid1+Bport ≠ a ע .
╟ فخ سم , Ъ ٹ **clear mac-address-table dynamic**.

فخ سم

فخ سم ╕ MAC فخ سم Â فخ سم Ո ╟ فخ سم ╕ ر˘ a ╟
فخ سم ˘ فخ سم ٧ Ո╕ (a ً Ո ע)˘ فخ سم ل Л Ъ
جم ˚ ˘ . Æ˘ فخ سم ≠ a Â

فخ سم

فخ سم ╕ MAC فخ سم Â ٱ Л Ъ فخ سم ى فخ سم ↑
Â فخ سم a ע˘ ٧ Ո╕ ˘ فخ سم ل Л Ъ
ٱ ˚ ˘ . Æ˘ فخ سم ≠ a Â

У ˘ ل Л Ъ MAC فخ سم ى
فخ سم˘ б Â

MAC فخ سم Ո VLAN

MAC فخ سم Ո VLAN ˘ ر MAC فخ سم ل Л Ъ جم VLAN
جم˘ a ر VLAN فخ سم ل Л Ъ a ر ٨ Â VLAN
Э У فخ سم Â У VLAN ً MAC فخ سم˘ è VLAN ل
˘ ÿ ً Â

MAC فخ سم

MAC فخ سم

Ю فخ سم '

فخ سم لا	300
╟ فخ سم	╟ ¯
فخ سم	فخ سم
فخ سم	فخ سم

~

فخ سم لا б جم У ˘ a 2 Â

لا فخ سم

Ю ѝ فخ سم لا '

ħυ ϟ	
Ruijie(config)# **mac-address-table aging-time** [*0 |10-1000000*]	У سم فخ ¯ ˙ جم ╟ ˙ ˘ Æ ˘ فخ تن 10̆ 1000000 ˘ ѝ 300 Â ѝ 0 ˘ فخ سم لا ╖ ˘ ¯ ˚ سم فخ a لا Â

ϟ Л∪ جم Ю ħυ ϟ **no mac-address-table aging-time** فخ سم لا ѝ Â

╤ ╟ فخ سم

جم Ю˘ ϟ Л∪ ħυ ϟ **clear mac-address-table dynamic**╤ Э ╟ فخ سم' ϟ Л∪ ħυ ϟ **clear mac-address-table dynamic address mac-address** ╤ У MAC فخ سم ' ϟ Л∪ ħυ ϟ **clear**

mac-address-table dynamic interface *interface-id* ╕ У ∧
Aggregate Port

ل ل ت جم Ю Ьu ٹ **no mac-address-table filtering mac-addr vlan** *vlan-id* ĵ У فخ سم Â

Ю VLAN 1 MAC فخ سم ѝ 00d0.f800.073c

```
Ruijie(config)# mac-address-table filtering 00d0.f800.073c
vlan 1
```

MAC فخ سم

MAC فخ سم

MAC سم فخ ل لا ╖

ЮЎ MAC سم فخ ˘ ٨ MAC سم فخ ╖ ≠ كا
Â

MAC سم فخ ╖ '

hU ٩	
Ruijie(config)# **snmp-server host** *host-addr* **traps** [**version** {**1**|**2c** |**3** [**auth** | **noauth** | **priv**]}] *community-string*	MAC سم فخ NMS Â host-addr ' IP. Version' ل ف Trap. community-string' ل Trap Э ل

Ruijie (config)#**snmp-server**

MAC سم فخ ل لا

جم ЮЎ ل Лъ Ю " ћъ ҷ MAC فخ سم '

ћъ ҷ	
Ruijie# **show mac-address-table notification**	MAC سم فخ ل لا ╗
Ruijie# **show mac-address-table notification interface**	٨ MAC سم فخ ل لا
Ruijie# **show mac-address-table notification history**	MAC سم فخ ل لا ٦ ل

Ю MAC سم فخ ل لا У Â

MAC سم فخ ╗ '

```
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
```

IP ∩ MAC فخ سم

╟ IP ∩ MAC فخ سم ╖ ˘ ┘ Л∪ ⁸ Â
У IP سم فخ ∩ У MAC سم فخ ˘ ‡ ┘ IP سم فخ ∩
MAC سم فخ ک ┐ سم فخ IP ' ї ‡ Â

– سم فخ ˘ ┘ Л∪ ш ⁸ ⁄ Â
˘ سم فخ ⁸ ˘ ˙ ”I 802.1X à ┘ Л∪ ┤ ACL
Â

سم فخ

ج Ю˘ ┘ Л∪ Л∪Ю سم فخ '

ħυ ҂	
Ruijie(config)# **address-bind** *ip-address mac-address*	IP سم فخ ∩ MAC سم فخ
Ruijie(config)# **address-bind install**	ŭ ╖

┘ Л∪ ج Ю **no address-bind** *ip-address mac-address* ┘
IP سم فخ ∩ MAC سم فخ Â

no address-bind install ħυ ҂ ┘ ╖ Â

سم فخ

┘ Л∪ ج Ю **show address-bind** ħυ ҂ IP
سم فخ ∩ MAC سم فخ '

```
Ruijie# show address-bind
Total Bind Addresses in System : 2
IP Address      Binding MAC Addr
----------      ----------------------
3.3.3.3         00d0.f811.1112
3.3.3.4         00d0.f811.1117
```

IPV6 IPV6 :

ÿ IP

Ruijie# **configure terminal**	
Ruijie(config)# **address-bind ipv6-mode compatible**	ipv6
Ruijie(config)# **address-bind ipv6-mode loose**	ipv6
Ruijie(config)# **address-bind ipv6-mode strict**	ipv6
Ruijie(config)# **no adress-bind ipv6-mode**	ipv6

IP 192.168.5.2 00d0.f822.33aa
IPV6

```
Ruijie# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# address-bind 00d0.f822.33aa ip 192.168.5.2
Ruijie(config)# address-bind ipv6-mode compatible
```

IPV6 **DHCP Snooping** MAC+IP
MAC+IP IPV6
IPV6

	Ipv4	**IPV6**
	IPV4+MAC	IPV6
Ce	IPV4+MAC	IPV6

ЪU ҳ	
Ruijie# **configure terminal**	
Ruijie(config)# **address-bind uplink** *intf-id*	فخ سم ٨
Ruijie(config)# **address-bind install**	فخ سم ٨

ل ЛU جم ЮO **no address-bind uplink** *interface-id* ل ٨
no address-bind install ل ٨ Â

فخ سم ٨

ل ЛU جم ЮO **show address-bind uplink** ЪU ҳ
فخ سم ٨'

```
Ruijie# show address-bind uplink
Ports       State
------------ ------
Fa0/1       Enabled
Fa0/2       Disabled
Fa0/3       Disabled
Fa0/4       Disabled
Fa0/5       Disabled
Fa0/6       Disabled
Fa0/7       Disabled
Fa0/8       Disabled
Fa0/9       Disabled
Fa0/10      Disabled
```

DHCP Snooping

DHCP Snooping Ӯ

DHCP

DHCP ˜ ╟ ↑ ↵ ˇ IP ﻓﺨﺴﻢ Â У ﺻﺮ ή
DHCP ↵ IP Ю '

1 ﻓﻲ

DHCP Client ↵ DHCP DISCOVER DHCP Serverˇ Client ﺟﻢ У
↑ ┡ ⅄ : ˇ ‡ ↵ DHCP DISCOVER Â

DHCP Server ↑ DHCP DISCOVER ⅄ˇ У Client↑
(IP ﻓﺨﺴﻢ)ˇ ⅄ ↵ DHCP OFFER Â

DHCP Client ↑ DHCP OFFER ⅄ˇ ↵ DHCP REQUEST ˇ
↵ ┡ ⅄ ˇ ˆ ε ┡ ⅄ ↵ ┡ ⅄↑ ﻓﺨﺴﻢ Â

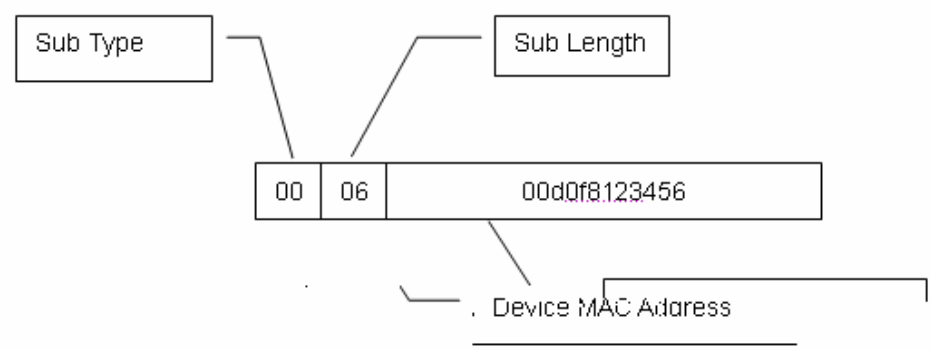
┡ ⅄ ↑ DHCP REQUEST ˇ ї ↵ Ⅱ↑ ˇ ↵ Ⅱ↑ ˇ ‡
↵ DHCP ACK ' a ↵↑ ˇ ‡ ↵ DHCP NAK Â DHCP Client
↑ DHCP ACK ˇ ┡ ⅄↑ Â ↑ DHCP NAKˇ
‡ ↵ DHCP DISCOVER Â

DHCP Snooping

DHCP Snooping . DHCP ˜ ↵ Ⅱ ∩ ┡ ⅄ DHCP
ˇ ↵ Ⅱ ⅄ DHCP ˇ DHCP ┡ ⅄ Â ⅡЮ

2 في

Agent Remote ID



3 في

DHCP Snooping فخ سم ╖

DHCP snooping فخ سم ╖ DHCP ˘ ⁄
(IP فخ سم à MAC à VLAN à PORT à) ˘ DHCP snooping
Â DHCP snooping ╖ˆ IP ˚ ˘ ÿ
⁸ ˪ DHCP snooping ⁄ ˪ IP ˘
IP فخ سم Â

DHCP Snooping Bootp

DHCP Snooping ﷺ DHCP ˜ ⁸ ╖ ˘ Bootp
a Â ў ﭺ ﻯ ﺝ Bootp a ﺝ DHCP Option˘ ' ﺹ à
Â ﭺ DHCP Snooping Bootp
⁸ Â

ﻉ ˘ DHCP Snooping ╖ ˘
╖ Bootp ˜ Â DHCP Snooping DHCP
˪ ˘ ╖ Bootp ˘ ⁄ Bootp ˘ ˪ IP
فخ سم à MAC فخ سم à ˪ ˪ VLAN ˘ ╖ У ˆ DHCP
Snooping Â

Bootp ﺝ DHCP Snooping У ˘ ˪
˪ Â ﺝ Bootp ╟ ˘ ˆ ˪
˪˘ ˘ ╟ ћu ʒ ˆ Â

DHCP snooping ╖

DHCP Snooping فخ سم ˪ IP ˘ a ARP Â

ѝ ╗ ˘ ARP ˘ ARP Â ARP
˘ ┘ Л Ъ ┐ ARP-CHECK à DAI ˜

DHCP Snooping è Y

1¨ DHCP Snooping ╗ б DHCP Relay Option 82 DHCP Snooping ˆ DHCPy Otion 82

Ruijie(config)# [**no**] **ip dhcp snooping bootp-bind**	Ո DHCP snooping Bootp

Ю DHCP Snooping ╖ '

```
Ruijie# configure terminal
Ruijie(config)# ip dhcp snooping bootp-bind
Ruijie(config)# end
```

MAC ╖

Ю˘ MAC ╖ й Â ╖ ˅ DHCP Snooping
UNTRUST ˄ Э DHCP У Â
MAC Ո DHCP CLIENT MAC ˅˘ ˘ ‡
' Ї ‡ ˘ ‡ Â

Ђυ ҂	
Ruijie# **configure terminal**	
Ruijie(config)# [**no**]**ip dhcp snooping verify mac-address**	Ո MAC ╖

Ю MAC ╖

```
Ruijie# configure terminal
Ruijie(config)# ip dhcp snooping verify mac-address
Ruijie(config)# end
```

Ю˘ a ج Â ج Ю˘
IP فخ سم ˘ ˃ Л╚ ╖ Â

Ђυ ҂	
Ruijie# **configure terminal**	
Ruijie(config)# [**no**] **ip dhcp snooping binding mac-addrees vlan** *vlan_id* **ip** *ip-address* **interface** *interface-id*	DHCP Snooping

Ю ╕ У '

```
Ruijie# configure terminal
Ruijie(config)# ip dhcp snooping binding 00d0.f801.0101 vlan
1 ip 192.168.1.1 interface fastethernet 0/9
Ruijie(config)# end
```

~

1

ЮDHCP snooping فذ سه ╖ '

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

DHCP Snooping Flash ▾

ЮЎ ╖ Â и ў ╟ ⁄ˇ DHCP Snooping
╟ ˇ DHCP Snooping ╟
Flash ▾ ╖ Â

ћU ҂	

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

ħυ ϡ DHCP Snooping '

ħυ ϡ	
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

ħυ ϡ DHCP Snooping Â

ħυ ϡ	
Ruijie# **debug ip dhcp snooping {event | packet}**	/ DHCP Snooping

'

```
Ruijie# debug ip dhcp snooping event

Ruijie# debug ip dhcp snooping packet
```

IGMP Snooping

IGMP

جھ IGMP ﻡﻣ ˝I Ў IP ⊣ Â

جھ Internet Э˘ Ո ´ ⊣ Ь جھ
ѝ ¦ Â ´ a У Ь
˘ ﻕ ѝ Ь ⋋ ѝ У У ⊿ IP ˘ ⊿
Э ≠ ﺳﻣ ⊿ ˘ ´ ˘ IP ⊿ a
˘ IP У ў У IP ⊣ ⊿ У ў ˘
a ў ˘ ﻕ Â جھ Ю
ˆ Multicast˜ ˘ ā У ў ⊿ ⊣
Â Юﻓﻲ Â

1 فهي

IP У IP ⅃ У “ ў ” ˘ ↑ ΰ 0 ў ў
У ´ IP ﻓﺨ ﺳﻢ Â

ў ﺳﻢ ﺨ ﻓ ≠ ﻯ “ ﺳﻢ ﺨ ﻓ ”˘ ﻧ ﻯ D ﺳﻢ ﺨ ﻓ˘ . ÿ 224.0.0.0 ~
239.255.255.255 Â 224.0.0.0~224.0.0.255 ﺳﻢ ﺨ ﻓ˘ è '

¸ 224.0.0.1 · ў
¸ 224.0.0.2 ·

2 ﺳﻢ ﺨ ﻓ^ MAC ﺳﻢ ﺨ ﻓ˜ ÿ IP ﺳﻢ ﺨ ﻓ Â IP ⅄
23 Æ ⅃ 01-00-5e-00-00-00 ˆ MAC ﺳﻢ ﺨ ﻓ Â '
IP ﺳﻢ ﺨ ﻓ ﻯ 224.255.1.1˘ È˘ Ὼ ⁸ ﻯ e0-ff-01-01˘ ⅄ 23 Æ ﻯ 7f-01-01˘ б
01-00-5e-00-00-00 ﻯ' 01-00-5e-7f-01-01 Â 01-00-5e-7f-01-01
. ﻯ 224.255.1.1 MAC ﺳﻢ ﺨ ﻓ Â

IGMP(Internet Group Management Protocol) ˜ ў Ո б ў
˘ ў ˜ ˆ ﺳﻢ ╗ ﻧ
˘ ⅃ ˜ ﺳﻢ ﻢﻬ ˜
ї ╟ ^ . ї ÿ ˜ ~ ˘
˜ б Â Â ɱ Ь IGMP' IGMPv1 ﺞﻤ RFC1112
˘ IGMPv2 ﺞﻤ RFC 2236 ˘ IGMPv3 ﺞﻤ RFC3376 Â

Ю ˘ ˆ ⋮ Ў ﺞﻤ IGMPv1 à IGMPv2 ў ╗ У
^ ╗ 224.1.1.1˜ Â

IGMPv1 ˘ ў ⅃ Э ⋀ ⅂ 224.1.1.1 IGMP Report ˘
╗ Â ˆ ˘ ‡ ﻯ ˆ ⋀ Ю ﺞﻤ
˜ ˘ ﺞﻳ ⋀ ⅂ Â Ь ⋀ ⅂ 224.0.0.1
^ ў ˜ IGMP Query ˘ ў ˘ ‡ ﻫ IGMP
Report ˘ ⋀ a ˆ ў IGMP Report ˘ ‡ ﻯ ⋀
Ю a ﺞﻤ ˜ ˘ ﺞﻳ a ⅄ ⋀ ⅂ Â

IGMPv2 ⅄ Ю v1˘ —— ╗ IGMP Leave ˘ Л ў
⅂ Л ў ╟ Â ﺞﻤ IGMPv2 ˘ ў ╗ ⅄ v1 У ˘ ў
⅂ У IGMP Report ╗ ˆ У Â ⅂ 224.0.0.1
IGMP Query ˘ ў ˘ ‡ ﻫ IGMP Report ˘
a ˆ ў IGMP Report ˘ Â ﺞﻤ IGMPv2 ˘
ў ⅂ Л ў ╟ У Â ў a Ά У ˘ ў ╟
⅂ IGMP Leave ÿ Â ˆ IGMP Leave ⅄˘ ⅂
IGMP Query ї ﺞﻤ è ў
Â è ў ˘ ‡ ﻫ IGMP Report Â
a ˆ ў ﻫ ˘ Â

ﺞﻤ IGMP v1/ v2 ﻣﻣ Э˘ IGMP v3 ╗ Â IGMPv3 ⅄
⅄ IGMPv2 ⅄ Â ﺞﻤ IGMP v1/ v2 ˘ ў ⋀ ﺳﻢ ﺨ ﻓ
ā ╗ ÿ У ⅂ ﺳﻢ ﺨ ﻓ Â IGMP v3
ў a ^ ў ╗ ˘ ⅄ ^ ў
ﺳﻢ ﺨ ﻓ Â ў ⅂ Л У ↑ " У " ÿ ف

Â ل IGMP v3 ا У ˘ a à
´ ˘ è جھ У فذ سم
Â

ل IGMPv2 ˘ IGMPv3 ЛЬЮ ч صر' Membership Query à
Version 3 Membership Report Â è Membership Query ĵ ѝ Ь '

¸ General Query' ٨ Ю ˜ ,

¸ Group-Specific Query' ٨ Ю ˜ ,

¸ Group-and-Source-Specific Query' صر ѝ IGMPv3 ╗ ˘
٨ Ю ĭ ˜ " ч Â

IGMP Version3 ل ل Ю IGMP Version1 Ո IGMP Version2 Â
IP ˘ RFC 1112 à RFC 2236 Лъ ا RFC 3376 Â

IGMP Snooping

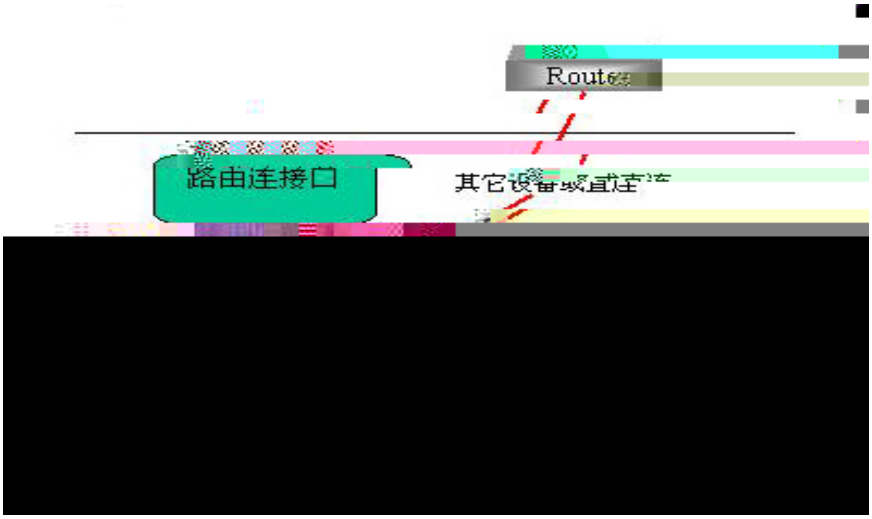
جھ γ (Layer2) Ю˘ ѝ ч ˘ ˘
Â Э ѝ صر ˘ جھ VLAN ˘
Ѧ ˘ ѫ VLAN ˜ ĵ ˘
ĭ Â

IGMP Snooping ā ˘ ٨ Ѧ جھ
٨ ч˘ ÿ a ;ĵ è Â

IGMP Snooping جھ Лъ γ Э ˘
Ո IGMP ˘ Ո Â IGMP Snooping
ѿ ѭ ľ Ŀ˘ ÿ ѿ ѭ ' γ
ľ Ŀ ў б ˘ ا
٨ Â ľ Ŀĵ ў ч IGMP report( ) ˘ γ
٨ ╗ ч ' γ ľ Ŀĵ IGMP
Leave ˜ ˘ γ ٨ ÿ ĵ Â
ч IGMP Query ˘ جھ ĵ IGMP Query Л˘ جھ У
ĵ ў IGMP Report ˘ ٨ ÿ ĵ Â

٨

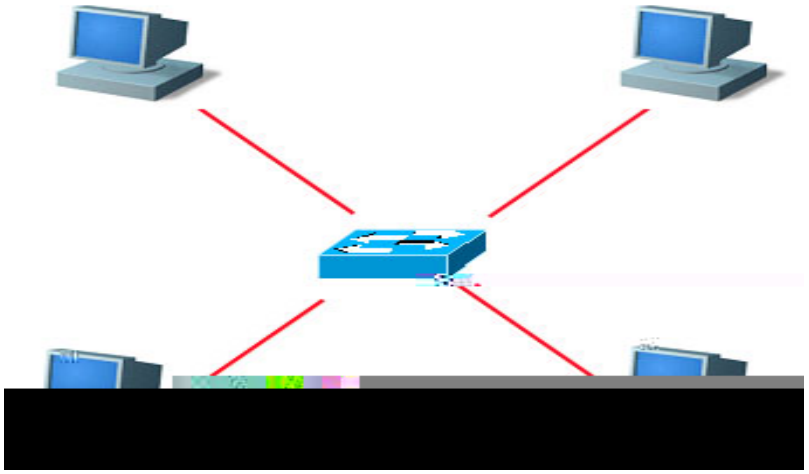
٨ Ь ٨˘ Юفي Â



في 2

ў ٦ IGMP Report à IGMP Leave ÿ ٨ ٦ ٦
Â ٦ ÿ ٨ ↑ IGMP Query ٪ ٨ ٦ ٦ ў
٨˘ ÿ ٨ ↑ IGMP Query Â ٨
٨ Â

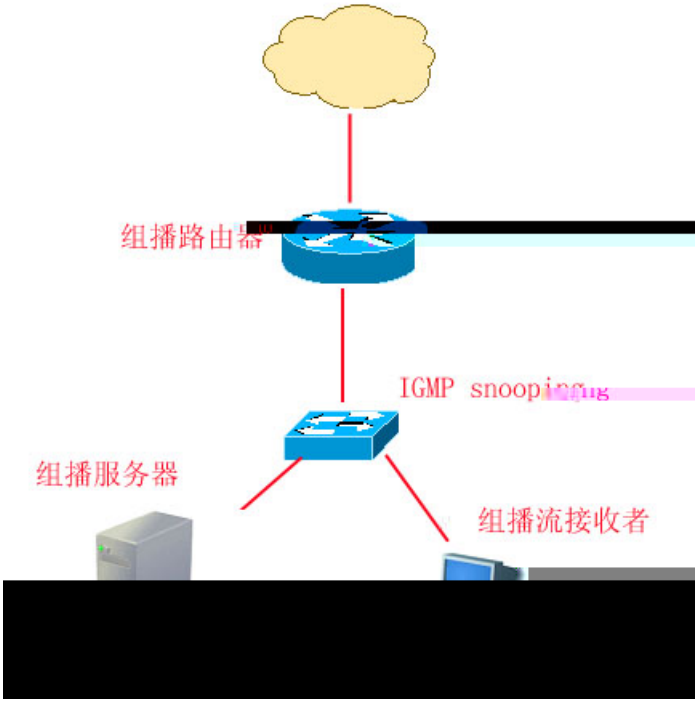
˘ جھ ˘ ٨ a جھ ˘
٨˘ IGMP snooping Â ЮفيI



في 3

جھ ˘ ˘ ني ٨ PC ٦ ٦
˘ ≠ ٦ ˘ ˘ ץ ٤ ٨ IGMP
snooping ٦ ˘ a У ٨ ٪ ٨ Â

٨ ˘ ٨ ٪ VLAN ˘ ЮفيI



في 4

IGMP Snooping γ a ل ˘
≠ ل ٨˘ Л∪ ل è
Â ل ˜ a У Э ˘
ل Л∪ جـ γ Э ٨ ل ف à ف
˘ Л∪ ˜ Â

~

Э في ˘ Ґ Ь˘ γ ≠ ╠… У
ل ĵ ˘ Ґ Ь ң ل
ل a ˘ ٨ ل ╠ ĩ ң ل ’
˜ У ل ĵ ٨ˆ ٨ IGMP
snooping ˜ ~ ˘ Л∪ ل Â

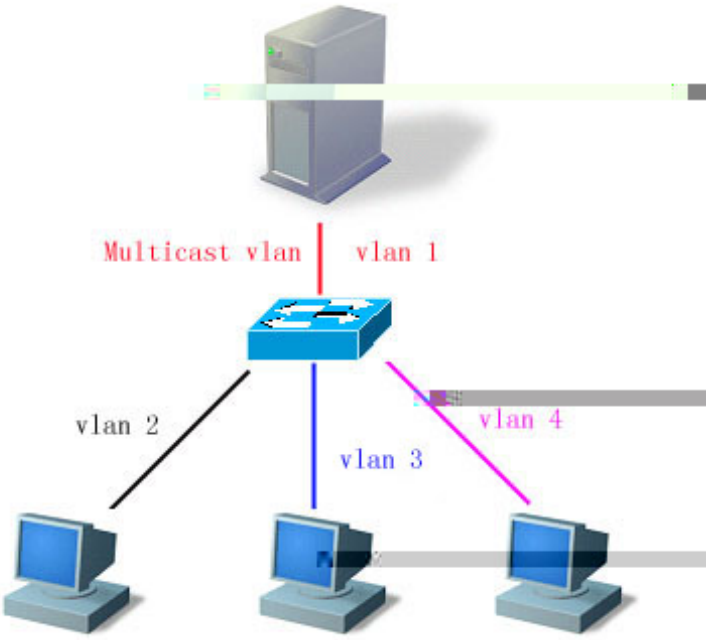
IGMP Snooping ٨

DISABLE ' جـ Ю˘ IGMP Snooping a ˘ . γ a Ґ
Ь ў б IGMP ˘ جـ VLAN ل Â

IVGL ' جـ Ю˘ ٨ VLAN Â ў ل б
ل У VLAN ٨ Â

SVGL ' جـ Ю˘ ٨ VLAN ў У Â ў ل Л∪ VLAN

Â У Multicast VLANˇ جھ VLAN ˆ ٦ Л ٦
VLAN è ў ٦ Â Юفي '



5 في

٧ VID Multicast VLAN ˆ UNTAG ˘ ٧
native vlan й Multicast VLAN

fast-leave

IGMP ˜ Leave “a ٨ Э ˘ ٤
IGMP Query ˘ ў : ٨˘ ٨ ٣ جم ^
У ٨ ٤ У ˜˘ IGMP Snooping ٤ Л∪ ĵ LEAVE
˘ ╗ и Fast Leave Â

IGMP snooping suppression

ŭ IGMP Snooping ˘ فخسم ٤ جم IGMP ˘
جم ╗ ٦ ĵ Query ٤ У Report ˘ γ
У Report ĵ ˘ جم ٤ У
Query ĵ ŭ Snooping ٨ ˘ ĵ Report Â и ٣ Ь
Ы Report Ч ₣˘ ٨ ў ╗ ٤ У ˘ γ
٤ ĵ У Report Ч¡ ٨˘ è Report ⁸ Â
╗ IGMP Snooping Suppression.

IGMP v3 Report ˘ IGMP Snooping Suppression ٤
v1˘ v2 Report ⁸ Â

ή صر

˘ ў بز б ш Â ٤ Л∪
à à Ь˘ ⅋ Â
Юفي Â

' γ IGMP Snooping

'

1. IGMP Snooping ╗

~

VLAN à Access à Trunk à AP IGMP Snooping a Â private vlan Igmp snooping Hash ă Â

IGMP Profiles

IGMP Profile permit/deny SVGL IGMP Filtering IGMP Profile Profile

Ruijie(config)# **ip igmp profile** *profile-number*	IGMP Profile 1 65535 Â
Ruijie (config-profile)# **permit** | **deny**	permit deny deny Â range Â
Ruijie(config-profile)# **range** *ip multicast-address*	Â
Ruijie# **end**	Â

IGMP profile **no ip igmp profile profile number** Â

profile range **no range ip multicast address** Â

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
```

Л Э ˘ IGMP Profile ‡ permit 224.1.1.1 225.1.1.1
226.1.1.1 deny

ő IGMP query/dvmrp PIM ˘ Л

no

Ruijie(config)# **ip igmp**
Snooping vlan *vlan-id*
mrouter
{**interface** *interface-id* | **learnpim-dvmrp**}

٨ ٧ تن

٨ ى VLAN فذ سم ٍ ٍ ٧
Â ٧ a ٧ ٍ ٍ ٧ Л∪ IGMP
Profile ٨ ٧ تن Â

جھ ЮЎ Ю ٨ ٧ تن'

ħυ ٹ	
Ruijie(config)# **ip igmp snooping vlan** *vlan-id* **mrouter interface** *interface-id* **profile** *profile name*	٨ ى ٨ à profile Â ٨ profile ٧ٹ ٨ Э Â
Ruijie(config)# **end**	ھى Â

٧ Л∪ **no ip igmp Snooping vlan** *vlan-id* **mrouter interface** *interface-id* **profile** ٹ б profile Â

Л∪Ю ٨ ٧ تن '

```
Ruijie# configure terminal
Ruijie(config)# ip igmp Snooping vlan 1 mrouter interface
gigabitEthernet 0/7 profile 1
Ruijie(config)# end
Ruijie# show ip igmp Snooping mrouter
Vlan    Interface      State     IGMP profile
----    ---------      ------    -------------
1   GigabitEthernet 0/7    static        1
1   GigabitEthernet 0/12   dynamic       0
```

╠ ˜ ٨ ע

جھ ΰ ╠ ٨ ˜ ˇ ╠ ˜ ٨ 300s ى ע ˇ
جھ ע ٹ ˜ Mrtoue ٨ ˇ ‡ ٹ ╠ ٹ
٨ˇ Ю ħυ ٹ ‡ ٧ Л∪ ע ˇ جھ تن 1-3600s Â

جھ ЮЎ Ю ٨ ٧ تن'

ħυ ٹ	
Ruijie(config)# **ip igmp snooping** Ã ÐÂ 79Â€	

Ruijie(config)# **end**	ھ Â

ل Л **no ip igmp snooping dyn-mr-aging-time** у й Â

ЛЮ ╠ л у й 100 '

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

IVGL

ж Ю Ю IGMP Snooping й IVGL '

Ьu ҷ	
Ruijie(config)# **ip igmp Snooping ivgl**	IGMP Snooping й **IVGL** Â
Ruijie(config)# **end**	ھ Â

ЛЮ IGMP Snooping й IVGL '

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

DISABLE

ж Ю Ю IGMP Snooping й DISABLE '

Ьu ҷ	
Ruijie(config)# **no ip igmp snooping**	IGMP Snooping
Ruijie(config)# **end**	ھ Â

Query :

л IGMP Query ˜ a ж˘ ж л
Query У ĺ ў IGMP Report ˘ ‡ й л
a Ѧ ˘ γ л ÿ л ĵ Â й 10

Ъυ ϡ	
Ruijie(config)# **ip igmp snooping suppression enable**	γ suppression ╖ Â
Ruijie(config)# **end**	ﻫ Â

no ip igmp snooping suppression enalbe Ъυ ϡ Suppression ╖ Â

ЛЬЮ Suppression ╖ '

```
Ruijie# configure Terminal
Ruijie(config)# ip igmp snooping suppression enalbe
Ruijie(config)# end
```

IGMP Snooping ᵕ

ℸ Л Ъ ﺟ IGMP Snooping Ю˜ У ∧ ˘ a
ℸ ∧ IGMP : Â

ﺟ Ю˜ Ю IGMP Snooping ᵕ '

Ъυ ϡ	
Ruijie(config)# **ip igmp snooping ivgl**	IGMP Snooping й **IVGL** Â
Ruijie(config)# **ip igmp snooping vlan** *vlan-id* **static** *ip-addr* **interface** *interface-id*	У ∧ Â • *vlan-id* vid • *ip-addr* ﻓﺦ ﺳﻢ • *interface-id'* ∧ ∧
Ruijie(config)# **end**	ﻫ Â

ℸ Л **no ip igmp snooping vlan** *vlan-id* **static** *ip-addr* **interface** ***i****nterface-id*
╕ ᵕ Â

ЛЬЮ й IGMP snooping ᵕ '

```
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
Abbr: M - mrouter
      D - dynamic
      S - static
VLAN  Address              Member ports
---- -------------   ----------------------------
```

ЬU ₹	
Ruijie# **show ip igmp snooping**	IGMP Snooping ɱ

```
Ruijie# show ip igmp snooping mrouter
Vlan    Interface       State     IGMP profile number
----     --------        -------     -------------------
1   GigabitEthernet 0/7    static        1
1   GigabitEthernet 0/12   dynamic       0
```

╟ ┤

æ ЮО ЮОћu ъ ┘ ┤ æ ┤ ‡˘ . GDA '

ћu ъ	
Ruijie# **show ip igmp snooping gda-table**	┘ ┤ æ ┤ ‡ Â

ЛuЮО GDA ┘ Лu ┤ У ˚ ┤ '

```
Ruijie# show ip igmp snooping gda-table
Abbr: M - mrouter
     D - dynamic
     S - static
VLAN  Address            Member ports
-------------------------------------------------------------
1      224.1.1.1          GigabitEthernet 0/7(S)
```

┤

æ ЮО ЮОћu ъ IGMP Snooping ґ ┤ '

ћu ъ	
Ruijie# **show ip igmp snooping**	IGMP Snooping ґ ┤ Â

IGMP Profile

æ ЮО ЮОћu ъ IGMP Profile '

ћu ъ	
Ruijie# **show ip igmp profile** *profile-number*	IGMP Profile Â

IGMP Filtering

æ Ю ЮЋu ҷ IGMP Filtering '

Ћu ҷ	
Ruijie# **show ip igmp snooping interface** *interface-id*	IGMP Filtering Â

ЛЮ й IGMP Filtering

```
Ruijie# show ip igmp snooping interface GigabitEthernet 0/7
Interface         Filter Profile number     max-groups
----------        ----------------------    -----------
GigabitEthernet 0/7          1               4294967294
```

IGMP Snooping è ø

IGMP Snooping ٨ ѫ (Masks)˘ ѫ Ћ
٨ ê ø " Ì Âѫ fхѕ à ٨ Ո ACL Ь
ѫ ˘ ل a ل ң ҏ Â ѫ ˘
Л Ь ╥ ; Â ў ѫ fхѕ ╥ ´ ч ˘ ў ٨
´ ч ˘ ACL ل ل ā ч ╥ ї ў ╟ Â ACL æ
ل 8 ˘ ў ѫ fхѕ Ո ٨ è У ╥ ˘ ‡
ACL ل ˜ ч Â ل ў ╟ѫ fхѕ Ո ٨ ˘ ‡ ACL ل
˜ 4 ˘ ل ⅓Ю 4 Â ل ˘ ACL ⅓
a ч ˘ ‡ ў ѫ fхѕ à ٨ ╥ ˘
Â Ь ╥ ╥ ҷ й ø
˘ ل Л ˜ è ч ╥ ´ ╥ Â Ь
╥ ل ў ˘ ٨ ˘ ‡ ل Л ѫ fхѕ ╥ ^ ˝
ѫ fхѕ ~ ˝ ´ ACL ACE˘ ٨ ‡ ل Л ў
Â

æ IGMP Snooping ٨ ˘ ٨ ˘ ‡ ل
a ٨ ╥ ˘ Л ' Source port check applying failed for hardware out of resources Â è
˘ ˘ Л ٨ Â

&

S3750 " ˘ æ igmp snooping

MSTP

MSTP

STP à RSTP

STP à RSTP

STP ˜ ˘ ≠ RSTP ˜ ˘ IEEE 802.1D Ռ IEEE 802.1w Â

STP ˜ ң à ˜ Â

γ Лυ ˘ ч LAN ۷ У ╟ ˘ ї ‡ ң
Â й ╕ У ﷺ ۷ ˘ ۷ ˘ è У
˘ ۷ ˘ ۸ У ˘
˘ й ╟ Â ⁸ У ˘ STP
˜ ╟ﷺ Â У ﷺ ЛЮ '
¸ ۷ ŭ ╟ ﷺ У ص Â
¸ ۷ ˘ ╟ ˘ ﺟ
۷ ص Â
ﷺ ˜ У ۷ ╟ Â
۷ У Â ۷ ˘ ˚ Â

RSTP ˜ ۻ Ю 802.1D STP ˜ ˘ Ռ STP ˜ У é
ﷺ à ╖ ˘ ў “ ”Â У ﷺ
RSTP ˜ з ˜ ˘ У ۷
۷ a 1 ˆ STP 50 ˜ Â

Bridge Protocol Data Units(й BPDU)

¸ ٨ ID˜ Port ID˜ ˇ ٨. ˝I Ո ٨ /١ ٨ Â

BPDUʃ Bridge Protocol Data Units˘ ˜ ´ ˜

Â ЛЬ ففخ سسم

01-80-C2-00-00-00˜ ˆ Ώ ٨ ˜ ٨ ففخ سسم Â

BPDU ЛЬЮ '

¸ Root Bridge ID˜ ٨ ID˜ Â

¸ Root Path Cost˜ ˜ Â

¸ Bridge ID˜ ID˜ Â

¸ Message Age˜ ˜

¸ Port ID˜ ٦ ٨ ID˜ Â

Forward-Delay Time à Hello Time à Max-Age Time Ь ˜ ٨ Â

è У ٦ ٦ У à ٨ Æ Â

У ٨ ˛ . ˝I BPDUʃ Bridge ID˘ Root Path Cost ˜ ˇ ٨ ˇ ٦ ٦ ٨ Â

˛ æ. ˝I BPDUʃ Â

٨ . ˝I ٨ ˇ BPDU Ю

'

¸ У ٨ ˆ Root Bridge˜ Â

¸ У ٨ˆ Root Port˜ ˇ . ˛ Root Bridge ٨ Â

¸ ˛ ˆ Root Bridge˜ Â

¸ LAN ˆ Designated Bridge˜ ˇ Æ LAN б Â Ո LAN ٨ ٨ ٨ˆ Designated Port˜ Â

¸ ٨ˆ Root port˜ Ո ٨ˆ Designated Port˜ Forwarding Â

¸ è a ٨ Discarding

Bridge ID

IEEE 802.1W ˇ ´ У ˆ Bridge ID˜ ˇ ЛЬ ٨ ˆ Root Bridge˜ Â Bridge ID 8 ˇ ٦ 6 ٨ mac ففخ سسم˘ ٨ 2 Ю ˇ ٨ 4 bit . ˝I ˆ Priority˜ ˇ ٦ 8 bit System ID˘ ٨ ЛЬ ٦ ˜ ˇ ٨ RSTP ٨ Ơ ٨ . ˝I 4096 Â

	Priority value				System ID											
Bit Æ	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Spanning-Tree Timers

ЛЬЮ :¦ Ь Â

¸ Hello timer ч BPDU Â

¸ Forward-Delay timer Ч Ч Â RSTP ˜ Лb STP ˜ ˇ Ч ÿ Listening Ч Ч Learning ˇ ÿ Learning Ч Forwarding Â

¸ Max-Age timer BPDU Â ˇ Â

Port Roles and Port States

Ч ж У ^ Port Role˜ ˇ ж a Ч Â

¸ Root port ¦ ^ Root Bridge˜ Ч Â

¸ Designated port LAN Ч ¦ Â

¸ Alternate port Ч Ч˘ У Ч ˇ Ч Ч й Ч Â

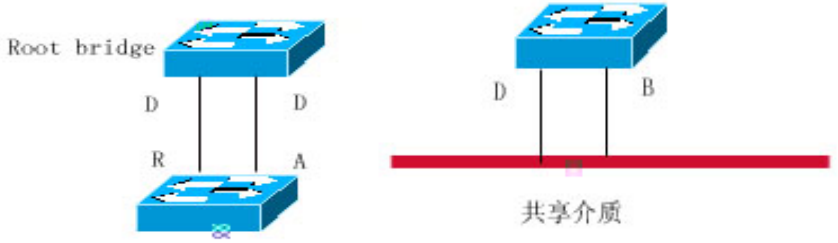
¸ Backup port Designated Port Ч˘ У ч Ч ж У LAN Э˘ ж ˙ ”I Ч й Designated Port æ ”I Ч й Backup Port Â

¸ Disable port ґ a ╟ Ч˘ ˙ Operation State й Down Ч ¦ Â

ЛЬЮ й Ч Ч في 1 à 2 à 3

R = Root Port D = Designated Port A = Alternate Port B = Backup Port

ж ⁞ Ю˘ Ч ”I ÿ ¦ Ч ˜



في 1 في 2

في 3

٨ Ь ^ Port State~ Ї ٦ ˇ ÿ ٨
Â

¸ Discarding' a ˆ ٦ˇ ≠ a Mac فخ سم ˜ Â

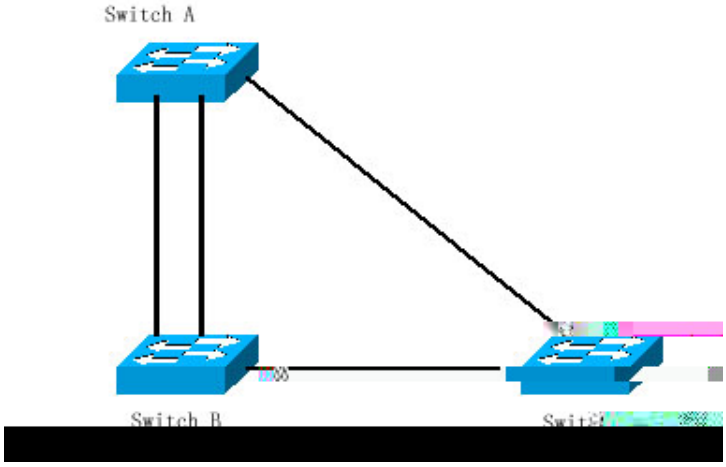
¸ Learning' a ˆ ٦ˇ Mac فخ سم ˜ ˇ
Â

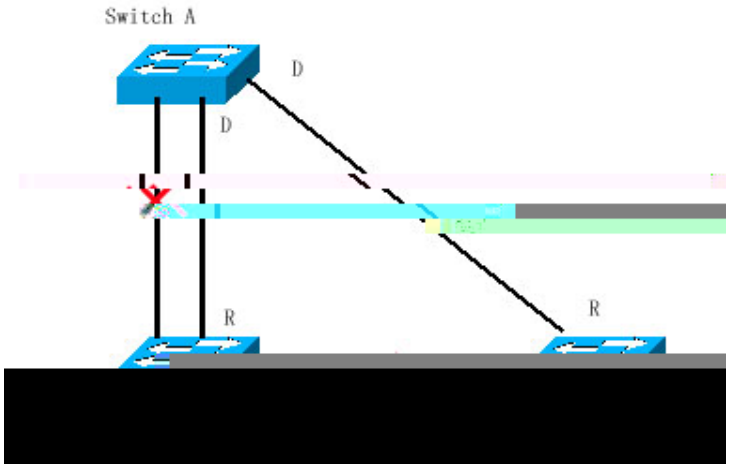
¸ Forwarding' ˆ ٦ˇ ≠ Mac فخ سم ˜ Â

У ˇ ٨ Root Port Ω Designated Port
Forwarding ˇ è ٨ ٨ Discarding Â

^ ή صر ~

جم ٦ Л∪ STP à RSTP ~ У صر
Â Юفي 4 ˇ Switch A à B à C bridge ID ˇ . Switch A
. ″I Â A б B ˆ ″I ˇ A Ω C й ″I ˇ B Ω C й ″I Â
Switch A й ˇ Switch B Ω Switch C ˇ
ˇ ң Â





في 7

RSTP

جھ ӯ RSTP ╖ ˘ . ٨ “ ” Forwarding Â

STP ˜ ٨ ˆ Port Role˜ ٨ 30 (ѝ Forward-Delay Time 2 ˘ Forward-Delay Time ٦ ˘ ѝ 15) ٨ Ѫ Forwarding ˘ 3 ٦ ٦ ע ٨˘ Root Port Ո Designated Port 30 Ѫ Forwarding˘ ڃ ѝ У صر 50 Â

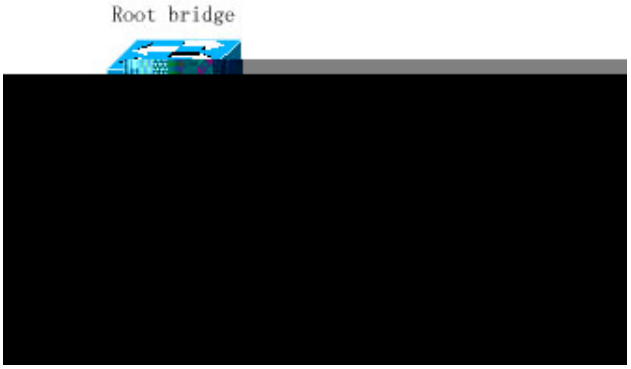
RSTP ٨ Forwarding a У ˘ في 8 ˘ Switch A ٦ RSTP “Proposal” ˘ Switch B ٦ Switch A . ”I ˘ Switch A ѝ ˘ ĵ ٨ ѝ Root Port˘ . Forwarding˘ ٨ ÿ Root Port ٨ Switch A ٦ “Agree” Â Switch A Designated Port ĵ “ ٨ ” ≠ Forwarding Â ٨ Switch B Designated Port ٨ ٦ “Proposal” Â ڃ جھ Ɔ˘ RSTP جھ ٦ ٦ ע У صر ˘ ĵ Â

في 8

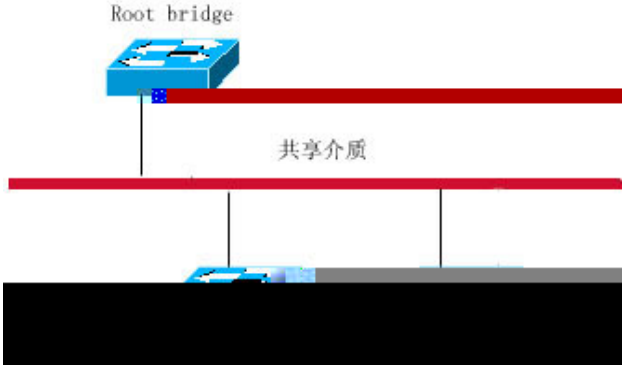
~

ЛЪЭ “ ” ˚ ˘ ٧ “Point-to-point Connect
~ ”Â и ч ٦ ˘ a и Â

في 9 ˘ è كا في и “ ” ٭ ЛЪЮ " “ ”
Â في

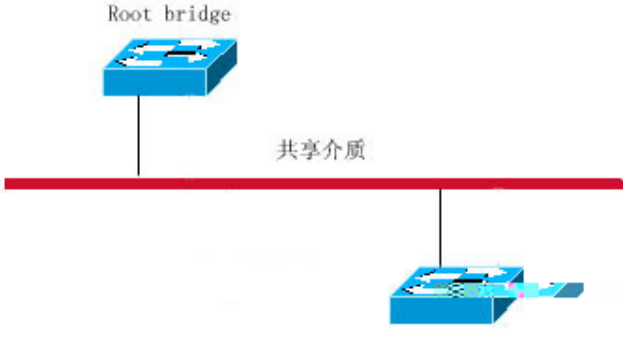


في 9



في 10

ٱ à Юفي ѝ “ ” ˘ Ш†



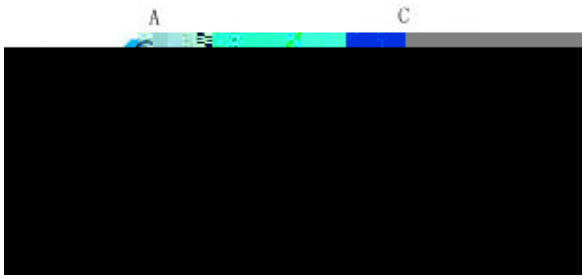
في 11

RSTP б STP

RSTP ˜ ٱЛъ б STP ˜ ˘ RSTP ˜ ¦ BPDU Л

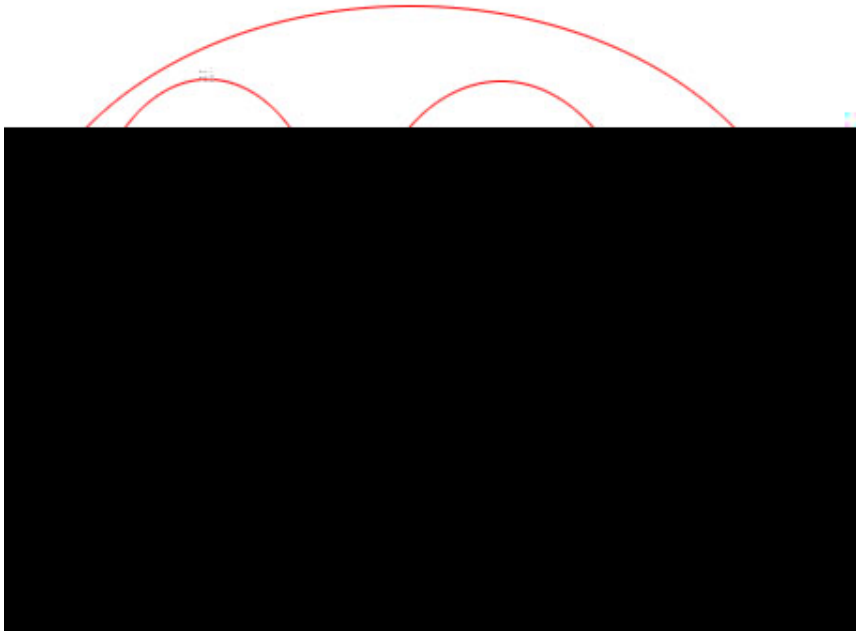
في 14

ÿ A C à D¦ B ÿ A ¦ B
Ю˜ A Ո B DISCARDINGˆ في 15
˜ Â C à D a ↑ ü Vlan1˜ ↓ Vlan1 ↑˘ A
Vlan1 б B Vlan1 Â



في 15

ὶ ᾱ ˘ MSTP ᾗ ˘ ↓Л↻ У Л У Vlan ¸ ˚
ὶ У Instance˜ Л Instance У ˆ MST Region˜ kÃukÇÁDmKH '- þ YF½
ˆ ὶ IST˝ Internal SpanningÄ' Û 4žûÔr T´€Rp•i GJÃ:U@Đ,€



16 في

˘ ң ˘ ≠ ⅄ Vlan a ⅄ : Â

,ǂ MSTP Region

Л Э ˘ ˘ MSTP ң ˘ ″l ⅄ ѕѧ , ǂ MSTP Regionˇ ⅄ MSTP Region “MST ”У ⅄ Â

MST ↑ '

¸ MST ⅄ ^ Name˜ ' ⅄ 32 MSTP Region Â

¸ MST Revision Numberˈ У 16bit MSTP Region Â

¸ MST Instance—vlan ' ⅄ ⅄Л… 64 Instancê id ÿ 1ǂ 64˜˘ Instance 0 ⁸ ѫ ˘ Л 65 Instance Â ⅄Л ǂ 1-4094 Vlan a ⅄ Instancê 0˙ 64˜˘ ǂ Vlan Instance 0 Â ˘ MSTIˆ MST Instance˜ У “Vlan ” BPDU MSTI MSTI ˘ a ⅄ CIST Ո è MSTI : Â

⅄ ѫ **spanning-tree mst configuration** Ъ ҷ “MST ” Л Э Â

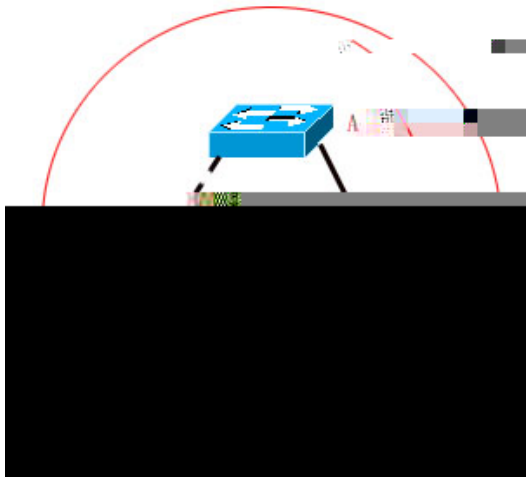
MSTP BPDU Л Э ˘ У ⅄ ǂ BPDU MST Ո У ˘ ѝ ⅄ Э Ո ⅄ У MST Regionˇ ї ‡ ѝ ÿ ⅄ У Region Â

&

STP Ю Instance—vlan ˘ Л ЇĄ
MSTPЃ Л∪ Ո- Â

ي 18

MSTI 2 Instance 2˜ ˇ ي 19˜ C ˙ ˝I ˇ и Region Root˜ ЇĄ è ∧ ˇ A ∩ B DISCARDING Â ج ˇ Instance 2 “Vlan ” ˇ ∧ B¦ C à A¦ C ⅃ ˇ “Vlan ” Â

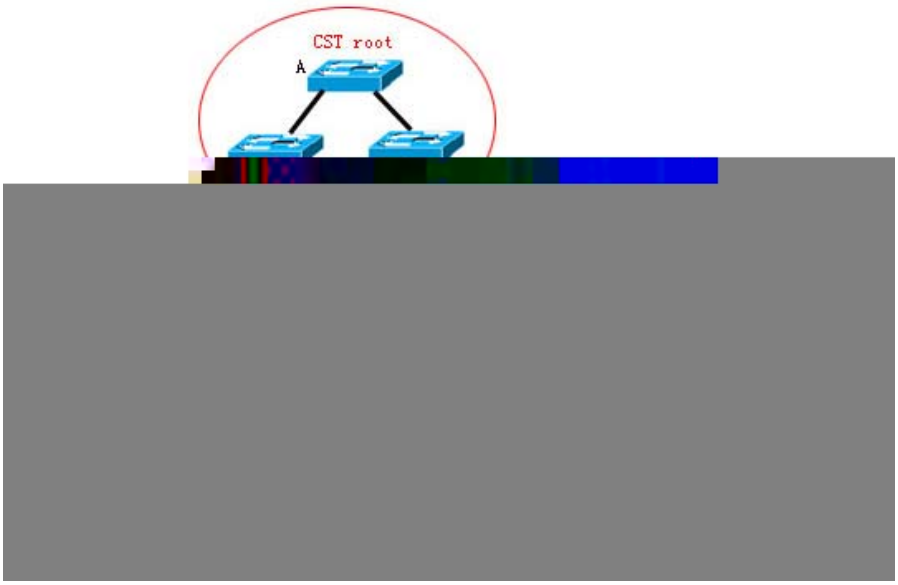


ي 19

ج MSTP ˜ a У ∧ ف Vlan˜ Л∪ Vlan и ∧ Path Cost ∩ Priority˜ Л∪ MSTP ˜ a Â

MSTP region ˆ CST˜

MSTP region CST ⅃Л∪ У ˇ a ⅃ MSTP Region ≠ У ˇ и CST(Common Spanning Tree) Â ي 20 ˇ CST ˇ Bridge ID A и CST (CST Root)˜ ⅃ ≠ Region CIST Regional Root Â ج Region 2 ˇ B¦ CST Root Root Path Cost ˇ Л∪ и Region CIST Regional Root Â ⅃ ˇ Region 3 C и CIST Regional Root Â



20 ف

CIST Regional Root a У Region Bridge ID ﻝ ˘ Region ˛ CST Root Root Path Cost Â

ﻝ ˘ CIST Regional Root Root Port MSTI Port Role˘ ѝ “Master port”˘ ѝ Instance “ ﻥ ”˘ Instance FORWARDING Â ѝ ˘ Region CST Root “ ﻥ ” ﻥ ﺟ Region У ﻝ Э!

Hop Count

IST Ո MSTI a Message Age Ո Max Age BPDU ї˘ IP TTL ⁸ ˘ Hop Count Â

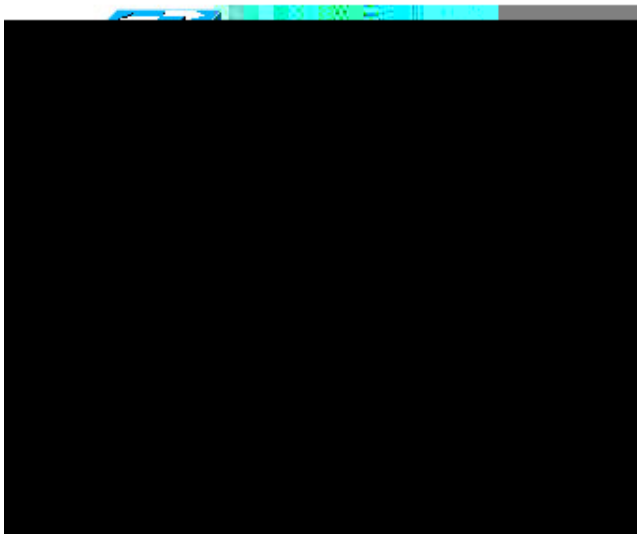
ﻝ Л **spanning-tree max-hops** ћ ҙ Â ﺟ Region ˘ ÿ “

ﻝ STP RSTP ˜ ´ У Region˘ а б У ﻝ У Region Â

MSTP ﻝ

Port Fast

ﻧ ˘ ﻫ ﻝ Л ﻧ ﻳ Port Fast˘ ﻧ Forwarding˘ ﻝ ﻟ ﻧ Forwarding ˆ a Port Fast ﻧ˘ 30 Forwarding˜ Â Ю ﻓ У ف ﻧ ﻝ Л ﻳ Port Fast enable Â



ﻓ 21

ﺟ Port Fast ﻧ ˛ BPDU˙ ‡ Port Fast Operational State ﻳ Disabled Â ﻧ STP Forwarding Â

ﻧ ╟ ⁞ (AutoEdge ╖)

AutoEdge ╖ ﻧ ﺟ У ﺗ (ﻳ 3)˘ a˛ Ю ﻧ ﻝ BPDU˙ ‡ ﻳ ﻧ a У ﻝ ˘ ÿ ﻧ ﻳ ﻧ˘ Forwarding Â ╟ ﻳ ﻧ ﻧ ﭺ ˛ BPDU ╟ ⁞ ﻳ ﻧ Â

ﻝ Л **spanning-tree autoedge disabled** Ъ ﻍ ﻝ ﻧ ╟ ⁞ ╖ Â

╖ Â

~

1) ٨ ╟ ╖ б Port Fast ă ˘ Л ѝ Â

2) ╖ ٨ б Ю ٨ ~ ك ٦ ˘ Л STP ~
a ╖ Â ٫ ٨ ٦ ˘ ٨ Autoedge
a ˘ ٦ ج ~ ك ˘ Â

3) ٨ ″I BPDU Filter˘ ‡ ٨ Forwarding˘ a ╟ ⋮ ѝ
٨ Â

4) ╖ ٦ б ٨ Â

5) AutoEdge ╖ IEEE 802.1D 2004 Ћ˘ ج ˘ Bridge
Hello Time ٨ تن ѝ 1.0-2.0 Â Л ج AutoEdge ╖
Hello Time ج تن ˘ تن ٦ Â
Hello Time تن˘ ″I ٨ AutoEdge ╖ Â

BPDU Guard

BPDU Guard enable˘ ≠ ´ Interface enable Â ч
⋮ Â

٦ Л ج **spanning-tree portfast bpduguard default** Ъ ҳ
BPDU Guard enabled ˘ ج Ю˘ Interface Port
Fast ٨ ╟ ѝ ٨˘ Interface ⁞ BPDU˘ ٨
Error-disabled ˘ Л ’ ٫ ٨ ˘ ٦
╕ У ٫ ˘ ٦ ٦ Â

≠ ٦ Л ج Interface Ю **spanning-tree bpduguard enable** Ъ ҳ
´ Interface BPDU Guard˘ б ٨ ї ٨ ~ Â ج
Ю Interface ⁞ BPDU˘ Error-disabled Â

٨ ҷ BPDU Guard ╖ Error-disabled ˘ ٦ Л ج
Ю **errdisable recover** Ъ ҳ ٨ ÿ Â

BPDU Filter

BPDU Filter enable˘ ≠ ´ Interface enable Â ч
⋮ Â

٦ Л ج spanning-tree portfast bpdufilter default Ъ ҳ
BPDU Filter enabled ˘ ج Ю˘ Interface Port Fast
٨ ╟ ѝ ٨˘ ‡ ٨ a BPDU˘ ≠ a ٦ BPDU˘
˘ ٨ ў a⁞ BPDU Â ٨ ҷ ⁞ BPDU Port

Fast Operational disabled BPDU Filter

Interface BPDU Filter Interface spanning-tree bpdufilter enable Interface BPDU Filter Interface a BPDU a BPDU Forwarding

TC Guard

Tc-Protection tc MAC ARP TC TC TC Guard TC TC Guard TC Guard TC TC TC TC

---

1) tc-guard

2) tc

3) tc-guard, a tc

4) tc-guard, a BPDU tc

BPDU MAC

BPDU MAC BPDU MSTP a BPDU MAC BPDU BPDU interface BPDU MAC MAC MAC no bpdu src-mac-check BPDU MAC BPDU

BPDU

BPDU 1500 BPDU

BPDU Â

Root Guard ╖

æ Ո , ǐ æ ⊿ У ˘ ˘
˘ ⊿ ǐ . ˝I ˘ ÿ ⊻ ɱ
Æ ˘ ⊿ ╟ Â Root Guard ╖ ѝ
Â

ŭ Root Guard ╖ ⋀˘ ⁸ è æ Э ⋀ ѝ ⋀ Â
ǐ . ˝I BPDU ˘ ŭ Root Guard ╖ ⋀
ѝ root-inconsistent (blocked) Â

⋀ Root Guard ѝ blocked ⊿˘ Root Guard
╖ ⋀ ╖ ˆ . æ ⋀ Ю **spanning-tree guard**
none Ћ ȝ ˜˜ ѝ Â

~

1) Root Guard ŧRoot Guard è ȯЊЎ .

1) ┘ Loop Guard Â

2) ┘ У a ┘ Root Guard Ω Loop Guard Â

3) Loop Guard ┘ ┌ ┐ Â

MSTP

Spanning Tree

Ю " Spanning Tree

Enable State	Disable a STP
STP MODE	MSTP
STP Priority	32768
STP port Priority	128
STP port cost	┌ ┐ "
Hello Time	2
Forward-delay Time	15
Max-age Time	20
Path Cost	ص
Tx-Hold-Count	3
Link-type	┌ ┘ ┐ "
Maximum hop count	20
vlan б	vlan 0 ┘ جھ 0

┘ **spanning-tree reset** Spanning Tree ┌ (a Span)

à Spanning Tree

Spanning-tree

MSTP Â

Spanning-tree Â

. ″I ^ Switch Priority˜

. ″I ĵ ف ѝ ˇ ﻻ ≠ ĵ
Â ˜ . ″I ^ ~ ˇ –
Â ﻻ Л∪ a ﻻ Instance ĵ a ﻻ . ″I ˇ ﻝ Instance
ﻻ ˜ Â a ﻻ Region ˇ ﻯ
CIST˜ Instance 0˜ . ″I Â

Bridge ID ˇ . ″I 16 ˇ ѝ 4096 ˇ ĵ ⁞ 0˝
4096˘ 8192˘ 12288˘ 16384˘ 20480˘ 24576˘ 28672˘ 32768˘ 36864˘
40960˝ 45056˝ 49152˝ 53248˝ 57344˝ 61440 Â ѝ 32768 Â

ˇ ЛЬЮ . ″I '

Ьυ ҳ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **spanning-tree** [**mst** *instance-id*] **priority** *priority*	a ﻻ instance . ″I ˇ a ╗ instance ﻯ ˇ . instance 0 Â *instance-id˝* تن ѝ 0˝ 64 *priority˘* ﻻ تن ѝ 0 ĵ 61440˝ 4096 ˇ ѝ 32768 Â
Ruijie(config)# **end**	ﻫĵ Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

ĵ ˇ ﻻ **no spanning-tree mst** *instance-id* **priority**
Ьυ ҳ Â

ﻯ. ″I ^ Port Priority˜

ч ﻯ ج У Ў Э˘ У . ″I ^ ~ ﻯ
Forwarding ˇ æ. ″I ^ ~ ﻯ Discarding Â ч
ﻯ . ″I У ˇ ﻯ ﻝ Forwarding Â ﻻ Л∪ ج У
ﻯ Э a ﻻ Instance ĵ a ﻻ ﻯ. ″I ˇ ﻝ Instance ﻻ
˜ Â

Ո . ″I У ˇ ﻻ . ″I ≠ 16 ˇ ѝ 16 ˇ ĵ ⁞ 0˝
16˝ 32˝ 48˝ 64˝ 80˝ 96˝ 112˝ 128˝ 144˝ 160˝ 176˝ 192˝ 208˝ 224˝
240 Â ѝ 128 Â

ˇ ЛЬЮ ﻯ. ″I '

Ьυ ҳ	

Ruijie# **configure terminal**	Â
Ruijie(config)# **interface** *interface-id*	interface ˇ ﾉ interface ↑ ﾍ ∩ Aggregate Link Â
Ruijie(config-if)# **spanning-tree** [**mst** *instance-id*] **port-priority** *priority*	a ﾉ instance ﾍ . ”I ˇ a ╗ instance ﾍ ˇ . instance 0 Â *instance-id* ﺗﻦ ﻯ 0 64 *priority* interface . ”I ˇ ﾍ ﺗﻦ ﻯ 0 240 16 ˇ ﻯ 128

Ruijie(config03.82 699.14 0.48 3 [illegible] 0.48 6Tf 0.0009 Tc 6.3show s3 0 Td[(*interface-id*,]5,ÎG!5BÄ

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

Î ˘ ˩ **no spanning-tree mst cost** ˥ Ъυ ҂ Â

Path Cost ˆ path cost method˜

˥ Path Cost ѝ ˘ ╟ ˥ ˥ Path Cost Â IEEE 802.1d ∩ IEEE 802.1t ˩ a ˩ Path Cost ˘ 802.1d ˧ a ˩

Max-Age Time

BPDU Â й 20 Â

˘ ЛЬЮ Max-Age Time'

Ьu ҳ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **spanning-tree max-age** *seconds*	max age time˘ ч تن й 6ʃ 40 ˘ й 20 Â
Ruijie(config)# **end**	ىʃ Â
Ruijie# **show running-config**	Â

Ruijie# **cotg-c.72 -188.1 -13.68 re6lnfiu.0007 co Tf0 T0001 Tw 3.34d( )Tj/-c.72 - rutartup Tf0 Tc**

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

ˆ ˘ ˩ **no spanning-tree tx-hold-count** Ъ ҂ Â

link-type

ʌ ص a “ ”ˢ У ˆ

MSTP Region

ﻝ ﻝ У MSTP Regionˇ ŭ ﻝ ﻝ ﻝ ˆ Nameˇ à ﻝ Revision Number à ﻝ Instance—Vlan Â

ﻝ Л 0ˉ 64 ﻝ Instance ↑ ŭ ف Vlanˇ ⅓Ю Vlan ╠ Instance 0 Â У Vlan ﻝ У Instance Â

ﻩ STP Ю Instance—Vlan ˇ ﻝ Ѧ MSTPˇ Л Ո Â

ˇ ЛЮ MSTP Regionˈ

Ьυ ҂	
Ruijie# **configure terminal**	Â
Ruijie(config)# **spanning-tree mst configuration**	MST Â
Ruijie(config-mst)# **instance** *instance-id* **vlan** *vlan-range*	vlan ╗ Ў У MST instance *instance-id*ˇ تن ﻩ 0ˉ 64 *vlan-range*ˇ تن ﻩ 1ˉ 4094 ' instance 1 vlan 2-200 vlan 2Ў vlan 200 ╗ Ў instance 1 Â instance 1 vlan 2,20,200 vlan 2 à vlan 20ˇ vlan 200 ╗ Ў instance 1 Â ﻝ ˇ ﻝ Л **no** Ьυ ҂ vlan ÿ instance ĭ ˇ ĭ vlan ╠ instance 0 Â
Ruijie(config-mst)# **name** *name*	MST ﻝ ˇ ﻝ Л 32 Â
Ruijie(config-mst)# **revision** *version*	MST revision numberˇ تن ﻩ 0ˉ 65535 Â ﻩ 0
Ruijie(config-mst)# **show**	MST Â
Ruijie(config-mst)# **end**	ﻫ Ў Â
Ruijie# **copy running-config startup-config**	Â

MST Region Configuration ˇ ﻝ Л **no spanning-tree mst configuration** Ьυ ҂ Â ≠ ﻝ Л **no instance** *instance-id* ĭ instance Â ﻝ ˇ **no name** à **no revision** ﻝ Л Ў ⋮ MST name à MST revision number Ў Â

ЛЮ ﻩ '

```
Ruijie(config)# spanning-tree mst configuration
```

```
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)#
```

~

æ vlan Ω instance µή Ь vlan … ˘ ΐ ‡
æ ΐ н ρ Э ┘ vlan Ω instance Â

Maximum-Hop Count

Maximum-Hop Count BPDU æ У Region Л Ч Л

٨

٨ ˘ ٦Ծ ٨ ٤ BPDU ɱ ٨
a ٦ MSTI ˘ Ծ б è ң ك Â

˘ ԾЮ ٨ '

Ьu ҙ	
Ruijie# **configure terminal**	Â
Ruijie(config)#**interface** *interface-id*	٨
Ruijie(config-if)# **spanning-tree compatible enable**	٨
Ruijie(config-if)# **end**	ﻫ Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

٧ ˘ ٤ **no spanning-tree compatible enable** ٨ Ьu ҙ
Â

MSTP ٤

٤

٨ ╟ ┊ ╖ (AutoEdge ╖) Â
è ٤ Â

Port Fast

Port Fast ٨ ٨ Forwarding Â ҷ й ˆ BPDU Port Fast Operational State й disabled ў ٨ б STP Forwarding Â

˘ ԾЮ Port Fast

Ьu ҙ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **interface** *interface-id*	interface ˘ ٨ interface ↑ ٨ Ո Aggregate Link Â

Ruijie(config-if)# **spanning-tree portfast**	interface portfast Â
Ruijie(config-if)# **end**	Â
Ruijie# **show spanning-tree interface** *interface-id* **portfast**	Â
Ruijie# **copy running-config startup-config**	Â

Port Fast

ˇ ЛЬЮ BPDU Guardď

Ьu ҙ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **spanning-tree portfast Bpduguard default**	BPDU guard
Ruijie(config)# **interface** *interface-id*	interface ˇ Л interface ↑ ٧ Ո Aggregate Link Â
Ruijie(config-if)# **spanning-tree portfast**	interface portfastˇ bpduguard Â
Ruijie(config-if)# **end**	ﻫ Â

Ruijie# **show running-config**

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

BPDU Filter˘ ˩ Л˘ ħ ҷ **no spanning-tree portfast bpdufilter default** Â

´ Interface BPDU Filter˘ ˩ Л˘ Interface ħ ҷ **spanning-tree bpdufilter enable** ˘ **spanning-tree bpdufilter disable** BPDU Guard Â

TC Guard

˘ ЛЬЮ TC Guard

ħ ҷ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **spanning-tree tc-protection tc-guard**	TC Guard
Ruijie(config)# **end**	ه Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

˘ ЛЬЮ ٨ Ю TC Guard

ħ ҷ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **interface** *Interface-id*	interface ˘ ˥ interface ↑ ٨ Ո- Aggregate Link Â
Ruijie(config-if)# **spanning-tree tc-guard**	interface TC Guard Â
Ruijie(config-if)# **end**	ه Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

BPDU MAC

BPDU MAC ˘ ٨ ˩ MAC ف س ى MAC BPDU ˘

è BPDU Â

ʎ ˇ ˩ Л∪ ЛЮ BPDU MAC '

ћ∪ ҂	
Ruijie# **configure terminal**	Â
Ruijie(config)# **interface** *Interface-id*	interface ˇ ʌ interface ↑ ʎ Ո· Aggregate Link Â
Ruijie(config-if)#**bpdu src-mac-check** *H.H.H*	bpdu mac Â
Ruijie(config-if)# **end**	ﻫ Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

bpdu mac ˇ ˩ Л∪ ʎ Ю ћ∪ ҂ **no bpdu src-mac-check** Â

ŭ Root Guard

ˇ ЛЮ ŭ ʎ Root Guard

ћ∪ ҂	
Ruijie# **configure terminal**	Â
Ruijie(config)# **interface Interface-id**	ʎ ˇ ˩ ʎ ↑ ʎ Ո· Aggregate Link Â
Ruijie(config-if)# **spanning-tree guard root**	ŭ Root Guard spanni0 Tf2 0 Td8E1c

Ruijie(config)# **spanning-tree Loopguard default**	ŭ Loop Guard Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

ˇ ЛЬЮ ﷺ ㄟ ŭ Loop Guard

ћυ ҳ	
Ruijie# **configure terminal**	Â
Ruijie(config)# **interface** *Interface-id*	ㄟ Â ㄴ ㄟ ↑ ㄟ ∩ Aggregate Link Â
Ruijie(config-if)# **spanning-tree guard loop**	ŭ Loop Guard Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	Â

ㄟ ╖

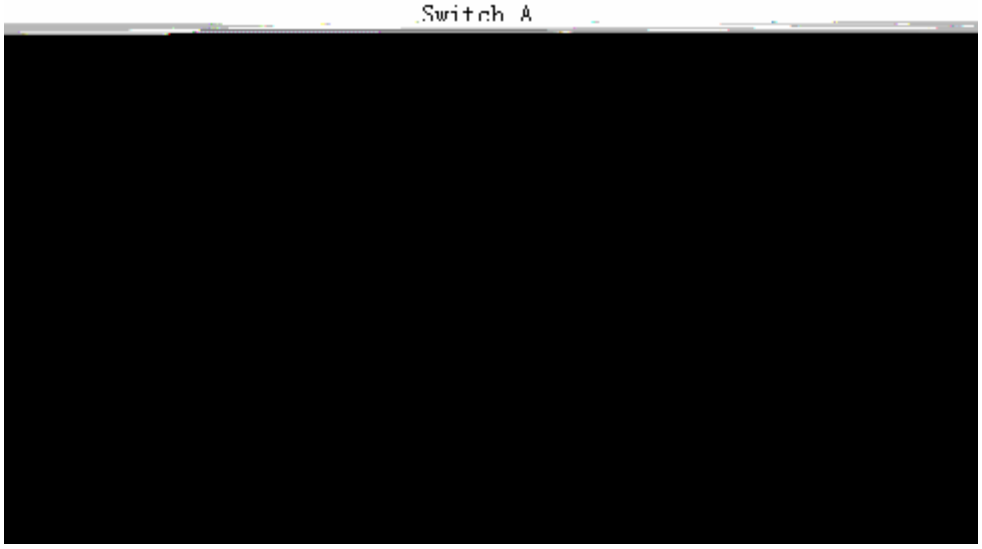
ˇ ЛЬЮ ㄟ ╖ Â

ћυ ҳ

Ruijie# **show spanning-tree inconsistentports**	block
Ruijie# **show spanning-tree mst configuration**	MST
Ruijie# **show spanning-tree mst** *instance-id*	instance MSTP
Ruijie# **show spanning-tree mst** *instance-id* **interface** *interface-id*	interface instance MSTP
Ruijie# **show spanning-tree interface** *interface-id*	interface instance MSTP
Ruijie# **show spanning-tree forward-time**	forward-time
Ruijie# **show spanning-tree Hello time**	Hello time
Ruijie# **show spanning-tree max-hops**	max-hops
Ruijie# **show spanning-tree tx-hold-count**	tx-hold-count
Ruijie# **show spanning-tree pathcost method**	pathcost method

MSTP

1) MSTP
2) Vlan-Instance MST MST Revision Number
3) MSTP
4) BPDU Guard PC Port Fast



1) **Switch A**

٨ Gi 0/1 Ո Gi 0/2 Trunk ٨˘ … VLAN 2 Ո VLAN 3 Â

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# switchport mode trunk
Ruijie(config-if)# exit
Ruijie(config)# interface gigabitEthernet 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
```

ѝ MSTP ˘ VLAN 2 ¦ Instance 1˝ VLAN 3 ¦ Instance 2˝ MST ˩ ѝ ruijie˘ MST Revision Number ѝ 1˝ MST ˘ ŭ ˜ Â

```
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
```

```
Ruijie(config)# spanning-tree
Enable spanning-tree.
# ج       Э      Instance1    ˙ ˝I   й 4096
Ruijie(config)# spanning-tree mst 1 priority 4096
```

3) Switch C

```
#       ٨ Fa 0/1 Ո Fa 0/2      Trunk ٨˘  …   VLAN 2 Ո VLAN 3 Â
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
```

```
#           й MSTP    ˘      VLAN 2    ¦  Instance 1˝    VLAN 3    ¦
Instance 2˝      MST     ˩   й ruijie˘  MST Revision Number й 1˝    ŭ
  ˜  Â
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.
```

```
# ج       Э      Instance 2    ˙ ˝I
Ruijie(config)# spanning-tree mst 2 priority 4096
```

```
#       ŭ BPDU Guard ╖  ˘          ٨ Fa 0/3 й Port Fast Â
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, Ruijiees, 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
```

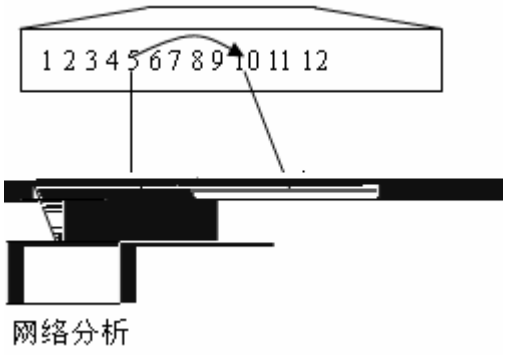
```
PortAdminAutoEdge : Enabled
PortOperAutoEdge : Disabled
PortAdminLinkType : auto
PortOperLinkType : point-to-point
PortBPDUGuard : Disabled
PortBPDUFilter : Disabled
PortGuardmode  : None
###### MST 0 vlans mapped :1, 4-4094
PortState : forwarding
PortPriority : 128
PortDesignatedRoot : 1000.00d0.f822.33aa
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

ㄴЛъ SPAN У ㄲЭ ∫ Э ㄲУ ∫
RMON∫ ㄲЭ ∫ ㄲЭ ÂSPAN ㄲЭ
Ґㄴ MIRROR∫ ㄲЭ ∫ Â

˘ جھ في 1 ˘ ˆ ”I ㄲ5 Э ∫ ˆ ”I ㄲ10ˇ جھ ㄲ10
Э ∫ Ґ ㄲ5 ˘ ㄴ ㄲ5 Э Â



في 1 SPAN

SPAN ㄴЛъ Ґ ÿ ㄲ ˘ ↑ Â

SPAN a ⁝ ㄲҐ ㄲ ˘ ㄴ Ґ ÿ ㄲ Ы
У ∫ ㄲÂ У ㄲ˘ У 100Mbps
ㄲ У 1000Mbps ㄴ Â

Ң ҏ

¸ جھ S3750 " Ң ҏ Э˘ ˘ й untag ˘
∫ ㄲ ㄴ tag Â

¸ S3750 "˘ SPAN ㄲ ℸ

¸ S3750 "˘ SPAN ㄲ ℸ

¸ S3750 "˘ ㄲй ㄲ ˘ ㄲ й tag Â

SPAN Ռ

ĵ Ռ SPAN У Ռ

SPAN

У SPAN У ٨ Ռ ٨ ٨ Â ٦ Ռ ´ ٨
˘ Ռ ٦ ٦ Â

٨ У SPAN ˘ Switched port Ռ routed port ٦ Ռ ѝ ٨ Ռ
٨ Â SPAN a ⁝ Â

٦ Ռ SPAN ج У disabled port Ə˘ ˘ SPAN a Э ٦
ĵ Ռ ٨ Â **Show monitor session session number** Ъ ҳ
SPAN Â У SPAN ج Э ٨ a Э ĵ
٨ ٦ Â

صر

SPAN ↑ ӈ ЛЪЮ صر'

' ٨ Э ĵ У ĵ ٨ Â ج У SPAN
˘ ٦ У ŭ ٨ Â Ы ҷ˘ ÿ ٨
٦ ˘ ٨ ˘ a ⁝ SPAN ╖ ˘ Ÿ ٦ ĵ
٨ Â

Ч ' ÿ ٨ ٦ У ĵ ٨ Â ج У SPAN
˘ ٦ У ŭ ٨ Â Ы ҷ˘ ÿ ⁞ ٨ ٦ ĵ
٨ ٦ ˘ ٦ ˘ ≠ a ٦ ĵ ٨ Â Ы ҷ ٦
ĵ ٨ ٦ ٦˘ ٨ ٨ ˘
MAC à MAC à VLAN ID Ռ ٩ TTL 2

1. ⅃ Л Ъ switched port˜ routed port AP Â
2. a ⅃ Л Ъ ⅄ ѝ ∧ Â
3. ⅃ Л Ъ ⅄ Â
4. ∧ Ո ∧ ⅃ Л Ъ У VLAN a У VLAN Â

∧

SPAN У ∧ (≠ ∤ ∧) ˘ ∧ Â

∧ ЛЪЮ '

¸ ⅃ Л Ъ switched port à routed port Ո AP Â

SPAN

ǂ ⱨ Э SPAN˘ ↑ ѽ ЛЪЮ :

SPAN

— ㄟ ㄟ╗ ↑ У AP ˇ SPAN ㄟ
ㄟ ㄐ Â

… У SPAN ㄟ∩ ㄟ

… У SPAN ㄟ(ㄟ)∩ ㄟ(ㄟ)Â

ћυ ҂	
Ruijie(config)# **monitor session** *session_number* **source interface** *interface-id* [| -] {**both** | **rx** | **tx**}	ㄟ Â *interface-id*˝ ㄟ ㄏ Â
Ruijie(config)# **monitor session** *session_number* **destination interface** *interface-id* {**encapsulation | switch**}	ㄟ Â *interface-id*˝ ㄟ ㄏ ╗ *encapsulation* ㄟ ㄟ ╗ , ╗ *switch* ㄟ ㄟ ╗ Â

ㄕ SPAN ˇ ㄐ **no monitor session** *session_number* ћυ ҂ Â ㄕ SPAN ˇ ㄐ **no monitor session all** ћυ ҂ Â **no monitor session session_number source interface** *interface-id* ћυ ҂ **no monitor session** *session_number* **destination interface** *interface-id* ㄐㄕ ㄟ ㄟ

ЮО … У SPAN ' 1Â ¨l˘ ɱɳ 1 ˘ ㄌ ㄟ 1 MIRROR↑ ㄟ 8Â **Show monitor session** ћυ ҂ Â

```
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
```

ÿ SPAN ㄕ У ㄟ

ÿ У SPAN ㄕ ㄟ Â

Ъu ъ	
Ruijie(config)# **no monitor session** *session_number* **source interface** *interface-id* [| -] [**both** | **rx** | **tx**]	╡ ∧ Â interface-id˝ ∧ /\ Â

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

Ъu ъ ┘ ÿ ⋎ SPAN ╡ ∧ ÂЮO ∧ 1 ÿ 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 Ъu ъ ┘ ⌠ SPAN ,Ю **show monitor** Ъu ъ SPAN 1 ⌠

```
Ruijie# show monitor session 1
sess-num: 1
src-intf:
GigabitEthernet 3/1 frame-type Both
dest-intf:
GigabitEthernet 3/8
```

IP فخسم б Ь

IP فخسم

IP فخسم Ў

IP فخسم 32 Æ γ ¤ ˘ ѝ Ո ˘ У ˊ ¤ Â˝ ¤
˘ ˆ ѝ ني ˘ 8 Æ˘ تن ÿ 0~255˘ ľ . Ŀ /ľ ˘
ľ 192.168.1.1 Ŀ ˊ ¤ IP فخسم Â

IP فخسم ɻ ₦Ҝ˘ IP ˜ فخسم Â32 Æ IP فخسم ч ˆ
' 1˜ ˆ ' 2˜ فخسمسم ˆ Â ˆ Ű Æ ˘ ɱń
IP فخسم ɬ Л, ˆ ني Â

A فخسم˘ Æ ѝ ľ 0 Ŀ˘ 7 Æ /ľ˘ 24 Æ سم
فخسم Â Ω ۰ Æ سم

&

ⷢ ني Æ ѝ Ї 1111 Ь. فخ سم a ў ˘ فخ سم ѝ E فخ سم˘
فخ سم Â

جم ˘ IP فخ سم , ˘ У IP فخ سم
ў Â б ˘ ‡ ў ў IP سم
فخ Â سمفى Ш ل Л ل فى ^ CNNIC˜ ˘ IP فخ سم¦
ѝ فى ل б Л¦ Ѽ Л^ ICANN,Internet Corporation for Assigned Names and Numbers˜ Â ѝ ˘ a
IP فخ سم˘ ≠ a ў ˘ ў ж فخ سم Â

Ю ѝ б ل فخ سم " '

⁞	فخ سم	
A	0.0.0.0	
	1.0.0.0~126.0.0.0	ل
	127.0.0.0	
B	128.0.0.0~191.254.0.0	ل
	191.255.0.0	
C	192.0.0.0	
	192.0.1.0~223.255.254.0	ل
	223.255.255.0	
D	224.0.0.0~239.255.255.255	ل
E	240.0.0.0~255.255.255.254	
	255.255.255.255	

è ж Ь فخ سم ˘ فخ سم a جم ˘
ў فخ سم ˘ ‡ IP فخ سم
فخ سم Â Ю ѝ فخ سم ˘ فخ سم RFC 1918 Ⱨ'

⁞	IP فخ سم تن	
A	10.0.0.0~10.255.255.255	1 A
B	172.16.0.0~172.31.255.255	16 B

C	192.168.0.0~192.168.255.255	256 C

IP ﻓﺦ ﺳﻢ à TCP/UDP ﻧ ﻧ è ↑ ˘ ﻧ RFC 1166 Â

IP ﻓﺦ ﺳﻢ Ь "

IP ﻓﺦ ﺳﻢ Ь ↑ ЛЬЮ л ˘ ﻧ У ˘ è Ь ﻠ Лъ
é ã ї Â

¸ ﻧ IP ﻓﺦ ﺳﻢ ^ ~

¸ ﻓﺦ ﺳﻢ ~ ^ ARP~ ^ ﻠ ~

¸ IP↑ ﻣﻢ ﻓﺦ ﺳﻢ ^ ﻠ ~

¸ IP ^ ﻠ ~

¸ ↑ ^ ﻠ ~

ﻧ IP ﻓﺦ ﺳﻢ

У ﻧ IP ﻓﺦ ﺳﻢ˘ ﻠ Лъ Ո ﻠ IP ˘ ﻧ IP ﺳﻢ
ﻓﺦ˘ ﻧ IP ~ Â

↑ У ﻧ IP ﻓﺦ ﺳﻢ˘ ﺟﻢ ﻧ ЛЬЮЬ ҳ'

Ьъ ҳ	
Ruijie(config-if)# **ip address** *ip-address mask*	У ﻧ IP ﻓﺦ ﺳﻢ
Ruijie(config-if)# **no ip address**	ﻠ У ﻧ IP ﻓﺦ ﺳﻢ

≠ У 32 ˘ IP ﻓﺦ ﺳﻢ ف Ű ﻱ ↑ Â
˘ ﻱ “1” IP ﻓﺦ ﺳﻢ Æ ﻱ ↑ ˘ ﻱ “0”
IP ﻓﺦ ﺳﻢ Æ ﻱ ў ﻓﺦ ﺳﻢ ↑ Â A ﻱ
“255.0.0.0” Â ﻠ Лъ ¯ У , ↑ ˘ , ↑ У
ў ﻓﺦ ﺳﻢ ↑ У Æ ≠ ﻱ ↑ ˘ ў ˘ ╗
˘ ﻱ Â

&

Э˘ Æ ﻠ Лъ ў ﻓﺦ ﺳﻢ ↑ У Æ Â ﻧ ң ҕ
ﻧ ÿ ↑ ÿ ↑ ﻠ Â

б Л IP мсгхф Ю " Ь " ˘ ЛЮЮ Ь й ⅄ ˘ ⅄Л
ā ĭ '

¸ Л IP мсгхф

Л IP мсгхф

Л ң ҏ ⅄Л У Л IP мсгхф˘ è У й ў IP мсгхф˘ è
й IP мсгхф Â IP мсгхф Э 8˘ IP мсгхф б ў IP Л Ⅎ
IP мсгхф a ⅄ Â жм ˘ ĺ IP мсгхф˘
жм ЛЮЮ Ю IP мсгхф'

¸ У ў мсгхф Â ˘ жм У ммм У С
˘ ⅄ĺ 254 Л ў Â ммм ў 254 Л ˘ У С a
ĺ ˘ ĺ Л У С мсгхф Â ч ˘ Л
IP мсгхф Â

¸ ммм Ү ˘ ,ĺ Â IP мсгхф
⅄Л ˘ ĺ ммм IP Â ˘
У IP мсгхф Â

¸ У ч Л У ˘ ⅄Л… У
˘ IP мсгхф ˘ Â У a жм
ч ч ЛЭ Л Â

&

IP мсгхф ɱ˘ ў IP мсгхф Â Э У Л
IP мсгхф˘ ‡ è ≠ ⅄ У IP мсгхф Â è Ⅵ
"I ĺ IP мсгхф˘ ⅄Л й ў мсгхф Â

IP мсгхф˘ жм Л ЛЮЋu ҷ'

Ћu ҷ	
Ruijie(config-if)# **ip address** *ip-address mask* **secondary**	Л IP мсгхф
Ruijie(config-if)# **no ip address** *ip-address mask* **secondary**	ⅆ Л IP мсгхф

мсгхф ˜ ^ ARP˜

жм ммм ˘ IP ч мсгхф' 1˜ мсгхф˘ ↑ Ŭ жм

MAC IP IP MAC

IP MAC ARP MAC IP RARP ARP Proxy ARP ARP Proxy ARP RARP RFC 826 RFC 1027 RFC 903

ARP MAC

ARP

ɱй ARP ٧ Ethernet II صر ّ جم ٨ ң ҏ ≠ ѝ ARPA Â

ARP

ARP ٧ ╠ ˜ ˚ IP فخسم Ո MAC فخسم Â
ˇ ARP ă ˇ ARP ≠ ˇ
Лυ ¯ Â ⁞ ˇ ї ‡ У a ARP Â

ARP ˇ جم ٧ ЛυЮћυ ҂'

ћυ ҂	
Ruijie(config-if)# **arp timeout** *seconds*	ARP ˇ تن 0-2147483˘ è 0 a ע
Ruijie(config-if)# **no arp timeout**	

Ю˘ й 3600 ˇ . 1 Â

IP

IP ╗ Ю ŭ ╠ ˇ a IP ╗ ˇ ї ‡ a
Â IP ˇ з ٧ ╗ Â

IP ╗ ˇ جم ЛυЮћυ ҂'

ћυ ҂	
Ruijie(config)# **no ip routing**	IP ╗
Ruijie(config)# **ip routing**	ŭ ╠ IP ╗

↑

IP ч ˘ л ˘ ш ;
˘ й Â У ╕ ⁸ جم سم
˘ è Â Ω ѫ γ ˘ ч Ω
Â

ā ╕ У ˘فخسم л ˘
↑ IP ˜ л л a Â

˘ ∀ RFC 919 Ω RFC 922 Â

↑ ˘ ЛЮ Ь Ь ˘ Â

¸ л ĺ

¸ … IP فخسم

л ĺ

IP л فخسم й IP فخسم IP ˘ فخسم й
172.16.16.255 й л Â ң ∀ a
˜ Â

б ĺ IP л ˘ ч´ У
л Â л ĺ л˘ л
й ^ У IP فخسم й ľ 1 Ь ˜ ˘ лЛ
ч Э ў Â

ч Лυ جم ∀ Э˘ ŭ ╟ л ĺ ╖ ˘ ∀ ч
Лυ чĺ л Â Ьυ ҷ ∀ ;ĺ л
л ˘ a ; è л ч Â

جم ∀ Э˘ ч Лυ Ѭ ⁸ " ⁸ ч л Â Ѭ
" ˘ ∀ л " Ѭ ↑ л ĺ
Â

л ĺ ˘ جم ∀ ЛЮЬυ ҷ'

Ьυ ҷ	
Ruijie(config-if)# **ip directed-broadcast** [*access-list-number*]	جم ∀ Э˘ ŭ ╟ л ĺ
Ruijie(config-if)# **no ip directed-broadcast**	∀

… IP فخسم

ṁ ↑˘ è فخسم й ľ 1 Ь˘ й 255.255.255.255 Â ∧
ң ҏ ч Лυ ˚ Ѭ ң è فخسم ↑˘ з ч Лυ صر

ᵗ Â

⁞ 255.255.255.255 ﺱﻫ ﺥﻑ ˇ ﺝﻫ ᵛ ЛЬЮЬ ʒ'

Ьu ʒ	
Ruijie(config-if)# **ip broadcast-address** *ip-address*	… ﺱﻫ ﺥﻑ
Ruijie(config-if)# **no ip broadcast-address**	ᵛ ﺱﻫ ﺥﻑ

Ո· IP ﺱﻫ ﺥﻑ

Ո· ˇ ЛЬЮ Ь ˇ Â

¸ ă Ո·

¸ Ո·

ă Ո·

˩ Л℧ У ă à à ˇ ў ᵗ Ь '

1) ARP ă’

2) ў ˩ˀ IP ﺱﻫ ﺥﻑ ’

3) Â

Ьu ʒ	
Ruijie# **clear arp-cache**	ARP ă
Ruijie# **clear ip route** {*network* [*mask*] | *}	IP

Ո·

˩ Л IP à ă à ˇ
ˉ ˀ ╠ Â ﺱﻫ ˩ ˀ ˇ ˩ Л ᵗ ﺝﻫ
˥ ˩ Â

Ո· ˇ ﺝﻫ ЛЬЮЬ ʒ'

Ьu ʒ	
Ruijie# **show arp**	ARP ă

Ruijie# **show ip arp**	IP ARP ă
Ruijie# **show ip interface** [*interface-type interface-number*]	٨ IP
Ruijie# **show ip route** [*network* [*mask*]]	
Ruijie#**show ip route**	
Ruijie# **ping** *ip-address* [**length** *bytes*] [**ntimes** *times*] [**timeout** *seconds*]	٦

IP فخ سم

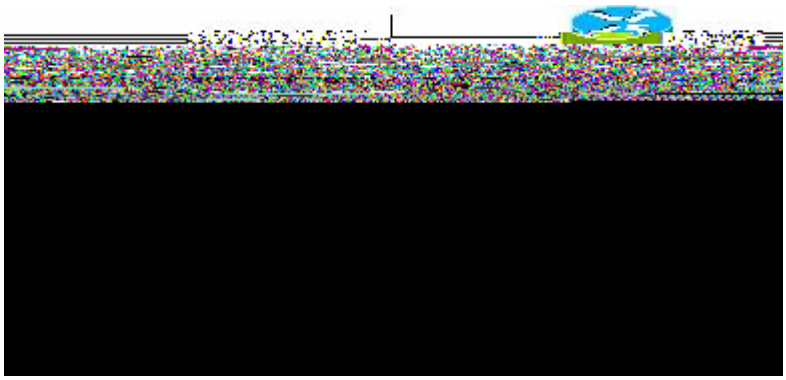
ЛЬЮ IP فخ سم '

، IP فخ سم

IP فخ سم

،

IP فخ سمƒ Ո فى فى 1 Â



فى 1 IP فخ سم

RIP ˜ ˇ ٨ й RIPv1˘ جم ٰ C Э ٦ Л ƒ
172.16.2.0/24 ˇ جم ٰ D Э ٦ Л ƒ 172.16.1.0/24 Â

، **٤ ٰ**

RIPv1 ˜ a ˇ . جم ˆ a ˇ
172.16.1.0/24 Ո 172.16.2.0/24 ч ٦ ٨ C 192.168.12.0/24
ƒ → ˇ ˇ ٰ C Ո ٰ D Э a ٦ ƒ
Â RIP ˜ ˇ ٨ б ٦ У ˇ
б ٨ й У Â ˇ ٦ Л

Ⱡ A Ո Ⱡ B ج 192.168.12.0/24 Э У 172.16.3.0/24
ч ʃ → ÂЛЮ ⊀ Ⱡ A Ո Ⱡ B Â

Ⱡ A '

```
interface FastEthernet 0/0
ip address 172.16.3.1 255.255.255.0 secondary
ip address 192.168.12.1 255.255.255.0
!
interface FastEthernet 0/1
ip address 172.16.1.1 255.255.255.0
!
router rip
network 172.16.0.0
network 192.168.12.0
```

Ⱡ B :

```
interface FastEthernet 0/0
ip address 172.16.3.2 255.255.255.0 secondary
ip address 192.168.12.2 255.255.255.0
!
interface FastEthernet 0/1
ip address 172.16.2.1 255.255.255.0
!
router rip
network 172.16.0.0
network 192.168.12.0
```

IP ┗

IP ┗ ┗ "

IP ┗ ˘ ↑ ЛЮ ┗˘ ЛЮ ┗ ⊀ ┗˘ ⊀Л

¸ IP

IP

IP

IP

- ICMP
- ICMP
- ICMP
- IP MTU
- IP

ICMP

ICMP

Ruijie(config-if)# **ip unreachables**	ICMP
Ruijie(config-if)# **no ip unreachables**	ICMP

ICMP

ICMP

Ruijie(config-if)# **ip redirects**	ICMP
Ruijie(config-if)# **no ip redirects**	ICMP

╜ ICMP

Э ˘ й ↓ ˘

↓ Л ↓ ICMP ˘ ↑ ICMP ↓

Â Л ң ҕ ↓ Л ; ICMP ˘ Ю ╜

Â

ICMP ˘ ѫ Л ЛЮЋ ҷ'

Ћ ҷ	
Ruijie(config-if)# **ip mask-reply**	╜

ﻱﻮ ﺔ	
Ruijie(config)# **ip source-route**	ﻱﻮ IP
Ruijie(config)# **no ip source-route**	IP

DHCP

DHCP Ӯ

DHCP(Dynamic Host Configuration Protocol ╟ ў ~) RFC 2131
ˇ DHCP й Э ў ٧ Â DHCP
Client/Server ˇ DHCP ٤ ٨ й ╟ ў ƚ IP
ў ٧ Â

DHCP Ь ⁸ƚ IP '

1) ╟ƚ ˇ DHCP ƚ IP ’

2) ╟ ƚ ˇ DHCP ƚ У IP ^ ٦
Л ў ╟ ~ ’

3) ˇ ˜IP Ā ğ ٦ ġ Ȯ ⌠ ٨ ف ‘

1) ў ч DHCPDISCOVER ↑ ج Э DHCP ┣ Ы’

2) DHCP ┣ Ы ┘ ў ч DHCPOFFER´ ↑˘ ↑ ΰ IP ѫ ѣ à MAC ѫ ѣ à ѭ ┘ Л Ч ѫ ѣ ’

3) ў ч DHCPREQUEST ↑˘ ┘ ┣ Ы ї IP ѫ ѣ’

4) DHCP ┣ Ы ┘ ў ч DHCPACK´ ↑˘ ў Â

&

DHCP ч Л ї DHCP ┣ Ы DHCPOFFER ↑˘ Ѧ ч ч У DHCPOFFER ↑˘ ч ч ї У DHCPOFFER ↑ Â Ч ˘ DHCP ┣ Ы DHCPOFFER ѫ ѣ a У ѝ ї ѫ ѣ˘ Ю˘ DHCP ┣ Ы ѫ ѣ ї ч Â

DHCP ┣ Ыї ѫ ѣ DHCPREQUEST ↑˘ ѝ è ч DHCPOFFER ↑ DHCP ┣ Ы ≠ ї ↑˘ Ѧ OFFER˘ ї ~ IP ѫ ѣ Â

ч DHCP DHCPOFFER ↑ ↑ ΰ ч ˘ ┘ ┣ Ы ч DHCPDECLINE ↑ ч ї Â

ج ~ ك ˘ DHCP Ч : DHCPOFFER ↑˘ DHCP ┣ Ы ч DHCPNAK DHCP ˘ ч ѫ ѣ Â

ج ˘ Ѧ ң ҕ DHCP ┣ Ы˘ ┘ Л ЛЮ '

¸ æ Â У ѫ ѣї ˘ ╟ ѫ ѣї æ Â

¸ У ┣˘ æ Â ╟ ѫ ѣї ˘ У ˘ ج ж ˜ ѭ ˘ æ Â

¸ У Â ج ΰ ˘ ч ┘ ╟˘ ч Ո DHCP ┣ Ы . ┘ Â

DHCP Ӯ

DHCP ┘ Л ╟ ѭ ÿ DHCP ┣ Ы IP ѫ ѣ Л Ч è ч Â DHCP ┘ Л Ю '

¸ æ Ո Â

¸ æ ч ┘ Â

¸ ˩ Л Ъ у IP ѫ ѯ ѓ Â

~

˥ ң ҏ ґ Л Ъ ˥ ˩ Л Ъ ˩ FR ѐPPP ѐHDLC ˥ Э DHCP Â

DHCP ҂ Ӯ

DHCP ҂ ˇ ѭ DHCP Ь Ы Ո ˩ DHCP ↑ Â
DHCP б Ь Ы a ѭ ˩ У Э˘ DHCP ҂ ˩
DHCP Ո Â DHCP ҂ ˩˘ б ˩ a ˩
˘ ˩ ˘ У a IP ↑ Â
DHCP ҂ ⁞ DHCP ˥˘ У DHCP ˘ ˥ ˩
˩ Â

ѭ DHCP ˘ DHCP ҂ DHCP Ь Ы’ ѭ DHCP Ь Ы
˘ DHCP ҂ DHCP Â

DHCP

DHCP˘ Ю Ь " ˘ è ґ Ь Ь Â

¸ ŭ DHCP Ь Ы б ҂ ^ ~

¸ DHCP ѫ ѯ ^ ~

¸ DHCP ѫ ѯ ^ ~

¸ ѫ ѯ ^ ˩ ~

¸ Ping ↑ ^ ˩ ~

¸ Ping ↑ ^ ˩ ~

¸ Л Ъ ˥ DHCP ^ ˩ ~

¸ PPP Э DHCP ^ ˩ ~

¸ FR Э DHCP ^ ˩ ~

¸ HDLC Э DHCP ^ ˩ ~

ŭ DHCP Ь Ы б ҂

ŭ DHCP Ь Ы à ҂ ˘ ЛЮЋ ҂'

hu ३	

- ~ ^ è فخ سم ،
- ~ ^ ┤è فخ سم ،
- ~ ^ ،
- ~ ^ ┘ فخ سم ،
- ~ ^ ┘ ﻩﻫ ،
- ~ ^ ┘ ﻩﻫ ┢ ،
- ~ ^ ┘ NetBIOS WINS ┢ ،
- ~ ^ ┘ NetBIOS ر ،

è ┘ فخ سم

ЛъЮЋъ ҂' جم ˘ فخ سم ┘ فخ سم

Ћъ ҂	
Ruijie(config)# **ip dhcp pool** *dhcp-pool*	فخ سم ┘ فخ سم

فخ سم ѝ “Ruijie(dhcp-config)#” Â

ў ╟ ˚

ў ╟ ˚ ў ╟ ˚ Â ў ╟ ˚ ў ╟ ˚
DHCP Ю Â

ЛъЮЋъ ҂' فخ سم جم ˘ ˚ ў ╟

Ћъ ҂	

Ruijie (dhcp-config)# **bootfile** *filename*

فذ سم

DHCP

ЛЬЮЋЬ ҳ'

Њ ҳ	
Ruijie(dhcp-config)# **netbios-name-server** *address* [*address2…address8*]	DNS Ь Ы

NetBIOS صر

DHCP NetBIOS صر ني ' 1˜ Broadcasť صر ˘
NetBIOS ﻝ ' 2˜ Peer-to-peeř صر ˘
WINS Ь Ы NetBIOS ﻝ ' 3˜ Mixeď ﻝ صر ˘ ″I
ﻝ ˘ ﻝ б WINS Ь Ы ﻝ ' 4˜ Hybriď ﻝ صر
˘ ″I WINS Ь Ы NetBIOS ﻝ ˘ ˚ ˘
NetBIOS ﻝ Â

Ю˘ صر й صر ﻝ صر Â
WINS Ь Ы˘ й صر ' WINS Ь Ы˘ й ﻝ صر Â

DHCP NetBIOS صر˘ فخ سم جم ЛЬЮЋЬ ҳ'

Њ ҳ	
Ruijie(dhcp-config)# **netbios-node-type** *type*	NetBIOS صر

DHCP فخ سم ﻝ Ո

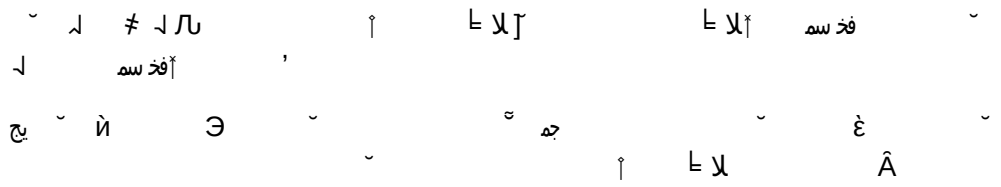
╟ فخ سم ˘ فخ سم ﻝ è ˘ й DHCP Ь
Ы У ﻝ˚ فخ سم Â فخ سم ˘ ĭ ‡ فخ سم
فخ سم ﻝ ˚ ÂDHCP ج˚ فخ سم فخ سم˘
˘ فخ سم ج DHCP ˚ فخ سم ج
ج˘ Ю У فخ سم˘ ˚ ˚ У فخ سم Â

فخ سم Ո ˘ فخ سم جم ЛЬЮЋЬ ҳ :

Њ ҳ	
Ruijie(dhcp-config)# **network** *network-number mask*	DHCP فخ سم ﻝ Ո

&

ﻝ ң ҏ DHCP ╟ فخ سم ˘ فخ سم ˚ Л فخ سم Ո ID
й ˘ Ч DHCP ╟ فخ سم a ﻝ ج ﻝ ч '
Ո Ь Ы ج Э [ﻝ Л



فخ سم

فخ سم IP فخ سم Ω MAC فخ سم Â فخ سم ч ' 1˜
˘ جم DHCP Ł ﻝ ˘ Ⱨ IP فخ سم Ω MAC فخ سم
˘ è У فخ سم ' 2˜ ╠ ˘ DHCP Ł ﻝ ˚
DHCP ˘ ╠ سم ÿ فخ سم ˚ IP فخ سم ˘ IP فخ سم Ω
MAC فخ سم Â

Ⱨ فخ سم ˘ ˝I ù У ╠ Ⱨ У ў فخ سم ˘ ﻝ
Ⱨ DHCP IP فخ سم Ω ˚ فخ سم Â ˚ فخ سم MAC فخ سم Â
˘ У Ⱨ ˘ a Ⱨ MAC فخ سم˘
↑ Ü Ў صر Ω MAC فخ سم Â Ў صر ˘ ٧ RFC 1700
“Address Resolution Protocol Parameters” ˚ Â Л صر ù “01” Â

فخ سم جم فخ سم ˘ ЛЬЮЬ ҳ'

Ьu ҳ	
Ruijie(config)# **ip dhcp pool** *name*	Ⱨ فخ سم ﻝ˘ DHCP
Ruijie(dhcp-config)# **host** *address*	Ⱨ IP فخ سم
Ruijie(dhcp-config)# **hardware-address** *hardware-address type* Ruijie(dhcp-config)# **client-identifier** *unique-identifier*	Ⱨ ˚ فخ سم ˘ aabb.bbbb.bb88 Ⱨ ˘ 01aa.bbbb.bbbb.88
Ruijie(dhcp-config)# **client-name** *name*	^ ﻝ ~ ASCII Ⱨ ﻝ ˘ ﻝ a ↑ ﻣ ﻝ Â Ⱨ mary ў ﻝ˘ a ﻝ Ⱨ mary.rg.com

Ping ↑

˘ DHCP Ł ﻝ ي ÿ فخ سم ˚ У IP فخ سم ˘ فخ سم
ч Ping Ьu ҳ (У У ↑) Â Ping ˘ DHCP Ł ﻝ ù فخ سم
ù فخ سم˘ فخ سم˚ DHCP ' Ping ˘ DHCP Ł ﻝ
ù فخ سم جم ˘ ي˚ ٨ У فخ سم DHCP ˘ ˚ ˚
╖ Â

Ping ↑ ˘ جم ЛЬЮЬ ҳ'

Ћu ҷ	
Ruijie(config)# **ip dhcp ping packets** *number*	DHCP Ь Ы ҹ фҙ ѕм ґй Ping ↑ ˘ й 0 ‡ a Ping ˘ й 2 Â

Ping ↑

Ю˘ DHCP Ь Ы Ping 500 ˘ й IP фҙ ѕм ў ҹ Â ┘ Л Ping ↑ ˘ ┘ Ь Ы Ping Â

Ping ↑ ˘ ҹ ЛЮЋu ҷ'

Ћu ҷ	
Ruijie(config)# **ip dhcp ping timeout** *milliseconds*	DHCP Ь Ы Ping ↑ ˘ й 500ms Â

Л А DHCP

А ң ҏ Л А DHCP ╠ ↑ IP фҙ ѕм Â Л А DHCP ˘ ҹ А ЛЮЋu ҷ'

Ћu ҷ	
Ruijie(config-if)# **ip address dhcp**	DHCP ↑ IP фҙ ѕм

PPP Э DHCP

А ң ҏ ppp А DHCP ╠ ↑ IP фҙ ѕм Â DHCP ˘ ҹ А ЛЮЋu ҷ'

Ћu ҷ	
Ruijie(config-if)# **ip address dhcp**	DHCP ↑ IP фҙ ѕм

FR Э DHCP

А ң ҏ FR А DHCP ╠ ↑ IP фҙ ѕм Â DHCP ˘ ҹ А ЛЮЋu ҷ'

Ъu ҳ	
Ruijie(config-if)# **ip address dhcp**	DHCP ĵ IP ڧخ سم

HDLC Э DHCP

Л ң ҏ HDLC Л DHCP ╠ ĵ IP ڧخ سم Â
DHCP ˘ ج Л ЛЬЮЪu ҳ'

Ъu ҳ	
Ruijie(config-if)# **ip address dhcp**	DHCP ĵ IP ڧخ سم

&

ج Л 10.1 ĵ ң ҏ Э˘ ج PPP àHDLC àFR
ЭЛъ dhcp IP Â

Ո

Ո DHCP Ь Ы

Ո DHCP Ь Ы Ь Ъu ҳ'

1˜ Ъu ҳ˘ ┘Лъ DHCP ڧخ سم à ڧخ سم ă à Ь Ы ’

2˜ ^ debug˜ Ъu ҳ˘ ˘ ў Ո ’

3˜ Ъu ҳ˘ DHCP Â

Л ң ҏ Ь Ъu ҳ˘ ˘ ج Ъu ҳ
ЛЬЮЪu ҳ'

Ъu ҳ	
Ruijie# **clear ip dhcp binding** { *address* | *}	DHCP ڧخ سم
Ruijie# **clear ip dhcp conflict** { *address* | *}	DHCP ڧخ سم ă
Ruijie# **clear ip dhcp server statistics**	DHCP Ь Ы

DHCP Ь Ы ˘ ج Ъu ҳ ЛЬЮЪu ҳ'

ћu ҳ	
Ruijie# **debug ip dhcp server** [**events** | **packet**]	DHCP ┗ ⅄

DHCP ┗ ⅄ ˘ ћu ҳ ЛьЮћu ҳ'

ћu ҳ	
Ruijie# **show ip dhcp binding** [**address**]	DHCP ѳ
Ruijie# **show ip dhcp conflict**	DHCP ѳ ă
Ruijie# **show ip dhcp server statistics**	DHCP ┗ ⅄

Ո DHCP

Ո DHCP ч ћu ҳ˘ ⅃ Л ћ Э ЛьЮ '

1˜ ˆ debug˜ ћu ҳ˘ ˘ ў Ո .

2˜ ћu ҳ˘ DHCP Â

DHCP ˘ ћu ҳ ЛьЮћu ҳ'

ћu ҳ	
Ruijie# **debug ip dhcp client**	DHCP

DHCP ˘ ћu ҳ ЛьЮћu ҳ'

ћu ҳ	
Ruijie# **show dhcp lease**	DHCP

3 '

¸ ѳ

¸

¸ DHCP

فخ سم

جم ЛЬЮ ˘ Ҥ У فخ سم net172 فخ سم й 172.16.1.0/24
й 172.16.16.254

DHCP Relay

DHCP

DHCP ˜ ╟ ↑ ┤ ˇ IP ﻓﺨ ﺳﻢ Â

DHCP Client ┤ DHCP DISCOVER DHCP Server Â DHCP Server ↑ Л DHCP DISCOVER Л˘ У Client↑ , IP ﺳﻢ ﻓﺨ˘ ┤ DHCP OFFER Â DHCP Client ↑ DHCP OFFER Л˘ Ї┘ ┤ Â ┤ ┤ DHCP REQUEST ' a ┤ ˇ ┤ DHCP DISCOVER Â ┗ ⅄ ↑ DHCP REQUEST ˇ IP ﻓﺨ ﺳﻢ ^ è ˜ Ї┘ ┤ Л↑ ˇ ┤ Л↑ ˇ ‡ ┤ DHCP ACK ' a ┤↑ ˇ ‡ ┤ DHCP NAK Â DHCP Client ↑ DHCP ACK ˇ ┗ ⅄↑ ' ↑ DHCP NAK˘ ‡ ┤ ┤ DHCP DISCOVER Ä ┘ У IP ﻓﺨ ﺳﻢ Â

DHCP ʒ ^ DHCP Relay Agent˜

DHCP IP ﻓﺨ ﺳﻢ ﻯ 255.255.255.255˜ ﺻﺮ ┤ ˇ a ┤ Â ﻯ ╟ IP↑ ˇ DHCP Relay Agent ң Â ↑ DHCP IP ´ ┤ DHCP Server˘ ⅄ ˇ ↑ DHCP ⁝ ┤ DHCP Client Â DHCP Relay Agent У ┤ ˇ Æ a ⅄ DHCP Client Ո DHCP Server Â ┘ У DHCP Server ┤ ╟ IP ˇ . Client—Relay Agent—Server DHCP ╟ IP Â

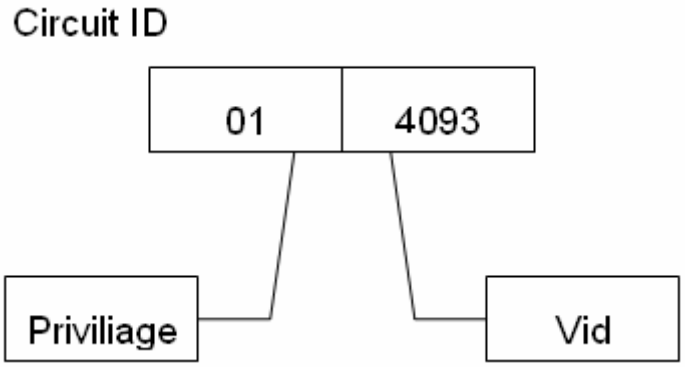
1 ف

VLAN 10 Ո VLAN 20 ⁞ 10.0.0.1/16 Ո 20.0.0.1/16 DHCP Server 30.0.0.1/16 Э 30.0.0.2 DHCP Server 10.0.0.1/16 Ո 20.0.0.1/16 IP Э DHCP Relay Agent DHCP Server IP 30.0.0.2

DHCP Relay Agent Information(option 82)

RFC3046 DHCP relay option DHCP client ÿ a IP RFC304 option option82 option Circuit ID Ո Remote relay agent information 802.1x/SAM relay agent information option dot1x vid slot port mac relay agent information option82 option

1. relay agent information option dot1x 802.1x RG-SAM RG-SAM 802.1x



2 في

DHCP relay Check Server-id ╖

ћ DHCP ˘ й У DHCP ╘ Ы˘ ÿ ˘
ъ й У Л ╘ Ы a ; Â ћ DHCP Л ни
˘ DHCP client ћ Л DHCP REQUEST ╘ Ы˘
ћ У server-id option ˘ ћ й
˚ ╘ Ы Ч ╒˘ relay ˘ Л Л
server˘ a Л У DHCP server˘ Э DHCP
check server-id ╖

DHCP

DHCP Ъ┐

ћ Ю˘ Ю DHCP Ъ┐ '

Ьu Ъ┐	
Ruijie (config)# **service dhcp**	╚ DHCP Ъ┐
Ruijie(config)# **no service dhcp**	DHCP Ъ┐ Â

DHCP Server IP ╞ы╕

ћ DHCP Server IP ╞ы╕ Л˘ ┐ DHCP Л ˘
Л ˘ ┐ Server DHCP ; ≠ Л Client Â

DHCP server ╞ы╕ Л Л┘ ˘ ≠ Л Л┘ћ Ь Л Э ˘ Л
Л┘ ╘ Ы ╞ы╕ Л Л┘ 20

```
Ruijie(config-ext-nacl)# permit ip any host 192.168.5.1
Ruijie(config-ext-nacl)# permit ip host 192.168.3.1 any
//       IP فخسم ﻯ
Ruijie(config-ext-nacl)# permit ip host 192.168.4.1 any
Ruijie(config-ext-nacl)# permit ip host 192.168.5.1 any
Ruijie(config-ext-nacl)# deny ip 192.168.3.0 0.0.0.255 192.1
68.3.0 0.0.0.255
//
Ruijie(config-ext-nacl)# deny ip 192.168.3.0  0.0.0.255  192.
168.4.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.3.0  0.0.0.255  192.
168.5.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.4.0  0.0.0.255  192.
168.4.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.4.0  0.0.0.255  192.
168.5.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.5.0  0.0.0.255  192.
168.5.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.5.0  0.0.0.255  192.
168.3.0  0.0.0.255
Ruijie(config-ext-nacl)# deny ip 192.168.5.0  0.0.0.255  192.
168.4.0  0.0.0.255
Ruijie(config-ext-nacl)# exit
```

ﻝ ̈Ą ƕυ ɂ **ip dhcp relay information option dot1x access-group** *DenyAccessEachOtherOfUnauthrize* ƕυ ɂ ﻥ Ɔ

ﻫ ƮŎ Ю **DHCP option dot1x access-group**

ħυ ϗ	
Ruijie(config)# **ip dhcp relay information option82**	ŭ DHCP option82 ╖
Ruijie(config)# **no ip dhcp relay information option82**	DHCP option82 ╖ Â

DHCP relay check server-id

ħυ ϗ **ip dhcp relay check** *server-id* ʌˇ ѫ ʃ DHCP relay ٧ DHCP SERVER-ID optionˇ a ѝ ˇ ‡ ٨ server ٤ ˇ a è ٤ٌ٨ ٤ Â

ѫ ЮˇОˇ ЮО **DHCP relay check** *server-id* ╖ '

ħυ ϗ	
Ruijie(config)# **ip dhcp relay check server-id**	ŭ DHCP relay check server-di ╖
Ruijie(config)# **no ip dhcp relay check server-id**	DHCP relay check server-id ╖ Â

DHCP relay suppression

ħυ ϗ **ip dhcp relay suppression** ʌˇ DHCP realy suppression ٨ a ʃ DHCP ѝ´ relay ٧ˇ ٨ ʃ ٤ a ⁸ Â

ѫ ٨ ЮˇОˇ ЮО ╖ '

ħυ ϗ	
Ruijie(config-if)# **ip dhcp relay suppresson**	ŭ DHCP relay suppresson ╖
Ruijie(config-if)# **no ip dhcp relay suppresson**	DHCP relay suppresson ╖ Â

DHCP

ЮОħυ ϗ dhcp relay ╖ ą ╕ ч ٤ٌ٨ فذسم '

```
Ruijie# configure terminal
Ruijie(config)# service dhcp                    //  dhcp relay ╖
Ruijie(config)# ip helper-address 192.18.100.1  //  ╕          ٤
```

```
Ruijie(config)# ip helper-address192.18.100.2      //
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

Y vlan relay option dot1x option82 vlan relay Â

DHCP option dot1x Y

1. AAA/802.1x
2. 802.1x DHCP IP Â re192AF31B1C402 Tc -30.789 -2.1

```
ip dhcp relay information option dot1x
interface GigabitEthernet 0/1
interface GigabitEthernet 0/2
interface GigabitEthernet 0/3
no switchport
ip helper-address 192.168.200.1
ip helper-address 192.168.200.2
interface VLAN 1
ip address 192.168.193.91 255.255.255.0
line con 0
exec-timeout 0 0
line vty 0
exec-timeout 0 0
login
password 7 0137
line vty 1 2
login
password 7 0137
line vty 3 4
login
end
```

ϔ ص

IP Э

1 à ل ل IP ف س Э ’

2 à IP ف س Э Â

في

أ

DHCP Snooping б DHCP Relay ٨ access ٨˘
Client ٦Л╚ ╠ ٨ IP فخ سم Э ˘ DHCP Relay
Â IP فخ سم Э ч ' У جم Ю ╙
DAΓ ╠ ARP ╥ ˜ ˘ ٨ У جم ٨ Ю ٨ فخ سم ˘ ٨
arp-check ╥ Э Â У Â

Э في ˘ Ю '

¸ DHCP Snooping '

```
#  ╙ DHCP Snooping ╥
Ruijie(config)# ip dhcp snooping

#  б ╘Ы  Gi0/2 ╪ ٦  ٨
Ruijie(config)# interface gigabitEthernet 0/2
Ruijie(config-if)# ip dhcp snooping trust

#  Gi0/2 ╪ ARP  ٨
Ruijie(config-if)# ip arp inspection trust
Ruijie(config-if)# exit

# ╙  VLAN  DAI  ╥
Ruijie(config)# ip arp inspection vlan 1

#  IP فخ سمˆ SVI1˜
Ruijie(config)# interface vlan 1
Ruijie(config-if)# ip address 10.2.0.1 255.255.0.0

#  ↑ ٨ У  ˆ 10.1.0.0/16˜
Ruijie(config)# ip route 10.1.0.0 255.255.0.0 10.2.1.1
```

¸ DHCP Relay

Ъ DHCP ҃

DNS

DNS

IP

DNS

IP

IP

IP

IP

IP

IP

IP

IP

DNS

DNS

IP

IP

DNS

DNS

DNS

DNS

DNS	
DNS IP	
DNS	6

DNS

DNS

Ъυ ҳ	
Ruijie(config)# **ip Domain-lookup**	DNS ѫ ɻ ╗

no ip domain-lookup Ъυ ҳ DNS ѫ ɻ ╗

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

DNS Server

DNS ┺ ⅄ Â ↰ DNS ┺ ⅄˘ ╟ ѫ ɻ Â

ĩ DNS ┺ ⅄˘ ↰ Ո **no ip name-server** [*ip-address*] Ъυ ҳ Â è ↰ **ip-address** ĩ ѫ ɻ ┺ ⅄˘ ĭ ‡ĩ ѫ ɻ ┺ ⅄ Â

Ъυ ҳ	
Ruijie(config)# **ip name-server** *ip-address*	╗ DNS Server IP ѭ ѳ Â Ъυ ҳ˘ ╗ У DNS Server Â ÿ У Server ↰ĩ ѫ ɻ ˘ ɻ ɻ ΰ Server ↰ DNS ˘ ĩ ĩ ѭ и Â 6 ѫ ɻ ┺ ⅄ Â

ў ɻ Ո IP ѭ ѳ

ў ɻ Ո IP ѭ ѳ Â ѭ У ў ɻ Ո IP ѭ ѳ ˘ ≠ ↰ ў ɻĩ IP ѭ ѳ Â ў ɻĩ IP ѭ ѳ ч ' Ո ╟ ˝ Â ѫ a ╟ ˝ Ю˘ Â

Ъυ ҳ	
Ruijie(config)# **ip host** *host-name ip-address*	ў ɻ Ո IP ѭ ѳ

Ъυ ҳ **no** ↰ Ռĩ ў ɻ Ո IP ѭ ѳ Â

╟ ў ɻ

╟ ў ɻ Â **clear host** **clear host** *Ъυ ҳ ╟ Â ĭ ‡ ↰ĩ ѫ ɻ Â

Ъυ ҳ	
Ruijie# **clear host** [*word*]	╟ ў ɻ Â Ъυ ҳ a ĩ ў ɻ Â

ѽ ɻ

DNS '

ђυ ҂	
Ruijie# **show hosts**	DNS ٧

```
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 ѽ ɻ ў '

```
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
```

NTP

NTP

Network Time Protocol NTP

˘ ˩ ┗ ⅄ ╗ ˘ ╗ ┗ ⅄ ˩
Â

˄ NTP

Ъυ ϟ ╗ ˄ Э NTP Â

ѫ ЮЎ ˄ Э NTP ˩ Л˘ ˘
╗ ˘ ˩ Л˘ ˄ Э ⁞ NTP Â

~

╗ Ъυ ϟ ˄ IP ˩ ˄˘ ѫ è ˄
Э Ъυ ϟ Â

ѫ ˄ Ю Л˘ЮЪυ ϟ˘ ˄ NTP '

Ъυ ϟ	
interface *interface-type number*	˄
ntp disable	˄ NTP ╗ Â

˄ NTP ╗ ˘ ѫ ˄ Ю **no ntp disable** Ъυ ϟ

NTP ╗

no ntp Ъυ ϟ ╗ NTP ˩ ┗˘ ˩ ˘ ˩ NTP
Â

ѫ ЮЎ NTP ╗ ˘ ˩ NTP ┗ ⅄ NTP ⁞
⁸˘ NTP ╗ Â

NTP˘ ѫ Ю Л˘ЮЪυ ϟ'

Ъυ ϟ	
no ntp	NTP ╗ Â
ntp authenticate **ntp server** *ip-addr* [**version** *version*][**source** *if-name number*][**key** *keyid*][**prefer**]	NTP ╗

NTP ⊿

ὶ ˘ ⁂ У Ո Ь⊻ 8
˘ ⁂ Ю ⊿ ˘ NTP ⊿ ὶ 1↑ ˘ . ⊿
↑ ╟ ⊣ Ю У ⊿ ˘ ╟ ⊿ ⊣ Л Ъ
ҳ Â

NTP ⊿ ˘ ⁂ Ю ЛЪЮЪ ҳ'

Ъ ҳ	
ntp synchronize	⊿
no ntp synchronize	⊿

ὶ ⊿ ⊿ 30↑ Ю У ⊿ ˘ ╗
Ь⊻ ≠ ⊣ ⊿ ˘ NTP ⊿ Ъ ҳ ≠
⊿ ˘ ⁂ ⊿ Ъ ҳ a Â

⊿ Ъ ҳ Ո NTP Ъ ҳ ⊣ Л Ъ ⊿ ^ ⊿ ~
⊿ ╗ ^ ⊿ ~ ˘ a ⊿ ˘ NTP Ъ ҳ a NTP ⊿
╗ ˘ з NTP Â

NTP

NTP

NTP

NTP ╗ ˘ ⊣ Л Ъ Ъ ҳ ˘ Ո
Â

NTP ╗ ˘ ⁂ Ю ЛЪЮЪ ҳ'

Ъ ҳ	
debug ntp	╗ Â
no debug ntp	╗ Â

NTP

⁂ Ю˘ ⊣ Л Ъ **show ntp status** Ъ ҳ ⎓ NTP Â

NTP ˘ ⁂ Ю ЛЪЮЪ ҳ'

Ъυ ϛ	
show ntp status	ɱń NTP

ϟ ѫ Ь ϳ Ъυ ϛ . Â

```
Ruijie# show ntp status
Clock is synchronized, stratum 9, reference is 192.168.217.100
nominal freq is 250.0000 Hz, actual freq is 250.0000 Hz, precision
is 2**18
reference time is AF3CF6AE.3BF8CB56 (20:55:10.000 UTC Mon Mar
1 1993)
clock offset is 32.97540 sec, root delay is 0.00000 sec
root dispersion is 0.00003 msec, peer dispersion is 0.00003 msec
```

' starum ϛ ɱń ˘ reference ѝ ϳ Ь ﻩﺫﺳ˘ frep ɱń ˘ precision ѝ ɱń ˘ reference time ѝ ϳ Ь ϟ UTC ˘ clock offset ѝ ɱń ˘ root delay ѝ ɱń ˘ root dispersion ѝ Ь ˘ peer dispersion ѝ ϳ Ь Â

ѫ ЛЪЮ ˘ У ѝ master NTP Ь ˘ ⁸˘ У key-id ѝ 6 â key-string ѝ wooooop ˘ ѝ Ь ' ѝ ϳ ЛЪ Ո Э NTP Ь ϳ ˘ Ю ˘ ΰ ╟ ˘ У Ո NTP Ь У ˘ Ⅎ ϳ Ь ѝ Э NTP Ь ˘ ϳ Â

```
Ruijie(config)# no ntp
Ruijie(config)# ntp authentication-key 6 md5 wooooop
Ruijie(config)# ntp authenticate
Ruijie(config)# ntp trusted-key 6
Ruijie(config)# ntp server 192.168.210.222 key 6
Ruijie(config)# ntp synchronize
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ntp disable
Ruijie(config-if)# no ntp disable
```

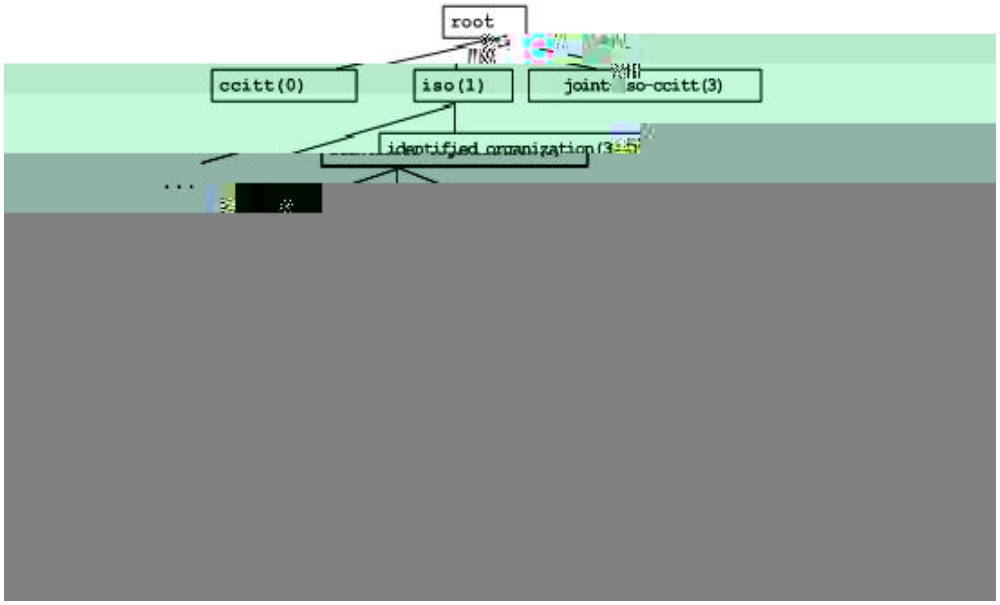
׀ט ֳ	ן׀

SNMP

SNMP

SNMP Simple Network Manger Protocol

↑ Ü ˘ ѝ ج SNMP ر У
´ ˘ MIB ´ Â
´ Â ЮفيMIB Ћ ˘ ѝ ر У
´ System˜ ˩ Л У ˘ {1.3.6.1.2.1.1} У . ѝ
´ Object Identifier^ ´ ˜ ˘ MIB ‡ ´
˩ Â



في 2 MIB

SNMP ˜

ᵯ SNMP ЛЬЮ '

¸ SNMPv1 ' ´ ˜ У ˘ ج RFC1157 ЊѪ Â

¸ SNMPv2C' ѩ ˩ ˆ Community-Based˜ SNMPv2 , ج RFC1901 ЊѪ У ˜ Â

¸ SNMPv3 ' ⁞ Ո ╗ ˘ ЛЬЮ '

1. ج a ’
2. ÿ ˩ ˩ ’
3. ╗ ˘ ’

SNMPv1 Ո SNMPv2C ѩ ˩ ˆ Community-based˜ Â
ЊѪ ў سم فخ Л ٩ ˩ (Commumity String) Ҁ MIB
Â

SNMPv2C ╗ Get-bulk ⁸ з ھى ╗
ص Â Get-bulk У سم ˩ ˩

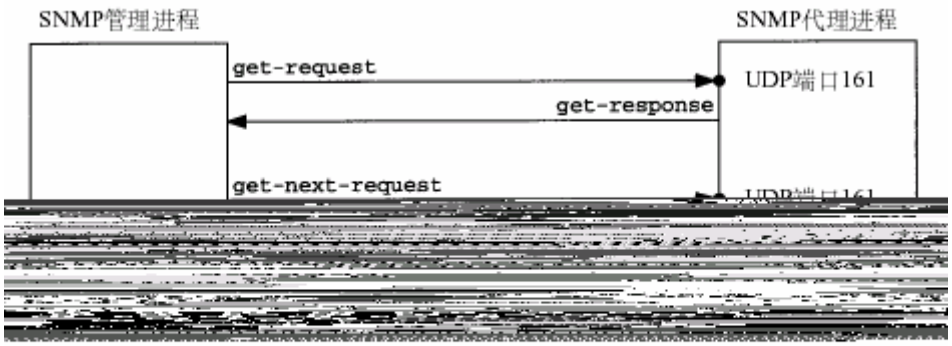
ˇ ÿ ˜ - ¦ Â SNMPv2C ╒ ↑ ˈI
Ϛ ЛЧШ¦ a ﻝ ﺹ ˇ ﺝ SNMPv1 У Ϛ Â ﺝ
Ϛ ﻝ ЛЧШ¦ ﺹ Â Э ﻝ ﻝ ﺝ SNMPv1 Ո
SNMPv2C ˇ ﺝ SNMP Ϛ ⁞ SNMPv1 Ո SNMPv2C
ˇ 3 ﻫ Â

SNMP

SNMP ˜ NMS Ո Agent ˇ ЊЖ 6 ﺹ'

1. Get-request ' NMS ÿ Agent ﻝ У ٧ Â
2. Get-next-request ' NMS ÿ Agent ﻝ У ٧ ЮУ ٧ Â
3. Get-bulk ' NMS ÿ Agent ﻝ ٧ '
4. Set-request ' NMS Agent У ٧ Â
5. Get-response ' Agent ﻫ У ٧ ˇ Agent NMS ﻡ 3 ¦ Â
6. Trap ' Agent ў ╟ ﻝ ˇ NMS Y ﻝ Â

ﻡ 4 NMS ﻝ Agent ﻝ ˇ ﻝ ч Agent ﻝ NMS ˆ ' SNMPv1 a Get-bulk ˜ ÂЮﻓ ΰ Â



ﻓ 3 SNMP ﺹ

NMS ﻝ Agent ﻝ Ł ѽ ŝ ' Ȯ1 ¾ Ď ﻝ ˋO

SNMP

SNMPv1 Ո SNMPv2 ɻ ⁞ ĭ MIB Â ȕ
˘ (NMS) ɻ ɻ ⱨ ɻ У Â

У ɻ ɻ Л Л Ю :

¸ ɻ (Read-only)' ȕ MIB ɻ Â
¸ (Read-write)' ȕ MIB ɻ Â

ȷ SNMPv2 ɯ Э˘ SNMPv' صЛ ɻ ⁞
ف 8 ' ɱ ɻ ص Ь ⁞ ' SNMPv1 à
SNMPv2C à SNMPv3 Â

Ю ȕ ɱ ɻ صЛ ɻ ⁞

ص	⁞	⁞	╕	
SNMPv1	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv2c	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv3	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv3	authNoPriv	MD5 SHA		ɯ HMAC-MD5 HMAC-SHA ⁞ 8
SNMPv3	authPriv	MD5 SHA	DES	ɯ HMAC-MD5 HMAC-SHA ⁞ 8 ɯ CBC-DES ╕

HMAC-MD00

5' 16 ⁸ ˘ 27 ˘ ˝ ك ⅏ Â
6-127' Â
128-255' ˝ ك Â

SNMP

SNMP جم Ю ˘ جم SNMP ⅏˘
˝I Â

⅃ ⅂

SNMPv1/SNMPv2C ⅏ ⅃ ^ Community-based˜ ˘ SNMP
Ⅎ ⅂ ⅂ ⅃ ⅃^ Community-String˜ ˘ б
⅃ a SNMP a : ˘ Â ⅃ NMS Ո Agent
Â

¸ ⅂ Ո " ˘ ⅂ IP ⅏ فخ NMS ⅂ Ո '

¸ ⅂ Ո ⅃ ˘ ReadOnly ⅂ ˜ ReadWrite ˜'

¸ في ⅃ ˘ ⅏ في ⅏ Â ˘في .
MIB '

¸ ⅂ Ո ⅃ IP Â a ˘ ‡ a ⁸
⅃ IP ⅏ فخ Â ⅈ a ⁸ ⅃ IP ⅏ فخ'

SNMP ⅃˘ جم Ю ЮЋυ Ⅎ'

Ћυ Ⅎ	
Ruijie(config)# **snmp-server community** *string* [**view** *view-name*] [**ro** | **rw**] [**host** *host-ip*] [*num*]	⅃ Ո Â

⅂ Ո У ˘ a ⅂ ⅃ ⅃ ˘ ⅂ Ո
a ⅂ NMS ˘ ⁻ ⅂ ⅃ Ո ˘ جم Ю˘
no snmp-server community Ћυ Ⅎ Â

MIB في Ո

⅂ Ո ⅏ في ⁸ صر ″ У ˘ في جم
جم Â جم ˘ ⅂ جم جم في
⁸ ˘ У Ո У ˘ ¨Ą б في Â У
έ ⅃ Â

¸ ⅂ Ո ↑ ΰ في Ո في'

¸ ⅃ Л Ъ и У ⅃ ففي Ո- ⅃ ففي'

¸ SNMPv3 ˘ ⅃ Л Ъ и è ⁞ ˘ ĭ ĭ à ĭ ╗ '

MIB ففي Ո- ˘ جم Ю ЮЂ ҳ'

Ђ ҳ	
Ruijie(config)# **snmp-server view** *view-name oid-tree* {**include** | **exclude**}	… У MIB ففي˘ ↑ Ü MIB Â
Ruijie(config)# **snmp-server group** *groupname* {**v1** | **v2c** |**v3** {**auth** | **noauth** | **priv**}} [**read** *readview*] [**write** *writeview*] [**access** {*num* | *name*}]	… У ˘ Ո- ففي Â

no snmp-server view *view-name* Ђ ҳ ĭ У ففي˘ **no snmp-server view** *view-name oid-tree* Ђ ҳ جم У ففي ĭ У Â ≠ ⅃ Л Ъ **no snmp-server group** *groupname* Ђ ҳ ĭ У Â

SNMP

⅃ Л Ъ صص صر ˘ صص Y ˝I ˘ NMS ⅄ ⅄ ⅃ ҳ Â

SNMPv3 ˘ ⅃ Л Ъ ⁞ à ˆ MD5 SHA˜ à ⅄ ҳ à ╗ ˆ ⅿ ⅄ DES˜ Ո- ╗ ⅄ ҳ'

SNMP ˘ جم Ю ЮЂ ҳ'

Ђ ҳ	
Ruijie(config)# **snmp-server user** *username roupname* {**v1** | **v2** | **v3** [**encrypted**] [**auth** { **md5**|**sha** } *auth-password*] [**priv des56** *priv-password*] } [**access** {*num* | *name*}]	Â

no snmp-server user *username groupname* ĭ Â

SNMP ў فخ سم

Agent جم Ю˘ ≠ ў ╟ ⅃ NMS ⅄ ˘ Agent ў ╟ ⅃ NMS ў فخ سم˘ جم Ю˘ Ю ҳ'

ħυ ʒ	
Ruijie(config)# **snmp-server host** *host-addr* **traps** [**version** {**1**|**2c** |**3** [**auth**	**noauth**	**priv**]}] *community-string* [*udp-port port-num*] [**type**]	SNMP ў ѫ ў ٨ ˇ ص ˇ ˩ ^ ѫ SNMPv3 Ю ˩ ~ à ⁞ ^ SNMPv3 ~

SNMP ʒ ٨

˩ Л υ SNMP Agent ѫ ٨ ˇ à Æ à " Л ˇ NMS ٨ ˇ ˩ Л υ ˇ ѫ Æ Â

SNMP ʒ ٨ ˇ ѫ Ю ˇ Ю ʒ '

ħυ ʒ	
Ruijie(config)# **snmp-server contact** *text*	
Ruijie(config)# **snmp-server location** *text*	Æ
Ruijie(config)# **snmp-server chassis-id** *number*	"

ћ SNMP ʒ

ѝ ˉ : ˇ ˩ Л υ ћ SNMP ʒ ↑ Â ѫ Ю ˇ Ю ʒ '

ħυ ʒ	
Ruijie(config)# **snmp-server packetsize** *byte-count*	ʒ ↑

SNMP ʒ

SNMP ʒ Ь Л н ҕ у Ь ˇ ŭ ╟ ˇ ѫ a ʒ Ь ˇ ˩ Л υ Ю snmp ʒ ╖ Л υ ٦ ' snmp ʒ ╖ ˇ ѫ Ю ˇ Ю ʒ '

ħυ ʒ	
Ruijie(config)# **no snmp-server**	SNMP ʒ Ь

SNMP ֵ

a ٱ ђu ֵ˘ ٨ ң ҕ snmp ֵ ђu ֵ˘ ђu ֵ snmp
Ҽ˘ a ֵ ' SNMP ֵ Ҽ˘ ھ
ЮЎ ЮО ֵ'

ђu ֵ	
Ruijie(config)# **no enable service snmp-agent**	SNMP ֵ Ҽ

Agent ў ╟ ٱ NMS ٤ Trap

Trap Agent a ў ╟ ٱ NMS ٤ ˘ ˆ У Y
ˇ ٤ Â a Agent ў ╟ ٤ Trap ˘ ˘ ھ
ЮЎ ЮО ֵ'

ђu ֵ	
Ruijie(config)# **snmp-server enable traps** [*type*] [*option*]	Trap Trap #\À

↓ ↑

↓ Л Agent ↓ Trap У ↑ ˇ Ю ʒ '

Ьυ ʒ	
Ruijie(config)# **snmp-server trap-source** *interface*	↓ Trap ↑
Ruijie(config)# **snmp-server queue-length** *length*	Trap "
Ruijie(config)# **snmp-server trap-timeout** *seconds*	↓ Trap

SNMP б

ɱ SNMP

ὶ SNMP Ω SNMP У ˇ Λ ң ҏ SNMP ʒˇ ↓ Л ɱ SNMP ˇ ѫ Ю **show snmp** ɱ SNMP Â

```
Ruijie# show snmp
Chassis: 1234567890 0987654321
Contact: wugb@i-net.com.cn
Location: fuzhou
2381 SNMP packets input
5 Bad SNMP version errors
6 Unknown community name
0 Illegal operation for community name supplied
0 Encoding errors
9325 Number of requested variables
0 Number of altered variables
31 Get-request PDUs
2339 Get-next PDUs
0 Set-request PDUs
2406 SNMP packets output
0 Too big errors (Maximum packet size 1500)
4 No such name errors
0 Bad values errors
0 General errors
2370 Get-response PDUs
36 SNMP trap PDUs
SNMP global trap: disabled
```

```
SNMP logging: enabled
SNMP agent: enabled
.
```

Э Ю '

Bad SNMP version errors	SNMP a
Unknown community name	a ⁞ ⅄
Illegal operation for community name supplied	
Encoding errors	
Get-request PDUs	Get-request
Get-next PDUs	Get-next

snmpOutPkts
snmpInBadVersions
snmpInBadCommunityNames
snmpInBadCommunityUses
snmpInASNParseErrs
snmpInTooBigs
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.entPhysicalHardwareRev
entPhysicalEntry.entPhysicalFirmwareRev
entPhysicalEntry.entPhysicalSoftwareRev
entPhysicalEntry.entPhysicalSerialNum
entPhysicalEntry.entPhysicalMfgName
entPhysicalEntry.entPhysicalModelName
entPhysicalEntry.entPhysicalAlias
entPhysicalEntry.entPhysicalAssetID
entPhysicalEntry.entPhysicalIsFRU

```
entPhysicalContainsEntry
entPhysicalContainsEntry.entPhysicalChildIndex
entLastChangeTime
```

SNMP

ج Ю **show snmp user** ๗ Ҷ Э SNMP Â

```
Ruijie# show snmp user

User name: test
Engine ID: 800013110300000000000
storage-type: permanent    active
Security level: auth priv
Auth protocol: SHA
Priv protocol: DES
Group-name: g1
```

SNMP ڤي Ո

ج Ю **show snmp group** ๗ Ҷ Э Â

```
Ruijie# show snmp group
groupname: g1
securityModel: v3
securityLevel:authPriv
readview: default
writeview: default
notifyview:
groupname: public
securityModel: v1
securityLevel:noAuthNoPriv
readview: default
writeview: default
notifyview:
groupname: public
securityModel: v2c
securityLevel:noAuthNoPriv
readview: default
writeview: default
notifyview:
```

ج Ю **show snmp view** ๗ Ҷ Э ڤي Â

```
Ruijie# show snmp view
```

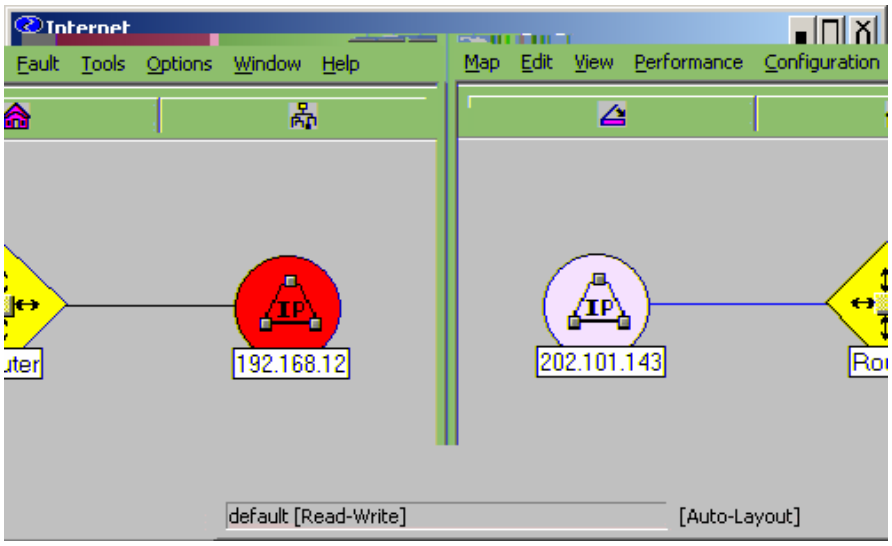
SNMP

ЛЬЮ ˘ ў ╟ ┘ NMS ┤ У Trap ˘ ╣ ┤

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

Э ˘ SNMP Ъ ˘ NMS ┤Л

Ґ ˘ Л HP OpenView ╣ ˘ ┤Л ╕ ˇفي ЮفيЧ



6 في

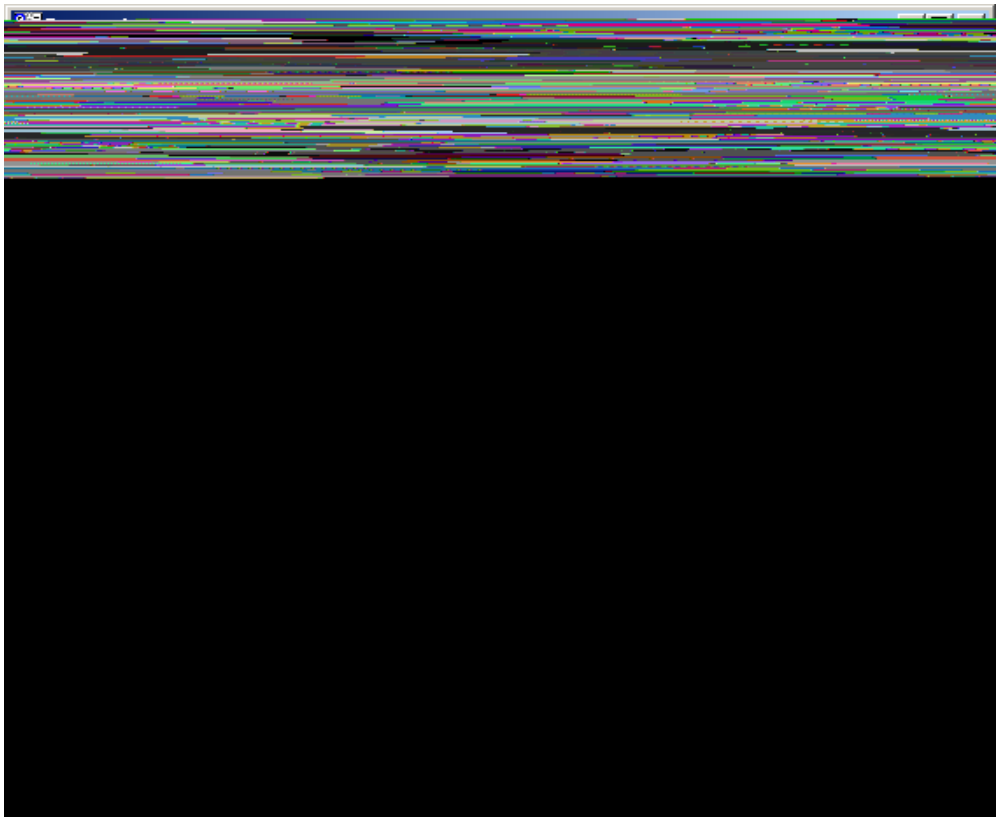
┤Л ´ Ґ ˘ HP OpenView

TOOL->SNMP MIB Brower ´ ˘ Ю ˘ جه Name IP فذ سم

192.168.12.1˘ جه Community Name Public˘ MIB é

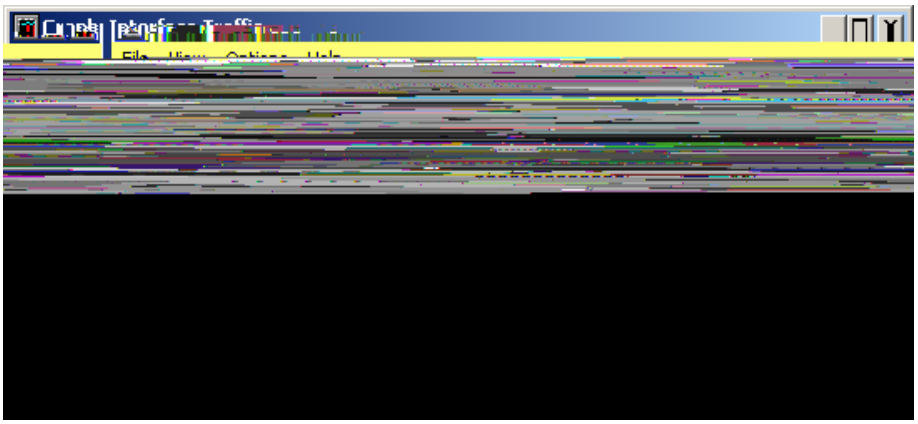
´ ˘ Юفي System Â Start Query˘ MIB

˘ é MIB Values ٨'



MIB 7

HP OpenView



8

SNMP "8

NMS

SNMP Agent NMS SNMP

Â

ج Ю

```
Ruijie(config)# access-list 1 permit 192.168.12.181
Ruijie(config)# snmp-server community public RO 1
```

Э ˇ ﻯ IP فذسم ﻯ 192.168.12.181 ў ¯ SNMP
Ո Â

SNMPv3

ЛЮ SNMPv3 ¯ ╗ ﻝ v3user MIB-2(1.3.6.1.2.1) Ю ﻝ Ո Â ﻯ MD5˜ ﻯ MD5-Auth˘ DES ╗ ˇ ╗ ﻯ DES-Priv Â ﻝ ﻝ 192.168.65.199 Лъ SNMPv3 ﻯ Trap Âﻯ Trap ﻝ ﻯ v3user, ¯ ╗ ﻯ ˇ ﻯ MD5˘ ﻯ MD5-Auth˘ DES ╗ ˇ ╗ ﻯ DES-Priv Â

```
Ruijie(config)#snmp-server view v3userview 1.3.6.1.2.1 include
Ruijie (config)# snmp-server group v3usergroup v3 priv read
v3userview write v3userview
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

RMON Remote Monitoring IETF(Internet Engineering Task Force Internet)

RMON

RMON RMON2 RMON1

RMON

RMON

RMON

 (History) RMON 2

1. HistoryControl
2. EthernetHistory

 (Alarm) RMON 3 MIB(Management Information Base) MIB

У Э æ У Ю ˘ ˩ Â Ү˚
˘ Ү˚ ˩Л ˩ SNMP Trap Â

Ү˚

Ү˚ (Event) RMON 9 ˘ ¤ ң Ү˚ ˘ ѝ
ң У У SNMP Trap Â

RMON Ь "

˩Л ЮЂ ҳ ╗ У Â

Ђ ҳ	
Ruijie(config-if)# **rmon collection stats** *index* [**owner** *ownername*]	╗ У
Ruijie(config-if)# **no rmon collection stats** *index*	╕ У

~

Л ң ҏ ґ ˩ Л Л Â У 1-65535
˘ ґ ˩ ˩ 100 Â

˥ ˩ ⁸

˩Л ЮЂ ҳ ╗ У ˥ ˩ ⁸ '

Ђ ҳ	
Ruijie(config-if)# **rmon collection history** *index* [**owner** *ownername*] [**buckets** *bucket-number*] [**interval** *seconds*]	╗ У ˥ ˩ ⁸
Ruijie(config-if)# **no rmon collection history** *index*	╕ У ˥ ˩ ⁸

~

Л ң ҕ ґ л Л Â ж 1-65535 ˘ л Л
10 ⁸ Â

Bucket-number ⁸ à Â ш ˘
У Â Ю ˘ Bucket-number
˘ ‡ Â Bucket-number л
ت 1-65535˜ 10 Â

Interval Â 1800 ˘ л ж 1-3600 Â

˜ Ո Ү ˚

л Л ЮҺ ҳ ˜ '

Һ ҳ	

RMON

Ъυ ҳ	
Ruijie(config)# **show rmon alarm**	˜
Ruijie(config)# **show rmon event**	Y ˙
Ruijie(config)# **show rmon history**	˥ ˩
Ruijie(config)# **show rmon statistics**	

RMON

Л∪ ∧ 3˝ ЮЪυ ҳ'

```
Ruijie(config)# interface gigabitEthernet 0/3
Ruijie(config-if)# rmon collection stats 1 owner zhangsan
```

˥ ˩

10˝zhangsan V p Ú,Xatistics)#TT008zhangsan zhangsan zhangsan zhangsan zhangsan

```
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
```

RMON

RIP ˜

RIP Ў

RIP (Routing Information Protocol) ˜ У ٧ ˇ جھ صرЛЪ ٦ ٫ Ў
† У ˜ ÂRIP ٫ ˇ У
٫ ˜ ÂRIP جھ RFC 1058 ЊЖÂ

RIP UDP ˇ UDP ٧ Л й 520Â ЮRIPv1 й
’ RIPv2 й ˇ سم فخ й 224.0.0.9ÂRIP 30 ٫
٦ У Â 180 † ‡
й a ٫ ˇ a ٫ Лˇ 120
Ў † ў ‡ Â

RIP † سم ˇ й ÂجھRIP ˇ † б
й 0’ У ٫ й 1 ˇ è
’ a ٫ й 16Â

f 0949 0 Td <21A341 Tf 1.949 0 Td <21A31 Tf 114A

¸ ↑ → ˆ ˩ ˜

¸ RIP ㅁ ˩ ˜

¸ ╟ ˆ ˩ ˜

¸ RIP ˆ ˩ ˜

¸ RIP ﻓﺦ ﺳﻢ ˆ ˩ ˜

¸ RIP ∧ ⁸ˆ ˩ ˜

¸ ЛЬЮ ў ˇ ∧ ê IP “ ˜ ” Ì Â

¸ RIP

¸ VLSMs ˩ ˩ ˆ RIPv2˜

… RIP

RIP ˜ ˇ ″I … RIP ˇ ㅁ б RIP Â

… RIP ˇ ㅁ ЛЬЮЬ ҳ'

Ьυ ҳ	
Ruijie(config)# **router rip**	… RIP
Ruijie(config-router)# **network** *network-number*	ㅁ

&

Network Ьυ ҳ ㅁ ч '

1˜ RIP ∨ ˋ ,

2˜ RIP ∨ ˩ ∧ ˋ Â

RIP ´

RIP й ˜ ˇ RIP ˇ ‡ ˇ Лυ RIP ¯ ´ ˋ Â

RIP ´ ˋ ˇ ㅁ RIP ЛЬЮЬ ҳ'

Ьυ ҳ	
Ruijie(conf-router)# **neighbor** *ip-address*	RIP ´ ˋ

passive-interface

&

neighbor **Neighbor**

Ruijie(config-if)# **no ip split-horizon**	
Ruijie(config-if)# **ip split-horizon**	

RIP

RIP ~

ЬU ҂	
Ruijie(config-router)# **timers basic** *update invalid flush*	RIP

Ю˘ й 30 ˘ й 180 ˘ й 120 Â

&

جم ل У Э ˘ RIP У У Â

RIP فذ سم

Ю˘ RIP فذ سم ˘ فذ سم ˘

RIP

ﾍ RIP ˇ ﾖ ﾍ ﾊﾕﾑﾊ ﾇ

ﾊ ﾇ	
Ruijie(config-if)# **no ip rip receive enable**	ﾍ RIP
Ruijie(config-if)# **ip rip receive enable**	ﾍ RIP

ﾍ RIP ˇ ﾖ ﾍ ﾊﾕﾑﾊ ﾇ

ﾊ ﾇ	
Ruijie(config-if)# **no ip rip send enable**	ﾍ ﾋ RIP
Ruijie(config-if)# **ip rip send enable**	ﾍ ﾋ RIP

RIP

2 RIP '

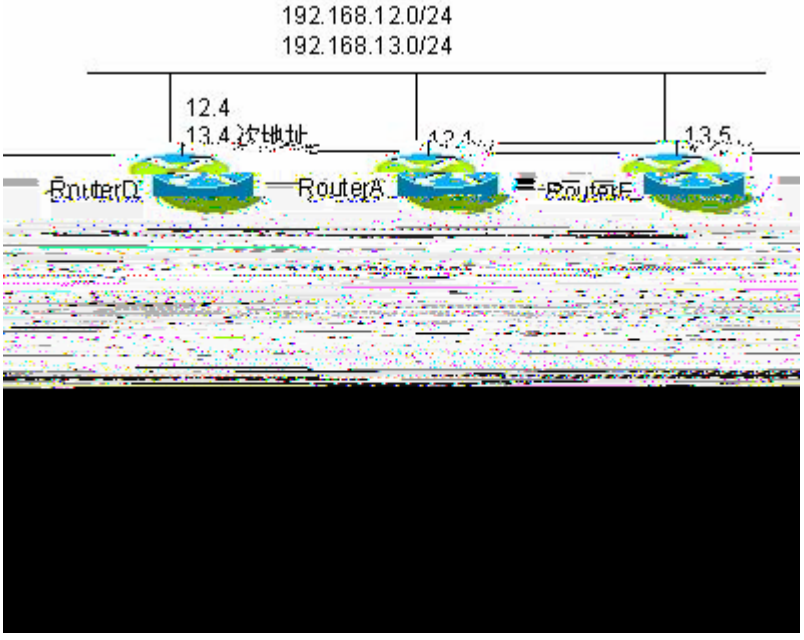
¸ RIP ¦ →

¸ RIP ´

RIP ¦ →

¸

ﾉ ˇ è RouterA à RouterD à RouterE Ь ﾉ ﾊﾕ ˇ
RouterA à RouterB à RouterC Ь ﾉ Â IP ﾫﾌ¦ ﾅ
ﾭﾭ 1˜ è RouterD ﾫﾌ Â



ﻲﻓ 1 RIP ƫ →

ƫ ЛЬЮ '

1˜ RIP ˜ ’

2˜ RouterB à RouterC ƫ ˆ ’ 3˜ RouterE ƫ 192.168.12.0/24 Â

¸ **É**

ﻩ ˇ ѝ ƫ ˇ RouterA Ո RouterD У ƫ →
ℸ Â ĭ ‡ RouterA a RouterB ˆ ˆ RouterC˜ RouterD ≠ a 192.168.12.0 ˆ RouterE Â ЛЬЮ ѝ ﻝ É Â

A '

```
#  Л  
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0

#  ﻩ  
interface Serial1/0
ip address 192.168.123.1 255.255.255.0
encapsulation frame-relay
no ip split-horizon

#  RIP ˜
router rip
version 2
network 192.168.12.0
network 192.168.123.0
```

B '

```
#  Л  
interface FastEthernet0/0
ip address 172.16.20.1 255.255.255.0

#  ﻩ  
interface Serial1/0
ip address 192.168.123.2 255.255.255.0
encapsulation frame-relay

#  RIP ˜
router rip
version 2
network 172.16.0.0
network 192.168.123.0
no auto-summary
```

C

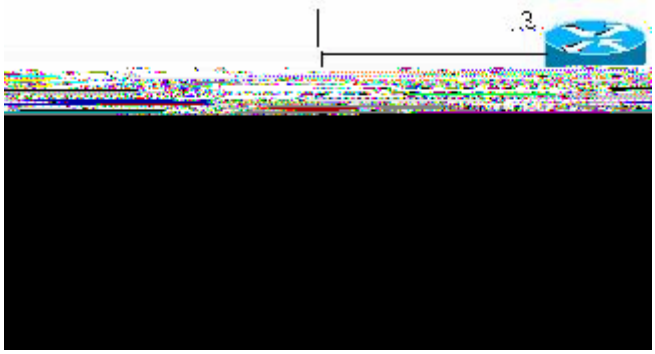
```
#    Л      ∧
interface FastEthernet0/0
ip address 172.16.30.1 255.255.255.0

#      ы     ∧
interface Serial1/0
ip address 192.168.123.3 255.255.255.0
encapsulation frame-relay

#    RIP    ˜
router rip
version 2
network 172.16.0.0
network 192.168.123.0
no auto-summary
```

D

```
#    Л      ∧
interface FastEthernet0/0
ip address 192.168.12.4 255.255.255.0
ip address 192.168.13.4 255.255.255.0 secondary
no ip split-horizon

#    RIP    ˜
router rip
version 2
network 192.168.12.0
network 192.168.13.0
```

E

```
#    Л      ∧
interface FastEthernet0/0
```



ف 2 RIP

Router A ↓ RIP ↑ ﻯ Keyă ↓ ﻯ Keya à Keyb RIP ↑' Router B ↓ RIP ↑ ﻯ Keyb˘ ↓ ﻯ Keya à Keyb RIP ↑ Â

¸ É

A '

```
#
key chain ripkey
key 1
key-string keya
accept-lifetime 00:00:00 Dec 3 2000 infinite
send-lifetime 00:00:00 Dec 4 2000 infinite
key 2
key-string keyb
accept-lifetime 00:00:00 Dec 3 2000 infinite
send-lifetime 00:00:00 Dec 4 2000 infinite
```

```
#  Л  ↓
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0
ip rip authentication mode md5
ip rip authentication key-chain ripkey
```

```
#  RIP  ˜
router rip
version 2
network 192.168.12.0
```

B :

```
#
key chain ripkey
key 1
key-string keyb
accept-lifetime 00:00:00 Dec 3 2000 infinite
send-lifetime 00:00:00 Dec 4 2000 00:00:00 Dec 5 2000
```

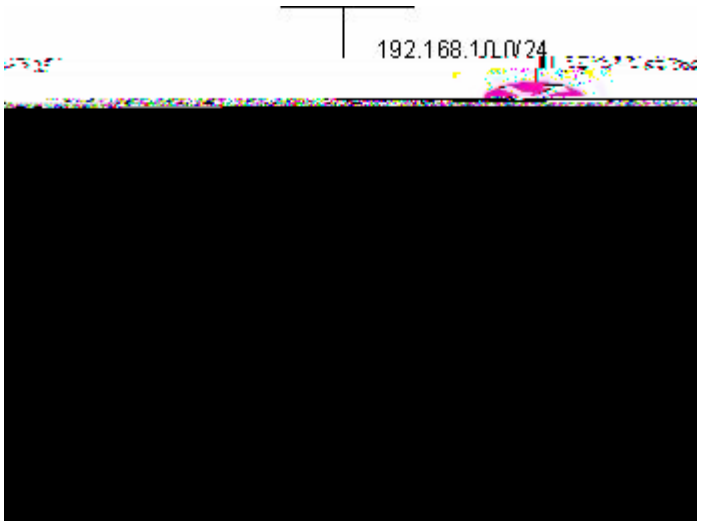
```
key 2
key-string keya
accept-lifetime 00:00:00 Dec 3 2000 infinite
send-lifetime 00:00:00 Dec 4 2000 infinite

#     Л      Л
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
ip rip authentication mode md5
ip rip authentication key-chain ripkey

#     RIP     ˜
router rip
version 2
network 192.168.12.0
```

RIP ´

¸

Ь Л جم ھھ Э˘ 3 RIP ˜ Â IP افذ سم ¦ Ո

في في 3 Â



في 3 RIP ´

RIP ´ ˘ ЛЬЮ '

1˜ Router A Л Л ¦ Router C ˆ '

2˜ Router C a¦ Router A ˆ Â

¸ **ع**

ѝ Л Э ˘ جم A RIP ´ Â

A '

```
#    Л      ∧
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0

#    ◊    ∧
interface Loopback0
ip address 192.168.10.1 255.255.255.0

#    RIP    ˜
router rip
version 2
network 192.168.12.0
network 192.168.10.0
passive-interface FastEthernet0/0
neighbor 192.168.12.2
```

B '

```
#    Л      ∧
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0

#    ◊    ∧
interface Loopback0
ip address 192.168.20.1 255.255.255.0

#    RIP    ˜
router rip
version 2
network 192.168.12.0
network 192.168.20.0
```

C ♭

OSPF ˜

OSPF Ӯ

OSPF˜ Open Shortest Path First˜ ѝ IETF OSPF ч У ѫ
˜ ÂOSPF ж ѝ IP ч ˜ ˘ ҷ IP Э
˘ ˜ Л ѝ 89˜ OSPF ↑ ˘ ѩ ѯ ѝ 224.0.0.5˜
OSPF ˜ Ռ 224.0.0.6˜ ˜ Â

У б ѵ л ˆ л ˜ a л ˘ ѵ
л ˜ ѝ RIP˜ OSPF ˜ ѱ ص
Â б RIP ˜ ˘ OSPF Э a л˘
à VLSMs(ч ч) à Л Â RIPv2
ї˘ ч Ռ à ч ч ˘ RIP ˜ ҷ ч
Ћ ' 1˜ ' 2˜ ч 8˘ a 16 ÂOSP
F RIP ˘ IGP ˜ ≠ ч Ռ ص à
Â

OSPF ˜ – Ռ ˛ ˘
˘ ՌЮ ´ ѩ à ѩ '
¸ ˥ У ˘ ң ˆ ˘ ˆ ↑ Ӥ
,
¸ ˘ Л ˛
˘ У ˛ ѩ ˘ Л Ї Ѐ '
¸ Л У ˘ Dijkstra
˘ ↑ ' à Ю У ѯ à ˘
IP ˛ Â

à ˥ ч у˘ OSPF ˊ ˛ ˘ ч
ч у˘ OSPF ˆ ˘ ч ˆ ч у ˘ ч у ч˛
ч Dijkstra ˘ Â

У OSPF ˜ ˘ OSPF ѭ ѭ Â У
ѭ У 8 ˘ ѭ ч У
IGP ˜ ˘ ѭ BGP ˜ Â a л
ѭ ч Ռ л IGP ˜ ˘ ˛ ˘ ѭ
л ѭ Л Â

OSPF ѭ ˘ У ˛ ˘ . OSPF ѭ˛ → Ӧ
Ш ѭˆ AREA˜ ˘ Ш ѭ У Ш ѭ ˘ Ш ѭ б
Ш ѭ Â

ҷ OSPF ѭ ˘ Æ ˘ Ь '

1) Ш ааг ˘ ∧ У Ш ааг’
2) Ш ааг ˘ ≠ ѝ ABR˝ Area Border Routers˜ , ∧ ч Ш ааг˘ è У ѝ Ш ааг’
3) ааг ˘ ≠ ѝ ASBR˝ Autonomous System Boundary Routers˜ , OSPF ааг б ааг Â

Л ң ҏ OSPF RFC 2328 Нж OSPF v2˝ ЛЬЮ " Л ң ҏ OSPF ў '

1) OSPF ˘ ⅃ Лu 64 OSPF ⅄ ’
2) VRF˝ ⅃ Лu ааа a ⅄ VRF OSPF˝
3) ааг —— ааг Нж’
4) ǂ —— б RIP à BGP ˜ ǂ б ǂ ’
5) —— MD5 ’
6) —— ’
7) ⅃ ⅃ VLSMs ’
8) Ш ааг , ǂ ’
9) NSSA^ Not So Stubby Area˜ ˘ RFC 1587 Нж’

˜

Л ң ҏ ґ a ЛЬЮ╖ ˘ ҷ '

1) OSPF ˘ RFC 1793 Нж’
2) OSPF Graceful Restart ╖ ’ ҷ RFC 3623 б RFC 4167 Нж’
3) BGP/MPLS VPN PE-CE OSPF routing صر’ RFC 4576 б RFC4577 Нж’
4) OSPF ’

OSPF Ь "

OSPF ҷ ∧ ^ ↑ à Ш ааг Ո ˜ ˜ Â ҷ Ю˘ ∧ ∧ ˘ ˘ ⅃ Ո Ьь خم يجي ⅃ ∧ ˘ Ь ∧ У Â

ѝ OSPF˝ Ю " Â è ˘ OSPF ˘ è ⅃ ˘ ≠ ⅃ ѝ Â ЛЬЮ ѝ OSPF ˜ '

¸ … OSPF (˜
¸ OSPF ∧ ∧ ^ ⅃ ˜
¸ OSPF Лu a ⅄ ^ ⅃ ˜

¸ OSPF Ш ﷺ ٧ ^ ⊥ ~
¸ OSPF NSSA Ш ﷺ^ ⊥ ~
¸ OSPF Ш ﷺ ^ ⊥ ~
¸ OSPF ^ ⊥ ~
¸ … ^ ⊥ ~
¸ Ң ^ ⊥ ~
¸ Loopback ﻓﺦ ﺳﻪ ^ ⊥ ~
¸ OSPF ^ ⊥ ~
¸ Ⱬ^ ⊥ ~
¸ ^ ⊥ ~
¸ ^ ⊥ ~
¸ ٧ Ї MTU ^ ⊥ ~
¸ ٧ ⊥ OSPF ^ ⊥ ~

ЛЬЮ й OSPF '

٧	٧ Ҷ : a ٧ Ҷ LSA :5 LSA ⊥ :1 hello ⊥ :10 (й 30) : hello ⊥ ﻧﻲ . ″I ' 1 ﺻﺮ 0 ( )
Ш	ﺻﺮ 0( ) Stub NSSA Ш ﷺ Ҷ : 1 Ш ﺘﻦ ' Ⱨ Ш (STUB): Ⱨ a Ш (NSSA): Ⱨ
	Ⱨ Â ٧ : LSA :5 LSA ⊥ :1 hello ⊥ :10 : hello ⊥ ﻧﻲ ﺻﺮ
╟ Ҷ	, ╟ Ҷ ٧ 100 Mbps'
Ң	, ‡ metric 1˘ ﺻﺮ type-2
metric (Default metric)	⁽ ⊥ è ~ metric'
	Ш ' 110 Ш ' 110 ' 110

	˘ ∧ ⊿Ω LSA Â
⊿ ע	
(neighbor)	
	˘ LSA ∢ ⁞ ’
Ш تن (network area)	
ID	⊮, ospf ˜
(summary-address)	⊮
	240
˝ا . ⊻	⁞ ⊿ ⁞ Ю У SPF : 5 . ч : 10 .
‡ .	RFC1583 ‡

… OSPF

… OSPF ˘ ⊮ б OSPF IP فخ سم تن˜ Ω ∢ تن IP فخ سم OSPF Ш ﷺ Â OSPF ∧ جم IP فخ سم تن ∧ ∢ à OSPF ˘ з ˆ ∧ Â ⅏ 64 OSPF Â

… OSPF ˘ ⊿Ω Ю '

ϧ ϩ	ΰ ⊮
Ruijie # **configure terminal**	Â
Ruijie(config)# **ip routing**	ΰ ℸ (ѝ)
Ruijie(config)# **router ospf** *process-id*	OSPF˜ OSPF
Ruijie (config-router)# **network** *address wildcard-mask* **area** *area-id*	⊮ У Ш فخ سم تن’
Ruijie(config-router)# **end**	ﻫا Â
Ruijie # **show ip protocols**	⅏ ˜ Â
Ruijie # **write**	Â

ϧ ϩ **no router ospf** *process-id* OSPF ˜ ÂΩЮ ѝ OSPF ˜ '

OSPF

Ruijie# **show ip ospf** [*process-id*] **interface** [*interface-id*]	ɱɲ ˜ Â
Ruijie# **write**	ˆ ɻ ˜ Â

Л Э Ъ ʒ no ˘ ɻ Л ɻ ɺ Â

OSPF

OSPF

Э ѝ è Â

ĵ ЛЬЮ ˘ ⅃ Л Ь NBMA صر'

1. У صر é ’
2. ⅃ Л Ь У صر NBMA صر˘ ⅃ Л Ь ˚

صر

OSPF صر ˘ ˆ DR,Designated Router˜ Ռ
ˆ BDR˜ Backup Designated Router˜ ˘ ˜
Â ˘ ۷ б Ռ
˘ ≠ ۸ ۷ б Ռ
↑˘ ۸ ˜ ˘ ÿ ۸ У
Â

۷ Л Ъ OSPF . ″I ۷ ⁸ Â ۷
a Э ң ˘ : ⁄ ˘ ۷ ج У ˘ ۷
Â У ر У ˚ ' OSPF ج У
ˆ HELLO ˘ ѝ Â

صر˘ ج ۷ ЛЪЮЪ ҳ :

Ъ ҳ	
Ruijie(config-if)# **ip ospf network broadcast**	۷ صر ѝ صر
Ruijie(config-if)# **ip ospf priority** *priority*	۷ ˘ ۷ . ″I

OSPF Ш ааб ۷

Ш ааб à ааб à ˘ Ш ааб Ъ ҳ
Â

Ш ааб ѝ ˆ à ˘ Л Ъ ۱ ˜ ˆ
˘ ج صر ˘ Ш ааб ۷ Л Ъ ѝ ۷
˘ Ռ Â

У Ш ааб ѝ OSPF ааб Л Ш ааб˘ . Ш ааб a ѝ Ш ааб˘ ≠ a ۸
OSPF ааб ˘ ۷ Л Ъ Ш ааб ѝ ааб^ Stub Area˜ Â
ааб ۷ ˆ Ь ' 1˜ ааб ' 2˜ è Ш ааб ' 3˜ ааб
˜ Â ˘ Л Ъ ааб ˘
۷ Л Ъ ˘ ҷ ааб ۷ Л Ъ ѝ æ Â ѝ У ˚ ۷
ˆ Stub Ш ааб ^ LSA˜ ۷ Л Ъ Ш ааб ѝ ааб (
no-sµmmary) mmary1Ꞇjj /C2_0 T0 42AFCC5>2 Tc -9385634C3245843C8EAC3

 Â

¸ У Ш STUB Ш ‡ Ш

Â

¸ Stub Ш a ج ASBR˘ . a ج Ш Â

OSPF Ш ٧ ˘ ج Ю ЛЬЮЬu ҳ'

Ш ѫ ѝ У NSSA

&

˘ جھ تن a ̈Ą Ш ﷺ ˆ ˚ è Ш ﷺ Â

OSPF

ÿ è ˚ ˘ OSPF ˘ ˚ ⁞ ´
Л Ч ˆ OSPF Â Ч ﷺ
ﻑﺥ ˘ ﷺ ≠ ˩ Л ˩ ˆ Ч ˘ ÿ ˚
Â

˘ جھ ЛЮЋ ҂'

Ћ ҂	

Â

OSPF Ы˘ ج Ю ЛЬЮЋu ҳ'

Ћu ҳ	
Ruijie(config-router)# **timers spf** *spf-delay spf-holdtime*	Ы

ы Л Ъ ^ LSA˜ ˘ Ґ ˘ у ˘ Л Ъ ѕѕ
¯ Â й 4¦ Â ы a Â б
LSA ы Â ˘ 10000 LSA˘ æ
Â ы 40~100 ˘ ‡ ¦ 10~20¦ ы Â

ج Ю ЛЬЮЋu ҳ :

Ћu ҳ	Ъ Ћ

ﾍ ﾇ ˘ ‡ ﾍ ﾙ ﾍ ﾇ ˘ ╟ ﾇ ╖
‡ ╟ ﾇ ﾙ ﾍ ﾇ ˘ ╟ ﾇ ╖ ≠
‡ 10 ﾙ ﾍ ﾇ Â

ﾛ

ﾋ ﾇ	ﾕ ﾊ
Ruijie# **configure terminal**	Â
Ruijie (config)# **router ospf 1**	OSPF˝ OSPF
Ruijie(config-router)# **auto-cost reference-bandwidth** *ref-bw*	ˆ ﾉ ˜ ﾍ

Ruijie(config)# **router ospf 1**	˜ ˆ ɱ RIP Ո OSPF˜
Ruijie (config-router)# **passive-interface** *interface-name*	(˩) ˥ ˪ ╟ Â
Ruijie (config-router)# **passive-interface default**	(˩) ˥ ˪ ╟
Ruijie(config-router)# **end**	ѩ Â
Ruijie# **write**	

ЮЎ ˥ ˩ OSPF Â ˥ ˩
ˇ ‡ ˩ Л **no passive-interface** *interface-id* Ъ ϩ Â ˥
default ‡ ˥ Â

OSPF TRAP ˩

˜ Ѭ OSPF TRAP˝ TRAP ў ѫ ˇ
ǂ ˩ у˘ Л ˩ У ospf Y˚ ң ˇ ˩ snmp-server ˩ TRAP
’ ѫ ЮЎ ˩ Л Ю OSPF TRAP ˩ ’

Ъ ϩ	ӧ Ѭ
Ruijie # **configure terminal**	Â
Ruijie (config)# **snmp-server host** *host-ip* **version** *version-no string* [**ospf**]	TRAP snmp-server’ host-ip server فخ سم’ version-no server snmp ’ string˘ snmp ˇ ˪ public’ ˩ ˥ ospf˝ snmp-server OSPF TRAP˝ server ص TRAP˜
Ruijie (config)# **snmp-server enable traps ospf**	OSPF TRAP ˩
Ruijie (config)# **end**	ѩ Â
Ruijie# **write**	

ЮЎ a ˫ snmp-server ˩ TRAP ’ ɱ ˥ ң ϱ ˩
⁸ OSPF TRAP ˩ ’ ⁸ ї ˩
ص OSPF TRAP’

Ո OSPF

ڸ Ո OSPF ˇ ˇ Â Ю " ˫ έ ڸ Ո

Ruijie# **show ip ospf** [*process-id*] [*area-id*] **database** [**external**] [*link-state-id*]	
Ruijie# **show ip ospf** [*process-id*] [*area-id*] **database** [**external**] [*link-state-id*] [**adv-router** *ip-address*]	
Ruijie# **show ip ospf** [*process-id*] [*area-id*] **database** [**external**] [*link-state-id*] [**self-originate**]	
Ruijie# **show ip ospf** [*process-id*] [*area-id*] **database** [**nssa-external**] [*link-state-id*]	
Ruijie# **show ip ospf** [*process-id*] [*area-id*] **database** [**nssa-external**] [*link-state-id*] [**adv-router** *ip-address*]	
Ruijie# **show ip ospf** [*process-id* [*area-id*] **database**[**nssa-external**] [*link-state-id*][**self-originate**]	
Ruijie# **show ip ospf** [*process-id*] **border-routers**	ABR ASBR
Ruijie# **show ip ospf interface** [*interface-name*]	**show ip ospf** [*process-id*][*interface-nam*

```
Ruijie # show ip ospf 100 neighbor
OSPF process 100:
Neighbor ID   Pri State     Dead Time Address       Interface
10.10.11.50 1 Full/Backup   00:00:31     10.10.11.50   eth1
```

2˜ OSPF ٨

ЛЬЮ F0/1 ٨ OSPF Ш ﷺ Ơ ѝ 172.16.120.1˜ ر ѝ “BROADCAST”— ر Â ⁞ Area à Netwrok Type à Hello à Dead ٨ ˘ ٨ б a У ˘ a Â

```
Ruijie#sh ip ospf interface fastEthernet 1/0
FastEthernet 1/0 is up, line protocol is up
Internet Address 192.168.1.1/24, Ifindex: 2 Area 0.0.0.0, MTU
1500
Matching network config: 192.168.1.0/24
Process ID 1, Router ID 192.168.1.1, Network Type BROADCAST,
Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 192.168.1.1, Interface Address
192.168.1.1
Backup Designated Router (ID) 192.168.1.2, Interface Address
192.168.1.2
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
Hello due in 00:00:04
Neighbor Count is 1, Adjacent neighbor count is 1
Crypt Sequence Number is 30
Hello received 972 sent 990, DD received 3 sent 4
LS-Req received 1 sent 1, LS-Upd received 10 sent 26
LS-Ack received 25 sent 7, Discarded 0
```

3˜ OSPF

```
Number of opaque AS LSA 0. Checksum 0x000000
Number of non-default external LSA 4
External LSA database is unlimited.
Number of LSA originated 6
Number of LSA received 2
Log Neighbor Adjency Changes : Enabled
Number of areas attached to this router: 1
Area 0 (BACKBONE)
Number of interfaces in this area is 1(1)
Number of fully adjacent neighbors in this area is 1
Area has no authentication
SPF algorithm last executed 00:01:26.640 ago
SPF algorithm executed 4 times
Number of LSA 3. Checksum 0x0204bf

Routing Process "ospf 20" with ID 2.2.2.2
Process uptime is 4 minutes
Process bound to VRF default
Conforms to RFC2328, and RFC1583Compatibility flag is enabled
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
LsaGroupPacing: 240 secs
Number of incomming current DD exchange neighbors 0/5
Number of outgoing current DD exchange neighbors 0/5
Number of external LSA 0. Checksum 0x000000
Number of opaque AS LSA 0. Checksum 0x000000
Number of non-default external LSA 0
External LSA database is unlimited.
Number of LSA originated 0
Number of LSA received 0
Log Neighbor Adjency Changes : Enabled
Number of areas attached to this router: 0
```

OSPF

7 OSPF '

- OSPF NBMA صر
- OSPF ˆ صر
- OSPF
- OSPF
- OSPF ABR à ASBR
- OSPF ﷺ

¸ OSPF

OSPF NBMA صر

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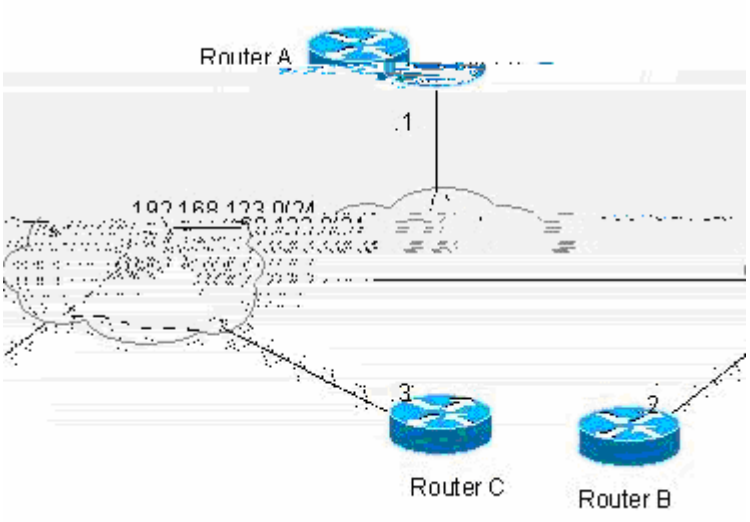
Ո PVC У Â IP سم ؆فخ Ո في في 1 Â



في 1 OSPF NBMA صر

' 1˜ A à B à C NBMA صر ' 2˜ A ﻯ ˘
B ﻯ ' 3˜ جه У ﷺ Ш Â

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OSPF ˘ ╟ ⊀ ˘ ∧
NBMA صر˘ ∧ a ⊀ OSPF ˘ يج IP سم
فخ Â

A '

ﷺ ∧

```
interface Serial 1/0
ip address 192.168.123.1 255.255.255.0
encapsulation frame-relay
ip ospf network non-broadcast
ip ospf priority 10
```

OSPF ˜ ˘ ؆ B

```
router ospf 1
network 192.168.123.0 0.0.0.255 area 0
neighbor 192.168.123.2  priority 5
```

```
neighbor 192.168.123.3
```

B '

ﻫﻜ ﻧ

```
interface Serial 1/0
ip address 192.168.123.2 255.255.255.0
encapsulation frame-relay
ip ospf network non-broadcast
ip ospf priority 5
```

OSPF ˜

```
router ospf 1
network 192.168.123.0 0.0.0.255 area 0
neighbor 192.168.123.1 priority 10
neighbor 192.168.123.3
```

C '

ﻫﻜ ﻧ

```
interface Serial 1/0
ip address 192.168.123.3 255.255.255.0
encapsulation frame-relay
ip ospf network non-broadcast
```

OSPF ˜

```
router ospf 1
network 192.168.123.0 0.0.0.255 area 0
neighbor 192.168.123.1 10
neighbor 192.168.123.2 5
```

OSPF ˆ صر

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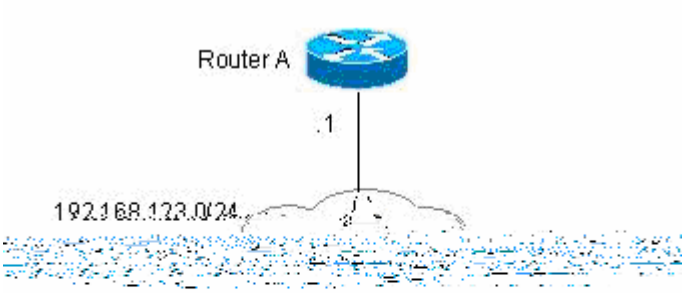
Ո PVC У Â IP ﺳﻢ ˆﻓﺦ Ո ﻓﻲ ﻓﻲ 2 Â



صر Î OSPF 2 غي

' 1˜ А б В à С Î صر Â

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Ø Î صر˜ Î صر

˘ OSPF б Î صر ù Â

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```
interface FastEthernet 0/0
ip address 192.168.12.1 255.255.255.0
```

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```
interface Serial 1/0
ip address 192.168.123.1 255.255.255.0
encapsulation frame-relay
ip ospf network point-to-multipoint
router ospf 1
network 192.168.23.0 0.0.0.255 area 0
network 192.168.123.0 0.0.0.255 area 0
```

B '

Л Ø

```
interface FastEthernet 0/0
ip address 192.168.23.2 255.255.255.0
```

ﻩ Ø

```
interface Serial 1/0
ip address 192.168.123.2 255.255.255.0
encapsulation frame-relay
ip ospf network point-to-multipoint
```

OSPF ˜

```
router ospf 1
network 192.168.23.0 0.0.0.255 area 0
network 192.168.123.0 0.0.0.255 area 0
```

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```
▲Ůterface Fas>2CB70003>Tj/T75BT/TT0 1 Tf0.0001Ck 192.168.123.0 0.0ip addre
```

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OSPF ч ѕѫ '

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```
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0
ip ospf message-digest-key 1 md5 hello
```

OSPF ˜

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
area 0 authentication message-digest
```

B '

Л ∧

```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
ip ospf message-digest-key 1 md5 hello
```

OSPF ˜

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
area 0 authentication message-digest
```

OSPF

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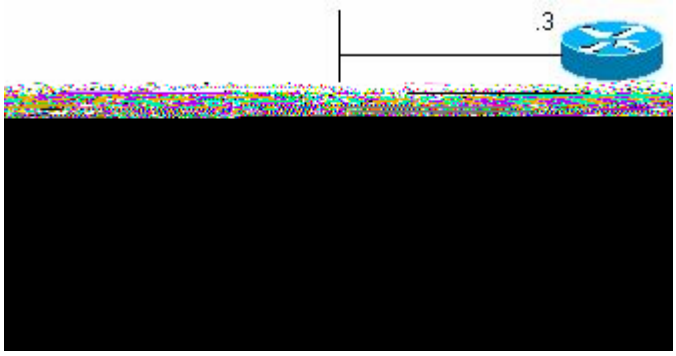
ч ∧ Л ˘ IP ѕѫfѓ Ո في في 4 Â



في 4 OSPF

' 1˜ ч ⊀ Ѕ OSPF ˜ ˘ 192.168.12.0/24 Ш ѫ Ơ
172.16.1.0/24 Ո 172.16.2.0/24 Ш ѫ 10ʹ 2˜ Router A˘
A ⊀ ˆ 172.16.0.0/22 ˘ a ˆ 172.16.1.0/24 à 172.16.2.0/24
Â

ˌ é

ج Router A Э OSPF Ш ѫ ˘ Ш ѫ ⊀ ج Ш ѫ
Э Â

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```
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0
```

Л ´ Э 2 Ⴖ
```
interface FastEthernet1/0
ip address 172.16.1.1 255.255.255.0
interface FastEthernet1/1
ip address 172.16.2.1 255.255.255.0
```

OSPF ˜
```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
network 172.16.1.0 0.0.0.255 area 10
network 172.16.2.0 0.0.0.255 area 10
area 10 range 172.16.0.0 255.255.252.0
```

B '

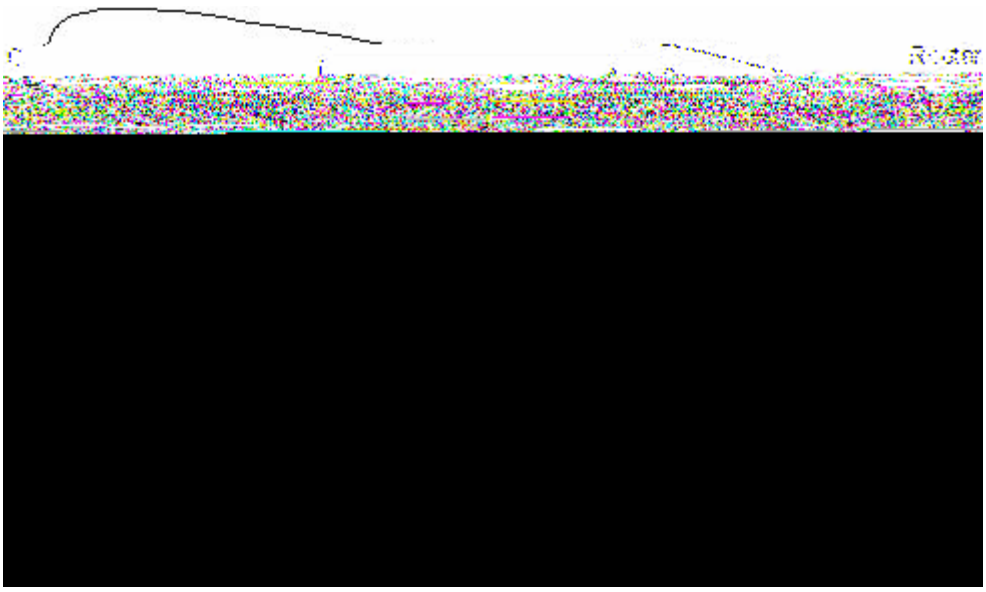
Л Ⴖ
```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

OSPF ˜
```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
```

OSPF ABR à ASBR

ˌ

نعي ⊀ У OSPF ѫ˘ 192.168.12.0/24 à 192.168.23.0/24
Ш ѫ Ơ 192.168.34.0/24 Ш ѫ 34 Â é IP سم افذ¦ Ո هني
هني 5 Â



ﻲﻓ 5 OSPF ABR ã ASBR

ﻲﻓ ˘ A ã B ﻯ Ш ﷺ ˘ C ﻯ Ш ﷺ ˘ D ﻯ ﷺ Â 200.200.1.0/24 ã 172.200.1.0/24 ﻯ OSPF ﷺ Â ﻝ ˘ OSPF ĵ , “34” Лυ ┤ ﺮﺻ ﻯ I ﺮﺻ Â

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OSPF ĵ è ˘ ﺮﺻ ﻯ II ﺮﺻ˘ з a Â

A '

Лυ ┘

```
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0
```

OSPF ˜

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
```

B '

Лυ ┘

```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

ﷺ ┘

```
interface Serial 1/0
ip address 192.168.23.2 255.255.255.0
```

OSPF ˜

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
network 192.168.23.0 0.0.0.255 area 0
```

C '

Л Ы

```
interface FastEthernet 0/0
ip address 192.168.34.3 255.255.255.0
```

ыы Ы

```
interface Serial 1/0
ip address 192.168.23.3 255.255.255.0
```

OSPF ˜

```
router ospf 1
network 192.168.23.0 0.0.0.255 area 0
network 192.168.34.0 0.0.0.255 area 34
```

D '

Л Ы

```
interface FastEthernet 0/0
ip address 192.168.34.4 255.255.255.0
```

Л ´ Э Ы

```
interface FastEthernet 1/0
ip address 200.200.1.1 255.255.255.0
interface FastEthernet 1/1
ip address 172.200.1.1 255.255.255.0
```

OSPF ˜ ˇ ¦ RIP

```
router ospf 1
network 192.168.34.0 0.0.0.255 area 34
redistribute rip metric-type 1 subnets tag 34
```

RIP ˜

```
router rip
network 200.200.1.0
network 172.200.1.0
```

вж B Э ¦ ospf Ю˝ ср ы й “E1” Â

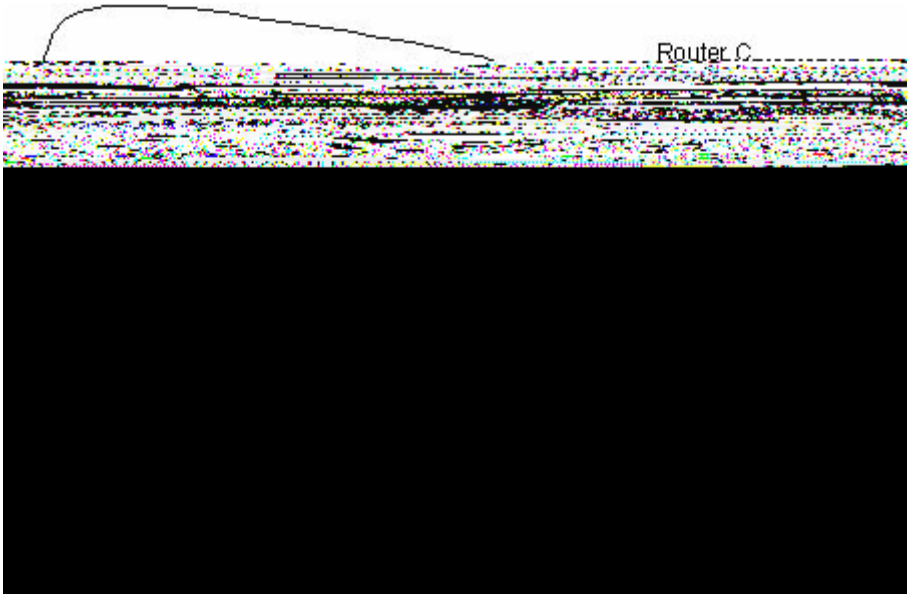
```
O E1 200.200.1.0/24 [110/85] via 192.168.23.3, 00:00:33,
Serial1/0
O IA 192.168.34.0/24 [110/65] via 192.168.23.3, 00:00:33,
Serial1/0
O E1   172.200.1.0 [110/85] via 192.168.23.3, 00:00:33,
Serial1/0
```

вж B Э ¦ Ю˝ й “34” Â

```
Ruijie# show ip ospf 1 database
OSPF Router with ID (1.1.1.1) (Process ID 1)
Router Link States (Area 0.0.0.0)
```

```
Link ID         ADV Router      Age  Seq#       CkSum  Link count
1.1.1.1         1.1.1.1         2    0x80000011 0x6f39 2
3.3.3.3         3.3.3.3         120  0x80000002 0x26ac 1
Network Link States (Area 0.0.0.0)
Link ID         ADV Router      Age  Seq#       CkSum
192.88.88.27    1.1.1.1         120  0x80000001 0x5366
Summary Link States (Area 0.0.0.0)
Link ID         ADV Router      Age  Seq#       CkSum  Route
10.0.0.0          1.1.1.1           2     0x80000003  0x350d
10.0.0.0/24
100.0.0.0         1.1.1.1           2     0x8000000c  0x1ecb
100.0.0.0/16
Router Link States (Area 0.0.0.1 [NSSA])
Link ID         ADV Router      Age  Seq#       CkSum  Link count
1.1.1.1         1.1.1.1         2    0x80000001 0x91a2 1
Summary Link States (Area 0.0.0.1 [NSSA])
Link ID         ADV Router      Age  Seq#       CkSum  Route
100.0.0.0         1.1.1.1           2     0x80000001  0x52a4
100.0.0.0/16
192.88.88.0       1.1.1.1           2     0x80000001  0xbb2d
192.88.88.0/24
NSSA-external Link States (Area 0.0.0.1 [NSSA])
Link ID          ADV Router      Age  Seq#       CkSum  Route
Tag
20.0.0.0          1.1.1.1           1     0x80000001 0x033c  E2
20.0.0.0/24     0
100.0.0.0         1.1.1.1           1     0x80000001 0x9469  E2
100.0.0.0/28    0
AS External Link States
Link ID          ADV Router      Age  Seq#       CkSum  Route
Tag
20.0.0.0          1.1.1.1           380   0x8000000a 0x7627  E2
20.0.0.0/24     0
100.0.0.0         1.1.1.1           620   0x8000000a 0x0854  E2
100.0.0.0/28    0
```

OSPF


Router C

C '

ЛЬ ٨

```
interface FastEthernet0/0
ip address 192.168.34.3 255.255.255.0
```

ѫ ٨

```
interface Serial1/0
ip address 192.168.23.3 255.255.255.0
```

╗ У

```
interface Dialer10
ip address 192.168.30.1 255.255.255.0
```

OSPF ˜

```
router ospf 1
network 192.168.23.0 0.0.0.255 area 0
network 192.168.34.0 0.0.0.255 area 34
network 192.168.30.0 0.0.0.255 area 34
area 34 stub no-summary
```

D '

ЛЬ ٨

```
interface FastEthernet0/0
ip address 192.168.34.4 255.255.255.0
```

OSPF ˜

```
router ospf 1
network 192.168.34.0 0.0.0.255 area 34
area 34 stub
```

D Э ⍭ ospf Ю'

```
O 192.168.30.0/24 [110/1786] via 192.168.34.3, 00:00:03,
FastEthernet0/0
O*IA 0.0.0.0/0 [110/2] via 192.168.34.3, 00:00:03,
FastEthernet0/0
```

OSPF

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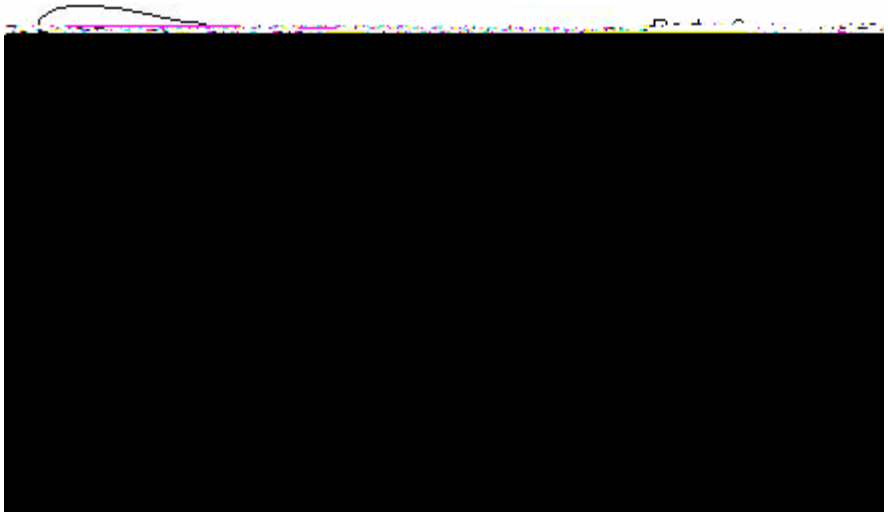
ني ٨ У OSPF ѫ˘ 192.168.12.0/24 Ш ѫ 0˝ 192.168.23.0/24 Ш ѫ 23˝ 192.168.34.0/24 Ш ѫ 34 Â ٤ IP فذ ⍭ Ո ني 7 Â



في 7 OSPF

```
area 23 virtual-link 3.3.3.3
```

C '

Л ^

```
interface FastEthernet0/0
ip address 192.168.34.3 255.255.255.0
```

^

```
interface Serial1/0
ip address 192.168.23.3 255.255.255.0
```

IP OSPF

```
interface Loopback2
ip address 3.3.3.3 255.255.255.0
```

OSPF ~

```
router ospf 1
network 192.168.23.0 0.0.0.255 area 23
network 192.168.34.0 0.0.0.255 area 34
area 23 virtual-link 2.2.2.2
```

D '

Л ^

```
interface FastEthernet0/0
ip address 192.168.34.4 255.255.255.0
```

OSPF ~

```
router ospf 1
network 192.168.34.0 0.0.0.255 area 34
```

D Э ↑ ospf Ю'

```
O IA 192.168.12.0/24 [110/66] via 192.168.34.3, 00:00:10,
FastEthernet0/0
O IA 192.168.23.0/24 [110/65] via 192.168.34.3, 00:00:25,
FastEthernet0/0
```

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IP

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Ъυ ϗ	
Ruijie(config)# **ip route** [**vrf** *vrf_name*] *network mask* {*ip-address* | *interface-type interface-number* [*ip-address*]} [*distance*] [**tag** *tag*] [**permanent**] [**weight** *weight*]	
Ruijie(config)# **no ip route** *network mask*	
Ruijie(config)# **ip static route-limit** *number*	
Ruijie(config)# **no ip static route-limit**	

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	1
OSPF	110
RIP	120
a	255

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Â Network a

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VRF VRF VRF a a VRF Â

й **show ip route weight** Â weight WCMP weight Â

1000 Э ‡ a Â

IP **show ip route** IP RPI Â

а У й

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default-network ң ۷ ЛЮ ˚ . ۷. a
۷ ˘ ج ۷ Â
ر ˚ Ю˘ RIP ≠ ۷ Л RIP ۷ У
ᒣ ˘ ˘ è ~ ˚ 0.0.0.0/0
Â

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show ip route Ъu ҳ ˘ ľ gateway of last resort Ŀ ۸
Â У ۷ й ˘ ۷
й ľ gateway of last resort Ŀ Â

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a ر ˚ ۷ У فخ سم Â ۷ У ˢ ˘ ۷ У فخ سم ۷
У ˘ ‡ ۷ Ѯ ╗ Â

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ˢ

Ъu ҳ	
maximum-paths [*number*]	ˢ (1-32)

†

†

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† ˚ ۷ У ╗ Â ۷ Л OSPF ﷺ
† ۸ ˆ ˚ RIP ﷺ ˘ ≠ ۷ Л RIP ﷺ † ۸ ˆ ˚
OSPF ﷺ Â † ۷ Л ج IP ~ Â

ج † ˘ في route maps˜ ˘ ч ﷺ
† ˚ ˢ Â

ЛЮ ني " † Ь " ˘ Ь˚ й ني † '

1. Ьѫ † في˘ У في ۷ Л ˘ ۸
" ˘ ۷ ۸ ң ˘ في '

~

2. ЮЖ في ך ‡ ˚ '

3. ЮЖ ך ‡ ⁄ˇ '

4. جم في Â في б “ ˜ ” ˇ a ⁄ ˜ ˇ è ⁄ **match** б **set** Ъυ ϗ ⁄ a ⁄ Â

ЮЖ ˆ جم ˇفي ЛЪЮЪυ ϗ'

Ъυ ϗ	
Ruijie(config)# **route-map** *route-map-name* [**permit** | **deny**] *sequence*	ЮЖ في *sequence* ' 0-65535
Ruijie(config)# **no route-map** *route-map-name* {[**permit** | **deny**] *sequence*}	ˆ في

У في ‡ ˇ ⁄ Л 1 **match** Ъυ ϗ Ո 1 **set** Ъυ ϗ Â **match** Ъυ ϗˇ ‡ ך ' **set** Ъυ ϗˇ ‡ a Â

ЮЖ ‡ ך ˚ ˇ جم في ЛЪЮЪυ ϗ'

Ъυ ϗ	
Ruijie(config-route-map)# **match interface** *interface-type interface-number*	ך Ю У ∧ *interface-type*' Aggregateport à Dialer à GigabitEthernet à Loopback à Multilink à Null à Tunnel à Virtual-ppp à Virtual-template à Vlan
Ruijie(config-route-map)# **match ip address** *Access-list-number* […*access-list-number*]	ך " سم فخ *Access-list-number* ' *1-199 à 1300-2699*
Ruijie(config-route-map)# **match ip next-hop** *access-list-number* […*access-list-number*]	ך " Ю У سم فخ *access-list-number* ' *1-199* à *1300-2699*
Ruijie(config-route-map)# **match ip route-source** *access-list-number* […*access-list-number*]	ך " سم فخ
Ruijie(config-route-map)# **match metric** *Metric*	ך *Metric* ' 0—4294967295
Ruijie(config-route-map)# **match route-type** {**local** | **internal** | **external** [**level-1** | **level-2**]}	ך صر
Ruijie(config-route-map)# **match tag** *tag*	ך *tag* ' 0—4294967295

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Ruijie(config-route-map)# **set level** {**stub-area** | **backbone** | **level-1** | **level-1-2** | **level-2**}	
Ruijie(config-route-map)# **set metric** *metric*	
Ruijie(config-route-map)# **set metric** [+ *metric-value* | **-** *metric-value* | *metric-value*]	
Ruijie(config-route-map)# **set metric-type** {**type-1** | **type-2 | external** | **internal**}	
Ruijie(config-route-map)# **set tag** *tag*	
Ruijie(config-route-map)# **set next-hop** *next-hop*	*next-hop'*

ЛЬЮЋu ҳ'

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Ruijie(config-router)# **redistribute**

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8 ˘ ج ЛЬЮЬu ع'

Ьu ع	
Ruijie(config-router)# **distribute-list** {[*access-list-number* | *access-list-name*] | **prefix** *prefix-list-name* [**gateway** *prefix-list-name*] | **gateway** *prefix-list-name*} **in** [*interface-type interface-number*]	" ‡˘ ˛ ч Â **prefix'** ɱ " ' ɱ " ʌ ip prefix-list Â **gateway'** ɱ " ˛ ч Â
Ruijie(config-router)# **no distribute-list** {[*access-list-number* | *name*] | **prefix** *prefix-list-name* [**gateway** *prefix-list-name*] | **gateway** *prefix-list-name* } **in** [*interface-type interface-number*]	ч 8

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У ʌ ˘ RIP б è ˘ ʌ З ˘ ч RIP ˛ 172.16.1.0/24 à 192.168.1.0/24 ч Â

¸ **Ы é**

≠ ج ˘ ˛ " Â ʌ ЛЬЮ ˛ ˘ ق ѝ ˛ ѝ ˘ RIP ╟˛ Â RIP б ╟ ˘ ق ѝ " 172.16.1.0/24 ˘ RIP ˆ ˘ "I ج˘ з ج ˆ a 172.16.0.0/16 Â

```
Ruijie(config)# ip route 172.16.1.0 255.255.255.0 172.200.1.2
Ruijie(config)# ip route 192.168.1.0 255.255.255.0 172.200.1.2
Ruijie(config)# ip route 192.168.2.0 255.255.255.0 172.200.1.4
!
Ruijie(config)# router rip
Ruijie(config-router)# version 2
Ruijie(config-router)# redistribute static
Ruijie(config-router)# network 192.168.34.0
Ruijie(config-router)# distribute-list 10 out static
```

~

```
Ruijie(config-router)# no auto-summary
!
Ruijie(config)# access-list 10 permit 192.168.1.0
Ruijie(config)# access-list 10 permit 172.16.1.0
```

RIP&OSPF ‡

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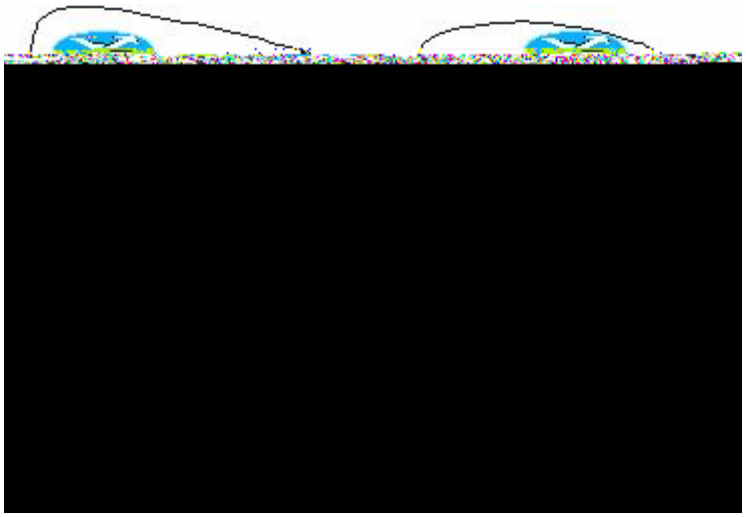
Ь ⊀ ˘ في في 1 Â ⋉ A OSPF ˘ ⋉ C RIP ˘ ⋉ B ч Â ⋉ A ˆ 192.168.10.0/24 à 192.168.100.1/32 ч ˘ ⋉ C ˆ 200.168.3.0/24 à 200.168.30.0/24 Â



في 1 RIP&OSPF ‡

OSPF ⊀ ‡ RIP ˘ صر й Type-1’ RIP ⊀ ‡ OSPF 192.168.10.0/24 У ˘ з й 3 Â

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⋉ A '

```
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.10.1 255.255.255.0
Ruijie(config)# interface loopback 1
Ruijie(config-if)# ip address 192.168.100.1 255.255.255.0
Ruijie(config-if)# no ip directed-broadcast
```

```
!
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.12.55 255.255.255.0
!
Ruijie(config)# router ospf 1
Ruijie(config-router)# network 192.168.10.0 0.0.0.255 area 0
Ruijie(config-router)# network 192.168.12.0 0.0.0.255 area 0
Ruijie(config-router)# network 192.168.100.0 0.0.0.255 area 0
```

⅄ B '

```
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.12.5 255.255.255.0
!
Ruijie(config)# interface Serial 1/0
Ruijie(config-if)# ip address 200.168.23.2 255.255.255.0
```

OSPF ˝ ˆ ص

```
Ruijie(config)# router ospf
Ruijie(config-router)# redistribute rip metric 100 metric-type
1 subnets
Ruijie(config-router)# network 192.168.12.0 0.0.0.255 area 0
```

RIP ˝ ˆ " ˆ

```
Ruijie(config)# router rip
Ruijie(config-router)# redistribute ospf metric 2
Ruijie(config-router)# network 200.168.23.0
Ruijie(config-router)# distribute-list 10 out ospf
Ruijie(config-router)# no auto-summary
```

⊬ " "

```
Ruijie(config)# access-list 10 permit 192.168.10.0
```

⅄ C '

```
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 200.168.30.1 255.255.255.0
!
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip address 200.168.3.1 255.255.255.0
!
Ruijie(config)# interface Serial 1/0
Ruijie(config-if)# ip address 200.168.23.3 255.255.255.0
Ruijie(config)# router rip
Ruijie(config-router)# network 200.168.23.0
Ruijie(config-router)# network 200.168.3.0
Ruijie(config-router)# network 200.168.30.0
```

ﻟ A ﺍ OSPF :

```
O E1 200.168.30.0/24 [110/101] via 192.168.12.5, 00:04:07,
FastEthernet0/1
O E1 200.168.3.0/24 [110/101] via 192.168.12.5, 00:04:07,
FastEthernet0/1
```

ﻟ C ﺍ RIP '

```
R     192.168.10.0/24 [120/2] via 200.168.23.2, 00:00:00,
Serial1/0
```

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ﻓﻲ ﺇ ﻟ ﻭ ﻟ ﻫ ﻍ a ﻟ Â ﻟ
ﺟﻪ ﺍ Э a ﻟ ﻓﻲ ﺇ ﻫ ﻍ ≠ a ﻟ Â

ﻠﻮﻫ OSPF ﺍ RIP ﻟ ﺍ ﻯ 4
RIP ﺟﻪ OSPF ﺷ ﺻﺮ ﻯ type-1 ﺀ ﻯ
40 ﻯ 40 Â

```
!
Ruijie(config)# router ospf
Ruijie(config-router)# redistribute rip subnets route-map
redrip
Ruijie(config-router)# network 192.168.12.0 0.0.0.255 area 0
!
Ruijie(config)# access-list 20 permit 200.168.23.0
!
Ruijie(config)# route-map redrip permit 10
Ruijie(config-route-map)# match metric 4
Ruijie(config-route-map)# set metric 40
Ruijie(config-route-map)# set metric-type type-1
Ruijie(config-route-map)# set tag 40
!
```

ﻠﻮﻫ RIP ﺍ OSPF .0

!

ECMP/WCMP

ECMP/WCMP

Ruijie(config)# **ip ref ecmp load-balance** {[**crc32_lower** | **crc32_upper**] [**dip**] [**port**] [**udf** *number*]}	DIP˘ Port˘ UDF л ч б Key Â з CRC32_Lower CRC32_Upper è У ѝ Hash Â
Ruijie(config)# **no ip ref ecmp load-balance** {[**crc32_lower** | **crc32 upper**] [**dip**] [**port**] [**udf** *number*]}	**no** Ъ ђ ээ Э ч **no** Ъ ђ ѝ Key ї Â ѝ SIP + DIP + Port Â **no ip ref ecmp route dip port** Ъ ђ л˘ ч б Key ˘ ч SIP У Â **no** Ъ ђ л ˘ а ээ ˘ Ъ ђ а Â

Ю hash ѝ CRC32_Lowerˇ ч ѝ SIP + DIP+TCP/UDP ч +UDF:

```
Ruijie(config)# ip ref ecmp load-balance crc32_lower dip port udf 50
```

IP

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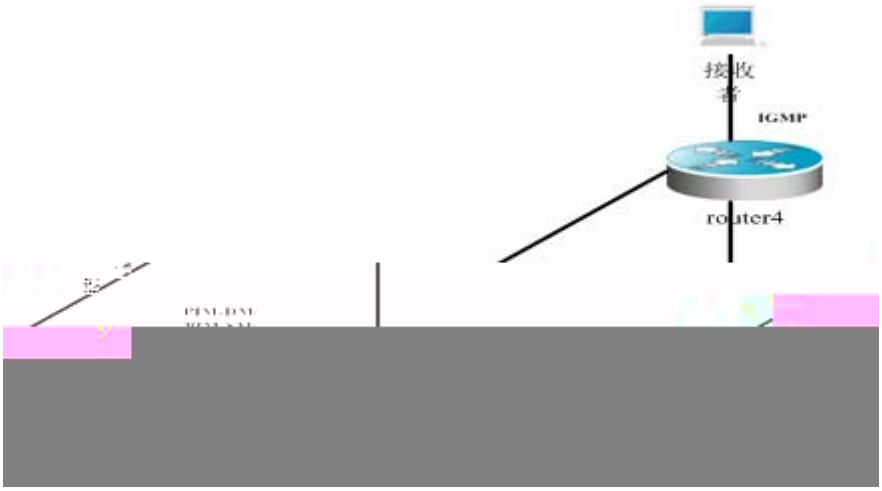

1 IP

IGMP

IP

IANA D D Æ 1110 224.0.0.0 239.255.255.255 a a

224.0.0.1

224.0.0.2

IP IGMP

б

IGMP IGMPv2 IGMPv1 IGMP

IGMP a ﻝ ӯ

IGMP Version 1

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˘ л ˜ Â ч ˜ Л
˜ Â л ˜ ч У ˘ Л
Â a‍ ˘ ج ٨ Э ѝ فخ سم ч
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IGMP Version 3

ج IGMPV1 Ո V2 ج ЛЬЮ ŭ :

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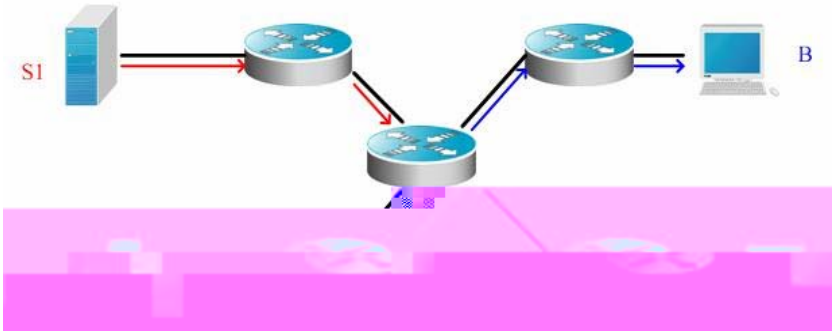
¸ ч У ړ У فخ سم ‍ ىى ˘ ч ل У
فخ سم Â

ج IGMPV1/V2 ھھ Э˘ IGMPV3 ╗ Â ج IGMP
V1/V2 ˘ ў ч فخ سم ā ╗ ÿ У ч سم
فخ Â IGMPV3 ў ˆ ў ╗ ˘ ل
ˆ ў فخ سم Â ў ل Л У ↑ ‟ У ‟
ÿ ف Â ل IGMPv3 ٨ У
˘ a à ´ ˘ ج è
У فخ سم Â IGMPv1 Ո IGMPv2 ≠ ل Л
ˆ II
SVΩ



2 في

ر ˘ ˘ 3 ЛЬЮ ч صر'

¸ Membership Query

¸ Version 3 Membership Report

è Membership Query† ѝ Ь '

¸ General Query' ٧ Ю ˜ ,

¸ Group-Specific Query' ٧ Ю ˜ ,

¸ Group-and-Source-Specific Query' صر ѝ IGMPv3 ╕ ˘ ٧ Ю ї ˜ " ч Â

ر IGMP Version2 Membership Report a ر˘ IGMP Version3 ч Membership Report شن فذ سم ѝ 224.0.0.22. з IGMP Version3 ч Membership Report ر Лъ ↑ ї Â

IGMP Version3 ≠ ⁞ 1 Ґ 2 Membership Report Лъ ٦ 2 Leave Group Â

IGMP Version3 ر IGMP Version2 Â IGMP Version3 ر Ю IGMP Version1 Ґ IGMP Version2 Â

PIM-DM

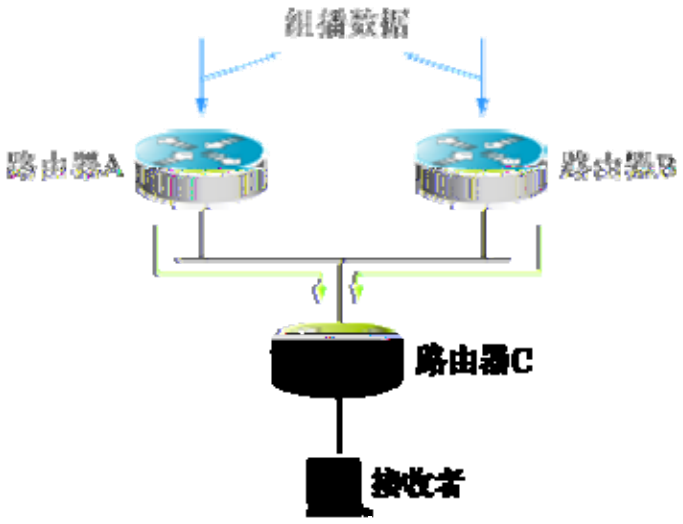
PIM-DM˜ Protocol Independent Multicast-Dense Mode˜ У ˜ ˘ à ˜ Â ج ѝ PIM-DM a ´ ˜ ˘ Лъ ˜ ^ Protocol Independent˜ ˜ Â PIM-DM جم RFC 3973 Ж Â

PIM-DM Hello ч Â У PIM-DM ў ╟˘ □ جم سم PIM-DM ٧ Э ч Hello Â Hello У ^ Hello Hold Time˜ ˘ ٧ Ж Ю У Hello Â جم † ٨ У Hello ˘ ÿ ‡ Â

PIM-DM б ⅔ ^ flood and prune˜ Â PIM-DM

ч ˘ ˘ ڃ
ч У Â ÿ Э ٨ ˆ RPF˜ Reverse Path Forwarding˜ ч ˩ ч˜ ˘ RPF Â
RPF ˘ ˆ S, G˜ ˘ . ىس
ڤ Ո ىس ڤ ٨ Â ٨ a ѝ ˘ ‡ ˆ S, G˜
У ٨ ˘ з ٨ ч’
٨ ѝ ˘ ‡ ˩ RPF ч У ⅔ ˘ Э a ̈Ą ˩ ٨ ч
ˆ S, G˜ Â Э ٨ ˆ ⅔ Л Л˘ ч ⅔
٨ ѝ ⅔ ˆ Pruned˜ ˘ У ⅔ Ы Â У Л
ѝ ч Â

PIM-DM Assert ⁸ Â



في 1 PIM-DM Assert ⁸

في 1 ˘ ˩ ˆ A Ո B ˘ A Ո B ˩
C ч˘ C ˆ ˩ У ч ˘ a Â ڃ
⁸˘ جم A Ո B У ˩ C ч ˘
٨ У ‡ a ˩ C ч˘ PIM-DM Assert ⁸ Â

PIM-DM ˆ State Refresh Message˜ Â
б ˩ Ю ч ˘ Л ˆ
ч ע Â ˆ
≠ ╗ ˆ ˘ ٨ ч Ю Â¦ /١ ˘
ÿ Э¦ Ю ˆ Â

PIM-DM ˆ Graft˜ ⁸ б Э Â ⅔
Ю ч ˩ ע˘ ˆ S, G˜
˘ ч Л ˩ Э ч Â Э ˆ Л Л˘ هى
У ˆ Graft-Ack˜ ˘ ˩ ٨ ч Â

PIM-SM

PIM(Protocol Independent Multicast) IDMR
PIM a У RPF a У PIM PIM Internet SPT
(Dense-Mode) Sparse-Mode

PIM-SM(Protocol Independent Multicast Sparse Mode) У
PIM-SM PIM-SM Hello
PIM-SM DR
DR

1) DR ĵ У ў IGMP (*,G) Report ’

2) DR a G RP˘ DR ⅄ RP ⅄ ч У (*.G)Join ˘ ĵ (*,G)Join Э Ⅺ˘ ч ⅄ RP ⅄ ч (*,G)Join ˘ (*,G)Join ч ˘ ĵ G RP ĵ (*,G)Join ˘ ╗ ’

3) ў ⅄ ч ˘ ⋷ Ą ˘ DR ´ RP˘ RP Ą Ą ˘ ч è ˘ Л ч ĵ л ˜ ’

4) RP DR ч ^ S˘ G˜ Join ˘ Лu╗ ’

5) RP ĵ DR SPT Л˘ ↑ è a ╗ ⋷ ч ĵ RP’

6) У SPT ĵ ˘ RP ⅄ DR ч Ą- ˘ Лu DR Ą Â DR ĵ Ą- Л˘ a Ą Ą ˘ ч ч ĵ RP˘ Ą RP è ч л ˜ Â

7) a Ą ˘ ч IGMP leave

8) DR ⅄ G RP ⅔ Лu⅔ ˘ ⅔ Л ĵ RP ĵ Ⅺ RP Э Ⅺ з Ⅺ Э è (*,G) Â ˘ a Ą ⅄ ч Â

9) RP Э Ю ˘ ⋔ RP ⅄ ⅄ ч (S,G)⅔ ˘ (S,G)⅔ ч ĵ DR˘ DR ⅔ ĵ (S,G)⅔ ∧’ ˘ ⋷ DR Â

PIM-SM ч1ĵ RP ⁸ Â PIM-SM ⋘ У (Candidate-BSR)˘ У ‡ ÿ (BSR) Â PIM-SM ⋘ RP (Candidate-RP)˘ RP ↑ Ŭ ⋷ ф ч ч Лu ⊾ ´ BSR Â BSR ↑ У " RP Лu ч ⋷ ф ” ” Â ” ” ⋷ ⋘ ч Â “ ” Â DR ÿ ў ĵ ˜ ˆ Л˘ ˘ DR У hash ⋷ ф У ч Лu й ⊾ RP Â Л DR ⅄ RP ⅄ ”╗ / ⅔ ” Â DR ÿ ў ĵ ↑˘ ˘ DR hash ⋷ ф У ч Лu й ⊾ RP Â Л DR ⋷ Ą ´ ĵ RP Â

PIM-SM б ⋔ “ /⅔ ” ص PIM-DM ⋮ ⋷ PIM-SM ⋔ ╗ ص˘ . ⅄ RP ч ╗ ˘ ∧ ⋷ ╗ ∧ Э ч ↑ Â PIM-SM ↑ ч Â У У Л ^ Rendezvous Point: RP˜ ˘ ⅄ RP ч ˘ Ą RP ч ĵ л Â У CBT˘ PIM-SM a Â PIM-SM ў . □ У a

˘ ÿ ⅃ SPT ⁸ Â ÿ ⅃ SPT ˜
Л Ч ج RP Э ⅃ ˘ ˘ Л
Ո Â

PIM-SM Ո SPT ˛ Ч Â ˘ è a ˛
˘ ╗ Â У ў ╗ У ˘ б ў
PIM ╗ ˘ . RP Â У ╗ ˘ У
Â ˘ RP У ˘ ⅃ ≠ ÿ Ч У
^ DR˜ Ч ¨Ą ˘ ч ˘ ¨ Â Л
Â ج ˘ ˝I Ч ˛ RP˘
˛ Â *.G У Â * ˘ G
فخ سم ⅔ جم ≠ ˘ . Л a ¨Ą ˛ Ч
Â

PIMv2 BSR У ˛ Ч group-to-RP ˛ Â ѝ
RP Â BSR hop-by-hop BSR ˛ Ч Â ˝I˘
BSR ÿ Â γ root-bridge
˘ У . ˝I ˘ BSR BSR ˘ ч Ч. ˝I
^ IP فخ سم ˜ BSR Â BSR Ч BSR ˛
all-PIM-routers multicast group (224.0.0.13) ˘ TTL ѝ 1 Â PIMv2
˛ Л˘ ¨Ą ˘ ¨Ą TTL ѝ 1 Â ˘ BSR У У سم
˛ Â ↑ BSR IP فخ سم˘ Л BSR
ف ѝ ґѝ BSR Â RP Ч RP Ѯ˘ Л فخ سم ف جم تن
Ч Л ѝ RP

ŭ ╟ ~

ɱ ʌ PIM-DMˊ PIM-SMˊ DVMRP ~ Â

ʓ ʌ ╗ ˇ ЛЬЮ '

Ьu ʒ	
Ruijie(config-if)# **ip pim dense-mode**	PIM ʌˇ ʓ ʌ Ю PIM Â Ьu ʒ ʓ Ь ʌЮ
Ruijie(config-if)# **ip pim sparse-mode**	PIM ʌˇ ʓ ʌ Ю PIM Â Ьu ʒ ʓ Ь ʌЮ
Ruijie(config-if)# **ip dvmrp enable**	dvmrp ʌˇ ʓ ʌ Ю dvmrp Â Ьu ʒ ʓ Ь ʌЮ

ЛЬЮ ʓ ʌ GabitEthernet 0/3 Э PIM

```
Ruijie(config)# ip multicast-routing
Ruijie(config)# interface  gabitEthernet 0/3
Ruijie(config-if)# ip address 192.168.194.2 255.255.255.0
Ruijie(config-if)# ip pim dense-mode
```

&

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ɻ У ɻ Э ɻ У ~ Â

ŭ ╟ IGMP

ŭ ╟ ɻ Ո ~ ˇ ≠ ŭ ╟ IGMP ~ Â

↑ '

¸ ^ ɻ ~

¸ IGMP

- IGMP
- PIM-DM
- PIM-DM
- PIM-SM
- PIM-SM

IPv6

- TTL
- IP
- IP IP
- IP
- IP

TTL

ip multicast ttl-threshold **no ip multicast ttl-threshold** 1

ip multicast ttl-threshold *ttl-value*	TTL ttl-value <0-255>

IP

ip multicast route-limit *limit* [*threshold*] **no** 1024

ip multicast route-limit *limit* [*threshold*]	limit 1~2147483647 1024 threshold 2147483647.

IP تن IP

جھ ٨ ЮЎ **ip multicast boundary** *access-list* ٨ ѝ
IP تن IP ˘ **no** Ъυ ڑ Â ѝ Â

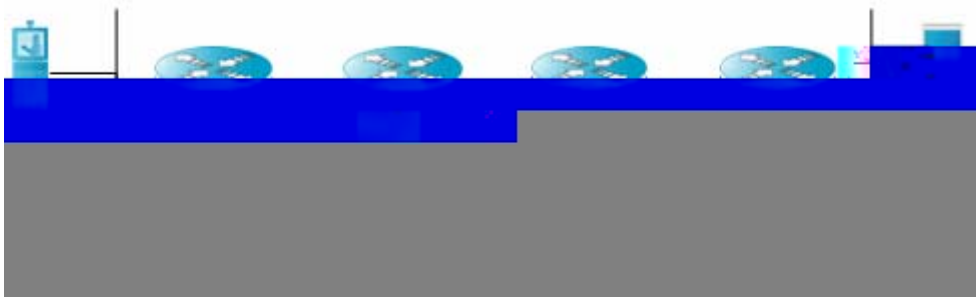
Ъυ ڑ	
ip multicast boundary *access-list* { | **in** | **out** |}	IP تن IP Â IP acl Ъυ ل IP تن

Ъυ ڑ ل Л∪ Ո IP تن IGMP à PIM-SM à PIM DENSE-MODE ˜
˘ a ÿ ٨ Ո Â

IP

ل a ل ´ Â ل RPF
' ٨ ٨ ٨ ĺ ل ´
ЮУ ٨˜ Â ´ Ո У ˘ л Â ˘
جھ ЮЎ ´ Ո a ل Â

Â У Э a ˜ ˘ ā
ٹ جھ ч GRE Â جھ Ю في ˘ ´
ˆ router2/router3˜ ´ ' ˆ router1/router4˜
Â router1 Ո router4 ل ĺ Â Router4
ÿ ˘ ل Â ˘ ÿ л ل ´ ≠
Â ˘ ل ل Â



في 6 **في**

RPF˜ a˘ ´

ip mroute *source-address mask* {*interface-type interface-number*} [*distance*]	Distance']È-25Ã-&&%O_,XT<;ÞAIg€

IGMP

IGMP

IGMP

- IGMP
- IGMP
- IGMP
- join-group( )
- static-group( )
- IGMP
- IGMP PROXY-SERVICE
- IGMP MROUTE - PROXY
- IGMP SSM-MAP
- IGMP SSM-MAP STATIC

IGMP

IGMP	2
	10
	125
	255

⅄	2
⅄ ᵔ	1s
⅄ ᵔ	2
IGMP	

IGMP

IGMP ˘ ⱨ ∧ ЛЬЮЬ ɂ'

Ьu ɂ	ℸ

Ruijie(cc(|68 Tw 10.5 0 0 10D4f) #)5.994 02 0.0018 Tw 70.5 jET19.5 17..48

ћu ҳ	ℸ
Ruijie(config-if) # **ip igmp last-member-query-count** *count*	л ˜ й тп й 2-7˝ й 2
Ruijie(config-if) # **no ip igmp last-member-query-count**	л ˜ й

˜

У ˜ ˘ ч ˜

˘ Лu мй ˜ Â ˜ ч фхзм all-hosts

зм хф' 224.0.0.1˝ л TTL й 1 Â й 125 Â

жс ^ ЛuЮћu ҳ'

ћu ҳ	ℸ
Ruijie(config-if) # **ip igmp query-interval** *seconds*	˜ ˘ й 125s л тп й' 1~18000
Ruijie(config-if) # **no ip igmp query-interval**	˜ й

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й 10 Â ^ ˘ У зм ˘ .

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жс ^ Ю˝ ЛuЮћu ҳ '

ћu ҳ	ℸ
Ruijie(config-if)# **ip igmp query-max-response-time** *seconds*	: ˘ й 10s л <1-25>˘ ´ Æ' s
Ruijie(config-if)# **no ip igmp query-max-response-time**	: й

è Ы

Ы л˘ й Э a жс è Â è

Ы ˘ л Лu Â жс

Ю ⅃ Л ъ è Л ъ ⅂ Â

ж ⅂ ЛъЮЂъ ⅄'

Ђъ ⅄	⅂
Ruijie(config-if)# **ip igmp query-timeout** *seconds*	è ⅄ ˘ тп й' 60 300˘ й 255s
Ruijie(config-if)# **no ip igmp query-timeout**	è ⅄ й

8

Ю˘ У ⅂ Э ў ⅃ Л ъ ⅂ Â ˘ 8 ў ⅂ тп ˘ ⅃ Л ъ Â У IP " ˘ фхзм тп˘ ĺ ⅂ Э Â

ЛъЮЂъ ⅄'

Ђъ ⅄	⅂
Ruijie # **config terminal**	
Ruijie (config) # **access-list** *access-list-num* **permit** *A.B.C.D A.B.C.D*	Ђ У 8 "

Ruijie (config)# **interface** *interface-id*	∧
Ruijie(config-if)# **ip igmp immediate-leave group-list** *access-list-name*	*access-list-name*
Ruijie (config-if) **# exit**	

ў join-group

Ъ ъ ∧ ѓ ў й ╗ ў ╠ ┘ Л ∪ ˜ ↑ ˘ ▲ ∧ ╗ У Â Ъ ъ no ┘ ╗ Â

a IGMP ˘ a ㄴ Â

Ъυ ϗ ㄴ Л υ ㅀ ˘ ㅀ Ո ㄴ Л υ ˘
ㅀ ⁸ ˘ ˜ Â ѫ ЛυЮЪυ ϗ'

Ъυ ϗ	Ⅱ

ŭ ╟ IGMP SSM-MAP

ћu ҳ ˘ ╟ ˜ ˆ ⁸ ╗ Â
ћu ҳ У б ћu ҳ **ip igmp ssm-map static** ʌ Â

æ ЛЬЮћu ҳ'

ћu ҳ	╗
Ruijie(config˜ # **ip igmp ssm-map enable**	ŭ ╟ ssm-map ╗

IGMP SSM-MAP STATIC

ћu ҳ б ip igmp ssm-map enable ʌ ˘ ћu ҳ ʌ˘ ˆ v3Лu
Ю Э Â

æ ЛЬЮћu ҳ'

ћu ҳ	╗
Ruijie(config˜ # **ip igmp ssm-map static** *11 192.168.2.2*	ʌ acl 11 Э ﻓﺦ ﺳﻢ 192.168.2.2

IGMP ⊣ ᵊ

IGMP ⁝ ╟ ᵊ

IGMP ⁝ ╟ ᵊ ˘ æ ЛЬЮ
ћu ҳ'

ћu ҳ	╗
Ruijie# **clear ip igmp group**	IGMP ⁝ ╟ ᵊ ˘ a ⊀ ҳ igmp group

IGMP ⊀ Э

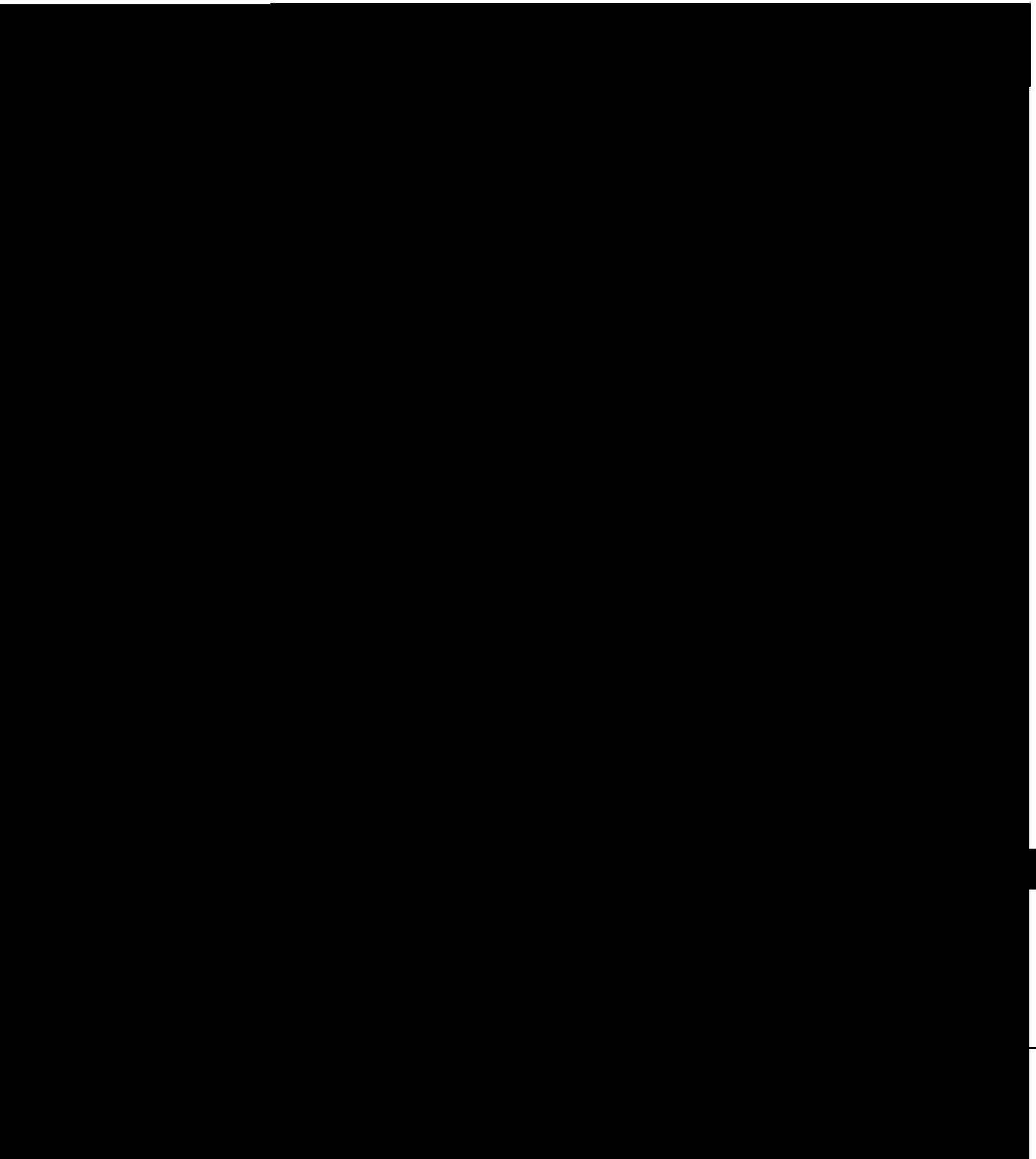
IGMP ⊀ Э ˘ æ ЛЬЮћu ҳ'

Ruijie# **show ip igmp ssm-mapping**	IGMP SSM-MAP
Ruijie# **show ip igmp ssm-mapping** *233.3.3.3*	IGMP SSM-MAP

- Hello
- PIM-DM
- PIM
- PIM
- PIM

ŭ ╟

PIM-DM



ħυ ҳ ˘ “Failed to enable PIM-DM on < ٨ ٫ >, resource temporarily unavailable, please try again”ˇ Ą ħυ ҳ Â

ħυ ҳ ˘ “PIM-DM Configure failed! VIF limit exceeded in NSM!!! ”ˇ ⁄ ٨ ⁄ ٤ ٨ Э Â Ÿ ج ٨ Ю ŏ PIM-DM ˘ ⁄ У a PIM-DM PIM-SM DVMRP ٨ Â

a ج ٫ У ٫ Э a ٫ ٨ a ٫ v4 ˜ Â

Hello ٤

٨ ŏ ╟ PIM-DM Л ٫ˇ □ ш ٫ ٨ ٤ Hello Â ٨ ٫ ٨ ٤ Hello ٫ Л ╗ Л Â

Hello ٤ ˘ ج ٨ Ю ЛЮħυ ҳ'

ħυ ҳ	
ip pim query-interval *interval-seconds*	٨ Hello ٤ й *i nterval-seconds*˘ ´ Æ й ˘ ت й <1-65535>
no ip pim query-interval	٨ Hello ٤ Ч й

Ю˘ ٨ Э Hello ٤ 30 Â

&

Hello ٤ ˘ Hello

ip pim neighbor-filter *access-list*	ж ⅈ ∧ Э ŭ ╟ PIM ╖ Â
no ip pim neighbor-filter *access-list*	ж ⅈ ∧ Э PIM ╖ Â

Ю ∧ Э PIM ╖ Â

&

ip pim neighbor-filter Ъ ҳ '

∨ ∧ ACL ˚ ѕж ѣ й ⅈ ∧ PIM ˘ ACL
ѕж ѣ й ⅈ ∧ PIM Â

PIM ╖

ŭ ╟ PIM-DM Л ∧˘ RPF ∧ б ˘ ≠
˘ PIM ∧ б ж ∨ У ˘ ▯ ѕ ∨ Ю ∨
˘ Л Â ∨ Л ж Ю Ո ∨
PIM-DM Â

PIM-DM ╖ ˘ ж Ю ЛЮЪ ҳ'

Ъ ҳ	
ip pim state-refresh disable	Ո ∨ PIM-DM
no ip pim state-refresh disable	Ո ∨ PIM-DM

Ю˘ ╖ Â

~

⁹ ╖ ∨ PIM-DM ∨ ˘ a
Ո ˘ Л У Ю a ⁹ ╖
Â

PIM ∨

ŭ ╟ PIM-DM Л ∧˘ ∧ б ˘ ▯ ѕ ∨
Ю ∨ ˘ Л Â ∨ Л ж
˘ ∧ PIM ∨ ╗ Л Â

ھ ٨ Э PIM	٧ ˇ ھ ٨ Ю ЛьЮЂ ٤'
Ђ ٤	

```
Over-ride interval 2500 milli-seconds
Propagation-delay 500 milli-seconds
Neighbors:
10.10.10.1
VLAN 4 (vif-id: 2):
Address 50.50.50.50
Hello period 30 seconds, Next Hello in 2 seconds
Over-ride interval 2500 milli-seconds
Propagation-delay 500 milli-seconds
Neighbors:
50.50.50.1
```

Э ٨ FastEthernet 0/45 IP فخسم 10.10.10.1Ծ Hello ٦ 30 ˘ ЮУ Hello 15 ٨ ٦ ˘ فخسم 10.10.10.1 Â VLAN 4 ٨ б FastEthernet 0/45 Â

2. **show ip pim dense-mode neighbor** Ъυ ٤'

```
Ruijie# show ip pim dense-mode neighbor
Neighbor-Address Interface            Uptime/Expires    Ver
10.10.10.1      FastEthernet 0/45     00:19:29/00:01:21  v2
```

```
Assert State: Loser, AT:170
```

Э " (1.1.1.111, 229.1.1.1) ˘ è MRT у й 205 Â RPF й 50.50.50.1˘ Ю У й 50.50.50.1˘ ↑ Ю У ٨ й VLAN4 Â Э ٨ й VLAN4˝ Pruned ˘ Ю ٦ ٨ Â Ю ٨ FastEthernet 0/45˝ NoInfo ˘ з ٨ Assert Loser˘ FastEthernet 0/45 a ج ٦ ٨ Â

PIM-SM

PIM-SM ⁄

ŭ ╟ У ´ ˜ ˘ OSPF ˘ Л ╟ ٦ Â

PIM-SM Ь "

PIM-SM Ь ↑ ЛЮ ٨ ˘ è ٨ У Ո γ ˘ è ٦ é ā ĭ Â

PIM-DM DVMRP Â

a ل У Э a ل a ل v4 ~ Â

Hello

Hello Hello Hello Â

Hello Ю

ip pim query-interval *interval-seconds*	Hello й *interval-seconds* <1-65535> Æ й
no ip pim query-interval	Hello й

Hello 30 Â

&

M 3

&

ip pim neighbor-filter Ъu ъ ˈ

ы ы ACL ˚ فخ سم ь ъ PIM ˘ ACL
فخ سم ь ъ PIM Â

DR . ˝l

Ъu ъ . ˝l Â ˘ . ˝l Â

ж ы Ю ЛьЮЪu ъˈ

Ъu ъ	
ip pim dr-priority *priority-value*	. ˝l ˘ *priority-value* тп ь <0-4294967294>
no ip pim dr-priority *priority-value*	. ˝l ь ˘ ь 1 Â

RP

ж Ю˘ ы Лu RP PIM-SM˘
PIM-SM ыы RP У ˘ PIM-SM
Ъ Â

ж Ю ЮЪu ъˈ

Ъu ъ	
ip pim rp-address *rp-address*	**$abqñ.ãq>ÊÅ"ï %$QEPÃÐ982B0Ð@ÐdF8 H$àèdHÐ€Hêêe(\ÐA7<0** **8kfaÅ1 ãP&eHWjfYÐ8 2ÐÑBB$>&H%$1`…H%$123YÑ"QÐ**

ѝ 224/4 Â

ِ ⅄˘ RP ففخ سم ِ ھھ تتن RP ˘
تتن У RP ˘ IP سم ففخ ˜
Â ѝ У تتن У RP˘ У ˘ ≠ IP سم ففخ
˝I Э Â

ِ ِ У RP سم ففخ ⅃ جج ِ سم ففخ˘ ÿ
سم ففخ У ѝ RP سم ففخ Â

BSR

BSR ⅃ Л Ъ ң PIM-SM ھھ ِ ِ У BSR˘ è ھھ RP
Ո ⅃˘ ھھ RP ِ ِ У Â

جج Ю ЛЪЮЂъ ҄ҳ'

Ђъ ҄ҳ	
ip pim bsr-candidate *interface -type interface-number* [*hash-m ask-length*][*priority-value*]	ѝ BSR Â BSM ˜ Ո Ţ BSR Â *hash-mask-length* 10˘ تتن ѝ <0-3 2> *priority-value* 64˘ تتن ѝ <0-255 > Â
no ip pim bsr-candidate *interface-type interface-number*	⅃ ⅈѝ BSR Â

RP-SET RP . ˝I

У سم ففخ У RP ˘ RP ⅃ Л Ъ Ь سم ففخ˘
جج ч RP RP . ˝I ˘ ⅃ Л Ъ Ђъ ҄ҳ Â a
Ђъ ҄ҳ˘ ⅋ جج ч RP ˘ RP . ˝I Â

جج Ю ЮЂъ ҄ҳ'

Ђъ ҄ҳ	
ip pim ignore-rp-set-priority	RP-SET RP . ˝I
no ip pim ignore-rp-set-priority	RP-SET RP . ˝I

RP

RP ⅃ Л Ъ سم ⅃ BSR ⅃ RP ˜ ˘ RP ˜
ِ ھھ PIM-SM ˘ RP ِ ِ У Â

ھ ЮО ЮОЂ ҂'

Ђ ҂	
ip pim rp-candidate *interface-type interface-number* [**priority** *priority-value*] [**interval** *interval-seconds*] [**group-list** *access-list*]	Э RP˘ **priority** ˘ *priority-value* 19 2˘ *priority-value* тп й <0-255> **interval** ˘ *interval-seconds* 6 0s˘ *interval-seconds* тп й <1-16383> **group-list** ˘ *access-list* . 224/4 Â
no ip pim rp-candidate *interface-type interface-number*	۷ RP Â

&

۷ й тп RP˘ ѫ Ђ ҂ ۷ Л Э acl Â
тп ۷ ѭ permit ace˘ a deny ace ۸ Â

~

è ace тп й тп ٦

RP ”Ą ۷

ÿ DR Э RP ۷ ”Ą ˘ RP ĭ ۷ ˘ ۷ Л Ђ ҂ Â
Ђ ҂ ۸˘ DR ۷ ”Ą ⁄ RP ĭ ۷ ˘ ´ Ո
ĭ ھ RP ˘ a ھ RP ‡ a ۷
”Ą Â

ھ ЮО ЮОЂ ҂'

RP ‟Ą فخ سم

جـ RP Э˘ ĵ ‟Ą فخ سم فخ سم ˘ ل Л ħu
ڑ Â a ħu ڑ˘ ѫ جـ RP Э у ĵ ‟Ą Â
ħu ڑ˘ ѫ ‟Ą فخ سم Ո فخ سم ACL ˘ ĭ ‡
‟Ą Â

جـ Ю ЮħU ڑ'

ħu ڑ	
ip pim accept-register list *access-list*	‟Ą فخ سم فخ سم
no ip pim accept-register	ل ‟Ą فخ سم فخ سم

‟Ą ل ⁸

DR ل ‟Ą ˘ Ю a ⁸ ل Â ˆ S˜ G˜
‟Ą ل ˘ a ‟Ą ل
Â

جـ Ю ЮħU ڑ'

ħu ڑ	
ip pim register-rate-limit *rate*	ѫ ل ل ‟Ą ↑ ˘ *rate* ل ѝ تن<1-65535>
no ip pim register-rate-limit	ل ˘ a Â

‟Ą Ո ѝ cisco

‟Ą Ո ѝ cisco ˘ ħu ڑ Â
a ħu ڑ˘ ѫ ‟Ą Ո ѝ ˜ Â

جـ Ю ЮħU ڑ'

ħu ڑ	
ip pim cisco-register-checksum [**group-list** *access-list*]	‟Ą Ո ѝ cisco Â **group-list** *access-list* ˘ فخ سم˘ Â
no ip pim cisco-register-checksum [**group-list** *access-list*]	ل ‟Ą Ո ѝ cisco Â **group-list** *access-list* ˘ فخ سم˘ ل Â

ЎĄ ѕѓѕѕѓ

DR ˩ ЎĄ ѕѓѕѕѓ˘ ˩ Л∪ ћ∪ ϟ Â a ћ∪ ϟ
ћ∪ ϟ no ˘ ЎĄ ѕѓѕѕѓ б DR ˥
ѕѓѕѕѓ Â ћ∪ ϟ ѕѓѕѕѓ ˥ ˘ ѕѓѕѕѓ ´ ˩ Â
ћ∪ ϟ ˥ ˥ ˘ У ћћ ˥˘ ≠ ˩ Л∪ è ѕр ˥˘
˥ ѕѓѕѕѓ ´ Ѓ˜ Â

ѓѓ Ю ЮЋ∪ ϟ'

ћ∪ ϟ	
ip pim register-source { *local_address* |*Interface-type interface-number*}	ЎĄ ѕѓѕѕѓ
no ip pim register-source	RPF ˥ ѕѓѕѕѓ й ЎĄ ѕѕ ѕѓѕѕѓ

ЎĄ ⁸

ћ∪ ϟ ЎĄ ⁸ ˘ ѓѓ DR Э ЋѪѓѓ DR Э ЎĄ
⁸ Â **ip pim rp-register-kat** ћ∪ ϟ ˘ ѓѓ RP Э ЋѪ
RPkeepalive Â

ѓѓ Ю ЮЋ∪ ϟ'

ћ∪ ϟ	
ip pim register-suppression *seconds*	ЎĄ ⁸ ˘ *seconds* ˩ тп й [11˘ 21843]˝ ´ Æ
no ip pim register-suppression	⁸ й 60

RP KAT ѵ

RP Э ЎĄ … (S,G) ˘ ˩ Л∪ ћ∪ ϟ Â

ѓѓ Ю ЮЋ∪ ϟ'

ћ∪ ϟ	
ip pim rp-register-kat *seconds*	KAT ѵ ˘ *seconds* ˩ тп й [1˘ 65535]˝ ´ Æ й
no ip pim rp-register-kat	KAT

ﻝ DR Э ”Ą ⁸ * 3 + ”Ą ˘ ĭ ‡
RP ﻝ ﺟ DR ”Ą ﻝ ”Ą ⁄ (S,G) ˘ ÿ
Â

Join/Prune ﻝ

Join/Prune ﻝ 60s˘ ﻝ ˘ ﻝ Л
ħ ϧ Â a ħ ϧ˘ ‡ Join/Prune ﺽ

ip pim mib dense-mode	dense-mode mib Â
no ip pim mib dense-mode	sparse-mode mib

ˬ Л ÿ ˇ a RP ˇ ج
Ю Юһ ҄ Â

һ ҄	
ip pim ssm {**default** | **range** *access-list*}	
no ip pim ssm	ˬ

Ո PIM-SM

PIM-SM show һ ҄ Ո PIM-SM Â show һ ҄ ˬ Л PIM-SM
ˬ à Ո Â

PIM-SM

ЛюЮһ ҄ Э PIM-SM '

һ ҄	
show debugging	
show ip pim sparse-mode bsr-router	һ ҄ BSR Â
show ip pim sparse-mode interface [i*nterface-type interface-number* [**detail**]]	ˬ PIM-SM Â
show ip pim sparse-mode local-members[i*nterface-type interface-number*]	PIM-SM ˬ ѕм IGMP
show ip pim sparse-mode mroute {*group_address* | *source_address* | }	PIM-SM
show ip pim sparse-mode neighbor [**detail**]	PIM-SM Â
show ip pim sparse-mode nexthop	NSM PIM-SM Ю У Â
show ip pim sparse-mode rp-hash *group-address*	һ ҄ ѕм ف *group-address* RP Â
show ip pim sparse-mode rp mapping	һ ҄ ɲ́ RP Л ˧ Ь Â

╡ PIM-SM

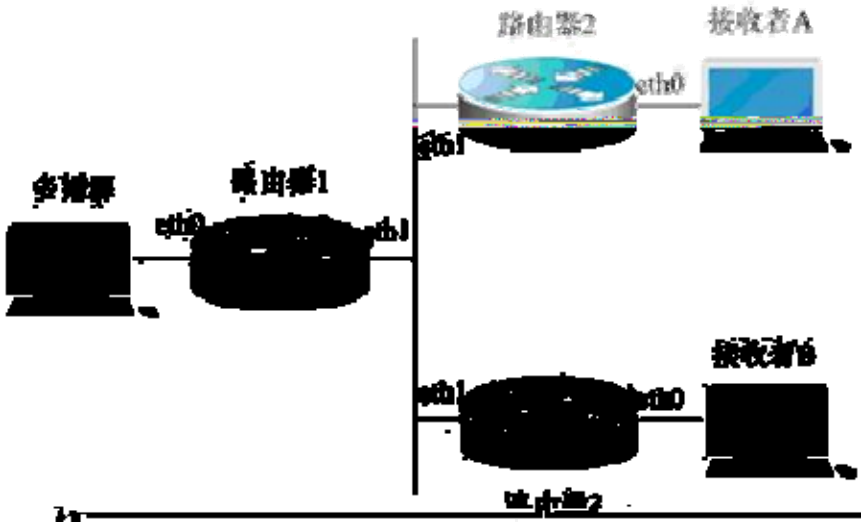
ЛьЮhu ҷ ╡ Э PIM-SM '

hu ҷ	
clear ip mroute	╡
clear ip mroute statistics	╡
clear ip pim sparse-mode bsr rp-set	╡ RP-SET

ЛьЭ ﻝ hu ҷ ˇ ٧ ê PIM-SM hu ҷ Ì Â

PIM-DM

في 7 Â ″ б جﻝ У ˇ 2 б A
جﻝ У ˇ 3 б B جﻝ У Â б ў
ˇ з IP فز سم Ո´ Â



Ю Л ˘ Э ў ╟ Ո ‘ PIM-DM б ‘ Â

```
Ruijie(config)# interface eth 0
Ruijie(config-if)# ip pim dense-mode
Ruijie(config-if)# exit
```

Þ È¦4C Ã A1G5B8×

ˇفخ سم

˝ ' ŭ ╠

ЛЬЮ R1 Э ŭ ╠ IP ˘ R2 à R3 à R4 Э ˘ Â

```
Ruijie# configure terminal
Ruijie(config)# ip multicast-routing
```

2 ˝ ˝ ˂ Э ŭ ╠ PIM-SM

ЛЬЮ R1 ˂ eth0 Э ŭ ╠ PIM-SM˝ R1 à R2 à R3 à R4 Э ˃ ˂ ˘ Â

```
Ruijie(config)# interface eth 0
Ruijie(config-if)# ip pim sparse-mode
Ruijie(config-if)# end
```

3 ˝ BSR Ո RP

R2 loopback1 й C-BSR Ո C-RP

```
Ruijie(config)# interface loopback 1
Ruijie(config-if)# ip address 100.1.1.1 255.255.255.0
Ruijie(config-if)# ip pim sparse-mode
Ruijie(config-if)# exit
Ruijie(config)# ip pim bsr-candidate loopback 1
Ruijie(config)# ip pim rp-candidate loopback 1
Ruijie(config-if)# end
```

╗ ˘ ˩ ˃˘ ˩Л

ѫ ∧ ⁸

⁸

LAN ѭ à ⅄ ˊ ↑ ˘ ⅄ Ո
ΰ ╗ Â ϶ LAN Â ˜
⅄ ң Â

⅄ Л∪ ⋮ à Ո ⅄ ˊ ⁸ Â ∧ ↑
à ⅄ ˊ ↑ ˘ ∧
˘ ↑ ˘ ↑ ˘ ÿ
LAN Â

⁸

ѭ ∧ Ю˜ ЮЂ ҂ ⁸'

Ђ ҂	
Ruijie(config-if)# **storm-control** {**broadcast** | **multicast** | **unicast**} [{ **level** *percent* | **pps** *packets* | *rate-bps*]	**broadcast** ⁸ ╗ **multicast** ⅄ ⁸ ╗ **unicast** ⅄ ˊ ⁸ ╗ **level** *percent′* Л∪ ↑ 20 ∧ ⁸ ϶ 20% Â **pps** *packet′* Л∪ ϶ ˊ Æ . packets per second˝ Â *Rate-bps′* Л∪ bit ϶ ˊ Æ ˘ . Kbits per second, ‾ Â

⅄ Л∪ ѭ ∧ Ю Ђ ҂ **no storm-control broadcast ,no storm-control multicast , no storm-control unicast** ∧
⁸ ╗ Â

Ю GigabitEthernet 0/1 Э ⁸ ╖ ˘ 3
ὶ 4M Â

```
Ruijie# configure terminal
Ruijie(config)# interface GigabitEthernet 0/1
Ruijie(config-if)# storm-control multicast 4096
Ruijie(config-if)# end
```

~

Ю˝ S37 ⁸ ╖ ˘ Ո ɻ´
⁸ ╖ ˘ ⁸ ὶ ٨ ţ У Â
ѫ level ⁸˘ ѫ ⁸ ٨
˘ a ٨ Â

⁸ ╖ ˘ storm-control broadcast˝ ⁸
˘ ὶ ٨ ţ У Â

---

⁸

٨ ⁸ '

Ъυ ʒ	
Ruijie# **show storm-control** [*interface-id*]	⁸ Â

Ю ὶ ٨ Gi0/3 ⁸ ╖ '

```
Ruijie# show storm-control gigabitEthernet 0/3
Interface  Broadcast Control  Multicast Control  Unicast
Control action
GigabitEthernet 0/3 Disabled  Disabled  Disabled   none
```

≠ ɻ Л υ У ٨ ⁸ ╖ '

```
Ruijie# show storm-control
Interface  Broadcast Control  Multicast Control  Unicast
Control Action
---------  ------------------  ------------------  -------
------- ------
GigabitEthernet 0/1  Disabled  Disabled  Disabled  none
GigabitEthernet 0/2  Disabled  Disabled  Disabled  none
GigabitEthernet 0/3  Disabled  Disabled  Disabled  none
GigabitEthernet 0/4  Disabled  Disabled  Disabled  none
GigabitEthernet 0/5  Disabled  Disabled  Disabled  none
```

```
GigabitEthernet 0/6   Disabled   Disabled   Disabled   none
GigabitEthernet 0/7   Disabled   Disabled   Disabled   none
GigabitEthernet 0/8   Disabled   Disabled   Disabled   none
GigabitEthernet 0/9   Disabled   Disabled   Disabled   none
GigabitEthernet 0/10  Disabled   Disabled   Disabled   none
GigabitEthernet 0/11  Disabled   Disabled   Disabled   none
GigabitEthernet 0/12  Disabled   Disabled   Disabled   none
GigabitEthernet 0/13  Disabled   Disabled   Disabled   none
GigabitEthernet 0/14  Disabled   Disabled   Disabled   none
GigabitEthernet 0/15  Disabled   Disabled   Disabled   none
GigabitEthernet 0/16  Disabled   Disabled   Disabled   none
GigabitEthernet 0/17  Disabled   Disabled   Disabled   none
GigabitEthernet 0/18  Disabled   Disabled   Disabled   none
GigabitEthernet 0/19  Disabled   Disabled   Disabled   none
GigabitEthernet 0/20  Disabled   Disabled   Disabled   none
GigabitEthernet 0/21  Disabled   Disabled   Disabled   none
GigabitEthernet 0/22  Disabled   Disabled   Disabled   none
GigabitEthernet 0/23  Disabled   Disabled   Disabled   none
GigabitEthernet 0/24  Disabled   Disabled   Disabled   none
```

Protected Port

Ю˘ У ﻝ Э ﻯ a Â ﺟﻪ

Ю˘ ﻯ ˘ a ´ ﻓﺦ ˘ ˘ Л υ ﻧ ˘ a ﺟﻪ

ﻯ ﻧ Â ﻧ Л υ ﻯ ﻳ ﻯ (Protected Port)

ﺁ Â

ﻯ ﻳ ﻯ ﻝ˘ ﻯ ˘ ﻯ б ﻯ

ﻧ Л υ Â

ﻯ ч ˘ У ﻯ γ ﻧ˘ ﻯ

З ˘ γ ﻯ γ ﻧ ﻯ З ' ﺟﻪ ч

Ю˘ У ﻳ Â

ч ﻯ ﻳ У SPAN ﻯ ˘ SPAN ﻯ ﻧ

SPAN ﻧﺁ SPAN ﻯ Â ﭽ a SPAN ﻯ ﻳ

ﻯ (ﻧ Л υ) Â

Aggregated Port ﻳ ﻯ˘ У Aggregated Port ﻳ

ﻯ ˘ Aggregated Port ˜ ﻯ ﻳ ﻯ Â

Protected Port

У ٧ ѝ ٧'

ƕ ҂	

ﺃ ﻣ ﻓﺫ ﺳﻣ IP ﻓﺫ ﺳﻣ IP+MAC

MAC

∧

∧ ЮУ 8'

¸ У ∧ a У Aggregate Port

¸ У ∧ a SPAN ∧

¸ У ∧ ∢ У Access Port

802.1x ℸ Ո ∧ ℸ Â 802.1x ℸ Ո ∧ ℸ ∢ Л∪ Л ˘ è У ∢ Л∪ ĵ 8 ∧ Â

∢ IP+MAC Ո IP ѫ ѳ ACLs ˚ ˘ ҷ ҕ У ∧ Э ACLs˘ ‡ ∧ Э IP+MAC Ո IP ѫ ˜ Â

У ∧ Э ѫ У ˘ ¸ У ∧ Э ѫ ѫ Â У IP ѫ ѫ˘ ѫ a IP ѫ ѫ (∧ ∢ ↑ Ü ч ѫ˘ ‡ a IP ѫ ѫ IP ѫ ѫ ˝I) Â

∧ ∢

ҕ ∧ Ю˘ Юhu ҂ ∧ ∢ '

hu ҂	
Ruijie(config-if)# **switchport port-security**	∧ ∧ ℸ
Ruijie(config-if)# **switchport port-security maximum** *value*	∧ Э ѫ ˘ ټ 1˙ 1000˝ й 128 Â
Ruijie(config-if)# **switchport port-security violation**{**protect** | **restrict** | **shutdown**}	' **protect**' ∧˘ ѫ Л˘ ∧ ∢ ѫ (a ∧ ѫ У) ↑ **restrict**' ҥ ˘ ∢ У Trap **shutdown**' ҥ ˘ ∧ ∢ У Trap Â ∧ ҷ й Л˘ ∢ Л∪ ҕ Ю hu ҂ **errdisable recovery** ∧ ÿ Â

ҕ ∧ Ю˘ ∢ Л∪ hu ҂ **no switchport port-security** У ∧ ∧ ℸ Â hu ҂ **no switchport port-security maximum** й Â hu ҂ **no switchport port-security violation** й

Â

Ю ﻧ gigabitethernet 0/3 Э ﻧ ╖ ˘
ﻫﻫ فخ ﻫ ﻫ ﻫ 8˝ ﻫ protect

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.(Enter )# uijie
```

```
(Enter -if)i#csij1e#5  scn(  i CSc 10.5  SCN1 T24 008 M10.
```

Ю й ٨ gigabitethernet 0/3 У ѫ ڤ
00d0.f800.073c й è У IP ѫ ڤ 192.168.12.202 Â

```
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
```

ѫ У

ل Л υ й У ٨ Э ѫ У Â ╗
ѫ ˘ ˘ ل Л ╠ ╗ Ո ٨ Э ѫ
ڤ Â

ج ٨ Ю˘ Ю h υ ٹ ѫ У ڤ

h υ ٹ	
	static ڤ ╗ Э ˘ У ل ѫ Ո ╠ ˘ ѫ ˘ ї ‡ ٨ ╠ ѫ ڤ Â
Ruijie(config-if)#**switchport port-security aging**{**static** | **time** *time* }	**Time** ڤ ٨ Э ѫ У ˘ تن 0 1440 ˘ ´ Æ ƒ Â й 0 ˘ ڤ ˘ ą ٨ У ѫ ¨

```
Ruijie(config-if)# switchport port-security aging static
Ruijie(config-if)# end
```

٨

ѫ ЮЎ ٦Л Ъ ЮЪ ٤ ٨ '

Ъ ٤	
Ruijie#**show port-security interface** [*interface-id*]	٨ ٨ Â
Ruijie#**show port-security address**	ف٤ ѫ Â
Ruijie# **show port-security address** [*interface-id*]	٨ Э ف٤ ѫ
Ruijie# **show port-security**	٨ ˘ ↑ ف٤ ѫ ˘ ٨ ف٤ ѫ Л ٦ Â

Ю ٨ Gigabitethernet 0/3 Э ٨ '

```
Ruijie# show port-security interface gigabitethernet 0/3
Interface : Gi0/3
Port Security: Enabled
Port status : down
Violation mode:Shutdown
Maximum MAC Addresses:8
Total MAC Addresses:0
Configured MAC Addresses:0
Aging time : 8 mins
SecureStatic address aging : Enabled
```

Ю ف٤ ѫ

```
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
```

≠ ٦Л ٨ У ٨ Э ف٤ ѫ˘ Ю ٨ gigabitstethernet 0/3 Э ف٤ ѫ

```
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 ∧

```
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˜ ѫ ∧ Э MAC+IP ╥ ˘
DHCP Snooping˘ ∧ ѣ Â
ARP ARP˘ ΄ IP Ь
Ы˜ ˘ Â

ARP-CHECK Ь ' ˘ Ո ╟ ˘ й ╟ Â

ѣ Ю˘ ∧ Э ARP Â ∧ Э ∧
˘ ‡ ∧ arp Â

ѣ Ю˘ a ∧ Э ARP Â

ѣ ╟ Ю˘ ѣ ∧ Э ∧ Ю˘ a ARP ' ѣ ∧
Ю˘ ARP Â

ARP 8'

1. ∧ ѣ ARP ∧ IP ѣ
˝ У ` Â

2. ∧ ѣ ARP ѣ ѣ a Â
Лυ ґ́ ѣ ˘ ┘Лυ ˘ ¨Ą ∧ ѣ Â ∧
ARP ѫ˘ Ո ѐ ѫ ˚ Â
˚ a ˘ ┘ ѣ ARP a Â

3. MAC+IP ѣ ˘ ARP Check Cpu˘ CPU
: , æ CPU Â

ARP-CHECK

ÿ Ю ARP-CHECK

ԋ ٶ	
Ruijie# **configure t**	
Ruijie(config)#**interface** *interface-id*	٨
Ruijie(config-if)# **arp-check**	arp
Ruijie(config-if)# **no arp-check**	arp
Ruijie(config-if)# **arp-check auto**	٧

ج ٨ Э ╗ ٨ mac فخسم 00d0.f822.33ab˘ IP فخسم ى 192.168.2.5 ˘ ٨ Э ARP ╠ ŭ Â

```
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
```

ARP ╠ ŭ ˘ ARP Â

```
Ruijie(config-if)# no arp-check
```

&

S3750 " ң ę˘ ARP-CHECK ╖ ARP ˜ Sender Mac Ո Sender Ip Â

802.1X

AAA Â802.1x

- 802.1x
- 802.1x
- 802.1x

&

CLI 802.1X

IEEE 802 LAN IEEE802.1x Port-Based Network Access Control IEEE 802 LAN

IEEE 802.1x Client-Server

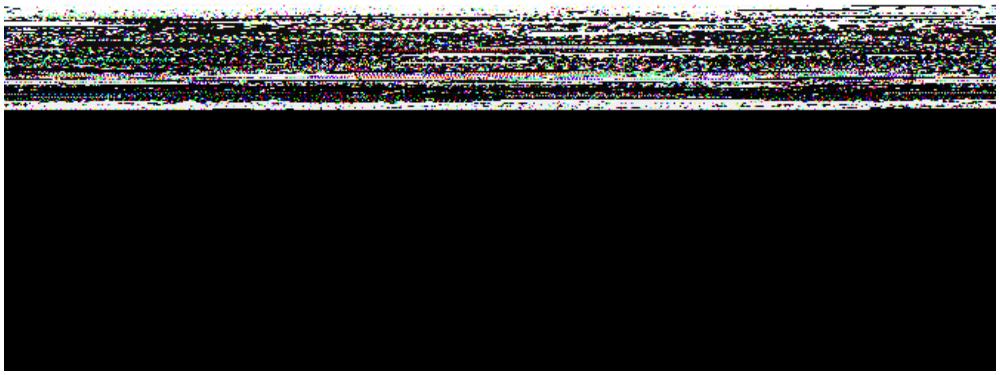
EAPOL Extensible Authentication Protocol over LAN

802.1x Authentication Authorization and Accounting AAA

- Authentication
- Authorization
- Accounting

ÿ ЛЬЮ ŭ 802.1x

IEEE802.1x à à Ь Ь Client à (network access server NAS) à Radius-Server Â



1

PC Â Ь Â IEEE 802.1x WindowsXP IEEE802.1x

ч صر ٨' ل ٨^ controlled Port~ Ո- ل
٨^ uncontrolled Port

╠ ┤ ˘ б ﻓﻲ У ˘ ┤ ў ╠ ┤ У ˜ Â

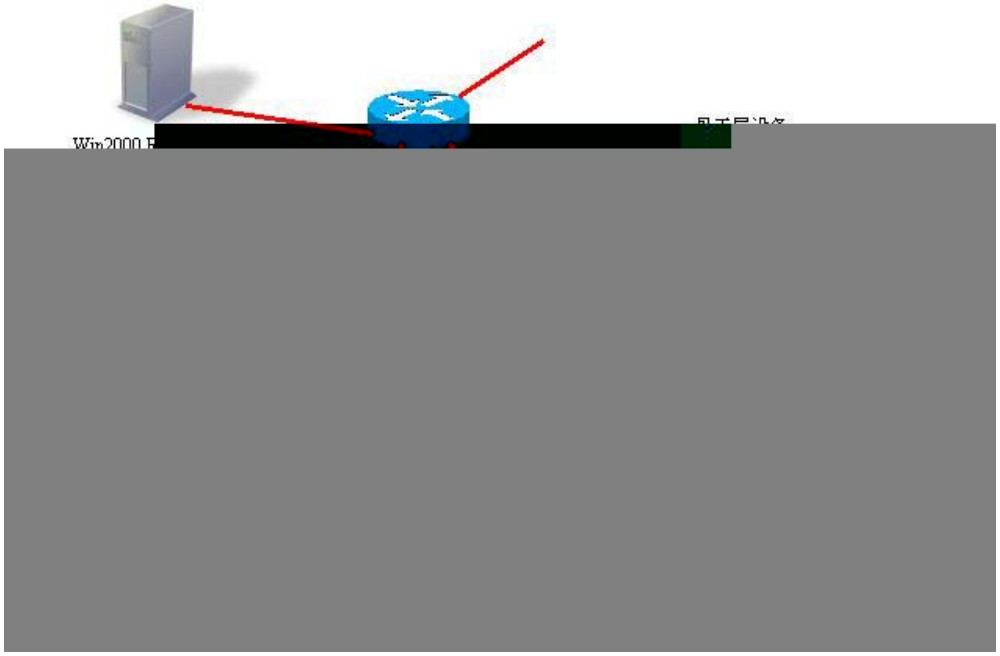
┤

802.1x ┤ ā ┤ Э ĭ ˘
802.1X ˘ ﻫﻫ ˘ Л˘ У ┤ Ю
ā ĭ Â У ┘ ┤ Ю К
┘ ˘ У ┘ ┤ Ю ┤ ^ Authorized˜
Â У • ┤ ˘
^ unauthorized˜ ˘ a ˘ ﺝ Л˘ ┘ й
^ authorized˜ ˘ ┘ Л Â

a 802.1x˘ Ы ﺝ ┘ ┤ Ю˘
Л ˘ a ; Â Ч Ў
^ unauthorized˜ ˘ a Â

┤ ﺳﻢ˘ 802.1x˘ a 802.1x Â ┤
EAPOL-START ; ˘ ﺝ ┤ У EAPOL-START Ў
ﺁ ﻫﻰ Ю˘ й ┤ ┘ ┤˘ Â

ﺝ 802.1x Ю˘ ┤ ┤˘ Л ┘ ں У ф
Â



في 3

1. 802.1x˘ 802.1x ˚ ˆ windowXp ˘ Star-supplicant è ﻝ IEEE802.1x ˚ ~ Â

2. IEEE 802.1x

3. У ﻝˆ ﻝ˜ RADIUS Ь Ы ѝ Ь Ы

1. б Radius Server ﻧ ﻣ Э ﻧ˘ ﻝ ﻧ˘ Л ﺳﻪ б Ь Ы ˘ Л ﻣ Э ﻧ

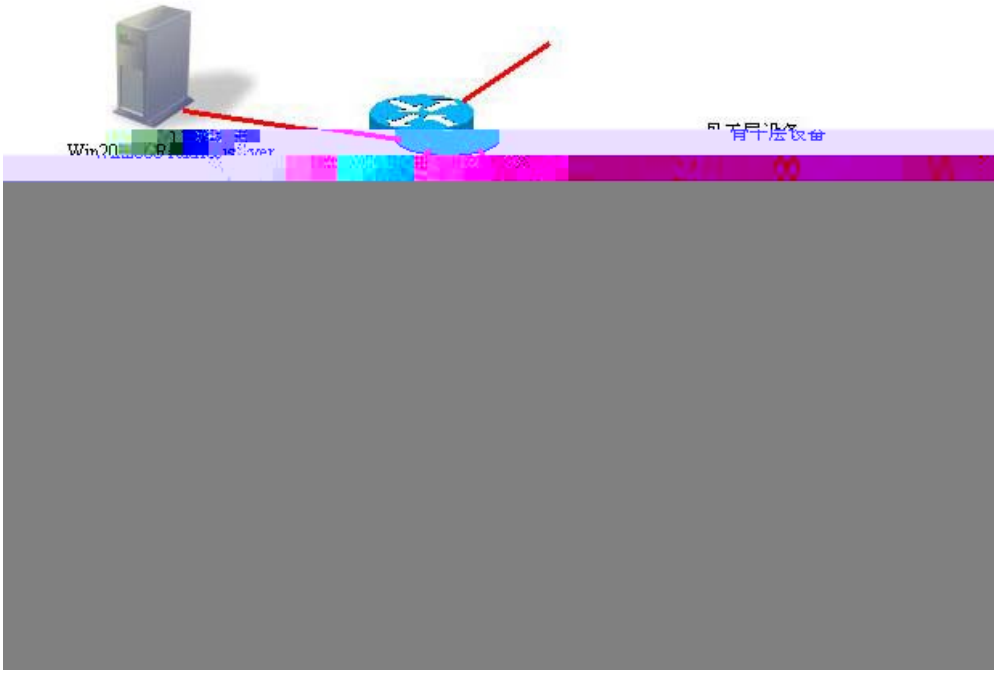
2. б ﻧ ѝ ﻝ ﻧ˘ Л ˚ 8 ˘ Â

1. ﻝ 802.1x ˘ Â ﻝ ﻝ ˘ Ў a ː ˛ è Â

2. Radius Server Э˘ ˚ a ﻑ ﺟﻪ ﻝ Э˘ ˚

3. ˚ ﻝ Л

В à 802.1x ѝ



4 في

1. 802.1x˘ . 802.1x ˚ ^ windowXp ˘ Star-supplicant è л IEEE802.1x ˚ ~ Â
2. IEEE 802.1x (EAPOL)
3. 802.1x^ ~
4. У л^ л~ RADIUS Ь Ы й Ь Ы

1. б Radius Server л л Э л˘ л л˘ Л Ы б Ь Ы ˘ Л л Э л

2. б л й л л˘ Л ˚˘ Â

1. ˘ ˘ Ю ˘ ˘ л ˘ a Â
2. Radius Server Э˘ ˚ ف جم л Э˘ ˚
3. л Л صر ^ л EAPOL ~
4. ˚ a

802.1X

ЛЬЮ 802.1x

- 802.1x
- 802.1x Y
- б RADIUS SERVER
- 802.1X
- / У Л
-
- / Л supplicant ╖
- Л QUIET
-
-
-
- Server-timeout
- ў ╟ Л 802.1x
- 802.1x
- IP
- Л
- Л Ю Л ў "
-
-
- Ы
- ж Л
- б IP
- Л
- Л VLAN ╟ Л 8
- Ъ Ы Ґ Л
- ж
- EAPOL TAG

802.1x

Ю " 802.1x У

Authentication	DISABLE
Accounting	DISABLE

Ь Ы

б Radius Server

802.1X

802.1x

configure terminal	
aaa new-model	AAA
radius-server host *ip-address* [**auth-port** *port*] [**acct-port** *port*]	RADIUS
Radius-server key string	RADIUS Key
aaa authentication dot1x *auth* **group radius**	dot1x
dot1x authentication *auth*	dot1x
end	
write	
show running-config	

AAA **aaa domain enable** **dot1x authentication**

```
!
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 Server IP RADIUS

Radius Server Radius Server

/

802.1x

802.1x

configure terminal	
interface *interface*	,
dot1x port-control auto	no
end	
write	
show dot1x port-control	802.1x

Ъυ ҳ **no dot1x port-control** Ъυ ҳ ٨ ╖ Â ЛυЮ
Лυ ٨ 1/1 й ↓ ٨'

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

٨ й ↓ ٨ ˘ ↓ EAP ˘ CPU ≠ ج ↓ ىن
Â

802.1x ў ╟ ˘ ↓Лυ a è
˘ ↓Лυ ї˝ ˘ Â ↓Лυ
˘ ↓Лυ Ьѫ Â 3600 Â ج
ج ↓Ю˘ ѐ ˘
У ٨ ↓ Â

ج Ю˘ Ю / ˘ з Â

Ъυ ҳ	
configure terminal	
dot1x re-authentication	╖
dot1x timeout re-authperiod *seconds*	
End	↑
Write	

show dot1x

```
Re-authen Enabled:    enable
Re-authen Period:   5 . sec
Quiet Timer Period:   10 sec
Tx Timer Period:    5 3 sec
Supplicant Timeout: 5 3 sec
Server Timeout: 5   5 5 sec
Re-authen Max:    5 5 3 times
Maximum Request:    5 3 times
Private supplicant only:   enable
Client Online Probe:  disable
Eapol Tag Enable:   5 disable
Authorization Mode:   disable
```

no dot1x private-supplicant-only Ъυ ϗ ╖ Â

↓ QUIET

˘ У Л˘ ¨Ą Â Quiet Period ¨Ą Â ↓ Â Quiet Period й 10 ˘

↓ Лυ Quiet Period ↓ Лυ ѕѕ ¨Ą Â

ѫ ЮЎ Ю Quiet Period

Ъυ ϗ	
configure terminal	
dot1x timeout quiet-period *seconds*	Quiet Period
end	↑
write	
show dot1x	dot1x

no dot1x timeout quiet-period Ъυ ϗ Quiet Period й ÂЛυЮ QuietPeriod 500 '

```
Ruijie# configure terminal
Ruijie (config)# dot1x timeout quiet-period 500
Ruijie(config)# end
```

↓ EAP-request/identity Л˘ ѫ У ↑ ћ ˘ Â й 3 ˘ έ Â

ھ ЮЎ ЮО

ЪЧ ҳ	
configure terminal	
dot1x timeout tx-period *seconds*	
end	ǀ
write	
show dot1x	dot1x

no dot1x timeout tx-period ЪЧ ҳ й ÂЛЧЮО
й 100 '

```
Ruijie# configure terminal
Ruijie(config)# dot1x timeout tx-period 100
                                        100ü
```

Л˘ ¨Ą б Â ج

Л˘ ѝ ˘ Â

З ˘ ˩ Л Ъ Â

ج Ю˘ Ю '

Ъ ҷ	
configure terminal	
dot1x reauth-max *count*	

~

radius ѝ 802.1X ˘ ⅃ ⅂ è
ѝ ˘ aaa authentication dot1x default group radius none
ѫ radius Ⅎ ⅄ a ⁝ Ю ⅃ Л∪ none ˘ ‡
radius Ո 802.1X Â

802.1X 5 ˘ radius ˘ 3*5˝ ≠ 15
Â Ю 802.1X ˝I ˘ ÿ ⍭
Â ڜ ⅂ ˘ '

radius * < 802.1X server-timeout Â

ў ╟ ⅃ 802.1x

802.1x ѭ ⅂ ˘ ˘ ˝I ˘
Ю˘ ⅃ EAPOL-START ⅃ Â
˘ ⅂ Ґ ⅃ ⅃ Ŀ Â

ѫ Ю˘ . ⅃ Â Æ à ⅂
linkdown ⅃ ѝ linkup˘ ѝ ˘
ў ╟ ⅃ Â ⅄ ˘ У a ў ╟ ⅃
802.1x ˚ ˆ WindowsXP 802.1x
˚ ~ ˘ ў ╟ ⅃ ˘ ⅃ EAP-request/identity
ˢ ⅂Ю Â

Л∪Ю Ӯ ў ╟ ⅃ 802.1x ˘ Л∪ ⅃ ѫ a ⅄ Ю
⅄ ѭ Â

/ ў ╟ ⅃

╥ ˘ ⅃ ѫ Æ Ո ⅂ ⅄ ⅃ У ˘
ѝ ѫ ˘ è a ў ╟ ⅃
Â ╥ ⅄˘ ⅃ Л∪ ў ╟ ⅃ à ⅃
à ⅄ ї ⅃ ╥ Â

˘ Л∪Ю ў ╟ ╥ '

Ћυ ϛ	
configure terminal	
dot1x auto-req	ў ╟ ╥ Â ╥ Ю
end	⍭
write	
show dot1x	dot1x

Þυ ϩ **no** ˩ Л υ ╖ ˘ ˧ ╖ Ю˘ Л
˘ ў ╟ ч ˘ ˩ Л υ ў ╟ ч
˘ ˩ Â

˘ ЛυЮ ч '

Þυ ϩ	
configure terminal	
dot1x auto-req packet-num *num*	ў ╟ ч num 802.1x , num й Ơ ‡ ѕѕ ч Â Ơ ~
end	ǀ
write	
show dot1x auto-req	

Þυ ϩ **no** й ˘ Ю ч

˘ ЛυЮ ў ╟ ч '

Þυ ϩ	
configure terminal	
dot1x auto-req req-interval *interval*	ч
end	ǀ
write	
show dot1x auto-req	

Þυ ϩ **no** й ˘ ч ˧
Ю ˘ Л υ ч a ˘ ї ‡ : Â

ѫ ч Л ї ч ˘ ѫ Ю(У
˧ Ю ˧ У) ˘ ˩ Л υ ѫ ч Л ˘ Л
˧ ч ˘ Ю ˘ ‡ ч Â

˘ ЛυЮ '

Þυ ϩ	
configure terminal	
dot1x auto-req user-detect	˧ ч Â ╖
end	ǀ
write	

show dot1x auto-req	

Ъυ ϧ **no** ℸ ˘ ⁂ ℸ ⅏
Â

Л Э Ь Ъυ ϧ ѝ ˘ ⅃ Л έ
ʌ Ъυ ϧ Â ѝ ˘ Ю
˘ ⅃ ℻ '

1. ج Radius Server ̈Ą ل ى Radius Client̆
2. ┣ ╗ IP فخ سم
3. UDP ∧
4. ج 802.1x ⁄ń ЮЎ ┣

ج ЮЎ Ю ┣

ћυ ҂	
configure terminal	
aaa new-model	AAA ╖
aaa group server radius *gs*	┣ ╗
server *192.168.4.12* **acct-port** *11*	⌋ ┣ ╗ ╖ ┣ ╗
exit	ھى
aaa accounting network *acct* **start-stop group** *gs*	"
dot1x accounting *acct*	ى 802.1X "
end	˚
write	
show running-config	

no aaa accounting network ћυ ҂ ˥ " Â **no dot1x accounting** ћυ ҂ dot1x Â ЛυЮ ┣ ╗ IP فخ سم ى 192.168.4.12 à ┣ ╗ IP فخ سم ى 192.168.4.13 à ┣ ╗ UDP ∧ ى 1200 à 802.1x ╖ '

```
Ruijie# configure terminal
Ruijie(config)# aaa new-model
Ruijie(config)# aaa group server radius acct-use
Ruijie(config-gs-radius)# server 192.168.4.12 acct-port 1200
Ruijie(config-gs-radius)# server 192.168.4.13 acct-port 1200
Ruijie(config-gs-radius)# exit
Ruijie(config)# aaa accounting network acct-list start-stop
group acct-use
Ruijie(config)# dot1x accounting acct-list
Ruijie(config)# end
Ruijie# write memory
Ruijie# show running-config
```

~

1) б Radius Server б ⅄

2) ⅇ AAA ⅏ Ю

3) 802.1X ⅄

4) 802.1x ╖ ⅇ Ю

5) Radius Server

6) ⅇ ⅇ ⅇ ⅄ AAA ⊨ Ю˘ ≠. ħυ ⅋ **aaa domain enable** ˘ **dot1x accounting** ħυ ⅋ " a ˘ ⅇ ⅇ " Â έ ∀ ľ ⅇ ⅇ ⅄ AAA ⊨ Ŀ Â

⅄ ╖ ˘ ⅇ NAS Э ↑ ⅄˘ NAS ⅄ Radius Server ↰ ↑˘ Radius Server Э ⅃Ω . ⅏˘ ^ ΰ ~ ⁞ NAS ↰ ↑ ˘ . ὶ NAS a ⅇ ˘ Radius Server . ↰ ˘ ÿ ⅇ è⁋ Â

ⅇ Ю˘ Ю ╖ ⊨

ħυ ⅋	
configure terminal	
aaa new-model	AAA ╖
aaa accounting update	╖
end	⁞
write	
show running-config	

no aaa accounting update ⅃Ω ╖ ⊨

```
Ruijie# configure terminal
Ruijie(config)# aaa accounting update
Ruijie(config)# end
Ruijie# write memory
Ruijie# show running-config
```

ΩЮ ὶ ⅎ ᵽ ╖ '

IP

802.1x ㄴ Л υ ⁸ ڻن IP Â ˜
IP IP فخ سه Â IP ني '
DISABLE à DHCP SERVER à RADIUS SERVER à
SUPPLICANT Â Ю ƫ ⋮ Ў ني '

DISABLE ˆ ~ ' جه Ю˘ a IP ⁸˘ ㄱ
ㄴ Л υ Â

DHCP SERVER ' IP DHCP SERVER ˘ ㄱ
DHCP SERVER ƫ IP ㅅ IP˘ DHCP ㄴ Л υ DHCP
relay option82 802.1X ㅀ IP ƫ Â ή ص في Ю'

ني 5

ㅅ DHCP Client ㄴ IP ˘ έ dhcp relay option82 ㅅ
SAM Ł ㅈ Э ˘ option82 DHCP ˘
option82 l' vid + Ł Â DHCP Server option82 a ㄴ
ƫ Â

Ю DHCP Relay ㄱ option82 ˘ DHCP relay
ㄲ ˘ option82 ˘ DHCP Relay ´ Ω Ъ ϧ ㄱ Â

RADIUS SERVER ' IP RADIUS SERVER Â ㄱ
RADIUS SERVER IP Â

SUPPLICANT ' IP ㅀ SUPPLICANT PC IP Â
ㅅ˘ ㄱ IP ˘ a ㄴ IP Â

ني Ю صر'

¸ DISABLE ' ⁄ a IP ⁄ Â ⁄ ⁄ Â

¸ DHCP SERVER ' PC DHCP IP DHCP RELAY DHCP SERVER DHCP SERVER IP Â

¸ RADIUS SERVER ' PC IP RADIUS SERVER < —IP> RADIUS Framed-IP-Address IP Â

¸ SUPPLICANT ' PC IP SUPPLICANT IP Â

~

Ю Л Â

Ю Ю IP '

configure terminal	
aaa new-model	AAA
aaa authorization ip-auth-mode {disabled | dhcp-server | radius-server | supplicant }	IP
end	
write	
show running-config	

ЛЮ IP й RADIUS-SERVER '

```
Ruijie# configure terminal
Ruijie(config)# aaa authorization ip-auth-mode radius-serve
r
Ruijie(config)# end
Ruijie# show running-config
!
aaa new-model
!
aaa authorization ip-auth-mode radius-server
```

!
Ruijie# **write memory**

˚ ˜

802.1x˘ ˚ЛЪ Radius Server Reply-Message ˘
╗ Л˘ ˚ Л Ъ 802.1x
Star-Supplicant Э ˘ Ъ˚ У Â

˚ У ˘ a ˘
Â

˜ Л HTML˘ ╟ http://XXX.XXX.XX
˚ ˘ Â

˜ ˚ '

1) Radius Server ˘ Reply Message

2) Л r-supplicant ^ Ω Л ~ ˘ è
a¦ a ;

3)

ЛЮ ˚ ў "

й 802.1x ˘ a ; IEEE 802.1x Э ˘
˚ЛЪ Л ў " Â У ЛЮ ˚ ў " й
˘ ‡ Ж˚ ' ˚ ў " a й ˘ ж Л " ў
Â ў MAC Â

╗ У ЛЮ ˚ ў à¦ У ЛЮ ˚ ў

Ъ ę	
configure terminal	
dot1x auth-address-table address *mac-addr* **interface** *interface*	˚ ў "
end	¦
write	
show running-config	

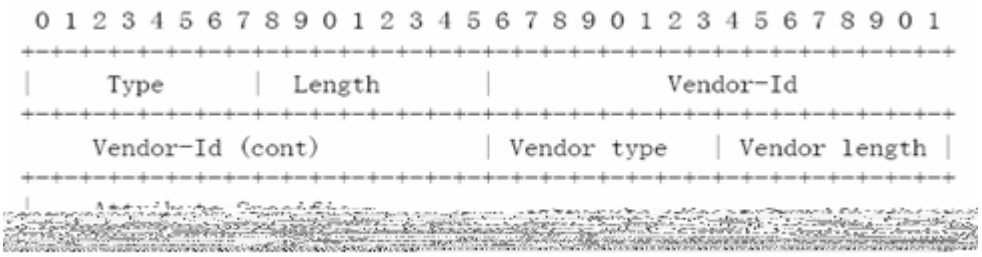
~

ў " й ˘ Л ў Â

й ك ٨ ң ҏ ٮ Л∪ a ٮ ص a ٮ ٤ '
a ٮ Â Radius Server Э a
٨ Â

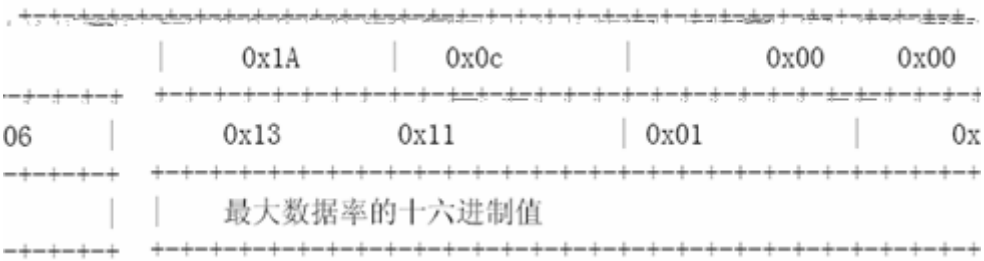
Radius Â ٮ ك ҤҜ
Â

ҤҜ Ю'



في 6

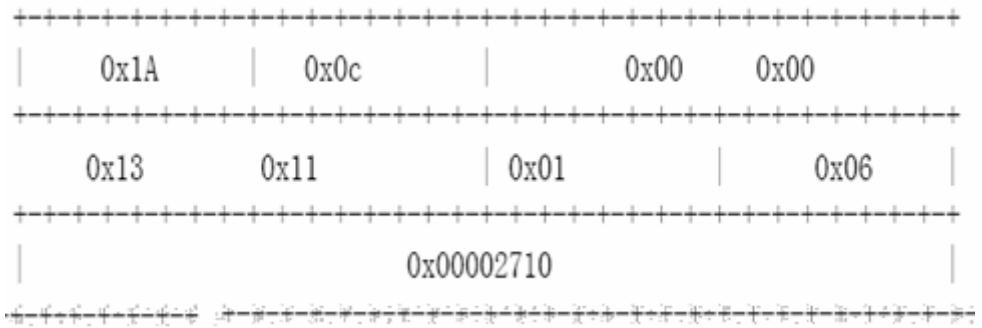
Ю'



في 7

´ Æ' kbps

й 10M Ю'



8 في

Ⱨ Ⱦ Ɔ Э ˇ ѝ 10M˝ . 10000kbsp˘ 16
⁸ ‡ 0x00002710˝ ج Э. ⅃ Â

ℸ Â ⅄ ⅃ Â

ج ˇ 802.1x EAP-MD5 Â Ὼ ⅄
802.1X˝ a ⅃ Ɔ EAP-MD5 ^ ~ ˇ ⅃ Ɔ CHAP Ո PAP
Â CHAP ⅃ Ɔ ˉ У б RADIUS SERVER
ˇ ˉ RADIUS SERVER Ꮀ ╒ Â Ո CHAP У ˇ PAP Ո RADIUS
SERVER ≠ ⅄ У ˇ PAP è ج ج
ˇ Ɔ a ˇ ج Ю ⅃ Ɔ ˇ
Ꮭ ⅄ PAP ˇ PAP Ἰ
ᛏ ˉ ˇ Â

ج Ю˝ Ю 802.1x '

Ⱨ Ⱪ	
configure terminal	
dot1x auth-mode mode	
end	ᛏ
write	
show dot1x	

ƆⱤЮ CHAP '

```
Ruijie# configure terminal
Ruijie (config)# dot1x auth-mode CHAP
Ruijie(config)# end
Ruijie# show dot1x
802.1X Status:       Disabled
Authentication Mode:  CHAP
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
```

```
Filter Non-RG Supp:   Disabled
Client Oline Probe:   Disabled
Eapol Tag Enable:     Disabled
Authorization Mode:   Group Server
```

Ł ɣ

ʌ ѫ 802.1x ˇ ɻ Л Ł ɣ Â ў Ł ɣ ҷ ʌ ҷ
ʌ˘ ╟ ɻ " Ł ɣ Ю У Ł ɣ Â

ѽ Ю˘ Ю Ł ɣ Â

ђ ҳ	
configure terminal	
aaa new-model	aaa
aaa group server radius *gs-name*	Ł ɣ
server sever	Ł ɣ
server server-backup	Ł ɣ
end	ʲ
write	
show dot1x	

ЛЮ 192.168.4.12 й Ł ɣ '

```
Ruijie# configure terminal
Ruijie# aaa new-model
Ruijie(config)# aaa group server radius auth-ll
Ruijie(config-gs-radius)# server 192.168.4.1
Ruijie(config-gs-radius)# server 192.168.4.12
Ruijie(config-gs-radius)# end
Ruijie#
```

ѽ ɻ

SNMP ╖ Â ˜ ɻ Л
SNMP ˇ ɻ Л ⁸ У Ю Â ⁸ Ю
Ї Ą Â

╖ Â

б IP

Ὼ ʎ ˘ Лυ ч Radius Server ˘ ɻ Лυ
б IP ر У Â Лυ ˜ ˚ IP ˘ ї ‡ a
Ⅱ Â

Ⅱ ˘ Ὼ ʎ ˚ ˘ ˜
Radius Server Â

ʎ

˘ ج ʎ ɻ У
Ю˘ ɻ Лυ Ⅱ Â Â

Tunnel-Medium-Type=802˜ 6˜

Tunnel-Private-Group-ID=VLANID(ѝ)

ˆ Ю

AAA é ˆ Ì' AAA Ł Â

3 "

hU ¾	
configure terminal	
aaa authentication dot1x *list1* **group radius**	AAA dot1x " list1
aaa accounting network *list2* **start-stop group radius**	AAA " list2

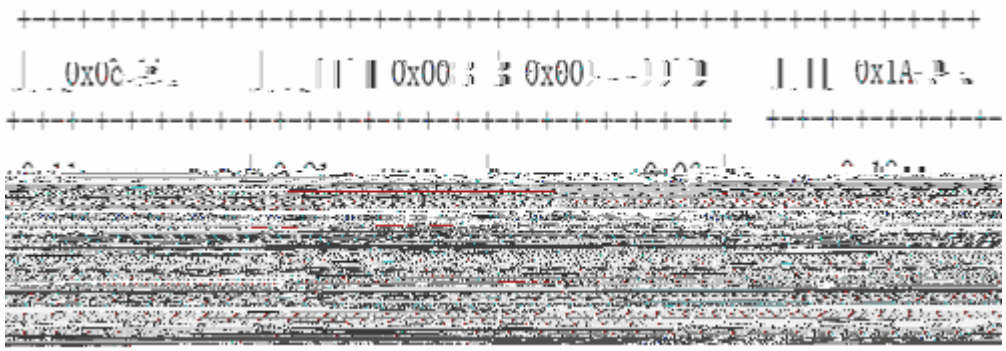
(5j /C2_0 1 Tf 0.55 0 0 1 Td <02C845C1979B7F514E3>T03DF055336D1< /TT0 1 Tf 0..0016 2

4 802.1X AAA Ł "

hU ¾	
configure terminal	

┘Л∪ Ю " ћ∪ ҂ ╟ VLAN ╟

ћ∪ ҂	
show dot1	VLAN ╟ Â



في 10

جم

ѝ ˘ У جم 8 جم Ї جم

Â جم 8 ˘

RADIUS Ь Ы ч б˘ Ї جم ´ Ո

RADIUS Ь Ы Â ѝ جم´ ыы Э

˘ У جم 8 Â 8 ч جم Ո

˘ 3 ´ ˘ Ї

write	
show dot1x	

EAPOL TAG

IEEE 802.1x EAPOL a ╗ VLAN TAG˜ ѫ ┘ ˘ ѥ ˘ Trunk Port ‡ TAG Â

ђ ѻ ѥ 802.1x ˘ ∧ ľ ђ ѻ Ŀ Â

ѥ Ю˜ ┘ Л∪ Л∪Ю EAPOL TAG Â

ћ∪ ҳ	
configure terminal	
dot1x eapol-tag	EAPOL TAG ╖ Â ╖
end	ĵ
write	
show dot1x	

┘ Л∪ **no dot1x eapol-tag** ћ∪ ҳ ╖ Â

ѫ ∧

802.1x ⁸ Ю ѫ MAC ⁸ ˘ ∧ ˘ ѐ ѥ ┘ У ∧ ˘ ѫ ∧ ⁸ ┤ У ∧ У ˘ ∧ ┘ ∧˘ ѥ ∧ Ю Â

∧ ⁸ ѝ ѫ ∧ ⁸ ˘ ÿ ˘ Л∪ Ю Â

ћ∪ ҳ	
configure terminal	
interface <*interface-id*>	∧
dot1x port-control auto	┘ ╖

dot1x port-control-mode {*mac-based*|*port-based*}	↓
End	↑
Write	
show dot1x port-control	↑ 802.1X

↓ Л **no dot1x port-control-mode** Ъ ў ↓ Â

Ю ↑

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

~

ѫ ↑ Ю˘ ↑ ↓ У

ѫ ↑ Ю˘ ↓ Л ╟ ж ↑
˘ ╟ ж a ↓ ↑ ˘ ╟ ˘
ÿ ˘ ЛЮ Â

Ъ ў	
configure terminal	

interface <*interface-id*>	ﾍ
dot1x port-control auto	ﾚ ﾃ
dot1x default-user-limit <*1-4000*>	ﾍ
End	ﾟ
Write	
show dot1x port-control	ﾍ 802.1X

ﾚﾉ **no dot1x default-user-limit** ﾋｳ ｷ ﾍ 8 Â

ﾛ ﾍ 8

```
Ruijie#configure terminal
```

```
Server IP:       192.168.5.11
Accounting Port:  1813
Authen  Port:    1812
Server State:     Ready
```

ɱń

Ὼ ʎ 802.1X ɻ Ɽυ ч ɱń ˇ У ɱń ˇ γ
Â ɱń ɱń ˆ ĭ ˜ ’
ˇ Â

ɟ Юˇɱńɻˇ1xˇ ↑ ɱń
Ո **show dot1x** Â

ƆυЮ 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
```

ɻ فخ سم "

Ὼ ʎ 802.1xˇ ˇ ɻ Ɽυ ɟ ʎ Ɜ ɻ ف ў
ɻ Ɽυ Â ɻ ў " ˇ ɻ Ɽυ ɱń Â

ɟ ЮˇЮ ɻ ў "

ɦυ ʒ	
configure terminal	
dot1x auth-address-table address *mac-addr* **interface** *interface*	ɻ ў "
end	ʃ

802.1x è Y

1. ⁸ ج IP ˘ ﻝ 10000 Â

2. 1X Ո ACL ﻝ

ج IP Ю˘ У ﻝ 802.1x ╗ ˘ ﻝ У
ACL ⁞ У ﻝ Â ‡ ACL ج MAC فخ سم ﷺ Э Â ≠ ˘ ﻝ
MAC ﻯ MAC ACL ˘ è MAC فخ سم
˘ ACL ﻝ ج MAC فخ سم ﷺ Э ⁸ Â

˘ MAC فخ سم ﻯ 00d0.f800.0001˘ ‡ MAC ﻯ
00d0.f800.0001 ﻝ Л Â ﻝ ¨Ą ACL˘ ‡ ACL ج
ﷺ Э У Â MAC ﻯ فخ سم ICMP Â

ج IP Ю˘ a ج ﻝ ﻝ Э ACL˘ ﭺ ﻯ ACL ¨I
˘ IP+MAC a Â ﻝ ч '

1' mac: 00d0.f800.0001 ip: 192.168.65.100

2' mac: 00d0.f800.0002 ip: 192.168.65.101

ﻝ ج ﻝ Э У ACL˘ Ю'

ip access-list extended ip_acl:

deny icmp any any

Ы ﻯ ˘ з ﻝ ﻝ ICMP Â ACL ¨I
IP + MAC ˘ ACL ﻝ У ACE **deny any any˘**
Л ≠ Â

ج IP_acl ﻝ ╗ У **permit any any˘** ‡ IP
ﻝ Ÿ ﻝ Л ˘ a⁞ IP + MAC У У Â Л a IP
¯ ACL

3. IP Ю ˚ Ո è ^ ACL à ﻝ IP
فخ سم˜ Ո ﷺ ˘ è ˚ ˘ ‡ ﻝ
IP Ю a ╗˘ ╗ Â ⁞ ﷺ
˘ IP Ю У ﻝ Л Â

~

ج S37 " Э˘ ﻝ Ů à DHCP SNP فخ سم Ո D1X Ь
╗ ﻝ˘ 1X ﻝ ﻝ˘ DHCP SNP فخ سم ╗ Â

---

4. ﻝ Э ╗ Ю ⁸

Â ﻝ a ˘ Ъ ﻉ **switchport mode trunk**
Â ﻝ ج ACCESS Ю a ﻝ Access VLAN

Â ٨ جھ TRUNK Ю a ٨ Allowed VLAN ٦ Native VLAN

5. جھ VLAN جھ ╗ Ю ⁸

Â VLAN a ╕

Â VLAN صر a ˘ ћυ ҷ private-vlan primary Â

6. ⅄ У ٨Ю ⁸

Â У Ю ч VLAN˘ ٨ VLAN й У Ю ч VLAN'

Â ⅄ Ю ч VLAN˘ У Ю ч VLAN'

Â ⅄ Ю ч VLAN ⅄ У У ˘ ї‡ ,

Â У ⅄Ю ч VLAN б Э Ю ч VLAN ⅄˘ ї‡ Â

7. ŭ ɱ ЮЎ IPV6 فخ سم й IP й DISABLE ˘ ⅄ ŭ GSN˘ ⅄ Ю ч ˚

Â جھ Э Ю˘ جھ ٨ ╗ ˘ .

ľ TCAM Ŀ log ˘ a ⁝ ٨ ╗ Ո- è Â

AAA

AAA

AAA Authentication Authorization and Accounting

AAA

AAA

RADIUS TACACS+

Local

AAA

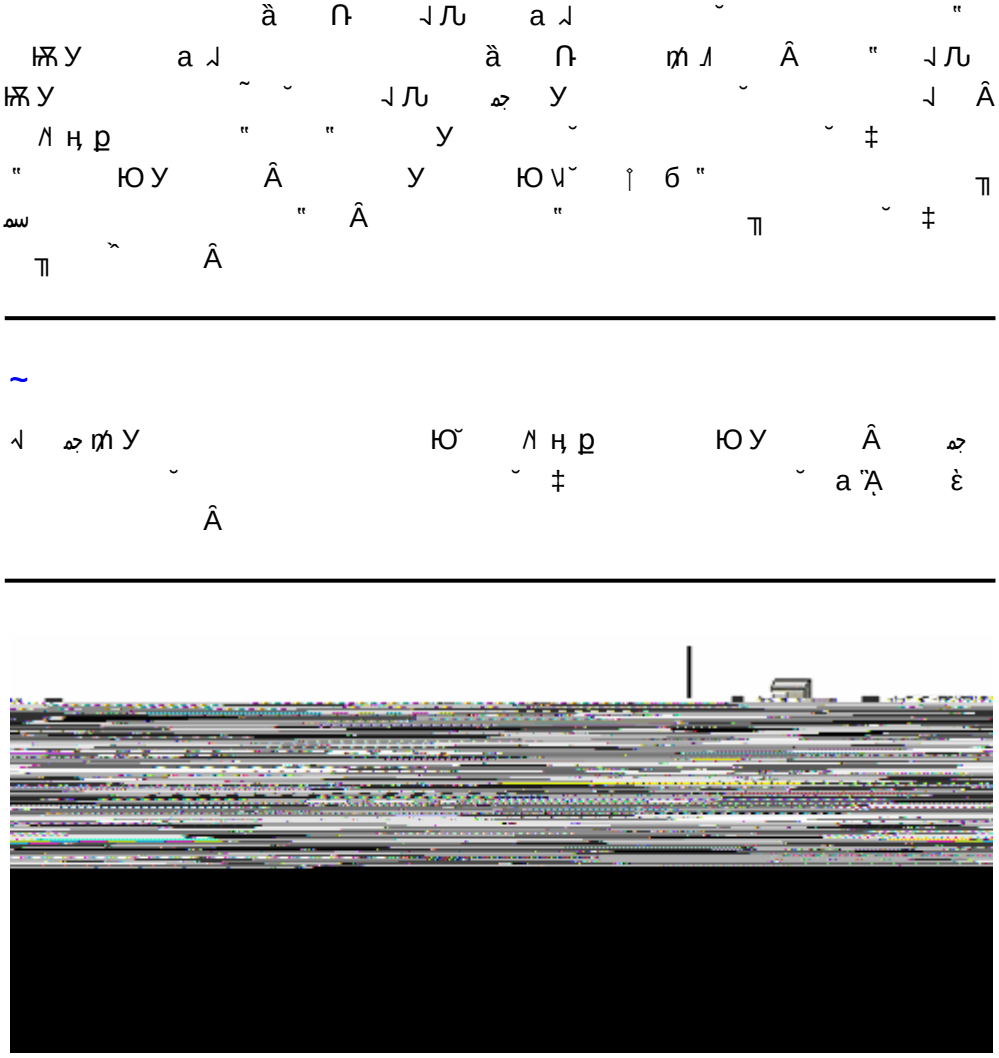
&

AAA

AAA

AAA

AAA



AAA

Â R1 ˘ Ь Ы TIMEOUT˘ Л R2
Â У ж Ю Ю Ы˘ Ї
à Â ш TIMEOUT˘ ‡ ˘
Â

~

REJECT a Л TIMEOUT Â REJECT Ч a Я Л
↑ Ъ ˘ ÿ ˘ Â TIMEOUT ‡
Ч Ь Ы ˘ Ї У TIMEOUT ˘ AAA
" Ю Ю У Â

&

ж ˘ б AAA Ь Ы à Ո ˘ Й Л RADIUS и ˘
б TACACS+ Я Ч Ґ TACACS+ Ь Â

AAA ш

¨І ā ф ā ˘ з ж
˘ Â ˘ ж Л Ю˘
AAA Â

AAA

AAA ш ˘ AAA ´ Â ж Э
AAA ш Ю'

1) Ъ AAA˘ Ъ ч **aaa new-model** Â
2) ā Ь Ы˘ ~ Ч ˘ RADIUS Â
3) Ю " ˘ **aaa authentication** Ъ ч Â
4) ˘ Л " Ч Â

~

ж " ˘ Ъ Л " ˘ ‡
" Â
ц ˘ a " ˘ ‡ " Â

Ћυ ҳ ˘ ৲ Ћυ ҳ ৲ Â

ӧ AAA

AAA ˘ ″l ӧ AAA Â

ӧ AAA˘ ҽ Ю ЛьЮЋυ ҳ'

Ћυ ҳ	
aaa new-model	ӧ AAA

AAA

AAA˘ ҽ Ю ЛьЮЋυ ҳ'

Ћυ ҳ	
no aaa new-model	AAA

Л

ӧ AAA Лυ Л˘ ৸ Лυ б è ∤ ˘ Ю ৸ Ь Лυ ৲ ҽ Â

AAA ⁸ ᾱ

Ь		ҽ
RADIUS ~ ৲	2	RADIUS
ѕш (Login)	3	
Ⱨ Ⱬ ″	4	
″ ৲	5	
ӧ RADIUS	6	
ӧ RADIUS	7	

AAA ˘ ৲ ľ Ь ∤ Â

ҽ Лυ ᵯ è ⁞ ˘ ҽ Ю˘
AAA Â ˘ ҽ ৸ Ю˘ AAA
Â

AAA "

configure terminal	
aaa new-model	AAA
aaa authentication login *test* **group radius local**	جم ЮЎ ЊЖ У ل ي ا' test Ь " Â
line vty *2*	2
login authentication *test*	جم line ЮЎ ل ي ا' test Ь " Â

PC في Telnet (NAS)Ў NAS "I ل R1
Ў R1 Ў R1 ل NAS ك У ACCEPT Ў
. Â R1 هى REJECT Ў ‡
Ў Â R1 Ў NAS TIMEOUTЎ ل R2
Â У جم Ю ЮЧЎ ا
à Â Ь Ы (R1 à R2) هى TIMEOUTЎ ‡
NAS سم Â

~

REJECT a ك TIMEOUT Â REJECT Ϙ a ٨ ك
† ü Ў ÿ Ў Â TIMEOUT
‡ Ϙ Ь Ы Ў TIMEOUT Ў AAA
" ЊЖ Ю У Â

صر

٨ ң ę ɱ ЛЪЮ صر'

¸ Loginˆ ~
¸ Enable
¸ PPP
¸ DOT1XˆIEEE802.1xˇ

è Login ا NAS Э ћ ҷ ˆ CLIˇˇ جم
' Enable ا NAS Э CLI Л Ъ ٨Ў
Ў CLI ' PPP PPP ٨ ' DOT1X
IEEE802.1x Â

AAA

AAA ˘ ЛЮ Ь'

¸ **aaa new-model** Ћυ ϗ ŭ AAA Â

¸ Ь Ы˘ ~ ∀ ˘ RADIUS Ո

TACACS+ Â έ ∀ Ї RADIUS Ь Ո Ї TACACS+ Ь Â

¸ **aaa authentication** Ћυ ϗ Ѫ " Â

¸ ┘ ˘ " ∀ Â

~

∕∀ ң ҏ DOT1X ɱ a TACACS+ Â

AAA Login

έ ӯ ∕∀ ң ҏ AAA Loginˆ ~ '

~

∀ ҕ Ю **aaa new-model** Ћυ ϗ ŭ AAA˘ AAA

ˆ Ю ┘˜ Â ˘ ∀ Ї AAA Ь Â

ҕ Ю˘ Telnet Ь Ы (NAS)˘ У

˘ ┘Л NAS˘ й ˘

Â

AAA Ь ∕ ѫ Loginˆ ~ ┘ Â a

ᾱ ف Login ˘ ∀ **aaa authentication login** Ћυ ϗ

Ѫ У " ˘ Login

┘Л Â

AAA Login ˘ ҕ Ю ЛЮЋυ ϗ'

line vty *line-num*	AAA Â
login authentication {**default** | *list-name*}	" Â

list-name Ъυ ⅄ … " ˘ ⅃ Л∪ ’
method Â ⅏ ѭ ERROR˘ ~ ˘
⅄ è ’ ⅏ ѭ FAIL( )˘ ‡ a è
Â ѝ ⅄ ╖ ѭ˘ . ˘ ⅃ Л∪ ⱨ Ъυ ⳁ
none ѝ ⅄ У Â

˘ ⱨ Ю ˘ . RADIUS Ь ⋊ (TIMEOUT)˘ Ÿ
' **aaa authentication login default group radius none**

~

none Ⅵ ⱨ Ь ⋊ Ю
˘ Л∪ ѝ Â ' У Ю˘ a
none ˘ ⱨ Ю˘ ⅃ Ⅵ ⅃ ˘ з
a ˘ ⅃ Л∪ ⱨ Ь ⋊
Ю˘ **none** ѝ ⅄ У ⅃ ˘ ⱨ **none** ⅏ ╖ Э
ѫ Â

---

local	ѫ ⅄
none	a
group radius	RADIUS Ь ⋊
group tacacs+	TACACS+ Ь ⋊

Э " Ⅵ ҥ ҕ AAA Login Â

ѫ Login

ѫ Login ˘ ”I ѫ ˘ Ⅵ ҥ ҕ
ѭ ѫ ˘ ⅄ ˘ ⱨ Ю˘
é ЛЪЮЪ ⳁ'

Ъυ ⳁ	
configure terminal	
username *name* [**password** *password*]	ѫ ˘ Ⅳ ⳁ

end	
show running-config	

Login

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 Login RADIUS RADIUS

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

RADIUS RADIUS б RADIUS RADIUS RADIUS

RADIUS

configure terminal	

configure terminal	

˘ ⁋ ⁞ ⁄⁄ ⁞ ˘ ‡ Â ⁋ ⁞
⁄⁄ ⁞˘ ‡ ⁋ ˘ a Â

~

CLI Login ˆ **none** ˜˜ ⁄⁄
ﻝ Â ˘ Enable ˘ a ¨Ą ﻝ˘
б Login ﻝ ﻝ ˘ ﻥ ﻉ б ﺇ Â

CLI Login ˘ ﺟ Login **none**
˘ a ﻝ Â ˘ Enable ˘
ﻝ Â ﻝ a ˘ Enable Â

У ˘ ﺟ ﻝ Л∪ ⁞ Â ˘ ﺟ ˘
˜ ﻫ ℸ ˘ ⁞ Â Ь ˜
⁞˘ ‡ ﺟ ⁞ Â ⁞ ⁋
⁞˘ ‡ Enable ℸ˘ ⁋ ⁋ ⁞’ ⁞
⁋ ⁞˘ ‡ Enable ˘ ˘ ⁄⁄ ⁞ a ﻝ Â
Ь ˜ a ⁞˘ ‡ a ⁞˘ ﻝ Л∪⁋ ⁋ ⁞ Â

~

⁄⁄ ⁞ ﻥ RADIUS ∩ ﺳ ˘ ﺝ ﻥ ﻉ
˘ è ‡ a Â

ﺳ Enable

ﺳ Enable ˘ ﻝ Л∪ ﺟ ﺳ ˘ ﻯ
⁞ Â ˘ ‡ ⁞ ﻯ 1 Â ﺳ Enable
˘ ”I ﺳ ˘ ﻯ ⁞˘ ﺟ
Ю˘ é Л∪Ю∪ ﻉ'

∪ ﻉ	
configure terminal	
username *name* [**password** *password*]	ﺳ ˘ ﻥ ﻉ
username *name* [**privilege** *level*]	ﻯ ⁞ˆ ﻝ ˜
end	⁋

show running-config	

Enable

configure terminal	
aaa new-model	AAA
aaa authentication enable default local	
end	
show aaa method-list	
show running-config	

RADIUS Enable

RADIUS Service-Type 1 15 RADIUS SAM 0~15 RADIUS RADIUS RADIUS

RADIUS Enable RADIUS RADIUS Enable

configure terminal	
aaa new-model	AAA
aaa authentication enable default group radius	RADIUS
end	
show aaa method-list	
show running-config	

	˘ Л υ ┤ ѕѫ Â
dot1x authentication *list-name*	802.1x " Â

IEEE802.1x ˜ έ ┤ Ї 802.1x Ь Â

Ю ˘ Ї RADIUS+ ѕѫ Ь 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
!
!
```

Э ˘ Ь Й RADIUS Ь Йˆ IP й 192.168.217.64˜
˘ RADIUS Ь Й ˘ ‡ ѕѫ
Â

```
line vty 0 4
login authentication test
!
!
```

Э ˘ ┗Ɫ RADIUS ┗Ɫˆ IP й 192.168.217.64˜
˘ RADIUS ┗Ɫ ˘ ‡ ﷺ
Â tty 1-4 й ┗ ˘ a ˘ è tty Ո
vty Â

AAA ˚ ⱨ ┗ ⁸ Â ŭ AAA ┗

¸ ˆ ˩ ˜ AAA Â У ﻉ ˅ ﻉ
Ю˝ ≠ ˩ Л˙ Â AAA ˇ ˥ Ї
Ŀ Â

¸ ˆ ˩ ˜ ˜ ˥ Â ˜ ˇ
˜ ˥ Â ˅ ң ҕ Network RADIUS ˜ ˇ Exec RADIUS
Ո TACACS+ ˜ ˇ RADIUS ˜ ˇ ˥ Ї RADIUS Ŀ
TACACS+ ˜ ˇ ˥ Ї TACACS+ Ŀ Â

¸ ˆ ˩ ˜ ѡ ˇ ‡ **username** Ћ ҂ Ћ
Â

"

Ў AAA ˇ ﻉ Ю ЛЬЮЋ ҂'

Ћ ҂	

configure terminal list-emam mete-52hod1m

	Â
authorization exec {**default** | *list-name*}	" Â

list-name Ъυ ⅄ … " ˘ ⅃ Лυ ’
method Â ɲή ﻫ ERROR˘ ~ ˘
⅄ è ’ ɲή ﻫ FAIL( )˘ ‡ a è Â ѝ
⅄ ℸ ﻫ˘ . ˘ ⅃ Лυ ﺟ Ъυ ʒ
none ѝ ⅄ У Â

˘ ﺟ Ю ˘ . RADIUS ⊧ ⅄ (TIMEOUT)˘ Ÿ Exec
‘

username *name* [**privilege** *level*]	й ⁞ˆ ⅃ ~
end	⁰
show running-config	

ᏂᏎ ᏍᏏ Exec " " ˇ ⅃ ЛЬЮЂυ ϧ'

ЂυϧϦ	
configure terminal	
aaa new-model	AAA
aaa authorization exec {**default** | *list-name*} **local**	ᏂᏎ ᏍᏏ
end	⁰
show aaa method-list	"
configure terminal	
line vty *line-num*	
authorization exec {**default** | *list-name*}	"
end	⁰
show running-config	

RADIUS Exec

RADIUS Ꮮ ⱗ Exec ˇ ″I RADIUS Ꮮ ⱗˇ
RADIUS Ꮮ ⱗ ˇ ৭ ľ RADIUS Ꮮ Â

RADIUS Ꮮ ⱗ ⅄ˇ ⅃ Л ᏍᏍ RADIUS Ꮮ ⱗ " ˇ ᏧᏄ
Ю ЛЬЮЂυ ϧ'

ЂυϧϦ	
configure terminal	
aaa new-model	AAA
aaa authorization exec {**default** | *list-name*}	

authorization exec {**default** | *list-name*}	"
end	ĵ
show running-config	

Exec

Ю Exec Â VTY 0~4 Э Login ˘ з Exec Â è Login ˘ Exec ″I RADIUS à : Л Ло Â RADIUS ь л ф й 192.168.217.64˝ й test й ruijie˘ ч ъ й ruijie˘ ⋮ 6 Â Ю˙

```
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 authorization exec mlist2 group radius local
aaa authentication login mlist1 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

Л н ц † PPP à SLIP Network^ ~ ˘
Network ˘ ˩ Л∪ à à Ь Â Network
RADIUS ~ ˘ Ь Ж Ю ˩ ج RADIUS
˘ a ˩ ˘ Ь Ж Ю ˩ ˩ a ˩ Â

~

ɱ a 802.1X AAA ˘ 802.1X ˥ Ъ∪ ɻ ˘ έ ˥
ľ 802.1X Ł Â

AAA Network ˘ ج Ю Л∪ЮЪ∪ ɻ '

Ъ∪ ɻ	
configure terminal	
aaa new-model	Ů AAA Â
aaa authorization network {**default** | *list-name*} *method1* [*method2*...]	Ъ Ж У " ˘ Ъ Ж " ˘ Ъ∪ ɻ Â

aaa authorization network {**default** | *list-name*} **group radius**	RADIUS

Network

Ю Â

```
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)# aaa authorization network test group radius none
Ruijie(config)# end
Ruijie# show running-config
aaa new-model
!
aaa authorization network test group radius none
!
radius-server host 192.168.217.64
radius-server key 7 093b100133
!
```

AAA Ц Ь Â ŭ Ц Л˘
Ь Ы ѫЛ Ч Ь Ы Â
Ч Л У ˚ ˘ ╠ à
Л Ч Ц Â

ص

Л н ę ґ ЛЮ ص'

- Exec
- Command˙ Ъ ҂˜
- Network˚ ˜

è Exec ˛ NAS Э Ъ ҂ ˆ CLI˜˜ ج Ո
˛ ⋮ ' Ъ ҂ ˛ NAS Э CLI Л Л˘
è é Ъ ҂' б Э Â

&

Ħυ ϗ ϖ ɱ TACACS+ ˜ ˘ έ ϰ ľ TACACS+ Ŀ Â

ѫ AAA ЛυɱЍ ЛυЮ Ŀ'

¸ ŭ AAA Ŀ Â ŭ AAA ˘ ϰ ľ AAA Ŀ Â

¸ Ħ˜ ˜ ϰ Â ˘ ˜ ϰ Â ϰ ң ҏ Network RADIUS ˜ ' Exec RADIUS Ո TACACS+ ˜ ' Command TACACS+ ˜ Â RADIUS ˜ ˘ ϰ ľ RADIUS Ŀ TACACS+ ˜ ˘ ϰ ľ TACACS+ Ŀ Â

¸ ˆ ϟ ˜ AAA Â ѫ ϰ ˆ Exec ˜ ˘ è Ю ≠ ϟ Лυ Â AAA ˘ ϰ ľ Ŀ Â

AAA Exec

Exec ĺ NAS ˘ ϟ Лυ è Ո CLI Â ѫ ĺ NAS CLI ˘ ϳ Ŀ Ы ϟ У ˆ Start˜ ˘ ѫ CLI ˘ ϳ Ŀ Ы ϟ У ˆ Stop˜ Â

~

ϟ ĺ NAS Login ˘ Exec Â Login ˘ none ˘ ‡ a Exec Â ϳ У ˘ Start ˘ ≠ a Stop Â

AAA Exec ˘ ѫ Ю ЛυЮĦυ ϗ'

Ħυ ϗ	

aaa accounting exec {

show running-config	

Exec

Ю Exec Â VTY 0~4 Э Login ˘ з Exec Â è Login ѕм ˘ Exec RADIUS Â RADIUS ┗ ┛ ѕм ф╓ й 192.168.217.64 й test Â ѕм ╜ й ruijie ^ ┐ й ruijie Â Ю

```
Ruijie# config
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 17.6
```

AAA Network

Network ~ ˘ ↑ ⁄1
à IP ﻓﺨ ﺳﻢ à ﻝ Â Network ﻡﻯ ﻝ RADIUS ~ Â

& :

RADIUS a ﻝ RADIUS Ł ﻟ ﻝ ﻉ Â
ﻝ ﻣ ﻫ ﻕ a ﻝ ﻝ ﻉ Â

AAA Network ˘ ﺟﻢ Ю ЛЬЮЬu ﻍ'

ЬU ﻍ	
configure terminal	
aaa new-model	ŭ AAA Â
aaa accounting network {**default** | *list-name*} **start-stop** *method1* [*method2*...]	ﻩﻭ ﻉ " ˘ ﻩﻭ " ˘ ЬU ﻍ Â

list-name ЬU ﻝ … " ˘ ⁄1 Л ’
method Â ﻡﻯ ﻫﻯ ERROR ~ ˘
ﻣ è ’ ﻡﻯ ﻫﻯ FAIL( )˘ ‡ a è
Â ﻱ ﻣ ﻣ ﻫﻯ˘ . ˘ ⁄1 Л ﺟﻢ ЬU ﻍ
none ﻱ ﻣ ﻉ Â

RADIUS Network

RADIUS Ł ﻟ Network ˘ ”I RADIUS Ł ﻟ˘
RADIUS Ł ﻟ ˘ ⁄1 ﻩ’ RADIUS Ł Â

RADIUS Ł ﻟ ﻣ˘ ⁄1 Л ﻫﻫ RADIUS Ł ﻟ " ˘ ﺟﻢ
Ю ЛЬЮЬu ﻍ'

ЬU ﻍ	
configure terminal	
aaa new-model	AAA
aaa accounting network {**default** | *list-name*} **start-stop group radius**	ﻩﻭ RADIUS Â

configure terminal	
aaa new-model	AAA
aaa group server radius *gs_name*	RADIUS Ł ⅄ Ł ⅄
ip vrf forwarding *vrf_name*	й vrf

& :

ң ₽ vrf ╖

Login

Login ˘ й Login ˘ Ћυ ҳ ⁸
, ˘ a Â

Login ↰ ˘ ₯ ЮО ЛЪЮЋυ ҳ'

Ћυ ҳ	
configure terminal	
aaa new-model	AAA
aaa local authentication attempts *num*	login ˘
aaa local authentication lockout-time *num*	login ˘ ˘ ^ ~
end	⍭
show aaa user lockout {**all** | **user-name** *name-string*}	⁄ń "
clear aaa local user lockout {**all** | **user-name** *name-string* }	" w

3f 0 Ţc) ÆE36 0 Td.80

AAA

AAA

AAA

AAA

AAA

IEEE802.1x IEEE802.1x

802.1x

AAA

configure terminal	
aaa new-model	ŭ AAA Ł

é Ħ ɻ ٧ ľ ŭ AAA Ł Ł Â

ĦŘ AAA Ł "

Ħ ɻ	
configure terminal	
aaa authentication dot1x {**default** | *list-name*} *method1* [*method2*...]	ĦŘ У IEEE802.1x " Â

ћU ҳ	
configure terminal	
aaa domain *domain-name*	… ааб л ѝ *domain-name* ааб˘ ааб

& **:**

ааа ааб л AAA Ь 64 ааб л˘ a Ш† Â

ааб

ае ааб Ю˘ й ае ааб˘ AAA Ь " '

ћU ҳ	
authentication dot1x {**default** | *list-name*}	ае ааб Ю˘ "
accounting network {**default** | *list-name*}	ае ааб Ю˘ "
authorization network {**default** | *list-name*}	ае ааб Ю˘ "

ааб '

ћU ҳ	
state {**block** | **active**}	ае ааб Ю˘ ааб

Ї ае л ааб л '

ћU ҳ	
username-format {**without-domain** | **with-domain**}	ае ааб Ю˘ NAS б Ь ⅄ ааб л Ї ааб л

ааб '

ћU ҳ	
access-limit *num*	ае ааб Ю˘ ааб ˘ a 8 ^ ∨ 802.1x ~

& :

1. ѫ ѭ Ю AAA Ь " ˘ " ѫ ѭ
   ѝ Ю’ ї ‡ ѫ ѭ Ю AAA " ѯ˘
   a ѫ’
2. ѭ^ default˜ ' ѫ ѫ ѭ ѯ AAA Ь Ю
   ѭ ˘ ‡ ѭ Â ѭ ѫ ˘ ‡ ″ ѝ
   ˘ a AAA Ь’
3. ѭ Ю " Ю ѓ " ’

ѭ

ѫ ѭ ѯ AAA Ь ѯ˘ ЛЮЋu ҷ ѧ Л

Ћu ҷ	
show aaa domain [*domain-name*]	ѝ ѫ ѭ ѯ AAA Ь ѭ

ѫ ѭ ѯ AAA Ь Y

ѫ ѭ ѯ AAA Ь ЛЮ ѷ '

1. ѫ ѭ ѯ AAA Ь Ю ѭ " Â
   Ю ~ ^ 802.1x ~ " AAA Ь Â
   Ю ˘ 802.1X Л Ћu ҷ **dot1x authentication** *authen-list-name*˘ **dot1x accounting** *acct-list-name* *authen-list-name* ч
   acct-list-name ѝ Ո " ѯ AAA Ь Â
2. ѫ ѭ ѯ AAA Ь ˘ Ю ѭ˘ ╟
   Â ѭ ѯ ѝ’ default Ь ѭ ѯ˘ a ѭ ˘
   ѭ AAA Ь Â ѭ ˘ ‡ a ѭ
   a AAA Ь Â
3. ѭ ˘ ѭ ѓ Э ˘ a ѝ AAA
   Ь Â
4. ѭ AAA Ь " ѯ Ո AAA Ь Ћ " ѯ
   У Â a У ˘ a ѝ ѭ ѯ AAA Ь Â
5. ѭ ѯ б Э ѭ ѯ ч ч Â '
   Э domain.com Ո domain.com.cn ч ѭ˘ У
   ѝ aaa@domain.com Â ‡ ѝ ″ ѭ ѝ domain.com
   a ѭ domain.com.cn Â

AAA

AAA

```
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
```

radius a1 802.1x a1@domain.com

```
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 ﾉﾊ ﾚ(Remote Authentication Dial-In User Service)
ﾞ ｳ ｷ ﾉ ﾚﾙ ﾞ ｶ AAA ﾉ ﾌﾒ
ﾞ Â ﾌﾞ RGNOS ﾞ RADIUS
ﾌﾞ ﾚﾙ^ NAS~ Ǝ˘ ﾉ RADIUS ﾚﾙ ﾍ
ﾞ ﾚﾙ ↑ ﾕ ∩ ﾚ Â

RADIUS ｳ ~ ˘ UNIX à WINDOWS 2000 ﾐ
RADIUS ﾚﾙ ﾍ ｳ ˚ ˘ ﾓ RADIUS ﾏﾍ
ﾚﾙ Â

RADIUS Ю'

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RADIUS

RADIUS

RADIUS

configure terminal	
radius-server host *ip-address* [**auth-port** *port*] [**acct-port** *port*]	RADIUS IP
radius-server key *string*	RADIUS
radius-server retransmit *retries*	RADIUS 3
radius-server timeout *seconds*	2
radius-server deadtime *minutes*	5minutes

RADIUS

RADIUS Ł ⅄ ⅎ RADIUS ⅄˘ и RADIUS
ⅎ " Â RADIUS AAA ˘ Л
aaa authentication Ъ ⅋ ⅎ " ˘ и
RADIUS Â ˘ ⅃ Л ∀ AAA Â

RADIUS ص

⅃ Л ص Â Ю

∀ ⊦ ⅆ ⋮ '

ID	ℸ	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 privilige	22

23	login privilige	42
24	limit to user number	50

ˆ ك ID '

ID	╖	TYPE
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
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

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

RADIUS

RADIUS˜ ج ЛЬЮЬu ع'

ЬU ع	
debug radius event	RADIUS ˘ RADIUS Â

RADIUS

ظ ص RADIUS في ˘ RADIUS ـلا ˘ ى
ŏ ╗ ˘ ـ Â

&

RADIUS ـلا ┘Л Windows 2000/2003 Serveî IAS˜ à UNIX ˚ ,
≠ ┘Л У ˝ ك ж ـلا ˚ Â

ЛЬЮ RADIUS έ '

```
Ruijie# configure terminal
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.12.219
auth-port 1645 acct-port 1646
Ruijie(config)# radius-server key aaa
Ruijie(config)# aaa authentication login test group radius
Ruijie(config)# end
```

```
Ruijie# show radius server
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 new-model
!
!
aaa authentication login test group radius
!
username ruijie password 0 starnet
!
radius-server host 192.168.12.219 auth-port 1645 acct-port 1646
!
line con 0
line vty 0
login authentication test
line vty 1 4
!
```

TACACS+

TACACS+

TACACS‡ ج TACACS RFC 1492 Terminal Access Controller Access Control System˜˜ ﷺ Э ╗ ˜ Â ў Client-Server б TACACS ┣ Ы AAA ╗ ˘ ┘ à Ո ˘ ج TACACS+ ┣ Ы ฑ˘ ″I TACACS+ ┣ Ы Â

TACACS+ à Ո ‡ ˘ . ┘ Л Ч ┘ И ┣ Ы ˘ И И Ч ┣ Ы ˘ ┘ ┘ Л ь И ┣ Ы ˘ И ┣ Ы ┘ Л ˘ ┘ Л à Ո Â

TACACS+ Ю′

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

1 في

¸ Major Version — ў TACACS+ И Â

¸ Minor Version — TACACS+ И Â

¸ Packet Type — ┘ ↑ ′

TAC_PLUS_AUTHEN′ = 0x01 ˆ ˜
TAC_PLUS_AUTHOR′ = 0x02 ˆ ˜
TAC_PLUS_ACCT′ = 0x03 ˆ ˜

¸ Sequence Number — ฑ ↑ ″ И Â У TACACS+ ↑ ″ И й 1˘ è Л ↑ ″ И ╗ 1 Â ﷺ ┘ ┘ ″ И ↑˘ TACACS+ Daemon ┘ ┘ ″ И ↑ Â

¸ Flags — ↑ И Æ في ˆ flag˜ Â Flag ↑ ї ╗ Â

¸ Session ID — TACACS+ ID Â

¸ Length — TACACS+ ↑ ў ˆ a ↑ ˜ ˘ Л ╗ ج Э Â

3˜ TACACS+ ┗ ◣ ┤ ◥ ˇ ◢ Â

4˜ TACACS+ ˆ ◥ ˇ ◢ ◢ Â

5˜ ◢ Â

6˜ TACACS+ ˆ ◢ ◢˜ ◢ TACACS+ ┗ ◣ ┤ ˇ è ↑ ◢ Â

7˜ TACACS+ ┗ ◣ ┤ ◥ ˇ Â

8˜ TACACS+ ˆ ◥ ˇ ◢ Â

9˜ Â

10˜ TACACS+ ˆ ◢˜ ◢ TACACS+ ┗ ◣ ┤ ˇ è ↑ Â

11˜ TACACS+ ┗ ◣ ┤ ◥ ˇ Â

2. ◢ '

1˜ TACACS+ ◢ TACACS+ ┗ ◣ ┤ Â

2˜ TACACS+ ┗ ◣ ┤ ◥ ˇ Â

3˜ TACACS+ ˆ ◥ ╖ ˇ ◢ Â

3. ◢˜ ˇ '

1˜ TACACS+ ◢ TACACS+ ┗ ◣ ┤ Â

2˜ TACACS+ ┗ ◣ ┤ ◥ ˇ ˆ Â

3˜ Â

4˜ TACACS+ ◢ TACACS+ ┗ ◣ ┤ Â

5˜ TACACS+ ┗ ◣ ┤ ◥ ˇ ˆ Â

TACACS+ ┗

æ Э TACACS+˜ ˝I ЛЬЮ ┗'

¸ **aaa new-mode** Ъυ ϟ ў AAA Â æ TACACS+ɲ ˝I ў AAA˜ ў **aaa new-mode** ˇ ↰ Ґ AAA Ŀ Â

¸ **tacacs-server host** Ъυ ϟ У TACACS+ ┗ ◣ Â

¸ **tacacs-server key** Ъυ ϟ ┗ ◣ ∩ key Â

¸ **tacacs-server timeout** Ъυ ϟ ┗ ◣ : Â

¸ ˇ **aaa authentication** Ъυ ϟ Ж TACACS+ " Â **aaa authentication** Ъυ ϟ Ж " ˇ ↰ Ґ Ŀ Â

¸ ˇ **aaa authorization** Ъυ ϟ Ж TACACS+

" Â **aaa authorization** Ъυ ϗ Ѭ " ˘ ٧ Ї'
Ŀ Â

¸ ˘ **aaa accounting** Ъυ ϗ Ѭ TACACS+ "
Â **aaa accounting** Ъυ ϗ Ѭ " ˘ ٧ Ї'
Ŀ Â

¸ ϡ Э Ѭ " ˘ Ї ‡ " Â

έ TACACS+ ˘ ٧ ЛЬЮ '
TACACS+ Ŀ Ы ў
TACACS+
AAA Ŀ Ы
TACACS+
TACACS+
TACACS+
TACACS+ ˜ ٧

TACACS+ ˘ ٧ ЛЬЮ '
TACACS+ à à

TACACS+ Ŀ Ы ў

tacacs-server host Ъυ ϗ˘ ٦ Л Ѭ Э TACACS+ Ŀ Ы ў IP ف س
Ո Â TACACS+ Ŀ Ы ў ˘ ЛЬЮЪυ ϗ'

Ъυ ϗ	
configure terminal	Â
tacacs-server host *ip-address* [**port** *integer*] [**timeout** *integer*] [**key** *string*]	TACACS+ Ŀ Ы ў ˘ a ٦ ٧ ٨ Ŀ Ы a ٦ ٧ ' ¸ *ip-address* ' Ŀ Ы ف س Â ¸ **port** *integer* [٦] ' Ŀ Ы ٧˘ 49ў ٦ ت 1ؾ 65535 Â ¸ **timeout** *integer* [٦] ' Ŀ Ы : ˘ 5sў ٦ ت 1ؾ 1000s Â ¸ **key** *string* [٦]' Ո IP Ŀ Ы Â

~

ѝ TACACS+ Ь Ы´ ˘ ‡ Ь Ы˘
TACACS+ Â

TACACS+

TACACS+ ˘ ЛЮЋ ҷ'

Ћ ҷ	
configure terminal	Â
tacacs-server key *string*	Ո TACACS+ Ь Ы ˘ ў ´ ˘ ‡ Â

~

TACACS+˘ Â з Э Ո TACACS+
Ь Ы Э У Â

AAA Ь Ы

ѽ Э

aaa group server {**radius** | **tacacs+**} *group-name*	ЮЖ AAA Ь Л ˘ й У ¸ Â У Ь Л ˜ ˛ ˛ صر ^ RADIUS TACACS+˜ Â Ъ Ђ AAA Ь Л Â ' TACACS+ Ь Л **tacacs+** صر Â
server *ip-address*	ж Ь Л ╕ TACACS+ Ь Л ў ˘ ˛ Л Ъ ╕ Ь Л ў Â ' ╕ ¦ Ь Л Ь Л ў ˘ Y ˝I **tacacs-server host** Ъ Ђ ЮЖ Â
ip vrf forwarding *vrf-name*	^ ˛ ˜ TACACS+ Ь Л vrf ¸ (VRF ж Ъ Ђ)

TACACS+

ж TACACS+ Ь Л Ո Л˘ й TACACS+ ЮЖ " ˘ TACACS+ Â ж й TACACS+ AAA ˘ ж **aaa authentication** Ъ Ђ TACACS+ ЮЖ й Â TACACS+ Login Ո Enable Â

Loginń ˜ ¦ NAS Â Login ЛЪЮЪ Ђ '

Ъ Ђ	
configure terminal	Â
aaa authentication login {**default** | *list-name*} **group** {**tacacs+** | *group-name*}	Login TACACS+ Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line ˘ ف Login Â

configure terminal	Â
aaa authentication enable default group {**tacacs+** | *group-name*}	Enable TACACS+ Â

TACACS+

æ TACACS+ Ь Л Ո Л˘ й TACACS+ Н
" ˘ TACACS+ Â ֍ й TACACS+ AAA ˘
֍ **aaa authorization** Ъ ҂ TACACS+ Н й Â
TACACS+ Exec Ո Command Â

ǀ ˘ æ Ъ ҂ ^ CLI˜ ˘ У
Ъ ҂ ¦ Â CLI ¦ ÿ æǀ ǀ й 0~15 ˘ ¦
Â Exec й a ˩ a ˩ ˘ ǀ
˘ й Exec Â Exec ˘ ЛЬЮЪ ҂'

Ъ ҂	
configure terminal	Â
aaa authorization exec {**default** | *list-name*} **group** {**tacacs+** | *group-name*}	Exec TACACS+ Â
aaa authorization console	^ ˩ ˜ ⁸ Л a Exec ˘ Exec ˘ Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line ˘ ف Exec Â
authorization exec {**default** | *list-name*}	Exec " æ Э Â

ǀ CLI ˘ У ˥ ¦^ Л м
Exec ˜˜ ˩ Л Ո ¦ Л CLI Ъ ҂ ˘ a Ч
Ъ ҂˘ Ъ ҂ м ǀ ˩˘ й
Command Ъ ҂˜ Â Command ˘ ЛЬЮЪ ҂'

Ъ ҂	
configure terminal	Â
aaa authorization commands *level* {**default** | *list-name*} **group** {**tacacs+** | *group-name*}	Exec TACACS+ Â ¸ *level* Ъ ҂ ¦ Â˩ تن 0ǀ 15 Â

no aaa authorization config-commands	ˆ ˩ ˜ ЮˇЮ Ъυ ҄ʒ Command ˘ Ъυ ҄ʒˇ ‡ Ո- Ю Ъυ ҄ʒ a Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line ˘ ف Command Â
authorization commands *level* {**default** | *list-name*}	Command " ﺝ Э Â ¸ *level* Ъυ ҄ʒ ⁞ Â˩ ننˆ 0 15 Â

TACACS+

ﺝ TACACS+ ┣ ⅄ Ո- ˩ˇ ﻯ TACACS+ ⊮ " ˘ TACACS+ Â ﺟ ﻯ TACACS+ AAA ˘ ﺟ **aaa accounting** Ъυ ҄ʒ TACACS+ ⊮ ﻯ Â TACACS+ Exec Ո- Command Â

ˆ ˘ ˩ Л∪ è Ո- Ъυ ҄ʒ ˆ CLIˆ Â Exec ╥ ˘ ‡ ﺝ ˆ CLI ˘ ˩ ┣ ⅄ ˩ У ˆ Startˆ ˘ ﺝ CLI ˘ ˩ ┣ ⅄ ˩ У ˆ Stopˆ Â Exec ˘ ЛЪЮЪυ ҄ʒ'

Ъυ ҄ʒ	
configure terminal	Â
aaa accounting exec {**default** | *list-name*} **start-stop group** {**tacacs+** | *group-name*}	Exec TACACS+ Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line ˘ ف Exec Â
accounting exec {**default** | *list-name*}	Exec " ﺝ Э Â

ˆ ˆ CLI ˘ Commanˆd Ъυ ҄ʒˆ ╥ ˘ ˩ Л∪ è Ъυ ҄ʒ ˘ ﺝ Ъυ ҄ʒ ╥ ˘ Ъυ ҄ʒ ˩ ˆ ┣ ⅄ Э ⅄ Â Command ˘ ЛЪЮЪυ ҄ʒ'

Ъυ ҄ʒ	
configure terminal	Â

aaa accounting commands *level* {**default** | *list-name*} **start-stop group** {**tacacs+** | *group-name*}	Exec TACACS+ Â ¸ *level* ÞU ¾ ⁞ Â¬ تن 0¦ 15 Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line ˘ ف Exec Â
accounting commands *level* {**default** | *list-name*}	Exec " جھ Э Â ¸ *level* ÞU ¾ ⁞ Â¬ تن 0¦ 15 Â

TACACS+ ˜ ٩

جھ Э TACACS+ ˘ ŕ TACACS+ ┗ ⅄ Â ┘ TACACS+ ˜ ٩ ˘ ЛЮÞU ¾'

ÞU ¾	
configure terminal	
tacacs-server timeout *seconds*	Лu ŋń ˆ ŕ 5 ˜˜ ў ˘ ‡ Â
Ip tacacs source-interface *interface*	┘ tacacs+ ¦ ┗ ⅄

```
Ruijie(config)# tacacs-server key aaa
```

3. ﾉ tacacs+ '

```
Ruijie(config)# aaa authentication login test group tacacs+
```

4. ﾇ ﾍ Э :

```
Ruijie(config)# line vty
```

Л Э enable tacacs+ Ю Â

```
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. aaa

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

2. tacacs+ server

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

3. tacacs+

```
Ruijie(config)# aaa authorization exec test group tacacs+
```

4. :

```
Ruijie(config)# line vty 0 4
Ruijie(config-line)#authorization exec test
```

Л Э tacacs+ Ю Â

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

```
!
!
aaa authorization exec test group tacacs+
!
tacacs-server host 192.168.12.219
tacacs-server key aaa
!
line con 0
line vty 0
authorization exec test
!
```

15 Commans TACACS+ '

1. ″I Ů aaa'

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

2. ⁄ tacacs+ server '

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

3. ⁄ tacacs+ Ъυ ʒ '

```
Ruijie(config)# aaa accounting commands 15 default start-stop
group tacacs+
```

4. ج ∧ Э :

```
Ruijie(config)# line vty 0 4
Ruijie(config-line)# accounting commands 15 default
```

Л Ъ Э enable ʈ tacacs+ Ь ⅄ ˇ Ю Â

```
Ruijie#show running-config
!
aaa new-model
!
!
aaa accounting commands 15 default group tacacs+
!
!
tacacs-server host 192.168.12.219
tacacs-server key aaa
!
line con 0
line vty 0 4
```

!

SSH

SSH Ū

SSH Secure Shell Â SSH ╖ У Telnet
ˇ б Telnet a ↓ ▒ ╕ Â У a
ĵ ˇ SSH ↓ Л Ո
╖ ˇ Л a ↓ IP ▒ à ↓ Â

SSH

	SSH1	SSH2
↓	RSA	RSA à DSA
	▒ RSA Ὼ ╖ Â	KEX_DH_GEX_SHA1 KEX_DH_GRP1_SHA1 KEX_DH_GRP14_SHA1
╖	DES à 3DES à Blowfish	DES à 3DES à AES-128 à AES-192 à AES-256

▒ ∧ ⅓ ▒ Dn ∧ ⅓ S ▒ A à Ä

SSH

SSH

SSH ┣	
SSH	^ 1 Ո 2˜
SSH	120s
SSH	3

1. ѫ SSH ˘ Â ҷ ҽ
˘ ’ ^ Telnet ┘Л ˜
2. ┘ (Username) б (Password) Â ґ
a ┘ ˘ ┘ ┘Л ˘ Â

SSH Server

Ю˘ SSH Server Â SSH Server˘ ҽ
Ю˘ **enable service ssh-server** Ћ ҳ˘ ┘ SSH ˘ SSH Server й ENABLE Â

Ћ ҳ	
configure terminal	
enable service ssh-server	SSH Server
crypto key generate {**rsa|dsa**}	

~

ї ˘ a ҽ Ћ ҳ [**no**] **crypto key generate**’ Ћ ҳ **crypto key zeroize** Ћ ҳї Â

SSH Server

SSH Server ў ج Ю **no enable service ssh-server**
Ћu ҳ˘ SSH Server й DISABLE Â

Ћu ҳ	
configure terminal	
no enable service ssh-server	SSH Server

SSH server

Ю SSH Server 1 Ո 2 Â ЛЬЮЋu ҳ SSH Â

Ћu ҳ	
configure terminal	
ip ssh version {**1	2**}	SSH
no ip ssh version	SSH й ˘ SSHv1 б SSHv2ў

SSH

Ю SSH Server й 120 ˘ Â ЛЬЮЋu ҳ SSH Â

Ћu ҳ	
configure terminal	
ip ssh time-out *time*	SSH ˆ ىن 1-120sec˜
no ip ssh time-out	SSH й 120 ’

SSH

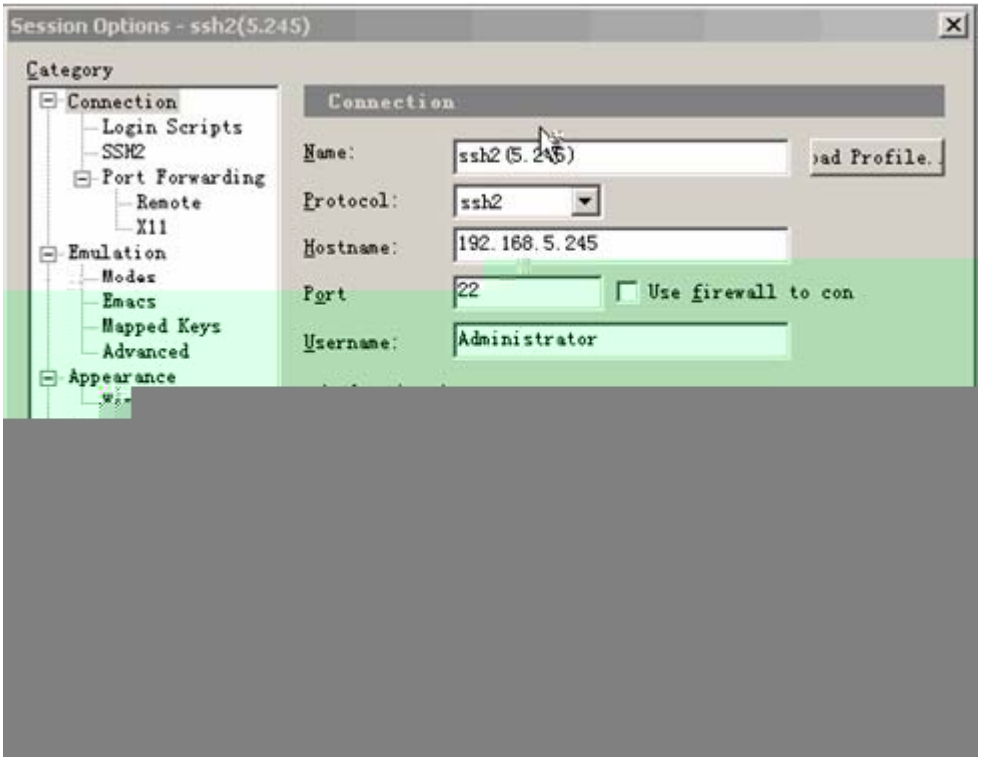
Ћu ҳ SSH ˘
й Â Ю SSH Server й 3 ˘ . ┘Л Ь
┘ б Â ЛЬЮЋu ҳ SSH Â

ћu ϩ	
configure terminal	
ip ssh authentication-retries *retry times*	SSH ˆ تن 0-5˜
no ip ssh authentication-retries	SSH ѝ 3 '

' Э ћu ϩ έ ٧ [SSH ћu ϩ ٧ ΅Ą] Â

SSH

┘Л SSH ˘ ⁄ SSH Server ╖ ˘
Ю ╖ Â Windows Telnet ˚ a SSH˝ ϫ
Ь ˚ ˘ ⁄ ↑ ' Putty˘ Linux˘
SecureCRT Â Ю Л ˚ SecureCRT ѝ Ў SSH ˘
Юفي'

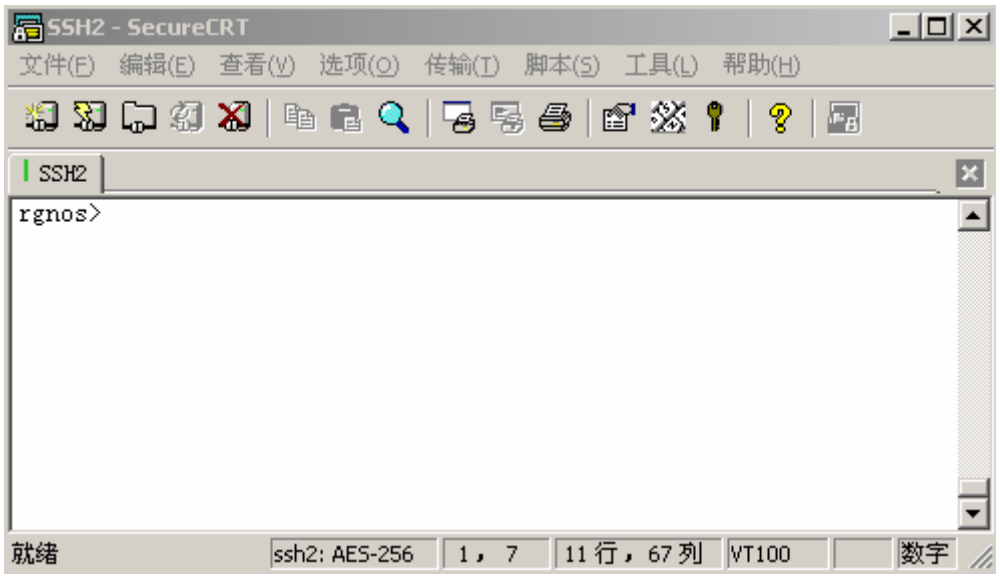


1 في

1 في ˜ 2 ˘ ϫ جم Protocol SSH2˝ Hostname
ў IP سم˘ ѝ 192.168.5.245

4 في

Telnet ┘Л∪ Ո┣ Telnet У Â Юفي '



5 في

GSN

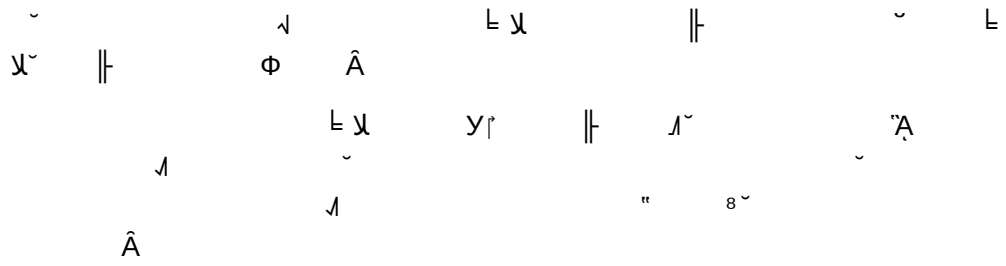
GSN Ӯ

ā ЛЬЮني '

1) ⅄ˆ RG Security policy Management Platform˜
2) ˆ RG Security Agent˜
3) ˆ RG Restore System˜
4) ˆ RG Security Switch˜

⅄ˆ RG SMP˜

⅄ ˘ ā ǐ ˚ ڜ
Â ˆ Э˘ .
˜



GSN

Ю GSN

Ю	
configure terminal	
[**no**] **security gsn enable**	GSN

Ю GSN

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

SMP server

SMP Server IP SMP Server

Ю	
Configure terminal	

[**no**] **security** { [**v1** | **v2**] **community** *community* | **v3 user** *username* }	Ո smp Ь ⅄ ⅃ . Ƅυ ҳ snmp v1 à v2 à v3. community Â security v1 community Ո security community У , v1˘ ∢ ѝ . v3, ‡ ҷ snmp-server Ƅυ ҳ Ю v3 , Ƅυ ҳ ∀ ê SNMP Ì
[**no**] **smp-server host** *ip-address*	SMP Ь ⅄ ѳѫ ѕѫ

~

ҷ security v3 user , ҷ SNMP ĭ v3 user Â

Y ˚

ѝ Y ˚ ˘ ѕѫ ∢ Y ˚ Ո
SMP ˘ ∢ Л∪ Y ˚ ⁸ ˆ
Y ˚ Â

˘ ∢ Л∪ ЛυЮƄυ ҳ Y ˚ '

Ƅυ ҳ	
Configure terminal	
[**no**] **security event interval** *interval*	Y ˚ ˘ *interval* 1-65535s Ю ѝ 5 ˘

∀ ѳѫ ѕѫ

∢ Л∪ Ƅυ ҳ ⁸ Ї ҷ ∀ ҥ ѳѫ ѕѫ ˘ ∀
˜ ∀ ѳѫ ѕѫ '

Ƅυ ҳ	
Configure terminal	

interface *interface*	٨
[**no**] **security address-bind enable**	٨ ٿ فخ سم

~

GSN Y

GSN

GSN ˚ ˘ ˚ ˘ Л GSN
л н ҏ a л a л˘ л GSN
˚ л è ´ ˘ Л ў ╗ ˆ л ARP
╗ ~ ≠ ˚ л ˘ GSN ≠ ˚ Â и
╟ ˘ GSN ⁸ ╒˘ Лэ ў GSN a ў
è ˚ ╗ Â

б GSN ă У ╗

GSN ˘ GSN б Ю У ╗ э Э ă ˘ э
╗ Л ˘ л ╗ Â

1) GSN a б 1x ip Â
2) GSN a л л Â
3) GSN a э AP л Э ˘ л a ╗ AP л˘
GSN л ╗ AP л л л ╗
˘ У л ╗ AP л ″I╕ л Э
Â

GSN è Y

GSN ˚ ˘ Л Ю У
л : GSN '

IP+MAC ' IP+MAC л˘ MAC
˘ GSN л MAC ˘ IP+MAC
˘ ÿ GSN л Â

ACL' ACL б GSN Ю ă ≠ GSN ╗
˘ э GSN ў a ў ACL Â

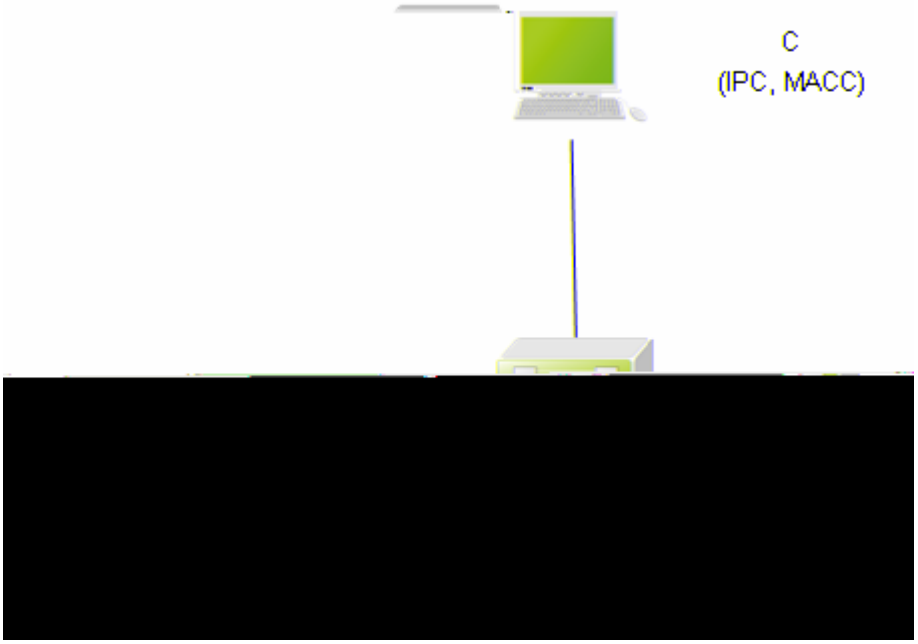
╟ ARP

DAI

DAI Dynamic ARP Inspection, ﻝ ﻯ ╟ ARP Â ﺍ ARP ﻝ Â a ﻝ arp

ARP

ARP ˜ ˇ ARP ˜ a ﺍ ARP ﻝ Â ¯ ˜ ARP Â è ˇ ﻩ ﺭﺻ Â Юՙ



ﻲﻓ 1

ﻲﻓ ՚ A,B,C ﻙ ﺟ Э˘ з Æ ﻝ У ˇ IP Ո MAC ﺍ ⁞ ﻯˆ IPA, MACA˜ (IPB, MACB) (IPC, MACC), A Ո B ˇ A ﺟ У ARP ˇ B MAC Â B ﺍ ARP ˇ ARP ˇ IPA Ո MACA, ﻟ ARP Â A ﺍ ﻝˇ ARP ˇ IPB Ո MACB Â

ﺟ ﺭﺻЮ˘ C ﻝ Л∪ A Ո B ARP a Â ˇ a ﻝ ARP ˇ IP ﻑﺧ ﺳﻣ IPA/IPB, MAC ﻑﺧ ﺳﻣ MACC˘ ˇ A ﺟ ARP (IPB à

MACC), B ج ARP (IPA, MACC). ˘ A Ω B
ل Ω C ˘ A à B У Â C Ї
˘ ﻯ ﻱ ﻝ ˘ ﻝ У . ﻱ Â
ﻝ Â

DAI Ω ARP

DAI ﻯ ﻝ ARP ﻱ Â ў ЛЬЮ ǘ '
¸ ج DAI ╖ VLAN ﻯ Э в ARP

DAI

DAI **ARP**

ARP

DAI

- VLAN DAI
- ARP
- DHCP snooping database

VLAN DAI

VLAN DAI

VLAN vid DAI vlan-id = vid ARP DAI a ARP

show ip arp inspection vlan VLAN DAI

VLAN DAI

ħυ ϗ	
Ruijie(config-if)# **ip arp inspection trust**	∧ ┘
Ruijie(config-if)# **no ip arp inspection trust**	∧ a ┘

∧ ARP

æ NFPP ˘ NFPP ╟ ╖ ˘ a æ ħυ ϗ Â

ħυ ϗ æ γ ∧ ˘ ȝ γ ∧ ѝ У SVI ˜ ∧ Â

Ю˘ У ∧ ARP ѝ 15 ARP Â ∧ a ⁸ Â

1 ∧ ĺ ARP ⁸ ˘ ⅄ ĺ ˘ a У Â

┘Л **show ip arp inspection interface** ħυ ϗ ⅄ γ ∧ ⁸ Â

∧ ARP ˘ æ ∧ ЛЬЮħυ ϗ'

ħυ ϗ	
Ruijie(config-if)# **ip arp inspection limit-rate** { *<1-2048>* **| none**}	∧ ARP ˘ ´ Æ' / **none**' a ⁸
Ruijie(config-if)# **no ip arp inspection limit-rate**	

NFPP(₥) ң ҏ˘ ⁸ NFPP ˘ a ¨Ą DAI Â

DHCP snooping database

∧ ê DHCP Snooping Ì Â

DHCP Snooping database˘ ‡ ARP

DAI

VLAN ĭ ŭ DAI ╖

⅄ VLAN ŭ ˘ æ ЛЬЮħυ ϗ'

Ru ʒ	
Ruijie(config)# **show ip arp inspection vlan**	ᐟ VLAN ᵕ

ᐟ ɣ ᐞ DAI

ᐟ ɣ ᐞ DAI ˇ ج ЛЬЮЬ ʒ'

Ru ʒ	

ᐟ ɣ ᐞ DAI

Ruijie(config)# **show ip arp inspection interface**

8 "

ѝ Л ң ҕ ā У ǂ ˘ 8 "
ℸ Â Л ң ҕ ҍ ЛЮ " '

¸ IP 8 "

¸ IP 8 "

¸ MAC 8 "

¸ MAC 8 "

¸ Expert 8 "

˧ Лυ é a ˧ 8 " 8 Â

8 " ӯ

ACLs ѝ 8 " (Access Control Lists)ў ≠ ѝ " ^ Access Lists˜ ˘ ѝ ˘ ѥ ѝ ↑ ÂACLs ӈ У ‡ Л Э 8 ' Â è ˜ن
˧ Лυǂ ѝ ACLs Ո QoS ACLs Â

˧ Лυ 8 ˜ص 8
Â ACLs ѥ è ǂ ˘ ÿ
Л ˘ ך ˚ (Conditions) ā è
(Permit) (Deny) Â

˘ ACLs 8 ف ÿ ˘ Qos
. ˝I ǂ Ո Â

ACLs У " ˘ ѝ 8 " (Access Control Entryў ACE) Â 8 " ך ˚ Л ѝ Â

" ‡ ˧ Лυ ѕ ف ѧ à ѕ ف ѧ à Э ˜ ˘ Ш ѕ
Â

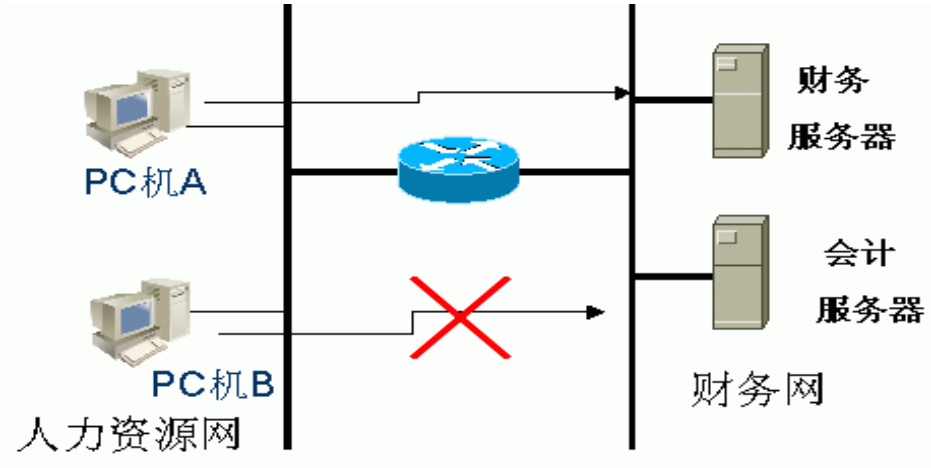
ѝ ӂ "

" Ы ҷ ˘ ў ЛЮ У '

¸ 8 ' 8 ˧ ӂ ѕ ˘ ˧ ѥ ӂ ѕ ǂ
Â

8 ' Ù ˇ ЮЖ ‡ˇ ˩Л 8 У
ˇ Ъ ˩ WWW Ո ˚ Ъˇ È Ь TELNET ‡ ~ ˇ
ج ˇ ˩ У ў Â

في 1 У ˇ ج ˇ ˩ ў A Ь ˇ ў B
Â Юفي 1 Â



في 1 " 8

⁸ " ⅄ Ш ⅄ ˘ ÿ У ⅄
˘ У У ↑ ˚ ″ ⅄ ך ˘ ⋇ ⅄ ⅄
˘ a ¨Ą Â

/ ACL à ⅄ ‡

ACL ج ∧ ˛ ˘ ї̆ б ∧ ACL У
ACE ך ’ ACL ج ÿ У ∧ ˘ ї̆ б
∧ ACL У ACE ך Â

ج ⁸ a ⅄ ‡ ˘ ‡ ⅃ ⅄ ˘ ≠ ⅃ ∧ è ů Â

ї A46F1Ć10218Ę9j09jDA039A 4511EFE352C364,Xj0 0 DA4035ADA46F1C102189 -1.18C111D6E7F15D12B3902C29d[<2C

ACE' permit tcp host 192.168.12.2 any eq telnet 2 هي

&

(Layer 3 Field) (Layer 4 Field) ACL Expert 8 " ^ Expert ACLs

IP "

IP	1-99 1300 - 1999
IP	100-199 2000 - 2699

‡ ⅄

╕ ‡ ╕⅂ " ⅄˘ ⅄ … Л∪ ⅄˘ ´ ⅂
˘ ⅋ ⅂ " Â Л∪ " ⅄ Â ⍝ ā
⅋ ⅂ ˘ ⅄… ⅂ б ⅄ ˘ ⅂ ⅎ
⅄ ⅄˘ a Ą è ‡ ⅄ Â

… У ⅄˘ ˘ ‡ ⅄ ⅄ a Â

Ю '

access-list 101 **deny ip any any**

access-list 101 **permit tcp** 192.168.12.0 0.0.0.255 **eq telnet any**

У ‡ ⅄ IP ˘ Л∪ 192.168.12.0/24 ў
Telnet ˘ ⍨ й ⍝ ⅂ Ո У ‡ ⅄ ⅎ ˘ a Ą
⅄ ‡ ⅄ Â

IP "

⍾ " ↑ ЛЮ ч '

1. ⍓ ⍾ "

2. ⍾ " ⅋

⍾ " ˘ ЛЮ ч '

У ⍝ Ю ЛЮЂ ⅋'

Ђ ⅋	╖
Ruijie(config)# **access-list** *id* {**deny** | **permit**} {src *src-wildcard* | **host** *src* | **any** } [**time-range** *tm-rng-name*]	⍓ "
Ruijie(config)# **interface** *interface*	" ⅋
Ruijie(config-if)# **ip access-group** *id* { **in** | **out** }	" ⅋

γ ⍝ ACL Ю ЛЮЂ ⅋'

Ђ ⅋	╖
Ruijie(config)# **ip access-list** { **standard** | **extended** } { *id* | *name* }	"
Ruijie (config-xxx-nacl)# [*sn*] { **permit** | **deny** } {src *src-wildcard* | **host** *src* | **any** } [**time-range** *tm-rng-name*]	й ACL ╖ , έ ⅋ Ђ ⅋ ⅋

Ruijie(config-xxx-nacl)# **exit** Ruijie(config)# **interface** *interface*	8 " ˘ " ∧
Ruijie(config-if)# **ip access-group** *id* { **in** | **out** }	" ∧

&

У ∧ ACL ˘ γ ∧ Л Ъ Ъ ∧ Ո ACL ˘ ∧ Л Ъ
. ″I (ج ACE . ″I) Â

IP "

" ˘ ج ЛЪЮЪ ٦'

Ruijie# **show access-lists** [*id* | *name*]

Ú Â

8 W

¸ 192.168.12.0/24 ў ‹ ‹ Э UNIX ў TELNET Ь PING Ь Â

¸ ‹ Switch B 8 ‹ Э a 192.168.202.0/24 ў Ь Â

&

ЛЪЭ у ‹ ‡ ‹ Э ў ў ˘ a ‹ Э ў Â

¸

Switch B '

```
Ruijie(config)# interface GigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.12.1 255.255.255.0
Ruijie(config-if)# exit
Ruijie(config)# interface GigabitEthernet 0/2
Ruijie(config-if)# ip address 2.2.2.2 255.255.255.0
Ruijie(config-if)# ip access-group 101 in
Ruijie(config-if)# ip access-group 101 out
```

˘ У ‹ й 101 "

```
Ruijie(config)# access-list 101 permit tcp 192.168.12.0 0.0.0.255 any eq telnet time-range check
Ruijie(config)# access-list 101 deny icmp 192.168.12.0 0.0.0.255 any
Ruijie(config)# access-list 101 deny ip 2.2.2.0 0.0.0.255 any
Ruijie(config)# access-list 101 deny ip any any
```

Time-Range ш

```
Ruijie(config)# time-range check
Ruijie(config-time-range)# periodic weekdays 8:30 to 17:30
```

&

" 101 ‹ У ‡ ‹ access-list 101 deny ip any any ‹ЛЪ a ˘ ‹ й " ‹ Й У ‡ ‹ Â

‹ S3750 " ң ‹ Э˘ ‹ У ‡ ‹ access-list 101 deny ip any any Â

s3750 ң ‹ Ip acl ‹ Л“eq” tcp,udp 4 ‹ ‹

Switch A '

¸ è ⅃Л

Л ⅄˘ ⱨ̣Л ⅄Э " 101, Л ⅄Э

```
Ruijie> enable
Ruijie# configure terminal
Ruijie(config)# mac access-list extended mac-list
Ruijie(config-mac-nacl)# deny host 0013.2049.8272 any ipx
Ruijie(config-mac-nacl)# permit any any
Ruijie(config-mac-nacl)# exit
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# mac access-group mac-list in
Ruijie(config-if)# end
Ruijie# show access-lists
mac access-list extended mac-list
deny host 0013.2049.8272 any ipx
permit any any
Ruijie#
```

&

" ⅄ permit any any a a ˘ ⱬ̀ " ⅄ ŭ У

‡ ⅄ Â

ⱨ̣ S3750 " ң ҏ Э˘ permit any any ⅃Л a Â

Expert "

ⱨ̣ Э

Expert " ^ Л 2700 -2899˜ й ѫ " Ո MAC "
Л ˇ з VLAN ID Â

´ У Expert " ˇ ⊣ Л " Л Ҍ
‡ˇ è Л ⊣ У Л ⊣ ˇ Л Л ⊣ ⌡ ⊣ У
" Â

Expert "

Expert " ↑ ЛЮ ч '

1. Ҍ Expert "
2. " Л ( )

Expert " ˇ ЛЮ ч

У ѭ Ю ЛЮҺ ҷ'

Һ ҷ	Ղ

Ruijie (config)# **access-list** *id* {**deny** | **permit**} [*prot* | {[*ethernet-type*] [**cos** *cos*]}] [**VID** *vid*] {src *src-wildcard* | **host** *src* } {**host** *src-mac-addr* | **any**} {ds{**list** 1 Tf0 Tc Tf0 Tc000.4 13.61 T2 0.48 0 Tddst-w2(ildcard)Tj/TT1 1 Tf-0.0026 Tc

&

У ٨ ACL ' γ ٨ Л Ъ Ъ Ј Ո ACL ˘ ѫ
. ″I ˘ ٨ Л Ъ . ″I (Ъ ҳ [sn]) Â

s3750 ң ҏ lp acl ٨ Л“eq” tcp,udp 4 ٨ ٦

Expert "

" ˘ ѫ ЛЪЮЪ ҳ'

Ruijie # **show access-lists** [*id* | *name*]

٨ Л Ъ Expert "

Expert "

Expert " ˘ ЛЪЮ ٣ '

¸ VLAN20 0013.2049.8272 ў Giga 0/1 ٨ Â

¸ è a

```
Ruijie> enable
Ruijie# config terminal
Ruijie(config)# expert access-list extended expert-list
Ruijie(config-exp-nacl)#  permit  ip  vid  20  any  host
0013.2049.8272 any any
Ruijie(config-exp-nacl)# deny any any any any
Ruijie(config-exp-nacl)# exit
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# expert access-group expert-list in
Ruijie(config-if)# end
Ruijie# show access-lists
expert access-list extended expert-list
petmit ip vid 20 any host 0013.2049.8272 any any
deny any any
Ruijie#
```

" ACL80

ACL80 ≠ ∤ Ⱶ " ˘ Ǖ Ⱶ ˥ ɱ 80 ˘
Â У " ˘ ACL80 ˩ Л ɱ 80
16 ˆ bit˜ Æ ˥ Â

&

16 a ↑ Ǖ ЛЮ '

˘ ⅄ ⇜ 16 У ace´ ˘ γ ace

```
Ruijie# configure terminal
Ruijie(config)#
```

Ruijie(config-ext-nacl)#

3) ACL

```
Ruijie(config)# ip access-list extended test-tcp-flag
Ruijie(config-ext-nacl)#
```

4) ╗ ACL

```
Ruijie(config-ext-nacl)# permit tcp any any match-allvåõeåï
```

ip access-list resequence *tst_acl 100 3*, ACE Л Ю

```
Ruijie(config)# ip access-list resequence tst_acl 100 3
ace1: 100
ace2: 103
ace3: 106
```

a sn-num ╕ ace4 ˘ Л Ю

```
Ruijie(config-std-nacl)# permit Â Â Â
ace1: 100
ace2: 103
ace3: 106
ace4: 109
```

seq-num = 105 ╕ ace5 ˘ Л Ю

```
Ruijie(config-std-nacl)# 105 permit Â Â Â
ace1: 100
ace2: 103
ace5: 105
ace3: 106
ace4: 109
```

Л ь 4 ″I ╕ ace Â

╛ ACE

```
Ruijie(config-std-nacl)# no 106
ace1: 100
ace2: 103
ace5: 105
ace4: 109
```

Э Л ≠ ┘Л ACE ╛ Â

▟▟ Ш ACL

┘Л ACL ▟▟ ˘ ACL ▟ У Â

ь ╜ ˘ ″I У Time-Range Â

Time-Range ˘ ╖ ˘

У ┘ Â

ÿ ˘ ┘Л ЛЮ У Time-Range

Ъ ъ	╖
Ruijie# **configure terminal**	Â
Ruijie(config)# **time-range** time-range-name	У ЪЖ ь ┘ У

Ruijie(config-time-range)# **absolute** [**start** *time date*] **end** *time date*

time range

ACL ĵ ˘ ACL У ˘ ≠ У
8 ˘ У ACL ѫ ∧ ѫ portmap ˘ ⅃ Л ѫ
Ո ∧ ˘ б У ACL a ⅃ ѭ. ″I Э˘ . ″I
∧ (∧ Ю IP/IP+MAC)˘ 802.1X Ո ACL ˘ .
ך Э ACL ˘ a ″Ą 802.1X˘
ACL Ո ∧ ˚ ’ a ך ACL ˘ ѫ ″Ą ∨
ך ∧ à 802.1X Ո ACL ˚ ˘
∧ ˘ ∧ ѝ ∧ Â

&

1. ↑ permit Ո deny Â
2. ∧ a
3. ∧ . ″I
4. IP Ю˘ ѭ 802.1x ˘
ѝ ˚ ˘ Ո IP Ю У Â
5. ѭ ɱ ″I ˘ Л
a Э Â

⅃ Л ACL˘ ѝ Â

ÿ ˘ ⅃ Л ЛЮ У

Ћ ϟ	Ⅱ
Ruijie# **configure terminal**	Â
Ruijie(config)# **security global access-group** *1*	

ÿ ˘ ⅃ Л ЛЮ ѝ ∧

Ћ ϟ	Ⅱ
Ruijie# **configure terminal**	Â
Ruijie(config)#**interface** *idx*	∧
Ruijie(config-if)#**security uplink enable**	ѝ ∧

∧ Ю ˘ ″I ⅃ ˘ ″Ą ∧ ѝ ∧ Â

ÿ ˘ ⅃ Л ЛЮ ∧ Ю

Ъu ҳ	ℸ
Ruijie# **configure terminal**	Â
Ruijie(config)#**interface** *idx*	٨
Ruijie(config-if)#**security access-group** *1*	٨ Ю

٨ Ю ٨˘ ″I ٧ ٨ ˘ ″Ą ₥ ٨

Ю Л∪ ̀й '

٨ 4 ̀й ٨˘ IP+MAC

```
Ruijie(config)#interface FastEthernet 0/4
Ruijie(config-if)#switchport port-security
Ruijie(config-if)#switchport port-security mac-address
0000.0000.0011 ip-address 192.168.6.3
```

٨ IP й 192.168.6.3 з MAC فخسم й 0000.0000.0011 ÿ
٨ 4 Э ˘ ѫ ٨ ٧ IPX Ъ ٧Л
У ˘ IPX ˘ Ю

```
Ruijie #configure
Ruijie (config)#expert access-list extended safe_channel
Ruijie (config-exp-nacl)#permit ipx any any
Ruijie (config-exp-nacl)#exit
Ruijie (config)#security global access-group safe_channel
```

≠ ٧Л∪ У ₥ ٨

```
Ruijie #configure
Ruijie (config-if)#expert access-list extended safe_channel
Ruijie (config-exp-nacl)#permit ipx any any
Ruijie (config-exp-nacl)#exit
Ruijie(config)#interface FastEthernet 0/4
Ruijie (config-if)#security access-group safe_channel
```

ѫ Ю ٨ Ю˘ “safe_channel”˘ ٨ 4
٧ IPX Â

TCP´ ┘

TCP Flag ´ ┘ ACL ℸ Â

й ج У Э A ˘ ٧ A ў ل B ў ٧
TCP ˘ a B ў ٧ ˥ A TCP
Â

في

في 4

Э في ˘ Ь ч ˘ A б G3/1 ٨ ˘
B б G3/2 ٨ Â

ĭ

B ў ٧ ˥ A TCP ˘ ٧ ÿ B
٧ G3/2 ٨ ٧ TCP . ل Â˥ TCP ل
˘ TCP˥ TCP SYN Æ з ACK Æ й 0 Â ج
˘ ل Л৬ 8 " Match-all ˘ ج G3/2 ٨ ٨
ل˘ TCP SYN Æ 1 з ACK Æ й 0 ˘ . ل
A ´ ل B Â

1) ⅈ 8 "

#

```
Ruijie# configure terminal
```

ج Ю… " ACL101

```
Ruijie(config)# ip access-list extended 101
```

TCP Flag SYN=1˘ з è ˆ ↑ Ü ACK Æ˜ Æ й 0

```
Ruijie(config-ext-nacl)# deny tcp any any match-all syn
```

è IP

```
Ruijie(config-ext-nacl)# permit ip any any
```

2) 8 " ⁄ Э

8 "

```
Ruijie(config-ext-nacl)# exit
```

" ∧ G3/2

```
Ruijie(config)# interface gigabitEthernet 3/2
```

ACL 101 G3/2 ⅄ ↑

```
Ruijie(config-if)# ip access-group 101 in
```

3) "

⁄ Ю **show** ћu ҂ ACL

```
Ruijie# show access-lists 101
ip access-list extended 101
10 deny tcp any any match-all syn
20 permit ip any any
```

QOS

QOS

Internet ˇ Internet Э ˇ
ˇ a a ˇ
“ ” ˇ
a Â QOS Â

QOS Quality of Service ~ Â
ˇ ˇ QOS QOS
Â QOS
Â

QoS

a QoS a p ˇ ˇ
a ˇ
ˇ ˇ ˇ
Â Â
ˇ ˇ Â
QoS p Â ˇ ˇ
ˇ Â
QoS ˇ ˇ
Â

QoS IETF Internet Engineering Task Force DiffServ
Differentiated Servece Mode ˇ Â DiffServ
, a ˇ IP
ˇ DiffServ IPv4 TOS Type Of Service Ipv6
Traffic Class 6 Â
Э Â

802.1Q Tag Control Information 3 ˇ
8 ˇ Ь User Priority bits Â

IPv4 TOS IPv6 Traffic Class
3 ˇ IPprecedence value IPv4 TOS
IPv6 Traffic Class 6 ˇ Differentiated Services
Code Point (DSCP) value Â

DiffServ

Per-hop Behavior

End-to-end QoSsolution

QOS

Classifying

CoS

CoS

QoS Policy-map

IP

QoS

User Priority bits

CoS

User Priority bits

CoS

&

QoS

QoS

Policy-map

Mac access-list extended

MAC

MAC

Ethertype

ACLs

DSCP

Policy-map

DSCP

″I ٨ . ″I Â

&

Э Ь ‡ ٦ ٦ У ٨ Э Â ﺝ Ю˘ Э Ь
‡ 3 à 2 à 1 . ″I Â¸ ″I ACLs ˘ ﺝ Ю˘
٦ ‡ 2 à 1˘ ﺝ ˘ ٨ QoS ˘ ‡
‡ 2 Ո 1 ÿ ÿ ٨ Э QoS ' ٨ QoS
˘ ﻍ ç DSCP 0 Â

IP ˘ ٦ Л∪ Л∪Ю ‡ '

¸ ٨ ù Trust ip-precedence˘ ‡ ÿ IP Ip precedence ^ 3 ~ ٧ ˘ Ї¦ CoS ^ 3 ~ Â

¸ ٨ ù Trust cos˘ ‡ CoS ^ 3 ~ ٧ Ip Precedence ^ 3 ~ Â ч ˘ У γ a ↑ ΰ User Priority bits˘ ﻍ ٦ Л∪ ٨ CoS CoS Â ٨ У γ ↑ ΰ User Priority bits˘ ‡ ÿ ٧ CoS Â

¸ ٨ Policy-map ﷺ Ip access-list (Extended) ACLs ˘ ﻍ ﺝ ٨ Э˘ ٧ IP ﻓﺨﺴﻢ à IP ﻓﺨﺴﻢ à Protocol à Л∪ ٨ ني TCP/UDP

Marking

Marking˙ ˘ Classifying Ո Policing ╟ Л˘ ѝ ї
DSCP Э Ю У ˘ Marking ╟ ѝ
QoS ˘ ↓Л Ъ QoS ACLs ↓ QoS ˘ ≠ ↓Л Ъ
Trust QoS ˘ ˘ Trust DSCP ÿ IP
DSCP Â

╗ . Â ﾍ QoS ╗ ˇ ┘ Л Ъ ﾍ Policy Map ˇ ﾍ й Off . ┘ Â Л Ъ Ю й QOS ' CoS 0

QOS

ip access-list extended {*id* | *name*} **…** **ip access-list standard** {*id* | *name*} **…** **mac access-list extended** {*id* | *name*} **…** **expert access-list extended** {*id* | *name*} **…** **ipv6 access-list extended** *name* **…** **access-list** *id* [**…**]	… ACL ACL
[**no**] **class-map class-map-name**	… class map ,class-map-name … class map no
[**no**] **match access-group** {*acl-num* | *acl-name* }	ACL, acl-name … ACL acl-num … ACL id no

Class1 Class-map ACL:acl_1 Class-map TCP 80

```
Ruijie(config)# ip access-list extended acl_1
Ruijie(config-ext-nacl)# permit tcp any any eq 80
Ruijie(config-ext-nacl)# exit
Ruijie(config)# class-map class1
Ruijie(config-cmap)# match access-group acl_1
Ruijie(config-cmap)# end
```

Policy Maps

… Policy Maps

configure terminal	
[**no**] **policy-map policy-map-name**	… policymap policy-map-name … policymap no policy map
[**no**] **class class-map-name**	… class-map-name … class map no

[no]set ip dscp new-dscp	ѝ IP ip dscp ' IP ˘ a ' new-dscp DSCP ˘ ﻝ تن ң ҏ a ﻝ a ﻝ
police rate-bps burst-byte [exceed-action {drop | dscp dscp-value}] **no police**	⁸ Ռ ѝ ǂ ╟ ˘ rate-bps ⁸ (kbps)˘ burst-byte ﻝ ⁸ (Kbyte)˘ drop ǂ ˘ dscp dscp-value ǂ DSCP ˘ dscp-value ﻝ تن ң ҏ a ﻝ a ﻝ

&

ﻝ У Policy Maps ǂ ﻝ Э˘ ‡ è police
ﻝ Â ǂ У ﻝ ´ Policy Maps police ˘ ﻝ
У ﻝ ﻱ У Policy Maps˘ ﻝ Policy Maps ﻝ б è
a У ˘ è Class ﻝ Лъ Ռ ѐ У ~ Â

˘ Лъ Ю … У ﻝ ѝ Policy1 Policy-map˘
Policy-map ﻝ Gigabitethernet 1/1

```
Ruijie(config)# policy-map policy1
Ruijie(config-pmap)# class class1
Ruijie(config-pmap-c)# set ip dscp 48
Ruijie(config-pmap-c)# exit
Ruijie(config-pmap)# exit
Ruijie(config)# interface gigabitethernet 1/1
Ruijie(config-if)# switchport mode trunk
Ruijie(config-if)# mls qos trust cos
Ruijie(config-if)# service-policy input policy1
```

ﻝ Policy Maps

ﻝ Лъ Ю Policy Maps ǂ ﻝ Э

Ъυ ҁ	
configure terminal	
interface *interface*	ﻝ

[**no**] **service-policy input policy-map-name**	… Policy Map ˆ ˄ Э’ policy-map-name … policy map ˌ ˘ input ˋ ˌ

"

˩ Л˅ ˋ ˄ " ' WRR˘ SP˘ RR˘ Ю˘ "
ˋ WRR

ۻ Л Ъ ЛЪЮ ۸

Ъ ҄	
configure terminal	
{**wrr-queue** | **drr-queue**} **bandwidth** **weight1...weightn**	weight1...weightn й " ˘ ۻ تن QOS ۻ
no {**wrr-queue** | **drr-queue**} **bandwidth**	no

Ю wrr й 1:2:3:4:5:6:7:8

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

CoS-to-DSCP Map

CoS-to-DSCP Map CoS ↑ DSCP , ↓Л Л Ю
CoS-to-DSCP Map ,CoS-to-DSCP Map
QOS

Ъ ђ	
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 ↓ ت ђ р 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 ˘ Л й
"

DSCP-to-CoS Map QOS , ↓Л Л Ю
DSCP-to-CoS Map :

mls qos map dscp-cos *dscp-list* **to** *cos*	DSCP to COS Map˘ *dscp-list*: DSCP " ˘ DSCP ‡ ˘ ٧ تن ң p a ٫ a ٫;*cos*: DSCP CoS ˘ ٧ تن ٸ' 0 7"
no mls qos map dscp-cos	ٸ

˘ ЛЬЮ DSCP 0 à 32 à 56 б"

```
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
```

٧ 8

٫Л Ль ЛЬЮ ٧ 8

ћυ ҷ	
configure terminal	
interface *interface*	٧
rate-limit { **input** | **output** } **bps** *burst-size*	٧ 8˘ input ٸ ˘ output ٸ ˘ bps 8 (kbps)˘ burst-size ٫ 8 (Kbyte)

no rate-limit	√	√

QOS

class-map

ㅓ Л Л Ю class-map

Ь ҄	
show class-map [*class-name*]	class map

'

ʽ

```
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

˧ Ꮑ ᏁЮ qos ‟

ƚu ʇ	
show mls qos queueing	QoS ‟ , CoS-to-queue map˘ wrr weight ˧ drr weight;

Юʽ

```
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

ㄴЛЪ ЛЪЮ QOS

Ъʊ ʒ	
show mls qos scheduler	∧. ″l "

Ю'

```
Ruijie# show mls qos scheduler
Global Multi-Layer Switching scheduling
Strict Priority
Ruijie#
```

mls qos maps

ㄴЛЪ ЛЪЮ **mls qos maps**

Ъʊ ʒ	
show mls qos maps [**cos-dscp** |**dscp-cos**|**ip-prec-dscp**]	**dscp-cos maps** **dscp-cos maps** **ip-prec-dscp maps**

Ю'

```
Ruijie# show mls qos maps cos-dscp
cos dscp
--- ----
0   0
1   8
2   16
3   24
4   32
5   40
6   48
7   56

Ruijie# 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
```

```
Ruijie# show mls qos maps ip-prec-dscp
ip-precedence dscp
------------- ----
0     56
1     48
2     46
3     40
4     34
5     32
6     26
7     24
```

mls qos rate-limit

ㄱㄴ ㄴㅇ ㄴㅇㅁ ㄱ ⁸

ㅎㅇ ㅋ	
show mls qos rate-limit [**interface** *interface*]	[ㄱ] ⁸

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

show policy-map interface

ㄱㄴ ㄴㅇ ㄴㅇㅁ ㄱ policymap

ћU ҳ	
show policy-map interface *interface*	[∧] policymap

```
Ruijie# show policy-map interface f0/1
FastEthernet 0/1  input (tc policy): pp
Class cc
set ip dscp 22
mark count 0
```

&

ɱn a mark count

QOS

ѫ Ť

Ὼ ∧ ᒪᑌ ∤ ˇ è Ꞝ

G0/2

&

ЛЬЮ ٧ " б QOS ACL Ъu ҂

#

```
Ruijie#configure
Enter configuration commands, one per line.  End with CNTL/Z.
```

Ы Ј ѝ salary_acl ACL

```
Ruijie(config)#ip access-list standard salary_acl
```

Ы ‡˘ Ь Ы

```
Ruijie(config-std-nacl)#permit host 192.168.217.225
```

VRRP

VRRP (Virtual Router Redundancy Protocol˘ ˜) ў
˘ Л∪ ў ч ˘ ч Л∪ a :
ґ Ю ╥ ┌ ˘ з a ¨Ą ч Â VRRP
и У Â VRRP л з ч У
Ъ ↑ ч ˘ ў ‡ ↑ ч л ˘
ч ↑ и ў Â ў
Ч ъ ˘ ‡ Ъ Ч
ў Â VRRP ў Э Ч ч У ˘
з. ґ Ю Ў Â

RFC 2338 Н VRRP ص IP ч è ˘ VRRP У
ف س ˘ ў ч è л
≠ ў Â VRRP и IP ч ╥
л˘ ч У ╠ ˘ ÿ
IP б ˘ л ≠ ў Ո л Â У
VRRP л ˘ ч У л
и ў ч ╥ ˘ è и ˘ VRRP
a л ┌ ў ‡ Â RFC 2338
┌ ‡'

¸ VRRP ˜ ´ ў Â ¨I л У VRRP
л л ч Э VRRP . ¨I ˘ . ¨I и ў
˘ л и Master Â . ¨I л˘ ‡ ч
ў IP ف س˘ ў IP ف س и ў ˘ ч Ł Â

¸ ў л˘ è и (л и Backup)˘
ў ч VRRP ў Â ˘
ў У ч У VRRP ˘ и ˆ ˘ Л∪
' ў Â
ĺ ў ˘ ‡ и Master Â
л и Master ˘

1 VRRP

У У VRRP ў ў ў

Â 1 1 R1 R2

Fa0/0 192.168.12.0/24 R1 R2

Fa0/0 VRRP ў VRRP IP

Â ў VRRP

VRRP ў ‡

Â ў PC 1 ў PC 2 PC

1 PC 2 VRRP ў

PC 2 Â

PC 1 a ў

R1 R2 VRRP ў R1 R2

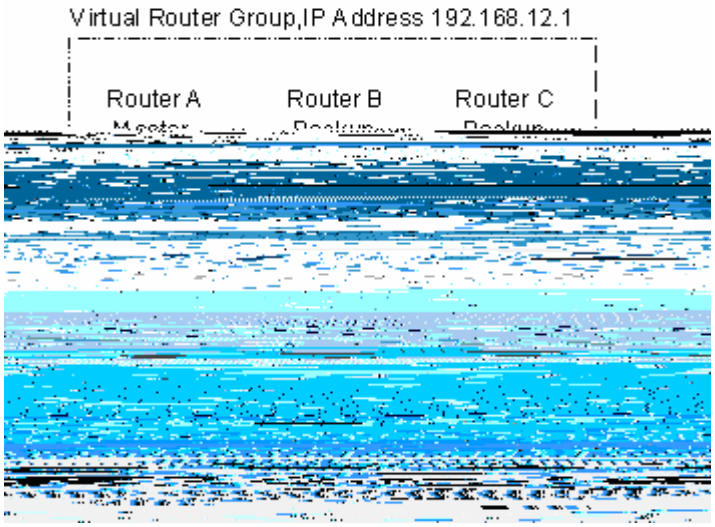
У ў Â

VRRP

VRRP ч б Â

б Â

VRRP 2 Â

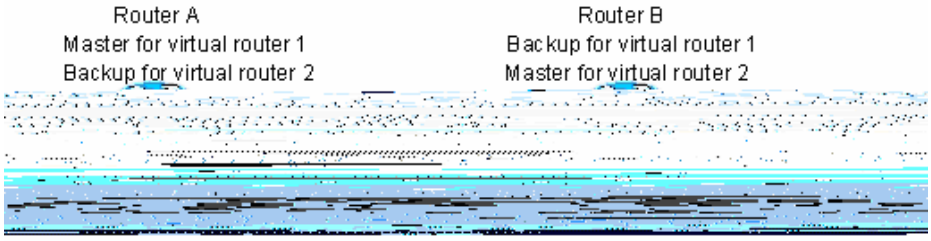


ي 2 VRRP

ي 2 A à B Л ч C К Л ч б ˘ ж è
Л ч Э VRRP ч У VRRP з VRRP
IP ф 192.168.12.1 è A й VRRP ў ˘
B б C й Â ў 1 à 2 Л ч 3 Л IP
ф 192.168.12.1 й Â ў ч è ↑ ў
(ж ي 2-2 A) ч Â У A ˘ ж
B б C ў ч ╖ ˘
´ Â

К

VRRP ч Л ي 3 Â



ي 3 VRRP

ي З ч Â 1˘ A Л
ч Fa0/0 IP ф 192.168.12.1 й IP ф˘ A
й ў ˘ B й Â 2˘
B Л ч Fa0/0 IP ф 192.168.12.2 й IP с
ф˘ B й ў ˘ A й Â ж
ж ˘ ў 1 Ո ў 2 1 IP ф 192.168.12.1 й
˘ ў 3 Ո ў 4 2 IP ф 192.168.12.2 й Â
ж VRRP ˘ A Ո B ˘ ч ↑
ж . Â

VRRP

VRRP

VRRP

- VRRP
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- VRRP
- VRRP
- VRRP

a

VRRP

IP

Ruijie(config-if)# **vrrp** *group* **ip** *ipaddress* [**secondary**]	VRRP
Ruijie(config-if)# **no vrrp** *group* **ip** *ipaddress* [**secondary**]	VRRP

Group 1~255 a IP Ipaddress a VRRP a Secondary IP IP

&

æ VRRP ˊ ╖ ˇ ⊿ У VRRP ⊿
VRRP ˆ ⊣ ˇ ĭ ‡ ⁾ VRRP
ˆ Â

æ VRRP ˊ

VRRP æ ˊ Ю˜ У ⊣ . ˝I ⁄ń Master .
˝I ˇ ˊ ⁄ VRRP ў Â VRRP æ ˊ
Ю˜ . ⊣ . ˝I ⁄ń Master . ˝I ˇ ≠ a ˊ ⁄
VRRP ў Â VRRP Л∪ ⋔ IP ƒ∂ѕ Ю˜ ˊ ĭ
Ђ a ˇ ⅜ ⁄ VRRP é . ˝I ˇ ╟ ⁄ VRRP
ў Â

Ђ ⅓	
Ruijie(config-if)# **vrrp** *group* **preempt** [**delay** *seconds*]	VRRP ˊ
Ruijie(config-if)# **no vrrp** *group* **preempt** [**delay**]	VRRP ˊ

⊿ ⋔ Delay Seconds Ђ VRRP ˆ
Master ⁄ń ˇ ⁄ 0 Â У ў VRRP ╖ ˇ VRRP
æ ˊ Ю Â

æ VRRP . ˝I

VRRP ˜ . ˝I ⋔ æ ⋌ ѕ
Æ Â æ ˊ Ю é . ˝I з IP ƒ∂ѕ ⁄
╟ (ў) ˇ ⊿ У æ . ˝I è
⁄ (ў) Â У ў VRRP ╖ ˇ VRRP
è . ˝I ⁄ 100 Â

Ђ ⅓	
Ruijie(config-if)# **vrrp** *group* **priority** *level*	VRRP . ˝I
Ruijie(config-if)# **no vrrp** *group* **priority**	VRRP . ˝I

. ˝I Level ⊿ тп ⁄ 1~254 Â VRRP IP ƒ∂ѕ б æ Л∪ ⋔ Э
IP ƒ∂ѕ У ˇ VRRP . ˝I ⁄ 255˜ VRRP ĭ

´ ˘ VRRP ╟ Master (৲ Л৬ ৲ ৶) Â

VRRP ৲৶

ѫ VRRP ৲ ৶˘ ৲ ╟ ѭ
. ˝I Â У ৲ ৶ й a ৶ ˚
ѫ VRRP . ˝I ˘ ৶ У ৲
з . ˝I è ৶Л৬ й VRRP ╟ (ў)
Â

Ћ৬ ҂	
Ruijie(config-if)# **vrrp** *group* **track** *interface-type number* [*interface –priority*]	VRRP ৲ (

VRRP

ЋU ҂	
Ruijie# **show vrrp** [**brief** | *group*]	ŋ⁄n VRRP
Ruijie# **show vrrp interface** *type number* [**brief**]	∧ Э VRRP

ЮO ЮO VRQRP VRRP CÃ+ A'<ï D OVIRHA]•¸ ¼„Æ€ 1ð<RQ ⁄0) (Š Õ l %

Ruijie# **debug vrrp packets**	VRRP
Ruijie# **no debug vrrp packets**	VRRP
Ruijie# **debug vrrp state**	VRRP
Ruijie# **no debug vrrp state**	VRRP
Ruijie# **debug vrrp**	VRRP
Ruijie# **no debug vrrp**	VRRP

ЮЭ ЋЭ ¬ '

1. **debug vrrp** ЋЭ ¬

```
Ruijie# debug vrrp
Ruijie#
VRRP: Grp 1 Advertisement priority 120, ipaddr 192.168.201.213
VRRP: Grp 1 Event - Advert higher or equal priority
%VRRP-6-STATECHANGE: FastEthernet 0/0 Grp 1 state Master ->
Backup
VRRP: Grp 1 Advertisement from 192.168.201.213 has invalid
virtual address 192.168.1.1
%VRRP-6-STATECHANGE: FastEthernet 0/0 Grp 1 state Backup ->
Master
Ruijie#
debug vrrp
```

```
VRRP: Grp 1 Event - Advert higher or equal priority
Ruijie#
```

Э ѫ VRRP ǀ VRRP ˆ (Advertisement) . ″I a æ ѫ. ″I Â

4. **debug vrrp packets** ħυ ϟ

```
Ruijie# debug vrrp packets
Ruijie#
VRRP: Grp 2 sending Advertisement checksum DD4D
VRRP: Grp 2 sending Advertisement checksum DD4D
VRRP: Grp 2 sending Advertisement checksum DD4D
```

Э ѫ VRRP 2 ѿ ϟ VRRP ˆ ˘ è VRRP Ո ѝ 0XDD4D Â

```
Ruijie# debug vrrp packets
Ruijie#
VRRP: Grp 1 Advertisement priority 120, ipaddr 192.168.201.213
VRRP: Grp 1 Advertisement priority 120, ipaddr 192.168.201.213
VRRP: Grp 1 Advertisement priority 120, ipaddr 192.168.201.213
```

Э ѫ ǀ 192.168.201.213 VRRP 1 VRRP ˆ ˘ è. ″I ѝ 120 Â

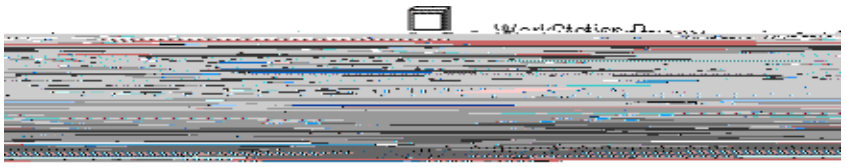
5. **debug vrrp state** ħυ ϟ

```
Ruijie# debug vrrp state
VRRP State debugging is on
Ruijie#
%VRRP-6-STATECHANGE: FastEthernet 0/0 Grp 2 state Master ->
Backup
%VRRP-6-STATECHANGE: FastEthernet 0/0 Grp 2 state Backup ->
Master
Ruijie# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# interface fastethernet 0/0
Ruijie(config-if)# no shutdown
Ruijie(config-if)# end
Ruijie#
%VRRP-6-STATECHANGE: FastEthernet 0/0 Grp 2 state Master -> Init
Ruijie#
```

Э Fastethernet 0/0 Э VRRP ѿ Masteř Backup Л ϟ Init Â

VRRP ńصر

جهفي 4 ˘ جه R1 б R2 Э VRRP й
192.168.201.0 /24 VRRP ˘ جه R3 Э VRRP ٧
╖ ÂЮ ٧ R1 б R2 VRRP
Â



فيجه4 VRRP فيجه

جهЮО ˘ R3 a ٧ ÂЮ R3

```
!
!
hostname "R3"
!
!
!
interface FastEthernet 0/0
no switchport
ip address 192.168.12.217 255.255.255.0
!
interface GigabitEthernet 1/1
no switchport
ip address 60.154.101.5 255.255.255.0
!
interface GigabitEthernet 2/1
no switchport
ip address 202.101.90.61 255.255.255.0
!
router ospf
network 202.101.90.0 0.0.0.255 area 10
```

```
network 192.168.12.0 0.0.0.255 area 10
network 60.154.101.0 0.0.0.255 area 10
!
!
!
end
```

VRRP ´

في 4

```
interface FastEthernet 0/0
no switchport
ip address 192.168.201.213 255.255.255.0
vrrp 1 ip 192.168.201.1
vrrp 1 timers advertise 3
!
interface GigabitEthernet 1/1
no switchport
ip address 60.154.101.3 255.255.255.0
!
!
router ospf
network 60.154.101.0 0.0.0.255 area 10
network 192.168.201.0 0.0.0.255 area 10
!
!
end
```

ل ˘ R1 б R2 ل VRRP 1 ˘ ل ل
IP سم فخ (192.168.201.1) з كا VRRP ´ ЮÂ R1
VRRP . ″I й 120ˇ R2 VRRP . ″I ل
100ˇ Л∪ R1 جھ ЮЎI VRRP Master Â

VRRP ٨

ھي 4 Â جھ ˘ (192.168.201.0/24)
R1 б R2 ˘ è ل
IP سم فخ 192.168.201.1ˇ 192.168.201.1
(è й 192.168.12.0/24) Â جھ R1 VRRP Master
Â б´ a ل ˘ جھ ˘ R1
VRRP ٨ GigabitEthernet 2/1 Â ЮˇR1 й ╠
(192.168.201.1) ╥ ˘ R1
a لˆ ˘ R2 Ҁ (≠ سم
فخ 192.168.201.1) ╥ Â ⁞ جھ R1 б ھھ ٨
GigabitEthernet 2/1 a ل ˘ R1 æ VRRP
. ″I ˘ ÿ R2 й ў ╠
(192.168.201.1) ╥ ’ ٨ R1 б ھھ ٨ GigabitEthernet
2/1 ˘ ж R1 VRRP . ″I ″Ą й ў ╠
╥ ÂЮ ˆ ⁞ R1 б R2 Â

R1 '

```
!
!
hostname "R1"
!
```

```
!
interface FastEthernet 0/0
no switchport
ip address 192.168.201.217 255.255.255.0
vrrp 1 priority 120
vrrp 1 timers advertise 3
vrrp 1 ip 192.168.201.1
vrrp 1 track GigabitEthernet 2/1 30
!

interface GigabitEthernet 2/1
no switchport
ip address 202.101.90.63 255.255.255.0
!
router ospf
network 202.101.90.0 0.0.0.255 area 10
network 192.168.201.0 0.0.0.255 area 10
!
!
end
```

R2 '

```
!
!
hostname "R2"
!
interface FastEthernet 0/0
no switchport
ip address 192.168.201.213 255.255.255.0
vrrp 1 ip 192.168.201.1
vrrp 1 timers advertise 3
!
interface GigabitEthernet 1/1
no switchport
ip address 60.154.101.3 255.255.255.0
!
router ospf
network 60.154.101.0 0.0.0.255 area 10
network 192.168.201.0 0.0.0.255 area 10
!
!
end
```

ل ˘ R1 б R2 ل VRRP 1 ˘ ل VRRP
( ) à ل ل IP فذ سم (192.168.201.1) з كا
VRRP ´ Ю Â R2 б R2 VRRP ˆ

(Advertisement) Й 3 Â Ю R1 VRRP
. ″I й 120 R2 VRRP . ″I 100 Л
R1 Ю ′I Master Â R1 й Master
Ю б GigabitEthernet 2/1 a R1 æ
VRRP . ″I 30 й 90 R2 й Master
Â R1 б GigabitEthernet
2/1 ╗ VRRP . ″I 30 120
R1 ″Ą й Â

VRRP

VRRP Â
У Л Э
Й

4 Â (192.168.201.0/24)
R1 б R2 (A) 1
IP 192.168.201.1 (C) ‡ 2
IP 192.168.201.2 Â R1 2 й
1 й R2 2 й
1 й Â Ю R1 б R2 Â

R1

```
!
!
hostname "R1"
!
interface FastEthernet 0/0
no switchport
ip address 192.168.201.217 255.255.255.0
vrrp 1 timers advertise 3
vrrp 1 ip 192.168.201.1
vrrp 2 priority 120
vrrp 2 timers advertise 3
vrrp 2 ip 192.168.201.2
vrrp 2 track GigabitEthernet 2/1 30
!
interface GigabitEthernet 2/1
no switchport
ip address 202.101.90.63 255.255.255.0
!
router ospf
network 202.101.90.0 0.0.0.255 area 10
network 192.168.201.0 0.0.0.255 area 10
!
```

```
!
end
```

R2 '

```
!
!
hostname "R2"
!
!
interface Loopback 0
ip address 20.20.20.5 255.255.255.0
!
interface FastEthernet 0/0
no switchport
ip address 192.168.201.213 255.255.255.0
vrrp 1 ip 192.168.201.1
vrrp 1 timers advertise 3
vrrp 1 priority 120
vrrp 2 ip 192.168.201.2
vrrp 2 timers advertise 3
!
interface GigabitEthernet 1/1
no switchport
ip address 60.154.101.3 255.255.255.0
!
router ospf
network 60.154.101.0 0.0.0.255 area 10
network 192.168.201.0 0.0.0.255 area 10
!
!
!
end
```

R2 б R2 VRRP 1 б 2 й ў a

VRRP б

VRRP

IP Ping a

¸ جھ è Э Ping IP سمفخ a ‡ ل ЛЮ ١ يچ :
VRRP ل Л **show vrrp** Ъ ٦ VRRP
'

¸ سم б Æ ل У سم
ARP Ї IP سمفخ ARP ˘ '

¸ سم б a جھ ل У ‡ جھ سم
Э Ї ĵ IP سمفخ '

' ل У VRRP Master

ĵ '

¸ ل У VRRP л Л ٨ Э VRRP a ل'

¸ ل У VRRP л Л ٨ Э VRRP ل كل ٪
˘ a У '

¸ ل У VRRP جھ Л ٨ ˘
ĵ Л ٨ '

¸ ل У VRRP Э VRRP ˆ ل a У ˘ з
˜ ℸ '

¸ ل У VRRP Э VRRP IP سمفخ a У Â

RLDP

RLDP

RLDP

RLDP Rapid Link Detection Protocol

1

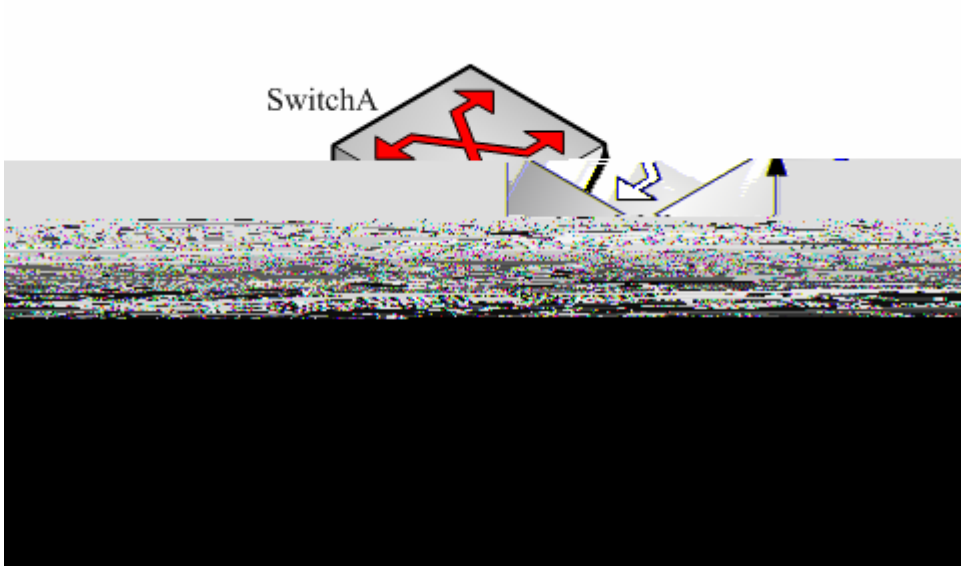
RLDP (Probe) (Echo).RLDP RLDP linkup Probe Probe

&

RLDP ´ Л Ո ч Л ╖ ˘ ч ٨
RLDP˝ з а У ŭ RLDP ٨ Ю ٨˘ ї ‡ RLDP
Â

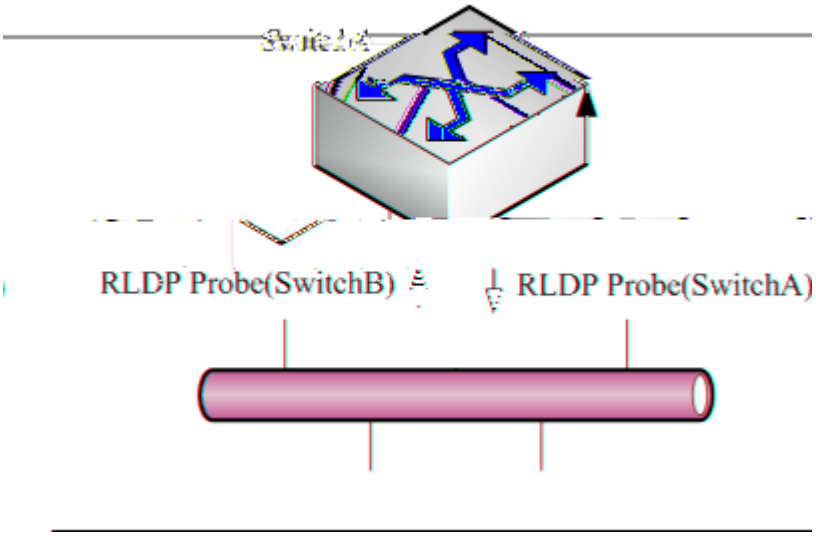
ή صر

'



2 في

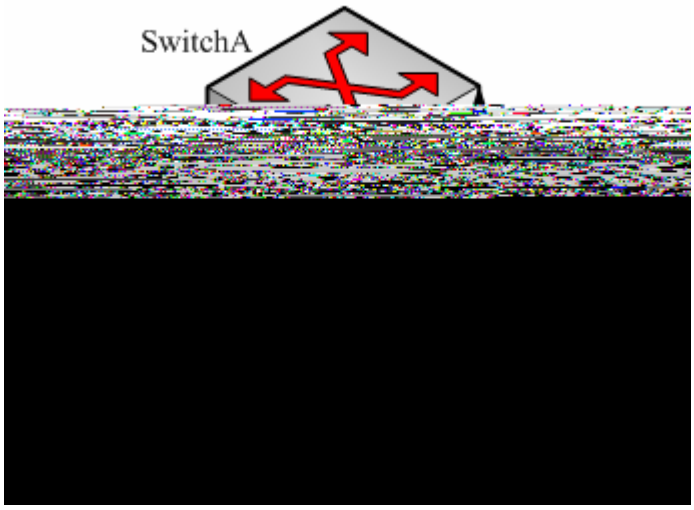
٨ Э Â Э في ˘ RLDP جه
٨ Э ∫ ч RLDP ˘ ‡ ٨ й ˘
RLDP



في 3 ´ ┘

´ ┘ ٨ ٨ ٨ ٨ ^
"I ´ ┘ ´ ┘ ٦ ~ Â Э في ˘ RLDP جھ
٨ Э ٨ ˚ ٨ ‡ ٨ ٪´ ┘ ˘ RLDP
Â ٨ ٨ ˚ RLDP
˘ ≠ ٪ ٦ ´ ┘ Â

٦ ┘ '



في 4 ٦ ┘

٦ ┘ ч ٦ Â Э في ˘
٨ جھ ٦ RLDP ٨˘ У ˚ ؛ ˘
ж ٪ ٦ ┘ Â ÿ Э ˘ ٦ ┘ Э ↑ ΰ ´ ┘
Â

&

ч У ŭ RLDP ≠ ѝ ч л ´ л ˘ ☯
ч л ´ л ˜ ч ŭ RLDP˘ Л∪
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RLDP

ÿ ЛЬЮ ŭ RLDP

¸ RLDP

¸ RLDP

¸ ч RLDP

¸ RLDP

¸ RLDP

¸ ч RLDP

RLDP

RLDP	DISABLE
ч RLDP	DISABLE
	2S
	3

~

¸ RLDP ﻉ ﷺ ﻉ (↑ AP) ∩ ﻉ Â

¸ RLDP untag Â

¸ RLDP ﺹ block ╗ ∩ STP Â ≠
ﻉ ﺹ ﻯ blcok ‡ stp ï ‡ STP ⁞ ´ ﻝ
ˇ ﻝ STP ﻉ ﻝˇ RLDP. ﻉ block Â

RLDP

ﻉ RLDP ˇ ﻉ RLDP Â

ﺟ ЮˇЮ RLDP

ħυ ϟ	
Ruijie(config)# **rldp enable**	RLDP ╗ Â
Ruijie(config)# **end**	ﻫ Â

RLDP ħυ ϟ **no** Â

ﻉ RLDP

RLDP ﷺ ﻉ ˇ ﺝ ﻉ RLDP Â ﻉ
ﺟ ﻉ RLDP ˇ ﻝ ﻉ ﺹ ∩ ﻉ Â
ﺹ ↑ ' unidirection-detect ´ ﻝ ~ à bidirection-detect ﻝ ﻝ
~ à loop-detect ~ Â ↑ ' warning ˆ ~ à block
ˆ ﻉ ˉ ﻝ ~ à shutdown-port ﻉ ~ à shutdown-svi
ﻉ ﺟ svi Â

ﺟ ЮˇЮ ﻉ RLDP ╗ '

ħυ ϟ	
Ruijie(config)# **interface** *interface-id*	ﻉ
Ruijie(config-if)# **rldp port** {**unidirection-detect** | **bidirection-detect** | **loop-detect** } {**warning** | **shutdown-svi** | **shutdown-port** | **block**}	ﻉ RLDP ﻝ ﺹ ∩ Â

Ruijie(config-if)# **end**	ھ

ٴ RLDP **no** У ص Â

ЛЮ ج GigabitEthernet 0/5 Э RLDP ص Ո

```
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
port state     : normal
local bridge   : 00d0.f822.33ac
neighbor bridge : 0000.0000.0000
neighbor port  :
unidirection detect information:
action : shutdown svi
state  :  normal
bidirection detect information :
action : warnning
state  :  normal
loop detect  information    :
action : block
state  :  normal
```

ٴ ύ

¸ ٴ a shutdown-svi ˇ ج ج ٴ ل
a Â

¸ ٴ Ю a ŭ RLDP ˇ ĭ ‡ ٴ
Â

¸ ج aggregate port Э block з ٴ ل ˇ ‡
ج ٴ ḿ a ل aggregate port ˘ ٴ ˇ ĭ ‡ ˘ ٴ
ل Ո a У Â

¸ RLDP ˇ ‡ ل ˆ Â ل Л log ╥
ˆ ل¦ log Ь Ы˘ log ⋮ ل Л З Â

¸ ل ˚ ⁸˘ ң ḓ block ٴ Ÿ cpu, ج
й block ˇ ٴ block ˇ Ÿ
cpu, ¦ ˇ Л ج
ص shutdown-port Â

RLDP

RLDP ╖ ∧ □ ﻫ ﻟ RLDP Probe Â

ﺟ ЮЎ Ю RLDP '

Ьυ ϛ	
Ruijie(config)# **rldp detect-interval** *interval*	˘ interval ﻟ ﺗﻦ 2-15s, 3s Â
Ruijie(config)# **end**	ﻫ Â

˘ Ьυ ϛ **no** Â

RLDP

RLDP ╖ ∧ ﺟ ^ × ~ ÿ ˆ ˘ ‡ ∧ ﻯ ˘ έ ﺻﺮ ∧ Â

ﺟ ЮЎ Ю RLDP '

Ьυ ϛ	
Ruijie(config)# **rldp detect-max** *Num*	˘ num ﻟ ﺗﻦ 2-10, 2 Â
Ruijie(config)# **end**	ﻫ Â

˘ Ьυ ϛ **no** Â

&

∧ ﺟ´ ﻝ Ո ﻟ ﻝ Ю ˘ ∧ ∧ ŭ ˘ Â

∧ RLDP

shutdown-port ∧ ﺟ ﻯ ў ╟ RLDP ˘ ā ˘ ‡ ﻟ Л Ьυ ϛ ŭ ╟ shutdown ∧ RLDP Â Ьυ ϛ ≠ è ∧ Â

ج Ю Ю ٨ RLDP '

Ьυ ٶ	
Ruijie# **rldp reset**	RLDP ٨ Â

&

≠ ٦ Лυ ج Ю **errdisable recover** Ьυ ٶ . ΰ
╟ rldp ٨ (shutdown-port
٨) RLDP Â ˘ rldp ٨ a ˘
≠ у ˘ **errdisable revover interval**
˘ rldp **errdisable recover interval**
˘ ≠ detect-interval* detect-max

```
interface GigabitEthernet 0/1
port state:normal
neighbor bridge : 00d0.f800.41b0
neighbor port   : GigabitEthernet 0/2
unidirection detect information:
action : shutdown svi
state  : normal
interface GigabitEthernet 0/24
port state:error
neighbor bridge : 0000.0000.0000
neighbor port   :
bidirection detect information :
```

ÿ Э ㄴ Л∪ ˚ ˘ ㅀ GigabitEthernet 0/1 Ь ص˙ ´ ㄹ
à ㄱ ㄹ à , ˚ ⋮ ㅣ ㅀ ㅉ svi à ㅂ
˘ à ㅀ ㅉ svĭ è ㄱ ˘ ㎛ ㅀ ㅣ
errorˇ ˘ ㅀ svi ≠ shutdown Â

TPP

TPP

TPP(Topology Protection Protocol˜) У ˜ Â

D Ո B Â

B CPU a Â A Â Ю C à D

Â

TPP

TPP Ո Â Ю a a

Â

&

Â TPP cpu topology-limit cup cpu 50-70, TPP TPP a TPP TPP Â

Â **no** Â

Ruijie> **enable**	
Ruijie# config terminal	
Ruijie(config)# **topology guard**	
Ruijie(config)# **end**	
Ruijie# copy running-config startup-config	

no topology guard ╖

ᄾ

ƕ ʢ Ю'

ƕ ʢ	
Ruijie> **enable**	ƕ ʢ
Ruijie# config terminal	
Ruijie(config)# **interface gi** *0/1*	ᄾ
Ruijie(config-if)# tp-guard port enable	ᄾ ╖
Ruijie(config-if)# **end**	ۿ ƕ ʢ

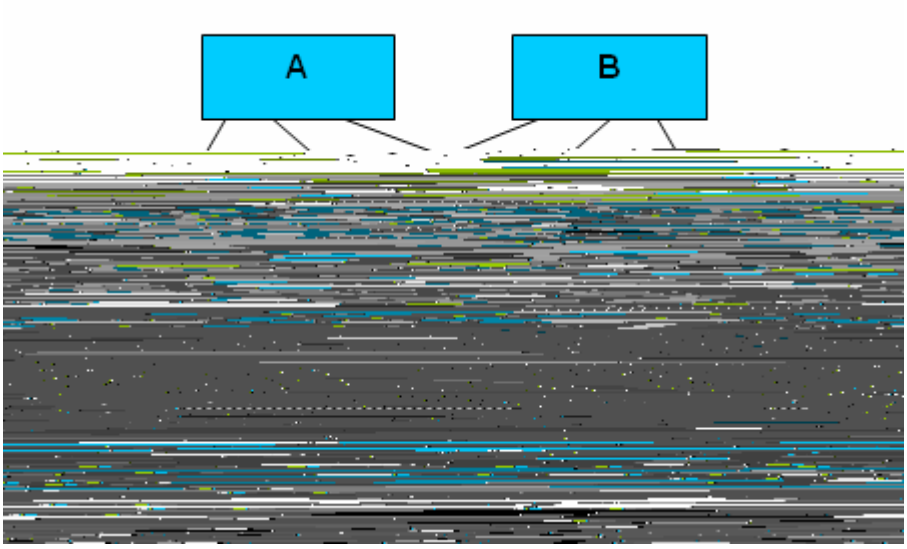
no tp-guard port enable ᄾ ˘ ƕ ʢ ᄾ ɣ ᄾ Ռ ᄾ Â a AP ˜ ᄾ Â

&

ѝ ˘ ˘

ᄾ ˘ ˩ ữ ˧ ᄾ ˘ ﺳﻤ

˘ a ˩ ˧ ˆ ˆ Â ˧ Ú ˈ ﺳﺠ



2 في

في A à B ŕ Ь ˘ C à D Ո E ŕ γ Â

Ь A à B Ո γ C à D Ո E ƙ ŭ MSTP ˊ ɻ ч ɻ Ь
ŭ VRRP ˜ Â ╗ MSTP Ո VRRP ╗ ˘
ɻ a Â

Ь A à B ╗ ˘ ɻ ɻ ɻ
╗ Â ɻ ɻ γ C à D Ո E ╗ Â

TPP

ɻ TPP Ю'

TPP ɻ

TTP ɻ

جم Ю ЮЋυ ʒ TTP ɻ '

Ћυ ʒ	
Ruijie# show tpp	TPP ɻ Â

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

˚ У ↓ Ո ╠ Э ˚ ˘
Flash й ╠ Ы˘ Ո
˚ ˘ Л υ ↑ У ˚ Â

˚ جھ Flash Э Л υ ˘ ˚ У ˚
˚ ھھ Â Ы Ї Ą ↓ è ˘ ˚
╠ Л υ ↑ هی فجـ ض ↑ ˘ Л υ ˚ ˘
˘ a ˚ ˘ й Ї ˚ – ˘ ˚
Ч ╗ Л υ ↑ Â

˚

ÿ ЛЮ ŭ ˚ '

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flash a 128M

dir

⁋

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ЮЎ Ю

Ruijie# **cd** *directroy*	directory Â
Ruijie# **cd** *../*	Э У
Ruijie# **cd** *./*	

ЛЮЮ Ю MNT Document

```
Ruijie# cd mnt/document
```

Л Ä MNT/Document Ю

8

8 У У Â

ЮЎ Ю **copy** Л Л Â

Ruijie# **copy flash:** *filename* **flash:** *directoryname*	8 Â
Ruijie# **copy flash:** *filename* **sour** *directoryname*	8 Â

ЛЮЮ У У

```
Ruijie# copy flash:config.tex flash:tmp/ r@      co2101C4j_ flash xtTT6 1 T
```

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Ьυ ҳ	
Ruijie# **dir**	ɱ Ю Â
Ruijie# **dir** *directory*	Â

ЛЬЮ ɱ Ո

```
Ruijie# dir
Ruijie# dir ../bak
```

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Ьυ ҳ	

Ruijie# **makefs dev** *devname*

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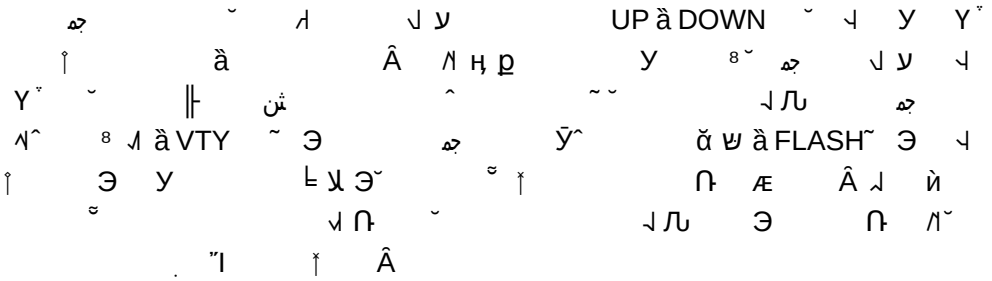
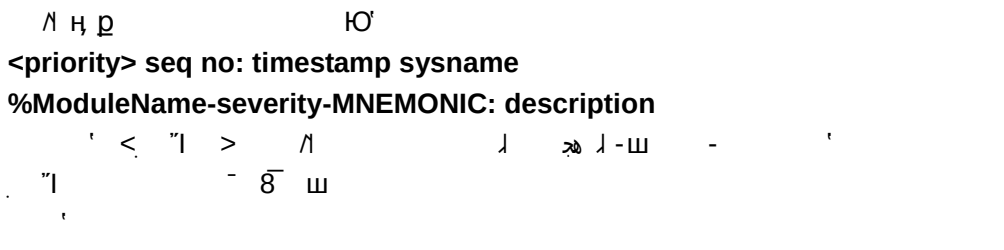
Ruijie#

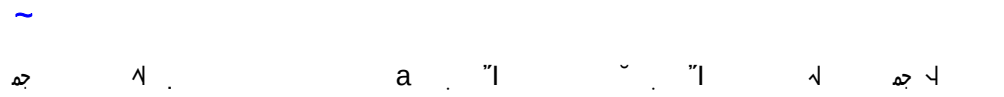


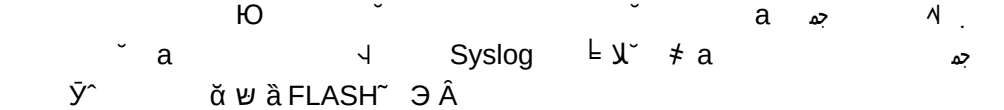


<priority> seq no: timestamp sysname

%ModuleName-severity-MNEMONIC: description


```
<189> 226:Mar  5 02:09:10 S3250 %SYS-5-CONFIG_I: Configured from console
by console
```





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Ьυ ʒ	
Ruijie(config)# **logging on**	
Ruijie(config)# **no logging on**	

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⅄ ⋮ ˜ . Â

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Â

a ⅄ ˘ ⋐ Ю ЛЬЮЬ
ʒ'

Ьυ ʒ	
Ruijie(config)# **logging buffered** [*buffer-size* | *level*]	⍭ ă ш

Ruijie# **termninal monitor** ⋐ VTY SysoggS

Ъυ ϗ	
Ruijie(config)# **logging console** *level*	ѫ ⁸ ⅄ Э ⁞
Ruijie(config)# **logging monitor** *level*	ѫ VTY ϟ(telnet ϟ) Э ⁞
Ruijie(config)# **logging buffered** [*buffer-size* | *level*]	ѫ ă Ш ⁞
Ruijie(config)# **logging file flash:***filename* [*max-file-size*] [*level*]	ѫ FLASH Э ⁞
Ruijie(config)# **logging trap** *level*	ϟ Syslog Server ⁞

⅄ ң ҏ ⁞' й ЛЪЮ 8

Emergencies	0	˘ a
Alerts	1	. ⅄
Critical	2	
Errors	3	
warnings	4	ˆ
Notifications	5	صˇ a
informational	6	
Debugging	7	

˘ ⁞ ˘ . 0 ⁞ ⁞ Â

⁞ Лυ ⅄ˇ æ ⁞

Â Ъυ ϗ **logging console *6*** Лυ ⅄ˇ ⁞ й 6

6 ѫ ⁸ ⅄ Э Â

⁸ ⅄ ⁞ й 7 Â

VTY ϟ ⁞ й 7 Â

ϟ Syslog Server ⁞ й 6 Â

ѫ ă Ш ⁞ й 7 Â

ѫ FLASH ⁞ й 6 Â

ϟ Лυ Ъυ ϗ **show logging** ѫ a ⅄ Э ⁞ Â

ч Syslog Server . ″I У ↑ ˘ ң
ص Â

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Ьu ҷ	
Ruijie(config)# **logging facility** *facility-type*	
Ruijie(config)# **no logging facility** *facility-type*	ѝ Â

Ю л ӣ Ѫ'

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
14	log alert
15	clock daemon
16	local use 0 (local0)
17	local use 1 (local1)
18	local use 2 (local2)
19	local use 3 (local3)
20	local use 4 (local4)
21	local use 5 (local5)
22	local use 6 (local6)
23	local use 7 (local7)

Л ң ҏ ѝ 23 Â

فخ سم

ЮЎ ۷ Syslog Server سم فخ ﻯ ۷ ۸ سم فخ Ў ۷
Л Ъ ҳ ҂ ش سم فخ Â

۷ Л Log IP سم فخ Ў ≠ ۷ Л Log ۸ Â

سم فخ Ў ج Ю ЛЪЮЪ ҳ'

Ъ ҳ	
Ruijie(config)# **logging source interface** *interface-type interface-number*	۸
Ruijie(config)# **logging source ip** *A.B.C.D*	ip سم فخ

۷ LOG

ЮЎ б ˇ Л ۷ Ъ ҳ Ў a LOG Â
/ LOG ˇ Ъ ҳ LOG Â ج
Ю ЛЪЮЪ ҳ'

Ъ ҳ	
Ruijie(config)# **logging userinfo**	/ LOG ’
Ruijie(config)# **logging userinfo command-log**	Ъ ҳ ˇ ۷ LOG

ﻯ ˇ ج Ю ЛЪЮЪ ҳ'

Ъ ҳ	
Ruijie# **show logging**	ă ש ˇ Л ۷
Ruijie# **show logging count**	۸ ﺝﻫ
Ruijie# **clear logging**	ă ש
Ruijie# **more flash:***filename*	FLASH ˚

~

show logging count Ъ ع ˘ ˘ Л У
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ЛЪЮ У ŏ ╖ У ή ص '

```
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          // ŏ " Л
Ruijie(config)# service timestamps debug datetime  // ŏ debug
                                                    ˘
Ruijie(config)# service timestamps log datetime  // ŏ log
                                                  ˘
Ruijie(config)# logging 192.168.200.2    //  syslog server فخ سه
Ruijie(config)# logging trap debugging       //  ⋮
                                              ↰ syslog server
Ruijie(config)# end
```

1 تجى

1 تجى

جﺰى ٨ ŭ ╟ Ո

جﻫ ŭ ╟ جﺰى ٨ جﻫ ˘ ‡ جﻫ ´ Ю'
جﺰى ٨ جﻫ ˘ جﺰى ٨ ĭ ˘ جﺰى ٨
˘ ‡ جﺰى جﻫ ٨ جﺰى Ю˘ جﻫ У ٦ جﺰى ٨ Ÿ
˘ ‡ جﻫ ´ Ю Â

جﻫ جﺰى ٨ ˘ جﺰى ٨ ˘ جﺰى ٨ , ٦
'

STACKMODULE-LINKSTATUS-CHANGED: Link loss is detected in the stack loop.

Device [2] loss has been detected, system will reset.

جﻫ 10 جﺰى ٨ ˘ ‡ جﺰى ٨ ٦ Л Ս , ٦
'

STACKMODULE-LINKSTATUS-CHANGED: Link recover is detected in the stack loop.

10 ˘ جﺰى ٨ ˘ جﺰى ٨ ŭ ╟ ˘ جﺰى ٨ Â

جﻫ Ю˘ جﺰى ٨ ˘ a ŭ ╟
˘ ˜ Л˘ جﺰى ٨ ٧ ٦ Â

جﺰى ٨ a ˘ ≠ a جﻫ جﺰى ٨ à à ˜ Â
Я ˘ ‡ جﺰى ٨ ŭ ╟ ˘ جﺰى ٨ Â جﻫ جﺰى ٨
˘ У Л Ю Э ˘ جﺰى ٨ è ╟ Æ
˘ جﺰى ٨ Â

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جﻫ جﺰى ٨ à à ˜ ˘ ‡ جﺰى ٨ Æ˘ ˘
جﺰى ٨ Â

جﺰى ٨

جﺰى ٨ Ю '

تجى ⁄| ⁄|	تجى ⁄| هج
. ˝l	1
	SWITCH

/\| تجى ⁄| ˜

تجى ⁄| ў ˜ . ˝l ˘ . ˝l й ў ˘ ˜ . ˝l У ˘ ‡ MAC سمفخ ˘ MAC سمفخ й ў Â . ˝l /\| ŭ Â

تجى ⁄| /\|˘ ⁄| ў ⁄\| ˘ ԉ جم تجى ⁄| ɱ ˝l У ⁄| ў ˘ جم´ Ю ἐ. ˝l й . ˝l ˘ ἐ جم تجى ⁄| й ў Â . ˝l ÿ æ̂ й 1-10˜ ˜ й 1˘ ⁄\| . ˝l Â تجى ⁄| ŭ ╠ **show member**ƚυ ʇ تجى ⁄| ˜ ˘ ⁄ ԉ تجى ⁄| ˜ MACسمفخ تجى ⁄| ԉ ⁄ " Â

تجى ⁄| ÿ ˝ ̂ N /\| Э ‡ تجى ⁄| ԉ Â

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تجى ⁄| ⁄ ў ⁄\| ˘ ԉ جم تجى ⁄| ɱ ˝l У ⁄| ў ˘ ἐ. ˝l جم´ Ю й ˘ /\| تجى ⁄|˘ جم تجى ⁄| й ў Â

. ˝l

جم Ю, Юƚυ ʇ :

ƚυ ʇ	
Ruijie(config)# **device-priority** [*member*] *priority*	*member*: ⁄ 1-MAX, ˜ . *priority*: ⁄ 1-10, . ˝l Ю ˜ й 1

: ˜ 2 . ˝l й 8

```
Ruijie(config)# device-priority 2 8
```

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ﻝ ˇ write ﻩ ﻍ ˇ ﻡ ﻱ ﻝ Æ ﻝ ﻱ ﻝ .
ˮ I Â

⋮ ﻝ

ﻭ ˇ ﻝ Л ﻱ ﻝ ˜ ⋮ ﻝ Â ﻡ Ю, Ю
ﻩ ﻍ :

ﻩ ﻍ	
Ruijie(config)# **device-description** [**member** *member*] *description*	*member*: ﻝ 1-MAX, ˜ . *description*: ﻭ 31, ⋮ ﻝ Ю ˜ ﻭ 1

: ˜ 2 ⋮ ﻝ ﻭ red-giant

```
Ruijie(config)# device-description member 2 red-giant
```

ﻱ ﻝ ﻧ

ﻡ ﻧ Ю, Юﻩ ﻍ :

ﻩ ﻍ	
Ruijie(config-if)# **stack on**	ﻱ ﻝ ﻧˇ ﻝ Л no ﻧ ﻝ

: GigabitEthernet 0/28 ﻧ ﻱ ﻝ ╗

```
Ruijie(config)# int GigabitEthernet 0/28
Ruijie(config-if)# stack on
```

~

S3750 ˇ ﻧ ﻭ ﻱ ﻝ ﻧ ﻝ Л ﻧ
ﻱ ﻝ Â S3750-24 ˇ è GigabitEthernet 0/27˝ GigabitEthernet 0/28
ﻝ Л ﻭ ﻱ ﻝ ﻧ ’ S3750-48 ˇ è GigabitEthernet0/51ˇ
GigabitEthernet0/52 ﻝ Л ﻭ ﻱ ﻝ ﻧ Â ﻝ ˇ Э ﻧ Ы
ﻭ ˮ I ﻧˇ S3750 a ˮ I ﻱ ﻝˇ Л stack on ﻩ ﻍ
б medium-type fiber ﻩ ﻍ a ﻝ Â

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ЛЬЮ Ьu ٦ ﺝﺝﺝ ١ ﺝﻫ ˜ '

device-priority [*member*] *priority*
device-description [**member** *member*] *description*
stack on

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ў ╟ ╟ Â

ﺝﺝﺝ ١

ﺝﻫ ЮЎ ٧ Л Ь ЮЬu ٨ ﺝﺝﺝ ١

Ьu ٦	
Ruijie# **show version devices**	
Ruijie# **show version slots**	
Ruijie# **show version**	ﺝﺝﺝ ١
Ruijie# **show member** [*member*]	˜ ﺝﺝﺝ ١ *member*: ٧ 1-MAX, ˜

```
1       2     0     1
2       0     48    48     M5750-48GT/4SFP_Static_Module
2       1     1     1        M5700_STACK_IB4X
2       2     1     1        M5700_STACK_IB4X
3       0      24    24      M5750-24GT/12SFP_Static_Module
3       1     1     1        M5700_STACK_IB4X
3       2     1     1        M5700_STACK_IB4X
4       0    24       24     M5750-24GT/12SFP_Static_Module
4       1     1     1        M5700_STACK_IB4X
4       2     1     1        M5700_STACK_IB4X
5       0     24   24        M5750-24GT/12SFP_Static_Module
5       1     1     1        M5700_STACK_IB4X
5       2     1     1        M5700_STACK_IB4X
6       0     24    24       M5750-24GT/12SFP_Static_Module
6       1     1     1        M5700_STACK_IB4X
6       2     0     1
7       0     24    24       M5750-24GT/12SFP_Static_Module
7       1     1     1        M5700_STACK_IB4X
7       2     1     1        M5700_STACK_IB4X
8       0     48    48        M5750-48GT/4SFP_Static_Module
8       1     1     1        M5700_STACK_IB4X
8       2     1     1        M5700_STACK_IB4X
```

Ruijie#**show version**

```
System description : Red-Giant 10G Routing
Switch(RG-S5750-24GT/12SFP) By Ruijie Network
System start time       : 2007-4-23 17:39:11
System hardware version : 1.0
System software version : RGOS 10.1.00(2), Release(12889)
System BOOT version     : 10.1.11330
System CTRL version     : 10.1.11330
System Serial Number    : 1234942570002
Device information:
Device-1
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570002
Device-2
Hardware version : 1.0
Software version : RGNOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570001
Device-3
```

```
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570003
Device-4
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570004
Device-5
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570005
Device-6
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570006
Device-7
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570007
Device-8
Hardware version : 1.0
Software version : RGOS 10.1.00(2), Release(12889)
BOOT version     : 10.1.11330
CTRL version     : 10.1.11330
Serial Number    : 1234942570008
```

Ruijie#**show member**

```
Member     Mac Address     Priority Software Version
Hardware          Version   Description
------     -------------   ------------------------
----------------------------
1        00d0.f810.3323  1        RGOS 10.1.00(2),
Release(12889)   1.0        SWITCH
2        00d0.f822.33aa  1        RGOS 10.1.00(2),
Release(12889)   1.0        SWITCH
3        00d0.f822.33ae  1        RGOS 10.1.00(2),
```

```
Release(12889)  1.0        SWITCH
4       00d0.f822.33b0  1       RGOS 10.1.00(2),
Release(12889)  1.0        SWITCH
5       00d0.f822.33b2  1       RGOS 10.1.00(2),
Release(12889)  1.0        SWITCH
6       00d0.f824.23b4  1       RGOS 10.1.00(2),
Release(12889)  1.0        SWITCH
7       00d0.f833.44b4  1       RGOS 10.1.00(2),
Release(12889)  1.0       SWITCH
8       00d0.f855.33ae  1       RGOS 10.1.00(2),
Release(12889)  1.0        SWITCH
```