Ѧ

RG-S3750 "

صر ѽ Ԋ

RGOS 10.2(5)

ὸ

ᾌ ŋ ɘ ˚ ɔ˘ ἒ ᾋ ˘ a ˧ ˘ Ὼ Ὼ
ᴎ ᵏ ɘ Â Ὼ ᴎ جـ ἢ ᾌ ꟻ ɖ ἒ ᾋ ῆ ˩
˘ ת ɣ ᾌ è à a ñ ˘ Ꝺ ˧ Ⴖ ˘
Ὼ ᴎ a ˙ Â

ŋń

ŽĄ ˚ ѝ ' RGOS®10.2(5) Â

:;‘;: Л Ю " ж̃

[x | y | ...] ÿ ч э э è ۸ У э a Â

// ۸ й Â

3. ۸

⁘ ۸ ج ɔ è ⁞ ىس ˇ ⊖ ЊЖ Ю'

~ à ˆ à ɔ è Ү Â

& à à à ɔ ̈ 'I

&

 ̈Ą w R ̄ ۸ ص ۷ ۷ a ˇ ɔ è ۸ ң ҕ ۸ ص

 ̈Ą ̄ w R ą è ۷ Ű ѐ ң ҕ " ̈ ˆ ң ҕ ص ۸ à ~ ˇ é ᴇ ą Л G ą й ñ Â

 ̈Ą è ۴ Ⱶ ۴ Ⱶ ң ҕ في ˇ Ҙ ҂ У ЊЖЮ Ⱶˇ Л ۴ ҂ ~ Ь Ҭ Â

---

1 Ъ ч

G Ъ ч ˘ ч Л G Ъ ч Â

ў ↑ ЛЮ ё '

¸ Ъ ч

¸ ╠

¸ ӈ Ъ ч

¸ G Ъ ч **no Ո default**

¸ CLI ą

¸ G ˥ ч Ъ ч

¸ G

¸ CLI ą Ո

¸ CLI

1.1. Ъ ч

ǂ a ч ˘ м Ъ ч ā ф ч Л G Ъ ч Â

ж Ъ ч Ю ώ Л ^ ?˜ ч Л " э Ъ ч G Ъ ч Â

Ո У э ˘ ″I ¥ ^ User EXEC ˜ ˘ ч Л G Ъ ч Â ж Ю˘ ч ч Л G Ъ ч˘ з Ъ ч ╗ ≠ ч⁞ У Ҽ ⁸˘ R ę show Ъ ч Â Ъ ч ↄ a ̧ ɗ Â

G Ъ ч˘ ″I ώ ^ Privileged EXEC ˜ Â ˘ ж ώ ώ ч ч Â ж Ю˘ ч Л G Ъ ч˘ з ώ ѿ Â

G ^ ѿ à ч ˜ Ъ ч˘ ̧ м н ⁝ Â ɗ ф ą ˘ Ҽ Ъ ч ɗ Ю ˘ ж ŭ ╠ Ӓ Â ώ ѧ ˘ ″I ώ ѿ Â ÿ ѿ ч˘ ч Л ώ ч ѧ Â

Ю " ф Ъ ч à ị э à à ị Â Ǐ ѧ ѝ “Ruijie” Â

Ъ ч '

Ю Ъ			Ю У	Ъ Ѫ
User EXEC ^ ~	″I ώ Â	Ruijie>	ώ **exit** Ю Ъ Â ώ ˘ ώ **enable** Ю Ъ Â	G ѡ ầ ạ
Privileged EXEC ^ ~	ѿ Ю ˘ G **enable** Ю Ъ ώ Â	Ruijie#	ѡ ˘ ώ **disable** Ю Ъ Â ώ ώ ˘ ώ **configure** Ю Ъ Â	G Ю Ъ Ѧ **interfa** Q **interfa**

1.2. ╠

ȷ ΛƱ ƾ ƫ ȝ Ю ώ ⁄ˡ ˆ **?**˜ " ə ƫ ȝ ƫ ȝ Â ≠
ȷ ΛƱ " ȷ ƫ ȝ ˷Ω ə ƫ ȝ ˥ ə¸ Â Ю '

ƫ ȝ	
Help	ƾ˙ ¡ ƫ ȝ Ю ╠ ə¸ Â
abbreviated-command-entry?	ȷ ƫ ȝ ˷Ω s Â R ' Ruijie# **di**? dir disable
abbreviated-command-entry<Tab>	G ƫ ȝ ˷Ω Â R ' Ruijie# **show conf<Tab>** Ruijie# **show configuration**
?	" ƫ ȝ ЮУ ə ˷Ω ˷Ω Â R ' Ruijie# **show ?**
command keyword ?	" ˷Ω ˷Ω ЮУ ə ȷ Â R ' Ruijie(config)# **snmp-server community ?** WORD SNMP community string

---

~

ɣ ƫ ȝ˘ ˚ word/string Ω˷Ω ï ϙ Ю˘ . ˝ł ˥ ˷Ω ˘ Ω έ ɛ ╖ ˷Ω Â '

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

˘ aaa domain d ƫ ȝ˘ . ˝ł ˥ ˷Ω defaul˜ ƫ ȝ
aaa domain default Â

1.3. ņ̃ ƫ ȝ

ņ̃ ƫ ȝ˘ ˬ ώ ƫ ȝ ˷Ω У ˚ ˘ ˬ ˚ ⁞
ر У ƫ ȝ ˷Ω . ȷ Â

R **show configuration** Ъυ ϗ ϟ Ռυ ϔ ˈ

Ruijie# **show conf**

1.4. G Ъυ ϗ no Ո- default

ύ ψ Ъυ ϗ **no** Â ˘ G **no** ə ╖ ˘
б Ъυ ϗ ϟ ɔ Â R ϰ Ъυ ϗ **no shutdown** ΅Ω ϰ Ъυ ϗ
shutdown ϟ ɔ˘ . ϰ Â G a **no** ΅Ω ΅Ω
΅Ω Â

Ъυ ϗ **default** ˘ Ъυ ϗ **default** Ъυ ϗ ϋ ḣ Â
Ъυ ϗ ḣ ╖ ˘ ϯ ϫ ϙЮ **default** ɔ Ո- **no**
ϡ Â ϳ Ъυ ϗ ḣ ϊ ╖ ˘ ϫ ϙЮ˘ **default**
Ո- **no** ɔ ϟ Â **default** Ъυ ϗ ╖ ˘ ϟ
ϋ ϊ Â

1.5. CLI ə ϥ

Ю " ϖ ϫ G CLI ϟ ϳ ə ϥ Â

CLI ə ϥ ˈ

ə ϥ	ΰ ѭ	! ϰ ╠
% Ambiguous command: "show c"	ώ ˘ ϵ ϱ У Ъυ ϗ Â	ώ Ъυ ϗ˘ ϟ ѭ ´ ώ У э ϩ Â ϟ ώ ΅Ω

ώ ↓

Ї Â

ÿ Ъ ы Ъ ъ ώ Ъ ъ˘ Ю è ɔ'

ɔ	
Ctrl-P Э ы	ѫ Ъ ы Ъ ъ è ѭ У Ъ ъ Â ÿ У ˘ G ɔ ы Л Â
Ctrl-N Ю ы	ѫ G ѿ Ctrl-P Э ы ɔ Ѯ ы˘ G ɔ ѫ Ъ ы Ъ ъ è ѪЇ У Ъ ъ Â G ɔ ы Л Â

1.7. G

ѫ Ъ ъ ы G Ї ╖ Â ↑ '

ˏ

ˏ Ъ ъ ╟ ∧

1.7.1.

Ю " '

╖		
ѫ ╟ ″I Â ӧ	Ctrl-B ы	″I Ї У э Â
	Ctrl-F ы ы	″I Ї ы У э Â
	Ctrl-A	″I Ї Ъ ъ Â
	Ctrl-E	″I Ї Ъ ъ Â
Ї ώ Â	Backspace	Ї ″I У э Â
	Delete	Ї ″I ѫ Â
╟ У У Â	Return	ѫ ӧ Ѫ ӧ ы Э ╟ У ˘ Ю У ӧ ˘ Ѳ ѫ ӧ G Â
	Space	ѫ ӧ ӧ ы Э ╟ У ˘ Ю У ӧ ˘ Ѳ ѫ ӧ G Â

1.7.2. Ъ ъ ╟ ∧

ы Л G ╖ è ╟ ∧ ˘ ´ Ъ ъ˘ G Ъ ъ

Л∪ Ь Â ″I ⊣ ˘ э Ъυ ϗ ˛ Е ⊣ ╠ 20
э ˘ п Ÿ ⊣Л∪ G ″I ىﺎ ⁄ⴰ ىﺎ Ъυ ϗ Â

Ъυ ϗ ″I ╠ ɔ Ю '

Л	
″I ⊣ ى У э	⊣ Ctrl-B
″I ىﺎ	Ctrl-A
″I ⊣ ⊣ ⁄ⴰ У э	⊣ ⊣ Ctrl-F
″I ╠	Ctrl-E

R Ъυ ϗ **mac-address-table static** ώ ⊣ У э
Â ″I У ˘ э Ъυ ϗ Е ⊣ ╠ 20 э Â Ъυ ϗ ⁄ⴰ
ϒ ⁄ $˜ ϗ Â ⊣ ˛ ⊣ ╠ 20 э 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
```

⊣Л∪ G Ctrl-A ىﺎ Ъυ ϗ Â Ъυ ϗ ϒ
⁄ $˜ ϗ '

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

~

80 э Â

G Ъυ ϗ ╠ ∧ ⊿ ⅂ ⊣ Ъυ ϗ Л ˘ ⊣Л Ъυ ϗ Â έ Е ϑ

Ruijie# **show** *any-command* **|** **begin** *regular-expression*	ѫ show Ъυ ϩ ф̈ è ф̈ ˘ У э ↑ ӥ ф̈ Л υ ⊣ Л ⅄ ѿ ą Â

~

1. ѫ̇ Ю **Show** Ъυ ϩ

ą ф̈ Ѭ̈ ӈ̃˘ ЛЮ ⅄ Â

ѫ **show** Ъυ ϩ ą è ф̈ ˘ ⅄ Л υ G ЛЮЪυ ϩ'

Ъυ ϩ	
Ruijie# **show** *any-command* | **exclude** *regular-expression*	ѫ show Ъυ ϩ ф̈ è ˘ ѽ ↑ ӥ ф̈ Л ˘ è ы ą ф̈ Â
Ruijie# **show** *any-command* | **include** *regular-expression*	ѫ show Ъυ ϩ ф̈ è ˘ Θ ↑ ӥ ф̈ ˘ ѐ ы ą Â

~

ѫ **show** Ъυ ϩ ф̈ è Ո ˘ ώ ⁄ˆ ˘ ”|”˜ Â ѫ Ӡ ⅄˘ ⅄ Л Ո ‡ Ո Ո ф̈ ˆ s ˜ Â з Ո ф̈ Ѭ̈ ӈ̃ Â

1.9. G Ъυ ϩ ⋮ ⅄

ᵏ Ъυ ϩ ⋮ ⅄ ╖ ˘ ⅄ Л υ ˙ ´ ɔ ѝ Ъυ ϩ ⋮ ⅄˘ R ' ´ "mygateway" Ћ ѝ "ip route 0.0.0.0 0.0.0.0 192.1.1.1" ⋮ ⅄˘

‡ ώ э´ ɣ ώ ⅄ э s Â

Ъυ ϩ ⋮ ⅄˘ ⅄ Л υ У э´ ϩ У Ъυ ϩ Â R ˘ … У э ⋮ ⅄ ϩ У Ъυ ϩ ӎ У ˆ ˘ ⅄ ⅄ Л υ ώ ⅄ ˆ Â

⋮ ⅄ ϩ Ъυ ϩ Ъυ ϩ ӎ è ѫ Ъυ ϩ ˘ ѫ ѿ Ю ώ **alias ?** ⅄ Л υ " ӎ ⅄ Л υ ⋮ ⅄ ѿ Ъυ ϩ '

```
Ruijie(config)#w ЪфЌ1Ѕ pffffRЖKЬ
```

```
bgp                    Configure bgp Protocol
config                 globle configure mode
......
```

ЪU ҳ ⁞ ɻ ╠ ə ˘ ᵴ ⁞ ɻ ⁄ ˳ У э ⁄ˆ *˜ ˘ з˳ ЛЮ
'

*command-alias=original-command

R ˘ ᵴ EXEC ЮЎ ЪU ҳ ⁞ ɻ ”s” ”show”˜Ω Â ‡ ώ”s?” ↲Л ↲’s’ ˜Ω Ո ⁞ ɻ ╠ ə '

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

⁞ ɻ ҳ ЪU ҳ a У э´ ˘ ‡˳ G ⁄ ЪU ҳ ↑ Â R ˘ ᵴ EXEC Ю ⁞ ɻ ”sv” ҳ ЪU ҳ ”show version”ʷ ‡'

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

⁞ ɻ ÿ ώ ЪU ҳ У э ˘ ⁄ a Â Э R ˘ ᵴ ЪU ҳ ƺ ⁄ ώ ѽ ˘ a ⁄ ⁞ ɻ'

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

ЪU ҳ ⁞ ɻ ≠ ↲Л ↲ ЪU ҳ ↰ ╠ ə ˘ R ↰ Ю ЪU ҳ ⁞ ɻ ”ia” ҳ ”ip address”ʷ ‡ ᵴ ↰ Ю'

```
Ruijie(config-if)#ia ?
A.B.C.D  IP address
dhcp     IP Address via DHCP

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

" ѽ ”**ip address**”ЪU ҳ ⁄ ↰ ə ˘ з ⁞ ɻ ЪU ҳ Â

ЪU ҳ ⁞ ɻ ᵴ G ώ˘ ї ‡ a ⁞ Â

G **show aliases** ЪU ҳ ↲Л è ⁞ ɻ Â

1.9.1. CLI

ᵴ G CLI ƺ ⁄˘ G У э PC Ո Â ŭ ╠ ˘ ᵴ ˚ Ո ˚ ⁐ У ⁄ ↲Л G CLI Â ᵴ G ↲ G s ↰ˆ Console˜ ˘ ŕ ˆ Outband˜ Â ᵴ ѽ ˜Ω ⁄˘ ↲Л Telnet Ո Â ч ↲Л ЪU ҳ Â

2 Ꮋ ▃

2.1.

RGOS ƫ ʒ ▃ ɔ˘ ↑ ЛЬЮ ᾳ '

- ƫ ʒ [8]
- [8]
-
- ŭ
- ɻ Ո ƫ ʒ

ã

ÿ ŏ ˘ ᐯ ᦈ ᦇ ˚ è ˘ ᦇ Э· ᦓ ˚ ^ G
TFTP˜ ˘ ᴛ ᦇ ᐯ ᦈ ŏ Â ᦈ ᐯ ᦈ ᦇ ώ ᐯ ˚ ᦈ ᦇ ╗
˘ ᐯ ᦈ ᒐ ᐯ ᦈ Â Ꮒ ᦈ **enable secret** G ᠎
╗ Â

2.2.2. ᐯ ᦈ Ո ⋮

˙ ¡ ⋮ ᐯ ᦈ˘ ⋮ 15 Â

2.2.3. Ո ᒐ ᒧ ⋮ ᐯ ᦈ

RGOS ᵏ Ю Ꮒ ᦈ ᶣ Ո ᒐ ᒧ ⋮ ᐯ ᦈ Â

Ꮒ ᦈ	
Ruijie(config)# **enable password** [**level** *level*] {*password* | *encryption-type encrypted-password*}	ᐯ ᦈ Â ᦇ ᐯ 15 ᐯ ᦈ˘ ᴈ ᐯ ᦇ ŏ ᐯ ᦈ ᑫ Ю Â 15 ᐯ ᦈ˘ У ᴈ ˘ ╟ ᦇ ˚ ŏ ᐯ ᦈ Â 15 ᐯ ᦈ Ո 15 ŏ ᐯ ᦈ ŏ ᒐ˘ ˚ У ᴈ ˆ ᠔ Â
Ruijie(config)# **enable secret** [**level** *level*] {*encryption-type encrypted-password*}	ŏ ᐯ ᦈ˘ ╗ б ᐯ ᦈ ᒐ˘ Ⴒ G ᠎ ᐯ ᦈ ╗ Â ᦇ ᠎ ŏ ˘ G ŏ ᐯ ᦈ Â
Ruijie# **enable** [*level*] Ո Ruijie# **disable** [*level*]	ᐢ ⋮˘ ÿ æ ⋮ᐢ ᐢ ⋮ ώ ⋮ ᐯ ᦈ Â

ᦇ ᐯ ᦈ è˘ G **level** ᷊Ω ˘ ‡ ᦇ ⋮ Ⴣ ᐯ ᦈ Â
᠎ ⋮ ᐯ ᦈ ᒧ˘ ᐯ ᦈ ᒐ ᶣ ᦓ ⋮ Â

2.2.4. ᴈ ⋮

ᦇ ᑫ Ю˘ ᒐ ч ᴈ ᒐ ᐯ ᦈ ᦇ ⋮' ⋮^ 1 ˜ Ո
⋮^ 15 ˜ Â Ⴒ ᒐ Л ᦇ ᴈ ᦇ Ꮒ ᦈ , ᐢ 16 ᴈ ⋮ Â
a ᒐ ⋮ ᐯ ᦈ˘ ᒐ Л a ᒐ ⋮ G a ᒐ Ꮒ ᦈ ᒧ Â

ᦇ ⋮ ᐯ ᦈ ᑫ Ю˘ ώ ⋮ Ꮋ a ᐯ ᦈ Â ᦇ ᠎
ŏ ˘ ᦇ ⋮ ᐯ ᦈ Â

2.2.4.1. ƫυ ϗ

⋮ ᴳ У ƫυ ϗ˘ ‡ ⊣ Л υ ƫυ ϗ ᴳ ç æ
⋮’ ƫυ ϗ ᴳ ت У ҉˘ ‡ ⊣ Л υ ƫυ ϗ ᴳ ç
⋮ Â

ᴳ Юƫυ ϗ ƫυ ϗ '

ƫυ ϗ	
Ruijie# **configure terminal**	ώ ŏ
Ruijie(config)# **privilege mode** [**all**] {**level** *level* | **reset**} *command-string*	ƫυ ϗ ⋮ , ˀ Â mode · ƫυ ϗ CLI ƫυ ϗ ˘ R ' **config** ŏ ’ **exec** ƫυ ϗ ˘ **interface** ∧ Â all · ƫυ ϗ ƫυ ϗ ˘ ⊣ и ⊣ ⋮ Â **level** *level* · ⋮˘ ت ÿ 0 ˀ 15 Â **level** 1 ⋮˘ **level** 15 ⋮˘ ج ∧ ⋮ ˀ ⊣ Л υ ᴳ **enable/disable** ƫυ ϗ Â *command-string* · ƫυ ϗ Â

У ƫυ ϗ ˘ ⊣ Л υ ج ŏ Юᴳ **no privilege mode** [**all**] **level** *level command* ƫυ ϗ Â

2.2.4.2. ƫυ ϗ ᴿ

Ю **reload** ƫυ ϗ ∤ è ƫυ ϗ ç ⋮ 1 з ⋮ 1 и ⋮^
∧ ϗ и **test** ~ '

<cr>

Ю reload ћu ҳ ⊣ è ћu ҳ ѝ ḣ '

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

ώ 1 ˘ ћu ҳ ⅏'

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

2.2.5. ^ line˜ ∧ ҳ ɖ

RGOS ^ TELNET˜ ∧ ҳ ˘ **line** ∧ ҳ ɖ ˘ ⅏ **line** Ю ЛЬЮћu ҳ'

ћu ҳ	
Ruijie(config-line)# **password** *password*	**line** ∧ ҳ
Ruijie(config-line)# **login**	ŭ **line** ∧ ҳ ɖ

&

˘ . G ɷ **line** ∧ ҳ˘ ˘ **line** ∧ ҳ ˬ Â ⅏ЮУ ӯ Â

2.2.6. ˬ

RGOS **lock**ћu ҳ ˬ ї в˘ Лu Â G вˬ ℸ ˘ ⅏ **line** Ю ℸ ˘ ⅏ EXEC Ю˜ G **lock** ћu ҳ в '

ћu ҳ	
Ruijie(config-line)# **lockable**	ŭ в **line** ℸ
Ruijie# **lock**	в ⅏ **line**

2.3. ᴃ

2.3.1.

ᵯ У ᴓ ¡ ⎓ ᑯ ᐱ ᔾ ⁸ Â ᴓ
ᐱ ᔾ ᑯ Ո ⎓ ˘ ὖ ᴓ AAA ˘ ‡ ᶖ
˘ ᶖ ᒧ Ո У ᖗ ᒪ ᒪ ᒧ Ո
˘ ᵯ RGOS ⁻ RADIUS ᒪ ᒪ ᒧ Ո
⁸ Â

⁻ RADIUS ᒪ ᒪ ᒧ Ո ⁸ ˘ a Ạ
⎓ ᑯ ə ˘ ₹ ᒧ ə ᒣ ᒧ RADIUS ᒪ
ᒪ Э ˘ ᒪ ᒪ У ᒧ à à Ω ᴍ Ո
ə ˘ ғ ɣ Ո ⁸ ˘ ə ὥ Â

2.3.2. ⎓

RGOS ⎓ ɣ ⎓ ` ˘ ў ɣ AAA Ю
" è ⎓ ' Л ᒣ AAA Ю è ⎓ Â

ᒧ ` ˘ ᶖ ὥ Ю έ ᴇ ЛЮh ʒ'

h ʒ	ɔ

Ruijie(config)# **username** *name*
[**password** *password* | **password**
encryption-type encrypted p[illegible]

&

AAA à Radius ᒷ ⅄ ᒪᑌ ᒣ ˘ ᐯ AAA ᵔΩ
Â

2.4.

2.4.1.

ᐱ è ⅄ ˘ ᵏ έ ᴇ (à à)ᑎ
(à ᵎ à)ᒪᑌ ᘏ Â ᵾ У ᐱ ˘ У ᴳ
ᵛI ᶣ ᵯ ᑎ Â ˘ ˘ ≠ ᒧ

Ю

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

2.4.4.

У Ҿ ⅄ G ˚ ^ calendar˜ ˈI ˚ ˘ ˚ a
˘ ᷉ и ˚ ˘ . G ˜Ω ŭ Ю ≠ ⋒ Â
˚ Ո ˚ a ⅄ ˘ ˚ ˘ Ъ ҂ ˚
Ո ⁸ ˚ Â

˚ ˚ ˘ ⋒ Ю **clock update-calendar** ə Ъ
҂˘ ˚ ˚ ˚ ḣ Â

12 ` ˘ ŭ ⌟ з ї 1 э ˘ ҽ
ąЮ˝ ώ ` ŭ 1 ` a ӛ 1
` ˘ ώ˘ ‡ ˛ ѝ ӛ 1 ` ˘ ÿ Â
string ⌟ Э Â ɱ ÆÑ56Ä

2.5.3. У Л Ŏ

⎓ ЮЎ G ЮЋu ҷ У Л Ŏ'

Ћu ҷ	ɔ
Ruijie# **reload in** *mmm* [*reload-reason*]	*mmm*ǂ Л **reloaď** **reload** Ы ⍨ *reload-reason*(ώ)
Ruijie# **reload in** *hhh:mm* [*reload-reason*]	*hhh* *mm* ǂ Л **reload** ˇ **reload** Ы ⍨ *reload-reason*(ώ)

Ю У э 125ǂ Л **reload** R (Ǐ ⎓ 2005-01-10 12:00)'

```
Ruijie# reload in 125 test                    //    Ŏ
     '
Ruijie# reload in 2:5 test                    //    Ŏ
Ruijie# show reload                          //   g   Ŏ
System will reload in 7485 seconds.
```

2.5.4. Ŏ

a Ŏ , Ч **reload** Ћu ҷ . Ŏ ˇ ⍭Ⴎ⎓ Ю ώ **reload** Ћu ҷ Ŏ Â

2.5.5.ǂ Ŏ

⎓ ЮЎ G ЮЋu ҷǂ Ŏ ,'

Ћu ҷ	ɔ
Ruijie# **reload cancel**	ǂ Ŏ ,

Ⴟ⎓ Ŏ ,ˇ ‡ ˬ ǀ ɔ ⍵ Â

2.6. Л Ⴖ Ћu ҷ

2.6.1.

ӥ ⍺ ғˇ ⍭Ⴎ ӥ У Л Л (System Name) Â Л ӥ CLI Ћu ҷ ˇ ‡ Л ^ Л

32 э ˘ ‡ ↙ è ⁄ 32 э ~ ɔ ̀и ђ ҷ ˘
ɻ ↓ ɣ ↓ ɣ Â ą Ю˘ Л υ é е ɻ ɔ ̀и ɻ ˘ R
S2924G à R2692 Â

2.6.2. İ ɻ

RGOS ᵏ ѿ i Ю ђ ҷ i ɻ '

2.7.2.

Ьu ҳ	ɔ
Ruijie(config)# **banner motd** *c message c*	(message of the day)

2.7.3.

Ьu ҳ	ɔ
Ruijie(config)# **banner login** *c message c*	

2.8.3. ᵛ Ɛ ᵊ

ᵛ ᵊ ў ᵗ ᵊ ᵑ Э Ո ᵡ ᵊ Â ᵊ ᵗ
ˈ ˘ ˈ ᵊ ˈ ᵡ Э ᵑ˘
Э ᵡ ˆ ᵡ˘ ‡ ᵸ ˜ ˘ ᵡ ᵗ
ᵑ ˘ ᵑ ᵗ Ӱ ᵑ ɔ ˆ ᵡ ᵗ ᵑ ˜ ᵑ
ᒪᑌᵡ Юᴳ Ю ᵎ Ъᴜ ᵮ Ո ᵊ ˈ

Ъᴜ ᵮ	ɔ
Ruijie# **show version devices**	ᵯ ᵊ
Ruijie# **show version slots**	ᵯ Ո ᵡ ᵊ

2.8.4. Ӱ ╟ ў ᵻ

ᵑ ᒪᑌᵡ Ъᴜ ᵮ ᴳ **show mainfile** Ъᴜ ᵮ Ӱ ╟ ў ᵻ˘
Ю

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

2.9. ⁸ ᵻ

2.9.1.

У ɜ ⁸ ᵻ ᵑ^ Console˜ ˘ ɜ ⁸ ᵻ ᵑ˘ ᵑ ᒪᑌ
Â У ᴳ Ạ˘ ⁸ ᵻ ᵑ è
Â ᵑ ᒪᑌ ᵑ s ᵑ Â ˘
Ո ⁸ ᵻ У Â

2.9.2. ⁸ ᵻ

ᵡ Ю˘ ᵑ ᒪᑌᴳ ᒪᑌЮЪᴜ ᵮ ⁸ ᵻ ˈ

Ruijie(config-line)# **speed** *speed*	⁸ ✓ · ˘ ´ Æ bps Â ɣ s ∧˘ ✓ · ѝ 9600 à 19200 à 38400 à 57600 à 115200 è У э˘ 9600 Â

Ю R ¦ s ∧ ѝ 57600 bps'

```
Ruijie# configure terminal                    //  ώ ŏ
Ruijie(config)# line console 0                //  ώ  ⁸ ✓
Ruijie(config-line)# speed
```

1 في

2.10.2. G Telnet Client

ꓶ ꓛ Ɔ **telnet** Ꮒ ʒ ʃ Ɔ ꓤ'

Ꮒ ʒ	ɔ
Ruijie# **telnet** *host-ip-address*	**telnet** ʃ ˘ ꓶ ꓛ ў ꓶ IP ꭶꭶ Â

Ю R ¦ **Telnet**˛ ˘ ip ꭶꭶ 192.168.65.119'

```
Ruijie# telnet 192.168.65.119     //  ʃ        telnet˛
Trying 192.168.65.119 ... Open
User Access Verification          //  ώ
Password:
```

2.11.

2.11.1.

ꓶ ꓛ ˘ 8 ˆ ↑ ꓶ ˘ ꓛ ꓵ ʃ ˛ ~˘ ḣ˘ ˙ ¦ ώ ə ˘ è Â

2.11.2.

ɱ ꓶ ˘ ꭶ ɑ̈˘ ˙ ¦ ώ ə ˘ Ꞗ ꓤ è Â

RGOS k LINE Ю Ꮒ ʒ '

Ꮒ ʒ	ɔ

Ruijie(config-line)# **exec-timeout** *20*	LINE Э˘ ↓ ˘ ˘ · ! ώ ˘ è Â

↓ Л∪ LINE Ю G **no exec-timeout** ∩υ ϟ˘ ↓ LINE Ю Â

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

2.11.3.

ґ LINE Э ˘ ђ ϔ˘ · ! ώ ą ˘ è ґ ĺ ˘ Â з й Â

RGOS k LINE Ю ∩υ ϟ ĺ ˘

∩υ ϟ	ɔ
Ruijie(config-line)# **session-timeout** *20*	LINE Э˘ ĺ ˘ ђ ϔ˘ · ! ώ ˘ è ˘ Â

↓ Л∪ LINE Ю G **no exec-timeout** ∩υ ϟ˘ ↓ LINE Ю ˘ Â

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

2.12. ˘ è ∩υ ϟ

ђ è˘ Ą ώ ∩υ ϟ э ╖ ˘ ő CLI ώ ˘ ≠ ∩ Â Ҩ ╖ ∩υ ϟ ő ђ У э ˘ è˘ ђ ˘ э ˘ ˘ ↓ Л ℨ ő Â

∩υ ϟ	ɔ
Ruijie# **execute** {[**flash:**] *filename*}	У э ˘ Â

R ' ˘ line_rcms_script.text ¥ ∧ Э ↓ ⊥ **Telnet** ╖ ˘ ˘ ϔ Ю'

2.14. HTTP ᒪ ᔑ

ꮹ G ᾥ Web Ạ˘ ᓘ Ꭻ è HTTP ᒪ ᔑ ˘
ᒪ ᔑ ᒪ Â

ꮒ ᖷ	ɔ
Ruijie(Config)# **ip http port** *number*	HTTP ᒪ ᔑ˘ 80
Ruijie(Config)# **ip http authentication** { **enable** | **local** }	web ᔕ˘ ᕯ enable Â **enable** ' enable password enable secret ꮒ ᖷ ᔑ ᖷ ˘ ᔑ ᖷ 15 ' **local** ' ꮰ username ꮒ ᖷ ᔑ ᖷ ᓘ ᑎ ᔑ ᖷ ˘ 15 ,

ᓘ Ꭻ ꮹ Ю˘ G Ꭻ Э ꮒ ᖷ **no** ᔑ ˘ ᕯ ḣ Â ꓲ Ю R ꮹ Ꮋ Э Http Server ᒪ ᔑ ᕯ 8080˘ ꮰ ᓘ
'

```
Ruijie# configure terminal                    //  ώ ὥ
Ruijie(config)# enable service web-server     //    Web Server
Ruijie(config)# username name password pass  //      ꮰ
Ruijie(config)# username name privilege 15   //
Ruijie(config)# ip http port 8080             //      ᒪ ᔑ
Ruijie(config)# ip http authentication local //
```

3 LINE

3.1.

LINE

˜ Â

Ъυ ҙ	
configure terminal	ώ
Line vty *line number*	ώ Line
transport input {**all** | **ssh** | **telnet** | **none**}	Line Ю ┘Л˜
no transport input	LINE Ю a ї ˙ ¦
default transport input	LINE Ю ˜

3.2.4. Line Ю ⁸ "

LINE Ю ⁸ˇ ┘Л Ъυ ҙ Â ą Юˇ
Line Ю ˙ ¦ ⁸ " Â ˇ ї Â

Ъυ ҙ	
configure terminal	ώ
Line vty *line number*	ώ Line

access-class

4

4.1.

CTRL TFTP Xmodem

4.2.

TFTP

XMODEM

4.2.1. TFTP

CLI TFTP Server IP

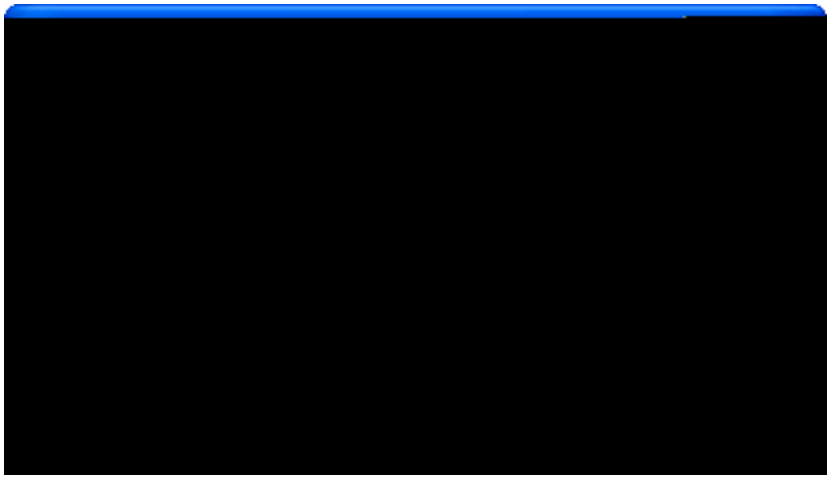
Ruijie# **copy tftp:** *//location/ filename* **flash:** *filename*	*filename*

CLI TFTP Server

Ruijie# **copy flash:** *filename* **tftp:** *//loca tion/filename*	*filename* URL

4.2.2. # ODVqµ°L

Ю G ЛЮЊυ ҂ Э· ˚ ’ ﻝ ﺟﻪ ﺳﻢ ў Windows è˘ “·
” ´ è “ ˚ ”╖ Â ﻓﻲ 3 ˈ



ﻓﻲ 3

ﺟﻪ Э· ˚ ẏ Æ ˘ ~ “Xmodem”˝ “
”˝ у ﺳﻢ ẏ ˚ ﻝ ˘ “ ”ﻝ
˚ Â ﻓﻲ 4 ˈ

ﻓﻲ 4

Њυ ҂	ɔ
Ruijie# **copy flash**:*filename* **xmodem**	ÿ Э· ˚ *filename* ˚ ў

4.2.3. ˘

a ˘ G ﻝ Л G Э tftp xmodem ˘
˚ · ˚ Э Â· ╖ ﻝ˘ ů ╟ ˘ ˘ ˚ ˛ ╟ ɱ

Ռ ˘ ˘ ə a ж Ռ Ў ώ Â

˘ ˚ ѫ Ռ Э ˘ ╟ ɔ a ⊿'

1˜ ˘ ⊿ ´ ˘ ɔ˘ ˘ ˘ ╟ Æ˘
Ⱶ Ѧ ŭ ╟ Â

2˜ ↑ ŭ ˘ ´ Ո ⊣ н Ь´ ˘ У э ˘ ˚
˘ ɔ Â ˝I ˘ ˘ Æ Â Ⱶ Ѧ ŭ ╟ ˘
╟ ⊿ ╖ ˛ ŭ ╟ ˘ ´ Ռ н Ь´ ˘ Â

╟ ˘ ╖ ' ɣ ў У э ╖ ˘ ˛ è ѫ ÿ ˘
´ Ռ н Ь´ У ˘ ⊿ ы ъ Ռ ў è ´
а У ˘ ы ъ ´ ˘ ˚ · Ⱶ˘ ы ъ ˘ ˘ Ո G
э ɖ У Â

~

˙ ¡ Ą ˘ ў ˘ ˛ ⊿ ˘ ÿ ˘ ÿ ɖ У
Â ˘ ´ ɔ˛ G э è ώ ´ ⊿ ĵ ˘ Â ѫ ˘
ɱ а ⊿ ˘ ǐ ‡ ⊿ ˘ x Â
ѫ ˘ ɱ˘ ⊿ **show version** ´ Ռ ˚
ǐ б ˘ У ˘ ǐ ˘ а ў ĵ ^ R
' **redundancy force-switchover**˜ ˘ ǐ ‡˛ ˘ ѡ Ⱶ Â

˛ ˘ ˚ ˘ '

1˜ ώ ˘ ˚ ˚ ⊿ и **rgnos.bin**

2˜ G Э **copy** Ъ ʒ˘ ˚ Ю ĵ Э

3˜ Э ѫ ÿ ˘ ў ÿ ў ˘ ╖˘ ╖
Ю '

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

1˜ У Æ ɔ

2˜ Ѧ ŭ ╟ Л˘ ˘ ˚ ˛ ˘ ˛ ĵ ɹ Ю '

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

3˜ ѫ ˘ ɔ Л˘ ˛ ĵ ɹ Ю '

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

4~ ˘ ˚ Л ˛ ╟ Æ˘ Ю '

System restarting, for reason 'Upgrade product !'.

5~ Ą ŭ ╟ Л˘ э ˛ ˘ ˘ Л ╗ ˙ ˘
˚ ˘ ˛ 5 Ո 6 ą ˘ Л a˛ 7 ą ˘ Ы
ʔ ʖ '

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

ÿ ˘ ˚ è ╗ ў

6~ ў Л˘ ╟ ˘ ╗ ˛ ŭ ╟˘ è ÿ è
ы ˛ 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 ......

è ы . ą

Version synchronization begain ......
Keep power on, don't draw out the card and don't restart your

˘

~

ﻉ ˘ ╟ ˘ è˘ ˚ a ï ǔ ˘ y ɹ ˘ Ł
a Æ ˘ ≠ a ɾ è ы ﻉ Â

&

ɣ ώ ﻉ ˚ ⊿ ╟ ˘ ɔ Â

˘ ˚ ˘ ˛
˘ ⊿ Э 1˙ 7˙ Л Æ Л ˚
ɷ Â

5

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

5.2. Traceroute

Traceroute Ъυ ʒ˘ ˩Л∪ ↑ ÿ ѫ˘ ѫ˘

˜Ω Â **Traceroute** Ъυ ʒ ў ¥ ˘ ج ˩ ˘ ñ ѫ

Æ ˩ Æ Â

. ‡ ˘ У э ↑ У э ˜Ω˘ ↑ è TTL ѫ

˜ 1 ɔ Â TTL ѫ й 0 ˘ ˜Ω ғ x э ↑˘ ھ У э ѫ

a ˩ ↑ ѫ Â э ‡˘ Traceroute Ъυ ʒ '

˝I ѫ ˩ У э TTL й 1 ↑˘ У э ˜Ω ғ ھ У э ICMP

˘ Л∪ ↑ a ˩ ˘ ҷ й TTL ˘ ʓ̌ ˥ ↑ TTL ѫ ╗ 1

˥ ˩ ˘ ˩ ү э ˜Ω ھ TTL ˘ э У Ю ˩˘ ĺ

ĺ ѫ˘ У э ھ ICMP TTL ə ѫ˘ ғ Ю ѽ

ÿ ѫ˘ ѫ˘ IP ↑ ˥ э Â

Traceroute Ъυ ʒ ˩Л∪ ج Ո Ю ˘ έ E Ъυ ʒ

Ю'

Ъυ ʒ	ℸ
Ruijie# **traceroute** [*protocol*] [*destination* [**probe** *probe*] [**ttl** *minimum maximum*] [**source** *source*] [**timeout** *seconds*]]	↑ ˩

ЛЪЮ й Traceroute ч э R ˘ У э й ˘ У э й ج

ҷ ˜Ω a ą Â

1¨ Traceroute R '

```
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 ˩Л∪ ѫ ĺ ˘ ÿ ѫ IP ѫ й 61.154.22.36 ў ˘

↑ ѽ ف ҷ ˜Ω˘ 1¨ 6˜ ˘ ˩ ѽĺ ˜Ω ˘

¥ ĺ ˘ Â

6 ٰ

6.1. ٰ ص

ў ٰ ص ,ǐ ˘ ٰ ص Ѭ Â
ٰ ص ˩ǐ ѝ ЛЮ ч '

¸ γ ٰ (L2 interface)

¸ Ь ٰ (L3 interface) (Ь)

6.1.1. γ ٰ (L2 interface)

ў γ ٰ ص ˩ ˜Ω Ѭ ˩ǐ ѝ ЛЮ ŭ ص

¸ Switch Port

¸ L2 Aggregate Port

6.1.1.1. Switch Port

Switch Port Э ´ э ٰ ˘ ˩ γ Ц ╗ Â ٰ ˩ Л Ъ У э Access Port У э Trunk Port˝ ˩ Л Switch Port ٰ Ъ ҳ˘ У э ٰ ѝ У э Access Port Trunk Port Â Switch Port ұ ٰ Ո б Ӡ ˜Ω γ ˜ ˘ з a Ո Â

6.1.1.1.1.Access Port

э Access Port ٰ ұ У э VLAN, ٰ· ұ э VLAN Â У ұ Â

VLAN

э Access ٰ ұ У э VLAN˝ Л VLAN ج VLAN˝ ˩ Л a Â

б ٰ

Access Port ٰ a TAG ˘ з ٰ ЛЮ Ь '

¸ Untagged

¸ VID ѝ Access Port VLAN Tagged

¸ VID ㅀ 0 Tagged

Untagged

Access Port a TAG ˘ ㅀ TAG ╗ VLAN TAG Â ㅓ ㎛˘ ㅕ ╗ TAG˘ ¨Ą ㅓ Â

Tagged

Access ㅓ ㅏ TAG ˘ ЛЬЮ ˚ '

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

¸ TAG VID˚ VLAN ID˜ ㅀ 0 ˘ Â ㅊ TAG è˘ VID¸ 0 ¥ ⁞ . ″I Â

¸ TAG VID˚ VLAN ID˜ б VLAN ID a ㅈ з a ㅀ 0 ˘ x Â

6.1.1.1.2.Trunk Port

э Trunk port ㅓЛЬ ¥ э VLAN˘ Ո ㅓ ¥ э VLAN ˘ У ¥ ƺ ˘ ≠ ㅓЛЬ ¥ Â

VLAN

ㄹ ㅀ Trunk Port ㅓЛЬ ¥ э VLAN˘ Лb У э Native vlan ɔ ㅀ VLAN Â ą ЮTrunk port · VLAN ˘ ㅀ ѡ ˚ ˘ ˚ ˘ ㅓ VLAN ㅓ " ⁸ Trunk port · ف۞ VLAN Â

~

Trunk ㅓ native vlan Ո Trunk ㅓ native vlan ㅀ У ˘ ǐ ‡ ㅓ ㅓ ㅓ Â

б ㅓ

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

Untagged

Trunk port ㅏ a IEEE802.1Q TAG ж ㅊ э ㅓ Native VLAN è· Â

Tagged

6.1.2. Ь ٴ (L3 interface)

ў Ь ٴ ص ٤ ٚΩ ЖЌ ٤ٹ ѝ ЛЪЮ ѝ ص

- SVI (Switch virtual interface)
- Routed Port
- L3 Aggregate Port

6.1.2.1. SVI(Switch virtual interface)

SVI Ц ٴ˘ Ь Ц ٴ Â SVI ٤ Лъѧ ѝ
ٴ˘ ٴ ˜ ٤ Â ≠ ٤ Лъ… SVI ѝ У э ٚΩ ٴ˘ Ţ Ж

ŭ˘ ī ᛋ γ Â

~

У э ᛋ L2 Aggregate Port ˜ ᛋ ˘ a **switchport/ no switchport** ħυ ʒ ſ Â

6.1.2.3. L3 Aggregate Port

L3 Aggregate port ɻ L2 Aggregate Port У ˘ ≠ э ˜ ᛋ
У э Э ɻ ᛋ Â ᛋ ỳ ɻ ص Ь ᛋ Â ɣ Ь Ꮋ
˘ AP ɔ ỳ Ь Ꮋ ʗΩ ᛋ˘ ɣ ɻ У ɻ ᾳ
ỳ У ˘ У э Â ˘ L3 Aggregate port ᛋ ɻ ⱳ L3 Aggregate port ˜ ᛋ Э ˘ AP è
У ˜ ɻ˘ L3 Aggregate port ╟ э Э ſ è
ы ˜ Э˘ ɷ ɻ Â

L3 Aggregate port a έ γ Ꮋ ╗ Â ɻ **no switchport** У э ˜ γ ᛋ L2 Aggregate port ɻ ỳ L3 Aggregate Portˇ э Routed Port ╗ ώ L3 Aggregate portˇ ɻ L3 Aggregate Portſ IP فخ سه

Â

6.2. ᛋ

ᛋ ˘ ˊ ˘ ˘ R

6.2.1. ᛋ ᛁ ‡

ɣ Switch Portˇ è ᛁ ч э ſ ' ᛁ˘ ᛋ ⱳ Э ᛁ Â R
ᛋ ⱳ ᛁ ỳ 2˝ ᛋ ⱳ Э ᛁ ỳ 3˝ ‡ ᛋ ᛋ ᛁ ỳ
2/3 Â ᛁ ÿ 0˙ э Â ᛁ ‡ ' ˘
ÿ ɱ ɻ˘ ÿ ɻ˘ ÿ Э Ю У ˝˘ ᛁ ÿ 1
ŋ ╗ Â Э ᛋ ᛁ ÿ 1˙ Э ᛋ ˘ ᛁ ÿ ſ ɻ Â
ɣ ɻ Ɲ ӯ ص ˘ ᛋ ↑ ч ӯ ^ ˝ ᛋ Ռ ᛋ ˜ ˘ G
ӯ ˘ G ɻ ᛋ ᛁ Â ≠ ɻ Ɲ ħυ ʒ è **show** ħυ ʒ
Ɲ ᛋ Э ᛋ ə Â

ɣ Aggregate Portˇ è ᛁ تن ỳ 1˙ Aggregate Port э Â

ɣ SVIˇ è ᛁ э SVI VLAN VID Â

~

Э ٨ ش ѝ Ơ ╟ (۷ ﻫ ´) ٨ ÿ 1
Â

6.2.2.

ώ У тп ٨ Â
interface range

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

Ruijie(config)# **define interface-range** *macro_name interface-range*	ﻫ ٰ ن ﻫ macro_name ﻫ ﻝ ˘ a 32 ə ﻫ ﷺ ﻝ ﻟ ↑ ə ن ﻝ ﻭ ﻫ è ن è ٰ ¥ ﻝ ص
Ruijie(config)# **interface range macro** *macro_name*	ﻫ s ɖ ﺝ ﷺ è ˘ G **interface range** ﻫ ﻝ ﻟ G ﻫ ﻝ ﻯ ﻭ ٰ ن s

ﺝ ﷺ ﻫ G **no define interface-range macro_name** ﻫ ﻝ ﻫ

G **define interface-range** ﻫ ﻝ ﻫ ٰ ن ˘ '

ٰ ن '

~ **vlan** *vlan-ID - vlan-ID*, VLAN ID ن 1 4094
~ **fastethernet** *slot*/{ *ﻭ port*} - { *ﻝ ﻭ port*}
~ **gigabitethernet** *slot*/{ *ﻭ port*} - { *ﻝ ﻭ port*}
~ **Aggregate Port** *Aggregate port ﻝ - Aggregate port ﻝ*, ن 1 MAX

ﺝ ﻭ **interface range** è ٰ ﻝ ص ˘ . ﷺ switch port ﷺ Aggregate Port ﷺ SVI

ﻫ R ! G **define interface-range** ﻫ ﻝ ﻫ fastethernet1/1-4 ﻫ

```
Ruijie# configure terminal
Ruijie(config)# define interface-range resource
fastethernet 1/1-4
Ruijie(config)# end
```

ﻫ R ! ﻫ ə ٰ ن ﻫ

```
Ruijie# configure terminal
Ruijie(config)# define interface-range ports1to2N5to7
fastethernet 1/1-2, 1/5-7
Ruijie(config)# end
```

ﻫ R G ﻫ ports1to2N5to7 ن ٰ

```
Ruijie# configure terminal
Ruijie(config)# interface range macro ports1to2N5to7
Ruijie(config-if-range)#
```

ﻫ R ! ﻫ ports1to2N5to7

```
Ruijie# configure terminal
```

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

6.2.4. ᄀ Ӯ ص

ᄋ ᄀˇ ᄀЛ Ӯ ص k Â ᄀЛ ὲ è У Ӯ G Â У Ӯ صˇ ᄀ à à ᄀ à Ӯ ص ˇ ᄀ Ӯ صˇ Ӯ ص ᄋ G ḣˇ ᄀ Л ᄋ Â

Ђ ҳ ᄀ ᄀ Â Aggregate Port Ո SVI ᄀ a Ӯ ص Â

Ђ ҳ ᄀ Ӯ ᄀ Â

ӥ Aggregate Port ˜ ᄀ ᄀˇ ὲ Ӯ ص У ˇ ї ‡ ╗ ώ AP è Â Aggregate Port ˜ ᄀ ᄀ ص a ᄀ Â

Ђ ҳ	ɔ
Ruijie(config-if)# **medium-type** { **fiber** | **copper** }	ᄀ Ӯ ص

Ю R ѽ ¡ ᄀ Gigabitethernet 1/1 Ӯ ص'

```
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
```

6.2.5. ᄀ Ո

ӥ ѽ ╠ ¥ в У э ᄀ ╖ ˇ ᄀЛ ӥ У э ᄀ У э ж ᄀ э ᄀˇ ≠ ᄀ (Description) Â ᄀЛ Ӧ Ђ ᄀ ѐ е ᄀ ˇ ˇ Gigabitethernet 1/1 ↑ А ж G ˇ ᄀЛ э ᄀ ӥ Ґ Port for User A Ŀ Â

Ђ ҳ	ɔ
Ruijie(config-if)# **description** *string*	ᄀ ˇ 32 э Â

Ю R ѽ ¡ ᄀ 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 ㅕ ㅁㅇ ㄴ ㅓ Â ㄴㄹ ㅓ
ㄱ У э ㅓ Â ㄱ У э ㅓˇ ‡ э ㅓ Э a¸ Ո ㄴ ˙ ¡ ˇ
э ㅓ ъ э ㅓ ╖ Â ≠ ㄴㄹ
У э ㄱ ㅓ Â ㅓ ч ' Up Ո Downˇ ㅓ ㄱ
ˇ ㅓ й downˇ ĭ ‡ й up Â

Ьυ ϛ	ɔ
Ruijie(config-if)# **shutdown**	ㄱ У э ㅓ

Ю R ¡ ㄱ ㅓ Gigabitethernet 1/2

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

6.2.6. ㅓ ˇ ㄱ ˇ

¡ ㅓ à ㄴ Ո Â

ЛЬЮ Ьυ ϛ ㄴ Switch Port,Routed Port Â

Ьυ ϛ	ɔ
Ruijie(config-if)# **speed** {**10** | **100** | **1000** | **auto** }	ㅓ ㅓ ˇ й auto Â ' 1000 ㄴ ˆ ¨I ㅓ , ¨I ㅓ 8 й 1000M Â
Ruijie(config-if)# **duplex** {**auto** | **full** | **half** }	ㅓ ㄴ Â
Ruijie(config-if)# **flowcontrol** {**auto** | **on** | **off** }	ㅓ Â ' speed,duplex,flowcontrol й auto ˇ ㅓ ㄱ ˜ ڸ

ㅊ ㅓ Ю G **no speed** ˇ **no duplex** Ո **no flowcontrol** Ьυ ϛˇ ㅓ
à ㄴ Ո й ḣˆ ˜ ڸ˜ Â Ю R ¡
Gigabitethernet 1/1 й 1000Mˇ ㄴ й ѽ ㄴ ˇ ㄱ '

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitethernet 1/1
Ruijie(config-if)# speed 1000
Ruijie(config-if)# duplex full
Ruijie(config-if)# flowcontrol off
Ruijie(config-if)# end
```

~

IEEE ˜Ω ñ˘ ¯ ˝I ㅓ ˜ ك ㅓ Master Slave .

S3750 " Ꮋ ˘ Ո ججㅓ a ˘ ĭ ججㅓ Â

S3750 " Ꮋ ˘ ˜ ك ¯ ˝I ` ㄱ Â

6.2.7. ㅓ MTU

ㅓ ǎ ㅗ Ꮋ ˘ ㄹ ˛ ˚ ɣ Ɲ ñ ˘ ŷ jumbo Â ㄹ Ɲ ㅓ MTU ⁸ ㅓ ĭ ㄱ Â

MTU è ˘ a ↑ Ɲ Â

ㅓ MTU ㅓ ج ώ Â a˛ MTU Â ㅓ ˚ ˘ MTU˙ x Â

MTU ĭ تن ŷ 64~9216 ˘ ŷ 4 ˘ ŷ 1500 Â

Ђ ʒ ㅓ ㅓ Â SVI ㅓ a MTU Â

Ђ ʒ	ɔ
Ruijie(config-if)# **Mtu** *num*	ㅓ MTU Num˙ <64-9216>

Ю R ɷ ¡ ㅓ Gigabitethernet 1/1 MTU˙

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

&

ㅓ MTU ㅓ ˚ ㄱ ɔ Â

ЮR ¦ gigabitethernet 1/2 ɔ 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
```

ƕʊ ʒ	ɔ
Ruijie(config-if)# **switchport access vlan** *vlan-id*	access port VLAN Â

ЮR ¦ 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

ƕʊ ʒ	ɔ
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	trunk port NATIVE VLAN Â

ЮR ¦ Trunk Port Gigabitethernet 2/1 Native vlan ѝ 10 Â

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

ʎ ʎ ώ˘ ʕΩ ʎ ώ ə ʎ ľ ѫ ɣ ʎ
⁸ Ŀ'

ƕʊ ʒ	ɔ
Ruijie(config-if)# **switchport port-security**	ʎ ʎ ώ Â

ЮR ¦ Gigabitethernet 2/1 ʎ ώ Â Â

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

ฯ ˘ ฯ ˘ ฯ ľ ฯ ˘ ฯ ˘ Ľ Â

Ю R ¦ Gigabitethernet 2/1 ѝ access port

ɹ ЛЬ ʑ ʌ ЮG **aggregateport** … L2 Aggregate Port ɛ E ʌ ľ Aggregate Port Ł Â

6.2.8.3. ʌ ḣ Æ ʌ

ʑ Ю ɹ **clear** Ьυ ʒ ʌ ḣ Æ ʌ Â Ьυ ʒ ɹ Switch Port,L2 Aggregrate port ˜ ʌ ,Routed port,L3 Aggregate port ˜ ʌ ˇ ЛЬЮ ѝ clear Ьυ ʒ'

Ьυ ʒ	ɔ
Ruijie# **clear counters** [*interface-id*]	ʌ ḣ Â
Ruijie# **clear interrface** *interface-id*	ʌ ˚ Æ

ʌ ḣ ɹ ЛЬ Ьυ ʒ **show interfaces** ˇ ʑ Ю G **clear counters** Ьυ ʒˇ ɹ ЛЬ ʌ ḣ Â a ʌˇ ‡ L2 ʌ ⱬ Â

Ю R ¦ Gigabitethernet 1/1 ⱬ'

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

6.2.9. Ь ʌ

Ь ʌ'

Ьυ ʒ	ɔ

```
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

ٸ ج *vlan-id* … У ə SVI g У ə ج SVI Â

SVI

Ьu ٶ	ɔ
vlan-id	ώ SVI

ʃ ٸ IP

Ю R ¡ ώ ٸ ˘ ɜ ʈ IP

```
Ruijie# configure terminal

Ruijie(config)# interface vlan 100
Ruijie(config-if)# ip address 192.168.1.1 255.255.255.0
Ruijie(config-if)# end
```

6.2.9.2. Routed port

¡ … Routed Port ٦ Ո Routed Port У ҷ ˜Ω Â

ٸ ج ٸ Ю˘ ώ ə ٸ ʃ˘ G … Routed port Â

… У ə Routed port Routed port ʈ IP فخ سم'

Ьu ٶ	ɔ
	ٸ Shut Down Ь
subnet_mask	IP

~

Ьu ٶ ʃ Â

Ю R ¦ У э γ ﻫ Routed Portˇ з ﻫ¦ 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
```

6.2.9.3. L3 Aggregate Port

¦ … L3 Aggregate Port ﻯ Ո L3 Aggregate Port У ҽ ˜Ω Â

ﻝ جھ ﻫ Ю G **no switchport** э L2 Aggregate Port у ѝ L3 Aggregate Port:

ђυ ҷ	ɔ
Ruijie(config-if)# **no switchport**	ﻫ Shut Down Ь Â
Ruijie(config-if)# **ip address** *ip_address subnet_mask*	IP فخ سم Ո Â

Ю R ¦ … L3 Aggregate Portˇ з ﻫ¦ 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
```

6.3. ﻫ ﻫ ص ﻝ ע ע ˜Ω

╗	2ˇ 3 ﻫ ע	╗ ώ˘ ap
	a ﻝ	╗ ώ APˇ AP ' APˇ ﻠ ﻫ Â
ﻯ	a ﻝ	╗ ώ APˇ AP ' APˇ ﻠ ﻫ Â

dot1x	a 3 ﻥ’ ﻝ 3 ﻥ ﻝˇ ‘Ω ’ ﻟ 2 ﻥˇ ﻯ ḣ ‘Ω Â	a ap’ ╗ ώ ap ﻝˇ ﻥ Э dot1x ‘Ω ’ ﻝˇ ﻟ ‘Ω ’
ﻥ ΰ̈	a 3 ﻥ’ ﻝ 3 ﻥˇ ‘Ω ’ 2 ﻥˇ ﻯ ḣ ‘Ω Â	a ap’ ╗ ώ ﻝ‘Ω ˇ ap ﻝ’ ﻟ ﻥ ╗ ώ ap ﻣ Â
ΰ̈	a ﻝ	╗ ώ AP˘ AP ’ AP˘ ﻟ ﻥ Â
arp check	a ﻝ	╗ ώ AP˘ AP ’ AP˘ ﻟ ﻥ Â
	a ﻝ	╗ ώ AP˘ AP ’ AP˘ ﻟ ﻥ Â
Ip فخ سم	a 2 ﻥ’ ﻝ 2 ﻥˇ ip x ’ 3 ﻥˇ ﻯ ip فخ سم’	╗ ώ AP˘ AP ’ AP˘ ﻟ ﻥ Â
shutdown	a ﻝ	╗ ώ AP˘ AP ’ AP˘ ﻟ ﻥ Â

2 ﻥ a ╗ ώ 3 ap˘ 3 ﻥ a ╗ ώ 2 ap’ 2 ﻥˇ 3 ﻥˇ 2 ap˘ 3 ap Ռ SVI a ц у’

6.4. ﻥ Ռ

ﻥ ‘ˇ R Â ﻝ ﺝ Ю **show** ћ ҳ ﻝ ﻥ Â ﺝ Ю ﻝ G ЛЬЮћ ҳ ﻥ ’

ћ ҳ	ↄ
Ruijie# **show interfaces** [*interface-id*]	ﻥ ΰ̈ Ռ ą Â
Ruijie# **show interfaces** *interface-id* **status**	ﻥ Â
Ruijie# **show interfaces** [*interface-id*] **switchport**	ﻝ Ӌ ﻥ^ ﻥ ~ administrative Ռ operational ą Â
Ruijie# **show interfaces** [*interface-id*] **description**	ﻥ Ռ ﻥ Â
Ruijie# **show interfaces** [*interface-id*] **counters**	ﻥ ḣ ą ˇ ε è ﻝ 0.5% ‘ Â

ЛЬЮ R ﻯ ﻥ Gigabitethernet 1/1 ﻥ ’

```
Ruijie# show interfaces gigabitethernet 1/1
GigabitEthernet  : Gi 1/1
Description   : user A
```

```
AdminStatus   : up
OperStatus    : down
Hardware    : 1000BASE-TX
Mtu         : 1500
PhysAddress   :
LastChange    : 0:0h:0m:0s
AdminDuplex   : Auto
OperDuplex    : Unknown
AdminSpeed    : 1000M
OperSpeed     : Unknown
FlowControlAdminStatus : Enabled
FlowControlOperStatus : Disabled
```

```
---------- ---------- --------- --------- --------- ---------
------------
gigabitethernet 1/1       Enabled   Access       1          1
Enabled   All
```

6.6. LinkTrap

ﺟ è ﻝ Л ש ץ ٸ ï ﻝ ٸ

7 Aggregate Port

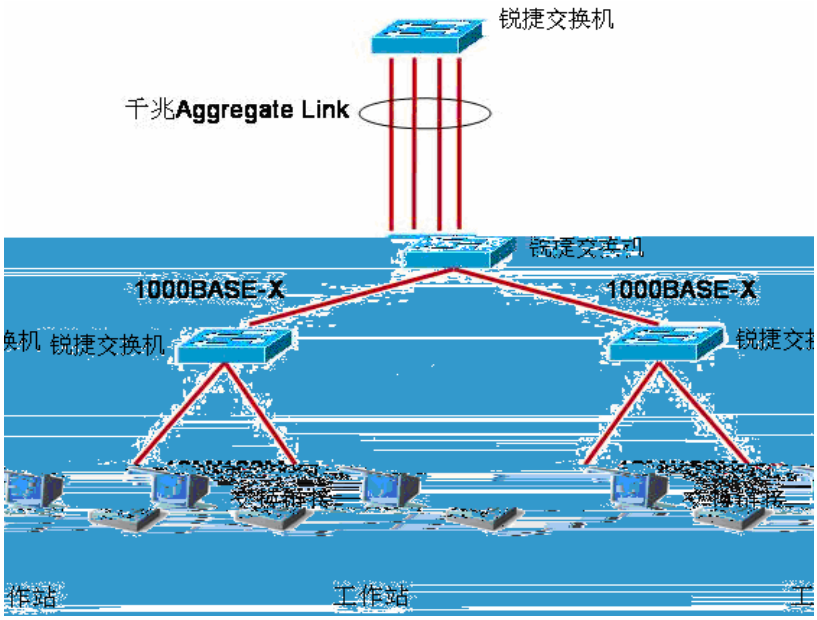
¡ جھ Э Aggregate Port Â

7.1.

7.1.1. Aggregate Port

τ ┤Л∪ э جھ У У э ˘ э τ ⁋
ϋ Aggregate Poîŕt ЛЬЮ AP˜ Â k AP ╖ ∧ IEEE802.3ad
ñ˘ ┤Л∪ ¥ ˘ k ┤ Â

AP è У ˜ ˘ ˜ ╟اسم ˛ AP è
è ˜ Э ∨ ÂAP è У ˜ ˛ ˘ a˛
┤˛ è ˜ Э Â



ي 1 ϑ صر AP

7.1.2.

AP ┤Л∪ MAC اسم فخ à MAC اسم فخ˘ MAC اسم فخ + MAC اسم
فخ à IP اسم فخ˘ IP اسم فخ Л∪ ┤ IP اسم فخ + IP اسم فخ ḣ اسم ك
˛ ˛ AP ˜ è Â ┤Л∪ **aggregateport load-balance** ˛

Â

MAC فخ سم MAC فخ سم ˆ ˆ AP ﻝ ﻉ ˜
è Â a ﻝ MAC ˇ ﻟ ˜ a ﻝˇ ﻝ MAC ˇ ÿ ﻝ У
ﻉ ˜ ﻟ Â

MAC فخ سم MAC فخ سم ˆ ˆ AP ﻝ ﻉ
˜ è Â ﻝ MAC ˇ ÿ ﻝ У ﻉ ˜ ﻟˇ a ﻝ MAC
ˇ ÿ a ﻝ ˜ ﻟ Â

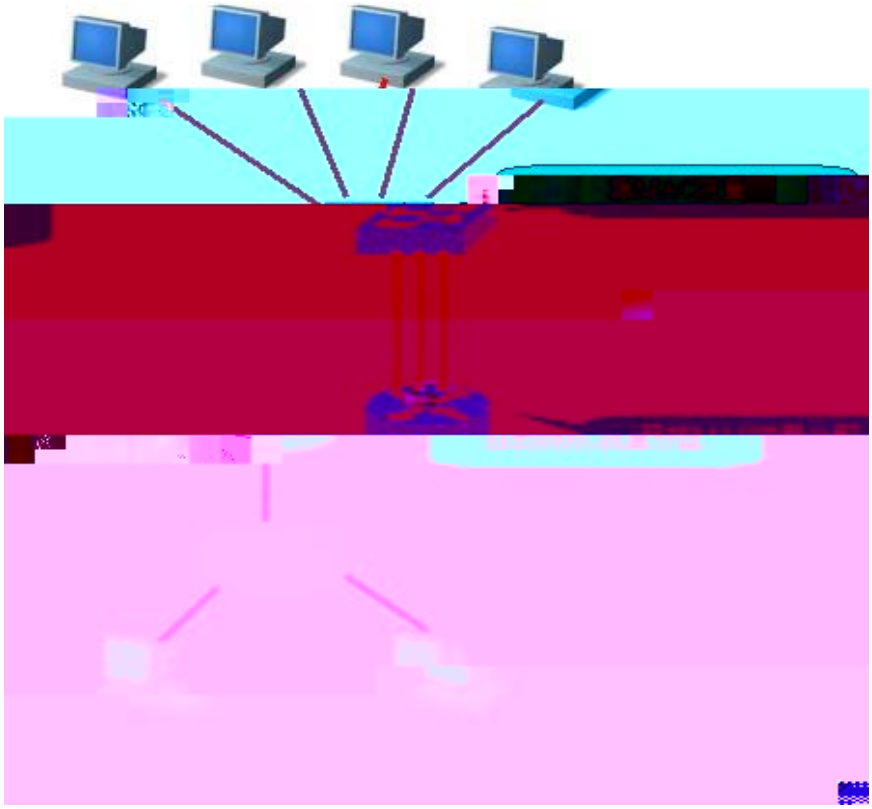
MAC+ MAC فخ سم MAC Ո MAC فخ سم
ˆ ˆ AP ﻝ ﻉ ˜ è Â ɛ a ﻝ MAC+ MAC فخ سم ﻝ
ˆ ˆ ﻝ У ﻉ AP ˜ è Â

IP فخ سم IP فخ سم IP IP ˆ Â a ﻝ
IP IP a ﻝ ˜ ﻟˇ ﻝ IP IP ‡
ﻝ ˜ ﻟ Â ɣ Ь ˇ جم
Ю ˆ ɣ ˇ ‡ ╟ ɣ MAC فخ سم MAC فخ سم
Â

IP فخ سم + IP فخ سم IP Ո IP ˆ Â
ɣ Ь ˇ جم Ю ˆ ɣ ˇ ‡ ╟
ɣ MAC فخ سم Â ɛ a ﻝ IP+ IP فخ سم ﻝ ˆ
ˆ ﻝ У ﻉ AP ˜ è Â

ʊ a ﻝ ﻯ ˆ ˇ Л ɾ كا ˆسم ≠
ˆ ﻯ ﻉ Э ˇ ˈI ˆ ¯ Â

جم Юفي è ˇ У ﻉ Ц AP б Ы ˇ ⁇ è ˆ في è
Э 4 ﻯ PC ˜ Л ʊ Ы й ˜Ω ˇ ˆ في è Ю 2 ﻯ PC ˜
Ы ﻟ MAC ˜Ω MAC فخ سمˇ ѝ ѽ Ы б ѐ ы ў ⁇
ѐ ы ˆ ˇ ѝ MAC فخ سم ' جم
Ц ˇ ‡ ѝ MAC فخ سم Â



في 2 AP في

7.2. Aggregate Port

7.2.1. Aggregate Port

AP Ю '

	ћ
ɣ AP ʌ	
Ь AP ʌ	
	ώ MAC فخ سم ĵ Â Â

7.2.2. Aggregate Port

AP ˜ ʌ ʌ У Â

γ ∧ ∧ ╗ ώ γ AP˘ Ь ∧ ∧ ╗ ώ Ь AP Â

AP a ∧ ΰ ╗ Â

∧ ╗ ώ У э a ﻉ AP ˘ AP ¸ ╟… Â

У э ∧ ╗ ώ AP˘ ∧ AP ≀ Ҷ Â

У э ∧ ÿ AP è ˘ ‡ ∧ ѝ è ╗ ώ AP ⁄ή Â

~

У э ∧ ╗ ώ AP Л , a ﻉ ∧ Э ˙ ¦ , ĺ ∧ AP.

7.2.3. Aggregate Port

ﻉ ∧ Ю˘ Ю ∧ ╗ ώ AP˙

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

7.2.5. Aggregate Port

æ ЮЎ ЮО AP '

Ьu ҷ	ɔ
Ruijie(config)# **aggregateport load-balance** {**dst-mac** | **src-mac** | **src-dst-mac** | **dst-ip** | **src-ip** | **ip** }	AP ˘ G ' **dst-mac'** ώ MAC فخ سم ĵ Â æ AP ﾉ è˘ MAC فخ سم ﾉ ĵ ﾉ ˘ MAC a ﾉ ĵ ĵ a ﾉ **src-mac'** ώ MAC فخ سم ĵ Â æ AP ﾉ è˘ a ﾉ MAC فخ سم ĵ ĵ a ﾉ ˘ ﾉ MAC فخ سم G ﾉ **ip'** IP б IP ĵ Â a ﾉ IP Í Í IP a ﾉ ˘ ﾍ˘ ﾉ У IP Í Í IP ﾉ ˘ ﾍ Â **dst-ip'** ώ IP فخ سم ĵ Â æ AP ﾉ è˘ IP فخ سم ﾉ ĵ ﾉ ˘ IP a ﾉ ĵ ĵ a ﾉ ˘ **src-ip'** ώ IP فخ سم ĵ Â æ AP ﾉ è˘ a ﾉ IP فخ سم ĵ ĵ a ﾉ ˘ ﾉ IP فخ سم G ﾉ ˘ **src-dst-mac'** MAC б MAC ĵ Â a ﾉ MAC Í Í MAC a ﾉ ˘ ﾍ˘ ﾉ У MAC Í Í MAC ﾉ ˘ ﾍ Â

AP ĵ ḣ˘ ﾍ Лu æ ŏ ЮG '

no aggregateport load-balance Ьu ҷ Â

7.3. Aggregate Port

æ ЮЎ ЮО AP Â

Ьu ҷ	ɔ
Ruijie# **show aggregateport** [*port-number*]{**load-balance | summary**}	AP Â

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

Ruijie#show aggregateport 1 summary

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

8 VLAN

¦ IEEE802.1q VLAN

8.1.

VLAN ˆ Virtual Local Area Network˜ ˘ ˇ У э
Э ,ˆ Â э ų ISO صر γ Â VLAN ,ˆ
a ↓ ↰ Æ ⁸ Â VLAN Ռ ↓ ˘
ɷ Æ ⁸˘ Ռ У Â γ ´ à Ռ
ˇ У э VLAN ǫ ↰ à ˘ a˛ ώ ὲ ы VLAN ʒ è Â Л˘ У
э ↰ ў Ռ ὲ a ˇ ↓ У э VLAN ў ˘ ‡ У э
Ь ˘ Ю Â

↓ Л Ъ У э ↰ Ж й У э VLAN ˜ ˘ ˆ э ↰
У ˆ ˘ з э ↓ Л Ъ э VLAN Â ╗ à ˆ Ռ ᵍ ↓ Л Ъ У э

8.1.1. VLAN

ң ҏ VLAN IEEE802.1Q ñ˘ 4094 э VLAN(VLAN ID 1-4094) ѐ è VLAN 1 a ┘ VLAN Â

8.1.2.VLAN ˜ ص

┘ Л∪ У э ∩ VLAN ˜ ص˘ э ∩ ˘ Л∪ ┤ э ∩ ┘ Л∪ ц э VLAN Â ˜Ω ц VLAN ˜ ص ˘ Ю

VLAN ˜ ص	VLAN ∩
Access	У э Access ∩˘ ┘ ц У э VLAN˘ з VLAN Â
Trunk˘ 802.1Q˜	У э Trunk ∩˘ ج ą Ю ц VLAN ˘ ┘ VLAN Â ≠ ┘ Л∪ ┘ VLAN " (Allowed-VLANs) ╗ Л∪ ⁸ Â

8.2. VLAN

У э VLAN Л∪ VLAN ID Â ج è˘ ┘ Л∪ ╗ à┐ à ᵍ VLAN 2-4094˜ VLAN 1 ╠… ˘ з a ┘ ┐ Â

┘ Л∪ ᴳ ∩ У э ∩ VLAN ˜ ص ╗ ώ à У э VLAN Â

8.2.1.VLAN ą ć

ج ћ ч Ю ώ **copy running-config startup-config** ћ ч ∥˘ VLAN ą ≠ ć ˙ Â VLAN ą ˘ ┘ Л∪ ᴳ **show vlan** ћ ч Â

8.2.2. VLAN

∩	ћ	ىتن
VLAN ID	1	1˙ 4094
VLAN Name	VLAN xxxx˘ xxxx VLAN ID	ىتن

VLAN State	Active	Active˘ Inactive

8.2.3.… à ɡ У э VLAN

ѫ ЮЎ ˩ЛЬ… ɡ У э VLAN

ћυ ʒ	ɔ
Ruijie(config)# **vlan** *vlan-id*	ώ У э VLAN ID Â ώ У э VLAN IDЎ ‡ ˬ … У э VLANˇ ώ ѫ VLAN IDЎ ‡ ɡ VLAN Â
Ruijie(config)# **name** *vlan-name*	ˆ ˩ ˜ й VLAN ˩ У э ɻ Â У ˇ ‡ ˬ ╟ й У э ɻ VLAN xxxxЎ è è xxxx 0 ﻲ Æ VLAN ID ʌ Â ˇ VLAN 0004 VLAN 4 ɻ Â

VLAN ɻ ﻫ ɻ ˇ ˤ ώ **no name** ћυ ʒ. ˩ Â

ЮО У э … VLAN 888Ў ћυ ɻ й Test888Ў з ɖ ˚ R ˈ

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

8.2.4.╕ У э VLAN

a ╕ VLANˆ VLAN 1˜ Â

ѫ Ю╕ У э VLANˈ

ћυ ʒ	ɔ
Ruijie(config)# **no vlan** *vlan-id*	ώ У э VLAN IDЎ ╕ Â

8.2.5. ɻ VLAN┤ Access ˤ

У э ˤ┤ У э a ѫ VLANˇ ѫ э VLAN ╟ … Â

ѫ ЮЎ У э ˤ┤ У э VLANˈ

Ъυ ϛ	ɔ
Ruijie(config-if)# **switchport mode access**	ЪЖ ٨ VLAN ˜ صˆ γ ACCESS ٨˜
Ruijie(config-if)# **switchport access vlan** *vlan-id*	ɜ ٨ǂ У ɜ VLAN

Ю ɜ R Ethernet 1/10 ɔ ὶ Access ٨ ╗ ώ ɷ VLAN20ʹ

```
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 ɜ R ɷ ¦ ΐ ˈ

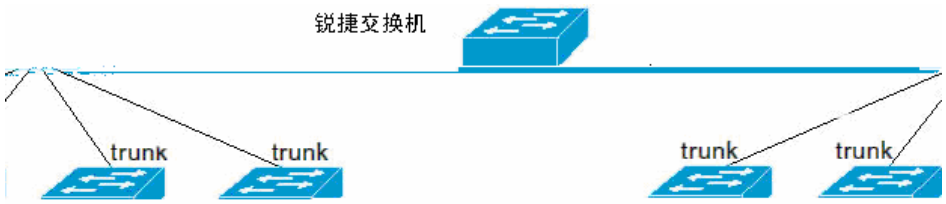
```
Ruijie(config)# show interfaces gigabitEthernet 3/1 switchport
Switchport is enabled
Mode is access port
Acsess vlan is 1,Native vlan is 1
Protected is disabled
Vlan lists is ALL
```

8.3. VLAN Trunks

8.3.1. Trunking

У ɜ Trunk У ɜ ɜ Л Ъ Ц ٨ Ո ɛ ы ˆ Ы Ц ˜ ˇ У Trunk Л Л ɣ ɜ VLAN Â

Trunk 802.1Q ñ Â Юفي ɷ У ɜ Trunk Â



ي 2

ى Л Ъ У э Л Ъ ٨ ˘ У э Aggregate Port ѝ У э Trunk ٨ ˜ Ω ц Aggregate Port ˘ Aggregate Port ˜ Â

У э ٨ ѫ ACCESS Ո TRUNK ʒ ˛ ˘ **switchport mode** Ъ ʔ '

Ъ ʔ	ɔ
Ruijie(config-if)# **switchport mode access**	У э ٨ ѝ Access
Ruijie(config-if)# **switchport mode trunk**	У э ٨ ѝ Trunk

ѝ Trunk ٨ ЪЖ У э Native VLAN Â Native VLAN ˜ ѫ э ٨ Э ى UNTAG ˘ ѝ ц э VLAN Â ˘ э ٨ VLAN ID ˆ . IEEE 802.1Q è PVID ˜ Native VLAN VLAN ID Â ى ˘ ѫ Trunk Э ى ц Native VLAN ˘ ‡ UNTAG Â э Trunk ٨ Native VLAN VLAN 1 Â

ѫ Trunk ˘ ч Trunk ٨ ц ى Native VLAN Â

8.3.2. У э Trunk ٨

8.3.2.1. Trunk ٨ ѧ

ѫ Ю ˜ ى Л Ъ У э ٨ У э Trunk ٨ Â

Ħυ ϗ	ɔ
Ruijie(config-if)# **switchport mode trunk**	ⱵⱾ ٨ صر ѝ γ Trunk ٨
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	ѝ э ٨ У э Native VLAN

У э Trunk ٨ Trunk ˜Ω Æ ḣ˘ G **no switchport trunk** ٨ Ħυ ϗ Â

8.3.3. ⱵⱾ Trunk ٨ ⅃ VLAN "

У э Trunk ٨ ⅃Л· VLAN˙ 1˙ 4094˜ Â л ˘
≠ ⅃Л Trunk ٨ ⅃ VLAN " ⁸ ҉ VLAN a
э Trunk ٨ Â

ѫ Ю˝ ⅃Л ¡ ᵛ ` 6 Ȯ

1,3-4094

8.3.4. Native VLAN

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

ھ ЮЎ ٦ Л Ъ ѝ У э Trunk ٨ Native VLAN Â

Ъ ҷ	ɔ
Ruijie(config-if)# **switchport trunk native vlan** *vlan-id*	Native VLAN

Trunk Native VLAN " ھ VLAN 1Ў G **no switchport trunk native vlan** ٨ Ъ ҷ Â

У э Native VLAN VLAN IDЎ ھ э Trunk ٨ ٦ ˘ ¸ ╟ Ω ٧ TAG Â

У э ٨ Native VLAN ѝ У э a ھ VLAN ˘ a¸ ╟… VLAN Â ˘ У э ٨ Native VLAN ٦ Л Ъ a ھ ٨ ٦ VLAN " è Â ˘ Native VLAN a ٨ Â

8.4. VLAN

ھ ЮЎ ٦ Л Ъ VLAN

```
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
```

8.5. VLAN R

8.5.1.

8.5.2.

Э ˘ ˝ , ˛ й VLAN 10 à VLAN 20 à VLAN 30 Л ц
2 ’ 3 э VLAN

```
Ruijie(config)#interface range GigabitEthernet 0/2-4
#          Gi 0/2-4    trunk
Ruijie(config-if-range)#switchport mode trunk
#
Ruijie(config-if-range)#exit
#    Gi 0/2
Ruijie(config)#interface GigabitEthernet 0/2
#       vlan      vlan
Ruijie(config-if)#switchport trunk allowed vlan remove 1-4094
#       vlan    10 20
Ruijie(config-if)#switchport trunk allowed vlan add 10,20
#    Gi 0/3
Ruijie(config-if)#interface GigabitEthernet 0/3
#       vlan      vlan
Ruijie(config-if)#switchport trunk allowed vlan remove 1-4094
#       vlan    10 20 30
Ruijie(config-if)#switchport trunk allowed vlan add 10,20,30
#    Gi 0/4
Ruijie(config-if)#interface GigabitEthernet 0/4
#       vlan      vlan
Ruijie(config-if)#switchport trunk allowed vlan remove 1-4094
#       vlan    20 30
Ruijie(config-if)#switchport trunk allowed vlan add 20,30
#
Ruijie(config-if)#exit
                  vlan
#      vlan          vlan id
Ruijie#show vlan
VLAN  Name      Status              Ports
---- --------  --------  --------------------------------
   1 VLAN0001   STATIC    Gi0/1, Gi0/5, Gi0/6, Gi0/7
                          Gi0/8, Gi0/9, Gi0/10, Gi0/11
```

VLAN

```
#       SVI 30     IP فذسه
Ruijie(config-if)#ip address 192.168.30.1 255.255.255.0
#    ھ ّ
Ruijie(config-if)#exit
```

Switch A

```
… VLAN
#    ّ
Ruijie#configure terminal
# …   VLAN 10
Ruijie(config)#vlan 10
# …   VLAN 20
Ruijie(config-vlan)#vlan 20
#    ھ ّ
Ruijie(config-vlan)#exit
```

Access

```
#    ّ    تن Gi 0/2-12
Ruijie(config)#interface range GigabitEthernet 0/2-12
#       Gi 0/2-12       Access
Ruijie(config-if)#switchport mode access
#       Gi 0/2-12        VLAN 10
Ruijie(config-if)#switchport access vlan 10
#    ّ    تن Gi 0/13-24
Ruijie(config-if)#interface range GigabitEthernet 0/13-24
#       Gi 0/13-24       Access
Ruijie(config-if)#switchport mode access
#       Gi 0/13-24        VLAN 20
Ruijie(config-if)#switchport access vlan 20
#    ھ ّ
Ruijie(config-if)#exit
```

Э Ң trunk ٨

ώ ٨ Gi 0/1

Ruijie(config)#**interface GigabitEthernet** *0/1*

٨ Gi 0/1 ٸ trunk ٨

Ruijie(config-if)#**switchport mode trunk**

ھ ٷ

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

9 Super VLAN

Super VLAN

9.1.

Super VLAN VLAN , ¦ У Â Super VLAN ч й VLAN л˘ У ж . у IP

ˇ Sub VLAN2 Ո Sub VLAN4 Æ ų Â Ĭ Sub VLAN2 è У ﻝ ў PC1 б è ﻝ У ﻝ ў PC2 ąˇ PC1 ﻝ б ų ﻝ У ˇ ‡ ﻝ IP ARP Â ж Ь ĺ ARP ﻝˇ è ج Sub VLAN2 تن ۈ ץ ˇ Уˋ ARP ﺝﻫˇ ARP ﺝﻫ ″I ARP è IP ﻓﺫﺳﻡ a ﺝﻡ Sub-VLAN2 èˇ x ˇ ﺝﻱ й Ո PC1 ﺝﻡ ﻝ У э ﻣﻫ ˇ ж ў PC1’ a SuperVLAN3 MAC ﻓﺫﺳﻡ PC1ˇ ARP Ɂ ɔ Â PC1 Ո PC2 ąˌ ARP Ɂ ˇ ﻝ PC1 ﻝ PC2 ↑, PC1 Ո PC3 ąˌ ‡ ﻝ Â

8'

¸ Super VLAN a ↑ ŭ˙ ¦ ˜ ﻝˇ ﻝ ↑ ŭ Sub VLANˇ Sub VLAN ↑ ŭ ﻝ Â

¸ Super VLAN a ṁ й è Super VLAN Sub VLAN Â

¸ Super VLAN a 1Q vlan G Â

¸ VLan 1 a ɔ й SuperVLAN Â

¸ Sub VLAN a й ﻝˇ a IP ﻓﺫﺳﻡ Â

¸ Super VLAN a G VRRPˇ a γ Â

¸ ﻣﻫ ų Super VLAN ﻝ ACL Ո QOS a Sub VLAN Â

9.2. Super VLAN

ﻝ Л Ъ G Ю ћ ъ Ɂ Super VLAN Â

ћ ъ Ɂ	ɔ
Ruijie# **configure**	ώ ΰ
Ruijie(config)# **vlan** *vlan-id*	ώ VLAN
Ruijie(config-vlan)# **supervlan**	SuperVLAN ╗
Ruijie(config-vlan)# **end**	ﻫﻩĺ

ą Ю˘ Super VLAN ╗ ˜Ω ˇ G **no supervlan** ﻝ Л ˜Ω supervlan ╗ Â

9.3. Super VLAN Sub VLAN

й SuperVLAN SubVLANˇ SuperVLAN Ћ Â

ﻝ Л Ъ G Ю ћ ъ Ɂ G У э VLAN ų Super VLAN SubVLAN Â

~

ل ع a SubVLAN

ħυ ٹ	ɔ
Ruijie# **configure**	ώ
Ruijie(config)# **vlan** *vlan-id*	ώ VLAN
Ruijie(config-vlan)# **supervlan**	vlan ϧ SuperVLAN
Ruijie(config-vlan)# **subvlan** *vlan-id-list*	ə sub vlan τ ╗ ώ supervlan è Â
Ruijie(config-vlan)# **exit**	ĺ ŭ

G **no subvlan** [*vlan-id-list*] ħυ ٹ SuperVLAN SubVLAN Â

9.4. Sub VLAN فخ سم تن

ل Лυ ϧ ə SubVLAN è سم فخ تنّ Лυ ғ Ш IP سم فخ ع ف ə SubVLAN. ل У ə SuperVLAN Ю SubVLAN سم فخ تن a ل Лυ Ц ۱ ۱ ц ↑ ŭ ˜Ω .

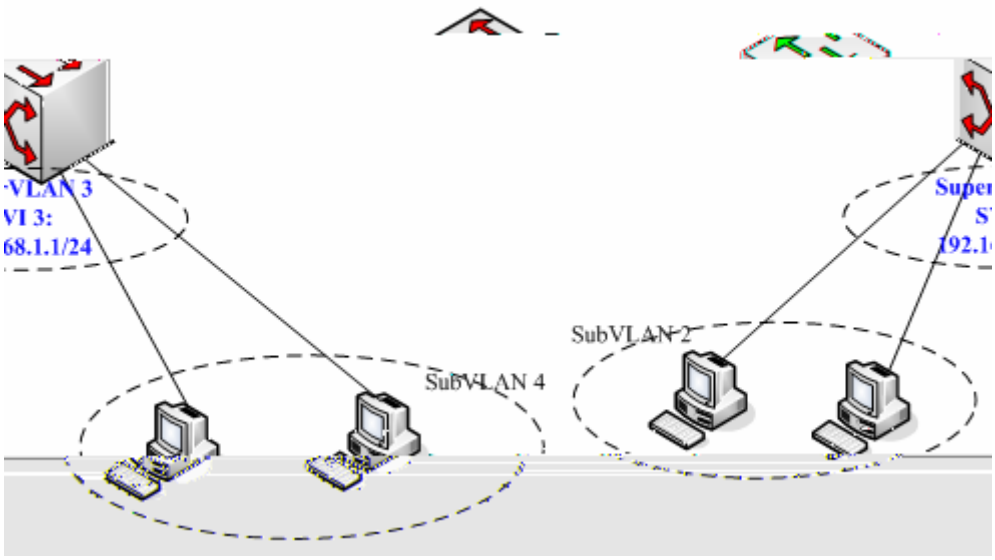
ج ŭ Ю Ю " Â

ħυ ٹ	ɔ
Ruijie# **configure**	ώ
Ruijie(config)# **vlan** *vlan-id*	ώ vlan
Ruijie(config-vlan)# **subvlan-address-range** *start-ip end-ip*	VLAN سم فخ تنّ start-ip ϧ SubVLAN IP سم فخ end-ip ϧ SubVLAN IP سم فخ
Ruijie(config-vlan)# **end**	ھĺ
Ruijie# **show run**	ɱ ۱

~

ل Лυ **no subvlan-address-range** Ĵ ɱ

9.8. ẘ R



في 2

Э في SuperVLAN R ˘ SubVLAN2 Ո SubVLAN4 ў ۷ Л
ə˘ è Ю' ˆ ۷ " ˜Ω ˛ ˜

```
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
```

␣ ѝ SubVLAN2 ╗ ώ ˜ ۷

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

␣ ѝ SubVLAN4 ╗ ώ ˜ ۷

```
switchport access vlan 4
!
```

␣ … SuperVLAN Ь ᛋ

```
interface Vlan 3
ip address 192.168.1.1 255.255.255.0
```

10 Protocol VLAN

10.1. Protocol VLAN

ʌ ʈ ˘ VLAN ʈ ˘ G ɣ ɻ У У э
VLAN˘ ЛЬЮ Ь ʅ '

1. VLAN ID

10.2. Protocol VLAN

10.2.1. Protocol VLAN

ą Ю Protocol VLAN

10.2.2. profile

Ю

2. æ э Profile ˘ ˝l¦ Profile˘ Ą Profile
3. a ˩ ң ҕ Profile э a ˩˘ S3750 7 э profile Â

10.2.3. profile

˩ Л Ю :

Ьυ ҙ	
configure terminal	ώ
interface [˄ *ID*]	ώ ˄
protocol-vlan profile *id* vlan *vid*	profile¦ ˄
no protocol-vlan profile	˄ Э profile
no protocol-vlan profile *id*	˄ Э э profile
end	˄

Ю R profile 1 Ո profile 2 ¦ 3 GE ˄ 1,VLAN¦ 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 ˄ Э ˩ Л profile

˩ profile æ a ˩ ˄ Э ˩ Л a ˩ vid

a ˩ ˝ ң ҕ ˩ Л VID a ˩˘ S3750 ˝ ˩ Л 4094 э VLAN Â

10.3. Protocol VLAN

ۍ Л Ъ ЛЪЮ Protocol VLAN ѫ

Ъ ҳ	
show protocol-vlan	Protocol VLAN ѫ

```
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
```

11 Private VLAN

11.1. Private VLAN

Ь ᵏ ك э У э VLAN˘ ‡ ц У ⅄ VLAN ⅄
4096 ᵍ ⓠ Ь ᵏ ك ’ ج Ь Э˘ э VLAN ⍞
У э ففسم У " ففسم˘ ą IP ففسم ˘ У ā
Private VLAN Â

VLAN(Private VLAN) У э VLAN γ ﷺ ,⍞ э ﷺ˘ э ﷺ
У э VLAN ' ў VLAN(Primary VLAN)Ո ╠ VLAN(Secondary VLAN)Â

У э VLAN ﷺ ⅄Л э VLAN ˘ У э VLAN Ҷ У э ﷺ Â ج У э VLAN ﷺ è VLAN ‘Ω м ⅄ У э ў VLANÂ э ﷺ ╠ VLAN ID a ⅄ Â

У э VLAN ﷺ è ⅄ У э ў VLAN˘ ╠ VLAN ⅄ У э VLAN ﷺ è γ ˘ ч ص ╠ VLAN'

¸ VLAN(Isolated VLAN)' ⅄ У э VLAN è ⅄ a ц γ ą Â У э VLAN ﷺ è ⅄ У э VLANÂ

¸ е VLAN(Community VLAN)' ⅄ У э е VLAN è ⅄ ⅄Л ц γ ą˘ л a б è е VLAN è ⅄ γ ą Â У э VLAN ﷺ è ⅄Л э е VLANÂ

⅄^ Promiscuous Port˘ ˘ ц ў VLAN è ⅄˘ ⅄Л б˙ ⅄ ˘ ↑ ⅄ У э VLAN ﷺ è ╠ VLAN ⅄Ո е ⅄ Â

⅄ (Isolated Port)˘ VLAN è ⅄˘ ⅄ б ⅄ Â

е ⅄ (Community port)˘ ц е VLAN è ⅄˘ ⅄ У э е VLAN е ⅄ ⅄Л ц ˘ ≠ ⅄Л б Â a б è е VLAN è е ⅄ ⅁ VLAN è ⅄ Â

VLAN è˘ ⅄ ў VLAN ⅄Л… SVI ⅄˘ ╠ VLAN a ⅄Л… SVIÂ

VLAN è ⅄ ⅄Л й SPAN ⅄˘ a ⅄Л й ę ⅄ Â

11.2. Private VLAN

11.2.1. Private VLAN

ą ЮЎ Private VLAN

11.2.2. VLAN ɔ ѝ VLAN

ЮЊu ҳ

Њ ҳ	
configure terminal	ώ
vlan *vid*	ώ VLAN
private-vlan{community | isolated| primary}	VLAN ص
no private-vlan{community | isolated | primary}	ۍ VLAN
end	VLAN
show vlan private-vlan [*type*]	VLAN

&

ج 802.1Q Vlan è é ˜ ۍ ą a ѝ VLAN˝ VLAN 1 a ѝ VLAN˝ ų é Trunk ۍ Uplink ۍ 802.1Q VLAN è˘ ˝I VLAN ÿ ۍ VLAN " è˥ ˘ У Private VLAN ų ACTIVE ЛЬЮ ˚ '

1) é Priamry VLAN

2) é Secondary VLAN

3) Secondary VLAN б Primary VLAN ˜Ω

ЛЬЮЊu ҳ 802.1Q VLAN ѝ Private VLAN˝

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

```
Ruijie# configure terminal
Ruijie(config)# vlan 404
Ruijie(config-vlan)# private-vlan isolated
Ruijie(config-vlan)# end
Ruijie# show vlan private-vlan
VLAN Type  Status    Routed   Interface   Associated VLANs
---- ----  --------  ------   ---------   ------------------
303  comm  inactive  Disabled             no association
404  isol  inactive  Disabled             no association
```

11.2.3. Ω Secondary VLAN Ω Primary VLAN

Ю Ω Secondary VLAN Ω Primary VLAN

Ю ¦	
configure terminal	ώ
vlan *p_vid*	ώ Primary VLAN
private-vlan association {*svlist* | **add** *svlist* | **remove** *svlist*}	Ω Secondary VLAN
no private-vlan association	б Secondary VLAN Ω
end	VLAN
show vlan private-vlan [*type*]	VLAN

w R Ю

```
Ruijie# configure terminal
Ruijie(config)# vlan 202
Ruijie(config-vlan)# private-vlan association 303-307,309,440
Ruijie(config-vlan)# end
Ruijie# show vlan private-vlan
VLAN Type  Status    Routed   Interface   Associated VLANs
---- ----  --------  ------   ---------   ------------------
202  prim  inactive  Disabled             303-307,309,440
303  comm  inactive  Disabled             202
304  comm  inactive  Disabled             202
305  comm  inactive  Disabled             202
306  comm  inactive  Disabled             202
307  comm  inactive  Disabled             202
309  comm  inactive  Disabled             202
440  comm  inactive  Disabled             202
```

&

ɔ ﻩ ﻭ Primary VLAN VLAN Â

11.2.4. Secondary VLAN ∩ Primary VLAN Ь ∧

⅃ Л∪ Ю '

Ьυ ⅋	
configure terminal	ώ
interface vlan *p_vid*	ώ Primary VLAN ∧
private-vlan mapping {*svlist* | **add** *svlist* | **remove** *svlist*}	Secondary VLAN ⍭ Primary VLAN SVI Ь Ꮋ Â
end	∧

Ю R 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#
```

&

ɔ è Primary VLAN ∩ Secondary VLAN ℸΩ Â

11.2.5. γ ∧ ɔ ﻭ VLAN ў ∧

ЛЬЮ γ ∧ ɔ ﻭ VLAN ў ∧ (Host Port)

Ьυ ⅋	
configure terminal	ώ
interface <*interface*>	ώ ∧ *fastethernet*, *gigabitethernet*, *tengigabitethernet*

switchport mode private-vlan host	ѝ γ Ꮋ
no switchport mode	VLAN
End	SVI ٨
switchport private-vlan host-association *p_vid s_vid*	ٹΩ γ ٨ б VLAN
no switchport private-vlan host-association	ٹΩ

w R Ю'

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

&

ɔ è Primary VLAN Ո Secondary VLAN ٹΩ

11.2.6. γ ٨ ɔ ѝ VLAN ٨

γ ٨ ɔ ѝ VLAN ٨˘ ЛЬЮ ɔ Ьυ ʒ'

Ьυ ʒ	
configure terminal	ώ
interface <*interface*>	ώ ٨ ”I¯, ”I˘ Ъ ”I
switchport mode private-vlan promiscuous	ѝ VLAN γ Ꮋ
no switchport mode	╕ ٨ VLAN
switchport private-vlan mapping *p_vid*{*svlist* | **add** *svlist* | **remove** *svlist*}	VLAN ٨ ﻩ VLAN˘ ٦ secondary VLAN ”
no switchport private-vlan mapping	٧ seconary VLAN.

Ю R '

```
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#
```

&

ɔ è Primary VLAN& ˜ Ƅ

11.4. Private VLAN ή صر R

11.4.1. ⅄ Ꮆ Э Private VLAN

11.4.1.1.

ھ ч ⅄ Э 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
```

␣ ㄴ 0ỏ 1 Ω 0ỏ 2 ¥ Community VLAN 100, ㄴ 0/3 ¥ Isolated VLAN 101, ㄴ 0/4 ὴ Promiscuous Port Â

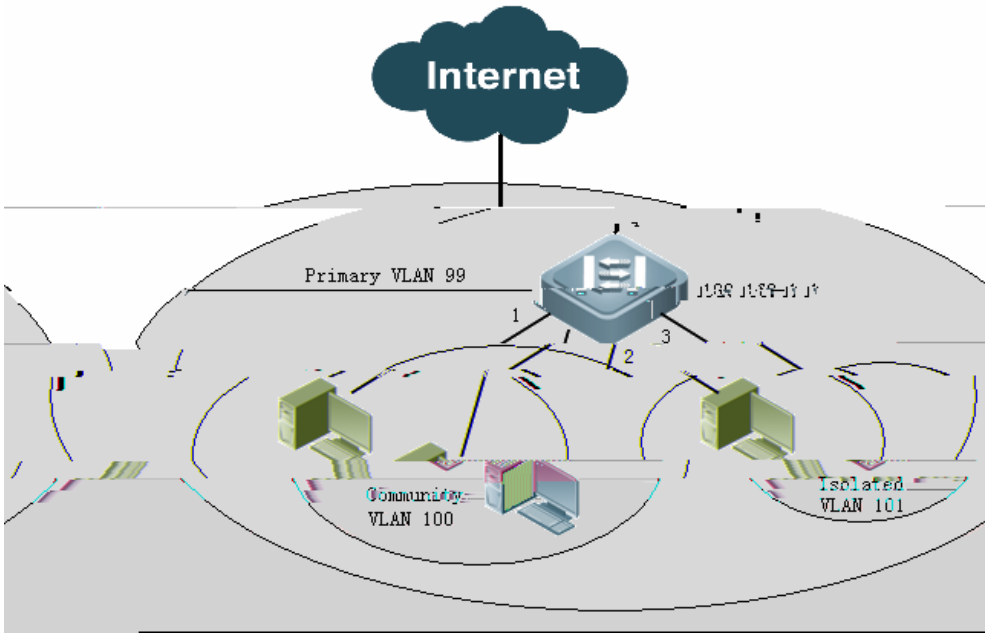
```
Ruijie(config)#interface gigabitEthernet 0/1
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport private-vlan host-association 99
100
Ruijie(config-if)#exit
Ruijie(config)#interface gigabitEthernet 0/2
Ruijie(config-if)#switchport mode private-vlan host
Ruijie(config-if)#switchport 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 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
```

11.4.2. ´ ﻝ Ь Ӈ Э Private VLAN

11.4.2.1.

ﻩ Private VLAN Ь Ӈ Э˘ ﻝ Л ﻭ Private VLAN У э SVI. У э Private VLAN Ю VLAN˘ ↑ Primary VLAN б Secondary VLAN˘ ﻝ Л ﻩ ﻝ У э SVI ӷ . ﻝ ﻩ Э э R ﻫ Э˘ ﻭ Primary VLAN У э IP ﻫ ﻑ , ӌ G Secondary VLAN ﻝ ﻩ Primary VLAN Ь . ﻝ Â

11.4.2.2.



11.4.2.3.

ﻝ Э У э R˘ … VLAN 99 ﻭ Primary VLAN˘ … VLAN 100 ﻭ Community VLAN˘ … VLAN 101 ﻭ Isolated VLAN˘ ˜Ω ў VLAN Â

```
Ruijie#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
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 primary
Ruijie(config-vlan)#private-vlan association 100,101
Ruijie(config-vlan)#exit
```

 ˽ ˺ 1 Ո ˺ 2 ¥ Community VLAN 100˘ ˺ 0/3 ¥ Isolated VLAN 101˘ ˺ 0/4 ˀ Promiscuous PortÂ

```
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
```

ˀ Primary VLAN У ɜ SVI (192.168.1.1)˘ Л˅ Secondary VLAN Ո Primary VLAN Ь ˺ Â

```
Ruijie(config)#interface vlan 99
Ruijie(config-if)#ip address 192.168.1.1 255.255.255.0
Ruijie(config-if)#private-vlan mapping 100-101
Ruijie(config-if)#show vlan private-vlan
VLAN    Type                Status      Routed      Ports
Associated VLANs
----- ---------- -------- -------- -------------------------
99          primary          active       Enabled     Gi0/4
100-101
100   community  active   Enabled  Gi0/1, Gi0/2         99
101   isolated   active   Enabled  Gi0/3                99
```

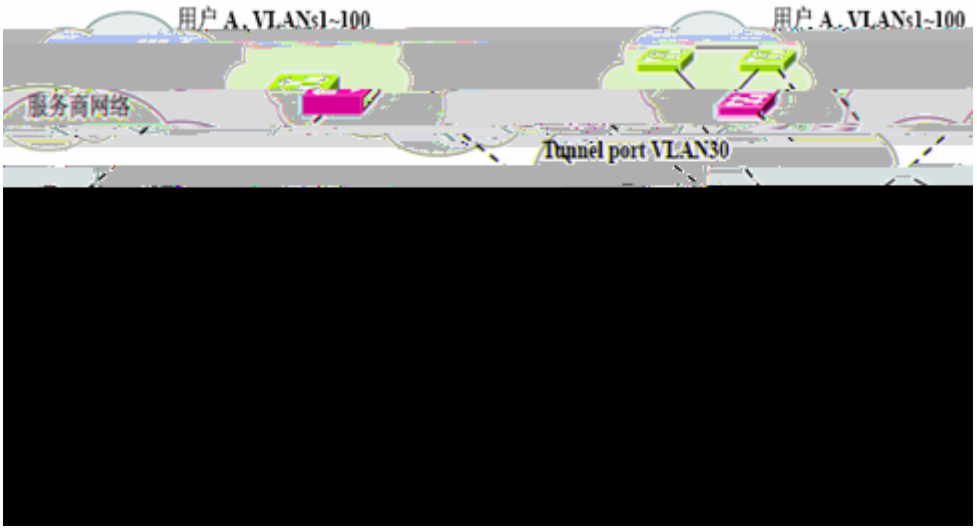
12 802.1Q tunneling

12.1. 802.1Q tunneling

ㄴ ᵏ ك ك н VLAN ㄱ VLAN ID ᵩ
Â ㄴ У э ㄴك VLAN تن ㄴ ㄱˇ з a ㄴ ㄴ
ك Ђ ㄴ جم У Â э У э VLAN تن ᵩ
⁸ ˇ з VLAN ㄲ ᵩ 802.1Q ₩ 4096 Â

¯ IEEE 802.1Q Tunneling( )╖ ˇ ㄴك ㄴЛυ У э VLAN(ㄴك VLAN)
э VLAN Â VLAN ɖ ˇ . ᴳ ώ
ㄴك a ㄴ VLAN ㄴˇ ≠ᵩ جم ㄴك ɖ̈ è ∫ · Â
ㄱ Tag VLAN تنˇ У э IEEE 802.1Q Tunneling( )
ㄲ й ㄲ (Tunnel Port) Â Ąˇ ㄴЛυ ㄲ У э VLAN
э й ж VLAN Â ˇ э Θ У э ㄴك VLANˇ جم
ㄴك è· ㄴك VLAN ↑ ㄱ Tag ˇ Лυ ㄴك VLAN جم è
· Â

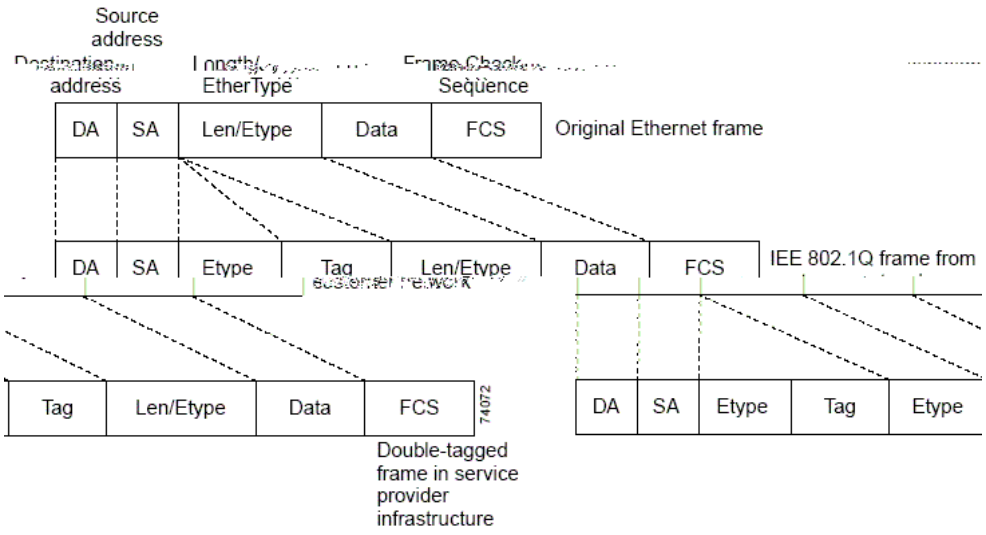
Ђ ÿ ὲ У э TRUNK ㄲˇ 802.1Q TAG ώ∫ ㄴك
У э ㄲ Â Ո ㄴك й (Asymmetric
Link)ˇ ج й У У э Trunk Portˇ ㄱ У . У э Tunnel Port Â a ㄴ
Tunnel Port ç a ㄴ VLAN Â Ю في



في 1

ÿ Trunk Port ώ∫ ㄴك ㄲ У э
Vlan ID IEEE 802.1Q Tag Â ώ∫ ㄲ ㄱˇ ᵩ ╗ У
802.1Q Tag (й ㄴك Tag)ˇ ↑ Ŭ ㄱ У э VLAN IDˇ э VLAN ID э

a ﻝ Â TAG ¸ ɖ ﺟ ¤ Â ώ ﻟ
Э ﻧ Tag ﻙ Tag VID ¤ Tag ‡ ɖ ɷ ώ
VID Â Юﻓﻲ ɷ ﻧ Tag ╕ '



2 ﻓﻲ

ﻧ Tag ÿ Tunnel Port ˘ ﻙ Tag Ω ﻠ˘ ﻝ ﻫﻯ ﻠ
ώ 802.1Q ˘ VLAN Â

ώ ɔ Untagged ˘ a Э Untagged
802.1Q Tag Â ﺟ ﻙ Э ﻙ Tag ∩
VLAN ﻣ (Tunnel port Access VLAN) Â ﻙ Tag . ″I ﷺ ﻯ Tunnel port
Э . ″I (˘ ﻯ 0) Â

ﻓﻲ è˘ A ç VLAN 3Ơ B ç VLAN 40 Â ώ
802.1Q Tag ↑ Э У ﻙ Tagˇ ﻯ ﻧ Tagˇ ﻙ Tag ↑ Ъ
VLAN 30 40Ơ ¤ Tag ↑ Ъ ɷ ﻠ VLAN ǫ ˘ VLAN 100 Â G
A ∩ B ώ ﻙ VID 100Ơ ų ﻙ Tag VID a ˘
ъ ﺟ ﻙ è ˙ ǂ Â э ﻝ Ʌ ǂ è VLAN ﻥ˘
ų è ﻳﺍ ˘ ≠ ų ﻙ Â

12.2. 802.1Q tunneling

↑ ЛЬЮ ¤ '

¸ 802.1Q Tunneling

¸ 802.1Q Tunneling ´

¸ 802.1Q Tunneling [8]

¸ У э 802.1Q Tunneling ﻣ

¸ У э Uplink ﻣ

¸ ﻙ Tag è TPID ḣ

¸ Tag . ″I ⁸

12.3. 802.1Q tunneling

Ю˘ 802.1Q ╖ '

12.3.1. 802.1Q tunneling ´

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

Native Vlan ' ج У э 802.1Q ˘ 802.1Q Trunk ∧ У э ∧ Â ج Ⴑ ᵏ ك ¤ Ꮋ ˘ ⅄ 802.1Q Trunk, Trunk ∧ Â TRUNK ˘ Э TRUNK ∧ Native VLAN б Tunnel port ACCESS VLAN a ⅄˘ ﺝ й Vid й Native VLAN ÿ Trunk ∧ ㄴ Ą˘ Tag¸ Ω Â

' ﺝ й 802.1Q Tunneling ∧¸ ╖ 4 э ⅃ك VLAN Tag˘ ¸ ÿ 1518 ╖ᛏ 1522 Â

Uplink ∧' Up-link ∧ ¥ è ы ⅃ك Э ∧ Â Э فهي 1 è ⅃ك Trunk Ports˘ Uplink ∧ è У Trunk ∧˘ a ⅄ ˘ ÿ Uplink ∧ Tag Â ÿ Trunk Port ˘ Native VLAN ㄴ ˘ ‡ a tag Â

Tag. ″I ⁸' ج ㄴ TAG ¤Ю˘ ¤ Tag(Tag) . ″I ⁸ ᛏ Tag(⅃ك Tag) Â

12.3.2. 802.1Q tunneling ⁸

802.1Q tunneling Ю ⁸'

¸ ∧ a й Tunnel Port

¸ Ap ∧ ⅄Л Tunnel Port

¸ й Tunnel ∧ a Ą ŭ 802.1x ╖ Â

¸ й Tunnel ∧ Э a ŭ Â

¸ й Tunnel ∧ Э a ╖ ώ STP Â

¸ й Tunnel ∧ Э a ŭ GVRP Â

¸ й Tunnel ∧ ᴳ System-guard Â

12.3.3. У э 802.1Q tunneling ٨

ж ŏ Ю G Interface Ъu ҳ ώ ٨ Â Ю Tunnel Port '

Ъu ҳ	
configure terminal	ώ ŏ
interface <*interface*>	ώ ٨
switchport access vlan <*vid*>	Access VLAN Â э Access VLAN a ٦
switchport mode dot1q-tunnel	٨ 802.1Q Tunnel
end	٨
show running-config	ŏ

&

٨ a й Tunnel Portˇ й Tunnel ٨ G System-guardˇ a ŭ GVRPˇ a ╗ ώ STP ˘ a ŭ ˘ a ŭ 802.1x Â

Ю R ¢ ¦ У э 802.1q Tunneling ٨ R '

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

12.3.4. У э uplink ٨

ж ŏ Ю G **Interface** Ъu ҳ ώ ٨ Â Ю Tunnel Port '

Ъu ҳ	
configure terminal	ώ ŏ
interface <*interface*>	ώ ٨
switchport mode uplink	٨ й uplink ٨
end	٨

Ю R ¢ ¦ У э ٨ R '

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

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

12.3.5. Ł ك Tag è TPID ḣ

æ ŏ Ю G Interface ħ ʒ ώ ∧ Â Ю

ħ ʒ	
configure terminal	ώ
interface <*interface*>	ώ ∧
frame-tag tpid <*tpid*>	tag è TPID Â ṅ 0x9100 Â ѫ ώ frame-tag tpid 9100 Â 16 ⁸ Â
end	∧
show frame-tag tpid	∧ tpid ḣ " Â

Ю R ¢ ¦ TPID R '

```
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
```

12.3.6. Tag . ″I ⁸

æ ŏ Ю G **Interface** ħ ʒ ώ ∧ Â Ю

ħ ʒ	
configure terminal	ώ
interface <*interface*>	ώ ∧
inner-priority-trust enable	⁸ ¤ tag(tag) priority ḣ↑ tag priority ḣ (Ł ك tag) Â
end	∧
show inner-priority-trust	Tag . ″I ⁸ Â

ЮR ¢ ¦ Tag. ″I 8 R'

```
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
```

13 MAC فخ سم

13.1. MAC فخ سم

13.1.1.

MAC فخ سم ↑ ΰ ϖ ϒ ϰ ϰ فخ سم ϑ Â MAC فخ سم ↑ ΰ ϖ ╠ à
à Ь ص فخ سم˘ τ ÿ ЛЮ ύ э MAC فخ سم Â

13.1.1.1.

, جم ҉ ąЮ, فخ سم ˚ , 3 فخ سم è ҉ ┘ ˚ ע
a Â w R Ю:

Ї A Ռ B ڇ ٨, A ѝ ў . A Ռ B ┘ ┘ .
Ї , A Ռ B فخ سم, ų ٨ ˜ فخ سم a ┘ .
┘ B Э У э mac1+vid1+Bport فخ سم, جم A Э . л
э فخ سم ≠˚ ˛ فخ سم è .

13.1.2. MAC فخ سم

13.1.2.1. MAC فخ سم

Ю فخ سم '

ق	
فخ سم لا	300
فخ سم ╟	╟ ¯
فخ سم	! ˙ فخ سم
فخ سم	! ˙ فخ سم

~

فخ سم لا ¸ б ḣ جم У Ę ˘ Л a¸ ḣ 2˝ Â

13.1.2.2. لا فخ سم

Ю ѝ فخ سم لا '

ḥu ʒ	ɔ
Ruijie(config)# **mac-address-table aging-time** [*0 |10-1000000*]	У ɔ سم فخ ¯ Л ɖ جم ╟ سم فخ è ˘ ´ Æ ˘ تن 10̋ 1000000 ˘ ѝ 300 Â æ ɔ ḣ ѝ 0 ˘ سم فخ لا ╖ ˜Ω ˘ ¯ ˚ سم فخ a¸ لا Â

Л Лu جم ώ Ю ḥu ʒ **no mac-address-table aging-time** سم فخ لا ѝ ḣ Â

13.1.2.3. ╤ ╟ سم فخ

جم Ю˘ Л Лu G ḥu ʒ **clear mac-address-table dynamic**╤ Э ╟ سم فخ' Л Лu G ḥu ʒ **clear mac-address-table dynamic address mac-address** ╤ У ɔ MAC سم فخ ' Л Лu G ḥu ʒ **clear**

mac-address-table dynamic interface *interface-id* ╕ У э ∧ Aggregate Port Э ╠ سم فخ' ≠ ┘Л∪ G ћ∪ ч **clear mac-address-table dynamic vlan** *vlan-id* ╕ VLAN Э ╠ سم فخ Â

┘Л∪ G Ю ћ∪ ч **show mac-address-table dynamic** ╠ سم فخ ╦ ╕ Â

13.1.2.4. ╕ Ґ╕ سم فخ

╕ У э سم فخ˘ MAC سم فخ(↑ سم فخ)˘ VLAN(э سم فخ ╕ ώ ф э VLAN سم فخ è)˘ ∧(سم فخ й MAC سم فخ ↑ ┤╡ ∧) Â

╕ У э سم فخ'

ћ∪ ч	э
Ruijie(config)# **mac-address-table static** *mac-add* **vlan** *vlan-id* **interface** *interface-id*	mac-addr' MAC سم فخ vlan-id' سم فخ VLAN interface-id' ↑ ┤╡ ∧(┘Л∪ ∧ Aggregate Port) جم vlan-id VLAN Э ╡ Л∪ mac-addr سم فخ й سم فخ ↑ ˘ э ↑ ┤╡ interface-id ∧ Э Â

┘Л∪جم ώ Ю ћ∪ ч **no mac-address-table static mac-addr vlan** *vlan-id* **interface** *interface-id* ╕ У э سم فخ Â

Ю R ¢ ¦ У э سم فخ 00d0.f800.073c˘ جم VLAN 4 è ┘ ╡ سم فخ й э سم فخ ↑ ˘ э ↑ ┤╡ ∧ Gigabitethernet 1/3 Э Â

```
Ruijie(config)# mac-address-table static 00d0.f800.073c vlan
4 interface gigabitethernet 1/3
```

13.1.2.5. ╕ Ґ╕ سم فخ

╕ У э سم فخ˘ ф э VLAN ¤ ф э ↑ سم فخ й سم فخ ↑ ˘ э MAC سم فخ˘ جم VLAN ¤ ╡ Л∪ э MAC
x Â

╕ У э سم فخ'

ћ∪ ч	э
Ruijie(config)# **mac-address-table filtering** *mac-addr* **vlan** *vlan-id*	mac-addr' MAC سم فخ vlan-id' سم فخ VLAN

ل ل ث جم ّ ّ ي Ю h ث ع **no mac-address-table filtering mac-addr vlan** *vlan-id*] У э فخ سم Â

Ю R ↑ ، ¢ ¦ VLAN 1 ¨ MAC فخ سم ى 00d0.f800.073c

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

13.1.3. e $ ôÞ

```
Total Mac Address Space Available: 8159
```

فخ سم У

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

13.2. MAC فخ سم У Л

13.2.1.

ф Ұ è Л У ą˘ G MAC فخ سم ╖
У Â MAC فخ سم ╖ Л˘ ˝ ĺ У э MAC سم
فخ ĺ У э ˝ ĺ MAC فخ سم˘ У э ч MAC فخ سم Л У ą ˚
ң ˘ Лъ SNMP Trap ą ч NMS(ɔ) Â
У э MAC فخ سم ╕ ң ˘ ъ У э (э MAC فخ سم
) G ˘ У э MAC فخ سم˝ (У э G ˘ جم
У سم فخ Ą̈ Ո ˙ ị ˘ MAC فخ سم
ÿ سم فخ è˝) ң ˘ ‡ У э ṃ G ф Â

G ˘ Л ˚ جم Ą̈˚ MAC فخ سم Л У ң
(Э)˘ ╖ Â й ф ˝ ˘ Л Лъ ч
MAC فخ سم Â ˚ فخ سم ą ╕ Лъ ˘
جم فخ سم ą è˘ ↑ Ü̈ ф э MAC فخ سم Л У ą ˘ ˚
سم ˝ Â

MAC فخ سم ң ˘ ą Л ˚ ĺ MAC فخ سم Ղ Л è Â
Trap NMS ч MAC فخ سم Л У Trap˘
Л Лъ MAC فخ سم Ղ Л ф MAC فخ سم Л У Â

MAC فخ سم ╖ سم Ұ ч ˘ Л MAC فخ سم У э ŭ ˝Ω Â MAC
سم فخ ŭ ˝Ω˝Ω ˘ ‡ ч Э Ƙ a˚ ң MAC فخ سم Â ч جم ŭ
˝Ω з ч Э MAC فخ سم Л У ╖ ąЮ˘ э ч ˚ ң MAC
سم فخ Л У ˘ ╖ ч Э MAC فخ سم Л У a˚ Â
Л Лъ ч Θ Θ ч فخ سم ╕ ˝ ˘ ≠ Л Лъ ч Л Â

~

MAC فخ سم Θ ╟ فخ سم˘ Ұ سم فخ Л У a˚ ң ą
Â

13.2.2. MAC سم فخ ل لا ╖

ϙ ЮЎ MAC سم فخ ώ ΎΩ ΎΩ ˇ ∧ MAC سم فخ ╖ ≠ كا ΎΩ Â

MAC سم فخ ╖ '

ћυ ϧ	ɔ
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 enable traps**	ΐ Ч ل Trap

Ruijie(config)#
mac-address-table notification

13.2.3. MAC سم فخ ل لا ءٍ

ھج ЮЎ æo ل Лu G Ю " hu ٹ MAC سم فخ ءٍ '

hu ٹ	ɔ
Ruijie# **show mac-address-table notification**	MAC سم فخ ل لا ╖ ŏ ءٍ
Ruijie# **show mac-address-table notification interface**	٨ MAC سم فخ ل لا G ą
Ruijie# **show mac-address-table notification history**	MAC سم فخ ل لا ءٍ ٦ ل

Ю MAC سم فخ ل لا ءٍ У ҏ R Â

MAC سم فخ ╖ ŏ ءٍ '

```
Ruijie# show mac-address-table notification
MAC Notification Feature : Enabled
Interval(Sec): 2
Maximum History Size : 154
Current History Size : 2
```

```
Ruijie# show mac-address-table notification interface
Interface          MAC Added Trap MAC Removed Trap
-------------------- -------------- ----------------
Gi1/1              Disabled      Enabled
Gi1/2              Disabled      Disabled
Gi1/3              Enabled       Enabled
Gi1/4              Disabled      Disabled
Gi1/5              Disabled      Disabled
Gi1/6              Disabled      Disabled
```

```
Ruijie# show mac-address-table notification history
History Index:1
Entry Timestamp: 15091
MAC Changed Message :
Operation   VLAN MAC Address    Interface
----------- ---- -------------- --------------------
Added       1    00d0.f808.3cc9 Gi1/1
Removed     1    00d0.f808.0c0c Gi1/1
```

13.3. IP

13.3.4. فخ سم

æo ⅃ Лυ جم ЮG **show address-bin**d [ip-address *ip* | mac-address *mac*]
Ћυ ʒ IP/MAC فخ سم Â

```
Ruijie# show address-bind ip-address 3.3.3.3
IP Address      Binding MAC Addr
-----------     -----------------
3.3.3.3         00d0.f811.1112
```

13.3.5. فخ سم ΐ

æo ⅃ Лυ جم ЮG **show address-bind summary** Ћυ ʒ è فخ سم
ʗΩ Лυ ⅂ فخ سم ɜ

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

~

System Address bind status جم è جم Ь ' SUCCESSʗ G
ɷ Ћυ ʒ address-bind install Ћυ ʒ ℼ فخ سم ' FAILʗ G ɷ
Ћυ ʒ address-bind install Ћυ ʒʗ Л ¥ ° a Лυ فخ سمʗ
Лυ ʗ فخ سم a ʗ ⅃ Лυ⅂ ⅂
فخ سم Ą ' Uninstallʗ فخ سم ʗΩʗ
فخ سم a Â

13.3.6. فخ سم IP

فخ سم ⅂ й ò ʗ ʗ ш Ь ʗ й ш Â è
⅃ ‡ʗ Ю

	Ipv4 ⅃ ‡	IPV6 ⅃ ‡
ш	⅃ ΐ ⅄ IPV4+MAC ° ⅃ Â	a ΐ · ¦ ipv6 ⅃ˆ ~ Â
	⅃ ΐ ⅄ IPV4+MAC ° ⅃ Â	ΐ IPV6 ⅃ Â
ò	⅃ ΐ ⅄ IPV4+MAC ° ⅃ Â	⅃ ΐ MAC й فخ سم MAC فخ سم IPV6 ⅃

IPV6 ٧ IPV6 ٧ : Â

ÿ ˇ ٧ Л Л Ю IP فخ سم '

ћ ҷ	ɔ
Ruijie# **configure terminal**	ώ ŏ
Ruijie(config)# **address-bind ipv6-mode compatible**	ipv6 й ò
Ruijie(config)# **address-bind ipv6-mode loose**	ipv6 й
Ruijie(config)# **address-bind ipv6-mode strict**	ipv6 й ш
Ruijie(config)# **no adress-bind ipv6-mode**	ipv6 й ˆ ш ˜ Â

ƕ ʒ	ɔ
Ruijie# **configure terminal**	ώ ΐώ
Ruijie(config)# **address-bind uplink** *intf-id*	فخ سم R ٨
Ruijie(config)# **address-bind install**	فخ سم R ٨

æo ٦ Л ت ΐώ ЮG **no address-bind uplink** *interface-id* ٧ R ٨
G **no address-bind install** ٧ R ٨ Â

13.3.8. فخ سم R ٨

٦ Л ت ЮG **show address-bind uplink** ƕ ʒ Ч è
ɷ فخ سم R ٨'

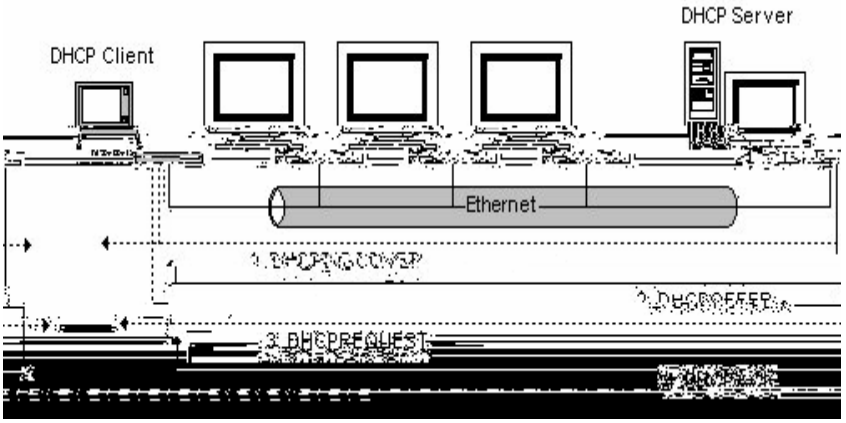
```
Ruijie# show address-bind uplink
Ports       State
------------ ------
Fa0/1       Enabled
Fa0/2       Disabled
Fa0/3       Disabled
Fa0/4       Disabled
Fa0/5       Disabled
Fa0/6       Disabled
Fa0/7       Disabled
Fa0/8       Disabled
Fa0/9       Disabled
Fa0/10      Disabled
```

14 DHCP Snooping

14.1. DHCP Snooping Ӯ

14.1.1. DHCP

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



1 في

DHCP Client ↵ DHCP DISCOVER DHCP Server˘ Client جه У
ą̈ ↑ ↳لا : ˇ ‡ ↵ DHCP DISCOVER Â

DHCP Server ↑ DHCP DISCOVER ⁄˘ У Client↑
(IP فخ سم)˘ ⁄ ↵ DHCP OFFER Â

DHCP Client ↑ DHCP OFFER ⁄˘ ↵ DHCP REQUEST ˇ
↵ ↳لا ˇ ˆ ع ىا ↳لا ↵ ↳لا↑ فخ سم Â DHCP ˜ ↑

DHCP Snooping G ┤╖ '

DHCP Snooping Trust ∧' ╕ DHCP ↓ IP Ц т┤ G ˘
ъ ↓ ж Ё╜ : ↓ IP фдзсм Â й ш Ё╜ ˘
∧ й ч ъ˘ TRUST ∧ Ո UNTRUST ∧ Â ╕ DHCP ˘
Θ è ↓¦ TRUST ∧ Â ╕ DHCP Ё╜ : ˘ Θ ↓ TRUST ∧
: ˘ x UNTRUST ∧ : Â л DHCP Ё╜
∧ й TURST ∧˘ è ы∧ й UNTRUST ∧˘ ↓Л
DHCP Ё╜ Â

DHCP Snooping ' ж DHCP ˘
IP фдзсм ˘ У ы Â DHCP Snooping Ո
Ё╜ Ъ Ц т ˘ ↓¦ IP фдзсм Л ┤ MAC à VID à PORT à
ф У э ˘ ÿ У э DHCP Snooping Â

DHCP Snooping ╖ DHCP л ˘ x a л
DHCP ˘ ф DHCP Snooping Â ЛЮ ґ ъ
й DHCP '

1. UNTRUST ∧ ¦ DHCP Ё╜ : ˘ ↑ DHCPACK à
DHCPNAK à DHCPOFFER Â

2. mac ╖ ˘ MAC б DHCP DHCP
Client a ↓ Â

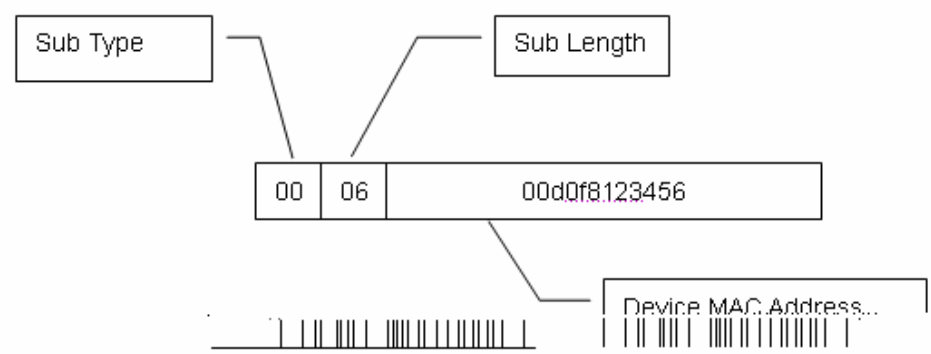
3. б DHCP Snooping è ф a У DHCPRELEASE Â

14.1.3. DHCP Snooping information option

¦ ˜ ж ґ IP фдзсм ˘ Æ
¦ IP фдзсм˘ . ф
¦ Â Ц ж DHCP ↓ ˘ ↓Л У Ҷ ˜Ω ф Л
DHCP option82 ╗ ю¦ DHCP è Â option82 ф ˘ Ё
Ё ↓Л ц й ¦ IP фдзсм Â DHCP snooping ╗ ю option82

في 2

Agent Remote ID



في 3

14.1.4. DHCP Snooping فخ سم ╖

DHCP snooping فخ سم ╖ DHCP Ђ ц ˘ ⁄ ą (IP فخ سم à MAC à VLAN à PORT à) ˘ DHCP snooping Â DHCP snooping è ą ╖ Ї IP ˚ è ˘ ÿ ⁸ ↓ DHCP snooping è ⁄ ↓ IP ˘ IP فخ سم Â

14.1.5. DHCP Snooping Bootp

DHCP Snooping سم ¥ DHCP ˜ ő ⁸ ╖ ˘ ¥ Bootp ò a Â ў ج ي ج Bootp è a ج DHCP ˜Ω Option˘ ' صر à Â ج DHCP Snooping Bootp è ⁸ Â

ج ɔ ˘ ъ DHCP Snooping ╖ ¢ ˘ ╖ ¢ Bootp ˜ Â DHCP Snooping DHCP Ђ ц ↓ ˘ ╖ ¢ Bootp ˘ ⁄ Bootp ˘ ˚ ↓ IP سم فخ à MAC سم فخ à ↓ ↓ VLAN ą ˘ ╖ У э Ї DHCP Snooping è Â

Bootp ج DHCP Snooping è ¥ У э ˘ ↓ ↓ Â ج Bootp Ђ ц è ╠ ˘ ת ї ↓ ɔ ↓˘ ˘ ╠ Ћ ч ї Â

14.1.6. DHCP snooping ˜Ω ő ╖

DHCP Snooping فخ سم ↓ IP ˘ a ARP Â

й ¢ ╗ ѽ ˘ ARP ˘ ARP Â ARP
˘ ┘ Л Ч ARP-CHECK à DAI ˜Ω ~

14.1.7. DHCP Snooping è ы Y

1¨ DHCP Snooping ╗ б DHCP Relay Option 82 ╗ ц ˘ . a ┘
DHCP Snooping Ո DHCP Relay Option82 ╗ Â

2¨ Ч й TRUST Ч Л˘ a Ą Ч Ю ѽ ⁸ Â

3¨ ў DHCP Snooping ╗ Л˘ DHCP CPU ˘ a ┘ ѽ
⁸ ; Â ج ' 1˜ . G a Л ѽ
˘ ŋ ┘ Л Ъ ∫ ففسم' ~ ┘ Л Ъ ∫ ففسم˘ п
┘ ¸ ج й a ѽ x ˘ ą Ю ¸ Э Â

14.2. DHCP Snooping

14.2.1. Ո˜Ω DHCP Snooping

ą Ю˘ DHCP Snooping ╗ й ˜Ω Â ╗ Л˘ DHCP Snooping DHCP Â

Ьu ҳ	
Ruijie# **configure terminal**	ώ
Ruijie(config)# [**no**] **ip dhcp snooping**	Ո˜Ω DHCP snooping

Ю DHCP snooping ╗ '

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

14.2.2. DHCP Snooping Bootp

ą Ю˘ DHCP Snooping ╗ a Bootp Â ╗ Л˘ DHCP Snooping Bootp ˘ Л Bootp ╗∫ DHCP Snooping è Â

Ьu ҳ	
Ruijie# **configure terminal**	ώ

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

Ю DHCP Snooping

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

~

¨ a¸ б ╟ ă Â ¤ ˘ Ÿ ┘Л
╟ ┘ ﻓﺬﺳ Â
¨ ¥ Â╕ б╕ ˘
Ћυ ҂ ┘ Â

14.2.5. DHCP snooping information option

ą Ю˘ ╗ ˜Ω Â ╗ Л˘ DHCP Snooping ﺟ ┘ ˘
¸ ﺟ DHCP è ╗ option82 ’ ┘ DHCP : è
option82 ╕ Â

Ћυ ҂	
Ruijie# **configure terminal**	ﺟ Ϋ

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

14.2.9. ٨ ٪ TRUST

Ruijie# **show ip dhcp snooping**	dhcp snooping ˜Ω ə‚

R '

```
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
```

14.3.2. DHCP snooping ə‚

ħυ ϡ ¥ DHCP Snooping è ə‚ '

15 IGMP Snooping

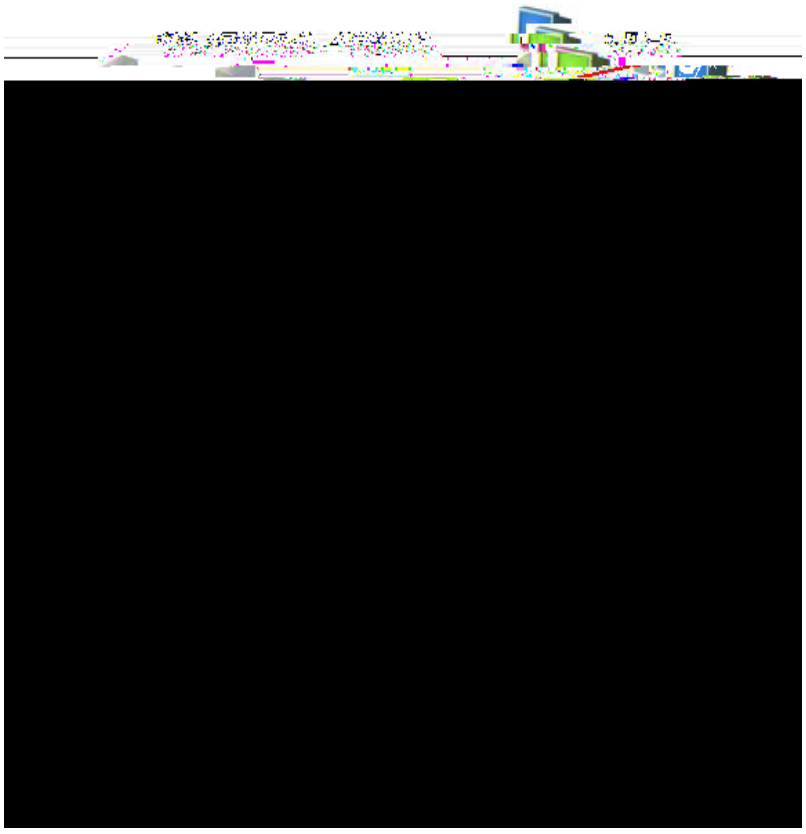
15.1.

15.1.1. IGMP

IGMP Internet IP

Multicast

点对多的传播方式



1 في

IP У э IP Л У э ў · ˘ э ↑ Ü 0 э э ў ў У э´ IP فخ سم Â

ў فخ سم ≠ й فخ سم ˘ ч й D فخ سم˘ . ÿ 224.0.0.0 ~ 239.255.255.255 Â 224.0.0.0~224.0.0.255 ų ɖ فخ سم˘ è è'

¸ 224.0.0.1 · è ў
¸ 224.0.0.2 · è

2 فخ سمˆ MAC فخ سم˜ ÿ IP فخ سم Â IP Л 23 Æ Л 01-00-5e-00-00-00 ĵ ғ MAC فخ سم Â ' IP فخ سم й 224.255.1.1˘ ɛ˘ Ὼ ⁸ й e0-ff-01-01˘ Л 23 Æ й 7f-01-01˘ б 01-00-5e-00-00-00 ɔ й' 01-00-5e-7f-01-01 Â 01-00-5e-7f-01-01 . й 224.255.1.1 MAC فخ سم Â

IGMP(Internet Group Management Protocol) ˜ ų ў Ո б ў Ƹ ˘ ў ˜ ˆ سم ╗ ώ ч э ą ˘ Л ˜ □ سم ﷺ ą̈ э ˜ ĭ ų ╠ ˆ . ĭ Ÿ ų э ˜ ~ ˘ ˜ Ὼ б Â Â ɱ Ь э IGMP' IGMPv1 جم RFC1112 è ˘ IGMPv2 جم RFC 2236 è ˘ IGMPv3 جم RFC3376 è Â

Ƹ̵ ˘ ъ ĵ ⋮ Ў جم IGMPv1 à IGMPv2 ў ! ╗ ώ Ƹ̵ ч ч ˆ Ĭ ╗ ώ 224.1.1.1˜ Â

IGMPv1 è˘ ў Л Э э ч ч 224.1.1.1 IGMP Report ˘ ╗ ώ è Â ĵ ˘ ‡ й ĵ ч Ю جم ˜ ˘ ڜ ч ч Â Ь ч ч 224.0.0.1 ˆ ў ˜ IGMP Query ˘ ў ˘ ‡ ھ IGMP Report ˘ э ч aĵ · ! ў IGMP Report ˘ ‡ й ч Ю a جم· ! ˜ ˘ ڜ a Л ч ч Â

IGMPv2 Л Ю ò v1˘ —— ╗ ɷ IGMP Leave ˘ Л ᴳ ў Л Л ў ╠ Â جم

Â ﻝ IGMP v3 ﻝ У э ˘ ȯ a à
´ ˘ è ج э ‟Ω У э فذسم
è Â

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

¸ General Query' ¥ ﻧ Ю ˜ ą '

¸ Group-Specific Query' ¥ ﻧ Ю ˜ ą '

¸ Group-and-Source-Specific Query' صر и IGMPv3 è ╗ ˘ ¥ ﻧ Ю ĭ ˜ " è ﻝ Â

IGMP Version3 ﻝ ﻝ Ю ȯ IGMP Version1 Ո IGMP Version2 Â
ﷺ IP ˜Ω ˘ RFC 1112 à RFC 2236 Лυ ﻝ RFC 3376 Â

15.1.2. IGMP Snooping

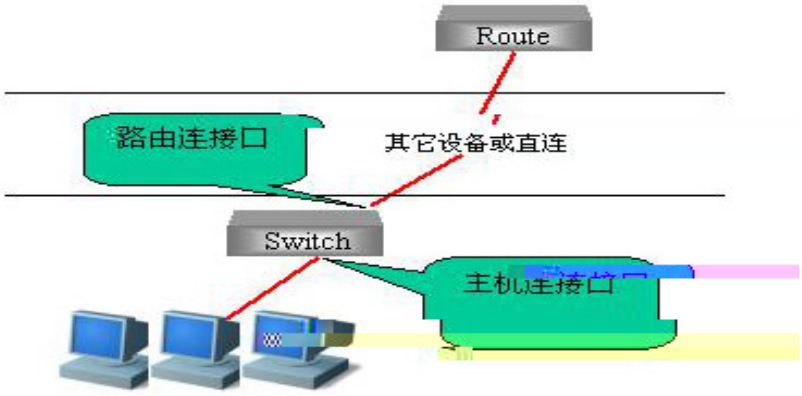
ج γ (Layer2) Ю˘ ɔ и ﻝ ˘ ˘
Â Э ὴ صر ˘ ج э VLAN è˘ э
‟Ą ﷺ ˘ ж VLAN è ˜ ĵ э ˘ ы ъ
ĭ Â

IGMP Snooping ɔ ﻑ ᾱ э ˘ G ﻝ ‟Ą ج
ﻝ ﻝ˘ ÿ a¸ ĵ è Â

IGMP Snooping ج Лυ γ Э ˘
Ո Ʒ IGMP ˘ ¥ Ո Â IGMP Snooping è
ŭ Ж ľ Ŀ˘ ÿ э ŭ Ж ъ ɔ ' γ
ľ Ŀ ў б Ʒ Ч ˘ ą ﻝ
ﻝ Â Ч ľ Ŀĵ ў ﻝ IGMP report( ) ˘ γ
ﻑ ﻝ ╗ ώ ﻝ è' γ ľ Ŀĵ IGMP
Leaveˆ ˜ ˘ γ ﻑ ﻝ ÿ è ĵ Â ˚
ﻝ IGMP Query ˘ ج ĵ IGMP Query Л˘ ج У ‟
ĵ ў IGMP Report ˘ ﻑ ﻝ ÿ è ĵ Â

15.1.3. ﻝ

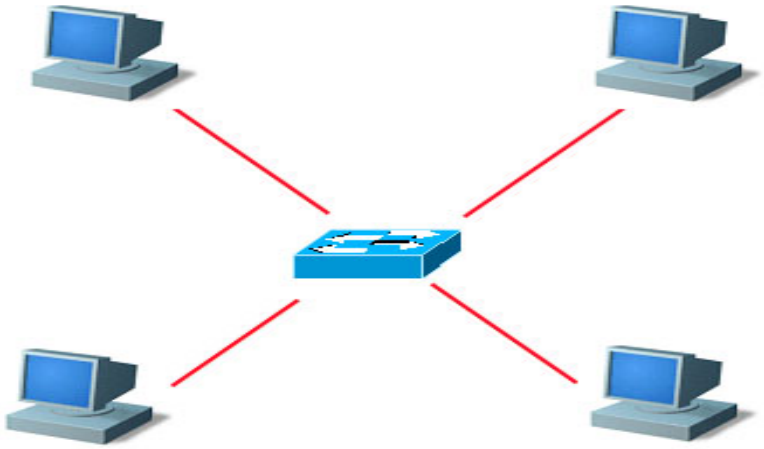
ﻝ Ь ﻝ˘ Юفي Â



في 2

ў ٦ IGMP Report à IGMP Leave ÿ ٨ ٦ ٦
Â ٦ ÿ ٨ ↑ IGMP Query ѝ ٨ ٦ ٦ ў
٨˘ ÿ ٨ ↑ IGMP Query x Â ¦ ٨
٨ Â

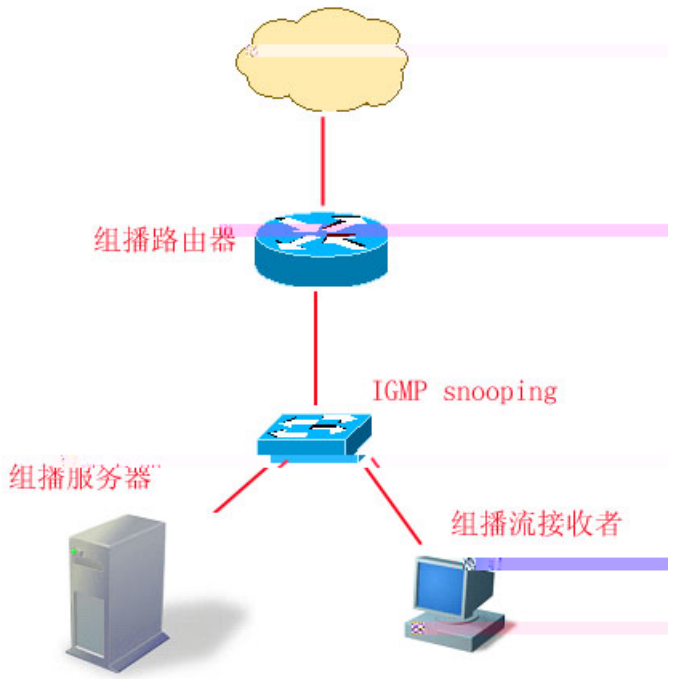
˘ جم ☪ è˘ ٨ è a جم ˘
٨˘ IGMP snooping ŋ Â ЮفيI



في 3

جم ə è˘ ˘ ني ٨ PC ٦ ٦
˘ ≠ ٦ ˘ ˘ è γ è ٨ IGMP
snooping ٦ ˘ a ˙ ¦ У э ٨ ѝ ٨ Â

٨ ˘ ٨ ѝ VLAN ☆ ˘ ЮفيI



ي 4

IGMP Snooping γ a л ч ˘
≠ ч ᴨ˘ Лυ ғ ч è
ы Â л ч ˜ a У Э ˘
ч Лυ ж γ Э ᴨ ч ف ق à ف ق
˘ Лυ ˜ Â

~

Э ف è˘ ľ Ŀ˘ γ ≠ ˚ ╠… У
ч ĵ ˘ л ľ Ŀ ң ч
ч a ˘ ᴨ ч ╠ ˚ ĩ ң ч ’
˜ У ч ĵ ᴨˆ ᴨ IGMP
snooping ˜ ~ ˘ Лυ ɖ ч Â

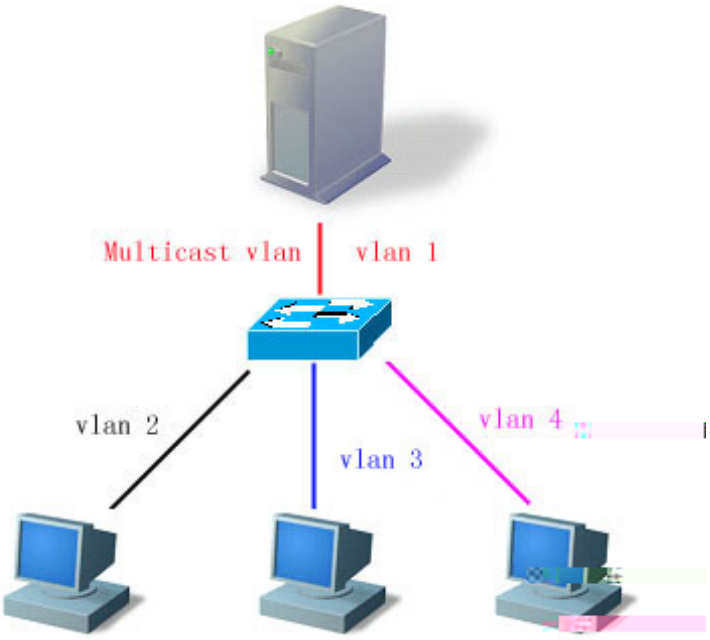
15.1.4. IGMP Snooping ᴎ ɔ

DISABLE ' ж Ю˘ IGMP Snooping a ɔ ˘ . γ a ľ
Ŀ ў б ƺ IGMP ˘ ж VLAN ǫ ч Â

IVGL ɔ ' ж Ю˘ ᴎ VLAN ц Â ў ч б
ц ч У э VLAN ᴨ Â

SVGL ɔ ' ж Ю˘ ᴎ VLAN ў ‘Ω м У Â ў ч Лυ VLAN

Â У э Multicast VLAN جم VLAN ↑ ل ∩ ل
VLAN è ы ў ل Â Юفي '



في 5

ل VID Multicast VLAN ^ UNTAG ˘ ٨
native vlan й Multicast VLAN˜ ˘ ل فذسم ˜ ٨˘
˜ ٨ a э VLAN ǫ Â ل VID Multicast
VLAN Â جم SVGL Ю˘ ɷ ٨˘ è ٨ ٨ ɣ Multicast
VLAN è˘ è ل جم ˛ VLAN è ل Â

IVGL Ո SVGL ч ل ∩ ل جم˘ ل ∩ й , ↑ У فذسم تن
SVGL˘ جم فذسم ǫ ل ^ GDA ˜ VLAN ل ˘ è ы
فذسم ‡ G IVGL Â

γ IGMP Snooping k IVGL б SVGL ˘
ɷ ˘ G ʒ a ل Â

15.1.5. ٨

γ è˘ ↑ ң ҏ IGMP SNOOPING ٨ ╗ ˘
ɷ ѿ Â

IGMP SNOOPING ٨ ш IGMP ώ ٨ Â IGMP
SNOOPING ٨ ʗΩ ˘ ÿ˙ ı ٨ ώ ѯ ﾉ ˘ Ҍ ˛
ъ ل↑ Ѫ ₰ Â d 0 Ã >

2. Э ѝ ٨

1. ´

2. ﺳﻢ ˘ –

15.2. IGMP Snooping

ъ ÿ ЛЬЮ ŭ э ¦ IGMP Snooping

¸ IGMP Snooping ḣ

¸ IGMP Profiles

¸ ٨

¸ ٨ ٦ تن

¸ IVGL

¸ DISABLE

¸ Query ⁝

¸ ٨

¸ IGMP Snooping ˜

¸ IGMP Filtering Â

15.2.1. IGMP Snooping ḣ

IGMP Snooping	DISABLE
٨	٨ ﻛ a ٨˘ a ╟ ˗ Â
٨	˝Ω
IGMP Profile	ѝ ˘ ѝ Deny
SVGL Multicast Vlan	VLAN 1
IGMP Filtering	
IGMP Snooping ˜	

IGMP Snooping

```
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 ˇ э IGMP Profile ‡ permit 224.1.1.1 225.1.1.1 Л 226.1.1.1 э è deny

15.2.3.

IGMP query/dvmrp PIM Л

Ruijie(config)# **ip igmp Snooping vlan** *vlan-id* **mrouter** {**interface** *interface-id* | **learnpim-dvmrp**}	**no**
Ruijie(config)# **end**	

Л 1/1

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

15.2.4. ٨ ٦ تن

ɣ ٨ ṁ ẏ VLAN ᾳ فذ سم ˜ ˘ ٦
Â ת ٦ ҽ a ٦ ˘ ˜ ٦Л IGMP
Profile ٨ ٦ تن Â

ﺟ ЮЎ Ю ٨ ٦ تن'

ħυ ҳ	ɔ
Ruijie(config)# **ip igmp snooping vlan** *vlan-id* **mrouter interface** *interface-id* **profile** *profile name*	٨ ẏ ə ٨ à ЎΩ profile Â ٨ profile ٦ʃ ə ٨ Э Â
Ruijie(config)# **end**	ﻫ Â

٦Л **no ip igmp Snooping vlan** *vlan-id* **mrouter interface** *interface-id* **profile** ʃ б profile ЎΩ Â

ЛυЮ ٨ ٦ تن R'

```
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
```

15.2.5. ╟ ˜ ٨ ע

ﺟ ŭ ╟ ٨ ˜ ˘ ╟ ˜ ٨ G 300s ɔ ẏ ע ˘
ﺟ ע ᾳ ʃ ˜ Mrtoue ٨ ˘ ‡ ʃ ╟ ʃ
٨˘ Ю ħυ ҳ ‡ ٦Л ע ˘ تن ﺟ 1-3600s Â

ﺟ ЮЎ Ю ٨ ٦ تن'

ħυ ҳ	ɔ
Ruijie(config)# **ip igmp snooping dyn-mr-aging-time** *time*	╟ ٨ ע ˘ *time* ' <1-3600> ḣ ẏ 300s Â

Ruijie(config)# **end**	ى Â

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

ЛЮ ╟ л у й 100 R'

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

15.2.6. IVGL

ж Ю Ю IGMP Snooping й IVGL '

h ч	э
Ruijie(config)# **ip igmp Snooping ivgl**	IGMP Snooping й **IVGL** Â
Ruijie(config)# **end**	ى Â

ЛЮ R IGMP Snooping й IVGL '

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

15.2.7. DISABLE

ж Ю Ю IGMP Snooping й DISABLE '

h ч	э
Ruijie(config)# **no ip igmp snooping**	~Ω IGMP Snooping
Ruijie(config)# **end**	ى Â

15.2.8. Query :

˚ л IGMP Query ˜ a ж˘ ж л
Query у ą ˛ ў IGMP Report ˘ ‡˚ й л
a Ą ˘ γ ˚ л ÿ л è˛ Â й 10

ھ ЮҐ ЮО Query : '

Ю ҳ

Ьu ҳ	ɔ
Ruijie(config)# **ip igmp snooping suppression enable**	Ү suppression ╖ Â
Ruijie(config)# **end**	ыь Â

G **no ip igmp snooping suppression enalbe** Ьu ҳ ЎΩ Suppression ╖ Â

ЛЬЮ R Suppression ╖ '

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

15.2.12. IGMP Snooping ъ

Ы ЛЬ ҷ IGMP Snooping ąЮ˘ У э ∧ э ˘ a
Ы л IGMP : Â

ҷ ЮЎ Ю IGMP Snooping ъ '

Ьu ҳ	ɔ
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 э ∧ э Â • *vlan-id* vid • *ip-addr* фхзм • *interface-id'* ∧ Л
Ruijie(config)# **end**	ыь Â

Ы ЛЬ **no ip igmp snooping vlan** *vlan-id* **static** *ip-addr* **interface** ***i****nterface-id*
Ў ъ Â

ЛЬЮ ѝ IGMP snooping ъ R'

```
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
---- -------------   ----------------------------
```

```
1     224.1.1.1              GigabitEthernet 0/7(S)
```

15.2.13. IGMP Filtering

æ Ę ąЮ˘ ┘ ⁸ э ∧ ∧ У à ⁸
∧Ю ї ╠ ╕ ώ Â IGMP Filtering ¢ Â

┘Л У э IGMP Profile æ У э ∧Ю˘ ∧ ¦ IGMP Report
˘ ‡ γ ж ˚ э ∧ ╕ ώ ѕ ғ ї˝ æ IGMP Profile ї т Ğ ą Â ˘ ‡ ї ╕ ώ˘ Ğ Л Л ă

≠ ┘Лæ У э ∧Ю ї ╕ ώ э ˘ т˘ γ ж ≠ a Ą à ă IGMP Report Â

æ Ю˘ Ю IGMP Filtering

Ю ę	ɔ
Ruijie(config)# **interface** *interface-id*	ώ ∧ Â
Ruijie(config-if)# **ip igmp snooping filter** *profile-number*	^ ┘ ~ Profile ų ∧˘ *profile number* т й 1- 65535.
Ruijie(config-if)# **ip igmp snooping max-groups** *number*	^ ┘ ~ ї ú э ╠ ╕ ώ ∧ , ∧ т й 0 – 4294967294 Â
Ruijie(config-if)# **end**	ы Â

15.3. IGMP Snooping ą

τ k ┘ ˜Ω IGMP snooping ą Ю

¸ ɱ

¸ ά ћ ќ W ę F ¾ ѕ ^ ┘ ь ћ

Ьu ҳ	ɔ
Ruijie# **show ip igmp snooping**	IGMP Snooping ɱ ɔ ㄱ ŏ Â

ЛЬЮ R G **show ip igmp snooping** Ьu ҳ IGMP Snooping ҽ '

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

15.3.2. Ո IGMP snooping ḣ

ᵴ ЮG ЮЬu ҳ Ո IGMP Snooping ḣ ҽ '

Ьu ҳ	ɔ
Ruijie# **show ip igmp snooping statistics** [**vlan** *vlan-id*]	IGMP Snooping ҽ Â
Ruijie# **clear ip igmp snooping statistics**	IGMP Snooping ҽ

ЛЬЮ R G **show ip igmp snooping statistics** Ьu ҳ IGMP Snooping ㄴ ҽ '

```
Ruijie# show ip igmp snooping statistics
GROUP    Interface    Last report       Last leave     Last
                        time          time         reporter
-------------- ----------- ------------  ------------   -
224.1.1.2 VL1:Gi4/2   0d:0h:0m:7s     ----     192.168.9.250
                       Report pkts: 1          Leave pkts: 0
```

15.3.3. ㄴ ҽ

ᵴ ЮG ЮЬu ҳ IGMP Snooping ㄴ ҽ '

Ьu ҳ	ɔ
Ruijie# **show ip igmp snooping mrouter**	IGMP Snooping ㄴ ҽ Â

ЛЬЮ R G **show ip igmp snooping** Ьu ҳ IGMP Snooping ㄴ ҽ '

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

15.3.4. ╟ ┤

æ ЮG ЮЋu ŗ ┘ ┤æ è ┤ ‡˘ . GDA '

Ћu ŗ	ɔ
Ruijie# **show ip igmp snooping gda-table**	┘ ┤æ è ┤ ‡ Â

ЛuЮR GDA ┘ ą Лu┘У э ˜ ┤ ą '

```
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)
```

15.3.5. ┤

æ ЮG ЮЋu ŗ IGMP Snooping ŋń ┤ '

Ћu ŗ	ɔ
Ruijie# **show ip igmp snooping**	IGMP Snooping ŋń ɔ ┘ ŭ Â

15.3.6. IGMP Profile

æ ЮG ЮЋu ŗ IGMP Profile ą '

Ћu ŗ	ɔ
Ruijie# **show ip igmp profile** *profile-number*	IGMP Profile ą Â

15.3.7. IGMP Filtering

æ? ЮG ЮЋu ҳ IGMP Filtering ə '

Ћu ҳ	ɔ
Ruijie# **show ip igmp snooping interface** *interface-id*	IGMP Filtering ə Â

ЛЪЮ ѝ IGMP Filtering ə

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

15.4. IGMP Snooping è ø

IGMP Snooping

16 MSTP

16.1. MSTP

16.1.1. STP à RSTP

16.1.1.1. STP à RSTP

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

STP ˜ ȯ ң à ᵏ ӈ м ` ˜ Â

γ Лυ ˘ ч э LAN ۷ У ╟ ˘ ї ‡ ˛ ң
Â л й ѽ ╗ У э ﷺ ۷ ˘ ӈ м ۷ ˘ ѐ è У Ҿ
ɣ ` ˘ ۷ ˘ ۷ У ˘ ӈ м
˘ й ╟ Â ⁸ У ɔ˘ STP
˜ ╟ﷺ ɔ Â ᴳ У э ﷺ è ЛЮ ɔ '

˛ ۷ ŭ ╟ ﷺ У э ʌ ص Â

˛ ۷ ƺ ˘ ╟ ˘ ᴳ ج˙ ¡ Ạ ѽ
۷ ʌ ص Â

ﷺ ˜ У ۷ ╟ Â ᴳ
Ҿ ۷ У Â ۷ ˘ ˚ ʌ Â

RSTP ˜ ѿ ۶ Ю ȯ 802.1D STP ˜ ˘ ѽ Ռ· STP ˜ У έ
ȯ ھ à ᵏ ӈ м ╗ ˘ ў “ ”Â У э ﷺ ӫ
RSTP ˜ з ˜ У ۷
۷ a 1 ˆ · STP 50 ˜ Â

16.1.1.2. Bridge Protocol Data Units(ӈ̃ й BPDU)'

У э ص ŋ ЛЮ Ї '

˛ э ᵧ У ID ̂ Bridge ID˜ ˘ ˙ ˝I Ռ Mac فذ سم ۸
Â

˛ ˚ ˆ Root Path Cost˜ ˘ ЛЮ Â

¸ э ʌ IDˆ Port IDˆ ˇ ʌ. ˝I Ո- ʌ ʌ ʌ Â

Ƹ Ҷ BPDUˆ Bridge Protocol Data Unitsˇ ˜ ´ Ĩ ˜
ʌ ą Â Ҿ Ո ﻓﺦ ﺳﻢ
01-80-C2-00-00-00ˆ ´ Ὼ ⁸ ˜ ѝ ﻓﺦ ﺳﻢ Â

э BPDU ՈЮ Ҿ '

¸ Root Bridge IDˆ ѝ IDˆ Â

¸ Root Path Costˆ ˜ Â

¸ Bridge IDˆ IDˆ Â

¸ Message Ageˆ ˜

¸ Port IDˆ ч ʌ IDˆ Â

Forward-Delay Time à Hello Time à Max-Age Time Ь э ˜ ʌ Â

ѐ ы У Ҿ ч ɹ у à ʌ Æ Â

У э ʌ ĵ . ˝I BPDUˆ Bridge IDˇ Root Path Cost ˜ ˇ ﻡ ʌ ɖ Ҿ ą ˇ ɹ ɹ ʌ · Ҿ ą Â
ĵ æ. ˝I BPDUˆ x ą Â

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

16.1.1.4. Spanning-Tree Timers

ЛЪЮ :¦ э Ь э Â

¸ Hello timer ч BPDU Â

¸ Forward-Delay timer л Â RSTP ˜ Лъò STP ˜ ˘ л ÿ Listening л л Learning˘ ÿ Learning л Forwarding Â

¸ Max-Age timer BPDU Â э ˘ x Â

16.1.1.5. Port Roles and Port States

э л ћ è У э ^ Port Role˜ ˘ е ћ è a л ɔ Â

¸ Root port k ¦ ^ Root Bridge˜ л Â

¸ Designated port э LAN л ¦ Â

¸ Alternate port л л˘ У л ˘ л л й л Â

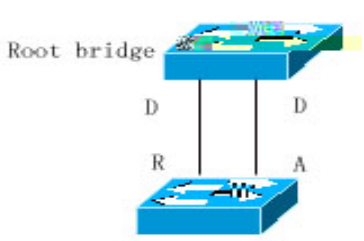
¸ Backup port Designated Port ` л˘ У э ч э л ћ У э LAN Э˘ ж . ″I л й Designated Port æ. ″I л й Backup Port Â

¸ Disable port ɱ a ų ╟ л˘ . Operation State й Down л ¦ ɷ э Â

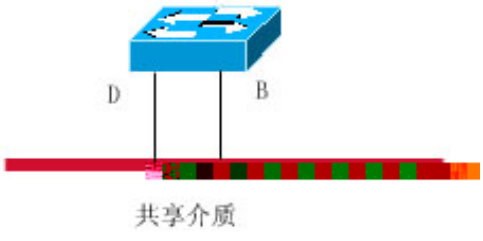
ЛЪЮ й л э л في 1 à 2 à 3

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

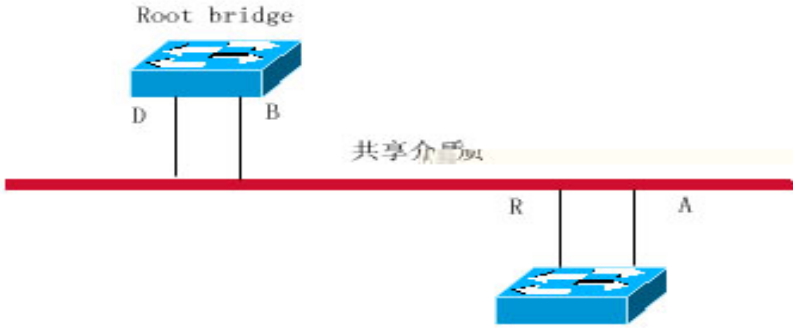
ћ ⁞ ɑ Ю˘ л. ″I ÿ ¦ л ˜



في 1



في 2



في 3

э ٧ Ь э ^ Port State˜ ĭ ٧ ˇ ÿ ⁸ э Â

¸ Discarding˙ a ˆ ٧ˇ ≠ a Mac فخ سم ˜ Â

¸ Learning˙ a ˆ ٧ˇ л Mac فخ سم ˜ ˇ э Â

¸ Forwarding˙ ˆ ٧ˇ ≠ Mac فخ سم ˜ Â

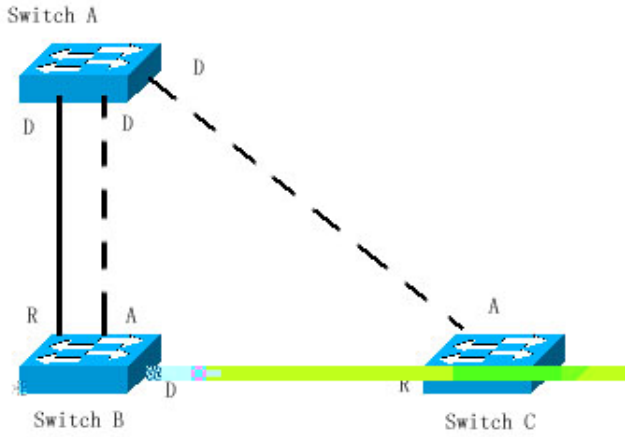
У э ˇ ٧ Root Port Ω Designated Port ˛ ώ Forwarding ˇ è ٧ ٧ ų Discarding Â

16.1.1.6. ^ ή صر ~

ج ٧ Л υ STP à RSTP ˜ ¦ Б У э ص ѡ Â Юفي 4 ˇ Ĭ 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 ṁ й ˇ Switch B Ω Switch C ṁ ѡ ț̈ м ˇ ҽ ˛ ң Â

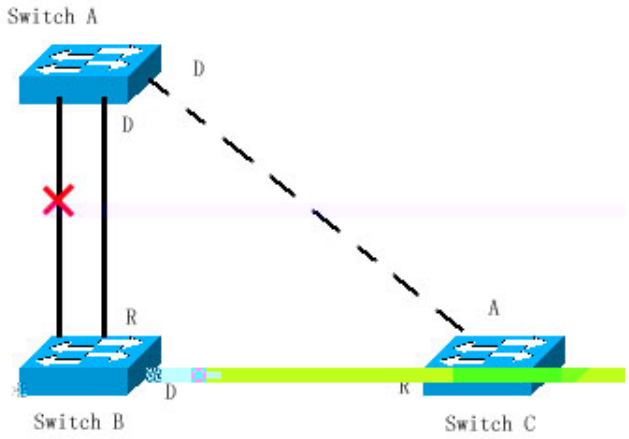
في 4

Ь ﻝ Switch ﻉ Spanning Tree ˜ ˇ ъ Ц BPDU ˆ Root Bridge˜ ﻭ Switch A Â Switch B ﻝ ч э ﻝ ﻉ Switch A Э˘ ˙ ˝I ﻝ ﻭ Root Port˘ ﻝ У э ﻝ ﻭ Alternate Port Â Switch C ﻝ ﻝ Л Ъ В¦ А˘ ≠ ﻝ Л Ъ ¦ А˘ п ц ﻝ ' В¦ А ˆ Path Cost˜ ≠ ¦ А æ̂ ﻝ ˜ ˇ ц Switch C ﻉ б В ﻝ ﻭ Root port˘ б А ﻝ ﻭ Alternate port Â ﻝ ˆ Port Role˜ ﻉ˘ ώ ﻝ э ﻝ ﻉ˘ ц ﻉ في 5 Â



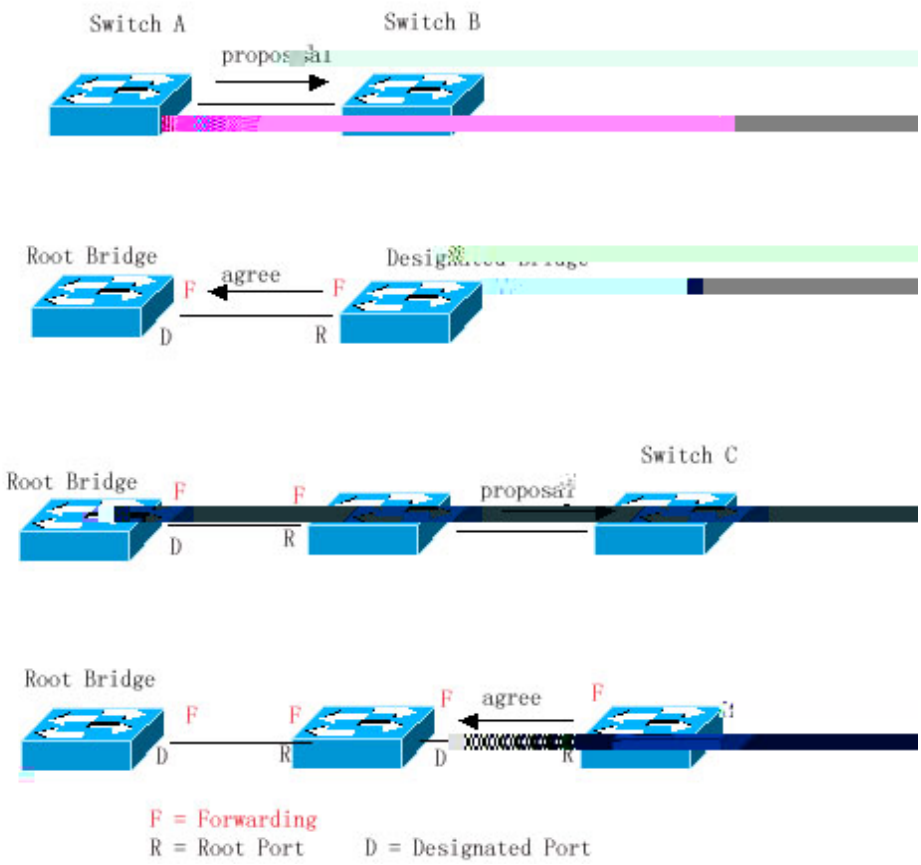
في 5

Switch A Ո Switch B Ǯ ╟ ﻉ ˇ ` ˛ . ң ɔ ˇ ц ﻉ في 6 Â



في 6

Switch B Ո Switch C Ǯ ﻉ ˇ Switch C ˛ ╟ Alternate port ﻭ Root port˘ ﻉ في 7 ϙ Â



8 في

~

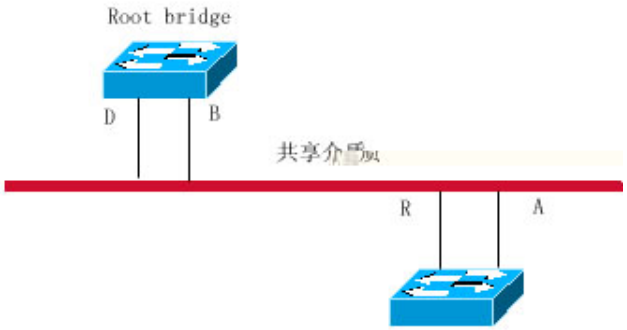
ЛЭ “ ” ˚ ˘ ٧ “Point-to-point Connect

~ ”Â ѝ ѡ ٧ ٦ ˘ a G ѝ Â

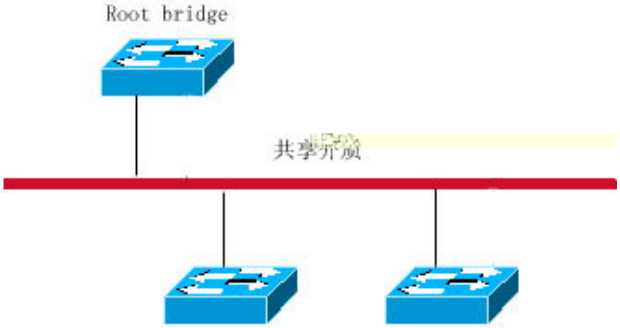
è 9 في ˘ è كا في ѝ “ ”˘ ЛЮ " ѡ “ ”

R في Â

R'

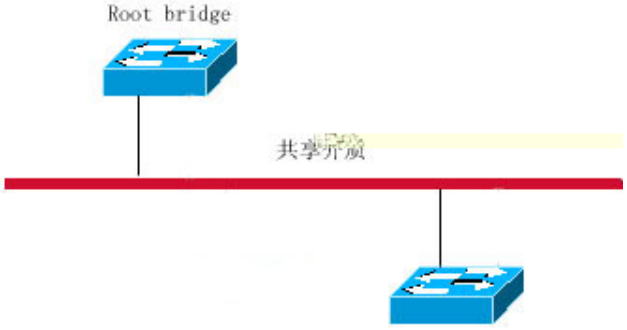


في 9



في 10

ٱ à Юفي ѝ ˘ Ш†



في 11

16.1.1.8. RSTP б STP ò

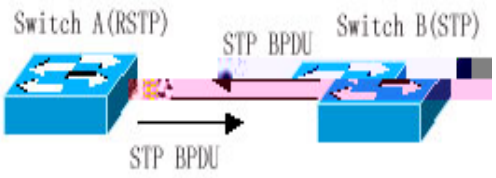
RSTP ˜ ٦ Л∪ б STP ˜ ѿ ò ˘ RSTP ˜ ˛ ↑ BPDU Л

╠ ″ б Ӟ STP ˜ RSTP ˜ ˘ б STP
ц ˩ STP Forwarding ˘ 30 ̈Ą Forwarding˘ ˩
RSTP ╖ Â

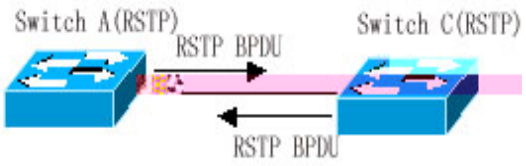
˩ ˘ RSTP Ո STP ˛ ˆ У э Â ﻲ 12 ˘ Switch A
RSTP ˜ ˘ Switch B ˩ STP ˜ ˘ ъ ₆ ц ˘ Switch A ˩ б
STP ˘ ˩ STP BPDU ò Â л ˩ ⓠ ˩ Switch C˘
RSTP ˜ ˘ л Switch A. ŋ ﻩ ˩ STP BPDU˘ ᴳ Switch C ≠ ѝ
б Ӟ ц STP ⓠ˘ ч ˩ RSTP . Л STP ˜ ˘
æ ⓠ Â

ѝ RSTP ˜ ᵏ ⓠ Protocol-migration ╖ ⁸ ˩ RSTP BPDU(ą
Ю˘ RSTP)˘ Switch A ⁸ ˩ ⓠ RSTP BPDU˘ Switch C
˩ б Ӟ ц RSTP ˘ ɣ ч ˩ Л RSTP ˜
ⓠ˘ ﻲ 13 Â

Protocol Migration



ﻲ 12



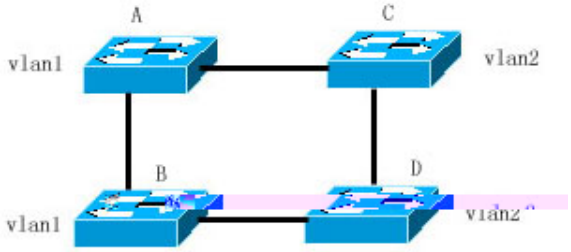
ﻲ 13

16.1.2. MSTP

MSTP˘ MSTP ﻩ STP à RSTP ﻫ Э ˩
˜ ˘ ↑ Ü ⓠ RSTP FORWARDING ⁸ Â

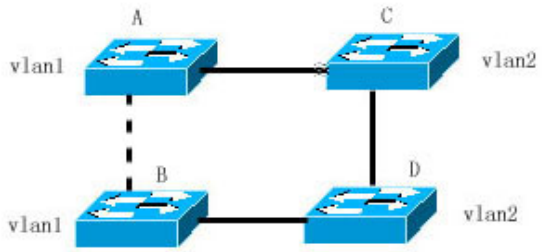
ɣ ˜ б Vlan ˙ ı ˘ ﻱ ﻩ Ю ˛ ң Л
Ю '

ﻲ 14 ˘ A à B ﻩ Vlan1 ⓠ˘ C à D ﻩ Vlan2 ⓠ˘ л Â



في 14

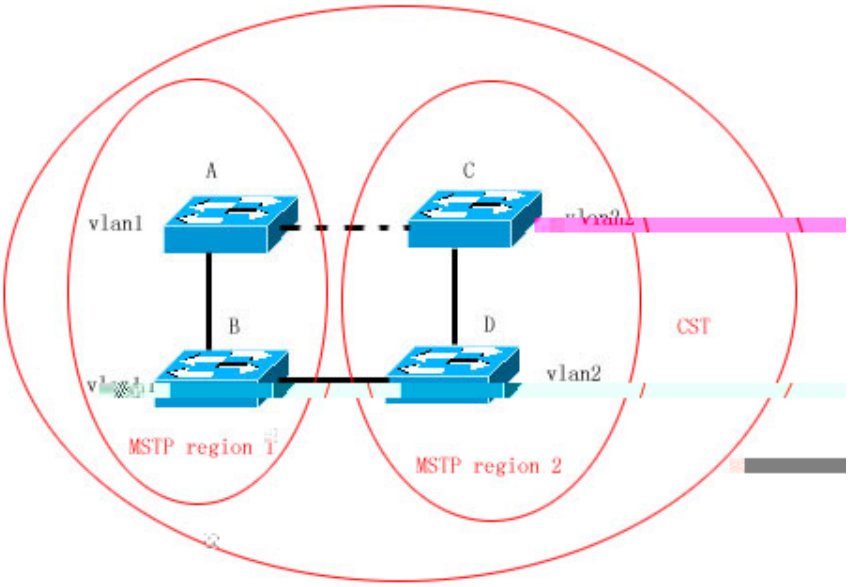
ÿ A ŋ C à D¦ B ÿ A ¦ B
ą Ю˝ ˚ A Ո B DISCARDING˜ في 15
˜ Â ų C à D a ↑ ŭ Vlan1˝ ┤ Vlan1 ↑˘ A
Vlan1 б B Vlan1 Â



في 15

ὴ ɷ ᾱ э ˘ MSTP ң ɷ˘ ┤Л∪ У л У э э Vlan ,¦
ὴ У э Instance˝ л Instance У э ѫ˜ MST Region˜ ˘
˜ э ᾷ ὴ IST˝ Internal Spanning-tree˜ ’ э
MST region л ų У э е˘ б è ы MST Region ¨Ą
˘ У э е ˘ ὴ CST˝ Common Spanning Tree˜ Â

˘ Л∪Э ┤Л∪ѫ MSTP Ю في 16 ' A Ո B
ѫ MSTP Region 1 ᾷ˘ MSTP Region 1 ң ˘ Л∪
DISCARDING˝ л MSTP Region 2 ą ≠ У Â л Region 1 Ո
Region 2 ¦ ⁞ ų ч э ˘ ч л “ ” ˘ ҷ ˜Ω
У DISCARDING Â



16 في

ˇ ȯ ȹ ң ˇ ≠ ⅄ Vlan a ⅄ : Â

16.1.2.1. ¦ ,ƭ MSTP Region

Л Э ˇ ˇ MSTP ң ɔ ˇ ″l ⅄ ,ƭ MSTP Regionˇ ⅄ MSTP Region ᾳ “MST ą ”У ⅄ Â

MST ą ˆ '

¸ MST ⅄ ^ Name˜ ' ⅄ 32 э s MSTP Region Â

¸ MST Revision Numberˈ У э 16bit g ḣ MSTP Region Â

¸ MST Instance—vlan ' ⅄ ⅄Л… 64 э Instancȅ id ÿ 1¦ 64˜ˇ Instance 0 ⁸ ˇ Л ″Ω 65 э Instance Â ⅄Л ƭ 1-4094 э Vlan ɣ a ⅄ Instancê 0ˉ 64˜ˇ ƭ Vlan ɣ Instance 0 Â ˇ э MSTIˆ MST Instance˜ У э “Vlan ” MSTI MSTI ᾳ Ո è ы MSTIˇ a ⅄

Â

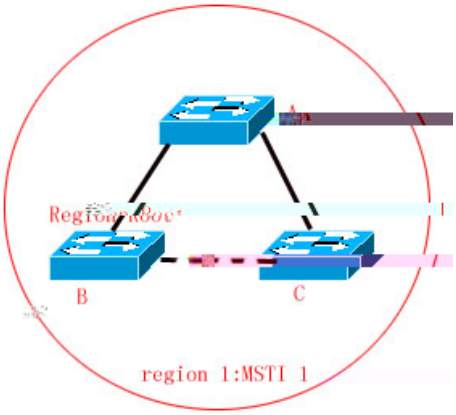
spanning-tree mst configuration ώ ƕ ҷ ώ“MST ”
Э ą Â

PDU Л Э ą ˇ У ⅄ ¦ PDU MST ą Ո У ˇ ¸ й ⅄ Э Ո ɣ ⅄ У э MST Regionˇ ĭ ‡ й ÿ ⅄ У э Region Â

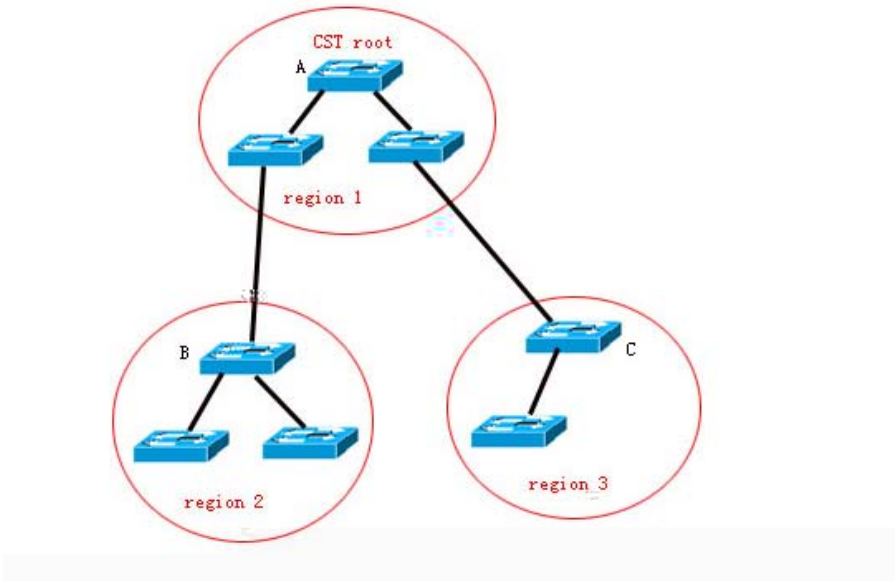
&

τ ᵴ ̃Ω STP Ю Instance—vlan ˘ Ѧ ̈Ą
MSTP˝ Ѫ ɖ Ո Â

16.1.2.2. MSTP region



18 في



20 في

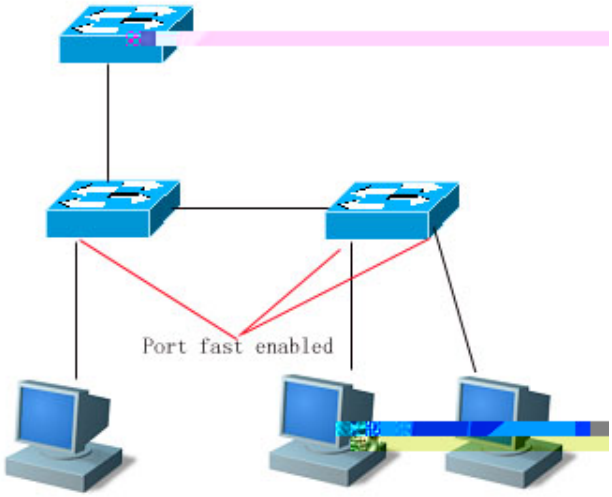
CIST Regional Root a У Region ᷍ Bridge ID

ل ٌĄ STP RSTP ˜ ´ У э Regionˇ а б˙ ¦ У э
ل У э Region Â

16.2. MSTP ل

16.2.1. Port Fast

٨ ˇ ж ل Л ٨ ѝ Port Fastˇ ٨
Forwardingˇ ĵ ل ȯ ٧ ٨ Forwarding ˆ а Port Fast
٨ˇ 30 Forwarding˜ Â Юفي ´ У э ف - ٨ ل Л ѝ
Port Fast enable Â



في 21

ج ´ Port Fast ٨ è ĵ ↑ BPDUˇ ‡ Port Fast Operational State
ѝ Disabled Â ĵ ٨˛ STP Ъ Forwarding Â

16.2.2. ٨ ╟ ¦ (AutoEdge ╖)

AutoEdge ╖ ٨ ج У تن ǫ (ѝ 3)ˇ а↑ Ю ٨
ل BPDUˇ ‡ ѝ ρ ٨ а У ل ˘ ÿ ٨ ѝ
٨ˇ Ъ ώ Forwarding Â ╟ ѝ ٨ ٨ ج ↑ BPDU ╟
¦ ѝ ٨ Â

~

1) ٨ ╟ ╖ б Port Fast ă ˘ Л∪ ̀ ñ Â

2) ╖ ɔ ¥ ٨ б Ю ٨ ˜ ك ٦ è˘ Л∪ STP ˜ a ╖ Â ٫ ٨ ¥ ٦ ˘ ٨ Autoedge a˛ ˘ ٨ ج ˜ ك è ˘ Â

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

4) ╖ ٦ б ٨ Â

5) AutoEdge ╖ IEEE 802.1D 2004 ñ Ћ˝ ج è˘ Bridge Hello Time ٨ تـ g ̀ 1.0-2.0 Â Л∪ ج G AutoEdge ╖ Hello Time ج تـ ą˘ ֎ تـ ٦ ˛ ï Â Hello Time ḣ تـ˘ ″I ٨ AutoEdge ╖ ˜Ω Â

16.2.3. BPDU Guard

¡]PÂ ÷0 | Ã ¹ ò€•îÞQP—•

BPDU Guard ŏ enable˘ ≠ ´ ɜ Interface enable Â ч ҽ ⋮ Â

٦ Л∪ ج è **spanning-tree portfast bpduguard default** ћ ҳ ŏ BPDU Guard enabled ˘ ج Ю˘ ɜ Interface ֎ Port Fast

Fast Operational disabled˝ BPDU Filter ≠ ╟ Â

≠ ┘ЛЪ Interface Ю spanning-tree bpdufilter enable ћЪ ҙ ´ э
Interface BPDU Filter enablê б ∧ ї ∧ ˜Ω˜ Â ж э ą Ю
Interface a BPDU˝ ≠ a ┘ BPDU˝ з Forwarding Â FoA.25109B1[illegible]

16.2.8. Root Guard ╖

æ è Ո ` , ǐ æ ⅄ У э ѫ ӟ ˇ ɣ ӂ ˇ
è ˘ ⅄ ǐ . ˝I ą ˘ ÿ ⅂ ɱ
Æ ˘ ⅄ ╟ Â Root Guard ╖ ѝ ѽ
ɑ Â

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

∧ Root Guard ѝ blocked ⅄˘ ˜Ω Root Guard
╖ ˜Ω ∧ ɖ ╖ ˆ . æ ∧ Ю ᴳ **spanning-tree guard**
none ħu ɜ ˜˜ ᴳ ʒ ѝ Â

~

1) ᴳ Root Guard ˬ ɣ ą è Â

2) ∧ æ ŭ Root Guard ╖ ⅄˘ ˬ ⁸ ѝ ∧˘ ⅄ ∧ ǐ
ѝ Blocked Â

3) ŭ Root Guard ∧ æ MST0 ǐ . BPDU ˘ ˬ
⁸ è æ ᴿ è ∧ ѝ Blocked Â

4) ⅄ У э ∧ a ⅄ ŭ Root Guard Ո Loop Guard Â

5) ŭ Root Guar ⅄˘ ∧ ╟ ⋮ ╖ Â

16.2.9. Loop Guard ╖

æ STP è˘ Ꮋ ∧ Ո è ы ∧ ŋ a Э Ꮋ ⅃
BPDU Â ת ɣ ´ ⅄ ˘ ҿ ∧ ⅃ ᷒ a
ǐ Э BPDU ⅄ ∧˘ ⅂ ∧ˬ ǐ Forwarding
˘ Ꮋ ҥ Â Loop Guard ╖ ⁸ ҥ Â

ɣ ѽ Loop Guard ╖ ∧˘ У ӟ aǐ Э ⅃
BPDU ˘ Loop Guard ╖ . ˘ ∧ ѝ loop-inconsistent
(Block˜ э ⁸ ҥ Â ǐ ∧ ǐ BPDU ˘ ∧
ˬ ÿ loop-inconsistent è ˘ Â

~

1) ⅄ ѫ ɣ ѿ ∧ ŭ Loop Guard Â

2) ⅄ У э ∧ a ⅄ ŭ Root Guard Ո Loop Guard Â

3) ŭ Loop Guard ⅄˘ ∧ ╟ ⋮╖ Â

16.3. MSTP

16.3.1. Spanning Tree

Ю " Spanning Tree

	ћ
Enable State	Disable˘ a STP
STP MODE	MSTP
STP Priority	32768
STP port Priority	128
STP port cost	∧ ╟ ″
Hello Time	2 STP

Ьυ ҳ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **spanning-tree**	Spanning Tree ˜ Â
Ruijie(config)# **end**	ѭ Â
Ruijie# **show spanning-tree**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

ˆΩ Spanning Tree ˜ ˇ ˩ **no spanning-tree** ŏ Ьυ ҳ Â

16.3.3. Spanning Tree

802.1 ˆΩ ˜ ñˇ STP à RSTP à MSTP Ь ɜ Spanning Tree ˜ ˚ ¨Ą ṁ ˇ ˛ ц ò Â л ĺ Ҿ˝ a ŏ ñ ˇ ˩ ˛ У Ҿ ò Â ᵹ ъ ᵏ ѫ У Ьυ ҳ ˇ Лυ ᵏ ˚ ᵹ ˩ è ы˝ б a ò ˇ ĺ ĺ æ Spanning Tree ˇ Лυ ò ǯ Â

ˇ ÿ MSTP ĺ ĺ RSTP STP ˇ ˆΩ MSTP Region ə Â

MSTP Â

ώ ˇ ЛυЮ Spanning Tree ˜ ˈ

Ьυ ҳ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **spanning-tree mode mstp/rstp/stp**	ĺ Spanning Tree Â
Ruijie(config)# **end**	ѭ Â
Ruijie# **show spanning-tree**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

Spanning Tree ˜ ˇ ˩ **no spanning-tree mode** ŏ Ьυ ҳ Â

MSTP

Ruijie# **configure terminal**	ώ ΐ Â
Ruijie(config)# **interface** *interface-id*	ώ interface ˇ ʌ interface ˚ ʎ Ո Aggregate Link Â
Ruijie(config-if)# **spanning-tree** [**mst** *instance-id*] **port-priority** *priority*	a ʖ instance ʎ . ˮI ˇ a ╗ instance ʎ ˇ . instance 0 Â *instance-id* ˝ تن ى 0 ˙ 64 *priority* ˝ interface . ˮI ˇ ʖ ḣ تن ى 0ˀ 240 ˙ 16 ˮ ˇ ḣ ى 128

```
Ruijie#
```

ĵ ḣˇ ↓ **no spanning-tree pathcost method** ŏ ƕ ʒ Â

16.3.8. Hello Time

↓ BPDU Â ḣ ẏ 2 Â

ώ ˇ ЛЬЮ Hello Time'

ƕ ʒ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **spanning-tree hello-time** *seconds*	hello_timeˇ ↓ ḣ ټ ẏ 1ĵ 10 ˇ ḣ ẏ 2 Â
Ruijie(config)# **end**	ىĵ Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

ĵ ḣˇ ↓ **no spanning-tree hello-time** ŏ ƕ ʒ Â

16.3.9. Forward-Delay Time

ٸ ↓ Â ḣ ẏ 15 Â

ώ ˇ ЛЬЮ Forward-Delay Time'

ƕ ʒ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **spanning-tree forward-time** *seconds*	forward delay timeˇ ↓ ḣ ټ ẏ 4 ĵ 30 ˇ ḣ ẏ 15 Â
Ruijie(config)# **end**	ىĵ Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

ĵ ḣˇ ↓ **no spanning-tree forward-time** ŏ ƕ ʒ Â

16.3.10. Max-Age Time

BPDU Â ḣ ẏ 20 Â

ώ ˘ ЛЬЮ Max-Age Time

Ьυ ҳ	ɔ
Ruijie# **configure terminal**	ώ ő Â
Ruijie(config)# **spanning-tree max-age** *seconds*	max age time˘ ↓ ḣ ت ẏ 6 40 ˘ ḣ ẏ 20 Â
Ruijie(config)# **end**	ى Â
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

ḣ˘ ↓ **no spanning-tree max-age** ő Ьυ ҳ Â

~

Hello Time à Forward-Delay Time à Max-Age Time ɷ У э ↓ ḣ ت ˘ Ь э ʒ У э ⁸ ˜Ω ˘ ' 2*(Hello Time + 1.0 seconds) <= Max-Age Time <= 2*(Forward-Delay – 1.0seconds) Â Ь э ↰ э ˚ ˘ ĭ ‡ ↓ a Â

16.3.11. Tx-Hold-Count

↓ BPDU э ˘ ḣ ẏ 3 э Â

ώ ˘ ЛЬЮ Tx-Hold-Count Ö©#r/ Tˆ@ (ƒ nr Ti ↵ iQ6$(. 6 Ç Ç

16.3.14.

```
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)#
```

~

vlan instance vlan instance

16.3.15. Maximum-Hop Count

Maximum-Hop Count BPDU Region Instance

Maximum-Hop Count

Ruijie# **configure terminal**	
Ruijie(config)# **spanning-tree max-hops** *hop-count*	Maximum-Hop Count 1 40 20
Ruijie(config)# **end**	
Ruijie# **show running-config**	
Ruijie# **copy running-config startup-config**	

no spanning-tree max-hops

16.3.16.

ᛋ ò ˇ ᒧᒪᑌ G ᛋ ᒧ BPDU ᷢᷣ ᛋ
a ᒧ MSTI ᵠ ˇ ᒪᑌ б è ᵸ ᶏ ᶎ ᵵ Â

ώ ˇ ᒪᑌЮ ᛋ ò '

ᏼᑌ ᵶ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)#**interface** *interface-id*	ώ ᛋ

ώ ˇ ЛьЮ BPDU Guardґ

Ьu ҙ	ɔ

Ruijie# **configure terminal**

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

ˇΩ

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

ώ ˘ ЛЬЮ ѫ ɣ ヘ ŭ Loop Guard

ƅʊ ʒ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **interface** *Interface-id*	ώ ヘ Â ɻ ヘ ↑ ヘ ∩ 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**	ɖ Â

16.4.10. ˜Ω ヘ ɖ ╗

ώ ˘ ЛЬЮ ˜Ω ヘ ɖ ╗ Â

ƅʊ ʒ	ɔ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)# **interface** *Interface-id*	ώ ヘ Â ɻ ヘ ↑ ヘ ∩ Aggregate Link Â
Ruijie(config-if)# **spanning-tree guard none**	ѯ ヘ ЮЎ ˜Ω
Ruijie# **show running-config**	Â
Ruijie# **copy running-config startup-config**	ɖ Â

16.5. MSTP ∩

MSTP ᵏ ɷ ЮЎ ƅʊ ʒ ƅʊ ʒ ɣ ﾉ ə ｲ ə ˘ ﾉ ƅʊ ʒ ╗ ЮЎ

ƅʊ ʒ	ŭ ƅ
Ruijie# **show spanning-tree**	MSTP ﾉ ヘ ə ｲ ə

Ruijie# **show spanning-tree summary**

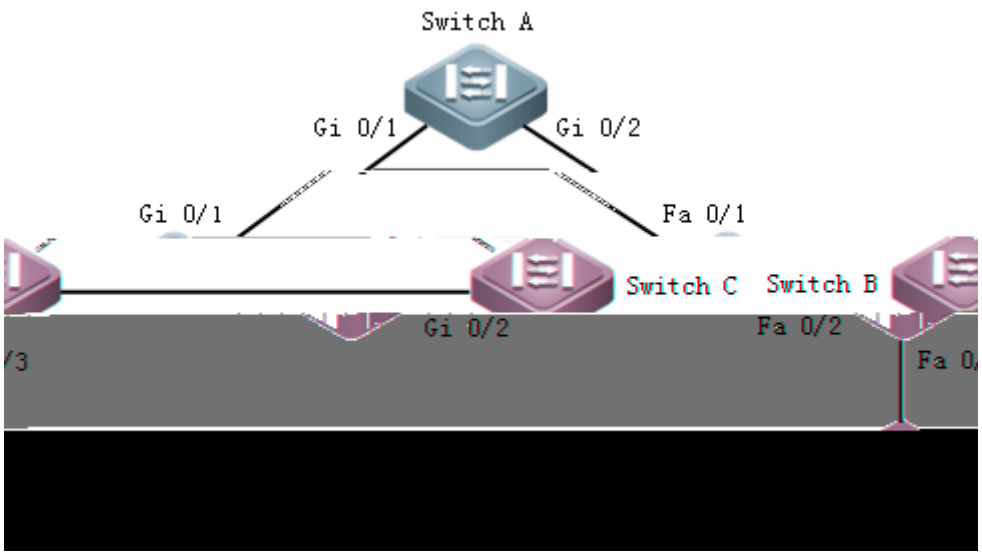
Ruijie# **show spanning-tree inconsistentports**	۞ ɗ ɗ block ۸
Ruijie# **show spanning-tree mst configuration**	MST ۰ ə
Ruijie# **show spanning-tree mst** *instance-id*	instance MSTP ə
Ruijie# **show spanning-tree mst** *instance-id* **interface** *interface-id*	interface instance MSTP ə
Ruijie# **show spanning-tree interface** *interface-id*	interface instance MSTP ə
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

16.6. MSTP ή ص R

16.6.1.

1) Ь ۸ Ь ˘ MSTP Â
2) ۶ Э Vlan-Instance ˘ Ƙ MST ۱ à MST Revision Numberˇ R . ˝I
3) MSTP ə
4) ŏ ŭ BPDU Guard ╗ ˘ ۶ PC ۸ Э Port Fast ╗ Â

16.6.2.



16.6.3.

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 ə ˘ 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)# show
Multi spanning tree protocol : Enable
Name    : ruijie
Revision : 1
Instance  Vlans Mapped
-------- ---------------------------------------------
0       : 1, 4-4094
1       : 2
2       : 3
---------------------------------------------------
Ruijie(config-mst)# exit
Ruijie(config)# spanning-tree
Enable spanning-tree.
```

ѫ Э Instance 0 ˙ ˝I ѝ 4096

```
Ruijie(config)# spanning-tree mst 0 priority 4096
```

2) **Switch B**

ѧ Gi 0/1 Ґ Gi 0/2 ų Trunk ѧ˘ … VLAN 2 Ґ VLAN 3 Â

```
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˘ ѽ ˜ 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.
# ₂ Э Instance1 ˙ ˝I й 4096
Ruijie(config)# spanning-tree mst 1 priority 4096
```

3) Switch C

```
# ∧ Fa 0/1 ∩ Fa 0/2 ɣ Trunk ∧˘ … VLAN 2 ∩ 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

```
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
```

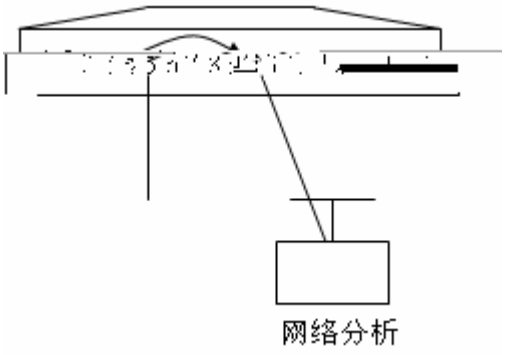
17 SPAN

17.1.

17.1.1. SPAN

ل ﻠ G SPAN У э ٨ Э ↑ Ң Э ٨ У э ↑
RMON↑ G ٨ Э ↑ ٨ Э Â SPAN э ٨ Э
Ո ل MIRROR↑ э ٨ Э ↑ Â

R ˇ جم في 1 è ˇ ‾ ”I ٨ 5 Э ↑ ‹ ‾ ”I ٨ 10 ‘ جم ٨ 10
Э ↑ G Ո ٨ 5 ˇ ل ٨ 5 Э Â



في 1 SPAN R

SPAN ل ﻠ ώ Ո ÿ ٨ ˇ ↑ ώ Â

SPAN a ⁝ ٨ Ո ٨ Ң ˇ ل ώ Ո ÿ ٨ Ы
‹ У ` ↑ ٨ Â У э ٨ˇ R У э 100Mbps
٨ У э 1000Mbps ل x Â

17.1.2. Ң ҏ

¸ جم S3750 " Ң ҏ Э ˇ ę Ą ˇ ę ŷ untag ˇ ę
↑ ę ٨ ¸ ل tag Â

¸ ұ S3750 " ˇ SPAN ę ٨ ї Ң ℼ

¸ ұ S3750 " ˇ SPAN ę ٨ ℼ

¸ ұ " ˇ ę ٨ ŷ ٨ ˇ ٨ ę ŷ Â

17.2. SPAN Ռ

ſ ֏ Ռ SPAN ՇՈ Ս Ҷ Ռ

17.2.1. SPAN ˬ

Ս ə SPAN ˬ Ս ə ٨ Ռ ٨ ٨ Â ٦ Ո ´ ə ə ٨ ώ˘ Ռ ٦ ٨ Â

٨ Ս ə SPAN ˬ ˘ Switched port Ռ routed port ٦ Ո ŭ ٨ Ռ ٨ Â SPAN ˬ a ⁝ Ӌ ɔ Â

٦ Ո SPAN ˬ ֏ Ս ə disabled port Ə˘ ˘ SPAN a Ə ٦ ɔ ſ G Ռ ٨ Â **Show monitor session session number** Ի ҳ ֏ SPAN ˬ ɔ Â Ս ə SPAN ˬ ֏ Ə ٨ a Ə ſ ٨ ұ ٦ ɔ Â

17.2.2. صر

SPAN ˬ ↑ Ӈ ՈԻՕ صر'

' ٨ Ə ſ Ս˙ ſ ٨ Â ֏ Ս ə SPAN ˬ è˘ ٦ Ս ə ŭ ə ٨ ώ Â ұ Ҷ ٨ ֏˘ ÿ ٨ ώ ٦ x ˘ ٨ ŏ˘ Л a ⁝ SPAN ╖ ˘ Ÿ ˬ ٦ ſ ٨ Â

Ч ' ÿ ٨ Ч Ս˙ ſ ٨ Â ֏ Ս ə SPAN ˬ è˘ ٦ Ս ə ŭ ə ٨ Â ұ Ҷ ٨ ֏˘ ÿ ⁞ ٨ Ч ſ ٨ ٦ x ˘ ٦ ˘ ≠ a ˬ Ч ſ ٨ Â ұ Ҷ ٨ ֏ Ч ſ ٨ ٦ ٦˘ R ٨ Ӆ ٦ MAC à MAC à VLAN ID Ռ ٩ TTL Ч ٦ ע Â ٦ ˘ ſ ٨ ≠ˬ ٦ ע Â

Ч ٦ ' ↑ Ə ч Â ֏ Ս ə SPAN ˬ è˘ ٦ Ս ə ŭ ə ٨ ώ Ռ Â

17.2.3. ٨

٨ (≠ ٤ ٨) ٦ Ռ Ս ə switched port à routed port AP˘ ٨ ṁ ſ Â ֏´ ə SPAN ˬ è˘ ٦ Ռ ώ˘ Ռ ٩ ٦ ˘ ұ ٨ ə a ṁ ⁸ Â

Ս ə ٨ ՈԻՕ '

1. ⅃ Л Ъ switched port˘ routed port AP Â
2. a ⅃ Л Ъ ⅄ ѝ ∧ Â
3. ⅃ Л Ъ ώ ⅄ Â
4. ∧ Ո ∧ ⅃ Л Ъ ұ У э VLAN a ұ У э VLAN è Â

17.2.4. ∧

SPAN˛ У э ∧ (≠ ∤ ∧)˘ ұ ∧ Â

∧ ЛЪЮ '

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

17.3. SPAN

ǂ ɷ ¡ ⱬ Ӈ Э SPAN˘ ↑ ӧ ЛЪЮ :

17.3.1. SPAN

₸	
SPAN	

17.3.2. SPAN ´

ЛЪЮ ‡ SPAN '

1) ǂ ɢ ǂ ∧
2) ∧ a ѝ ∧˘ ∧ a ѝ ∧ Â
3) ⅃ Л Ъ У э disabled port ѝ ∧ ∧˘ Л SPAN ₸ a ɔ ˘ ǂ ∧ Ո ∧ ᴳ Â
4) **no monitor session** *session_number* ѽ Ъ ʊ ⅃ ÿ SPAN˛ è ǂ ∧ Â

SPAN ұ ᴳ ˘ ⅃ ЛЪЮ

٨ ٨ ╗ ώ╡ У э AP è˘ G SPAN ٨
٨ ٦ Â

17.3.3. … У э SPAN˛ ٨ Ո٠ ٨

… У э SPAN˛ ٨(٨)Ո٠ ٨(٨)Â

ħυ ٤	ɔ
Ruijie(config)# **monitor session** *session_number* **source interface** *interface-id* [| -] {**both** | **rx** | **tx**}	٨ Â ¥ *interface-id*ď ٨ ٨ Â
Ruijie(config)# **monitor session** *session_number* **destination interface** *interface-id* {**encapsulation | switch**}	٨ Â ¥ *interface-id*ď ٨ ٨ ╗ *encapsulation* ٨ ę ٨ ╗ , ╗ *switch* ٨ ę ٨ Ꮋ ╗ Â

╡ SPAN˛ ˘ ٦ G **no monitor session** *session_number* ŏ ħυ ٤ Â ╡ SPAN˛ ˘ ٦ G **no monitor session all** ŏ ħυ ٤ Â G **no monitor session session_number source interface** *interface-id* ŏ ħυ ٤ **no monitor session** *session_number* **destination interface** *interface-id* ٦╡ ٨ ٨

Ю э R ¢ ¦ … У э SPAN˛ ' ˛ 1 Â ˝I˘ ⁽ˀ˛ 1 ˘ ٨ ٨ 1 MIRROR╡ ٨ 8 Â **Show monitor session** ħυ ٤ ¥ 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
```

17.3.4. ÿ SPAN˛ è╡ У э ٨

ÿ У э SPAN˛ è╡ ٨ Â

Ћu ҳ	ɔ
Ruijie(config)# **no monitor session** *session_number* **source interface** *interface-id* [˜ | -] [**both** | **rx** | **tx**]	˥ ʌ Â ɣ interface-id˘ ʌ ʌ Â

G **no monitor session** *session_number* **source interface** *interface-id* ŏ ω Ћu ҳ ɻ ÿ Ƴ ə SPAN˳ è˥ ʌ ÂЮ ə R ɷ ¦ ʌ 1 ÿ ˳ 1 è˥

```
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
```

17.4. SPAN

G **show monitor** Ћu ҳ ɻ ɱʌ SPAN ,Ю ə R ɷ ¦ **show monitor** Ћu ҳ SPAN˳ 1 ɱʌ

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

18 IP فخسم б Ь

18.1. IP فخسم

18.1.1. IP فخسم Ў

IP فخسم 32 Æ γ ⁸ ˘ ѝ ¢ ˙ ˙ ˛ Ո ғ ˘ У ˊ ⁸ Â ˊ ⁸
˘ ˛ ѝ ني ˘ 8 Æ ˘ تن ÿ 0~255 ˘ ʒ ľ . Ь Л ˘
ľ 192.168.1.1 Ь ˊ ⁸ IP فخسم Â

IP فخسم ل ₦ ˘ IP ˜ ˛ سم Â 32 Æ IP فخ ч э
' 1˜ ˛ ' 2˜ سمفخسم ˛ Â ű э Æ ḣ ˘ ɱ
G è IP فخسم ل Л , ˛ ني Â

A سم فخ ˘ Æ ѝ ľ 0 Ь ˘ 7 э Æ 24 э Æ سم
سم فخ Â Ω 128 э A ƶ ą ţ ğ ö

&

ɱʎ ني э Æ ѝ Ї 1111 Ь. فخسم a ї ў ˘ Ҩفخسم ѝ E فخسم˘ ұ ɖ فخسم Â

جم è˘ IP فخسم , ˘ У IP فخسم
ў Â б ц ˘ ‡ ĵ ў IP سم
فخ Â è ىفى Ш ۷ Л۷ ۷ è ىفى ц ą è ^ CNNIC˜ ˘ IP فخسمў
ѝ ىفى ц ۷ б Л ў Ѽ Л^ ICANN,Internet Corporation for Assigned Names and Numbers˜ Â ѝ ӫ ˘ a IP فخسم˘ Л ≠ a ғ ў ˘ ў ж فخسم Â

Ю ѝ ɖ б ۷ فخسم " '

[redacted]

C	192.168.0.0~192.168.255.255	256 э C

ˇΩ ų IP فخسم à TCP/UDP ٨ ٦ è ţ ą˘ ٨ RFC 1166 Â

18.1.2. IP فخسم · Ь "

IP فخسم · Ь ↑ ЛЬЮ ٨ ˘ Л ٨ У ṁ˘ è · Ь ٦ Лυ
έ ε ã ĭ Â

¸ ٨ IP فخسم ^ ~

¸ فخسم ~ ^ ARP˜ ^ ٦ ~

¸ IP ţ ыс فخسم ^ ٦ ~

¸ ˇΩ IP ^ ٦ ~

¸ ↑ ^ ٦ ~

18.1.2.1. ٨ IP فخسم

У э ٨ ѫ IP فخسم˘ ٦ Лυ Ո ٦ IP ˘ ٨ ѫ IP سم فخ˘ ٨ ĭ IP ˜ Â

ţ У э ٨ IP فخسم˘ جم ٨ è ЛЬЮћυ ę'

ћυ ę	ɔ
Ruijie(config-if)# **ip address** *ip-address mask*	У э ٨ IP فخسم
Ruijie(config-if)# **no ip address**	٦ У э ٨ IP فخسم

≠ У э 32 ḣ˘ IP فخسم ف ΰ э ŷ ţ Â
è˘ ḣ ŷ “1” IP فخسم Æ ŷ ţ ˘ ḣ ŷ “0”
IP فخسم Æ ŷ ў

б ٨ IP فخسم ЎΩ Ю " ˙ Ь " ˘ ЛЮ˙ Ь ɔ ѝ ˩ ˘ ˩Л
ą ā Ї '

¸ ٨ э IP فخسم

18.1.2.1.1. ٨ э IP فخسم

٨ ң ҏ ˩Л У э ٨ э IP فخسм˘ è è У э ѝ ў IP فخسم˘ è м ѓ
ѝ IP فخسم Â IP فخسم Э ⁸˘ л IP فخسم б ў IP Л ٦

è MAC Э й MAC MAC IP ' 2 IP IP

Э ч IP 48 MAC IP MAC ARP MAC IP й RARP Proxy ARP ARP Proxy ARP RARP RFC 826 RFC 1027 RFC 903 è

ARP MAC IP IP й ARP è MAC MAC IP MAC IP ARP ă è MAC IP IP ARP й RFC 826

18.1.2.2.2. ARP

ﻣﻤ ARP ﻉ Ethernet II ﺮﺻ ﺟﻫ ﻉ ﻧ ﻕ è ≠ ﻯ ARPA ﺴﺣ Â

18.1.2.2.3. ARP

ARP ﻉ ╠ ﺴ ﺍ IP ﻑﺨﺳﻫ ∩ MAC ﻑﺨﺳﻫ ɔ Â
ﺴ ARP ă è ɖ ﺴ ת ARP ≠ ﺴ
Лυ ¯ Â ⁞ ﺴ ﺋ ‡ У a ARP Â

ARP ﺴ ﺟﻫ ﻉ è ЛυЮћυ ʒ'

ћυ ʒ	ɔ
Ruijie(config-if)# **arp timeout** *seconds*	ARP ﺴ ﺗﻥ 0-2147483ﺴ è è 0 a ע
Ruijie(config-if)# **no arp timeout**	

ɑ Юﺴ ﻯ 3600 ﺴ . 1 ə Â

IP

IP

IP

ᒐ A ᑎ ᒐ B ᐢ جم 192.168.12.0/24 Э У э 172.16.3.0/24ᐢ

ﻝ ﻝ IP ˘ ﻝ سم ЛьЮ ﻝ · Ь'

¸ ŏ ICMP ˜ a ﻝ

¸ ŏ ICMP ﻝ

¸ ŏ ICMP

¸ IP MTU

¸ IP

18.2.2.1. ŏ ICMP a ﻝ

ĺ ŷ ↑˘ ↑ è ɷ a IP ˜
˘ ﻝ فخسم ﻝ ICMP ˜ a ﻝ Â ﻝ ˘ ɣ a
a ﻝ ↑ ˘ ≠ ﻝ ICMP ў a ﻝ Â ŏ
Â

ŏ ICMP ˜ a ﻝ ˘ ﺝ ﻝ è ЛьЮћ ʒ'

ћ ʒ	ɔ
Ruijie(config-if)# **ip unreachables**	ŏ ICMP ˜ a ﻝ Ռ ў a ﻝ
Ruijie(config-if)# **no ip unreachables**	˜Ω ICMP ˜ a ﻝ Ռ ў a ﻝ

18.2.2.2. ŏ ICMP ﻝ

¸ a . ˘ G ÿ У э ﻝ ĺ ↑˘ ÿ ﻝ ﻝ
Ы Â ↑ ÿ ﻝ ﻝ Ы˘ ¸ ﻝ У э
ICMP ﻝ ˘ ˆ ĺ فخسم ˜Ω ŷ ﻝ У Э ﻝ У ﻝ
Â ¸ ﻝ ↑ ∧ ﻝ Â ŏ
Â

ICMP ﻝ ˘ ﺝ ﻝ è ЛьЮћ ʒ'

ћ ʒ	ɔ
Ruijie(config-if)# **ip redirects**	ŏ ICMP ﻝ ˘ ŏ
Ruijie(config-if)# **no ip redirects**	˜Ω ICMP ﻝ

18.2.2.3. ӧ ICMP

ц Э э ˘ й ѫ ѵ ѧ ˘

19 DHCP

19.1. DHCP Ӯ

DHCP(Dynamic Host Configuration Protocol ╟ ў ~)ج RFC 2131 è ˇ DHCP й ц Э ў k ٧ Â DHCP ﷺ ц Client/Server ɔ ˇ DHCP Ь Ы й ╟ ў ↑ IP ﻓﺦ ﺳﻢ Ո k ў ٧ Â

DHCP Ь ⁸↑ IP ﻓﺦ ﺳﻢ'

1) ╟↑ ˇ DHCP ↑ ЮA IP ﻓﺦ ﺳﻢ'

2) ╟ ↑ ˇ DHCP ↑ У ˛ IP ﻓﺦ ﺳﻢˆ ٦ Л Ъ ў ╟ ﻓﺦ ﺳﻢ~ '

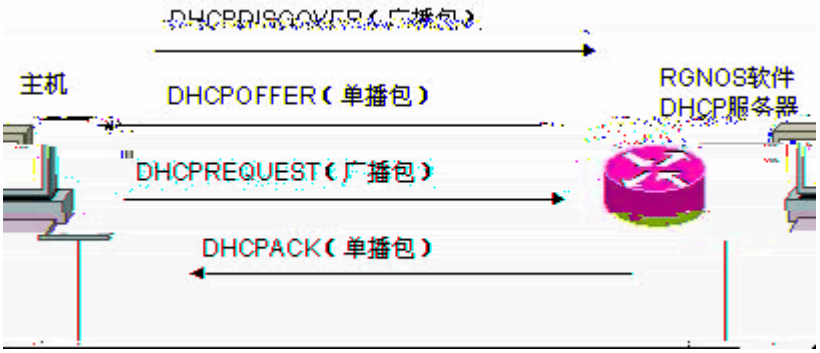
3) ˇ ˜ IP ﻓﺦ ﺳﻢ Â ˜ ٦ Л Ъ DHCP IP ﻓﺦ ﺳﻢ ٦ Â

Ь ﻓﺦ ﺳﻢ↑ è˘ ٧ ╟ ↑ ٦ Л Ъ G a Ą ﻓﺦ ﺳﻢ Â

DHCP ﷺ ц BOOTP(Bootstrap Protocol) ˘ é BOOTP è Ҷ ╥ ˘ б BOOTP Ո DHCP Ь Ы Ц ц Â BOOTP è Ҷ ╥ ˘ G ج э У э DHCP Ь Ы Â RFC 951 Ո RFC 1542 DHCP ~ ⓠ Â

19.2. DHCP Ь Ы Ӯ

Л н ҏ DHCP Ь Ы ѽ RFC 2131 ˘ ў ╥ й ў ↑ Ո IP ﻓﺦ ﺳﻢ Â DHCP ɔ ﷺ في 3-1 Â



في 1 DHCP ﷺ ɔ

DHCP IP ﻓﺦ ﺳﻢ Ю'

1) ў ч DHCPDISCOVER ↑ ж Э DHCP Ь Ы’

2) DHCP Ь Ы л ў ч DHCPOFFER´ ↑˘ ↑ ў IP ѕ ф à MAC ѕ ф à ѕ л ą Л ч ѕ ф ’

3) ў ч DHCPREQUEST ↑˘ л Ь Ы ї k IP ѕ ф’

4) DHCP Ь Ы л ў ч DHCPACK´ ↑˘ ў Â

&

DHCP ч Л ї э DHCP Ь Ы DHCPOFFER ↑˘ Л ч ч ˙ ¦ У э DHCPOFFER ↑˘ п ч ч ї У э DHCPOFFER ↑ Â Л ˘ DHCP Ь Ы DHCPOFFER è ѕ ф a У ь ї ѕ ф ˘ ą Ю˘ DHCP Ь Ы ą ѕ ф ї ч Â

DHCP Ь Ыї ѕ ф DHCPREQUEST ↑˘ ь ц è ч DHCPOFFER ↑ DHCP Ь Ы ≠ ї ↑˘ Л OFFER ˆ ї ~ IP ѕ ф Â

ч DHCP DHCPOFFER ą ↑ è ↑ ў ч ˘ ˯ л Ь Ы ч DHCPDECLINE ą ↑ ч ї ą Â

ж ~ ك è ˘ DHCP Ч ¦ DHCPOFFER ą ↑˘ DHCP Ь Ы ˯ ч DHCPNAK DHCP ˘ ч ѕ ф Â

ж è ˘ Л ң ҕ DHCP Ь Ы ˘ л Л ЛЮ ’

¸ æ ώ Â У ѕ ф ї ώ ˘ ╟ ѕ ф ї ώ æ Â

¸ у ˙ Ь ˘ æ Â ╟ ѕ ф ї ˘ у ц ˘ Ұ ж ж н ж ˘ ѕ ˘ æ ц Â

¸ è у Â ж ύ э ˘ ˙ ¦ Ч л ╟ ˘ ч g Ո DHCP Ь Ы . л Â

19.3. DHCP Ӯ

DHCP ч Л ╟ ѕ ÿ DHCP Ь Ы IP ѕ ф Л Ч è Ч Â DHCP ч Л Ю ’

¸ æ ц Ո Â

¸ æ ц ч л Â

DHCP

Ьu ҷ	ɔ
Ruijie(config)# **service dhcp**	ŭ DHCP Ł ɲ Ո DHCP è ҷ ℸ
Ruijie(config)# **no service dhcp**	˜Ω DHCP Ł ɲ Ո è ҷ ℸ

19.5.2. DHCP فخ سم

⋮ ˘ DHCP Ł ɲ ِ في فخ سم جم è ⊮ سم فخ†
DHCP Â ج ˘ æo ɖ У ֆ سم فخ a † ˘ † Ł
ɲ ɷ˘ æo ⊮ ֆ سم فخ a ï † Â

ف ֆ سم فخ a † ˘ جم ŏ è ЛЮЬu ҷ'

Ьu ҷ	ɔ
Ruijie(config)# **ip dhcp excluded-address** *low-ip-address* [*high-ip-address*]	⊮ IP سم فخ ـتن ֆ سم فخ DHCP a ِ †
Ruijie(config)# **no ip dhcp excluded-address** *low-ip-address* [*high-ip-address*]	ɲ سم فخ

DHCP Ł ɲ˘ У э ˜ † سم فخ ŏ a ï DHCP
† ˘ ɲ Л ч э ' 1˜ a ِ ɲ سم فخ ă ' 2˜ DHCP † سم فخ ˘
˜ ɷ ˘ ÿ DHCP† Â

19.5.3. DHCP سم فخ

DHCP سم فخ† Л ɲ · DHCP ɻ ɲ ˘ جم DHCP سم فخ
è ⊮ Â DHCP سم فخ ˘ ˙ G ŭ ɷ DHCP Ł ɲ˘ ≠ a
سم فخ† ' п ŭ ɷ DHCP Ł ɲ˘ a ï ɷ DHCP سم
فخ ˘ DHCP è ҷ ɔ Â

æo ɲ Л DHCP سم فخ э ⊮ à ɻ ˘ سم فخ ɻ Ո
Â ɲ ң ҏ ɲ Л ⊮ э سم فخ ˘ DHCP ⁺ è è ҷ IP سم فخ
ɑ † ف э سم فخ سم فخ Â

¸ DHCP ⁺ è è ҷ IP سم فخ˘ † б DHCP ⁺
ɲ IP سم فخ ɻ У سم فخ Â ⊮ э سم فخ ˘
سم فخ† '

¸ DHCP ⁺ è è ҷ IP سم فخ˘ † б سم فخ ɻ У
سم فخ Â ⊮ э سم فخ ˘ سم فخ† Â

DHCP سم فخ ˘ ЛЮ˙ Ł˘ ε è ɱ Ь э˙ Ł
'

19.5.3.4. فخ سم

DHCP ┡ ⅄ ↑ سم فخ˘ ϙ Ю й 1 Â ↑
˘ ї ‡ ⅄ a G سم فخ Â

سم فخ ˘ جم سم فخ è ЛьЮЋь ҂'

Ћь ҂	ɔ
Ruijie(dhcp-config)# **lease** {*days* [*hours]* [*minutes*] | **infinite**}	سم فخ

19.5.3.5. ممم ⅄

┤Л ممم ⅄˘ ў ⅄ ˘ a ў
⅄ ‚ ╟╬ Э ممم ⅄ ⅄ ў ⅄ Â

ممم ⅄˘ جم سم فخ è ЛьЮЋь ҂'

Ћь ҂	ɔ
Ruijie(dhcp-config)# **domain-name** *domain*	ممم ⅄

19.5.3.6. ممم ⅄ ┡ ⅄

ў ⅄ ˘ DNS ┡ ⅄ ممم ⅄ Â
DHCP ┤ G ممم ⅄ ┡ ⅄˘ جم سم فخ è ЛьЮЋь ҂'

Ћь ҂	ɔ
Ruijie(dhcp-config)# **dns-server** *address* [*address2…address8*]	DNS ┡ ⅄

19.5.3.7. NetBIOS WINS ┡ ⅄

WINS TCP/IP NetNBIOS ⅄ ↑ IP سم فخ У ممم ⅄ ┡ Â
WINS ┡ ⅄ У э جم Windows NT Ю ┡ ⅄ Â WINS ┡ ⅄ ŭ ╟╬ ⅄˘
‚ ÿ WINS ┤ Ą˘ WINS Ω˘ ‚ ⅄ WINS ┡
⅄ ┤ ⅄ ˘ WINS è б Э ┤ ┤Л ɖ У
ɷ Â

DHCP ┤ G NetBIOS WINS ┡ ⅄˘ جم سم فخ è

ЛъЮЋъ ҳ'

Ћъ ҳ	ɔ
Ruijie(dhcp-config)# **netbios-name-server** *address* [*address2…address8*]	DNS ⊾ ⅄

˘ ⊿ ≠ ⊿ Л∪ è ↑ ⊨ ⊻ ⊺ ˚ ⊨ ⊻ ↑ ⊻ ⊻ ⊿ ⊻ ↑ ’

ڍ ˘ ⅈ ⍵ ȯ Э ˘ ˜ ⊻ Ą˘ è ˘ ˘ ȯ ↑ ⊨ ⊻ ⒬ м Â

19.5.4. ⊻

⊻ IP ⊻ ∩ MAC ⊻ ˜Ω Â ⊻ ч ’ 1˜ ˘ ⊻ DHCP ⊨ ⊻ è˘ Ⓚ IP ⊻ ∩ MAC ⊻ ˘ è У э ⊻ ’ 2˜ ╟ ˘ DHCP ⊨ ⊻ ↑ DHCP ˘ ╟ ⊻ ÿ ⊻ è↑ IP ⊻ ˘ IP ⊻ ∩ MAC ⊻ Â

Ⓚ ⊻ ˘ ˝I ⅈ У э ╟ Ⓚ У э ў ⊻ ˘ ⊿ Ⓚ DHCP IP ⊻ ∩ ˘ ⊻ Â ˘ ⊻ MAC ⊻ Â ˘ У Ⓚ ˘ a Ⓚ MAC ⊻ ˘ ↑ ⒬ ⍵ Ў ⊽ ∩ MAC ⊻ Â ˜Ω ų Ў ⊽ ˘ ∧ RFC 1700 è ˜Ω ų “Address Resolution Protocol Parameters” ↑ ⓠ Â Л∪ ⊽ ⅈ “01” Â

⊻ ˘ ⊻ è ЛЬЮЬ ⊰'

Ьυ ⊰	ɔ
Ruijie(config)# **ip dhcp pool** *name*	Ⓚ⊻ ⊿˘ ώ DHCP
Ruijie(dhcp-config)# **host** *address*	Ⓚ IP ⊻
Ruijie(dhcp-config)# **hardware-address** *hardware-address type* Ruijie(dhcp-config)# **client-identifier** *unique-identifier*	Ⓚ ˚ ⊻ ˘ aabb.bbbb.bb88 Ⓚ ˘ 01aa.bbbb.bbbb.88
Ruijie(dhcp-config)# **client-name** *name*	ˆ ⊿ ˜ ñ ASCII Ⓚ ⊿ ˘ ⊿ a ↑ ⊻ ⊿ Â Ⓚ mary ў ⊿˘ a ⊿ Ⓚ mary.rg.com

19.5.5. Ping ↑

ⓠ˘ DHCP ⊨ ⊻ ⊻ ⊻ è↑ У э IP ⊻ ˘ ˚ ⊻ ч Ping Ьυ ⊰ (У У э ↑) Â Ping ˘ DHCP ⊨ ⊻ ⅈ ⊻ ⊻ ˘ ⊻ ↑ DHCP ’ Ping ˘ DHCP ⊨ ⊻ ⅈ ⊻ ⊻ ⊻ G ˘ ⊻ ⊿ У э ⊻ DHCP ˘ ↑ ↑ ⊓ Â

Ping ↑ ˘ ⊻ ώ è ЛЬЮЬ ⊰'

ԻՍ ՟	ɔ

Ruijie(config)#

Ьu ҳ	ɔ
Ruijie(config-if)# **ip address dhcp**	DHCP ĵ IP ƒфɔ ѕѫ

19.5.10. HDLC Э DHCP

Л ң ҏ HDLC Л DHCP ╠ ĵ IP ƒфɔ ѕѫ Â
DHCP ˘ ѫ Л è ЛьЮЬu ҳ'

Ьu ҳ	ɔ
Ruijie(config-if)# **ip address dhcp**	DHCP ĵ IP ƒфɔ ѕѫ

&

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

19.6. Ո ą

19.6.1. Ո DHCP Ł Ɣ

Ո DHCP Ł Ɣ Ь Ьu ҳ'

1˜ Ьu ҳ˘ ɻ Л DHCP ƒфɔ ѕѫ à ƒфɔ ѕѫ ă à Ł Ɣ ą '

2˜ ^ debug˜ Ьu ҳ˘ ą ˘ ў ɣ Ո '

3˜ Ьu ҳ˘ DHCP ˜Ω ą Â

Л ң ҏ ᵏ ѽ Ь Ьu ҳ˘ ˜Ω ą ɔ˘ ѫ Ьu ҳ è
ЛьЮЬu ҳ'

Ьu ҳ	ɔ
Ruijie# **clear ip dhcp binding** { *address* | *** }	DHCP ƒфɔ ѕѫ ą
Ruijie# **clear ip dhcp conflict** { *address* | *** }	DHCP ƒфɔ ѕѫ ă ą
Ruijie# **clear ip dhcp server statistics**	DHCP Ł Ɣ

DHCP Ł Ɣ ˘ ѫ Ьu ҳ è ЛьЮЬu ҳ'

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

DHCP ┡ ⅄ ɔ ˇ ﻡ ћu ҳ è ЛьЮћu ҳ'

ћu ҳ	ɔ
Ruijie# **show ip dhcp binding** [**address**]	DHCP ﺱ ﻑ ﻩ
Ruijie# **show ip dhcp conflict**	DHCP ﺱ ﻑ ă ﻩ
Ruijie# **show ip dhcp server statistics**	DHCP ┡ ⅄ ﻩ

19.6.2. Ո DHCP

Ո DHCP ч ћu ҳˇ ⅃ Лu ﻡ Э ЛьЮ ɔ'

19.7.1. فخسم R

جLЛЮ è˘ Ьж ф У э فخسم net172ˇ فخسم й 172.16.1.0/24ˇ ˇΩ й 172.16.16.254ˇ ѕѓ ѧ й rg.comˇ ѕѓ ѧ ┗ ы й 172.16.1.253ˇ WINS ┗ ы й 172.16.1.252ˇ NetBIOS صر й ѧ صرˇ فخسم й 30 Â فخسم è ф 172.16.1.2~172.16.1.100 فخسم ˇ è м فخسم كا فخسم й ┤ فخسم Â

```
ip dhcp excluded-address 172.16.1.2 172.16.1.100
!
ip dhcp pool net172
network 172.16.1.0 255.255.255.0
default-router 172.16.1.254
domain-name rg.com
dns-server 172.16.1.253
netbios-name-server 172.16.1.252
netbios-node-type h-node
lease 30
```

19.7.2.

جLЛЮ è˘ MAC فخسم й 00d0.df34.32a3 DHCP ┼ IP فخسم й 172.16.1.101˘ й 255.255.255.0˘ ў ѧ й Billy.rg.com˘ ˇΩ й 172.16.1.254ˇ WINS ┗ ы й 172.16.1.252ˇ NetBIOS صر й ѧ صر Â

```
ip dhcp pool Billy
host 172.16.1.101 255.255.255.0
hardware-address 00d0.df34.32a3 ethernet
client-name Billy
default-router 172.16.1.254
domain-name rg.com
dns-server 172.16.1.253
netbios-name-server 172.16.1.252
netbios-node-type h-node
```

19.7.3. DHCP

ЛЮ è˘ й ┐ FastEthernet 0/0 DHCP ╠┼ فخسم Â

```
interface FastEthernet0/0
ip address dhcp
```

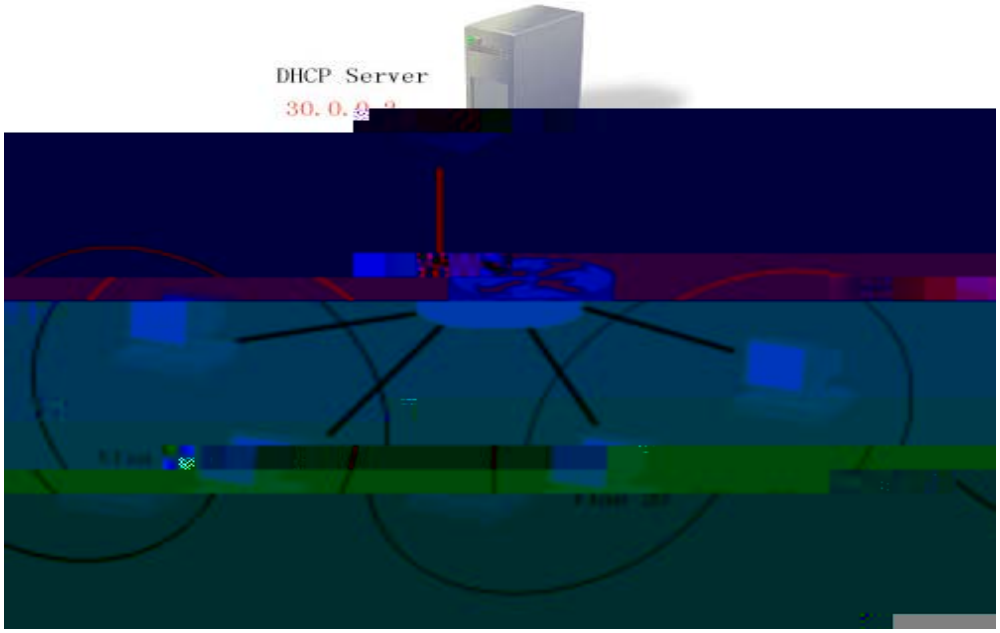
20 DHCP Relay

20.1.

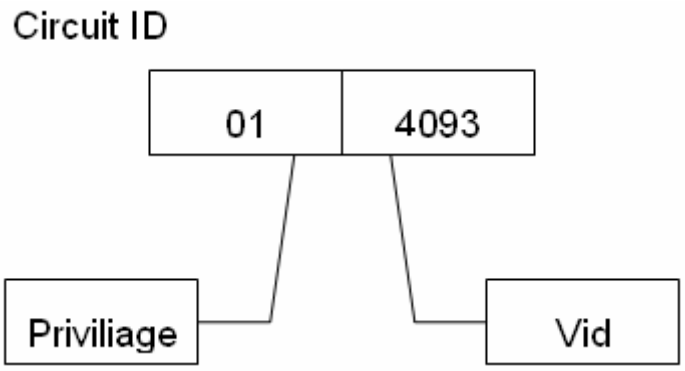
20.1.1. DHCP

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 ы ˜ Ї ┘ Л↑ ˇ ┘ Л↑ ˇ ‡ ┘ DHCP ACK ' a ┘↑ ˇ ‡ ┘ DHCP NAK



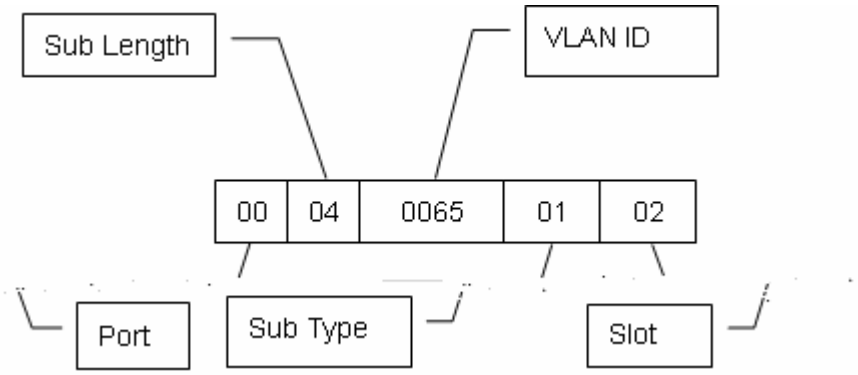
1 في



في 2

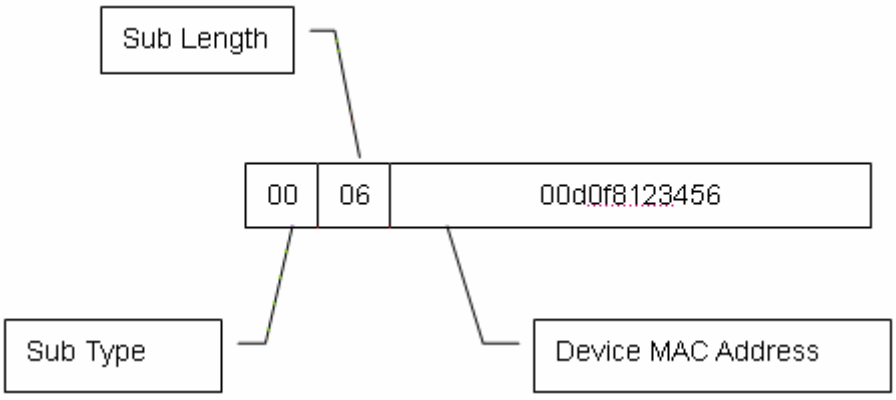
2. relay agent information option82' option a ﻝ è ы ˜ ﻫ ˘ ﺟ DHCP relay è˘ ˚ DHCP ɛ ﻥ˘ ﻝ ﻝ ﺳ ﻓ ﺥ ﻉ ˘ ﻝ option82 ﻉ Э· ˚ ﻟ ﻝ˘ option Ю'

Agent Circuit ID



في 3

Agent Remote ID



في 4

Ruijie(config-if)# **no IP helper-address** *A.B.C.D*

20.2.4. DHCP option dot1x access-group

ح option dot1x è˘ ⁸ æ IP ٨
У Ҏ IP ففسم ˘ Л٥ ٨ ⁸ æ ڳ ц ˘ ٨ Л٥
Ђ٥ ٤ **ip dhcp relay information option dot1x access-group** *acl-name*
˘ *acl-name* Ђ Ѫ ACL ”I ˘ Л٥ Ҏ ӫ ˘ ў
ұ ڳ ц Â ٨ ˘ ˜Ω ACL ĵ
٨ Э˘ з ACL ACE˘ б è ٨ ˜Ω ACL ă
˜Ω ˘ R '

й , У IP ففсм˘ й 192.168.3.2-192.168.3.254˘
192.168.4.2-192.168.4.254˘ 192.168.5.2-192.168.5.254’ ٨ 192.168.3.1 à
192.168.4.1 à 192.168.5.1 ɔ й ˜Ωففсм˘ aĵ Â ‡ ح ڳ ґ
G 192.168.3.x-5.x ففсмĵ web portal ЛЬЮ ˘ Â ҙ ح
Э Ю'

```
Ruijie# config
```

20.2.7. DHCP relay suppression

ћu ҳ **ip dhcp relay suppression** ʌ˘ ɷ DHCP realy suppression ʌ a ĵ DHCP ỳ´ relay ʟ˘ ɣ ʌ ĵ ʟ a ṁ ⁸ Â

ҷ ʌ ЮЎ Ю ╖ '

ћu ҳ	ɔ
Ruijie(config-if)# **ip dhcp relay suppresson**	ŭ DHCP relay suppresson ╖
Ruijie(config-if)# **no ip dhcp relay suppresson**	ЎΩ DHCP relay suppresson ╖ Â

20.2.8. DHCP R

Юћu ҳ ɷ dhcp relay ╖ à ╕ ɷ ч ┗ ʟ ﻓﺨ ﺳﻢ R '

```
Ruijie# configure terminal
Ruijie(config)# service dhcp                                    dhcp relay ╖
Ruijie(config)# ip helper-address 192.18.100.1 //  ╕ ŏ  ┗
                                                                ﻓﺨ ﺳﻢ ﻟ
Ruijie(config)# ip helper-address192.18.100.2     //  ╕ ŏ
                                                                ﻓﺨ ﺳﻢ ┗ ﻟ
Ruijie(config)# interface GigabitEthernet 0/3
Ruijie(config-if)# ip helper-address 192.18.200.1 //  ╕  ʌ
                                                                ﻓﺨ ﺳﻢ ┗ ﻟ
Ruijie(config-if)# ip helper-address 192.18.200.2 //  ╕  ʌ
                                                                ﻓﺨ ﺳﻢ ┗ ﻟ
Ruijie(config-if)# end
```

20.3. DHCP relay è ы Y

ɣ ɣ ˘ vlan relay ╖ option dot1x à ╟ ﻓﺨ ﺳﻢ Ո option82 У э ╖ ˘ ї ‡ ҷ ɣ Э ʌ vlan relay ╖ Â

20.3.1. DHCP option dot1x Y

1. ћu ҳ ҷ 0

4. ѫ ŭ ѽ 802.1x DHCP IP Ю ≠ MAC + IP ˘ Лъ a б DHCP ╠ ╖ a ⊿ ŭ Â

20.3.2. DHCP option82 Ү

DHCP option82 ╖ ¥ **dhcp option dot1x** ╖ ц ˘ a ⊿ G

20.4. DHCP

ѫ Ю **show running-config** ћ ҁ DHCP Â

```
Ruijie# show running-config
Building configuration...
Current configuration : 1464 bytes
version RGNOS 10.1.00(1), Release(11758)(Fri Mar 30 12:53:11
CST 2007 -nprd
hostname Ruijie
vlan 1
ip helper-address 192.18.100.1
ip helper-address 192.18.100.2
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
```

20.5. ή ص R

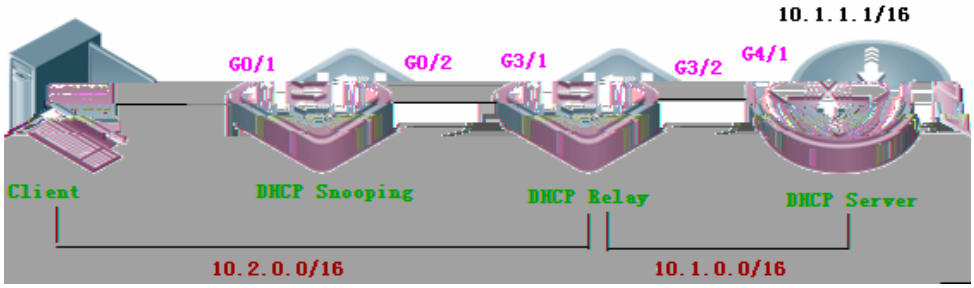
20.5.1. IP Э

20.5.1.1.

1 à ل Л ل IP ف س Э ’

2 à IP ف س Э Â

20.5.1.2. في



20.5.1.3. ĵ

DHCP Snooping Ц б

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

#      Gi0/2 й ARP      ә·  ∧
Ruijie(config-if)# ip arp inspection trust
Ruijie(config-if)# exit

# ŭ       VLAN    DAI          ╗
Ruijie(config)# ip arp inspection vlan 1

#            IP ﻓﺨﺴﻢ^  SVI1~
Ruijie(config)# interface vlan 1
Ruijie(config-if)# ip address 10.2.0.1 255.255.0.0

#     ¦  ∧ У э     ^  10.1.0.0/16~
Ruijie(config)# ip route 10.1.0.0 255.255.0.0 10.2.1.1
```

¸ DHCP Relay

```
# ŭ    DHCP è   Ɂ
Ruijie(config)# server dhcp

#    ╗ У э ŏ      DHCP    ┗ ﻓﺨﺴﻢ
Ruijie(config)# ip helper-address 10.1.1.1

#      б Snooping              ∧   IP ﻓﺨﺴﻢ
Ruijie(config)# interface gigabitEthernet 3/1
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 10.2.1.1 255.255.0.0

#      б Server              ∧   IP ﻓﺨﺴﻢ
Ruijie(config)# interface gigabitEthernet 3/2
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 10.1.0.1 255.255.0.0
```

¸ DHCP Server Э   '

```
# й      Relay          ∧      IP ﻓﺨﺴﻢ
Ruijie(config)# interface gigabitEthernet 4/1
Ruijie(config-if)# no switchport
Ruijie(config-if)# ip address 10.1.1.1 255.255.0.0

# ŭ    DHCP    ┗
Ruijie(config)# service dhcp

#      DHCP     ﻓﺨﺴﻢ˘    ﻓﺨﺴﻢ a¸    ¦
Ruijie(config)# ip dhcp excluded-address 10.1.1.1 10.1.1.10

#      ﻓﺨﺴﻢ    ⅄      ﻓﺨﺴﻢ
Ruijie(config)# ip dhcp pool star
```

```
#                ˜Ω
Ruijie(dhcp-config)# default-router 10.2.1.1
#      DHCP فخسم          ﾊ ﾊ
Ruijie(dhcp-config)# network 10.2.0.0  255.255.0.0
#     ¦  ﾊ У э     ˆ  10.2.0.0/16˜
Ruijie(config)# ip route 10.2.0.0  255.255.0.0  10.1.0.1
```

21 DNS

21.1. DNS

э IP ѫѣѕ ⊣Л∪ У э ў ⊿˘ ў ⊿ У э э s ˘ s ⫝̸
Â ⓒ ў ⊿˘ a ⊀ IP IP ѫѣѕ˘ ⊀ в
Ⱶ ў ⊿ ⓒ Â DNS ˜ ╖ Â

ў ⊿⍐ IP ѫѣѕ ч ' 1˜ ˘ ⊀ Э ў ⍐ IP
ѫѣѕ ˘ ⊀ ˘ з ⊀ k G ’ 2˜ ╟
˘ У ѫ ⊿ ^ DNS˜ ˘ ⊀ ҷ ж DNS ⊦⊻ Э ў ⍐ IP
ѫѣѕ ˘ Э G ў ⊿ ə ˘ ”I ⍐ DNS ⊦⊻ ў
IP ѫѣѕ Â

ў ⊿˘ ⍐ ў ⊿ IP ѫѣѕ ⊀ ṁ ѫ ⊿ ^ ў ⊿
˜ Â ҷ ѕѡ ў ⊿ ˘ ≠ DNS ѫ ⊿ Â ҷ
ѫ ⊿ ˘ ⊣Л∪ ”I ѫ ⊿ ˘ ѫ ⊿ a ╖˘ ”Ą
╟ ѫ ⊿ Â ⊣Л∪ У ҿ ѫ ⊿ ώ ѫ ⊿ è˘
⊣Л∪ ѫ ⊿ Â

21.2. ѫ ⊿

21.2.1. DNS

DNS Ю '

	ℏ
DNS ѫ ⊿ ╖ ˜Ω	
DNS ⊦⊻ IP ѫѣѕ	
ў "	
DNS ⊦⊻ э	6

21.2.2. DNS ѫ ⊿ ⊦

¡ DNS ѫ ⊿ ╖ ˜Ω Â

ħυ ҳ	ɔ
Ruijie(config)# **ip Domain-lookup**	DNS ѫ ɹ ╖ ˜Ω

ᴳ **no ip domain-lookup** ħυ ҳ ˜Ω DNS ѫ ɹ ᗡ!5B DNS DŃS **name-server** ɹ **config)** ɣ˘ **DN**

21.2.6. ѫ ѧ ҽ

! DNS ̃Ω ҽ '

22 ´ ˜ (SNTP)

22.1.

ɱˇ ჳ Э ɷ ˜ ɻ ˇ . NTPˆ Network Time Protocol-- ˜ ˜ ˇ У ˜ NTP ˜ ɣ ˇ . SNTP ˆ Simple Network Time Protocolˇ ´ ˜ ˜ Â

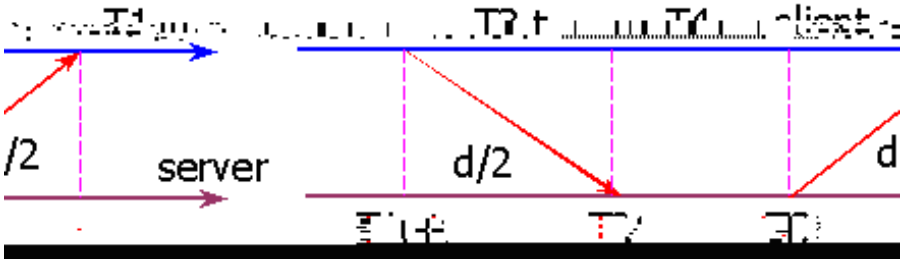
NTP ˜ ɻ Л ɻ ɻ Ո ɔ ˇ ˇ ჳ ΰ ψ a ɻ Ո ╟ :ˇ ɻ Л ᵏ 1-50 ms Â NTP ɻ ᵏ ⁸ˇ ΰ ⁞ Â ɲ NTP ˇ Â

SNTPˇ ´ ˜ ˜ NTP ɣ ˇ ჟ ˇ ɷ ´ ˇ Â У ≠ ⁞ 1 ɻˇ ≠ ⁂ ɮ ɻ Â

ɣ SNTP Ո NTP ΰ У ˇ Л SNTP Client ΰ ò NTP Server Â

22.1.1. SNTP Ɣ

SNTP ˜ / Ⴑ Ɣ ɔ ˇ Ⴑ Ɣ GPS ą ⁄ Ɣ ɔ ѝ ⁂ ñˇ Ⴑ Ɣ ᵏ Ⴑ ñ ą ˇ ˇ ⁞ ɻ Â



في 1

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

T1ˈ ɻ (Л ѝ ⅁)ˇ ѝ Originate Timestampˌ

T2' Ł Ɱ ˛ (Ɲ Ł ѝ ч)˘ ѝ Receive Timestamp'

T3' Ł Ɱ ѡ ą ˆ (Ɲ Ł ѝ ч)˘ ѝ Transmit Timestamp'

T4' ˛ ą ˆ (Ɲ ѝ ч)˘ ѝ Destination Timestamp'

T' Ł Ɱ Ո ʓ Ļ '

d' ч ʓ '

'

ę ѝ

T2 = T1 + t + d / 2;

Ɲ

T2 - T1 = t + d / 2;

ч ę ѝ

T4 = T3 – t + d / 2;

Ɲ

T3 - T4 = t – d / 2;

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

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

ɷ t Ո d˝ SNTP Client ˩ ɱ Â

. ˘ ɱ ѝ T4 + t

22.2. SNTP

Ȳ ˛ SNTP

22.2.1. SNTP

ɑ Ю˝ SNTP Ю'

	ћ
SNTP	Disable˝ ˜Ω SNTP Ł

NTP Server IP فخ سم	0
SNTP ﻝ	1800s
سم ש	+ϐ˝ . ח ѽ ש

22.2.2. SNTP

ώ ˘ ЛЬЮ SNTP'

ώ ŏ Â

```
Ruijie# config
```

SNTP˝ . ﻝ У Â ﻝ ώ ə ћ ҷ˘ ˛ ľ. ﻝ
Ŀ ˘ a ﻝ Â ŕ ѡ ȯ سم ﻝ ˘ ч ľ. ﻝ
Ŀ ѡ ҷ 5 Â

```
Ruijie(config)# sntp enable
```

ﻫﺍ

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

ɱ

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

ɖ Â

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

˝Ω SNT ˘ ﻝ Л **no sntp enable** ŏ ћ ҷ ˝Ω SNTP Â

22.2.3. NTP Server فخ سم

ҷ SNTP Ո NTP ŏ У ˘ Л SNTP Client ŏ ȯ
NTP Server Â Э ﺝ NTP Server˘ ﻝ Л У ə
У ə ṁ ŕ Ҕ Э NTP Server Â

έ ɛ NTP server فخ سم ﻝ Л http://www.time.edu.cn/ http://www.ntp.org/ Э
ﻝ Â

192.43.244.18(time.nist.gov) Â

ώ ˘ ЛЬЮ SNTP Server IP فخ سم'

ώ ŏ Â

```
Ruijie# config
```

ѫ ف Â

```
Ruijie(config)# sntp server <ip-addr>
```

ھ

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

ѝ

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

ɖ Â

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

22.2.4. SNTP ؍

SNTP Client У NTP Server˘ Л υ ғ
Â ЛЬЮ Ц Ո NTP Server ؍ '

ώ ŏ Â

```
Ruijie# config
```

2) ؍ ˘ ´ Æ й Â تن й 60 -65535 ˘ ḣ й 1800 Â

```
Ruijie(config)# sntp interval <seconds>
```

ھ

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

ѝ

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

ɖ Â

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

22.2.5. ѫ Ш

SNTP ˜ Л ۷ ñ (GMT)˘ й ѽ ñ
۷ ѫ ˘ ѫ Ш ñ Â

1˜ ώ ŏ Â

```
Ruijie# config
```

2˜ Ш˘ تن й -23 23˘ Ш˘ п ш Â 8 п ѿ
Ш˘ -8 8 Ш˘ 0 ñ Â ḣ й א I п ѿ ш Â

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

3˜ ‹ÅÎ

Ruijie(config)# **End**

4˜ ‰Ñ

Ruijie# **show running-config**

5˜ ¢Ç

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

¬Ì¤ **no clock time-zone** ĥ Â

22.3. SNTP

ÞÖ'

1) SNTP ˜Ω ¶

Ruijie# **show sntp**

2) G **show sntp** ¢Ç ¶ '

Ruijie# **show sntp**
SNTP state : ENABLE SNTP ĭ
SNTP server : 192.168.4.12 NTP Server
SNTP sync interval : 608782C5847213542099 61B4402D6>Tj/TT0 1 y0224

23 NTP

23.1. NTP

Network Time Protocol NTP G ل ע ע ~ ˇ ل Л
G è Ł Ы ṁ ل ע ˇ ل Л k ñ ^ LAN
Э б ñ ɣ 1 ˇ WAN Э ŭ ~ ˇ з ل G ╗
Â

NTP k ñ ˇ ˝I ñ ˇ У ف ñ
UTC Â NTP UTC ل Л Ы à ل à ~ ˇ ≠ ل Л ÿ
Internet Э ل Â ɷ ñ ل Â

NTP ╗ б Ы ąĭ ч ' У˘ NTP ŭ
ŭ ⁞ Л ч ŭ ˜Ω ' γ˘ ą Ы ą˙ '
NTP ŭ ŭ ⁸ ų У э ˘ п ч б Ы ʒ ╗
ą˘ Ы Â

ж ąЮ˘ a G ŭ ŭ ⁞ ⁸ Â G ŭ ⁞ ⁸ ‡ a
ą ╗ Â п Ө Ө ѫ ŭ ŭ ˘ a ʒ У ѫ ╗
Ы б ą˘ ѐ ыі ŭ Ы ╗
ч ч Ո Ы ╗ ą Â

ŭ ŭ ⁞ ⁸˘ ж ŭ è ЛЬЮЂ ʒ'

Ђ ʒ	ɔ
ntp authenticate	NTP ŭ ŭ ⁞ ⁸ Â
no ntp authenticate	˜Ω NTP ŭ ŭ ⁞ ⁸ Â

ntp authentication-key à **ntp trusted-key** ą˙
Â

23.2.2. NTP ŭ

NTP ŭ ŭ ˘ Ю ŭ Â

ŭ ˘ э У э ر У key-id ˘ ч Л **ntp trusted-key** key-id й ŭ ą˙ Â

ŭ ˘ ж ŭ è ЛЬЮЂ ʒ'

Ђ ʒ	ɔ
ntp authentication-key *key-id* **md5** *key-string* [*enc-type*]	NTP ŭ Â key-id' 1-4294967295 key-string' تن˙ enc-type' 0 Ո 7 ч صر Â

23.2.3. NTP ŏ ą̇ ID

ŏ ŏ л У э ˇ У э ŏ ŏ ą̇
Â ą̇ ˇ ↓ Л Ч ╗ ↑ л Â

ŏ ą̇ ˇ ж ŏ è ЛЬЮЋ ҳ'

Ћ ҳ	Ɔ
ntp trusted-key *key-id*	NTP ŏ ą̇ ID Â
no ntp trusted-key *key-id*	╕ NTP ŏ ą̇ ID Â

Л Э Ь Θ Θ ŏ ⁸ У э ˇ Ч б Ł Ы
╗ ą Ł Ы ą̇ Â

~

╕ ŏ ˇ ‡ ą̇ ą ≠˳ ╕ Â

23.2.4. NTP Ł Ы

ж ąЮ̆ NTP Ł Ы Â ↓ б 20 э
NTP Ł Ы Ц ц̌ ˆ ж ŏ Л Ч ˜Ω л˜ ↓ Л й У э Ł Ы
У э ˇ Ч б Ł Ы ╗ ą Â

б Ł Ы ą й NTP З̆ ↓ ↓ Л Ч NTP ∀̌
∀ ж Ч ∀ Э Ł Ы NTP Â

У э NTP Ł Ы̌ ж ŏ Ю ЛЬЮЋ ҳ'

Ћ ҳ	Ɔ
ntp server *ip-addr* [**version** *version*][**source** *if-name number*][**key** *keyid*][**prefer**]	NTP Ł Ы version̂ NTP л˜ ' 1-3 if-name ˆ ∀ ص ~ ' ↑ Aggregateport à Dialer GigabitEthernet à Loopback à Multilink à Null à Tunnel à Virtual-ppp à Virtual-template à Vlan ص Â keyid̛ 1-4294967295
no ntp server *ip-addr*	╕ NTP Ł Ы

∀ ¢ ŏ ŏ ⋮ Л Ч ⁸˘ Ą Ł Ы ą ą̇

˘ ↓ ¥ Ь Ы ╖ ąˇ ╖ ą Ь Ы ąˈ ↓
Â

23.2.5. ˜Ω ∧ NTP

Ъυ ϗ ╖ ˜Ω ∧ Э NTP Â

æ ąЮ˘ ˙ ∧ Э NTP ↓Л k ˘
э ╖ ˘ ↓Л ∧ Э ĵ NTP Â

~

╖ Ъυ ϗ ∧ IP ↓ ∧˘ æ è ы ∧
Э Ъυ ϗ Â

æ ∧ Ю ЛЮЪυ ϗ˘ ˜Ω ∧ NTP '

Ъυ ϗ	ↄ
interface *interface-type number*	ώ ∧
ntp disable	˜Ω ∧ NTP ╖ Â

∧ NTP ╖ ˘ æ ∧ Ю G **no ntp disable** Ъυ ϗ

23.2.6. NTP ╖ ˜Ω

no ntp Ъυ ϗ ╖ ˜Ω NTP ↓ Ь˘ ṃ ↓ ˘ ↓ ˜Ω NTP
ą Â

æ ąЮ˘ NTP ╖ ˜Ω ˘ Л ↓ ¢ NTP Ь Ы NTP ő ⋮
8˘ NTP ╖ ˙ Â

˜Ω NTP˘ æ ώ Ю ЛЮЪυ ϗ'

Ъυ ϗ	ↄ
no ntp	˜Ω NTP ╖ Â
ntp authenticate **ntp server** *ip-addr* [**version** *version*][**source** *if-name number*][**key** *keyid*][**prefer**]	NTP ╖

23.2.7. NTP ﻝ

ﻯ ﻫ ˇ ﻉ У è ˛ Ո Ⱡ ﻝ 8 ə
Ꮋ ц˘ ﻉ Ю ﻝ è˘ NTP ﻝ ﻯ 1 ˇ ﻝ
ˆ ╟ ﻟ Ю У ﻝ ˇ ╟ Ɔ ᴳ Ъ
ɂ Â

NTP ﻝ ˇ ﻉ ŏ Ю ƆЮЪ ɂ'

Ъ ɂ	ɔ
ntp synchronize	ﻝ
no ntp synchronize	˜Ω ﻝ

NTP ﻝ ɔ ŋ ⱠM
ɂ Ᵽ N T P Ή ˙ ﻙ

Ьυ ҳ	ɔ
show ntp status	ɱ́ NTP ə̨

ɻ ɯ̇ ɷ ʗΩ ə̨ Ŀ ɣ ʖ ɻ Ьυ ҳ . ə̨ 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 ҳ ɱ́ ˇ reference ỳ ɻ Ŀ ɣ ﻓﻈﺳ ˇ frep ɱ́ ˇ precision ỳ ɱ́ ˇ reference time ỳ ɻ Ŀ ɣ ɻ UTC ḣ ˇ clock offset ỳ ɱ́ Ļ ˇ root delay ỳ ɱ́ ˇ root dispersion ỳ Ŀ ɣ ˇ peer dispersion ỳ ɻ Ŀ ɣ Â

23.4. R

ɯ̇ ЛυЮ è ˇ è У э ỳ master NTP Ŀ ɣ ˇ ɷ ⁸ ˇ ɷ У э key-id ỳ 6 ầ key-string ỳ wooooop ˇ ỳ Ŀ ɣ ə̨ ' ỳ ɷ ɻ Лυ Ո Э NTP Ŀ ɣ ɻ ˇ τ Ю ˇ ΰ ╟ ѿ ˇ У э Ո NTP Ŀ ɣ У ˇ ɻ τ ɻ Ŀ ɣ ỳ Э э NTP Ŀ ɣ ˇ ɻ 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
```

24 UDP-Helper

24.1. UDP-Helper

24.1.1. UDP-Helper ӯ

UDP-Helper ў ╖ UDP è ч Â ч
Ь Ы˘ UDP ´ Л ч Ь Ы˘
Ї è ɔ Â

ᴳ UDP-Helper ╖ Л˘ Ї UDP ч Л ″ ˘
э UDP ч Л б ч ч Л ך ˘ ᵍ IP
ﻡﺳﻓ ѝ Ь Ы IP ﻡﺳﻓ˘ Ո´ ч Ь Ы Â

ᴳ UDP-Helper ╖ Л˘ 69 à 53 à 37 à 137 à 138 à

24.2.2. ŭ ╟ UDP-Helper è ┐╖

ћu ъ	╖
Ruijie(config)# **udp-helper enable**	**udp-helper enable** ћu ъ ŭ ╟ UDP è ┐╖ Â UDP è ┐ ¥ ˜Ω

G **no udp-helper enable** ћu ъ ˜Ω UDP è ┐╖ Â

& **:**

1) ą ЮO è ┐╖ ¥ ˜Ω Â

2) ŭ ╟ UDP è ┐╖ ˘ ‡ 69 à 53 à 37 à 137 à 138 à 49
UDP ┘ è ┐ Â

3) ˜Ω DUP è ┐╖ Л˘ UDP ┘ ┘
˘ ↑ ┘ Â

24.2.3. è ┐ ┗ Ы

ћu ъ	╖
Ruijie(config-if)# **ip helper-address** *IP-address*	UDP è ┐ ┗ Ы Â ą ЮO è ┐ ┗ Ы Â

G **no ip helper-address** ћu ъ¯ è ┐ ┗ Ы Â

& **:**

1) У э ┘ 20 э ┗ Ы

2) è ┐ ┗ Ы ج ┘ Э ˘ ج ŭ ╟ UDP-Helper
╖ Л˘ ÿ ┘ UDP ┘ ˘ Л˙ ┐ ↑ ┘
┗ Ы Э Â

24.2.4. è ┐ UDP ┘

ĥU ₹	₸
Pufie(ard-g)#otocol **udp** *ID*	è ↰ UDP ↰ Â ↰ ₡ UDP ↰ ˘ ‡ ↰ è ↰˘ Ï ‡ Â ᴳ UDP-Helper ₸ ↰˘ 69 à 53 à 37 à 137 à 138 à 49 ↰ è ↰

Ko ¡ÞÕforward è protocol udp port ↰ Â

& **:**

¸ ↰ UDP-Helper è ↰ ₸ ₡ è ↰ Ł ↰˘

è ↰ UDP 4ÂÝï' ‡ Rs ÍÜ éAð ÐÐ¥ K€tt¼ % "Á Q´T š œe C h 0

25 SNMP

25.1. SNMP ˜Ω

25.1.1.

SNMP Simple Network Manger Protocôl ´ ˜ ˜ ĵ˜ ћ 1988 8 ѝ У э ñ RFC1157 Â¦ ѭ˜ ҷ¸ ˜ ˜ SNMP ѝ Y Э ñ˜ Л ¥ ћ ˜ тц è G Â ¯ SNMP ˜ ˘ ˜ ┘Л Э ą à à Æ à ,˘ Ո SNMP ѭ ╗ Â

SNMP У э ˜ ˘ ѝ / Ь Ы ˘ ↑ Ь э ¦ '

¸ SNMP Ы

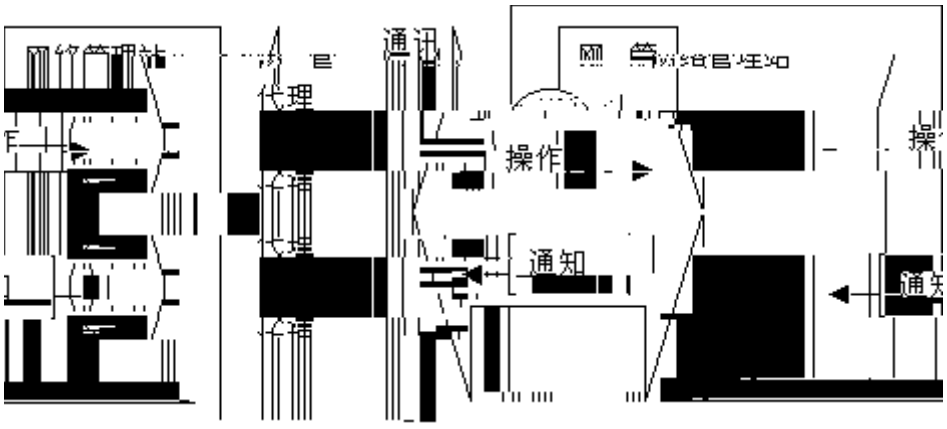
¸ SNMP Ʒ

¸ MIB ą

SNMP Ы˘ SNMP ⁸ Ո ˘ ≠ ѝ NMS (Network Management System) Â ћ NMS Э Л HP OpenView à CiscoView à CiscoWorks 2000˘ ˘ ┘ ѽ У ˚ · · Star View Â Ҿ ˚ ┘Л ғ Ո Â

SNMP Ʒ ˆ SNMP Agent˜ ћ Э ˚ ˘ ┘ à з ⁝ NMS Ո ⁸ ˘ ≠ ┘Л ў ╟ ┘ У Ҿ NMS Â

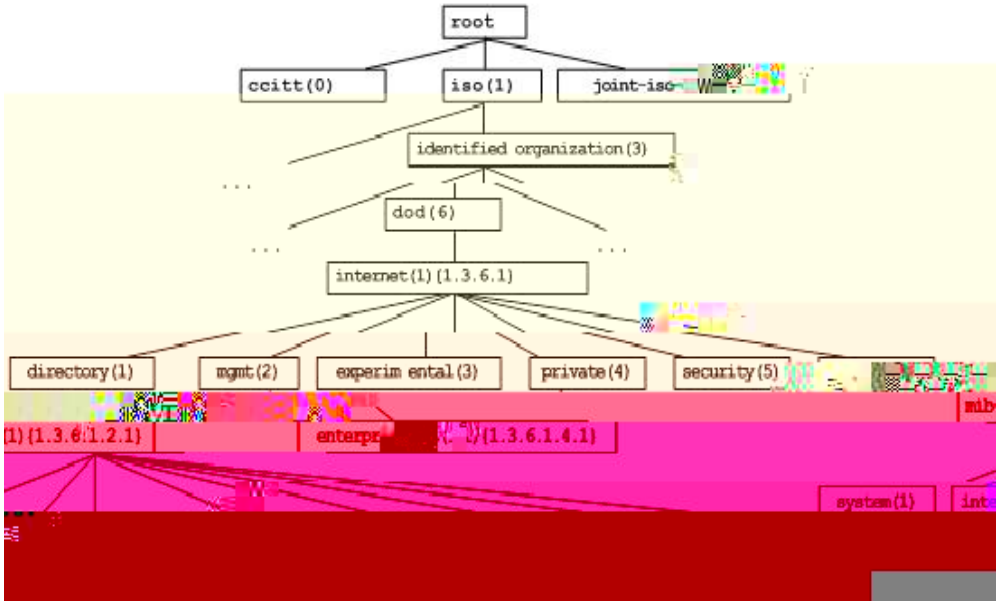
NMS Ո Agent ˜Ω ┘Л Ю ف '



ف 1 ˆ NMS˜ б Ʒ ˆ Agent˜ ˜Ω ف

MIB˜ Management Information Base˜ У э ą Â

è ↑ ü ɷ ə ˇ ѝ ɷ ج SNMP è ر У э
´ Ĩ ˇ MIB è ´ Ĩ Â
э ´ Ĩ Â Юفي MIB ћ ˇ ѝ ɷ ر У è э
´ Ĩ System˜ ˧ Л У s ˇ {1.3.6.1.2.1.1} У s . ѝ
´ Ĩ Object Identifier´ ´ Ĩ ˜ ˇ MIB ‡ ´ Ĩ
˧ Â



في 2 MIB

25.1.2. SNMP ˜

ɱ SNMP ЛЬЮ '

¸ SNMPv1 ' ´ ˜ У э ˇ ج RFC1157 è ћ Â

¸ SNMPv2C' ѫ ɣ Ѽ ˧ ɛ ˆ Community-Based˜ SNMPv2 , ج RFC1901 è ћ У э ˜ Â

¸ SNMPv3 ' ⁞ Ո ╗ ˇ ᵏ ɷ ЛЬЮ ѽ '

1. ɖ ج· è a '
2. ɖ ÿ ˧ ˧ '
3. ╗ ˇ ɖ '

SNMPv1 Ո SNMPv2C ѫ ɣ Ѽ ˧ ɛ ˆ Community-based˜ ѽ Â
ћ ў ѫ فج Л ˧ ˧ (Commumity String) Ɂ MIB
ɔ Â

SNMPv2C ╗ ɷ Get-bulk ɔ ⁸ з ɔ ѡ ╗
ə ص Â Get-bulk ɔ У ѫ ˧ è ə ˧

ˇ ÿ ˜ - ⁝ Â SNMPv2C ╒ ↑ ℓ
ϛ ЛЧШ¦ a ⅄ ص ˇ ﺝ SNMPv1 è ҉ Θ У ϛ Â ﺝ
ϛ ⅄ЛЧШ¦ ص Â ɣ Э ⅄ ⅄ ﺝ SNMPv1 Ո
SNMPv2C ɔ ˇ ﺟ SNMP ϛ ⁞ SNMPv1 Ո SNMPv2C
ˇ ɜ ﻫ Â

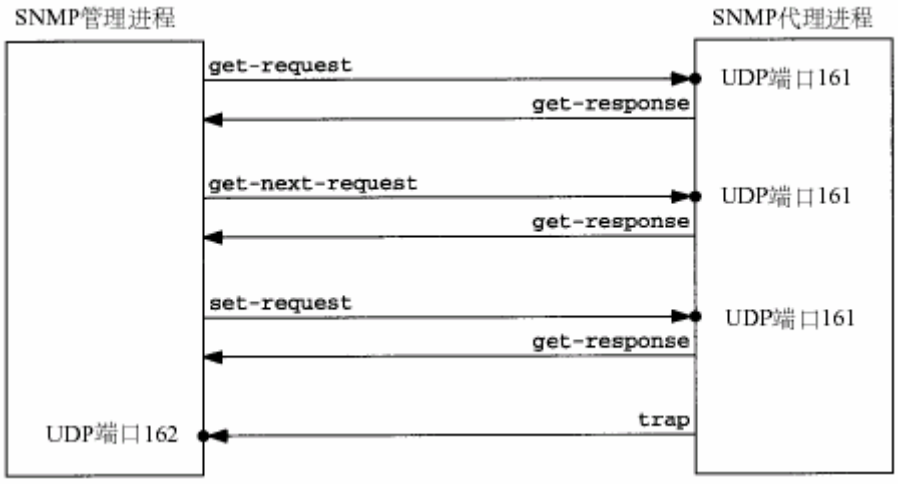
25.1.3. SNMP ɔ

SNMP ˜ è NMS Ո Agent ʖ Ц ҷ ˇ ҤѪ 6 ɔ ص'

1. Get-request ɔ' NMS ÿ Agent ⅄ У э э ∀ ḣ Â
2. Get-next-request ɔ' NMS ÿ Agent ⅄ У э э ∀ ЮУ э ∀ ḣ Â
3. Get-bulk ɔ' NMS ÿ Agent ⅄ ∀ ḣ'
4. Set-request ɔ' NMS Agent У э э ∀ ḣ Â
5. Get-response ɔ' Agent ﻫ У э э ∀ ḣ˘ Agent NMS ⅏ 3 э ɔ ⁝ ɔ Â

   Trap ɔ' Agent ў ╟ ⅄ ˇ NMS ҉ Y ⅄ Â

⅏ 4 э NMS ⅃ Agent ⅄ ˇ ⅄ ч э Agent ⅄ NMS ˆ ' SNMPv1 a Get-bulk ɔ˜ Â Юفي ҂ ΰ ɔ Â



فى 3 SNMP ص

NMS ⅃ Agent ⅄ ⅏ 3 ɔ Ո Agent ɔ UDP 161 ∧ Â Agent ⅄ Trap ɔ UDP 162 ∧ Â

25.1.4. SNMP ŏ

SNMPv1 Ո SNMPv2 G ɻ ⁞ ĭ G MIB Â ŭ ɷ ˘ (NMS) ɻ ɻ è ⱨ ɜ ɻ У Â

У ɜ ɻ ɻ Л Л ЛЮ :

¸ ɻ (Read-only)' ŭ ɔ k MIB ɻ Â

¸ ĵ (Read-write)' ŭ ɔ k MIB ɻ ĵ Â

ɯ SNMPv2 ɯ Э˘ SNMPv' ŏ рЛ ɻ ŏ ⁞ ف ŏ 8 ' ɱ ɻ ŏ р Ь ⁞ ' SNMPv1 à SNMPv2C à SNMPv3 Â

Ю ŭ ɱ ɻ ŏ рЛ ɻ ŏ ⁞

ŏ р	ŏ ⁞	⁞	╕	
SNMPv1	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv2c	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv3	noAuthNoPriv	ɻ		ɻ ɻ
SNMPv3	authNoPriv	MD5 SHA		k ɯ ɣ HMAC-MD5 HMAC-SHA ⁞ 8
SNMPv3	authPriv	MD5 SHA	DES	k ɯ ɣ HMAC-MD5 HMAC-SHA ⁞ 8 k ɯ ɣ CBC-DES ╕ 8

25.1.5. SNMP

ɣ ɾ У У ɜ SNMP Â ɣ ɜ SNMP ɛ Θ ↑ ŭ У ɜ SNMP Ґ v y ɜ ɔ Ȯ % Æ Д k

5' 16 ⁸ ḣ˘ 27 ɜ ˘ ˝ ك Ⱨ Â
6-127' ɖ Â
128-255' ˝ ك Â

25.2. SNMP

SNMP ɔ ج ŏ Ю ˘ ج SNMP ɱ˘
˝I ώ ŏ Â

25.2.1. ɻ ⊣

SNMPv1/SNMPv2C ⱨ ɣ ˝Ω ɻ ɛ^ Community-based˜ ŏ ˘ SNMP
Ɽ ⊻ ⊻ ɻ ɻ^ Community-String˜ ɔ˘ б
ɻ a SNMP a : ˘ x Â ɻ ɣ NMS Ո Agent ʤ
Â

¸ ⊣ Л ˝ ˜Ω ˘ ⊻ IP سمخف NMS ⊣ Л '

¸ ⊣ Л ˝Ω ɻ ɛ ɔ ˘ ReadOnly ⊻ ˜ ReadWrite ɲ˜'

¸ في ɻ ˘ ɣ ⱨ ɣ في Â ˘في . ï
MIB '

¸ ⊣ Л ᴳ ɻ IP Â a ˘ ‡ a ⁸ ᴳ
ɻ IP سمخف Â ŕ a ⁸ ᴳ ɻ IP سمخف'

SNMP ɻ˘ ج ŏ Ю ЮЋ Ɽ'

Ћ Ɽ	ɔ
Ruijie(config)# **snmp-server community** *string* [**view** *view-name*] [**ro** | **rw**] [**host** *host-ip*] [*num*]	ɻ Ո Â

⊣ Л У ˘ ɜ a ɻ ˝Ω ɻ ɛ ɻ ˘ ᴳ ⊣ Л
ᵏ a ɻ NMS ˘ ɲ ˝Ω ɻ ɛ ɻ Ո ˘ ج ŏ Ю˘
no snmp-server community Ћ Ɽ Â

25.2.2. MIB في Ո

⊣ Л ᴳ ⱨ ɣ في ⁸ ص ″ У ɜ ɔ ˜Ω ï̈ ج في ï
ʤ ä ج ˘ ⊣ ج في ï ʤ ä ï Â ج
⁸ ˘ У ҿ Ո У ɜ ˜Ω ˘ ˝Ạ ɜ б ɜ في˜Ω Â У ɜ ä
ɛ ɻ Â

¸ ⊣ Л ↑ ΰ في Ո في'

¸ ⅃ Л Ъ и У ⅃ فهي Ո ⅃ ĵ̃ فهي'

¸ SNMPv3 ˘ ⅃ Л Ъ и è G ŏ ⁞ ˘ ĭ̃
à ĭ ╗ '

MIB فهي Ո ˘ ج ŏ Ю ЮЪu ҳ'

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

G **no snmp-server view** *view-name* Ъu ҳ ĩ У э فهي˘ G **no snmp-server view** *view-name oid-tree* Ъu ҳ ج У э فهي è ĩ У Â ≠ ⅃ Л Ъ
G **no snmp-server group** *groupname* Ъu ҳ ĩ У э Â

25.2.3. SNMP

⅃ Л Ъ G ѫ ɣ ŏ ص ŏ ˘ ѫ ɣ Y ˝I
ə ˘ NMS ⅄ G ⅄ ⅃ ҳ ə Â

ɣ SNMPv3 ˘ ⅃ Л Ъ ŏ ⁞ à ^ MD5 SHA˜ à ⅄ ҳ à ╗ ^ ɱ ⅄ DES˜ Ո ╗ ⅄ ҳ'

SNMP ˘ ج ŏ Ю ЮЪu ҳ'

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

Ъu ҳ	ɔ
Ruijie(config)# **snmp-server host** *host-addr* **traps** [**version** {**1**|**2c** |**3** [**auth**	**noauth**	**priv**]}] *community-string* [*udp-port port-num*] [**type**]	SNMP ў ѕѡ ў ѧ ѵ ѧ ѧ SNMPv3 Ю ѧ ~ à ŏ ⁞ ^ Θ SNMPv3 ~

25.2.5. SNMP ҳ ѧ

ѧ Л Ц SNMP Agent ѡ ѧ ˘ à Æ à " ѧ ą ˘ NMS Ҫ ѧ ˘ ғ ѧ Л Ц ӂ˘ ѧ Æ ą Â

SNMP ҳ ѧ ˘ ѧ ŏ Ю˘ Ю ҳ'

Ъu ҳ	ɔ
Ruijie(config)# **snmp-server contact** *text*	
Ruijie(config)# **snmp-server location** *text*	Æ
Ruijie(config)# **snmp-server chassis-id** *number*	"

25.2.6. Ѫ SNMP ҳ

ѝ ѫ ˜ : ˘ ѧ Л Ц Ѫ SNMP ҳ ↑ Â ѧ ŏ Ю˘ Ю ҳ'

Ъu ҳ	ɔ
Ruijie(config)# **snmp-server packetsize** *byte-count*	ҳ ↑

25.2.7. SNMP ҳ

SNMP ҳ Ь ѧ ң ҏ ĸ У ə Ь˘ ŭ ╟ ˘ ѧ a ҳ Ь Ą˘ ѧ Л Ц Ю snmp ҳ ╖ Л Ц ѧ ˜Ω ą ' snmp ҳ ╖ ˘ ѧ ŏ Ю˘ Ю ҳ'

Ъu ҳ	ɔ
Ruijie(config)# **no snmp-server**	SNMP ҳ Ь

25.2.8. ˜Ω SNMP ϧ

a ˩ ɣ ƫ ϧ˘ ʌ ɥ ɒ ᵏ ɷ ˜Ω snmp ϧ ƫ ϧ˘ ƫ ϧ˳ snmp
Ŀ˘ ɲ a˳ ϧ ə ' ˜Ω SNMP ϧ Ŀ˘ ѫ ѿ
Ю˘ Ю ϧ'

ƫ ϧ	ɔ
Ruijie(config)# **no enable service snmp-agent**	˜Ω SNMP ϧ Ŀ

25.2.9. Agent ў ╟ ˩ NMS ˧ Trap

Trap Agent a ў ╟ ˩ NMS ˧ ˘ ɣ ˆ У Ҽ Y
˙ ˧ Â a ї Agent ў ╟ ˧ Trap ˘ ї ˘ ѫ ѿ
Ю˘ Ю ϧ' Agent Ŀ̆

25.2.11. ㄐ ɔ ㄟ

ㄐㄇ Agent ㄐ Trap У ㄟ ˇ Ю ʒ '

ħυ ʒ	ɔ
Ruijie(config)# **snmp-server trap-source** *interface*	ㄐ Trap ㄟ
Ruijie(config)# **snmp-server queue-length** *length*	ɜ Trap "
Ruijie(config)# **snmp-server trap-timeout** *seconds*	ㄐ Trap

25.3. SNMP б

25.3.1. ɱń SNMP

ὶ ɷ SNMP Ո SNMP è У ˇ ㅅ ɳ ɒ ᵏ ɷ SNMP ʒˇ ㄐㄇ ɾ ɱń SNMP ˇ ₔ

Ю **show snmp** ɱń 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
.
```

ץ Э ə ЮО '

ə	
Bad SNMP version errors	SNMP a
Unknown community name	a ⁞ ɻ
Illegal operation for community name supplied	ɔ
Encoding errors	
Get-request PDUs	Get-request
Get-next PDUs	Get-next
Set-request PDUs	Set-request
Too big errors (Maximum packet size 1500)	⁝
No such name errors	a ج ´ Ĩ
Bad values errors	ḣ ص
General errors	ע
Get-response PDUs	Get-response
SNMP trap PDUs	SNMP trap

25.3.2. ɱ SNMP Ɂ MIB

ج ЮЎ **show snmp mib** ɱ Ɂ MIB Â

```
Ruijie# show snmp mib
sysDescr
sysObjectID
sysUpTime
sysContact
sysName
sysLocation
sysServices
sysORLastChange
snmpInPkts
```

```
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
```

25.3.3. SNMP

ج ЮЎ **show snmp user** ๓ Ҷ Э SNMP
Â

```
Ruijie# show snmp user

User name: test
Engine ID: 8000131103000000000000
storage-type: permanent    active
Security level: auth priv
Auth protocol: SHA
Priv protocol: DES
Group-name: g1
```

25.3.4. SNMP ڤي Ո

ج ЮЎ **show snmp group** ๓ 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 ЮЎ **show snmp view** ๓ Ҷ Э ڤي Â

```
Ruijie# show snmp view
```

```
default(include) 1.3.6.1
test-view(include) 1.3.6.1.2.1
```

25.4. SNMP

25.4.1.

ۃ

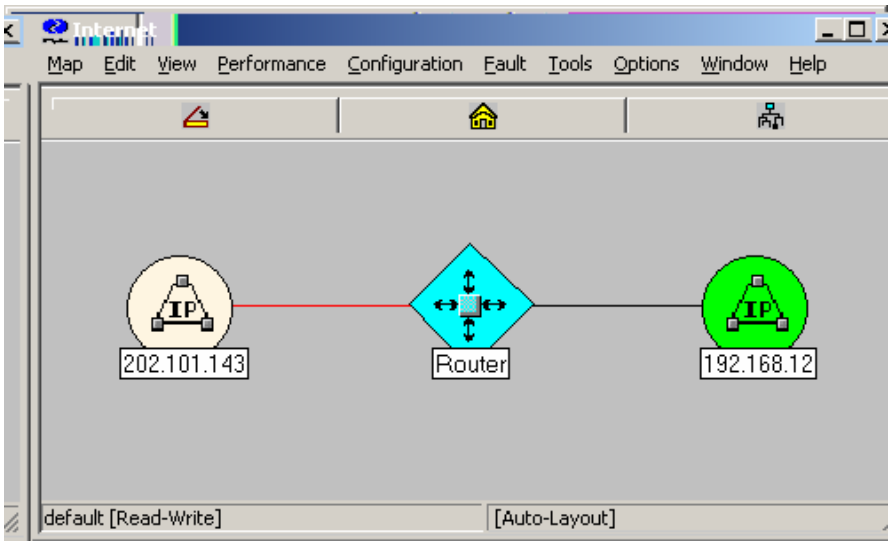
ﻲﻔ NMS IP
192.168.12.181 IP 192.168.12.1

ЛЬЮ ˘ ï ў ╠ ┘ NMS ┤ У Ҷ Trap ˘ й ┤

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

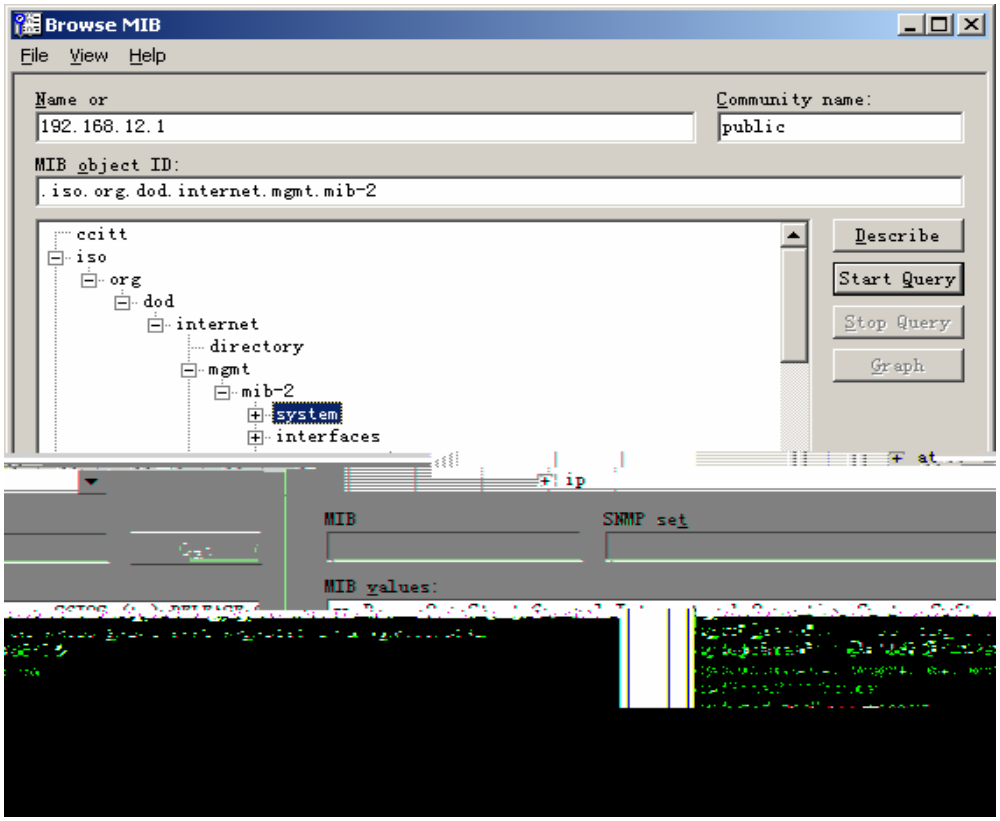
Э ˘ SNMP Ҙ ˘ NMS ғ ┤Л Ъ

Ո ѓ˘ Л Ъ HP OpenView й ᴿ˘ ┤Л Ъ ң ڤ˘ Юڤ'



ڤ 6

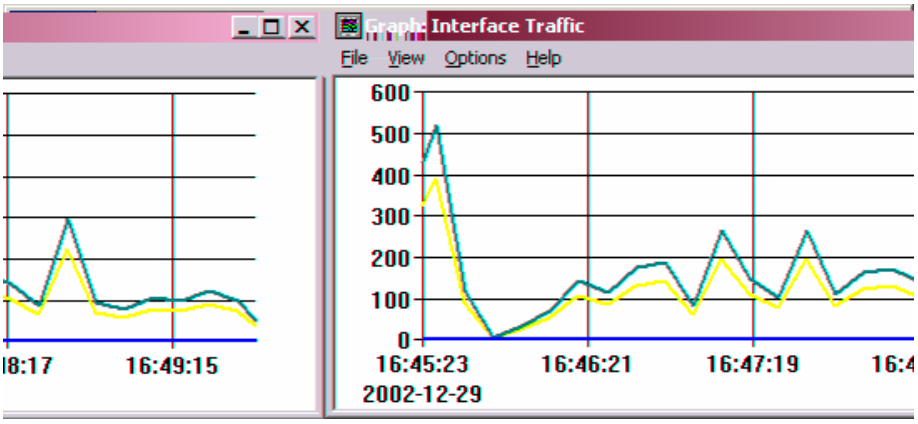
┤Л Ъ è ´ Ї Ո ˘ HP OpenView TOOL->SNMP MIB Brower ´ ˘ Ю ˘ ج Name è ѽ IP فذسم 192.168.12.1˘ ج Community Name è ѽ Public˘ MIB ɛ ɛ ´ Ї˘ Юڤ System Â Start Query˘ ғ MIB ѓ˘ ɛ ɛ MIB Values ┘'



في 7 MIB

HP OpenView ╖ ˘ ˘ ┘Л ╓ ^ ^

ˇ╓ ѐ ыі ѓ е ^ SNMP ╖ ˘ ˚ ˘ a جھ



في 8 ^ ╓

25.4.2. SNMP " ˜Ω ʁ R

^ н ҏ ┘Л " ˜Ω ˘ ┘ " è ї NMS ┘Л ¯
SNMP Agent Ո ˘ ⁸ NMS ˘ SNMP

ŏ Â

ج ŏ Ю

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

Э ˇ ˧ IP فذسم ѝ 192.168.12.181 ў ¯ SNMP Ո ֍ Â

25.4.3. SNMPv3 ˜Ω R

ЛЮ ї SNMPv3 ¯ ╗ ˩ v3user MIB-2(1.3.6.1.2.1) Ю ˩ Ո Â ѝ MD5˜ G ѝ MD5-Auth˘ DES ╗ ˇ ╗ ѝ DES-Priv Â ˩ ї ˩ 192.168.65.199 Лъ SNMPv3 ˧ Trap Â˧ Trap G ˩ ѝ v3user, ¯ ╗ ˧ ˇ ѝ MD5˘ G ѝ MD5-Auth˘ DES ╗ ˇ ╗ ѝ 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
```

26 RMON

26.1.

RMONˆ Remote Monitoringˇ ˜ IETF(Internet Engineering Task Forceˇ Internet ж) ñ ˇ э ˩Л∪ ˩ ⱬ
∩ ⁸ ˩ Ƹ Ꮋ Â RMON ⱨ Э ⱬˇ

»ÆÌ&’d Œ¥ º® úºí9ôÓ8V ÔÈ Ÿ ! Ȯ %

У э Э ḣ æ ɣ У э Ю ḣ ˘ ˛ ˩ Â ɔ Ɣ˚
˘ Ɣ˚ ˩Ʌ ˩ SNMP Trap Â

26.1.4. Ɣ˚

Ɣ˚ (Event) RMON è 9 ˘ ɑ ɣ ң Ɣ˚ ˘ ѝ
ң У э У э SNMP Trap Â

26.2. RMON ˙ Ł "

26.2.1.

˩Ʌ G ЮҺ ҳ ╗ У э Â

Һ ҳ	ɔ
Ruijie(config-if)# **rmon collection stats** *index* [**owner** *ownername*]	╗ У э
Ruijie(config-if)# **no rmon collection stats** *index*	╖ У э

26.2.4. RMON

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

26.3. RMON R

26.3.1. R

Л∪ ∧ 3˝ G ЮЪυ ҳ'

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

26.3.2. ˥ ˩ R

10ǂ Л∪ ∧ 3 ˥ ˩ ą ˘ G ЮЪυ ҳ'

```
Ruijie(config)# interface gigabitEthernet 0/3
Ruijie(config-if)# rmon collection historyzhangsan
```

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

26.3.4. rmon R

26.3.4.1. 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
```

26.3.4.2. 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
```

26.3.4.3. show rmon history

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

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

26.3.4.4. show rmon statistics

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

27 RIP ˜

27.1. RIP Ў

RIP (Routing Information Protocol) ˜ У ∧ ˇ جہ صЛЮ ┤ ┘ Ў è ⁞ ѽ ˜ ÂRIP ┘ ˇ У ┘ ˜ ÂRIPv1 جہ RFC 1058 è ЊЌ RIPv2 جہ RFC 2453 è ЊЌ ∧ RGOS ˚ ┘ ч э Â

RIP G UDP Ц ą ˇ UDP ∧ ∧ й 520Â ąЮRIPv1 й ' RIPv2 й ˇ فخسم й 224.0.0.9ÂRIP 30 ┘ ┤ У Â 180 ⁞ ‡ ą й а ┘ ˇ ώ а ┘ ∧ˇ 120 ą̈ Ў ⁞ Ҽ ў è⁞ Â

RIP G ⁞ سس ˇ й ÂجہRIP èˇ ⁞ б й 0ў У э ┘ й 1 ˇ è м ŋ ' а ┘ й 16Â

RIP ˜ ˇ ┘Лъ ў ⁞ ˇ ≠ ┘Лъ ң Â ЛъЮ ˚ ʒ Уˇ ∧ ң ҏ ┘Лъ **default-information originate** Ћъ ʒ ώ ˇ ˆ '

¸ ѽ **ip default-network**

¸ è ˜ ⁞ ѽ

RIP ┘ ∧ ┤ ˇ ∧ б RIP ˜Ω ˇ ∧ a˳ ˆ ˙ ¦ ÂRIP RIPv1 Ո RIPv2 ч э ˇ RIPv2 à MD5 Ո ┘ ┘ Â

∧ RIP ⁞ →ˆ Split Horizon˜ Â

27.2. RIP ˙ Ь "

RIP ˙ Ь " Ю ў

¸ … RIP ˆ ˜

¸ RIP ´ ˆ ┘ ˜

¸ ⁞ → ˆ ┘ ˜

¸ RIP ЊЌ ┘ ˜

¸ ℸ ˆ ┘ ˜

¸ RIP ˆ ˩ ˜

¸ RIP ѳѕ ˆ ˩ ˜

¸ RIP ˄ ⁸ˆ ˩ ˜

¸ RIP ˄ ˆ ˆ ˩ ˜

˜Ω ų ЛЬЮ ў ˇ ˄ ê IP “ ˜ ˜Ω” Ì Â

¸ ə

¸ ɬ

¸ ɬ ˩

27.2.1. … RIP

RIP ˜ ˇ ˝I … RIP ˇ Ѭ б RIP ˜Ω Â

… RIP ˇ ж ѽ è ЛЬЮЬ ҙ'

Ьυ ҙ	ɔ
Ruijie(config)# **router rip**	… RIP
Ruijie(config-router)# **network** *network-number wildcard*	Ѭ˜Ω

˩ Лυ ˩ *network-number* Ո *wildcard* ˄ ˇ G ж ѳѕ фѣ тп ѿ ˄ ѳѕ ˄ б RIP Â

wildcard ˄ ˇ RGOS ѳѕ тп ˇ G ж фѣ тп ѿ ˄ ѳѕ ˄ б RIP Â

&

network Ьυ ҙ Ѭ ˜Ω ч '

1˜ RIP ˆ ˜Ω ə '

2˜ RIP ˩ ˜Ω ˄ ˆ Ո ə Â

27.2.2. RIP ´

RIP й ˜ ˇ RIP ə . ˇ ‡ ˇ Лυ ғ RIP ¯ ´ ˆ ə Â

RIP ´ ˆ ˘ æ RIP è ЛυЮћυ ҳ'

ћυ ҳ	ɔ
Ruijie(conf-router)# **neighbor** *ip-address*	RIP ´ ˆ

ʌ ћυ ҳ G ˘ ɻЛυ 8 ʌ ǐ ǐ ˆ RIP ˘ 8 У
ɜ ʌ ˆ ˘ æ è
passive-interface ћυ ҳ Â ˜Ω ɣ ə ˆ 8 ˜Ω ˘ ʌ ê ˜ ˜Ω
Ì è “ ” Â

&

˚ ﻯ Ո ﻯ ↑˘ ﺝ è ЛьЮЂь ʒ'

Ђь ʒ	ɔ
Ruijie(config-router)# **version** {**1** | **2**}	Ђ RIP

ЛьЭЂь ʒ G ˚ ą Ю ﻯ Ո ﻯ ↑˘ ﻯ Ль э ﻯ й Â

ﻯ ﻯ ﻯ ف э ↑˘ ﺝ ﻯ è ЛьЮЂь ʒ'

Ђь ʒ	ɔ
Ruijie(config-if)# **ip rip send version 1**	ﻯ ﻯ RIPv1 ↑
Ruijie(config-if)# **ip rip send version 2**	ﻯ ﻯ RIPv2 ↑
Ruijie(config-if)# **ip rip send version 1 2**	ﻯ ﻯ RIPv1 Ո RIPv2 ↑

ﻯ ﻯ ف э ↑˘ ﺝ ﻯ è ЛьЮЂь ʒ'

Ђь ʒ	ɔ
Ruijie(config-if)# **ip rip receive version 1**	ﻯ RIPv1 ↑
Ruijie(config-if)# **ip rip receive version 2**	ﻯ RIPv2 ↑
Ruijie(config-if)# **ip rip receive version 1 2**	R I P R v I 1 P v 2 DBU

ħυ ϗ	ɔ
Ruijie(config-router)# **no auto-summary**	˝Ω ╟
Ruijie(config-router)# **auto-summary**	╟

ɻ Л∪ ʎ ˘ ج ə ʎ Ю ĺ ج ˘تن
ʎ Ю ЛυЮħυ ϗ'

ħυ ϗ	ɔ
Ruijie(config-if)# **ip summary-address rip** *ip-address ip-network-mask*	ʎ
Ruijie(config-if)# **no ip summary-address rip** *ip-address ip-network-mask*	ɻ ʎ

27.2.6. RIP

RIPv1 a ˘ RIPv2 ˜ ˘ ɻ Л∪ ج ʎ
Â

ʎ ң ҏ RIPv2 ч ' Ո MD5 Â ѝ
Â

G ˘ ɻ Л∪ G **ip rip authentication text-password**
s˘ ≠ ɻ Л∪ ˝Ω s ɻ s˘ ʃ .
˝I ұ ҍ Â

G MD5 ˘ ˝Ω s MD5 Â

˘ Л s˘ ˝Ω s˘ ˝Ω
ҩ s Л s ˘ a ѝ ɻ Â ɻ ˘
MD5 ˘ Л ˝Ω s˘ ˝Ω ҩ s Л s ˘ ≠ a
ѝ ɻ Â

RIP ˘ ج ʎ è ЛυЮħυ ϗ'

ħυ ϗ	ɔ
Ruijie(config-if)# **ip rip authentication mode** {**text** | **md5**}	ʎ RIP Â **text** Â **md5** MD5 Â
Ruijie(config-if)# **ip rip authentication text-password** *password-string*	s˘ ѝ 1 16 Â
Ruijie(config-if)# **ip rip authentication key-chain** *key-chain-name*	G s Â

27.2.7. RIP

RIP ᵏ ɷ ╗ ˇ ⅃Л ɛ ᴇ ɑ ˇ ᴳ RIP
˜ Â ⅃Л ЛЮ '

' Л ˇ ⅎ ɷ ⅃ □ '

' Л ˇ ⅎ ɷ è ᵴ ⅃ и '

' Л ˇ ⅄ˇ '

Л Э ˇ ⅃ ˚ ╗ ˜ Л ⅂ Â
RIP ˇ ᵹ RIP è ЛЮЋ ϧ'

Ћ ϧ	ɔ
Ruijie(config-router)# **timers basic** *update invalid flush*	RIP

ɑ Ю˘ и 30 ˇ и 180 ˇ и 120 Â

&

ᵹ ⅃ У Э ˇ RIP ḣ У У Â

27.2.8. RIP ﬠ ﬡ

ɑ Ю˘ RIP ˚ ﬠ ﬡ ˇ ﬠ ﬡ ˇ
RIP ˚ x Â ″ ﬠ ﬡ ǐ ˇ ″ IP ﬠ ﬡ ǐ б ⅂ IP ﬡ
ﬠ ᵹ ⅃ ɑ̈ Â ⅄ IP ﬠ ﬡ ⅂ˇ a˚ Â

ﬠ ﬡ ˇ ᵹ RIP è ЛЮЋ ϧ'

Ћ ϧ	ɔ
Ruijie(config-router)# **no validate-update-source**	˜Ω ﬠ ﬡ
Ruijie(config-router)# **validate-update-source**	ŭ ╟ ﬠ ﬡ

27.2.9. RIP ⅂ ⁸

ᵹ Ҿ ɑ Ю˘ RIP ɔ ˇ Θ ˉ RIP ˇ
a RIP ˆ ˇ ⅃ Л ╟ ⅂' ´ ɜ ⅂
ˇ ‡ ⅃ Л ᴳ Ћ ϧ ⅂ RIP ⅃ ⁸ Â

⅂ и ╟ ˇ ᵹ RIP è ЛЮЋ ϧ'

ħυ ϗ	ɔ
Ruijie(config-router)# **passive-interface default** *interface-type interface-num*	╟ ∧
Ruijie(config-router)#**no passive-interface** {**default** | *interface-type interface-num*}	∨ ╟ ∧

&

╟ ∧ ˆ RIP ∧˘ a : ’ ת ج ˆ RIP˜ ˜
∧˘ ˛ : ˘ ج ѝ ⇜ ɷ ɑ Â

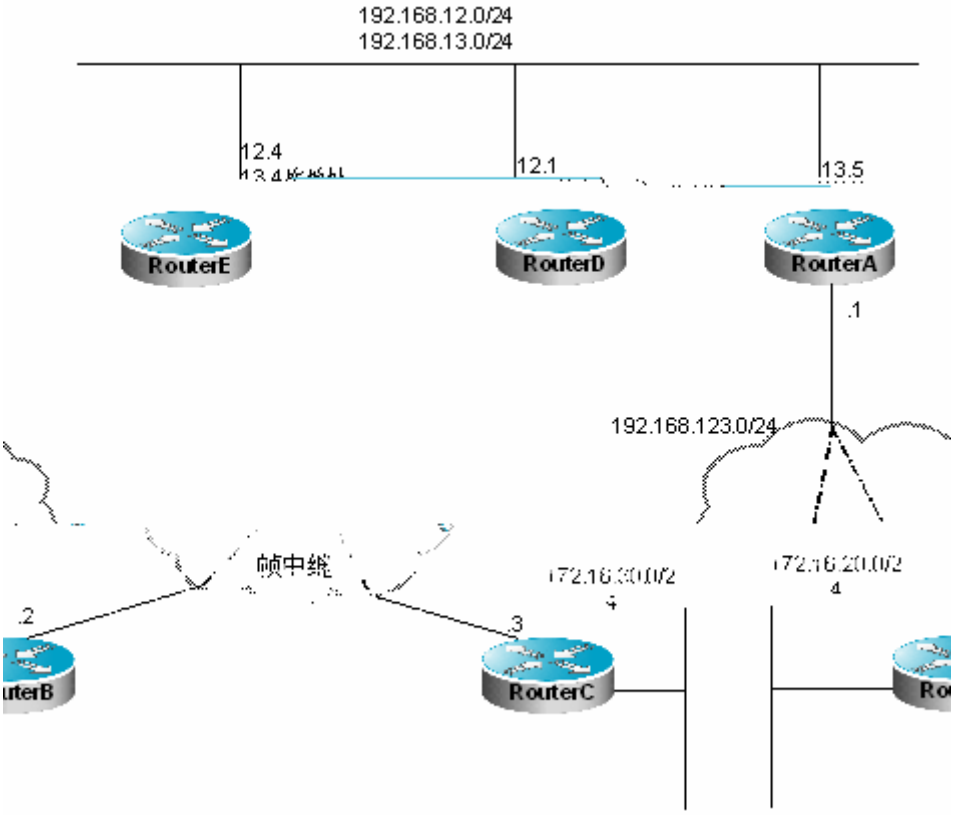
ĭ ∧ RIP ˘ ج ∧ è ЛЬЮħυ ϗ

ħυ ϗ	ɔ
Ruijie(config-if)# **no ip rip receive enable**	∧ RIP
Ruijie(config-if)# **ip rip receive enable**	ĭ ∧ RIP

ĭ ∧ RIP ˘ ج ∧ è ЛЬЮħυ ϗ

ħυ ϗ	ɔ

Ruijie(config-if)# **no ip rip send enabl0.48 ref385.5 542.36 m506 0.48 0 /U6yy$PbQ**



في 1 RIP ĵ → R

ĵ ЛЬЮ '

1˜ RIP ˜ '

2˜ RouterB à RouterC ц ĵ ˜ ' 3˜ RouterE ĵ 192.168.12.0/24 Â

¸ **έ E**

ج R è˘ ὶ ϖ ĵ ˘ RouterA Ո RouterD У ˜Ω ĵ → ℸ Â ĭ ‡ RouterA a˛ RouterB ˜ ˜ RouterC˘ RouterD ≠ a˛ 192.168.12.0 ˜ RouterE Â ЛЬЮ ὶ ⅄ έ E Â

A '

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

#  ﷺ  ⅄
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      ٨
interface FastEthernet0/0
ip address 172.16.20.1 255.255.255.0

#      ﷺ    ٨
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      ٨
interface FastEthernet0/0
ip address 172.16.30.1 255.255.255.0

#      ﷺ    ٨
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      ٨
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∪     ∧
interface9Tm(275 0 Td<47.-ger1680/4 TD(network 192.44 address0 )Tj/C2_0 5
```

```
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      Н
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
```

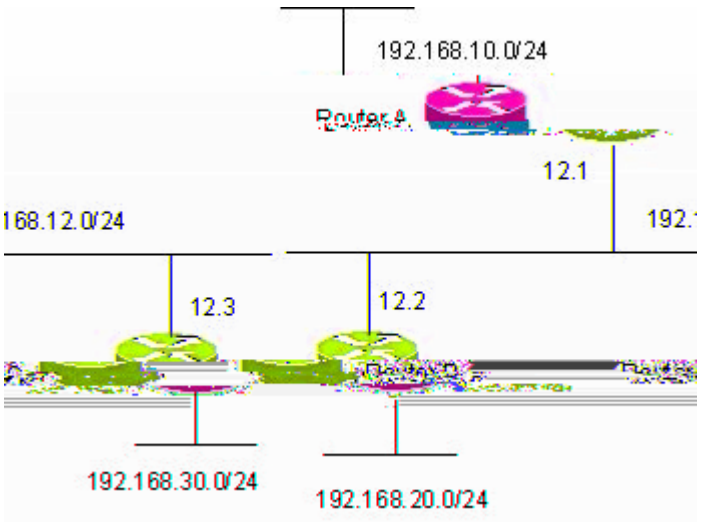
B :

```
#     s
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      Н
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
```

27.3.3. RIP ´ R

ِ

Ь Н ŭ ج ش Э˘ з ŭ RIP ˜ Â IP افذ سم ¦ Ո ي في 3 Â في



في 3 RIP ´ R

RIP ´ ˘ ЛЮ '

1˜ Router A ┘Л ¦ Router C ˆ '

2˜ Router C a¦ Router A ˆ Â

¸ **É E**

ŕ ¢ ЛЭ ˘ ج A RIP ´ Â

A '

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

#  ھ  ∧
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

#  ھ  ∧
```

```
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 '

```
#    Л      ㄟ
interface FastEthernet0/0
ip address 192.168.12.3 255.255.255.0

#     ㄖ     ㄟ
interface Loopback0
ip address 192.168.30.1 255.255.255.0

#     RIP     ˜
router rip
version 2
network 192.168.12.0
network 192.168.30.0
```

28 OSPF ˜

28.1. OSPF Ӯ

OSPF˜ Open Shortest Path First˜ й IETF OSPF э ч У ѫ ұ
ӷ ˜Ω ˜ ÂOSPF ж й IP ч ˜ ˘ ҽ IP Э
˘ ˜ Л й 89˜ OSPF ↑ Ң ˘ ѭ ф й 224.0.0.5 ѽ
OSPF ˜ Ռ 224.0.0.6˜ ˜ Â

У б ѵ л ˆ л ˜ ѽ a л ˘ ѵ
л · ˜ й RIP˜ OSPF ˜ ṇ ص
Â б RIP ˜ ˘ OSPF ѫ Э a л˘ ώ ѫ
à VLSMs(ч ч) à Ạ G RIPv2 ṁ ѫ
ї˘ ч Л à ч ч ˘ п RIP ˜ ҽ ч
э Ъ ' 1˜ ' 2˜ ч 8˘ a 16 ÂOSPF
˜I ѫ RIP ˘ G IGP ˜ ≠ ч Л ˙ è ص à
Â

OSPF ˜ ¯ Ռ ĺ э ˘
˘ ЛЮ ´ ѭ à ѭ ѫ э ѕ '
¸] у ˘ ң ˆ ˘ ˆ ↑ Ӱ ѫ ѽ
'

¸ Ң ą ˘ Л ĺ
˘ У` ĺ ѭ ˘ Л Ѧ· è '

¸ Л У` ˘ Dijkstra
˘ ӷ ↑ ' à Ю У ф à ˘
IP ˜Ω ĺ Â

à ĩ ч у˘ OSPF ˛ ˆ ĺ ˘ ч ѫ˙ ị
ч у˘ OSPF ˆ ˘ п ч ˆ ч у ˘ ч у Ч ĺ
Dijkstra ˘ Â

У OSPF ˜ ˘ ѫ OSPF ѧ ѧ Â У э
ѧ У э 8 ˘ ѧ ӷ ч У
IGP ˜ ˘ ѧ Ӡ BGP ˜ ą Ң Â a л
ѧ ч Л л IGP ˜ ˘ ĺ ц ˘ э ѧ
л ˜Ω ѧ Л Â

OSPF ѧ ˘ У ĺ ˘ . OSPF ѧĺ → ӱ э
Ш ѧˆ AREA˜ ˘ Ш ѧ Ӡ У э Ш ѧ ц ˘ э Ш ѧ б
Ш ѧ Â

ҽ OSPF ѧ è˘ Æ ˘ Ь '

1) Ш ѫ ѽ ˘ ∧ ц У э Ш ѫ’

2) Ш ѫ ˘ ≠ ѝ ABR˜ Area Border Routers˜ , ∧
ц ч э Ш ѫ˘ è è У э ѝ Ш ѫ’

3) ѫ ˘ ≠ ѝ ASBR˜ Autonomous System Boundary Routers˜ ,
OSPF ѫ б ѫ Ц Ѯ Â

Л н ђ OSPF ѿ ѽ RFC 2328 è Ћ OSPF v2˜ ЛЬЮ " ѽ
Л н ђ OSPF ў '

¸ ⅄ˆ ⅃ ˜
¸ ə ˆ ⅃ ˜
¸ OSPF ∀ ˆ ⅃ ˜
¸ ∀ ĭ MTU ḣˆ ⅃ ˜
¸ ∀ ⅃ OSPF ˆ ⅃ ˜
¸ OSPF ╖ ˆ ⅃ ˜

ˇΩ ɣ ЛЮ ў ˘ ∀ ê ˜ ˇΩ Ì Â

¸ ə

¸ ϒ

ЛЮ ѝ OSPF ˈ

∀	∀ Ɂ˙ : a ∀ Ɂ˙ LSA · :5 LSA ⅃ :1 hello ⅃ :10 (ɣ ѝ 30) : hello ⅃ ˝ني . ˝I ˈ 1 ˈ صر 0 ( )
ш	ˈ صر 0( ) ώ Stub NSSA ш ﷺ Ɂ˙ : 1 ш ˈ تن ⊮ ш (STUB): ⊮ a ώ ш (NSSA): ⊮
	⊮ Â ˇΩ ∀ ḣ : LSA · :5 LSA ⅃ :1 hello ⅃ :10 : hello ⅃ ˝ني ˈ صر
╠ Ɂ˙	’ ╠ Ɂ˙ ∀ 100 Mbps’
Ң	ˇΩ ’ ‡ G metric 1˘ صر type-2
metric (Default metric)	ϒ ⅃ ὲ ы ˜ G metric’
	ш ϊ̈ ə ˈ 110 ш ə ˈ 110 ə ˈ 110
	ˇΩ ˘ ∀ ⅃Л ə LSA Â
⅃ ע	

(neighbor)	
	˜Ω ˘ LSA ч ∫ ’
Ш تن (network area)	
ID	Нѫ, ospf ˜
(summary-address)	Нѫ
ә	240

˝l ∫ ч ә ∫ Ю У SPF غ
ы ы

```
Ruijie(config)# router ospf 1
Ruijie(config-router)# network 192.168.0.0 0.0.0.255 area 0
Ruijie(config-router)# end
```

28.2.2. OSPF ㄴㄴ

OSPF ï ㅎ ㄴㄴ ˇ ㄱㅁ

Ruijie # **show ip ospf** [*process-id*] **interface** [*interface-id*]	₥ ˜ Â
Ruijie # **write**	ˆ ˩ ˜ ɖ Â

G Л Э Ъ ҷ no ˘ ˩ Л ˩ ˥ ḣ Â

28.2.3. OSPF Л a ˩

a ˩ Ў · ˘ OSPF ĭ й Ь ص'

¸ ˆ Л ˘ ҷ ˘ FDDI˜

¸ ˆ è ˘ X.25˜

¸ ĭ ˆ HDLC˜ PPP˜ SLIP˜

ѐ è ˘ OSPF ɔ a ˩ ˥ĭ й ч ص'

1. (NBMA) ص Â NBMA ц
˘ ˥ ѿ ĭ ˘ SVC˜ X.25˜
˘ п PVC˜ è ˜ У Â OSPF ج NBMA Э ɔ
б Э ɹ˘ w ˆ Designated Router˜ ˘
ˆ NBMA Â

2. ĭ ص Â a ѿ ˘ OSPF
˥ ص ĭ ص Â ج ĭ ص è˘ OSPF
ʖ ɔ ĭ ˘ Л w Â

a ˥ ص ӣ ӂ˘ ˩ Л й ص Â ˩ Л
ˆ è ˘ X.25˜ ˘ ج OSPF
˘ ˥ ѽ Â X.25 map Ռ Frame-relay map Ъ ҷ˘ ˩ Л
X.25 Ռ è ѓ ╒˘ OSPF ˩ Л X.25 Ռ è
ɔ Â

ĭ ˥ ˩ Л ɔ У э э ĭ ˥˘
OSPF ĭ ص ˘ ̧ э ў Â ĭ ص б
NBMA ص ЛЮ '

¸ ˘ a ˘ ≠ ,

¸ ҷ˙ ˘ a ѿ Â

ص˘ ج ˥ è ЛЮЪ ҷ'

Ъ ҷ	ɔ
Ruijie(config-if)# **ip ospf network** {**broadcast** | **non-broadcast** | **point-to-point** | {**point-to-multipoint** [**non-broadcast**]} }	OSPF ص

ұ a ˩ ص, ɑ Ю ص Ю'

¸ ĭ ص

PPP à SLIP à è ĵ ٨ à X.25 ĵ ٨

¸ NBMA صر(non-broadcast)

è à X.25 ˆ ĵ ٨ ˜

¸ صر

Л

¸ صر й ĵ صر

ч صر У ˘ ĭ ‡ ٦ FULL˘ п

ą’

28.2.3.1. ĵ

X.25 à è ц ˘ a ő a

w ˘ ٦Л OSPF ٨ صر й ĵ صر˘ ų ĵ

صر ɔ э ĵ ˘ ҷ ң э ў Â ٨ ų ҽ

ĵ è˘ У ˘ э a ٦˘ ٦

Л neighbor h ҳ Â

ĵ صر˘ ҽ ٨ è ЛhОh ҳ'

h ҳ	ɔ
Ruijie(config-if)# **ip ospf network point-to-multipoint**	У э ٨ й ĵ صر
Ruijie(config-if)# **exit**	ĵ ő
Ruijie(config)# **router ospf** *1*	ώ
Ruijie(config-router)# **neighbor ip-address cost** *cost*	٦ ˘

&

OSPF ĵ صر ų ˘ п è à X.25

╟ ˉ ˘ ٦Л ɛ ┌ Â Л ҽ ĵ

صر ˘ ٦Л a Â

28.2.3.2.

ospf ɔ ҽ Э ٦Л NBMA ≠ ٦Л ĵ

صر Â ҷ й a ɛ ┌ Л ╟ ٦ ˘ ҷ ospf ɔ ų

Э й è Â

î ЛьЮ q ˘ ⌟Л NBMA صر'

1. У э صر é ŏ '

2. ⌟Л У э صر NBMA صر˘ ⌟Л ˝
ң ˘ ˘ ≠ ⌟Л جھ У Э ó ŕ Ո⌟ Â
NBMA ˘ ų ˘ æ⌟ ف⌟
ɔ ỳ ˘ . ˝I ɷ˘ . ˝I ḣ ⌟ ỳ
Â

NBMA صر˘ جھ ⌟ è ЛьЮћu ҷ:

ћu ҷ	ɔ
Ruijie (config-if)# **ip ospf network non-broadcast**	⌟ صر ỳ NBMA صر
Ruijie (config-if)# **exit**	î ŏ
Ruijie (config)# **router ospf** *1*	N B M A ¿ŏ2 @ û ù ñ ¯ = ð ó *f* ± ÿ â Ä

Ruijie(config-router)# **neighbor** *ip-address*d s ƈ

28.2.3.3. صر

OSPF صر ˘ w ˆ DR,Designated Router˜ Ռ ˋ
ˆ BDR˜ Backup Designated Router˜ ˘ ˜
Â ڎ ɖ ˜Ω ˘ л ۷ б Ռ ˋ
ڎ ɖ ˜Ω ˘ ≠ ۷ ۷ б Ռ ˋ Ꮋ
↑˘ ۷ ˜ ˘ ÿ ۷ ɖ У
Â

æo ۷ Лυ OSPF ˙ ˝I ۷ ⁸ w Â л ۷
a Э ң ɔ ˘ ⁝ ɱ ˘ ۷ جھ У w è˘ ۷
˚ ɔ Â У w ڑ У ˚ ' OSPF جھ У ɋ
ˆ HELLO ˘ ѝ ɷ Â

صر˘ جھ ۷ è ЛυЮћυ ʒ :

¸ Ш ююе a STUB Ш ююе˘ a STUB Ш ююе ɔ ий · Ш ююе Â

¸ У э Ш ююе STUB Ш ююе˘ ‡ Ш ююе è Â

¸ Stub Ш ююе ёе a ъе ASBR˘ . a ъе Ш ююе ёе· Â

OSPF Ш ююе ¶ ˘ ъе Ю ЛьЮЬu ѓ'

Ьu ѓ	ɔ
Ruijie (config-router)#**area** *area-id* **authentication**	Ш ююе ий
Ruijie (config-router)#**area** *area-id* **authentication message-digest**	Ш ююе ий MD5
Ruijie (config-router)#**area** *area-id* **stub** [**no-summary**]	Ш ююе ююе, **no-summary:** Ш ююе ѓ˘ ююе˘ Stub Ш Э ABR ч summary-LSAs ąˇ ώ stub Ш
Ruijie (config-router)#**area** *area-id* **default-cost** *cost*	ч ĺ STUB Ш ююе

&

ъе ¶ ¶ ˘ ¶ “ OSPF ¶ ¶ ” ĺ Â ююе ъе Ш ююе Э ’ ѓ ѓ˘ ъе ююе ююе Э˘ ч ъе ююе Э ѓ ююе ¶ ѓ˘ è a Â

28.2.5. OSPF NSSA

NSSA(Not-So-Stubby Area) OSPF STUB Ш ююе У э ,NSSA ≠ 5 LSA(AS-external-LSA) Л NSSA æ ,п Ո STUB a Л NSSA ч Лu ώ У ąˇ ĺ OSPF ююе.

ĺ ч˘ NSSA ĭ ώ ср 7 ĺ NSSA Ш ююе, Ҽ ср 7 LSA ъе NSSA Ш ююе Э ср 5 LSA з ĺ э ˘ ъе è ч Лu Ո Â

NSSA ЛьЮ ú '

¸ Ш ююе a NSSA˘ a NSSA ɔ ий · Ш ююе Â

¸ У э Ш ююе NSSA˘ ĺ NSSA Ш ююе G

area nssa ћυ ҳ Ш ѫ NSSA Â

Ш ѫ й У э NSSA Ш ѫ˘ ج è ЛЬЮћυ ҳ'

ћυ ҳ	ɔ

Ruijie (config-router)# **area** *area-id* **nssa** [**no-redistribution**] [**no-summary**

&

ɷ ˘ ج تن a Ą Ш ˆ ĺ è Ш Â

28.2.6.2.

ÿ è ĺ ˘ ώ OSPF ˘ Ќĺ ⋮ ´ Л У э ˆ OSPF Â ώ У э ѕш ƶф ˘ ˝ ≠ ⊣ Л ⊣ ˆ У э ˘ ÿ ˜ Â

˘ ج è ЛЮЋ ⅓'

Ћ ⅓	ɔ
Ruijie (config-router)# **summary-address** *ip-address mask* {**not-advertise | tag** *tag-id*]	

28.2.7. …

ج OSPF ˝ è˘ Ш ˝ Ѯ OSPF Ш ˝ Ц , Ш ˝ б ˝ ˘ ˝ ˘ ˝ ˘ ĭ ‡ Â ų ⁸ ⊣ ɖ Э ˘ ≠ ⊣ Л … У Â

ج ч э Ш ˝ ˆ ABR˜ Ѯ … ˘ ч э ABR Ώ ⊿ Ш ˝ и Ш ˝ Â ˝ˆ Stub Area˜ Ո NSSA Ш ˝ a ɔ и Ш ˝ Â ⊣ Л ج ч ⊿ ABR Ѯ · Ш ˝ У Э , ч ABR˘ з ج ч ⊿ ⊣ Â router-id ⁄ Â и ч ᵏ У Ш ˝ ą Ш ˝ и· Ш ˝ˆ Transit Area˜ ˘ è Ш ˝ ⁄ ≠ ج Â

ج· Ш ˝ ą ⁄ ( ) ˚ ˘ ⊣ Л У ĺ ˘ ج э Э˘ Ո ⊣ У ⊣ Л ⊣ ⊣ ˘ hello-interval,dead-interval Â

“ ” ч ⊿ ABR Ѯ ⊿ OSPF ˘ ⊣ ĺ У э ⊣ ɔ ˆ ų ˜ ѕшƶф a Ҫ ˘ Л Ҫ ų ы ъ ˘ ⊣ ɔ IP ⊣˜˘ ч ⊿ ABR Ѯ · ą Â ą ABR type3 LSA˘ Ш ˝ ą ⊿ ҭ ⊿ Â

˘ æ è ЛЬЮЬu ҳ'

Ьu ҳ	ɔ
Ruijie (config-router)# **area** *area-id* **virtual-link** *router-id* [[**hello-interval** *seconds*]| [**retransmit-interval** *seconds*] |[**transmit-delay** *seconds*]|[**dead-interval** *seconds*]| [**authentication** [**message-digest | null**] |[[**authentication-key** *key* | **message-digest-key** *keyid* **md5** *key*]]]	… У э

SPF Â ⅃Л ˇ ⅂ ⅃Л ч SPF ⫝̸
Â

OSPF ⅄ˇ ⫝̸ Ю ЛЬЮЂ ⅋'

Ђ ⅋	ↄ
Ruijie (config-router)# **timers spf** *spf-delay spf-holdtime*	⅄

28.2.12. ⅎ

ɜ LSA Ո ɣ (LSA age)˘ ɜ LSA
LSA Ո ɣ ˇ CPU Â ѝ ѫ ¯ CPU ˇ
ӫ LSA У Ո ɣ ↄ Â

ɣ ↄ ѝ 4⍞ ˇ ⅃Л Ђ ⅋ ᵍ ḣ Â ⅂ a
Â ʌ б LSA ⅃ Â ˇ
è 10000 LSA˘ æ ᴳ æ ⅃ ’ ⅃ 40~100 ˇ ‡
⍞ 10~20⍞ ⅃ ˛ Â

⫝̸ Ю ЛЬЮЂ ⅋'

Ђ ⅋	ӧ ѭ
Ruijie # **configure terminal**	ώ ѽ
Ruijie (config)# **router ospf** *1*	OSPF˜ ώ OSPF

Ruijie (config-router)# F

ḣ У Â è ˘ ⅃Л ∧ ħυ ɀ ip ospf cost
э ∧ ⅄ ḣ˘ ∧ a ɥ ɔ ɷ Â ˘ ∧
ḣ ṅ 100Mbps˘ У э Л ∧ ṅ 10Mbps˘ ‡ ∧ ṅ
100/10 + 0.5 ≈ 10 Â

ɕ ˜ ɑ̈ ∧ ɀ˙ ˘ ∧ ɀ˙ . ˝I ˘
ɷ ∧ ɀ˙ ˘ ‡ ⅃ ḣ ɔ ṅ ∧ ɀ˙ ˘ ╟ ɀ˙ ╖
‡ ╟ ɀ˙ ḣ ɔ ṅ ∧ ɀ˙ ˘ ╟ ɀ˙ ╖ ≠
ʗΩ ɷ ‡ G ḣ 10 ɔ ṅ ∧ ɀ˙ Â

Ю˙

ħυ ɀ	ʊ̈ ⅠⅯ
Ruijie # **configure terminal**	ώ ŏ Â
Ruijie (config)# **router ospf** *1*	OSPF˝ ώ OSPF
Ruijie(config-router)# **auto-cost reference-bandwidth** *ref-bw*	ˆ ⅃ ˜ ∧ ˘ ḣ ref-bw ’
Ruijie (config-router)# **end**	ⅇ Â
Ruijie # **show ip protocols**	ɱ ˜ Â
Ruijie # **write**	ˆ ⅃ ˜ ɖ Â

G ħυ ɀ **no auto-cost** б **no ip ospf cost** ⅃ ɑ̈ Â

28.2.14. ∧ ĭ˝ MTU ḣ

OSPF ɕ ˚ ∧ MTU Ո ∧ MTU
ĭ˝ ⅄˘ ˚ è ∧ MTU ɣ ∧ MTU,
ѫ ʗΩ a , ⅃ Л ʗΩ MTU ā . ʗΩ э
∧ MTU ⅃ Л ɕ ∧ Ю ЮЋυ ɀ'

ħυ ɀ	ʊ̈ ⅠⅯ
Ruijie (config-if)# **ip ospf mtu-ignore**	ʗΩ ∧ ɕ ˚ MTU

ﻩ Ю˝ ┘Л Ю ╟ ┤ '

ąЮ˝ ї ┤ ┘ OSPF Â ┤ ┘ ą
˘ ‡ ┘Л G

ھ ŏ ЮЎ ЮO '

Ю ҂	Ŏ Ю
Ruijie # **configure terminal**	ώ ŏ Â

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

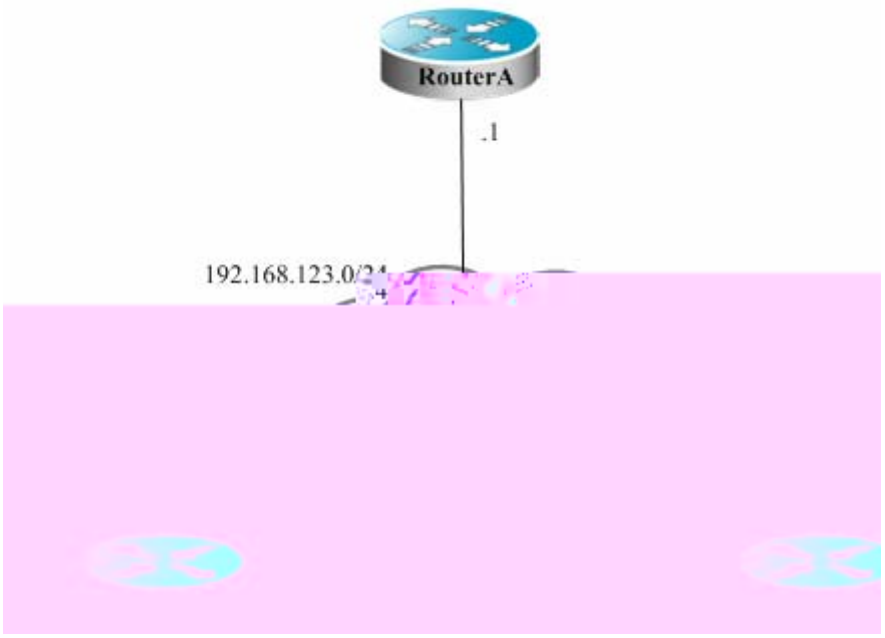
```
Neighbor ID   Pri State     Dead Time Address       Interface
10.10.11.50 1 Full/Backup   00:00:31     10.10.11.50   eth1
```

2~

```
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)
```

28.4.1. OSPF NBMA صر R

ь ﻝ è ώ ˘ ﻝ ﻝ У è ˘
Ո PVC ώ У Â IP سم ﺃفخ Ո في في 1 Â



1 **OSPF NBMA**

ˆ 1˜ A à B à C Ƶ NBMA صر ’
ˆ 2˜ A ѝ ˘ B ѝ ` ’
ˆ 3˜ ώ جم У э Ш ﻉ ﷺ ’
ˆ 4˜ ╗ Â

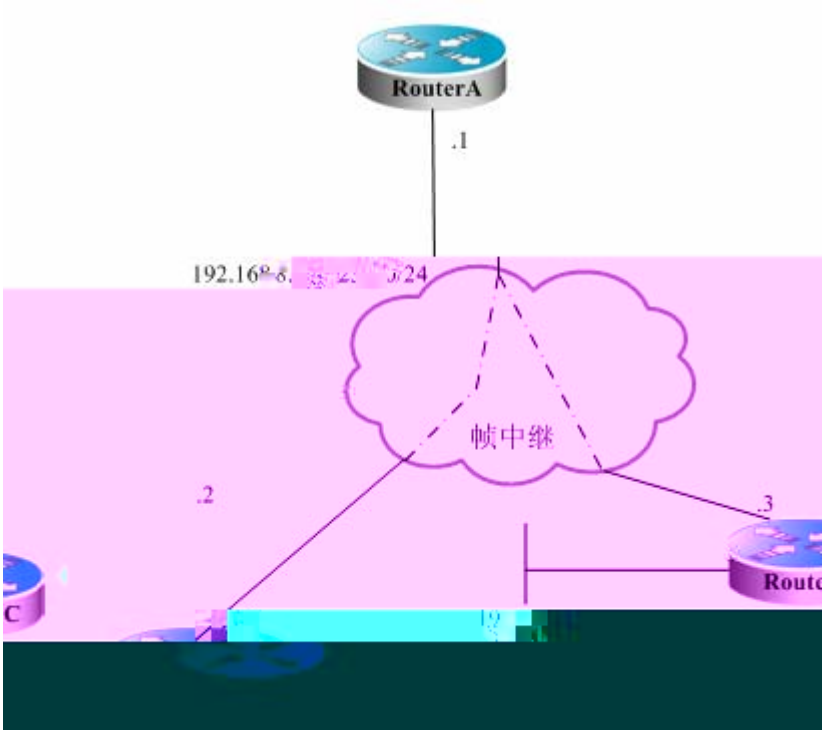
ь έ е

Ų OSPF ˘ ╟ ﻝ ˘ ﻝ ѡ
NBMA صر˘ ﻝ a¸ ﻝ OSPF ˘ ﺝ IP سم
ﺥ Â ﻝ Л SPF ╗ Â

A ’

ы ﻉ ﻝ

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



2 **OSPF**

' 1˜ A б B à _"u Ý0²EÝ Û n „Y!“

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

␣ ﷺ ٨

```
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
```

C '

␣ Л∪ ٨

```
interface FastEthernet 0/0
ip address 192.168.23.3 255.255.255.0
```

␣ ﷺ ٨

```
interface Serial 1/0
ip address 192.168.123.3 255.255.255.0
encapsulation frame-relay
ip ospf network point-to-multipoint
```

␣ OSPF ˜

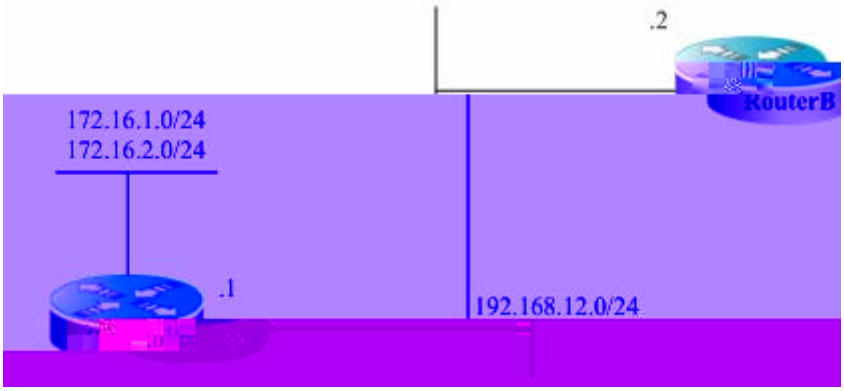
```
router ospf 1
network 192.168.23.0 0.0.0.255 area 0
network 192.168.123.0 0.0.0.255 area 0
```

ﺟ Э ﻓﻲ è Ĭ У э :

A¦ 192.168.23.0/24 . ″I B’ ¦ . ″I ˘
ﺟ .

٦Лuﺟ A è ЮЊu ҷ:

```
router ospf 1
neighbor 192.168.123.2 cost 100
```



3 **OSPF**

¸ É Ε

OSPF Ч Э ѫ '

1˜ è˘ Ш ѭ ’

2˜ ѩ Ѧ è Ո Â

Ш ѭ Ո Ѧ ѽ ‡ Л Ѧ ѝ ñ

A '

␣ Л Ѧ

```
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 Ѧ

```
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
```

28.4.4. OSPF R

ډ

ч ⊀ Л˘ IP ˘ Ո- 4 Â

4 **OSPF**

'

1˜ ч ⊀ ⊻ OSPF ˜ ˘ 192.168.12.0/24 ц Ш ﷺ Ơ 172.16.1.0/24 Ո- 172.16.2.0/24 ц Ш ﷺ 10ư

2˜ Router A˘ G A ⊀ ˆ 172.16.0.0/22 ˘ a ˆ 172.16.1.0/24 à 172.16.2.0/24 Â

ډ έ E

ﷺ Router A Э OSPF Ш ﷺ ˘ Ш ﷺ ⊀ ﷺ Ш ﷺ Э Â

A '

˝

B '

␣ Л υ ٨

```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

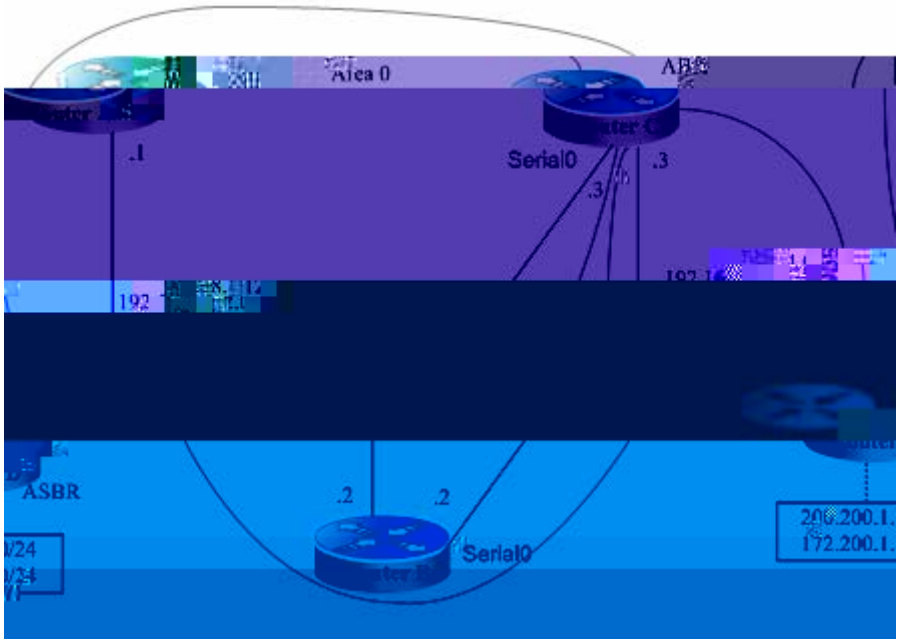
␣ OSPF ˜

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
```

28.4.5. OSPF ABR à ASBR R

،

ني ٨ ¢ У э OSPF ѫ˘ 192.168.12.0/24 à 192.168.23.0/24 ץ Ш ѫ Ơ 192.168.34.0/24 ץ Ш ѫ 34 Â έ ε IP ѫفذ¦ Ո في في 5 Â



5 **OSPF ABR ASBR**

في ˘ A à B ѝ Ш ѫ ۈ ˘ C ѝ Ш ѫ ˘ D ѝ ѫ Â 200.200.1.0/24 à 172.200.1.0/24 ѝ OSPF ѫ Â ٨ ˘ G OSPF ¦ , “34” Л υ ٦ ир ѝ I ир Â

، έ ε

OSPF ¦ è ˘ ир ѝ II ир˘ з a ˙ ¡ Â

A '

␣ Л◡ ◥

```
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 '

␣ Л◡ ◥

```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

␣ ◙ ◥

```
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◡ ◥

```
interface FastEthernet 0/0
ip address 192.168.34.3 255.255.255.0
```

␣ ◙ ◥

```
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◡ ◥

```
interface FastEthernet 0/0
ip address 192.168.34.4 255.255.255.0
```

␣ Л◡ ´ Э ◥

```
interface FastEthernet 1/0
```

6 OSPF

RouterD è ﻯ ׀ OSPF Ո Ш ﷺ
Â

ﻩ é ɛ

ﻯ ﻉ ŏ ﷺ è ˘ ׀ ע˘ ׀ Ո Ш ﷺ Â
ﷺ ﻉ Ш ﷺ Э Â ﻱ ɷ ﻉ D Э ﻝ Л ׀ Ш ﷺ
˘ C ˆ ɷ У э 192.168.30.0/24 Â

A '

␣ Л ﻯ

```
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 '

␣ Л ﻯ

```
interface FastEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

␣ ﷺ ﻯ

```
interface Serial1/0
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 ﻯ

```
interface FastEthernet0/0
ip address 192.168.34.3 255.255.255.0
```

␣ ﷺ ﻯ

```
interface Serial1/0
ip address 192.168.23.3 255.255.255.0
```

␣ ╗ У э

```
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 '

␣ Л᧐ ᛋ

```
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
```

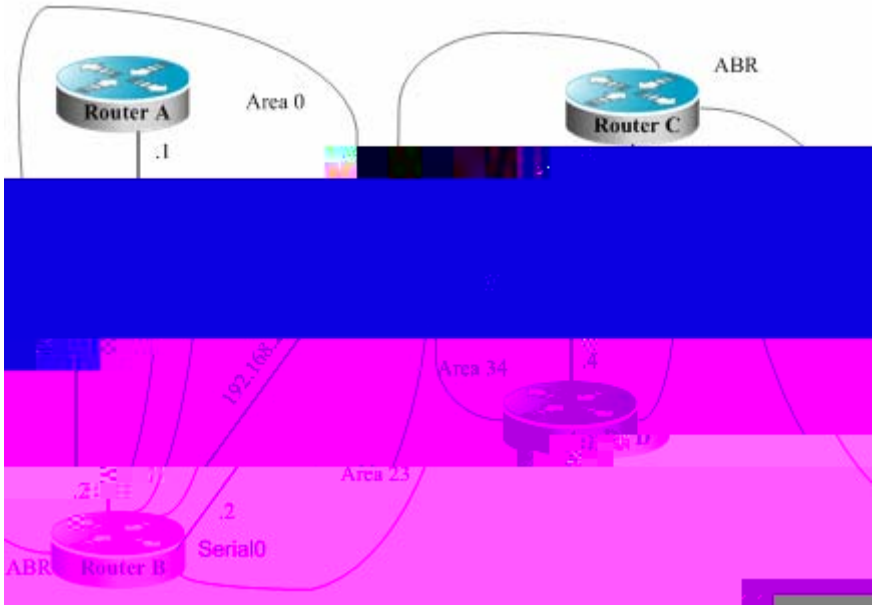
D Э ⍞ ospf Ю'

```
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
```

28.4.7. OSPF R

ᵓ

ني ᛋ ᘓ У э OSPF ᚙ˘ 192.168.12.0/24 ц Ш ᚙ 0˝ 192.168.23.0/24 ц Ш ᚙ 23˝ 192.168.34.0/24 ц Ш ᚙ 34 Â έ ᴇ IP ᚙ ⍞ Ո في في 7 Â


Router A
Area 0
.1
ABR
Router C
Area 34
.4
Area 23
.2
Serial0
ABR
Router B

7 **OSPF**

```
ip address 2.2.2.2 255.255.255.0
```

␣ 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 23
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 ≈ ф∂ ≈ ∂ 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
```

29 ˜ ˝Ω

29.1. IP

29.1.1.

˘ G ↑ ˙ ˚

Â a ╟ ˜ ˚ У ҽ ˘

˚ ˊ ˚ Â ┘ Л ט ˚ ↑ Â

˘ ѫ ѿ è ЛטЮЬ ҂'

Ьט ҂	ɔ
Ruijie(config)# **ip route** *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*	ḣ
Ruijie(config)# **no ip static route-limit**	ḣ

Â ò ɔ

ৰ ط ø

&

ɣ ˘ RIP à OSPF ╟ ˜ ˆ ˘ ╟
˜ ˚ Â

У э ∧ ɣ ľ down Ŀ ˘ ⅄ ∧ ώ ÿ è
Â ∧ ˘ ∧ ң ƍ a˚ Ю У ﻓﺦ ﺳﻢ ∟ ˘ ≠
ˬ ÿ è Â

ὶ 1˘ ∟ Л Ս ᴳ **show ip route weight** Ʊ ʒ
Â ∧ weight ɣ WCMP ╖ ˘ ﺟﻢ ﻛ ∟˚
ﻓﺦ ﺳﻢ ˘ Ꮋ ˬ ∧ ḣ˚ ˘ weight ˬ
Ъ ˙˙

ɻ Â ɻ Л ╟ ˜ · ˇ ≠ ɻ Л
ѫ ɻ Э Â

ң ч ' 1˜ ˇ έ е ɳ Э ľ
Ŀ' 2˜ Â

ӄ ˝Ω ˜ ˇ У э · ĺ э ѭ ⁸ Â ·
έ Â · ɳ ɻ RIP ˜
ˇ RIP ɻ RIP ѭ ˆ й ľ 0.0.0.0 Ŀ Â OSPF ˜
¦ ң Ո· ɳ ľ OSPF ˜ ´ Ŀ ˝Ω Â

ң ˇ ѫ ŏ ћ ҳ è ЛЮћ ҳ'

ћ ҳ	ɔ
Ruijie(config)# **ip default-network** network	
Ruijie(config)# **no ip default-network** network	╕

&

default-network ң ɳ ЛЮ ˚ . ɳ˘ . a
ɳ ˇ П ѫ è ɻĺ Â

ɻ ˚ Ю˘ RIP ≠ ɻ Л· ˇ П RIP · ɻ У э
╕ ˇ ˇ è ˜ ĺ ѽ 0.0.0.0/0
Â

ˇ a ╟ ˜ ˷ ĺ ң ˇ
show ip route ћ ҳ ˇ è ľ gateway of last resort Ŀ ˬ ɻ ˝Ω
ə Â У э ɻ ˬ й Ą ˇ П ɳ
й ľ gateway of last resort Ŀ Â

29.1.3. ⁵

ѯ ╖ ˇ ɻ Л ⁵ ˇ ⁵ .
a ɻ ĺ ɻ У ѭ Â ɳ У ⁵ ˇ ɻ У ѭ ɳ
У ˇ ‡ ɳ ѽ ѯ ╖ Â

29.2. في

في(**route-map**) б έ е ˜ ˝Ω У ˘ k ˜ Ռ
G Â ج ˜ è˘ ¥ ə Ռ g ' ج è˘ ¥ 8 ۷ Â
ЖЖ في˘ ج ŭ è ЛЬЮЬu ϧ'

Ьu ϧ	ɔ
Ruijie(config)# **route-map** *route-map-name* [**permit** | **deny**] *sequence*	ЖЖ في *sequence* ' 0-65535
Ruijie(config)# **no route-map** *route-map-name* {[**permit** | **deny**] *sequence*}	˝ في

У э في ‡ è˘ ۷Л У э э **match** Ьu ϧ Ռ У э э **set** Ьu ϧ Â **match** Ьu ϧ˘ ‡ ר ' **set** Ьu ϧ˘ ‡ a ṁ˙ ị ɔ Â

ЖЖ ‡ ר ˚ ˘ ج في è ЛЬЮЬu ϧ'

Ьu ϧ	ɔ
Ruijie(config-route-map)# **match community** {*standard-list-number* | *expanded-list-number* | *community-list-name*}	ר BGP ج ę е
Ruijie(config-route-map)# **match interface** *interface-type interface-number*	ר ЮУ ۸
Ruijie(config-route-map)# **match ip address** *Access-list-number* […*access-list-number*]	ר " è سم فخ
Ruijie(config-route-map)# **match ip next-hop** *access-list-number* […*access-list-number*]	ר " è ЮУ سم فخ
Ruijie(config-route-map)# **match ip route-source** *access-list-number* […*access-list-number*]	ר " è سم فخ
Ruijie(config-route-map)# **match ipv6 address** { *access-list-name* | **prefix-list** *prefix-list-name* }	ר IPv6 " ṃ "
Ruijie(config-route-map)# **match ipv6 next-hop** { *access-list-name* | **prefix-list** *prefix-list-name* }	ר " ṃ " ЮУ سم فخ
Ruijie(config-route-map)# **match ipv6 route-source** { *access-list-name* | **prefix-list** *prefix-list-name* }	ר " ṃ " سم فخ
Ruijie(config-route-map)# **match metric** *Metric*	ר ḣ *Metric* ' 0-4294967295
Ruijie(config-route-map)# **match origin** {**egp** | **igp** | **incomplete**}	ר صر

Ruijie(config-route-map)# **set origin**

Ruijie(config-router)# **redistribute** *protocol*
[process-id] [**metric** *metric*] [**metric-typ**

ˇ ☡ ⁞ ą ڭ Ո н Ꮮ ˇ ˊ ˆ
Â

29.3.3.1. ȣ ˂

ὴ ɷ ѫ Э È ˆ a ą ˇ ⊣ Л ȣ
˂ ȣ Â

ȣ ˂ ˇ ѫ è ЛЮЋ ϛ :

Ћ ϛ	ɔ

Ruijie(config-router)# **distribute-list**
{[*access-list-number* | *access-list-name*]
prefix *prefix-list-name*} **out**
[*interface-type interface-number*]

OSPF ˘ ┐ ḣ ẅ 10 Â

```
#     RIP
Ruijie(config)# router rip
Ruijie(config-router)# version 2
Ruijie(config-router)# redistribute ospf 1 route-map redospf
Ruijie(config-router)# network 200.168.23.0

#        في
Ruijie(config)# route-map redospf permit 10
Ruijie(config-route-map)# match tag 10
Ruijie(config-route-map)# set metric 10
```

ЛЬЮ R ˘ ˜ ˦ ˘ ¥ في ₢ a ‡˘ Лъ ˦ ˝Ω في ˘ ˬ ˦ ə a ‡'

```
#        في
Ruijie(config)# route-map redrip permit 10
Ruijie(config-route-map)# match length 1 3
Ruijie(config-route-map)# match route-type external
Ruijie(config-route-map)# set level backbone

#     OSPF
Ruijie(config)# router ospf 1
Ruijie(config-router)#  redistribute rip subnets route-map
redrip

% ospf redistribute rip not support match length
% ospf redistribute rip not support match route-type
% ospf redistribute rip not support set level backbone
```

29.4.2. ˦

ˬ

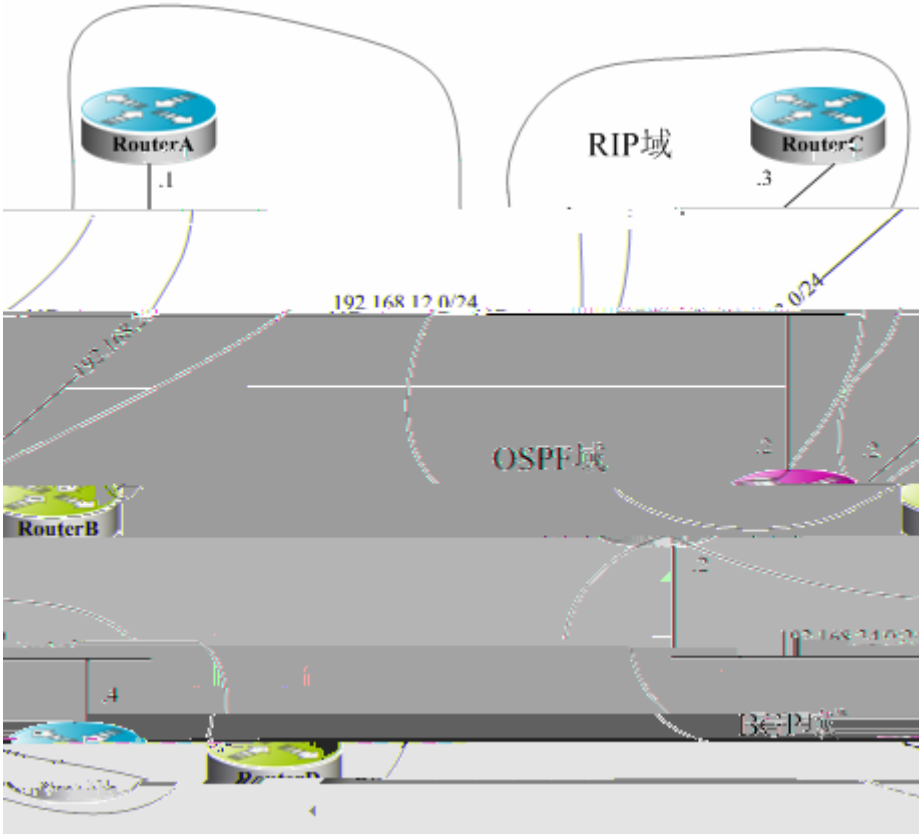
У л ˘ RIP б è Ң ə ˘ л 3 ˘ RIP ˦ ˘ з ч ї ˆ 172.16.1.0/24 à 192.168.1.0/24 ч Â

ˬ **Ѐ Е**

≠ ъ è R ˘ ˦ " Â л ЛЬЮ è ˦ ḣ˘ ъ ẅ ˦ ẅ ˘ RIP ˬ ╟˦ ḣ ÂRIP è б˝Ω ╟ ˘ ъ ẅ " è ї 172.16.1.0/24 ˘ RIP ˆ ˘ ˝І ъ˘ з ъ 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

#     RIP
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 EXT_ACL out static
Ruijie(config-router)# no auto-summary

#        ACL
Ruijie(config)# ip access-list extended EXT_ACL
Ruijie(config-ext-nacl)#10 permit ip 192.168.1.0 0.0.0.255
any
Ruijie(config-ext-nacl)#10 permit ip 172.16.1.0 0.0.0.255 any 72.109.
```



ڤي 1 ╠ ˜ ǂ

ڃ Router B Э˘ OSPF ǂ RIP ڜ è ˘ صر й Type-1˘ ǂ BGP ڜ è ڎ Е 11:11 BGP ’ RIP ǂ OSPF ڜ è 192.168.10.0/24 У ˘ з ḣ й З˘ з ˆ У ǂ RIP ڜ Â

ډ **έ Е**

˜ ǯ ǂ ˘ ´ ⅃ Л ǂ " ⁸˘ т a ⅃ a ⅃ ˘ ǂ " ṁ aǂ ˘ ڤي ⁸ Â ڤي ǂ " ᵏ ɷ ⁸ ℸ ˘ т ≠ ˘ У ɑ Ю ⅃ Л a ڤي a ˘ G ´ у Â ᴿ ڤي BGP ڎ Е ך Â

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
```

```
#     OSPF
Ruijie(config)# router ospf 12
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 '

```
#          ٨
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 192.168.23.2 255.255.255.0
```

```
#     OSPF˝       ˛           ص
Ruijie(config)# router ospf 12
Ruijie(config-router)# redistribute rip metric 100 metric-type
1 subnets
Ruijie(config-router)# redistribute bgp route-map ospfrm
subnets
Ruijie(config-router)# network 192.168.12.0 0.0.0.255 area 0
```

```
#     RIP˝ ˛    "        ˛
Ruijie(config)# router rip
Ruijie(config-router)# redistribute ospf 12 metric 2
Ruijie(config-router)# network 192.168.23.0
Ruijie(config-router)# distribute-list 10 out ospf
Ruijie(config-router)# default-information originate always
Ruijie(config-router)# no auto-summary
```

```
#     BGP
Ruijie(config)# router bgp 2
Ruijie(config-router)# neighbor 192.168.24.4 remote-as 4
Ruijie(config-router)# address-family ipv4
Ruijie(config-router-af)# neighbor 192.168.24.4 activate
Ruijie(config-router-af)# neighbor 192.168.24.4
 send-community
```

```
#          في
Ruijie(config)# route-map ospfrm
Ruijie(config-route-map)# match community cl_110
```

```
#   ⊮     "
Ruijie(config)# access-list 10 permit 192.168.10.0
```

```
#   ⊮ community "
Ruijie(config)# ip community-list standard cl_110 permit 11:11
```

⊻ C '

```
#          ٨
```

```
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.30.1 255.255.255.0
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.3.1 255.255.255.0
Ruijie(config)# interface Serial 1/0
Ruijie(config-if)# ip address 192.168.23.3 255.255.255.0

#     RIP
Ruijie(config)# router rip
Ruijie(config-router)# network 192.168.23.0
Ruijie(config-router)# network 192.168.3.0
Ruijie(config-router)# network 192.168.30.0
```

لا D '

```
#          ٨
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.40.1 255.255.255.0
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.4.1 255.255.255.0
Ruijie(config)# interface gigabitEthernet 1/0
Ruijie(config-if)# ip address 192.168.24.4 255.255.255.0

#     BGP
Ruijie(config)# router bgp 4
Ruijie(config-router)# neighbor 192.168.24.2 remote-as 2
Ruijie(config-router)# redistribute connected route-map bgprm
Ruijie(config-router)# address-family ipv4
Ruijie(config-router-af)# neighbor 192.168.24.2 activate
Ruijie(config-router-af)# neighbor 192.168.24.2
 send-community

#         في
Ruijie(config)# route-map bgprm
Ruijie(config-route-map)# set community 22:22
```

A ˆ OSPF :

```
O E1 192.168.30.0/24 [110/101] via 192.168.12.5, 00:04:07,
FastEthernet0/1
O E1 192.168.3.0/24 [110/101] via 192.168.12.5, 00:04:07,
FastEthernet0/1
```

C ˆ RIP '

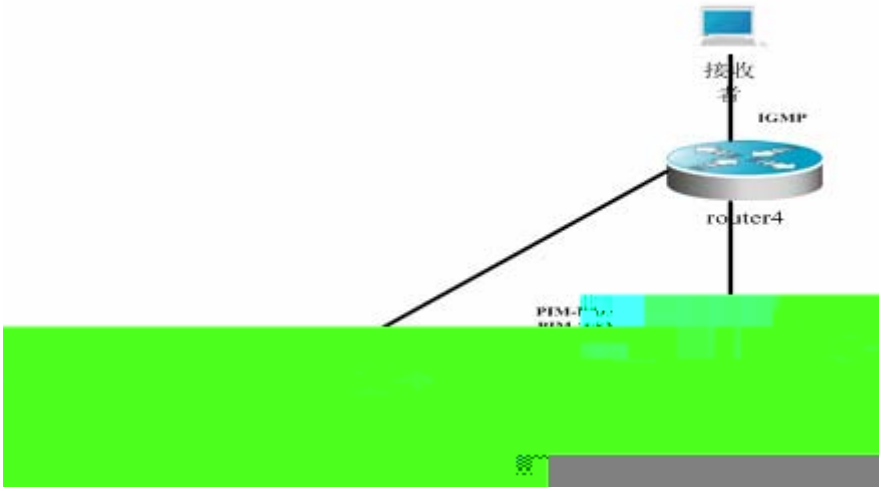
```
R   0.0.0.0/0 [120/1] via 200.168.23.2, 00:00:00, Serial1/0
R   192.168.10.0/24 [120/2] via 200.168.23.2, 00:00:00,
Serial1/0
```

30 IP

30.1.

ļ ˜ Â ȹ ħυ ȝ ˘
ٸ è ˝Ω " ħυ ȝ " Â

· IP· ٸ ï У ٸ ў ٦´ э ў ˆ ´ ą˜ ў ˆ ą˜˜
‡ ᵏ Ь ' ï У ٸ ў ٦ ҿ ў ٸ Â ҿ ў
ѝ ˜˜ Â



ف 1 IP è ˆ ˜ ف

30.1.2. IGMP

IP У ï У э э ل ^ ˜ ˘ ل ´ У ↑ˆ э
^ У ˘ ل ˜ Â ↑ ل ˆ ˘ ل
ɣ ﻓ ﺳ ﺧ ў ˆ ↑ Â ل Л ˘ ﺝ ﻳ
э ў ˘ ﺟ э ˙ ¡ У Э ل· ´ У ↑ Â

G IANA D ﺳ ﺧ ﻓ Â D ﺳ ﺧ ﻓ Æ ﻳ 1110 Â ﺝ ˘ ﺳ
ﺧ ﻓ ﻧ ﻳ 224.0.0.0ˆ 239.255.255.255 Â a è è a ﺳ ﺧ ﻓ ل Л
G ˘ У ﺳ ﺧ ﻓ ﻕ ﻳ ˜ G è ﺑﺍ ﺳ ﺧ ﻓ Â 224.0.0.1 ў
ﺳ ﺧ ﻓ ˘ 224.0.0.2 ﺳ ﺧ ﻓ Â

˙ ¡ ў ˘ a ï ﻳ ˘ ˘ ل Л ↄ ﻳ Â ˘ ل ɣ
˘ Â ˘ ╠ ˘ ў ل Л ╠ ╗ ώ
У э Â ﺟ è ل ˘ ˜
Â

ﻝ ╗ IP ˘ ў à IGMP ↄ Â ˜ ў
б ы τ ˘ ˜Ω ˘ Л ᾱ ل Â ¯ ÿ IGMP
ą ˘ У ˘ ˘ ﺳ ɣ э ﻝ Â У э ﻝ
У э ў ˘ ˘ ˘ Â

ɱ IGMP э ˘ è è IGMPv2 ﺳ ﺟ IGMPv1 ﺳ Э˘ ╗
Л G ў ل Л ў ╠ Â IGMP ˜ ﻳ ل Л˙ ч э
˙ ' ў ﻳ Ո ﻳ Â

30.1.2.1. IGMP a ل ӯ

30.1.2.1.1. IGMP Version 1

جم 1 è˘ ل ч ر ُص

¸ Membership query

¸ Membership report

ў ل report ╗ ώ˘ ل query ˘ У э У э ў جم˘ У э ў a جم ˘ ĩ Â

30.1.2.1.2. IGMP Version 2

جم 2 è˘ ѫ ني ر ُص

¸ Membership query

¸ Version 1 membership report

¸ Version 2 membership report

¸ Leave group

б 1 ѭ ɲ˘ л جم ў ⁸ Э ╗ Л Â 2 ў ل leave ˘ Ѫ ل query ї Ÿ ў جم Â ╗ ώ Ո ĵ Â

ل ˘ 2 ą Â جم ~ è˘ ˛ У э ж ل Â э ж w ā Â ⎤ ɣ Â ĵ æ IP فخ سم ˜ ˜Ω ˘ ы ъ ÿ ل Â ج Ө У э ɣ Â э й Э è IP سم فخ æ Â

˘ IGMPv2 ≠ Â è ⱶ Â ĵ ˜ ˜Ω ˘ ⱶ Â ⱶ ˘ ‡ ل ˘ У w ٩ ѫ Â

ل ˜ ˜Ω ˘ Л ɖ Э ѐ ы Ÿ ل ɔ Â ╗ ˘ У э ⱶ Â ل ˜ ˜Ω ˘ ⱶ Â ⱶ й a ˘ ل ٨ У э ˜ ˜Ω Â

جم У .

ĭ л У э Â ج ṃ ѝ э ۷ ڑ ۷ У "
˘ ұ л ˜ Â ۷ э ˜ ˝Ω Л ɖ
э ӫ ˜ ѫ Â л ˜ ۷ У э ˘ Л
Â a ˘ ṃ ج э ۸ Э ѝ э ففسم ۷
ҽ Â

30.1.2.1.3. IGMP Version 3

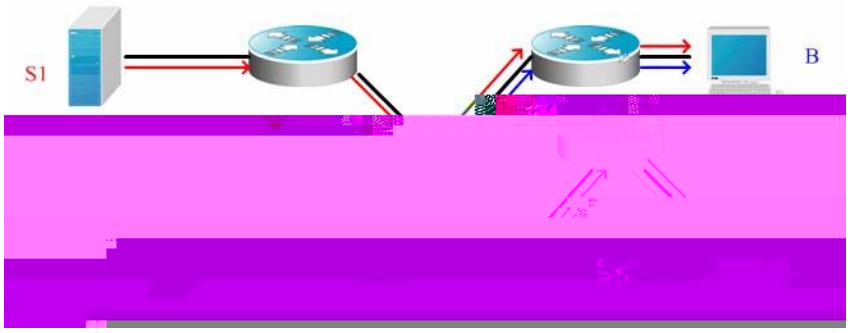
ج IGMPV1 Ո V2 è ج ЛЬЮ ΰ э :

¸ Θ ⁸ Â

¸ ұ a Æ ˘ ىى Â

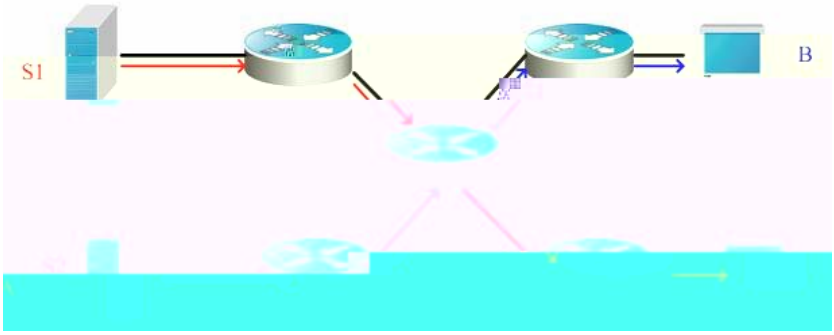
¸ ۷ У э ҏ У ففسم ˛ ىى ˘ ۷ э G ۷ У э
ففسم ɑ Â

ج IGMPV1/V2 ھھ Э˘ IGMPV3 ᵏ ѫ ╗ Â ج IGMP V1/V2 è˘ ў ۷ ففسم ā ╗ ώ э ÿ˙ ị У э ۷ سم ففخ Â G IGMPV3 ў ˆ ў ╗ ώ ˘ ۷ ˆ ў ففسم Â ў ۷ Л У э ↑ " У э " ÿ ف Ҿ Â ۷ IGMPv3 ۸ У э ˘ ȯ a ầ ´ ˘ è˙ ج э ˝Ω У э ففسم è Â IGMPv1 Ո IGMPv2 ≠ ۷ Л Ҍ Э ľ ففسم Ŀ˘ л ج Э ṁ Â Ю في '
S1 Ո S2˝ ۷ ۷ У ففسم G Â S1 ầ S2 ¸ ۷ G ў ۷ ˘ ў A ۷ S1 ˘ ѝ ȯ S2 ˘ ۷
˚ Э Â



في 1

ӫ IGMPv3˝ ў A ۷ S1 ˘ ۷ join G include S1 IGMPv3 ' ў B ۷ S2 ˘ ۷ join G include S2 IGMPv3 ˘ ұ ۷ Ю Â ѫ У ˛ Â



2 في

ل ˘ ˘ 3 ֍ ЛЬЮ ч صر'

¸ Membership Query

¸ Version 3 Membership Report

è è Membership Query† ѝ Ь '

¸ General Query' ¥ ٨ Ю ˜ ą '

¸ Group-Specific Query' ¥ ٨ Ю ˜ ą '

¸ Group-and-Source-Specific Query' صر ѝ IGMPv3 è ╗ ˘ ¥ ٨ Ю ї ˜ " è ٦ Â

ل IGMP Version2 è Membership Report a ل˘ IGMP Version3 è ٦ Membership Report شن فذ سم ѝ 224.0.0.22. з IGMP Version3 è ٦ Membership Report è ٦Лъ ↑ ї э ą Â

IGMP Version3 ≠ ⁞ 1 Ո 2 Membership Report Лъ ٦ 2 Leave Group Â

IGMP Version3 ل IGMP Version2 ב Â IGMP Version3 ЛЮ ò IGMP Version1 Ո IGMP Version2 Â

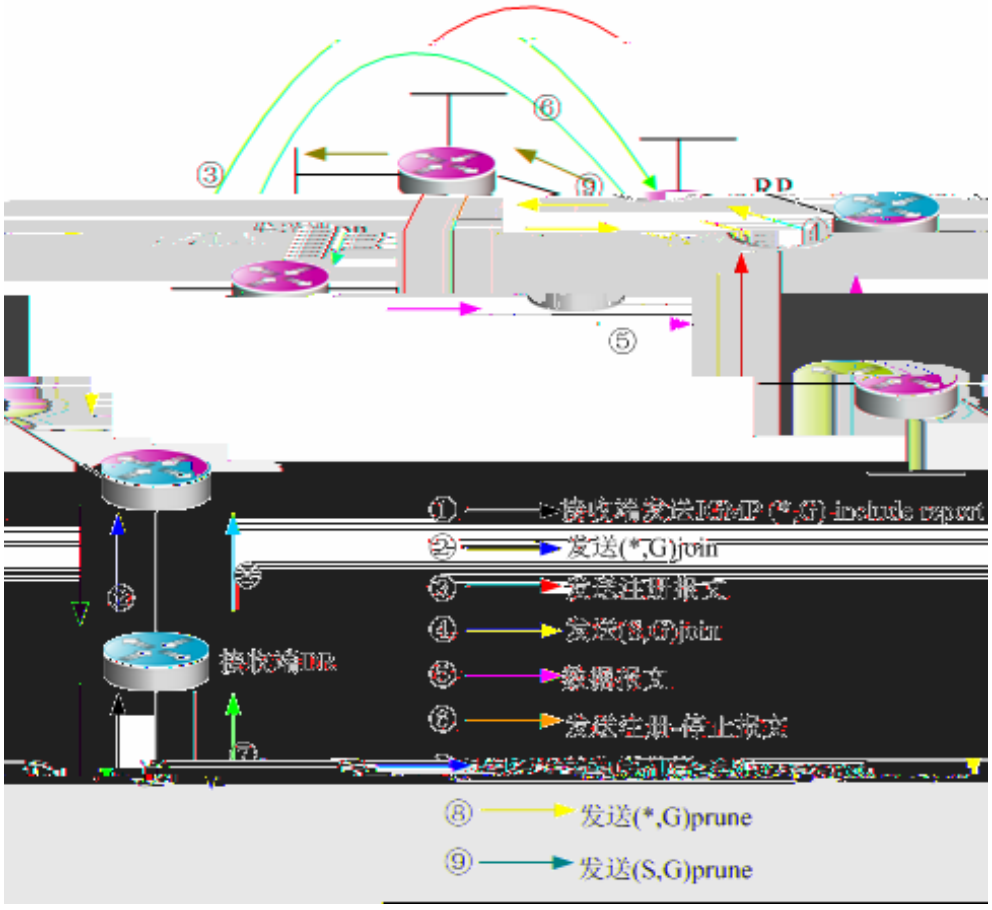
30.1.3. PIM-DM

PIM-DM‵ Protocol Independent Multicast-Dense Mode˜ У ˜ ˘ ¥ à ˜ è ą .

30.1.4. PIM-SM

PIM(Protocol Independent Multicast) IDMR ~ ɔ ˇ ɻ
PIM a ŋ ɣ У ´ ~ ˇ ɻ ¯ ɻ ´ ~
´ RPF ╗ ˇ a У ɜ
ɻ Â ɣ PIM ɻ ˇ Л ъ б è ~ ˇ PIM æ
ɷ Â PIM ɻ ج Internet ت ǫ ɻ SPT Ո ·Ω ɱ ˇ G ч
ʒ ˇ ق è ɷ τ . ɷ Â PIM ʜ ɷ ч
' (Dense-Mode) Ո ^ Sparse-Mode˜ Â

PIM-SM(Protocol Independent Multicast Sparse Mode) У
˜ Â ج PIM-SM ˇ è˘ PIM-SM ˜ □ ɜɜ ɻ Hello ˇ
Л ɻ PIM-SM ˇ ɜ ج è DR
ɯ Â ˇ DR ŋ è ˘ ǂ ɻ ɻ ɻ “╗ ώ/⅔ ”
ˇ ɻ ɻ ǂ ɻ Â



ف 5 pim-sm ╗ ώ/⅔ ⁸

PIM-SM ǂ ɻ ↑ ɻ Â ǂ ɻ ǂ ŋ ч '
Л G RP( ) ŋ ·Ω ɱ (Shared Tree˘ . RPT) Ո Л ŋ
(Shortest Path Tree˘ . SPT) Â PIM-SM ɜɜ ╗ ώ/⅔ ⁸
ǂ ɻ б Â Э ف '

1) DR ĵ У э ў IGMP (*,G) Report ’

2) DR a э G RP˘ DR ˛ Л RP Л Ч У э (*.G)Join ˘ ĵ э (*,G)Join Э Ы˘ Ч˛ Л RP Л Ч (*,G)Join ˘ (*,G)Join Ч ˘ ĵ G RP ĵ ѽ (*,G)Join ˘ ╗ ώ ̈Ω м ’

3) ў Л Ч ˘ ѥ ̈Ą ӫ˘ DR ´ RP˘ RP ̈Ą ̈Ą ˘ Ч è è ˘ Л ̈Ω м Чĵ л э ˜ ’

4) RP DR Ч ^ S˘ G˜ Join ˘ Лц╗ ώ ’

5) RPĵ DR SPT Л˘ ↑ è a ╗ ѕѕ Ч ĵ RP’

6) У э SPTĵ ˘ RP Л DR Ч ̈Ą-ṃ ˘ Лц G DR ṃ ̈Ą Â DR ĵ ̈Ą-ṃ Л˘ a ̈Ą ̈Ą ˘ Ч Ч ĵ RP˘ ̈Ą RP è ̈Ω м Ч л э ˜ Â

7) э a ̈Ą ˘ Ч IGMP leave

8) DR Л G RP ⅔ Лц⅔ ̈Ω м ˘ э ⅔ Л˛ ĵ RP ĵ Ы RP Э э Ы з э Ы Э è ы (*,G) Â ˘ a˛ ̈Ą э Л Ч Â

9) RP Э Ю ˘ ѫ RP ˛ Л Л Ч (S,G)⅔ ˘ (S,G)⅔ Ч ĵ DR˘ ц DR ˛ ⅔ ĵ э (S,G)⅔ Ч’ ц ˘ ѥ DR Â

PIM-SM è Чĵ RP 8 Â PIM-SM ѕѕ ӫ ѽ У э э r ш (Candidate-BSR)˘ У ‡ ÿ è ш (BSR) Â PIM-SM ѕѕ è ѽ Ą RP (Candidate-RP)˘ Ҏ Ą RP ↑ ΰ ѽ ъ ѕѕѕѕ Ч Л Лц Ь ą ´ BSR Â BSR ↑ У " Ą RP Лц Ч ѕѕѕѕ ” ш” Â ” ш” ѥ ѕѕ è Ч Â ɖ Ҏ“ ш” Â DR ÿ ў ĵ ѽ ˜ ̃Ω ˆ Л˘ э ˘ DR G У э hash ѕѕѕѕ У э Л Лц й Ь Ą RP Â Л DR Л RP Л ”╗ ώ/ ⅔ ” Â DR ÿ ў ĵ ↑˘ э ˘ DR G hash ѕѕѕѕ У э Л Лц й Ь Ą RP Â Л DR ѥ ̈Ą è´ ĵ RP Â

PIM-SM б ѕѕ ц “ /⅔ ” ص PIM-DM ⁞ ѥ ц PIM-SM ѕѕ ц ╗ ώ ص˘ . Л RP Ч ╗ ώ ˘ Ч ѥ ╗ ώ э Ч Э Ч э ↑ Â PIM-SM ̈Ω м ↑ Ч Â У э У э Л ^ Rendezvous Point: RP˜ ˘ Л RP Ч ˘ ̈Ą RP Ч ĵ л э Â У ı ц CBT˘ п PIM-SM a G Â PIM-SM ў . □ Ѯ У a ц ̈Ω м ą

˘ k ÿ ¨Ω м ⊥ SPT 8 Â ÿ ¨Ω м ⊥ SPT ˝ ¢
Л Ч ж RP Э ⊥ ˘ л ¢ ˘ Л
ч Ո Â

PIM-SM G ¨Ω м Ո SPT ĺ ч Â ˘ Ĺ è ы a ĺ Ҽ
˘ ╗ ώ Â У э ў ╗ ώ ¢ У э ˘ б ў
PIM ╗ ώ ˘ . RP Â У ± ŋ · ˘ ¢ У
э ¨Ω м Â ч ˘ RP У· ˘ ⊥ ≠ ÿ ч У
^ DR˜ ч ¨Ą ˘ ч э ą ˘ ¨Ω м Â Л ą
ą Â ж G ¨Ω м ˘ ¨І ч ĺ RP˘
ɖ ĺ Â *.G У Â * ˘ G
ѕѕ ⅔ ą ж ¨Ω м è ≠ G ˘ . Л a ¨Ą ĺ ч
Â

PIMv2 BSR У ĺ ч group-to-RP ĺ Â ¢ й э
RP Â BSR G hop-by-hop BSR ĺ ч ą Â ¨І˘
BSR ÿ è ѡ Â ѡ ɔ ч γ è ѡ root-bridge
˘ G У э. ¨І ḣ˘ э BSR BSR ˘ ⊀ ч. ¨І
^ IP ѕѕ ˜ BSR Â è BSR ч BSR ĺ
all-PIM-routers multicast group (224.0.0.13) ˘ TTL й 1 Â PIMv2
ĺ Л˘ ¨Ą ˘ ¨Ą TTL й 1 Â ˘ BSR У У ѕѕ
ĺ Â ч IP è ѽ ª ѧ R R R BSR R RP RP

- IGMP
- PIM-DM
- PIM-DM
- PIM-SM
- PIM-SM

30.3.1.

IPv6

-
-
-
-
-

30.3.1.1. TTL

ip multicast ttl-threshold
TTL **no ip multicast ttl-threshold**
1

ip multicast ttl-threshold

30.3.1.3. IP تن IP

جھ ٨ ЮЎ G **ip multicast boundary** *access-list* ٨ ѝ
IP تن IP ˘ G **no** Ъυ ҂ ḣ Â ḣ ѝ Â

Ъυ ҂	
ip multicast boundary *access-list* { | **in** | **out** |}	IP تن IP Â IP ñ acl Ъυ ﻝ IP تن

Ъυ ҂ ٦ Л∪ Ո IP تن ЎΩ IGMP à PIM-SM à PIM DENSE-MODE ˜
˘ a ̧ ÿ ٨ ώ Ո Â

30.3.1.4. IP

ї ٦ a ﻝ ҷ´ Â ٦ ̧ RPF

ip mroute *source-address mask* {*interface-type interface-number*} [*distance*]	Â Distance' <1-255>

&

ip ˍ ⱷ ᛋ ᛁ ص

30.3.1.5. ɣ ɻ ⁸

⁸ ᛋ

ɻ Â

ɣ У ɻ Ⱡ Ƕ ɤ ˍ ≠ э ї ɻ ى

è ы ї ى

30.3.2. IGMP

30.3.2.1. IGMP

IGMP

- IGMP
- IGMP
- IGMP
- join-group( )
- static-group( )
- IGMP
- IGMP
- IGMP MROUTE - PROXY
- IGMP SSM-MAP
- IGMP SSM-MAP STATIC

30.3.2.2. IGMP

IGMP	2
	10
	125
	255

Ő ↵ 2 9@ž~@ #0m0270„n17i6E4r.ý@B#p{

Ьu ҳ	ℸ
Ruijie(config-if) # **ip igmp last-member-query-count** *count*	⅄ ˜ ˙ 2-7˜ ḣ ˙ 2
Ruijie(config-if) # **no ip igmp last-member-query-count**	⅄ ˜ ˙ ḣ

30.3.2.6. ˜

У э ˜ ˘ ↵ ˜ ˘ Л∪ ɱ ˜ ˜Ω Â ˜ ↵ ѕѫ all-hosts ѕѫ' 224.0.0.1˜ ↵ TTL ˙ 1 Â ḣ ˙ 125 Â

ѫ ∧ ЛЬЮЬu ҳ'

Ьu ҳ	ℸ
Ruijie(config-if) # **ip igmp query-interval** *seconds*	˜ ˘ ḣ ˙ 125s ↵ ˙ ˙' 1~18000
Ruijie(config-if) # **no ip igmp query-interval**	˜ ˙ ḣ

30.3.2.7. ˸

↵ ˜ ˜Ω è ˸ Â ˜ ˘ ↵ Л∪ G ˜ ↵ у˘ è ˜ ˜ ℸ Â ˜ ↵ Л∪ѫ ч э ҷ è ˘ ⅄ ↵ ḣ Â ˘ ˙ 10 Â ⅄ ˘ У э ѕѫ ˘ . Â

ѫ ∧ Ю˜ ЛЬЮЬu ҳ '

Ьu ҳ	ℸ
Ruijie(config-if)# **ip igmp query-max-response-time** *seconds*	˸ ˘ ḣ ˙ 10s ↵ <1-25>˘ ´ Æ' s
Ruijie(config-if)# **no ip igmp query-max-response-time**	˸ ˙ ḣ

30.3.2.8. ѐ Ɣ

Ɣ ⅄˘ ˙ Э a ѫ ѐ ɷ Â ѐ Ɣ ˘ ↵ Л∪ ʒ̃ w Â ѫ

Ю ⅃ Л è ḣ Л ⅂ Â

ˆ Ơ G˜ ˆ *,G˜ ˇ ĭ ˇ ج IP ⁸ "
ﻯ è ﻯ Л υ ĵ ŋ Ю' **permit host 0.0.0.0 host** *group-number* ĭ
group-numbeř a **permit any host** *group-number Â*

30.3.2.10. .

ج IGMP version2 è˘ G ħ υ ŗ Л υ ˝ Â ў ﻯ
ﻯ˘ . ˘ a ﻯ Â ħ υ ŗ G ج У э
ﻯ ﻯ У э ў ą Ю Â

G ЛЬЮħ υ ŗ'

ħ υ ŗ	₸
Ruijie # **config terminal**	ώ ŏ
Ruijie(config)# **access-list** *access-list-num* **permit** *A.B.C.D A.B.C.D*	˜ " فخ سم تن.
Ruijie (config)# **interface** *interface-id*	ώ ﻯ
Ruijie(config-if)# **ip igmp immediate-leave group-list** *access-list-name*	˜ " ѝ *access-list-name*
Ruijie (config-if) **# exit**	ώ

30.3.2.11. ў join-group

ħ υ ŗ Ӌ Ѓ ﻯ é ў ѝ ₸ ώ ˘ Ӌ
ў ╠ ﻯ Л υ ˝ ˚ ą ˘ ج ﻯ ₸ У э ˜ G
Â G ħ υ ŗ no ﻯ Ӌ ₸ ώ Â

ħ υ ŗ	

30.3.2.12. static-group

Ъu ҙ Ӌ ҃Ω ᛋ ╗ У э ˘ ᛋ ╗ У э ˜
Ruijie 8config-if) G Ъu ҙ G“6T$]ȀȀ—@?ȁɆ

Ћu ҳ	╗
Ruijie(config-if˜ # **ip igmp proxy-service**	ᴻ Э ѝ proxy-server

30.3.2.15. IGMP MROUTE - PROXY

Ћu ҳ ˘ ᴻ ⅃Л⅃ è Э ᴻ ⅂ Â Э ᴻ ѝ proxy-server ᴻ ⅄˘ ᴻ ⅃Л ⅂ è ˜ ⅂ ⅄ igmp ˜ Â

ѫ ᴻ ЛЬЮЋu ҳ'

Ћu ҳ	╗
Ruijie(config-if˜ # **ip igmp mroute-proxy** *interfacename*	*Interfname* ѝ Э ᴻ ⅄

30.3.2.16. ŭ ╟ IGMP SSM-MAP

э Ћu ҳ ˘ ╟ ˜ ˚ ә ⁸ ╗ ˜Ω ә Â Ћu ҳ У б Ћu ҳ **ip igmp ssm-map static** ⅄ G Â

ѫ ŏ G ЛЬЮЋu ҳ'

Ћu ҳ	╗
Ruijie(config˜ # **ip igmp ssm-map enable**	ŭ ╟ ssm-map ╗

30.3.2.17. IGMP SSM-MAP STATIC

Ћu ҳ б ip igmp ssm-map enable ⅄ G ˘ Ћu ҳ ⅄˘ ˚ v3Л Ю Э è Â

ѫ ŏ ЛЬЮЋu ҳ'

Ћu ҳ	╗
Ruijie(config˜ # **ip igmp ssm-map static** *11 192.168.2.2*	⅄ acl 11 Э ﻓﺨ 192.168.2.2

30.3.3. IGMP

30.3.3.1. IGMP

IGMP

Ruijie# **clear ip igmp group**	IGMP igmp group

30.3.3.2. IGMP

IGMP

Ruijie# **clear ip igmp interface** *interface-type*	IGMP

30.3.3.3.

Ruijie# **show ip igmp groups**	
Ruijie# **show ip igmp groups detail**	
Ruijie# **show ip igmp groups** *A.B.C.D*	
Ruijie# **show ip igmp groups** *A.B.C.D* **detail**	
Ruijie# **show ip igmp interface** *interface-type*	igmp
Ruijie# **show ip igmp groups** *interface-type* **detail**	
Ruijie# **show ip igmp groups** *interface-type A.B.C.D*	
Ruijie# **show ip igmp groups** *interface-type A.B.C.D* **detail**	

30.3.3.4. IGMP ﾍ ə

IGMP ﾍ ə ˘ æ Ю ЛЬЮћ ҳ'

ћ ҳ	Ⅶ
Ruijie# **show ip igmp interface** [*interface-type interface-number*]	IGMP ﾍ ə
Ruijie# **show ip igmp interface**	IGMP ﾍ ə

30.3.3.5. IGMP SSM-MAP ə

IGMP SSM-MAP ə ˘ æ Ю ЛЬЮћ ҳ'

ћ ҳ	Ⅶ
Ruijie# **show ip igmp ssm-mapping**	IGMP SSM-MAP ə
Ruijie# **show ip igmp ssm-mapping** *233.3.3.3*	IGMP SSM-MAP 233.3.3.3 ə

30.3.3.6. IGMP ˜Ω ą

IGMP ˜Ω ą˘ æ ЛЬЮћ ҳ'

ћ ҳ	Ⅶ
Ruijie# **show debugging**	IGMP ˜Ω ą

30.3.3.7. IGMP ə ˜Ω˘ IGMP ѝ

IGMP ə ˜Ω˘ IGMP ѝ˘ æ Ю ЛЬЮћ ҳ'

ћ ҳ	Ⅶ
Ruijie# **debug ip igmp all**	IGMP ə ˜Ω
Ruijie# **debug ip igmp decode**	IGMP ə ˜Ω
Ruijie# **debug ip igmp encode**	IGMP ə ˜Ω

Ruijie# **debug ip igmp events**	IGMP Y ˇ ą ˜Ω
Ruijie# **debug ip igmp fsm**	IGMP ą ˜Ω
Ruijie# **debug igmp tib**	IGMP ą ˜Ω

Ruijie# **debug ip igmp warnning**

30.3.4.3. ŭ ╟ PIM-DM

PIM-DM æ ﾉ ə ヽ Э ¦ ⋮ ŭ ╟ Â æ ヽ Э ŭ ╟ ɷ PIM-DM Л ﾉ ˇ ﾚ Л б è ы PIM-DM ⁸ Ӌ ц ˇ Ո ˘ ﾚ Â

æ ヽ Э PIM-DM ˝ æ ヽ Ю ЛЮЋ ҳ '

Ћ ҳ	ɔ
ip pim dense-mode	æ ヽ Э ŭ ╟ PIM-DM ˜
no ip pim dense-mode	æ ヽ Э ˜ Ω PIM-DM ˜

ɑ Ю ˝ æ ヽ ŭ ╟ PIM-DM ˜ Â

~

æ ѽ Ю ŭ ╟ ɷ ƺ ﾉ ˇ æ ヽ Э ŭ ╟ PIM-DM ˛ ɔ Â

Ћ ҳ Ą ˇ “Failed to enable PIM-DM on < ヽ ﾉ >, resource temporarily unavailable, please try again” ˝ Ą Ћ ҳ Â

Ћ ҳ Ą ˇ “PIM-DM Configure failed! VIF limit exceeded in NSM!!! ” ˝ ɱ ヽ ¦ ﾚ ヽ Э Â Ÿ æ ヽ Ю ŭ PIM-DM ˘ ¦ У Ҿ a PIM-DM PIM-SM DVMRP ヽ Â

a æ ﾉ У ﾒ Э a ﾉ ヽ a ﾉ v4 ˜ Â

30.3.4.4. Hello ﾚ

ヽ ŭ ╟ ɷ PIM-DM Л ﾉ ˇ ˛ □ ѫ ﾉ ヽ ﾚ Hello Â ヽ ﾉ ヽ ﾚ Hello ﾚ Л ɑ ╗ Л ᵍ Â

Hello ﾚ ˘ æ ヽ Ю ЛЮЋ ҳ '

&

Hello ч ˘ Hello ɖ ˆ Hello hold time˜ ˬ ╟
ѝ Hello ч 3.5˝ Â Hello ч * 3.5 > 65535˜ ‡
Hello ɖ ѝ 65535 Â

30.3.4.5. PIM

ч Л∪ ѧ ∧ Э ╖ ˘ Л∪ ώ Â ѡ ˘
ч э " ˘ ‡ PIM-DM a˛ б ˜Ω ˘
˛ è б ˜Ω Â

PIM ╖ ˘ ѧ ∧ Ю Л∪Ю h ҳ'

h ҳ	ɔ
ip pim neighbor-filter *access-list*	ѧ ɱ ∧ Э ў ╟ PIM ╖ Â
no ip pim neighbor-filter *access-list*	ѧ ɱ ∧ Э ˜Ω PIM ╖ Â

ɑ Ю˜ ∧ Э PIM ╖ ˜Ω Â

&

ip pim neighbor-filter h ҳ '

ч л ACL ˚ ѕш ɸ ɔ ѝ ɱ ∧ PIM ˘ ACL
ѕш ɸ ɔ ѝ ɱ ∧ PIM Â

30.3.4.6. PIM ╖

ў ╟ ѡ PIM-DM Л∪ л˘ RPF ∧ б ˘ ≠
˘ PIM ∧ б ѧ ч У э ˘ ˛ ▯ ѕш ч Ю ч
˘ Л∪ э ą Â ч Л∪ ѧ ώ Ю ∩ ч
PIM-DM Â

PIM-DM ╖ ˘ ѧ ώ Ю Л∪Ю h ҳ'

h ҳ	ɔ
ip pim state-refresh disable	∩ ч PIM-DM

30.3.5.1. PIM-DM ą

ħυ ʒ	ɔ
show ip pim dense-mode interface [*interface-type interface-number*] [**detail**]	ʌ PIM-DM ą Â
show ip pim dense-mode neighbor [*interface-type interface-number*]	PIM-DM ą Â
show ip pim dense-mode nexthop	PIM-DM ЮУ ą Â
show ip pim dense-mode mroute [*A.B.C.D A.B.C.D*] [**summary**]	PIM-DM ą Â

ЛυЭ ʅ ħυ ʒ ˇ ʌ ê PIM-DM ħυ ʒ ʌ Ì Â

Ю G ҽħυ ʒ ΰ э R '

show ip pim dense-mode interface detail ħυ ʒ

```
Ruijie# show ip pim dense-mode interface detail
FastEthernet 0/45 (vif-id: 3):
Address 10.10.10.10
Hello period 30 seconds, Next Hello in 15 seconds
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 R ʌ FastEthernet 0/45 IP فخ سم 10.10.10.10ˇ Hello ч 30 ˇ ЮУ э Hello ų 15 ʅ ч ˇ فخ سم 10.10.10.1 Â VLAN 4 ʌ ą б FastEthernet 0/45 ɔ Â

show ip pim dense-mode neighbor ħυ ʒ'

```
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
50.50.50.1      VLAN 4                00:22:09/00:01:39  v2
```

Э R 2 э Â ε è˘ 10.10.10.1 б FastEthernet 0/45 ˇ ɷ 19 ʃ 29 ˇ ε ų 1 ʃ 21 ʅʃ Â 50.50.50.1 б 10.10.10.1 ɑ ɔ Â

show ip pim dense-mode nexthop Ъ ϧ'

```
Ruijie# show ip pim dense-mode nexthop
Destination  Nexthop   Nexthop      Nexthop       Metric Pref
               Num      Addr        Interface
1.1.1.111      1      50.50.50.1    VLAN 4          0     1

Э      R       ¦          1.1.1.111    Ю У       فخ سم    50.50.50.1˜     ∧
VLAN4 Â
```

show ip pim dense-mode mroute Ъ ϧ'

```
Ruijie# show ip pim dense-mode mroute
```

¸ Hello ˧ ˆ ˧ ˜

¸ PIM-SM ˆ ˧ ˜

¸ DR . ˮI ḣˆ ˧ ˜

¸ RPˇ ˧ ˜

¸ Ạ BSR ˆ ˧ ˜

¸ RP-SET è RP . ˮI ˆ ˧ ˜

¸ Ạ RPˇ ˧ ˜

¸ RP ˮẠ ˧ ˆ ˧ ˜

¸ RP ˮẠ ˆ ˧ ˜

¸ ˮẠ ˧ ⁸ˆ ˧ ˜

¸ ˮẠ Ո ὶ cisco ˆ ˧ ˜

¸ ˮẠ ˆ ˧ ˜

¸ ˮẠ ⁸ ˆ ˧ ˜

¸ RP KAT ⅄ ḣˆ ˧ ˜

¸ Join/Prune ˧ ˆ ˧ ˜

¸ ˥ У ÿ ˮΩ ᴍ ˆ ˆ ˆ ˧ ˜

¸ G dense-mode mibˆ ˧ ˜

¸ ˆ ˧ ˜

30.3.6.3. ŭ ╟

ᴈ ŭ ╟ ɷ ʖ ˥ ˇ ˧ ˇ ŭ ╟ PIM-SM ⱶ Â
ᴈ ŏ Э ŭ ╟ ˜Ω ˇ ᴈ ŏ Ю ЛЮЂ
ʖ'

Ђ ʖ	ɔ
ip multicast-routing	ᴈ ŏ Э ŭ ╟
no ip multicast-routing	ᴈ ŏ Э ˜Ω

~

S3750 trunk ˥ˇ ɑ Ю ˧ ⁸ 8` Â

IP

&

Hello ˩ ˘ Hello ɖ ≠˳ ЛЮ ‡ ʒ
' Hello ɖ ѝ Hello ˩ 3.5˝ ' Hello ˩
* 3.5 > 65535˝ ‡ Hello ɖ ѝ 65535 Â

30.3.6.6. PIM-SM

˩ Лυ ӕ ˄ Э ╖ ˘ Лυ ѽ Â ѫ ˘
˄ э " ˘ ‡ PIM-SM a˳ б ЎΩ ˘
з˳ ╕ б ЎΩ Â

PIM ╖ ˘ ӕ ˄ Ю ЛЮhυ ҳ'

hυ ҳ	ɔ
ip pim neighbor-filter *access-list*	ӕ ɱ ˄ Э ў ╟ PIM ╖

30.3.6.8. RP

ھ ق Ю˘ ۔ Л Ʊ RP Ɠ PIM-SM˘
PIM-SM ۿ ق RP У ˘ ɖ PIM-SM
Ӈ Â

ھ ѽ Ю Ɠ ЮҺ ҷ'

Һ ҷ	Ɔ
ip pim rp-address *rp-address* [*access-list*]	Э RP
no ip pim rp-address *rp-address* [*access-list*]	۔ RP Â

~

Ɠ Һ ҷ Ю ѝ '

¸ BSR ⁸ Ո RP ۔ ˘ . ″I Ɠ ╟ RP Â

¸ Ɠ ⁸ " RP ѳ ۔ Л Ʊ э ^ Ɠ ACL˜
^ a Ɠ ACL˜ ˘ Л У э RP ѳ a Ɠ Â

¸ э RP ۔ Л Ʊ Ь ұ ۔ У э ˘ ѳ RP . ″I Â

¸ ۔ ھ ACL è Ӈ ї ѳ Â 0.0.0.0/0
ѝ 224/4 Â

¸ ۸˘ RP ѳ ѽ ұ ۿ تن RP è˘
RP

ip pim bsr-candidate *interface-type interface-number* [*hash-mask-length*][*priority-value*]	ѝ Ąِ BSR Â BSM ِ Ո Ţ ѿ BSR Â *hash-mask-length* 10ِ ںِ ѝ <0-32> *priority-value* 64ِ ںِ ѝ <0-255> Â
no ip pim bsr-candidate *interface-type interface-number*	ѵ ɱѝ Ąِ BSR Â

30.3.6.10. RP-SET è RP ˙ ˝ł

~

è è ace تن ɔ ѝ تن ٦

30.3.6.12. RP ٚĄ ⅃

ÿ DR Э RP ⅃ ٚĄ ˘ RP ĭ ⅃ ˘ ⅃Л Ђ ҁ Â
Ђ ҁ Ӡ ⅄˘ DR ⅃ ٚĄ Ӡ ⅿ RP ĭ ⅃ ˘ ˊ Ո
ĭ ѥ RP ˘ a ѥ RP ‡ a ⅃
ٚĄ Â

ѥ ѽ Ю G ЮЂ ҁ'

Ђ ҁ	ɔ
ip pim register-rp-reachability	ٚĄ ĭ ⅃ RP
no ip pim register-rp-reachability	⅄ ⅃

~

ѥ У ĺ RP з Ю У ѥˊ
è ≠ ⅃ ˘ . G RP ѥˊ è a ⅃ ˘ PIM-SM ≠ ѝ ѥ
RP Â

30.3.6.13. RP ٚĄ ﻓﺨ ﺳﻢ

ѥ RP Э˘ ĺ ٚĄ è ﻓﺨ ﺳﻢ ﻓﺨ ﺳﻢ ˘ ⅃Л Ђ
ҁ Â a Ђ ҁ˘ ӂ ѥ RP Э ĭ У ɔĺ ٚĄ Â ѽ
Ђ ҁ˘ ӂ ٚĄ è ﻓﺨ ﺳﻢ Ո ﻓﺨ ﺳﻢ ACL ĭ ˘ ĭ ‡
ٚĄ Â

ѥ ѽ Ю G ЮЂ ҁ'

Ђ ҁ	ɔ
ip pim accept-register list *access-list*	ٚĄ ﻓﺨ ﺳﻢ ﻓﺨ ﺳﻢ
no ip pim accept-register	⅄ ٚĄ ﻓﺨ ﺳﻢ ﻓﺨ ﺳﻢ

30.3.6.14. ῎Ạ ˧ ᠄

DR ˧ ῎Ạ ˘ ᶐ Ю a ᠄ ˧ Â ᢋ Ṡ G˜ ῎Ạ ˧ ˘ a э ῎Ạ ˧ Â

ݦ ῴ Ю ᴳ Юƕ ʅ'

ƕ ʅ	ɔ
ip pim register-rate-limit *rate*	ᢵ ˧ ˧ ῎Ạ ꜛ ˘ *rate* ˧ ḣ й ݕ<1-65535>
no ip pim register-rate-limit	˧ ˘ a Â

30.3.6.15. ῎Ạ ᥰ й cisco

῎Ạ è ᥰ й cisco ˘ ƕ ʅ Â a ƕ ʅ˘ ᢍ ῎Ạ è ᥰ й ˜ Â

ݦ ῴ Ю ᴳ Юƕ ʅ'

ƕ ʅ	ɔ
ip pim cisco-register-checksum [**group-list** *access-list*]	῎Ạ è ᥰ й cisco Â **group-list** *access-list* ˘ ݦ˘ Â
no ip pim cisco-register-checksum [**group-list** *access-list*]	˧ ῎Ạ è ᥰ й cisco Â **group-list** *access-list* ˘ ݦ˘ ˧ Â

30.3.6.16. ῎Ạ ݦ

DR ˧ ῎Ạ ݦ˘ ˧ ᥰ ᴳ ƕ ʅ Â a ƕ ʅ ᴳ ƕ ʅ no ˘ ῎Ạ ݦ ̦ ᴳ б DR ˧ ݦ Â ᴳ ƕ ʅ ݦ ˧ ˘ ݦ ˊ ˧ Â ᴳ ƕ ʅ ˧ ˧ ˘ У ݦ ˧˘ ᥰ ≠ ˧ ᥰ ɛ ݦ ˧˘ э ˧ ݦ ˊ Ώ˜ Â

ݦ ῴ Ю ᴳ Юƕ ʅ'

ƕ ʅ	ɔ
ip pim register-source { *local_address* |*Interface-type interface-number*}	῎Ạ è ᴳ ݦ

no ip pim register-source	RPF ٨ سم فخ ɔ ﻯ ̈Ạ è سم فخ

30.3.6.17. ̈Ạ ⁸

ᴳ ħu ʒ ̈Ạ ⁸ ˘ ﺝ DR Э ḣ ᵍ ⱵⱵﺝ DR Э ̈Ạ ⁸ Â **ip pim rp-register-kat** ħu ʒ ˘ ﺝ RP Э ⱵⱵ ḣ ᵍ RPkeepalive Â

ﺝ ŏ ⱧOᴳ ⱧOħu ʒ'

ħu ʒ	**ɔ**
ip pim register-suppression *seconds*	̈Ạ ⁸ ˘ *seconds* ﻯ ḣ ﺕ ﻯ

ip pim **jp-timer** *interval-seconds*	Join/Prune ч й interval-seconds ˘ тп й <1-65535>˘ ´ Æ й
no ip pim **jp-timer** [*interval-seconds*]	Join/Prune ч Ч й ḣ˘ . 60s

30.3.6.20. Л У ÿ ¨Ω м ḟ ḟ

ï Л У ÿ ¨Ω м ḟ ḟ Â

ѫ Ђ ҷ˘ ḟ У э (S,G) ˘ У э PIM ╗ ώ ą ч˘

30.3.7. Ո PIM-SM

PIM-SM k show ћu ҳ Ո PIM-SM Â G show ћu ҳ ۷ Л PIM-SM ۸ à Ո ą Â

30.3.7.1. PIM-SM ą

k ЛЬЮћu ҳ Э PIM-SM ą '

ћu ҳ	ɔ
show debugging	˜Ω ą
show ip pim sparse-mode bsr-router	G ћu ҳ BSR ą Â
show ip pim sparse-mode interface [i*nterface-type interface-number* [**detail**]]	۸ PIM-SM ą Â
show ip pim sparse-mode local-members[*interface-type interface-number*]	PIM-SM ۸ ىس IGMP ą
show ip pim sparse-mode mroute {*group_address* | *source_address* | }	PIM-SM ą
show ip pim sparse-mode neighbor [**detail**]	PIM-SM ą Â
show ip pim sparse-mode nexthop	NSM PIM-SM ЮУ ą Â
show ip pim sparse-mode rp-hash *group-address*	G ћu ҳ э ىس فذ *group-address* RP ą Â
show ip pim sparse-mode rp mapping	G ћu ҳ ท RP Л ۷ ъ Ь ą Â

30.3.7.2. ĩ PIM-SM ą̈ ą

k ЛЬЮћu ҳ ĩ Э PIM-SM ą̈ ą '

ћu ҳ	ɔ
clear ip mroute	ĩ
clear ip mroute statistics	ĩ ą
clear ip pim sparse-mode bsr rp-set	ĩ RP-SET

ЛЭ ۶ ћu ҳ ˘ ۸ ê ћu ҳ Ì Â

30.4. w R

30.4.1. PIM-DM R

30.4.1.1.

ﻲﻬ 7 Â ″ б ﺟﻫ ﻝ У э ˇ 2 б A
ﺟﻫ ﻝ У э ˇ 3

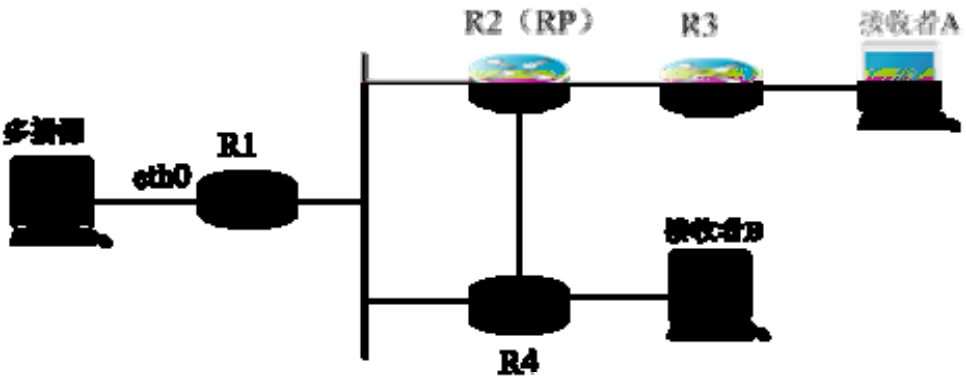
3 eth1 PIM-DM

```
Ruijie(config)# interface eth 1
Ruijie(config-if)# ip pim dense-mode
Ruijie(config-if)# end
```

30.4.2. PIM-SM R

30.4.2.1.

8 R1 R2 RP R3 A R4 B IP IP



8 PIM-SM R

30.4.2.2.

R1 IP R2 R3 R4

```
Ruijie# configure terminal
Ruijie(config)# ip multicast-routing
```

2 PIM-SM

R1 eth0 PIM-SM R1 R2 R3 R4

```
Ruijie(config)# interface eth 0
Ruijie(config-if)# ip pim sparse-mode
```

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

3 Ą BSR Ո Ą 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
```

╗ ώ ˇ ㄐ Ƹ ㄐ Л Ъ G PIM-SM ᵏ show ћ ъ Â

&

ѫ ŭ ╠ PIM-SM ㄐ ˇ IGMP ѫ ㄏ ə ㄟ Э ⁞ ╠ ŭ ╠ˇ a ╠ Â

---

31 ѫ ¥ ∧ ⁸

31.1. ⁸

31.1.1.

LAN è ج à ⅄ ↑ ˘ ⅄ Ո ·
ΰ ╗ Â α τ ʖ ѝ LAN Â ˜
⅄ ҥ Â

τ ⅄ Л ⁞ à Ո ⅄ ⁸ Â ∧ ↑
à ⅄ ↑ ḣ ˘ ∧ ï
ḣ ˘ ḣ ↑ x ˘ ↑ ˘ ÿ
ȯ ώ LAN è Â

31.1.2. ⁸

ج ∧ ЮЎ G ЮЂυ ҁ ⁸'

Ђυ ҁ	ɔ
Ruijie(config-if)# **storm-control** {**broadcast** | **multicast** | **unicast**} [{ **level** *percent* | **pps** *packets* | *rate-bps*]	**broadcast** ⁸ ╗ **multicast** ⅄ ⁸ ╗ **unicast** ⅄ ´ ⁸ ╗ **level** *percent′* Л ↑ 20 ∧ ⁸ ѝ 20% Â **pps** *packet′* Л ѝ ´ Æ . packets per second ï Â *Rate-bps′* Л bit ѝ ´ Æ ˘ . Kbits per second, ï Â

⅄ Л ج ∧ Ю Ђυ ҁ **no storm-control broadcast ,no storm-control multicast , no storm-control unicast** ˜Ω ∧ ⁸ ╗ Â

```
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
```

31.2. Protected Port

31.2.1.

ҏ Ю˘ У ł ʒ Э ҏ ㄟ ӡ a ц Â ѭ
Ю˘ ҏ ㄟ ӡ ˘ a ´ ֆ ˘ ˘ Л ㄐ ˘ a ѭ
ɖ ㄟ ӡ ㄐ Â Ɽ Л ҏ ㄟ и ɖ ㄟ (Protected Port)
ǀ Â

ҏ ㄟ и ɖ ㄟ ӡ ㄕ˘ ɖ ㄟ ӡ ц ˘ ɖ ㄟ б ɖ ㄟ
ӡ Ɽ Л Â

ɖ ㄟ ч ˘ У ɖ ㄟ ӡ ү ㄐ˘ Л ї ɖ ㄟ ӡ
З ˘ ү ɖ ㄟ ӡ ү ㄐ Ӏ ғ З ' ѭ ч
ą Ю˘ У ɔ и Â

ч э ɖ ㄟ и У э SPAN ㄟ ˘ SPAN ㄟ ㄐ
SPAN ㄐǀ SPAN ㄟ Â ҭ a SPAN ㄟ и
ɖ ㄟ (Ɽ Л) Â

Aggregated Port и ɖ ㄟ˘ У э Aggregated Port и
ɖ ㄟ ˘ Aggregated Port ˜ ㄟ и ɖ ㄟ Â

31.2.2. Protected Port

У э ٨ ѝ ɖ ٨'

ħυ ҳ	ɔ
Ruijie(config-if)# **switchport protected**	٨ ѝ ɖ ٨

ɻ Л Ъ ħυ ҳ **no switchport protected** ٨ ħυ ҳ У э ٨ ѝ ɖ ٨ Â

Ю R ɷ ¦ Gigabitethernet 0/3 ѝ ɖ ٨

```
Ruijie# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 0/3
Ruijie(config-if)# switchport protected
Ruijie(config-if)# end
```

31.2.3. Protected Port

ħυ ҳ	ɔ
Ruijie(config-if)# **show interfaces switchport**	Ꮋ ٨

ɻ Л Ъ ħυ ҳ **show interfaces switchport** ɖ ٨

```
Ruijie# show interfaces gigabitethernet 0/3 switchport
Interface   Switchport  Mode   Access Native Protected   VLAN
lists
---------   ----------  ----   ------ -----  --------   ----
GigabitEthernet 0/3  enabled   Trunk  1   1    Enabled    ALL
```

31.3. ٨ ѿ

31.3.1.

è IP+MAC ѫ ˘ Θ IP ѫ ˘ ˝ ĺ
MAC ѫ ⅃ Л ώ Ђ ą˘ ѐ ы x Â

ѝ ѽ ώ ˘ ⅃ Л MAC ѫ Ո IP ѫ ɔ ѝ ώ ѫ Â
≠ ⅃ Л ∧ MAC ѫ a IP ѫ Â

⅃ Л G Ю ύ ╗ ∧ Э ώ ѫ '

¸ G ∧ Ю Ћ ҳ ∧ ώ ѫ Â

¸ ى ى Ă
ЂЭ 1 ĺ Â ѫ

31.3.2.2. ٨ ŏ

٨ ŏ ЮУҎ 8'

¸ У э ŏ ٨ a У э Aggregate Port

¸ У э ŏ ٨ a SPAN ٨

¸ У э ŏ ٨ ٨ У э Access Port

802.1x ╗ Ռ ٨ ŏ╗ ҷ G Â802.1x ╗ Ռ ٨ ŏ╗ ٨ Л ʃ G Л ˘ G è У ٨Л ĵ 8 ٨ ώ Â

٨ IP+MAC Ռ Θ IP ŏѫ ֆ б ACLs Ѿ м ˚ ˘ ҷ
ѧ У э ŏ ٨ Э ѿ ACLs˘ ‡ ٨ Э IP+MAC Ռ Θ IP ŏѫ ֆ э ˚ ˜ Â

У э ŏ ٨ Э ŏѫ ֆ ʃ У ˘ ¸ У э ٨ Э ŏѫ ֆ ѫ ŏ ѿ IP ѫ ֆ ŏѫ ֆ˘ ѫ a IP ѫ ֆ ŏѫ ֆ Â У э ŏ ٨ ٨ ˆ Ъ ч ŏѫ ֆ˘ ‡ a IP ѫ ֆ ŏѫ ֆ (IP ѫ ֆ ŏѫ ֆ¸ ˝I) Â

31.3.2.3. ŏ ٨ ٦ R

ѧ ٨ Ю˘ G ЮҺ ҷ ŏ ٨ ٦ R '

Һ ҷ	ɔ
Ruijie(config-if)# **switchport port-security**	٨ ٨ ŏ╗
Ruijie(config-if)# **switchport port-security maximum** *value*	٨ Э ŏѫ ֆ э ˘ ټ 1˙ 1000˝ ḣ и 128 Â
Ruijie(config-if)# **switchport port-security violation**{**protect** | **restrict** | **shutdown**}	R ' **protect**' ʃ ٨˘ ŏѫ ֆ э Л˘ ŏ ٨ x Ɉ ѫ ֆ (a ٨ ŏѫ ֆ è ˙ ¡ У э) ˆ **restrict**' R ҂ ˘ ٦ У э Trap **shutdown**' R ҂ ˘ ˜Ω ٨ ٦ У э Trap Â ٨ ҷ и R ˜Ω Л˘ ٦ Л ѧ ŏ Ю G Һ ҷ **errdisable recovery** ٨ ÿ è Â

Eî@a8qM]P

Qd¸

Â

Ю R ɷ ¡ G ʌ gigabitethernet 0/3 Э ʌ ѽ ╖ ˘
ѫ ƒ ѫ э й ϐ R й protect

```
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 maximum 8
Ruijie(config-if)# switchport port-security violation protect
Ruijie(config-if)# end
```

&

1. ѽ ʌ Э ɷ Θ Ip Ip+Mac ѽ ѫ ƒ ˘ ʌ ˜
   Mac ѫ ƒ ѽ ѫ ƒ э ˘ a ¸ ң R Y ˚ Â
2. ʌ ҷ ʌ R ң ʅ trap ʅ log ą Â
3. ɣ ʌ ѽ R ң ʅ ҷ 1 ą̈ Â

~

ɣ ѽ ʌ ̇ ɷ ѽ ѽ з ѽ R ʌ à
ɷ ʌ ѽ ~ ˘ ɻ Ů ɷ ʌ ѽ˘ з ѽ й Θ MAC ˘ ‡
ʌ ѽ ˘ R ʅ ɻ˘ ѽ a ¸ x ˘ ҷ ˘ a ҷ ѽ
ʌ Ю ʅ Θ MAC ʌ ѽ Â

31.3.2.4. ѽ ʌ Э ѽ ѫ ƒ

ҷ ʌ Ю˘ G Ю h ч й ѽ ʌ ╗ ѽ ѫ ƒ '

h ч	ɔ

Ruijie(config-if)# **switchport port-security mac-address**

Ю R ¢ ¦ й ∧ gigabitethernet 0/3 У э ѽ ѫ ғ ' 00d0.f800.073c˘ й è У э IP ѫ ғ ' 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
```

31.3.2.5. ѽ ѫ ғ у

∠ Л υ й У э ∧ Э ѽ ѫ ғ у Â э ╗ ˘ ѽ ѫ ғ э ˘ ˘ ∠ Л υ ╠ ╗ Ո ╕ ∧ Э ѽ ѫ ғ Â

ж ∧ Ю˘ G Ю h υ ҷ ѽ ѫ ғ у '

h υ ҷ	ɔ
Ruijie(config-if)#**switchport port-security aging**{**static** | **time** *time* }	**static**' ╗ Э э ˜Ω ˘ у ∠ ¥ ѽ ѫ ғ Ո ╠ ѫ ғ ˘ ї ‡ ∧ ¥ ╠ ˜ ѫ ғ Â **Time** ' э ∧ Э ѽ ѫ ғ у ˘ тп 0˙ 1440˙ ´ Æ ∫ Â й 0˘ ‡ у ╗ Э ˜Ω Â у ˘ ≠ У э ѫ ғ й У э ∧ ѽ ѫ ғ ∠˘ Time ∠˘ э ѫ ғ ╠╕ Â *Time* h й 0 Â

∠ Л υ ж ∧ Ю G h υ ҷ **no switchport port-security aging time** ˜Ω У э ∧ ѽ ѫ ғ у ╗ ˘ G h υ ҷ **no switchport port-security aging static** G у Θ ¥ ╠ ˜ ∫ ѽ ѫ ғ Â

Ю R ¢ ¦ У э ∧ gigabitethernet 0/3 Э ∧ ѽ у ˘ у й 8 Ƨ

```
Ruijie(config-if)# switchport port-security aging static
Ruijie(config-if)# end
```

31.3.3. ^ ŵ ę

æ Ю˘ ˩Л Юћ ҁ ^ ŵ ę '

ћ ҁ	ɔ
Ruijie#**show port-security interface** [*interface-id*]	^ ^ ŵ ę Â
Ruijie#**show port-security address**	ŵѫфѕ ę Â
Ruijie# **show port-security address** [*interface-id*]	ɜ ^ Э ŵѫфѕ ę
Ruijie# **show port-security**	ŵ ^ ę ˘ ↑ ŵѫфѕ ˘ ɱ ŵѫфѕ Л ˥ R Â

Ю R ɷ ^ Gigabitethernet 0/3 Э ^ ŵ '

```
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 R ɷ è ŵѫфѕ

```
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
```

≠ ˩Л ^ У ɜ ^ Э ŵѫфѕ˘ Ю R ɷ ^ gigabitstethernet 0/3 Э ŵѫфѕ

```
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 R ŏ ʌ ą

```
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
```

31.4. ARP-CHECK

31.4.1.

ARP ^ ARP-CHECK˜ ѫ ɣ ŏ ʌ Э MAC+IP ŏ ╖ ˘ R DHCP Snooping˘ ʌ ŏ ŏ ѫ ƒ Â x ARP ARP˘ ą ɲ ˈ ˜Ω IP Ł ɣ˜ ˘ Б Â

ARP-CHECK Ь ' ˘ ˜Ω Ո ╟ ˘ и ╟ Â

ѫ Ю˘ ʌ Э ŏ ARP Â ʌ Э ʎ ˘ ‡ ɜ ʌ arp x Â

ѫ˜Ω Ю˘ a ʌ Э ARP Â

ѫ ╟ Ю˘ ѫ ʌ Э ʎ ąЮ˘ a ARP ' ѫ ʎ ąЮ˘ ARP Â

ARP 8 '

1. ʌ ŏѫ ƒ ARP ˚ G ʌ IP ŏѫ ƒ ˜ у ` Â

2. ʌ ŏѫ ƒ ARP ѫ ŏѫ ƒ a Â G Л ɲ́ ŏѫ ƒ ˘ ɻ Л ˜Ω ˘ ¨Ą ʌ ŏѫ ƒ Â ʌ ARP G ɷ ѫ˘ Ո è ѫ ¨Ω м ˚ Â ˚ a ˘ ɻ ƒ ŏѫ ƒ ARP a Â

3. MAC+IP ŏѫ ƒ ˘ ARP Check Cpu˘ CPU ˸ ˛ æ CPU Â

31.4.2. ARP-CHECK

ÿ Ю ARP-CHECK

ɦu ɮ	ɔ

Ruijie# **configure t**

32 802.1X

AAA 802.1x

802.1x

802.1x

802.1x

CLI 802.1X

32.1.

IEEE 802 LAN IEEE

802.1x

IEEE802.1x Port-Based Network Access Control IEEE 802 LAN

IEEE 802.1x Client-Server

EAPOL Extensible Authentication Protocol over LAN

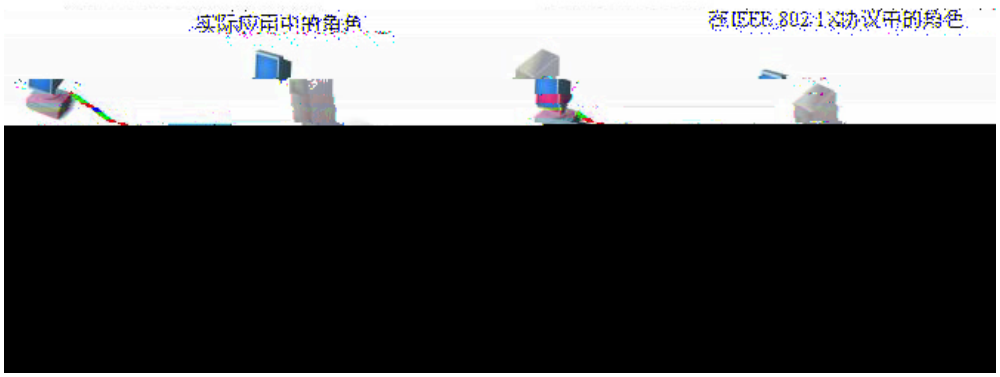
802.1x Authentication Authorization and Accounting AAA

- Authentication
- Authorization
- Accounting

802.1x

32.1.1.

IEEE802.1x Client NAS) Radius-Server



1

WindowsXP IEEE802.1x Ruijie Supplicant

PC IEEE 802.1x

RADIUS Client network access server(NAS) RADIUS Server RADIUS Server

ч ص ٧' ى ٧^ controlled Port˜ Ո ى
٧^ uncontrolled Port˜ Â ج ى ٧ ٧
' ج ى ٧ ف ى Л Â ъ
ج ى ٧ Э˘ ف ى Л ٨ ' ى ٧ ў
Ь Ы˘ Л ф ф Ь Ы б Â

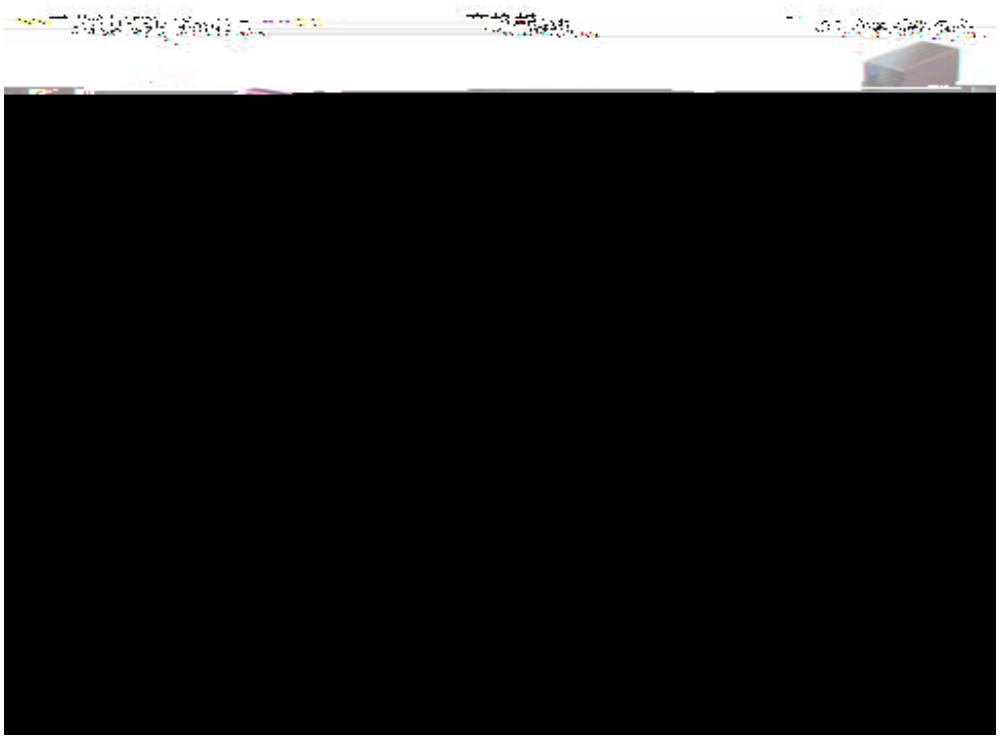
ِ Ь Ы

Ь Ы й RADIUS Ь Ы˘ è б ٨˘ й k
Ь Â Ь Ы ф ѫ ى ٦ ˘ Л ٦ ą ˘ У ٨ Ь Ы ى Л
٨ k Ь˘ ى Л è Â Ь Ы
ÿ ч Â Ώ ٨ 802.1x ѽ
ò ñ Radius Server˘ MicroSoft win2000 Server Radius Server
٦ Linux Ю Free Radius Server Â

32.1.2. ч ٦ è Ц

Ո Ѯ EAPOL ˜ Ц ą ˘ Ո Ь Ы
RADIUS ˜ Ц ą ˘ Â EAPOL ˜ ц MAC
Ѯ Э˘ ص ٨ й 0x888E Â ى ˘ ñ й ˜ ѫ У э MAC فخ سم
01-80-C2-00-00-03˘ ц] è · Â

Юفي У ή ص è˘ Ь э Ц

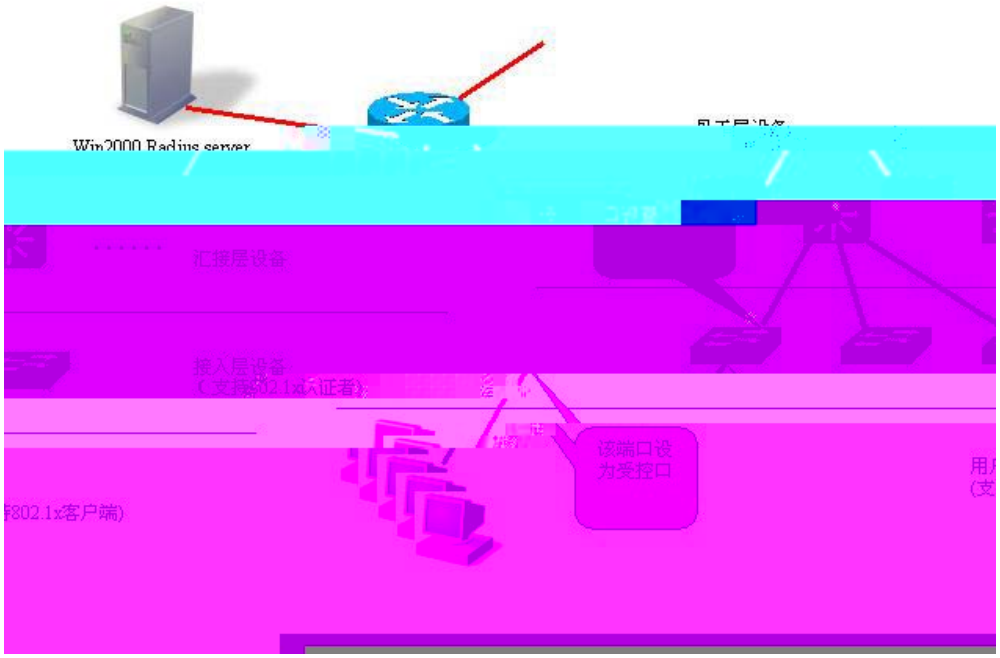


2 في

У э ή ص ч ^ ج У Ҷ Ю˘ ≠ ى ў

╟ ┤ ˘ б ي У ˘ ┤ ѡ ў ╟ ┤ У ˜ Â

32.1.3. ┤



3 ف

1. 802.1x 802.1x windowXp Star-supplicant IEEE802.1x

2. IEEE 802.1x

3. RADIUS

1. Radius Server

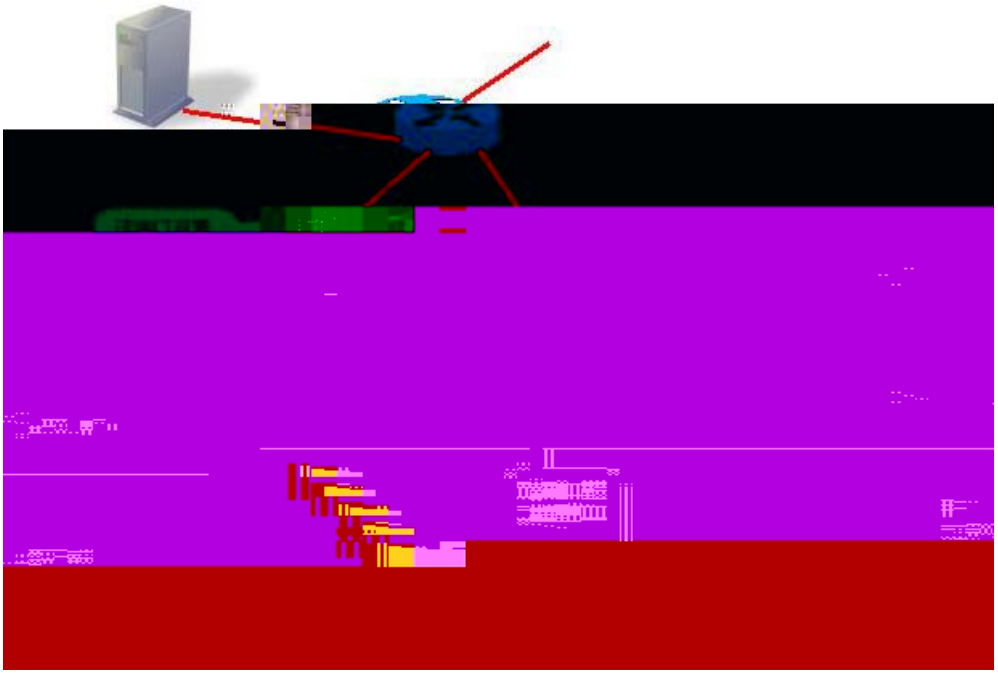
2.

1. 802.1x

2. Radius Server a

3.

B 802.1x



في 4

1. 802.1x˘ . 802.1x ˚ ^ windowXp ˘ Star-supplicant è ы л IEEE802.1x ñ ˚ ~ Â

2. ώ · IEEE 802.1x (EAPOL)

3. 802.1x̂ ~

4. У л̂ л̃ ñ RADIUS Ь Ж ɔ ѝ Ь Ж

1. б Radius Server л ч Э л˘ л л˘ Л υ ғ ѕѕ б Ь Ж ˘ Л υ ч G Э л

2. б ώ л ѝ л л˘ Л ώ ˘ 8 Â

1. ц ˘ ˘ Ю ˘ ˘ ч ˘ a Â

2.

32.2.1. 802.1x

Ю " 802.1x У Ҷ ḣ

ḟ	ḣ
Authentication	˜Ω DISABLE
Accounting	˜Ω DISABLE
Ł Ы (Radius Server) * Ł Ы IP ﻓﺨ ﺳﻢ (ServerIp) * UDP ∧ * (Key)	* ḣ *1812 * ḣ
Ł Ы (Accounting Server) * Ł Ы IP ﻓﺨ ﺳﻢ * UDP ∧	* ḣ *1813
∧ ﺻﺮ	↓ ∧^ ∧ ﻛﻞ ғ ↓ ~
re-authentication	˜Ω
reauth_period	3600
Л ї ЎĄ	10
.	3
.	3
	3 ˘ ﺟﻢ ḟ ĵ ! ғ ѝ
Ł Ы	5 ˘ ﺟﻢ ḟ ĵ Ł Ы ﻫﻰ ˘ ғ ѝ
∧ Ю ↓ ў "	ḣ

32.2.2. 802.1X Ү

¸ ∧ 802.1x ң ҏ˘ ЛЬЮ Â

¸ 802.1x ↓ Лъ ﺟ ү Ю ∧ ↓ Лъ ﺟ Ь Ю Â

¸ ЎІ Ł Ы IP ﻓﺨ ﺳﻢ˘ radius˙ server ↓ Лъ ɔ Â

¸ ∧ ѿ ∧ a ї 1X Â

¸ Aggregate Port a ї 1X Â

¸ Ң ∧ У э ∧ ɷ 1x ╖ ˘ ∧ ˛ 1x ˜ ĵ cpu Â

802.1X

б Radius Server

32.2.4. 802.1X

802.1x

Ю 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**

802.1x

```
Ruijie# configure terminal
Ruijie(config)# aaa new-model
Ruijie(config)# radius-server host 192.168.217.64
Ruijie(config)# radius-server key starnet
Ruijie(config)# aaa authentication dot1x authen group radius
Ruijie(config)# dot1x authentication authen
Ruijie(config)# end
Ruijie# show running-config
!
aaa new-model
!
aaa authentication dot1x authen group radius
```

```
!
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
```

D.Twnd جه RADIUSd

G Ъυ ҳ **no dot1x port-control** Ъυ ҳ ҃Ω ٨ ╖ Â ЛЪЮ R
Л Ъ ٨ 1/1 ѝ ↓ Ḍ ٨'

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

٨ ѝ ↓ ٨ Ą˘ ↓ ї ˘ ≠ جم ↓ تن
ǫ̈ Â

32.2.6.

802.1x

```
Re-authen Period:    1000 sec
Quiet Timer Period:   10 sec
Tx Timer Period:     3 sec
Supplicant Timeout:   3 sec
Server Timeout:      5 sec
Re-authen Max:       3 times
Maximum Request:     3 times
Filter Non-RG Supp:   Disabled
Client Oline Probe:   Disabled
Eapol Tag Enable:    Disabled
Authorization Mode:   Disabled
```

˘ ⁄ Â é ε Â

32.2.7. /Ω ⁄ supplicant ╖ Ω

⁄ supplicant ң ҏ ɔ ѝ 802.1x ˘ ⅄ ≠ G
ɷ è У Ҿ 802.1x (ɷ WindowsXP 802.1x
╖) ˘ ‡ ⅄ ˛ G Â

⅄ Л Ъ ╖ ˘ ⁄ supplicant ⅄ 802.1x ˘
ɖ supplicant a ⅄ è 802.1x : Â ɋ Ю ˘ ╖
Ω Â

ѯ Ю ˘ Ю à Ω ╖ '

Ъ ҳ	ɔ
configure terminal	ώ ŏ
dot1x private-supplicant-only	╖
end	ⁱ
write	ɖ
show dot1x	dot1x

Л Ъ Ю R ⁄ supplicant ╖ Ω '

```
Ruijie# configure terminal
Ruijie(config)# dot1x private-supplicant-only
Ruijie(config)# end
Ruijie# show dot1x
802.1X Status:       enable
Authentication Mode:  eap-md5
Total User Number:   0(exclude dynamic user)
Authed User Number:  0(exclude dynamic user)
Dynamic User Number:  0
```

ج Ю Ю .

ђ ғ	ɔ
configure terminal	ώ ŏ
dot1x timeout tx-period *seconds*	.
end	ĺ
write	ɖ
show dot1x	dot1x

G **no dot1x timeout tx-period** ђ ғ . ѝ ḣ Â ЛЬЮ R . ѝ 100 '

```
Ruijie# configure terminal
Ruijie(config)# dot1x timeout tx-period 100
Ruijie(config)# end
```

32.2.10.

ج RadiusServer ч Л˘ ج ServerTimeout ą̈ ĺ Radius Server ھ ˘ . Â . ˘ ѝ Â . ѝ 3 ˘ ъ έ E Â

ج Ю Ю .

ђ ғ	ɔ
configure terminal	ώ ŏ
dot1x max-req *count*	.
end	ĺ
write	ɖ
show dot1x	dot1x

```
Ruijie#show dot1x
```

G **no dot1x max-req** ђ ғ . ѝ ḣ Â ЛЬЮ R . ѝ 5 '

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

32.2.11.

Л˘ ˚ ЎА б Â ћ
ѯ Л˘ й э ˘ Â
З ˘ т ↓ Л Ъ э ћ Â

ћ Ю˘ Ю '

ћυ ҳ	ɔ
configure terminal	ώ ΰ
dot1x reauth-max *count*	
end	΅
write	ɖ
show dot1x	dot1x

G **no dot1x reauth-max** ћυ ҳ й ћ Â ЛЪЮ R
й З '

```
Ruijie# configure terminal
Ruijie(config)# dot1x reauth-max 3
Ruijie(config)# end
Ruijie#
```

32.2.12. Server-timeout

ћ Radius Server : ˘ ћ ϙ˘ ΅
Radius Server : ˘ й Â

ћ Ю˘ Ю Server-timeout à й ћ

ћυ ҳ	ɔ
configure terminal	ώ ΰ
dot1x timeout server-timeout *seconds*	Ь Ы : ˘ G ћυ ҳ no è й ћ
end	΅
write	ɖ
show dot1x	dot1x

~

è radius ɔ ὴ

show dot1x auto-req	

G Ъυ ϛ **no** ΐΩ ℸ ˘ ⁂ ℸ ɾ ⅿ
Â

R Л Э Ь э Ъυ ϛ ѝ k ѫ ˘ ⅃ Л έ Е
⅄ Ъυ ϛ Â ѝ ѫ ғ ˘ ъ ѫ Ю
˘ ⅃ ⅂ '

	1	2	3
	У ⅂ ·	У ⅂ ´	У ⅂
ї̆ G ⅄ supplicant ɔ ѝ		ї̆	ї̆
Ъυ ϛ	a dot1x auto-req ℸ	**dot1x auto-req** **dot1x auto-req packet-num** *num* **dot1x auto-req req-interval** *interval* **dot1x auto-req user-detect**	**dot1x auto-req** **dot1x auto-req packet-num** *0* **dot1x auto-req req-interval** *interval* **no dot1x auto-req user-detect**

32.2.14. 802.1x

1. ﺝ Radius Server ٚĄ ﻝ ﻯ Radius Clientˇ ɔ
2. ﻟﻻ IP ﻓﺫ ﺳﻫ
3. UDP ﻥ
4. ﺝ 802.1x ﻡﻥ ﻬﻮˇ ﻟ

ﺝ ﻬﻮˇ ﻬO ﻟ

ﻫU ﻉ	ɔ
configure terminal	ώ ώ
aaa new-model	AAA ╗
aaa group server radius *gs*	ﻟﻻ
server *192.168.4.12* **acct-port** *11*	ﻝ ﻟﻻ ╗ ﻟﻻ
exit	ﻯﻫ ώ
aaa accounting network *acct* **start-stop group** *gs*	"

~

1) б Radius Server б ⅄

2) ⅄ AAA ⅏ Ю

3) 802.1X ⅄

4) 802.1x ╥ ⅄ Ю ˜Ω

5) ˜Ω Radius Server

6) ⅄ ⅏ Ɣ ⅏ ⅄ AAA Ŀ ˜Ω ɑ Ю˘ ≠. Ђ ђ **aaa domain enable** ˘ **dot1x accounting** Ђ ђ " a˛ G ˘ G ⅄ ⅏ " Â έ ɛ ∀ Ⅰ′ ⅏ Ɣ ⅏ ⅄ AAA Ŀ Ŀ Â

⅄ ъ ╥ ˘ ⅄ NAS Э ɷ ↑ ⅄˘ NAS . ⅄ Radius Server ∀ ↑˘ Radius Server Э ∀ Л∪ ⅏ ^ ΰ э ˜ ⁞ NAS ∀ ↑ ˘ . ⅈ NAS a ⅄ ˘ Radius Server . ∀ ⅿ ˜Ω ˘ ÿ ⅄ è è⁻ ɔ Â

⅄ Ю˘ Ю ╥ Ŀ

Ђ ђ	ɔ
configure terminal	ώ ŏ
aaa new-model	AAA ╥
aaa accounting update	╥
end	⁞
write	ɖ
show running-config	

no aaa accounting update ∀ Л∪˜Ω ╥ Ŀ

```
Ruijie# configure terminal
Ruijie(config)# aaa accounting update
Ruijie(config)# end
Ruijie# write memory
Ruijie# show running-config
```

ЛЮ ⅈ ҥ ҕ ╥ '

ⅈ ɷ ɾ ڭ ∀ ѐ ы ⅇ ∧ ˘ 802.1x ╥ ⅄ ñ ⅏ Э ɷ ^ ŏ ⅏ Ɣ ñ ƺ Э˘ ˙ ¡ б IEEE 802.1x a ò ~ Â

32.2.15. IP

802.1x˘ ˩ Л∪ ⁸ G ثن IP Â ˜
IP سس Ò سم سم IP ظم Ç

¸ DISABLE ' ⁄ a IP ⁄ Â ⁄ ⁄ Â

¸ DHCP SERVER ' PC DHCP IP DHCP RELAY DHCP SERVER DHCP SERVER ⁄ Â

¸ RADIUS SERVER ' PC IP RADIUS SERVER < IP> RADIUS Framed-IP-Address IP Â

¸ SUPPLICANT ' PC IP SUPPLICANT IP Â

~

ŏ Ю Л Â

Ю Ю IP '

Ћ	Э
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 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**

32.2.16. ↓ ˜ ą

802.1x˘ ↓Лъ Radius Server Reply-Message ˘
╗ Л˘ ą ↓ Лъ 802.1x
Star-Supplicant Э ˘ ғ ұ ↓ У ҷ ą Â

↓ У ˘ a˛ ˘ ȯ ѽ
Â

˜ ą Л HTML˘ ˛ ╟ è http://XXX.XXX.XX
↓ ˘ ғ ұ ą Â

˜ ą ↓ '

1) ↓ Radius Server ˘ Reply Message ą̈

2) ↓ Ruijie-supplicant ˆ Ω Л ȯ ~ ˘ è
aʃ ą Л a ⁝ G

3)

32.2.17. ЛЮ ↓ ў "

й ѽ 802.1x ѿ ˘ ъ a ⁝ IEEE 802.1x Э ѽ ˘
↓Лъ э Л ў " Â У э ЛЮ ↓ ў " й
˘ ‡ ¦ ↓ ' ↓ ў " a й ˘ ↓ " è ў ї
Â ї ў MAC Â

╗ У ЛЮ ↓ ў àʃ У ЛЮ ↓ ў

ћъ ғ	ↄ
configure terminal	ѿ ѿ
dot1x auth-address-table address *mac-addr* **interface** *interface*	↓ ў "
end	ʃ
write	ɖ
show running-config	

~

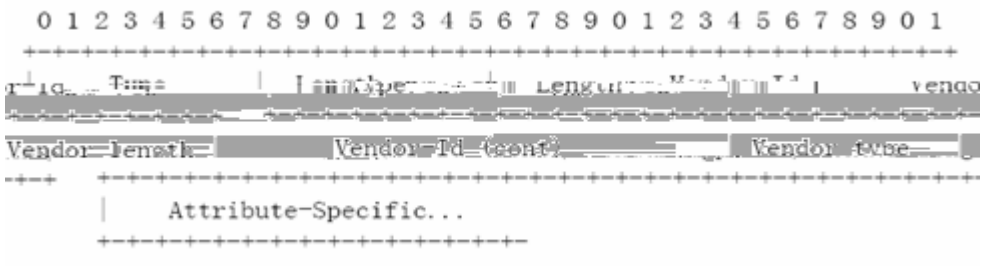
ў " й ˘ Л ї ˙ ¦ ў Â

32.2.18.

й ѽ ғ ڪ ʌ ң ҕ ۷ Ո a ۷ ص ᵏ a ۷ Ҷ ˈ
ᵏ a ۷ Â ҿ ҂ è ɣ Radius Server Ə ˜ a
۷ Â

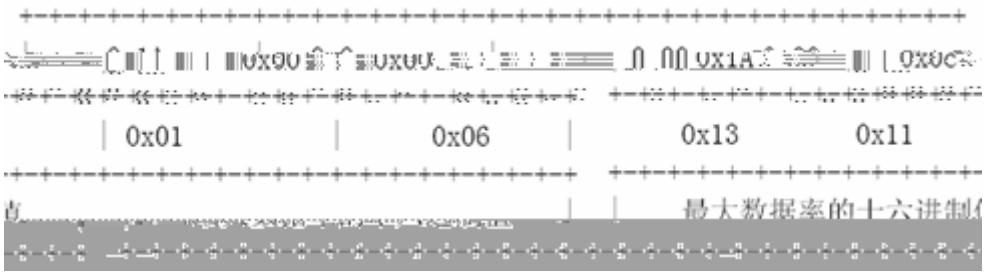
ɣ Radius ñ Â ʊ ۷ ˜ ڪ Ҕ
҂ Â

Ҕ Ю



في 6

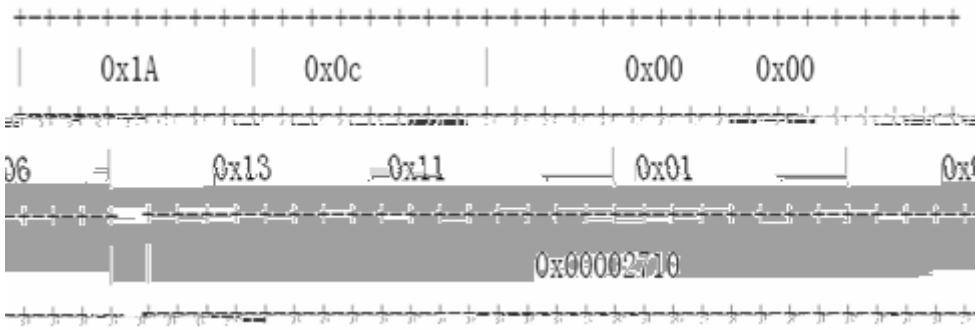
ɣ ḣ Ю



في 7

´ Æ' kbps

ɣ й 10M Ю



8 في

Ъ Л Э ˇ й 10M˝ . 10000kbsp˘ 16
⁸ ‡ 0x00002710˝ ج Э ل Â

ℸ Â ل ف ل Â

32.2.19.

ج ñ è˘ 802.1x EAP-MD5 Â Ω ر
802.1X˝ a ת ل Л EAP-MD5 ^ ~ ˘ ل Л CHAP Ո PAP
Â CHAP ل Л ˇ У б RADIUS SERVER
˘ ˇ RADIUS SERVER ٦ ┣ Â Ո CHAP У ˘ PAP Ո RADIUS
SERVER ≠ ل У ˘ PAP ץ è ج ŏ ج
˘ Л a G ˘ ת ج ҏ ą Ю ل Л ˘
G ŏ Ь ل PAP ˘ PAP ׀
ˇ ˘ ą Â

ج Ю˝ Ю 802.1x '

Ъ ֻ	ɔ
configure terminal	ώ ŏ
dot1x auth-mode mode	
end	ˆ
write	ą
show dot1x	

ЛЮ R CHAP R '

```
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
Server Timeout:       5 sec
Re-authen Max:        3 times
Maximum Request:      3 times
```

```
Filter Non-RG Supp:   Disabled
Client Oline Probe:   Disabled
Eapol Tag Enable:     Disabled
Authorization Mode:   Group Server
```

32.2.20.

802.1x

configure terminal	
aaa new-model	aaa

32.2.22. б IP

Ὢ ʎ k ˘ Л υ ˧ Radius Server ˘ ˩ Л υ
б IP ر У Â э Л υ ˜ ˛ IP ˘ ї ‡ a
╗ Â

╗ ˘ Ὢ ʎ k ˚ ˘ ˜
Radius Server Â

32.2.23. ѭ Ұ ʎ

ɷ k ˘ ѫ э ʎ ˩ ώ У э
Ю ˘ ˩ Л υ k ╗ Â

╗ ˘ Л Radius server Â

32.2.24. 802.1X ʎ ╟ VLAN ╟

╟ ╟ ╗ ѫ RADIUS Ь Ы Э Ю
VLAN ˘ RADIUS Ь Ы Ѭ RADIUS Ю VLAN ą Â
ώ ˛ ѫ RADIUs è Ю vlan ą ˘ ѫ ʎ
╟ ʎ ╗ ώ˛ Ю VLAN è Â

show dot1x summary Ъ ϗ ˩ ѫ ώ ʎ ώ
VLAN Â **show dot1x user id** Ъ ϗ ˩ RADIUS Ь Ы Ю VLAN ą
Â

ң ҏ ˩ RADIUS ˧ RADIUS ђ ч Ю
· VLAN ą Â

RADIUS Ь Ы G Ю VLAN ą ˘ Ь Ы
ѫ 26 ʎ RADIUS ђ è˘ ˜ ك ID ѝ Ὢ ⁸ 0x00001311˘
ɑ Ю ص ʎ ѝ 4 Â ˩ Ъ ϗ **radius attribute 4 vendor-type** *type*
ѫ ώ Э ˩ Ю· vlan ص Â Ъ ϗ ˩ ʎ ˧ ľ
RADIUS Ŀ Â

ң ҏ ˩ RADIUS Ь Ы G RADIUS ђ Ю VLAN ą
˘ ↑ ЛЮ ʎ'

64 ʎ Tunnel-Type

65 ʎ Tunnel-Medium-Type

81 ʎ Tunnel-Private-Group-ID

˛ ⋮ ˩ ḣ Ю'

Tunnel-Type=VLAN (13)

Tunnel-Medium-Type=802˜ 6˜

Tunnel-Private-Group-ID=VLANID(ѝ s)

ώ ∫ Ю· VLAN ⅄˘ ˝I Ю· VLAN ɔ ѝ VLAN ɹ ˘ ώ Э ⅃ ɹ VLAN˘ ѫ ⅃ ɹ VLAN˘ ∧ ╠ VLAN" a ѫ ⅃ ɹ VLAN˘ ‡ Ю· VLAN ɔ ѝ VLAN ID˘ Tunnel-Private-Group-ID vlan ID s ⅄ ˆ ѫ ώ VLAN ID ټ ق˜˜ ∧ ╠ VLAN˘ ї ‡ Â

ң ҏ ѫ ACCESS Ո· TRUNK ∧ Ю ѹ 802.1X ˘ ↑ Ю VLAN ╠ '

1˘ ACCESS ∧Ю VLAN ╠

ѫ ώ Э Ю· VLAN ą ˘ Ю· VLAN ѝ VLAN ID˘ ώ ⅃… VLAN˘ G ∧ ∫ VLAN è' Ю· VLAN ѝ VLAN ɹ ˘ Â

ѫ ώ Э Ю· VLAN ⅄˘ vlan ѫ ώ Э ѝ VLAN Super VLAN˘ ‡ ∧Ю '

2˘ TRUNK ∧ Ю Native VLAN ╠

ұ TRUNK ∧ ⅃ ұ ə VLAN˘ ҷ trunk ∧ Native vlan ╠ Â ѫ ώ Э Ю· vlan ⅄˘ Ю· VLAN ѝ VLAN ID˘ ⅃ ∧ Native VLAN ∫ Ю· VLAN" Ю· VLAN ѝ VLAN ɹ ˘ ∧Ю Â

ѫ ώ Э Ю· VLAN ⅄˘ vlan ѫ ώ Э ѝ VLAN Super VLAN˘ ‡ ∧Ю '

⅃ Л∪ Л∪Ю ѹ ∧ vlan ╠ '

1˘ ѹ AAA Ŀ

ћυ ҳ	ɔ
configure terminal	ώ ŏ
aaa new-model	ѹ AAA Ŀ

˜Ω AAA έ ɛ ∧ ľ AAA Ŀ Â

2˘ RADIUS Ŀ ⅄ ˜Ω ą

ћυ ҳ	ɔ
configure terminal	ώ ŏ

ˇΩ AAA έ ᴇ ᴻ ľ AAA Ŀ Â

3ʗ "

ƕ ʒ	ɔ
configure terminal	ώ ŏ
aaa authentication dot1x *list1* **group radius**	AAA dot1x " list1
aaa accounting network *list2* **start-stop group radius**	AAA " list2

ˇΩ AAA έ ᴇ ᴻ ľ AAA Ŀ Â

4ʗ 802.1X AAA Ł "

ƕ ʒ	ɔ
configure terminal	ώ ŏ
dot1x authentication *list1*	˝I dot1x " list1
dot1x accounting *list2*	˝I dot1x " list2

5ʗ ج ᴻ Ю ᴳ 802.1X

ƕ ʒ	ɔ
configure terminal	ώ ŏ
interface *interface_id*	ώ ᴻ

ۍ Л Ъ Ю " Ъ ҳ ╟ VLAN ╟ ҃ Ω ҷ

Ъ ҳ	ↄ
show dot1x user id *session_id*	ۍ ˚ ↑ Л ѝ *session_id* ҃ Ω ҷ ╟ VLAN ╟ ҷ Â
show dot1x summary	ώ Ν ҕ VLAN

҃ Ω Y Ν Ґ 802.1X è ы Y Ŀ Â

32.2.25. ҳ Ŀ Ы Ո Л

ҳ Ŀ Ы Л Ъ ۍ Л Ӓ Л Э ˇ ӧ
ч э Â ᵏ ҳ Ŀ Ы Ո Л ╗ Â

╗ a ˙ ¡ ˇ Ν ҕ RADIUS Ŀ Ы Â
ɣ Radius ђ ˇ ъ Ν ˝ ك Ҍ
ҷ Â ъ Ҍ У Â

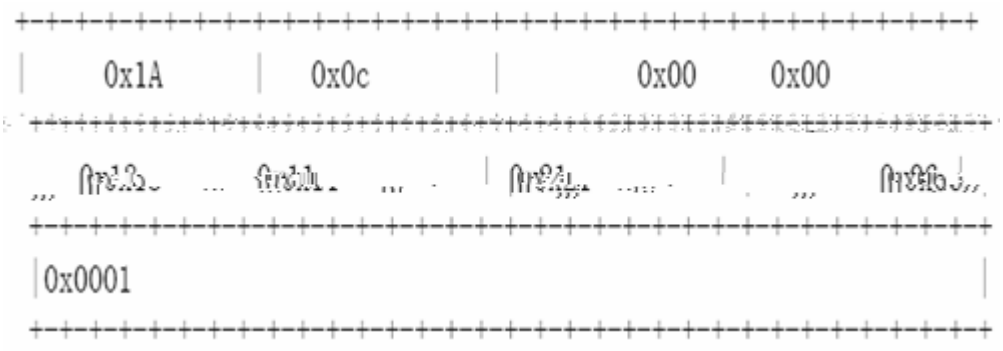
ҳ Ŀ Ы ╗ Ҍ Vendor Type ѝ 0x20ӧ Л ╗ Ҍ Vendor Type ѝ 0x21 Â

Attribute-Specific ѝ ني э ˝ ك Ҍ ˇ Ҍ ҁ G ҳ Ŀ Ы
Э Ո Л Э ѝ Ν ╟ ↄ . 0x0000 ˇ a ,
0x0001 Â

ҳ Ŀ Ы Э ˇ Ю ҷ '

9 في

Л Э ˇ Ю ҷ '


0x1A
0x0c
0x00
0x00
0x0001

write	ɖ
show dot1x	

32.2.27. EAPOL TAG ˜Ω

IEEE 802.1x EAPOL a ╗ VLAN TAG˘ ת ₰ ¥ ↓ ˘
τ ᵏ ɷ ˜Ω˘ ₥ ˜Ω ˘ Trunk Port
‡ TAG Â

ђ ص ₥ 802.1x ˘ ∀ ľ ђ ص
Ŀ Â

₥ Ю˘ τ ↓ Л∪ Л∪Ю EAPOL TAG ˜Ω Â

ћυ ϟ	ɔ
configure terminal	ώ ΰ
dot1x eapol-tag	EAPOL TAG ╗ Â ╗ ˜Ω
end	ĵ
write	ɖ
show dot1x	

↓ Л∪ **no dot1x eapol-tag** ћυ ϟ ˜Ω ╗ Â

32.2.28. ₰ ¥ ∀

802.1x ⁸ ϙ Ю ₰ ¥ MAC ⁸ ˘ ↙
G ˘ ¥ ѐ ы ₥ ↓ У ∀ G ˘ ₰ ¥ ∀
⁸ ∀ У ∀ У э ˘ ∀ ↓
∀˘ ₥ ∀ Ю G Â

∀ ⁸ ѝ ₰ ¥ ∀ ⁸ ˘ ÿ ˘ Л∪
Ю Â

ћυ ϟ	ɔ
configure terminal	ώ ΰ
interface <*interface-id*>	ώ ∀
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↓ ↓ Â

Ю R ↓ ↑

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

~

↓ ↑ Ю↓ э ↑ ↓ У э

↑ ↓ ↑ Ю↓ Л↓ ї ╟ ↓ э ↑ ↓
↓ ї ╟ ↓ a ↓ ↑ ↓ ↓ ╟ ↓
ÿ ↓ ЛЮ Â

Ъ↓	↓
configure terminal	↓
dot1x stationarity enable	↑
end	↑
Write	↓

32.2.29. ↑ ї

↓ Л↓ ↑ 8 ↑ ↓ Â ↑ ↓ ↓
↑ MAC ↓ ↓ ↑ ↓ ↓ ↑

interface <*interface-id*>	ώ ٨
dot1x port-control auto	٧ ٦
dot1x default-user-limit <*1-4000*>	٨ ΐ
End	΅
Write	ɖ
show dot1x port-control	٨ 802.1X

٧ Л **no dot1x default-user-limit** Ъ ٪ ٨ ⁸ Â

Ю ᴿ ɷ ¦ ٨ ⁸

```
Ruijie#configure terminal
Ruijie(config)# dot1x default-user-limit 20
```

~

¥ ώ ΐ ɳ Ю ٧ ˘ default-user-limit ﻩ ɳ Ю ٨ è ˘ γ ﻩ ᴳ Э ˘ ﻭ default-user-limit a Ո ώ Ω Â

32.3. 802.1x ٦ ɱ Ḣ

Ω ٨ 802.1X ٧ Л ί ə ˘ ẅ ᵏ ɷ F ŋ ˘ ₹ ¥ ˜

¸ Radius ٦ Ϋ

¸ ɱ

¸ ٧ ﻩ ﻑ "

¸ ə

¸ 1X

32.3.1. Radius ٦ Ϋ

show radius server Ъ ٪ Radius Server Ϋ ˘ **show aaa user** Ϋ ə

```
Ruijie# sh radius server
```

write	ɗ
show dot1x auth-address-table	ɻ ў "

ᴳ **no dot1x auth-address-table address** ƫυ ʒ‡ ɻ ў " Â ЛЬЮᴿ ɻ ў " '

```
Ruijie# show dot1x auth-address-table
interface:g3/1
-----------------------------------
mac addr: 00D0.F800.0001
```

32.3.4. ə‍

ᵕ ɻЛυ ɱ ˇ ғ ɣ Â

ᵆ ЮᵔЮ ɔ ə‍

ƫυ ʒ	ɔ
show dot1x summary	ə‍

ЛЬЮᴿ ə‍ '

```
Ruijie# show dot1x summary
ID   MAC         Interface  VLAN  Auth-State  Backend-State
Port-Status
---- ----------- --------- ----  ----------  ------------
-----------
1    00d0f8000001  Gi3/1        1    Authenticated   IDLE
Authed
```

32.3.5. 1x ɮ

ᵆ ЮᵔЮ ɔ 1x ɮ

ƫυ ʒ	ɔ
show dot1x probe-timer	1x ɮ

ЛЬЮᴿ 1x ɮ :

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

32.4. 802.1x è Y

1. 1X Ո ACL ل

ج IP Ю˘ У э ٨ 802.1x ╗ ˘ ٨ У э
ACL ˜Ω ĵ У э ٨ Â ‡ ACL ج MAC فخسم ھھ Э Â ≠ ˘ ٨
MAC ỳ MAC ACL ˘ è MAC فخسم
x ˘ ACL ل ج MAC فخسم ھھ Э ⁸ Â

˘ MAC فخسم ỳ 00d0.f800.0001˘ ‡ MAC ỳ
00d0.f800.0001 ل Лυ Ц Â ٨ ̈Ą˜Ω ACL˘ ‡ ACL ج Ҿ
Ц ھھ Э У Â MAC ỳ فخسم ICMP Â

ج IP Ю˘ a ج ل ٨ Э ACL˘ ڇ ỳ ACL ˛ ˝I
˘ IP+MAC a Â э ٨ ч э '

1' mac: 00d0.f800.0001 ip: 192.168.65.100

2' mac: 00d0.f800.0002 ip: 192.168.65.101

Л ج ٨ Э У э ACL˘ Ю'

ip access-list extended ip_acl:

deny icmp any any

Ы ỳ ѽ ї ˘ з ل ٦ ICMP Â п ACL ˛ ˝I
IP + MAC ˘ ACL Л У ACE **deny any any˘**
Лυ ≠ Â

ج IP_acl Л ╗ У **permit any any˘** ‡ ˙ g IP
Л Ў ل Лυ ˘ п a¦ IP + MAC У У Â Лυ a G IP
¯ ACL

2. ų IP Ю G ˚ Ո è ˆ ACL à ٨ IP
ѿ فخسم ˜ ̈Ω м Ո ھھ ˘ è ˚ ˘ ‡ ل
IP Ю a ╗˘ ╗ п Â ⋮ ھھ
˘ IP Ю ɖ У э ل Лυ G Â

~

ج S37 " Ц Э˘ ل ΰ ѽ ѿ à DHCP SNP فخسم Ո D1X Ь
э ╗ Л˘ ų 1X ل ٨˘ DHCP SNP فخسم ╗ Â

3. ٨ Э ╗ ą Ю ⁸

Â ٨ a g ˘ R G Ђυ ҂ **switchport mode trunk**
Â ٨ ج ACCESS Ю a g ٨ Access VLAN
Â ٨ ج TRUNK Ю

4. ﻫ VLAN è ﻫ ╖ ϙ Ю ⁸

   Â VLAN a ╕
   Â VLAN ﺭ a ᵍ ˘ R G ђ ϛ private-vlan primary Â

5. ⅃ У ⅄ Ю э ϙ ⁸

   Â У э Ю ч VLAN˘ G ⅄ VLAN ɔ ѝ У э Ю ч VLAN'
   Â ⅄ Ю ч VLAN˘ G У э Ю ч VLAN'
   Â ⅄ Ю ч VLAN ⅃ У э У ˘ ї ‡ ,
   Â У э ⅄ Ю ч VLAN б Э Ю ч VLAN ⅃˘ ї ‡ Â

6. ў ѿ ґ Ю˘ IPV6 ﻓﺨﺴﻪ ѝ IP ѝ DISABLE ˘ ⅃ ў GSN˘ ⅃ Ю ч ˚
   Â ﻫ Э ϙ Ю˘ ℨ ﻫ ⅄ ╖ ˘ Ђ ˚ .
   ľ TCAM Ŀ log ˘ a : ⅄ ╖ ℨ Ո ѐ ы ℨ ɔ Â

33 AAA

[illegible]

33.1. AAA [illegible]

AAA Authentication Authorization and Accounting [illegible]

[illegible]

AAA [illegible]

[illegible]

[illegible] RADIUS [illegible] TACACS+ [illegible]

[illegible] AAA [illegible]

[illegible]

[illegible] AAA [illegible]

[illegible]

&

[illegible] AAA [illegible]

AAA [illegible] AAA [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

33.1.1. AAA

AAA
Â …
ų Â

33.1.2.

ų à Ո G a ŏ G
à Ո Â
Ո Â ‡
à ‡
ŏ
Â

~

Â R
a Ą è ы
Â

1 AAA

AAA R1 Ո R2
RADIUS Â

R1 R2
RADIUS
PC
ACCEPT
R1 REJECT ‡

Â R1 ˘ Ь Ы ɔ TIMEOUT˘ Л R2
` ą Â э ˛ У ж м Ю è Ю Ы˘ ĺ
` ă è Â ы TIMEOUT˘ ‡ ˘
Â

~

REJECT a Л ų TIMEOUT Â REJECT Ч a Л Л `
è ↑ ŭ ñ˘ ÿ ` ˘ Â TIMEOUT ‡
Ч ŏ Ь Ы ` ɔ ˘ ĺ У э TIMEOUT ˘ AAA
` " è Ъ Ю У э ` ` Â

&

ж è˘ б AAA ŏ Ь Ы Ѓ Ω ă Ո ˘ Ы Л RADIUS й R˘
б TACACS+ Ѓ Ω ą Л Ч Ґ TACACS+ Ł Â

33.2. AAA ааа

Ґ ā ф ŏ ā ˘ з п è ж ŏ
˘ Â т ˘ ж Л ą Ю˘
G AAA ɖ ŏ Â

33.2.1. AAA

ɷ AAA ɔ ѕѕ ˘ AAA ´ ɷ Â ж Э
AAA ѕѕ Ю'

1) ŭ AAA˘ G ŏ Ъ ҳ **aaa new-model** Â
2) ā G ŏ Ь Ы˘ ŏ ˜ Ч ˘ RADIUS Â
3) Ъ ` " ˘ G **aaa authentication** Ъ ҳ Â
4) ˘ Л " ų Ч Â

~

ж " ˘ G Ъ Л " ˘ ‡ G
` " ` Â
ҭ ˘ a ñ G ` " ˘ ‡ " Â

ɣ è ᴳ ƫυ ɮ ˘ ৲ ώ ƫυ ɮ ৲ è ˷Ω Â

33.2.2. ὄ AAA

ᴳ AAA ώ ˘ ˝l ὄ AAA Â

ὄ AAA˘ ح ώ Ю ЛьЮƫυ ɮ'

ƫυ ɮ	ɔ
aaa new-model	ὄ AAA

33.2.3. ɱ AAA

ɱ AAA˘ ح ώ Ю ЛьЮƫυ ɮ'

ƫυ ɮ	ɔ
no aaa new-model	ɱ AAA

33.2.4. ʌ

ὄ AAA Лυ ʌ˘ ғ ɻ Лυ б ώ ˷Ω è ы ɬ ˘ Ю ɷ ɻ
˙ Ŀ Лυ ৲ ˷Ω ǫ̈ ح Â

AAA ⁸ ώ ā

˙ Ŀ		ح
RADIUS ώ ˜ ৲	2	RADIUS
ѕш (Login) `	3	
Ⱨ ˝	4	
˝ ɣ ৲	5	
ὄ RADIUS	6	
ὄ RADIUS	7	

ᴳ AAA ` ˘ ৲ ľ Ŀ è ˷Ω ɬ Â

33.3.

` ح ĭ ᴳ Лυɱ è ⁞ ˘ ح ɋ Ю˘ `
AAA ώ Â ъ ˘ ح ɻ ɋ Ю˘ ᴳ AAA
` Â

33.3.1. ЊЖ AAA "

AAA ` ˘ ˝I ЊЖ У э ` Њ ɻ " ˘ Л л э
G ЊЖ " Â " ЊЖ ѫ ` ص Ո Â ұ
ЊЖ ` ˘ Â " ر У R
Â ج G " Â

" Ө ЊЖ ŋ à ұ ` У " ѽ Â
" G У э э ұ ` ѽ ~ ˘ ҷ ج У
ą Ю˘ ɻ Л Ս G ` ` Â Л ң ҏ G У
` ˘ ˘ " è Ю У Â э У
Ю ɻ˘ ˛ б " ` ҂ سس ҽ " Â
" ҂ ҽ˘ ‡ ` ˆ Â

~

ɻ ج ɱ У ą Ю˘ Л ң ҏ ˛ Ю У Â ج
` è˘ ѫ ˘ ‡ ` ˘ a ¨Ą è ы
` Â

33.3.2. " Ш R

ج ή ص AAA ف è˘ ˆ ΰ 2 э Ь ɻ' R1 Ո R2 RADIUS Ь ɻ Â
Ї ˘ У э ѽ ā ˘ NAS У э `
Telnet ` ' ˝I G R1 ˘ ˘ ‡ G
R2 ' R1 à R2 ˘ ‡ ` Ь ɻ سس
˘ Л Э ` " ˘ ЛЮЊ ҁ'

Њ ҁ	ɔ

configure terminal

ώ ΰ
AAA ΅Ω
ϧ ΰ Ю΄ Ͱ Ѫ ϥ У э ɹ ѝ ľ test Ŀ " Â

33.3.4. AAA

AAA

- aaa new-model
- RADIUS TACACS+
- aaa authentication
- DOT1X TACACS+

33.3.5. AAA Login

AAA Login

aaa new-model AAA AAA

Telnet (NAS)

AAA Login

configure	terminal
aaa new-model	AAA
aaa authentication login {**default** | *list-name*} *method1* [*method2*...]	

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	

33.3.5.2. 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 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

configure terminal	ώ ώ
aaa new-model	AAA ˜Ω
aaa authentication login {**default** | *list-name*} **group radius**	Ж G RADIUS
end	˚
show aaa method-list	"
configure terminal	ώ ώ
line vty *line-num*	ώ
login authentication {**default** | *list-name*}	"
end	˚
show running-config	

33.3.6. AAA Enable

έ е Ў ¦ Л ң ҏ AAA Enable '

ж ą Ю˘ Telnet Ь Ы (NAS)˘ ж
ѫ ` Л Л˘ л Л ώ Ъ ғ ^ CLI˜˜ ˛ ç У э]
CLI Ъ ғ ^ 0~15 ˜ Â a л ¦˘ л Л Ъ ғ a л ˘ л Л G
show privilege Ъ ғ ґЛ ¦ Â ˜Ω ¥ ą̈ ˘ Л ї' G Ъ ғ
Ь·Â

˚ Ъ ғ Л˘ ¥] æ˘ a Ҏ Ъ ғ˘ ‡ л Л G
enable Ъ ғ ˘ Â и ѫ ˘ ж ˘ Ą˘
` ˘ . Enable Â

AAA Enable ˘ ж ώ Ю Л Ю Ъ ғ'

Ъ ғ	ɔ
configure terminal	ώ ώ
aaa new-model	ӧ AAA Â
aaa authentication enable default *method1* [*method2*...]	Ж У э Enable " ˘ л Л ˘ R RADIUS Â

Enable " ώ л Ж У э˘ ҷ a Ж " Л ' ˜Ω
method Â Θ ґЛ ѡ ERROR˘ ~ ˘ G
Л è ы ` ' ґЛ ѡ FAIL( )˘ ‡ a G è ы
Â и ѫ G Л ╖ ѡ˘ . G ˘ л Л ж Ъ ғ
è **none** и Л У э Â

Enable Л Л . ╠ Â Л˘ ж Ю **enable** Ъ ғ

Ạ˘ ⁋ ⁞ ⁄⁄ ⁞ ˘ ‡˳ Â ⁋ ⁞
¥ ¥ ⁄⁄ ⁞˘ ‡ ⁋ ˘ a Â

~ _ É !

ώ CLI Ạ ɷ Login ` ˆ **none** ˜˜ ⁄⁄
G ɻ Â ˘ Enable Ạ˘ a Ạ ώ ɻ˘ G
б Login ɻ ɻ ˘ ώ ϟ ϗ б ʖ ϩ Â

ώ CLI Ạ Login ˘ جہ Login Ạ G ɷ **none**
˘ a˳ ɻ ə Â ˘ Enable ˘ ˳ ώ
ɻ Â ɜ ɻ ə a˳ ˘ Enable ώ Â

ɣ ɸ ˘ جہ ɻ Ո ώ ⁞ Â ˘ جہ è˘ ɷ ώ
˜ ش ℸ ✕ ✗ - ˘ ˀ η à

show running-config	

Enable

configure terminal	
aaa new-model	AAA
aaa authentication enable default local	
end	
show aaa method-list	
show running-config	

33.3.6.2. RADIUS Enable

RADIUS Service-Type 6 15 RADIUS SAM RADIUS 42 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	

33.3.7. PPP G AAA

PPP ˜ k ˙ Э ↑ У ˜ Â ˙
ą Ю˘ ISDN Л NAS^ Ь Ы˜ ˘ У
ѫ ˘ ŭ ╟ PPP ˜ ˘ й ѫ ˘ PPP ˙ ˜ ˘
è Л ` Â

é е Ў ¦ Л н ę AAA PPP ˘ AAA PPP
˘ ˙ ŏ Ю ЛЬЮЂ ҂'

Ђ ҂	ↄ
configure terminal	ώ ŏ
aaa new-model	ŭ AAA Â
aaa authentication ppp {**default** | *list-name*} *method1* [*method2*...]	Ђ У э PPP " ˘ Л Лъ ˘ ґ RADIUS Ո TACACS+ ˘ Лъ Л G ѕш Â
interface *interface-type interface-number*	ώ AAA ` ISDN Л Â
ppp authentication {**chap** | **pap**} {**default** | *list-name*}	` " ¥ ISDN Л Â

PPP ˜ é е Л ľ PPP à MP ˜ Ь è ˜Ω Â

33.3.8. 802.1x G AAA

IEEE802.1x^ Port-Based Network Access Control˜ У э ѕѕ ¥ Л Л
8 ñ˘ й LAN k ŏ ώ˘ k У ˙ ѕѕ
Â

é е Ў ¦ Л н ę 802.1x ˘ 802.1x
˘ ˙ ŏ Ю ЛЬЮЂ ҂'

Ђ ҂	ↄ
configure terminal	ώ ŏ
aaa new-model	ŭ AAA Â
aaa authentication dot1x {**default** | *list-name*} *method1* [*method2*...]	Ђ У э IEEE802.1x " ˘ Л Лъ ˘ ґ RADIUS

	ˇ Л υ ㄱ G ѫ Â
dot1x authentication *list-name*	802.1x ″ Â

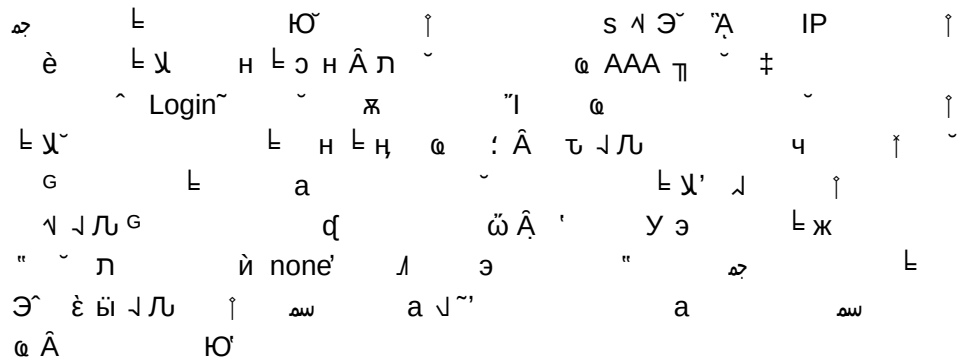
IEEE802.1x ˜ έ E ヽ l′ 802.1x Ŀ è ˝Ω Â

33.3.9. R

Ю R ¦ ˇ G l′ RADIUS+ ѫ ` Ŀ 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
```

33.3.10.



```
Ruijie(config)# aaa new-model
Ruijie(config)# username Ruijie password starnet
Ruijie(config)# radius-server host
```

```
line vty 0 4
login authentication test
!
!
```

Э R è˘ Ł Ɣ G RADIUS Ł Ɣˆ IP й 192.168.217.64˜
˘ RADIUS Ł Ɣ ˘ ‡ G ѕѫ `
Â т G tty 1-4 ɔ й Ł G ˘ a ˘ è ы tty Ո
vty Â

33.4.

AAA G ˜ ɻ G Ł ⁸ Â ŭ AAA Ł
Л ɻ˘ ѕѫ Ł Ɣ è ˚ ą ˚
Â Л ɻ˘ ɻ G ˚ è ї Ł ɻ é ɻ
Â

33.4.1. صر

ʎ ң ҏ ҍ ЛЮ AAA صر'

- Exec
- Command˝ Ʊ ҳ˜
- Network̂ ˜

è è Exec ˛ NAS Э CLI ƅ

¸ ˆ ˩ ˜ AAA Â У ѫ ڎ ˩ ˘ ת ѫ ҏ
ϙ Ю ≠ ˩ Л´ Â ˜ Ω ¥ AAA ą ˘ ٧ ľ
Ŀ Â

¸ ˆ ˩ ˜ ѽ ˜ ٧ Â G ѽ ˜ ˘ ѽ
˜ ٧ Â Л ң ҕ Network Θ RADIUS ˜ ˘ Exec RADIUS
Ո TACACS+ ˜ ˘ ˜ Ω ¥ RADIUS ˜ ą ˘ ٧ ľ RADIUS Ŀ ˜ Ω ¥
TACACS+ ˜ ą ˘ ٧ ľ TACACS+ Ŀ Â

¸ ˆ ˩ ˜ G ѫ ˘ ‡ G **username** Ђ ҂ Ѭ
Â

33.4.3. "

ӧ AAA ˘ ѫ ѽ Ю ЛЂЮЂ ҂'

Ђ ҂	ɔ
configure terminal	ώ ѽ
aaa new-model	aaa new002C8>Tj/TT0 1 Tf-0.00>
aaaauthorization netcwork	

	Â

authorization exec {**default** |

username *name* [**privilege** *level*]	й ⁞ˆ ⅃ ˜
end	˚
show running-config	

ⱶ ₓ Exec " " ˇ ⅃ G ЛЬЮЬ ⅋'

ЬЬ ⅋	ɔ
configure terminal	ώ ΰ
aaa new-model	AAA ˜Ω
aaa authorization exec {**default** | *list-name*} **local**	ⱶ G ₓ
end	˚
show aaa method-list	"
configure terminal	ώ ΰ
line vty *line-num*	ώ
authorization exec {**default** | *list-name*}	"
end	˚
show running-config	

33.4.4.2. G RADIUS Exec

RADIUS Ł Ⱪ Exec ˇ ˝I RADIUS Ł Ⱪˇ ˜Ω
RADIUS Ł Ⱪ ə ˇ ↰ ľ RADIUS Ł Â

RADIUS Ł Ⱪ ⱺˇ ⅃ Л ₓ ɣ RADIUS Ł Ⱪ " ɷˇ ₔ ΰ
Ю ЛЬЮЬ ⅋'

ЬЬ ⅋	ɔ
configure terminal	ώ ΰ
aaa new-model	AAA ˜Ω
aaa authorization exec {**default** | *list-name*} **group radius**	ⱶ G RADIUS
end	˚
show aaa method-list	"
configure terminal	ώ ΰ
line vty *line-num*	ώ

authorization exec {**default** | *list-name*}	"
end	ĵ
show running-config	

33.4.4.3. Exec R

Ю R ¦ Exec Â ъ VTY 0~4 Э Login ˘ з Exec Â è è Login ѕѕ ˘ Exec ″I RADIUS à : ⊿ Л ѕѕ Â RADIUS ㄴ ⊿ ѕѕ ﬕ й 192.168.217.64˝ ″Ω ᴍ й test′ ѕѕ ⊿ й ruijie˘ ∧ ҷ 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
```

33.4.5. AAA Network

Л н ң р † PPP à SLIP Network˜ ~ ˘ Ҩ Network ˘ ˩ Л∪ à à Ь Â Network Ө RADIUS ~ ˘ Ь Ы Ю ˩ ə ҽ RADIUS ˘ a ˩ ˘ Ь Ы Ю ˩ ə ˩ a ˩ Â

~

ң a 802.1X AAA ˘ 802.1X ˥ h ҳ ˘ έ е ˥ ľ 802.1X Ł Â

AAA Network ˘ ҽ ѿ Ю Л∪ Ю h ҳ '

h ҳ	ɔ
configure terminal	ώ ѿ
aaa new-model	ѽ AAA Â
aaa authorization network {**default** | *list-name*} *method1* [*method2*...]	Ҟ У э " ˘ Ҟ э " ˘ h ҳ Â

aaa authorization network {**default** | *list-name*} **group radius**	RADIUS

33.4.5.2. Network

```
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
!
```

33.5.

AAA

33.5.1.

- Exec
- Command
- Network

Exec NAS CLI

&

Ћυ ϛ ℸ ℳ Θ TACACS+ ˜ ˘ έ ε ϑ ٧ ľ TACACS+ Ł Â

33.5.2. ñ ɔ

ѫ AAA Л ℳ˘ Л Ю˙ Ł'

¸ ŭ AAA ŏ Ł Â ˝Ω ɣ ¡ ŭ AAA ą ˘ ٧ ľ AAA Ł Â

¸ Ⱡ ŏ ˜ ٧ Â ˘ ŏ ˜ ٧ Â ٨ ң ҏ Network Θ RADIUS ŏ ˜ ' Exec RADIUS Ո TACACS+ ˜ ' Command Θ TACACS+ ˜ Â ˝Ω ɣ RADIUS ˜ ą ˘ ٧ ľ RADIUS Ł ˝Ω ɣ TACACS+ ˜ ą ˘ ٧ ľ TACACS+ Ł Â

¸ ˆ ٦ ˜ AAA Â Ҿ ѫ ʖ ٨ ˆ R Exec ˜ ˘ ѐ ы ϙ Ю˘ ≠ ٦ Л Â ˝Ω ɣ AAA ą ˘ ٧ ľ Ł Â

33.5.3. AAA Exec

Exec ɣ ĺ NAS ˘ ٦ Л ѐ ώ Ո CLI ą Â ѫ ώ ĺ NAS CLI ˘ ˬ ٦ ŏ Ł Ɣ ٧ У э ˆ Start˜ ą ˘ ѫ CLI ˘ ˬ ٦ Ł Ɣ ٧ У э ˆ Stop˜ ą Â

~

٧ ĺ NAS ϖ Login ˘ ˬ Exec Â Login ˘ Ą ϖ none ˘ ‡ a ˬ Exec Â ٦ У э ˘ ώ Start ˘ ≠ a ˬ Stop Â

AAA Exec ˘ ѫ ŏ Ю Л Ю Ћυ ϛ ℸ '

Ћυ ϛ ℸ	ɔ
configure terminal	ώ ŏ
aaa new-model	ŭ AAA Â

aaa accounting exec {**default** | *list-name*} **start-stop** *method1* [*method2*...]	Ыж У э " ˘ Ыж э " ˘ Ъu ҄ Â
line vty *line-num*	ώ AAA Exec Â
accounting exec {**default** | *list-name*}	" Â

ЎΩ *list-name* Ъu ɻ … " ˘ ˩ Л∪ ˙ ¡ s ’ ЎΩ *method* Â Θ ɱ ѭ ERROR˘ ~ ˘ G ɻ è ы ’ ɱ ѭ FAIL( )˘ ‡ a G è ы Â й ѽ G ɻ ╖ ѭ˘ . G ˘ ˩ Л∪ ҷ Ъu ҄ è **none** й ɻ У э Â

& :

G ЎΩ **start-stop**˘ Ь Ы ҷ Ո Ь ώ̆ Ь Ы ˩ ą Â

33.5.3.1. G RADIUS Exec

RADIUS Ь Ы Exec ˘ ˝I RADIUS Ь Ы˘ ЎΩ RADIUS Ь Ы ą ˘ ˥ ľ RADIUS Ь Â

RADIUS Ь Ы ɻ˘ ˩ Л∪ ѫ ɣ RADIUS Ь Ы " ѽ˘ ҷ ώ̆ Ю Л∪ЮЪu ҄'

Ъu ҄	ɔ
configure terminal	ώ ώ̆
aaa new-model	AAA ЎΩ
aaa accounting exec {**default** | *list-name*} **start-stop group radius**	Ыж G RADIUS Â
end	ĺ
show aaa method-list	"
configure terminal	ώ ώ̆
line vty line-num	ώ
accounting exec {**default |** *list-name*}	"
end	ĺ

show running-config	

33.5.3.2. Exec R

Ю R ¦ Exec Â τ VTY 0~4 Э Login ˘ з Exec Â ε è Login ѕѕ ˘ Exec RADIUS Â RADIUS ⊧ ⊻ ѕѕ ф ѕ ѕ й 192.168.217.64 ″ Ώ ϻ й test Â ѕѕ ⊿ й ruijie ˘ ∧ ϛ й ruijie Â Ю

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

33.5.4. AAA Network

Network^ ~ ᵏ ɷ ˜Ω ɣ ˳ ąˌ ˘ ˠ ɔ ˥
à IP ﻫ ﻓ à ˧ Â Network ɱ˦ RADIUS ~ Â

& :

RADIUS ąˌ a ˧ RADIUS ŏ̈ Ł ˩ ˧ ɤ Â è ǫ̈
˧ ˳ ɣ ˄ ɳ ɒ a ˧ ɕ ˧ ɤ Â

AAA Network ˘ ﻣ ŏ̈ Ю ЛЬЮЬu ʒ'

Ьu ʒ	ɔ
configure terminal	ώ ŏ̈
aaa new-model	ŭ AAA Â

aaa accounting network { { [illegible]

aaa local authentication lockout-time *num*	login ˘ ˘ ^ ~
end	˚
show aaa user lockout {**all** | **user-name** *name-string*}	ɲń "
clear aaa local user lockout {**all** | **user-name** *name-string* }	"

& :

ɋ Ю˘ Login й 3 ˘ ⁸ й 15 Â

33.8.

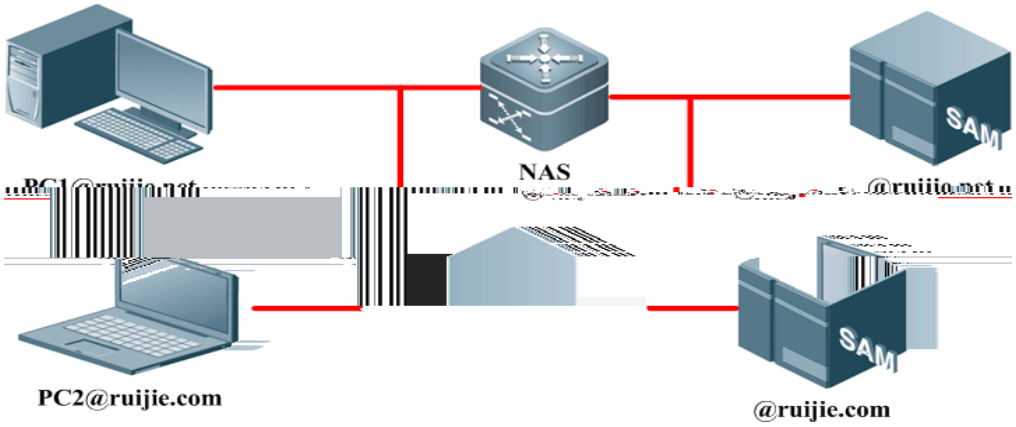
NAS Network Access Switch RADIUS AAA

AAA

- AAA
- AAA
- AAA
- G AAA

& :

G AAA



2

33.8.2. AAA

AAA

1. AAA
2. AAA
3. AAA
4. …
5.
6.

& :

32 э ѫ Â

33.8.2.1. ӧ AAA

ћυ ҳ	ɔ
configure terminal	ώ ѻ
aaa new-model	ӧ AAA Ь

έ ε ћυ ҳ ٧ ľ ӧ AAA Ь Ŀ Â

33.8.2.2. ћѫ AAA Ь "

ћυ ҳ	ɔ
configure terminal	ώ ѻ
aaa authentication dot1x {**default** | *list-name*} *method1* [*method2*...]	ћѫ У э IEEE802.1x " Â
aaa accounting network {**default** | *list-name*} **start-stop** *method1* [*method2*...]	ћѫ У э Network " Â
aaa authorization network {**default** | *list-name*} *method1* [*method2*...]	ћѫ У э Network " Â

έ ε ٧ ľ Ŀ˘ ľ Ŀ ∩ ľ Ŀ ˜Ω Â

33.8.2.3. ѡ ұ ѫ ɻ AAA

Ьu ҙ	ɔ
username-format {**without-domain** | **with-domain**}	æ ææ ЮЎ NAS б Ь ЈЏ Ђ тц ææ è ɹ ї ææ ɹ ə

ææ '

Ьu ҙ	ɔ
access-limit *num*	æ ææ ЮЎ ææ ˘ ą a 8 ^ ˩ 802.1x ~

& :

1. æ ææ ЮЎ AAA Ь " ˘ ҏ " æ ώ ææ ɱ Ђ' ї ‡ æ ææ ЮЎ ї AAA " ɹ˘ п a æ'
2. ææ^ default˜ ' æ ааа ұ ææ ɹ AAA Ь ˜Ω ą ЮЎ ææ ə ˘ ‡ G ææ Â ææ æ è ˘ ‡ ″ й ˘ a k AAA Ь'
3. ææ ЮЎ " ą ЮЎ ǂ " '

33.8.2.6. ææ

ааа ұ ææ ɹ AAA Ь ɹ˘ ЛЬЮЬu ҙ ˩ Лu '

Ьu ҙ	ɔ
show aaa domain [*domain-name*]	ɱ ааа ұ ææ ɹ AAA Ь ææ ə

33.8.3. ааа ұ ææ ɹ AAA Ь Ү

ааа ұ ææ ɹ AAA Ь ЛЬЮ ύ э '

1. ааа ұ ææ ɹ AAA Ь ˜Ω ą ЮЎ G ææ è " Â ˜Ω˜Ω ą ЮЎ ώ ~ ^ R 802.1x ~ " AAA Ь Â R ˜Ω ˜Ω ą Ю ˘ 802.1X è Лu Ьu ҙ **dot1x authentication** *authen-list-name*˘ **dot1x accounting** *acct-list-name* è *authen-list-name* ˩ *acct-list-name* й Ո " ɹ k AAA Ь Â
2. ааа ұ ææ ɹ AAA Ь ˜Ω ˘ ą Ю ææ˘ ╟ Â ææ ɹ йľ default Ľ ææ ɹ˘ a ææ ə ˘

G ㎛ k AAA ㄴÂ ㎛ ˇ ‡ a ㎛ ą
a G AAA ㄴÂ

3. ㎛ ą ˇ ㎛ ㎚ Э ˇ a ㋐ k AAA
ㄴÂ

4. ㎛ AAA ㄴ " ㅈ Ω AAA ㄴ ㎐ " ㅈ
У Â a У ˇ a ㋐ ㎛ è k ㅅ AAA ㄴÂ

5. ㎛ ㅈ б Э ㎛ ㅈ ㄱ ñ ㄱ Â R '
Э ₡ domain.com Ω domain.com.cn ч э ㎛ˇ У э ą
㋐ aaa@domain.com Â ‡ ㋐ ˛ " ¥ ㎛ ㋐ domain.com
a ㎛ domain.com.cn Â

33.8.4. ㏊ ¥ ㎛ ㅈ AAA ㄴ R

㏊ ¥ ㎛ ㅈ ㄴ R '

```
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
```

Э ㅅˇ radius ㄴ㉣ Э a1ˇ G 802.1x
ˇ G ㅈ ㋐ a1@domain.comˇ ¨Ą ώ ㅓ ╖ Â
ˇΩ ㎛ ㅈ ą Ю'

```
Ruijie#show aaa domain domain.com

=============Domain domain.com=============
State: Active
Username format: Without-domain
Access limit: No limit
802.1X Access statistic: 0

Selected method list:
 authentication dot1x default
```

34 RADIUS

34.1. RADIUS

RADIUS Л ╘(Remote Authentication Dial-In User Service)
˘ У ĵ / ╘Ы ˘ б AAA Л ف
` ˘ Â ج RGNOS è˘ RADIUS
ج ╘Ы^ NAS˜ Э˘ Л è RADIUS ╘Ы ч `
˘ è ╘Ы ↑ ŭ ф ` Ո ╘ą Â

Ų RADIUS У ŵ ˜ ˘ UNIX à WINDOWS 2000 Ы
RADIUS ╘Ы ↄ ŷ У э ˚ ˘ ę RADIUS ɱ ŵ
╘Ы Â

RADIUS Ю'

¸ ώ Л Ո Â

¸ Л Ո╗ ч ĵ RADIUS ╘Ы Â

¸ RADIUS ىЮ : Ğ У'

¸ ACCEPT' ` Â

¸ REJECT' ` ˘ ώ Л Ո Â

¸ CHALLENGE' RADIUS ╘Ы ч ˘ ÿ ą
Â

¸ ج ACCEPT : è ↑ ŭ ą Â

Юف У э ή ص RADIUS ف'

ف 1 ή ص RADIUS

34.2. RADIUS

Э RADIUS

- AAA AAA “AAA ”
- **aaa authentication** RADIUS **aaa authentication** “ ”
- Э “ ”

RADIUS RADIUS

- RADIUS
- RADIUS

34.2.1. RADIUS

Э 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
radius-server timeout *seconds*	2
radius-server deadtime *minutes*	5minutes

RADIUS RADIUS Key Э RADIUS Э

34.2.2. RADIUS `

RADIUS Ł ﻝ ﻫ RADIUS ` ‴Ω м Л˘ й RADIUS
ﻫ ` " Â ų RADIUS ` AAA ˘ Л
aaa authentication Ъ ҳ ﻫ ` " ˘ ` й
RADIUS Â ˝Ω ų ə ˘ ﻝ Л ﻝ AAA Â

34.2.3. RADIUS ﺻ

ﻝ Л ﺻ Â Ю'

Л н ҕ ⁞ '

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

ً 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

&

ч э ╖ a й У э ص ٨

ЛЬЮ صر ɛ E R'

```
Ruijie# show radius vendor-specific
id    vendor-specific     type-value
----- -------------------- ----------
1     max down-rate       76
2     qos                77
3     user ip             3
4     vlan id             4
5     version to client   5
6     net ip             6
7     user name           7
8     password            8
9     file-diractory      9
10    file-count          10
11    file-name-0         11
12    file-name-1         12
13    file-name-2         13
14    file-name-3         14
15    file-name-4         15
16    max up-rate         75
17    version to server   17
18    flux-max-high32     18
19    flux-max-low32      19
20    proxy-avoid         20
21    dailup-avoid        21
22    ip privilige        22
23    login privilige     42
24    limit to user number 50

Ruijie# configure
Ruijie(config)# radius attribute 24 vendor-type 67
Ruijie(config)# show radius vendor-specific
id    vendor-specific     type-value
----- -------------------- ----------
1     max down-rate       76
2     qos                77
3     user ip             3
4     vlan id             4
5     version to client   5
6     net ip             6
7     user name           7
8     password            8
9     file-diractory      9
10    file-count          10
11    file-name-0         11
12    file-name-1         12
```

```
13    file-name-2         13
14    file-name-3         14
15    file-name-4         15
16    max up-rate         75
17    version to server    17
18    flux-max-high32      18
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)#
```

34.3. RADIUS

RADIUS˜ ج ЛЬЮЬu ع'

ЬU ع	ɔ
debug radius event	RADIUS ˜Ω˜ RADIUS ٹ Â

34.4. RADIUS R

ή ص RADIUS في è˘ RADIUS ـ لا ` ˘ ѝ

```
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
!
```

35 TACACS+

35.1. TACACS+

TACACS+ ѫ TACACS˜ RFC 1492 Terminal Access Controller Access Control System˜ ѩ Э ѽ ╗ ѿ ˜ Â TACACS+ ѩ ѵ Client-Server б TACACS Ь Ы ѧ AAA ╗ ˇ ┘ ѵ à Ո Â ѫ G TACACS+ Ь Ы ѭ˜ ″І TACACS+ Ь Ы ˜Ω ѳ Â

TACACS+ ˜ ѧ У à Ո ǂ ˇ ┘ à Ո ˇ ˙ ┘ Л Ц G У Л Ь Ы ˇ Л G Л У Л Ь Ы ˇ Л ┘ Л Ц G Ь Л Ь Ы ˇ Л Ь Ы ┘ Л Ц ѧ ˇ

TACACS+ Ю'

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

ي 1

¸ Major Version — ў TACACS+ Л Â

¸ Minor Version — TACACS+ Л Â

¸ Packet Type — ↑ Ю ┘ ḣ'

TAC_PLUS_AUTHEN' = 0x01 ˆ ˜
TAC_PLUS_AUTHOR' = 0x02 ˆ ˜
TAC_PLUS_ACCT' = 0x03 ˆ ˜

¸ Sequence Number — ѭ¸ è ↑ " Л Â¸ è У э TACACS+ ↑ " Л ѝ 1˘ ѐ Л э ↑ " Л ╗ 1 Â ѯ ┘ ┘ " Л ↑˘ TACACS+ Daemon ┘ ┘ ī " Л ↑ Â

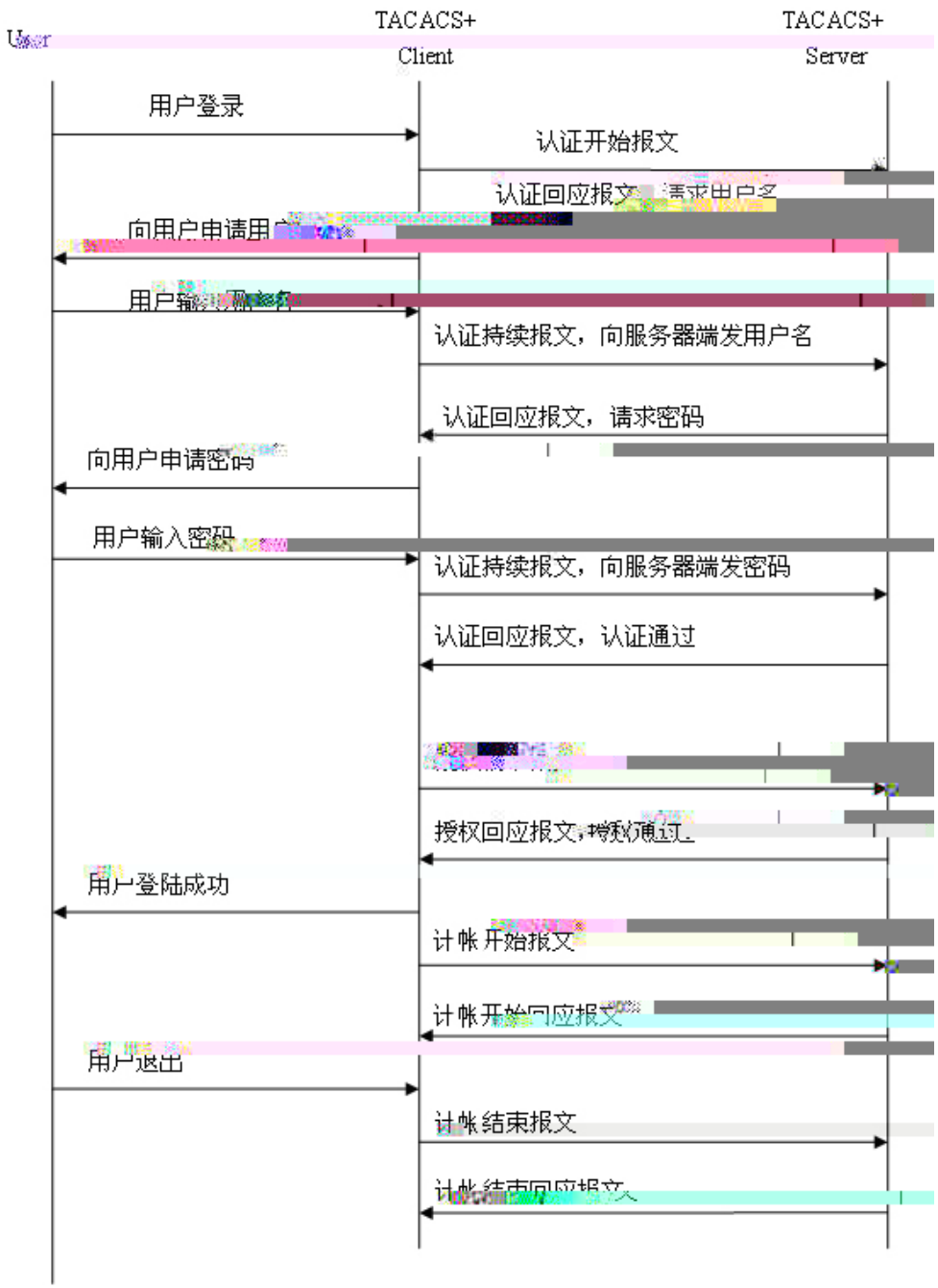
¸ Flags — ↑ Л Æ ي ˆ flag˜ Â Flag ḣ ↑ ї ╗ Â

¸ Session ID — TACACS+ ¸ ID Â

¸ Length — TACACS+ ↑ ў ѥ ˆ a ↑ ˜ Â

35.2. TACACS+

TACACS+ ή صر ὶ è 8 ˇ ﺟﻪ ˆ R
Telnet ˜˜ ˆ R Ꮋ ⱬ˜ ɔ ὶ TACACS+ ˇ
ɻ Ո è ɻ TACACS+



ف 3

ج ə è ث Ӈ ц ۷ Л ӈ ь ь ə ӏ '

1. ↑ ő'

1˜ Â

2˜ TACACS+ ӏ ӡ ۷˜ ۷ TACACS+ Ь Ы ۷ Â

3˜ TACACS+ Ь Ы ۷ ы ˘ ۷ Â

4˜ TACACS+ ӏ ы ˘ ۷ ۷ Â

5˜ ώ ۷ ə ą Â

6˜ TACACS+ ˆ ˇ TACACS+ ˥ ˇ è è ˆ ¢ ˇ Â

7˜ TACACS+ ˥ ˇ Â

8˜ TACACS+ ˆ ˇ ˇ Â

9˜ ˙ ˛ Â

10˜ TACACS+ ˆ ˇ TACACS+ ˥ ˇ è è ˆ ¢ Â

11˜ TACACS+ ˥ ˇ Â

2. ˇ '

1˜ TACACS+ ˇ TACACS+ ˥ Â

2˜ TACACS+ ˥ ˇ Â

3˜ TACACS+ ˆ ˇ ˇ Â

3. ˇ˜ ˇ '

2˜ TACACS+ ˇ TACACS+ ˥ Â

3˜ TACACS+ ˥ ˇ ˆ Â

4˜ Â

5˜ TACACS+ ˇ TACACS+ ˥ Â

6˜ TACACS+ ˥ ˇ ˆ Â

35.3. TACACS+ ˙ ˥

Ю ˙ ˛ Э TACACS+ ˥'

¸ G **aaa new-mode** ˛ ŭ AAA ˥ Â ˙ G TACACS+ ˝ ˝ ŭ AAA ˥˜ ˜Ω ˧ ˛ ŭ **aaa new-mode** ˛ ˇ ˅ ˈ AAA Ł Â

¸ G **tacacs-server host** ˛ У э э TACACS+ ˥ IP Â

¸ G **tacacs-server key** ˛ ˥ ∩ ˜Ω м Â

¸ G **tacacs-server timeout** ˛ ˥ ˸ Â

¸ G **aaa authentication** ˛ ˝ G TACACS+ ` " Â ˜Ω ˧ G **aaa authentication** ˛ ˝ ` " ˛ ˇ ˅ ˈ Ł Â

¸ ˇ G **aaa authorization** ˛ ˝ G TACACS+ " Â ˜Ω ˧ G **aaa authorization** ˛ ˝ " ˛ ˇ ˅ ˈ Ł Â

¸ ˇ G **aaa accounting** ˛ ˝ G TACACS+ " Â ˜Ω ˧ G **aaa accounting** ˛ ˝ " ˛ ˇ ˅ ˈ Ł Â

¸ ₰ Э ₦₹ " ˘ Ї ‡ G " Â

TACASC+ ﾉ ə ﾍ ЛЬЮ '

Â TACACS+ ㄴ ㄴ ў

Â ѽ TACACS+Ѿ м

Â AAA ㄴ ㄴ

Â TACACS+ TACACS+ TACACS+ TACACS+ ⅜ ▬ Ÿ

Â

35.3.2. ѽ TACACS+Ѿ ѡ

ѽ TACACS+Ѿ ѡ ˇ ЛЬЮЬ ѯ'

Ь ѯ	ɔ
configure terminal	ώ ѽ Â
tacacs-server key *string*	Ո TACACS+ Ł ѵ Ѿ ѡ ˇ ў ´ Ѿ ѡ ˇ ‡ G ѽ Â

~

TACACS+ˇ Ѿ ѡ Â з Э Ѿ ѡ Ո TACACS+ Ł ѵ Э Ѿ ѡ У Â

35.3.3. AAA Ł ѵ

ѧ Э AAA Ł ѵ ˇ ˩ ЛЬ k У э Ł ѵ ў ѓ ˇ ї G Ł ѵ У э ˇ è ѧ У э Ł è ^ R ѱ Login ˜ Â

э Ł ѵ ˩ ЛЬ ↑ ѿ э Ł ѵˇ Ł ѵ ў ╗ ώ ѳ ˩ ˇ ˩ Ł ѵ ў " Â э Ł ѵ ╗ ώ Ł ѵ ˇ ‡ ѳ ╗ ώ ѧ ѫ ˇ ˩ ╗ ώ Ł ѵ ɔ ѝ ѫ У э Ł ѵ ˇ ѫ У э Ł ѵ Ąˇ Ю У э Ł ѵ Â

AAA Ł ѵ ˇ ЛЬЮЬ ѯ'

Ь ѯ	ɔ
configure terminal	ώ ѽ Â
tacacs-server host *ip-address* [**port** *integer*] [**timeout** *integer*] [**key** *string*]	TACACS+ Ł ѵ ў ˇ ˥ ѫ Ŀ TACACS+ Ł ѵ ў Ŀ Â

aaa group server {**radius** | **tacacs+**} *group-name*	AAA RADIUS TACACS+ **tacacs+**
server *ip-address*	TACACS+ **tacacs-server host**
ip vrf forwarding *vrf-name*	TACACS+ vrf VRF

35.3.4. TACACS+

TACACS+ TACACS+ TACACS+ AAA **aaa authentication** TACACS+ Login Enable

Login NAS Login

configure terminal	
aaa authentication login {**default** | *list-name*} **group** {**tacacs+** | *group-name*}	Login TACACS+
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	line Login
login authentication {**default** | *list-name*}	Login

CLI Enable

configure terminal	

aaa authentication enable default group {**tacacs+**	*group-name*}	Enable TACACS+ Â

35.3.5. TACACS+

æ ¢ TACACS+ Ł Ɣ Ո ̈Ω ɱ ʖ ɻ ˇ ŭ TACACS+ Ⱨ Ɣ " ˇ TACACS+ Â ᵹ ŭ TACACS+ AAA ɔ ˇ ᵹ **aaa authorization** ħ ʮ TACACS+ Ⱨ ŭ ɢ Â TACACS+ Exec Ո Command Â

Ɣ ʃ ˇ æ ώ ħ ʮ ^ CLI˜ Ạˇ У э ħ ʮ ⋮ Â CLI ⋮ ÿ æʃ ʃ ŭ 0~15 ˇ ⋮ Â Exec ŭ a ɻ a ɻ ˇ ʃ ˇ э ŭ Exec Â Exec ˇ ЛЬЮħ ʮ'

ħ ʮ	ɔ
configure terminal	ώ ŏ Â
aaa authorization exec {**default**	*list-name*} **group** {**tacacs+**	*group-name*}	Exec TACACS+ Exec Â Ɛ ¤ 8 ɜ ɪ / ɔ 1 _ 8 ɲ ɔ 2 _ ŋ ɪ 1 d ɲ ƒ ŏ 1 c 0 2 C 8 1 4 Â 1 9 _ 4 9 6 . 5 2 _ 2 0

no aaa authorization config-commands	ˆ ˩ ˜ ˛ ЮЎ Ю Ъυ ϧ Command ˘ Ъυ ϧˇ ‡ ѽ Ո Ю Ъυ ϧ a Â
line [**aux** | **console** | **tty** | **vty**] *line-number* [*ending-line-number*]	ѽ line ˘ ف۾ Command Â
authorization commands *level* {**default** | *list-name*}	Command " ѫ Э Â 6) *level* Ъυ ϧ ⁞ Â˩ ىت 0ˀ 15 Â

35.3.6. TACACS+

ѫ ѽ TACACS+ Ŀ ˬ Ո¨Ω м ڑ ˩ˇ ѝ TACACS+ Ⱶ ¥ " ˘ TACACS+ Â ۋ ѝ TACACS+ AAA ɔ ˘ ۋ **aaa accounting** Ъυ ϧ TACACS+ Ⱶ ѝ G Â TACACS+ Exec Ո Command Â

¥ ˀ ˘ ˩ Л Ъ è ѽ Ո Ъυ ϧ ˆ CLI˜ ə Â Exec ╖ ˘ ‡ ѫ ѽˀ CLI ˘ ˛ ˩ Ŀ ˬ ˩ У э ˆ Start˜ ə ˘ ѫ CLI ˘ ˛ ˩ Ŀ ˬ ˩ У э ˆ Stop˜ ə Â Exec ˘ ЛЮЪυ ϧ'

Ъυ ϧ	ɔ
configure terminal	ѽ ѿ 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*]	ѽ line ˘ ف۾ Exec Â
accounting exec {**default** | *list-name*}	Exec " ѫ Э Â

¥ ˀ ѽˀ CLI ˘ Command Ъυ ϧ˜ ╖ ˘ ˩ Л Ъ è Ъυ ϧ ə ˘ ѫ Ъυ ϧ ╖ Ą˘ Ъυ ϧ ə ˩ ˀ Ŀ ˬ Э ˬ Â Command ˘ ЛЮЪυ ϧ'

Ъυ ϧ	ɔ
configure terminal	ѽ ѿ Â

aaaAAB(6(@ZZ)7kU

RADIUS

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

Л Э ¢ login tacacs+ ˇ Ю Â

```
Ruijie#show running-config
!
aaa new-model
!
aaa authentication login test group tacacs+
!
tacacs-server host 192.168.12.219
tacacs-server key aaa
```

```
!
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
!
```

35.4.3. TACACS+ Exec R'

1. ¨I Ů aaa'

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

2. ⁄ tacacs+ server ą '

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

3. ⁄ G tacacs+ '

```
Ruijie(config)# aaa authorization exec test group tacacs+
```

4. ‰ ^ Э :

```
Ruijie(config)# line vty 0 4
Ruijie(config-line)#authorization exec test
```

ЛЪЭ ¢ G tacacs+ˇ ЮÂ

```
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
!
```

35.4.4. G TACACS+ 15 Commans R'

36 SSH Ł

36.1. SSH Ў

SSH Secure Shell ĵĵ Â SSH ᵏ ╗ ɔ ɣ У ə Telnet
˘ б Telnet a ɻ ѫ ɣ · ╗ Â У ə a
ɖ ŏ ĵ ˘ SSH ɻ Л ᵏ ŏ ą ɖ Ո
╗ ˘ Л ɖ a ɻ IP ѫ ƒ à ɻ Â

36.2. SSH

	SSH1	SSH2
ɻ	RSA	RSA à DSA
Ђ	ѫ ɣ RSA Ὼ ╗ Ђ 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
	ѫ ɣ ʌ ʒ	ѫ ɣ ʌ ʒ
	a	MD5 à SHA1 à SHA1-96 à MD5-96
ϒ	NONE ϒ ˜	NONE ϒ ˜

36.3. SSH

~

ң ҏ Ө SSH Ł Ɣ ò SSHv1 б SSHv2˜ ˘ a SSH Â

36.4. SSH

36.4.1. SSH

	ḣ
SSH Ł	˜Ω
SSH	ò ˆ 1 Ո 2˜
SSH	120s
SSH	3

36.4.2.

1. ѫ ɣ SSH ŏ ˘ G Â ҷ ҕ ˘ G ’ ˆ Telnet ˩ Л ~
2. ώ ɻ (Username) б (Password) ɣ Â ɱ a ɻ ˘ ɻ ˩ Л˙ ώ˘ ת ώ ɣ Â

36.4.3. SSH Server

ɑ Ю˘ SSH Server ɣ ˜Ω Â SSH Serverˇ ҕ ŏ Ю˘ **enable service ssh-server** Ђ ҳ˘ ˩ SSH ˘ G SSH Server й ENABLE Â

Ђ ҳ	
configure terminal	ώ
enable service ssh-server	SSH Server
crypto key generate {**rsa**|**dsa**}	

~

ĩ ˘ a ҕ Ђ ҳ [**no**] **crypto key generate**’ Ђ ҳ **crypto key zeroize** Ђ ҳĩ Â

36.4.4. ̃Ω SSH Server

̃Ω SSH Server̆ ج ώ Ю̆ **no enable service ssh-server**
Ћυ ϟ̆ G SSH Server й DISABLE Â

Ћυ ϟ	
configure terminal	ώ
no enable service ssh-server	̃Ω SSH Server

36.4.5. SSH server

ϙЮ̆ SSH Server ò 1 Ո 2 Â G ЛьЮЋυ ϟ SSH G Â

Ћυ ϟ	
configure terminal	ώ
ip ssh version {**1	2**}	SSH
no ip ssh version	SSH й ˘ SSHv1 б SSHv2ʼ

36.4.6. SSH

ϙЮ̆ SSH Server й 120 ˘ Â G ЛьЮЋυ ϟ SSH Â

Ћυ ϟ	
configure terminal	ώ
ip ssh time-out *time*	SSH ˆ ىن 1-120sec˜
no ip ssh time-out	SSH й 120 ʼ

36.4.7. SSH

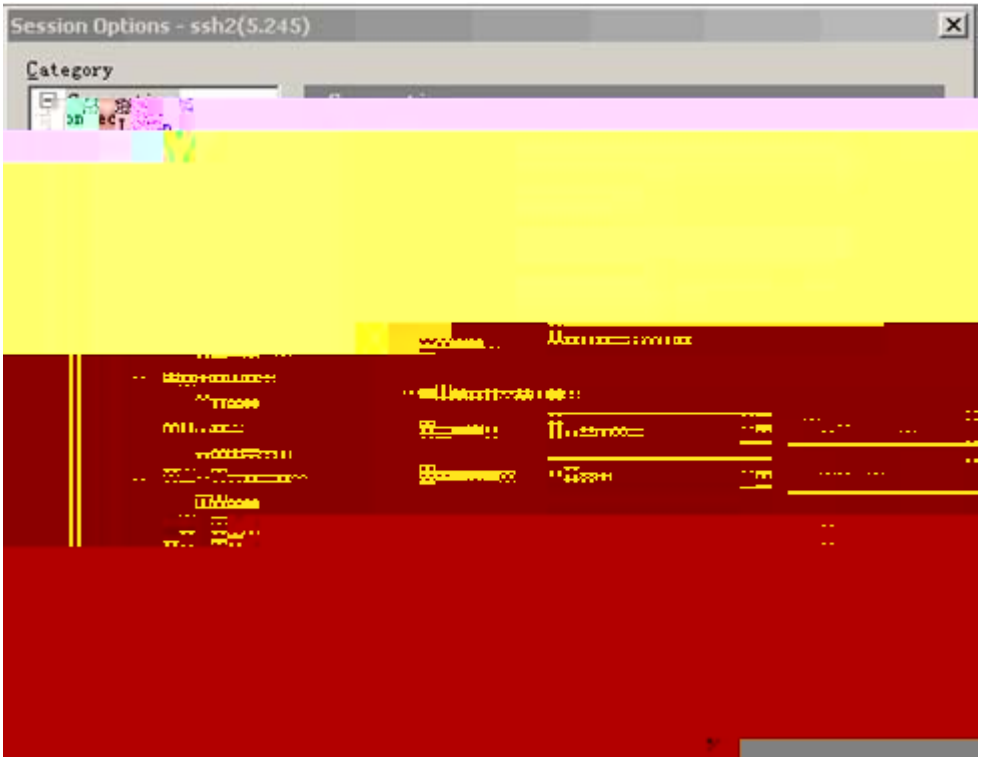
Ћυ ϟ SSH ˘
й Â ϙЮ̆ SSH Server й 3 ˘ . ↓Лυ ї Ь
ώ ɻ б Â G ЛьЮЋυ ϟ SSH Â

ħυ ʒ	
configure terminal	ώ
ip ssh authentication-retries *retry times*	SSH ˆ تن 0-5˜
no ip ssh authentication-retries	SSH ϧ 3 '

' Э ħυ ʒ έ ɛ ٧ [SSH ħυ ʒ ٧ ΆĄ] Â

36.5. G SSH

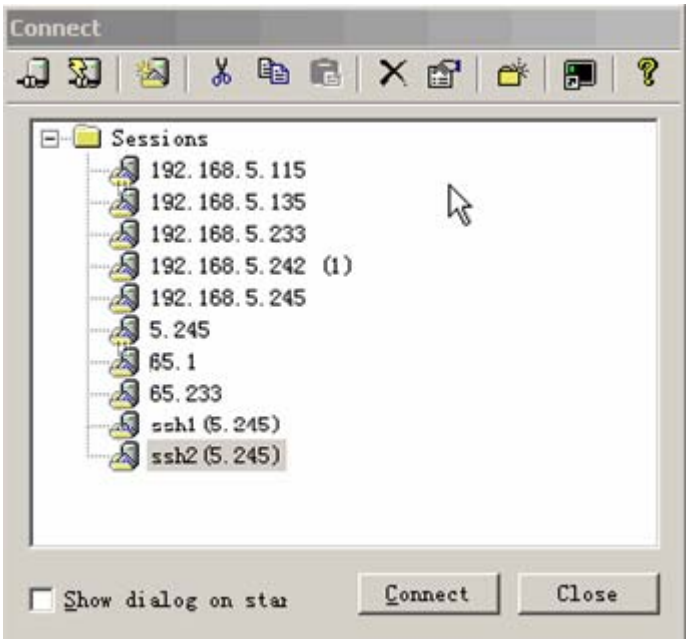
ل ЛЪ G SSH ˘ ɱϧ SSH Server ╖ ˘ ɑ
Ю ˜Ω ╖ Â ɣ Windows Telnet ˚ a SSH˝ ϫ G
Ь ˚ ˘ ɱϧ ò ↑ ' Putty˘ Linux˘
SecureCRT Â Ю Лυ ˚ SecureCRT ϧ R Ў SSH ˘
Юفي'



في 1

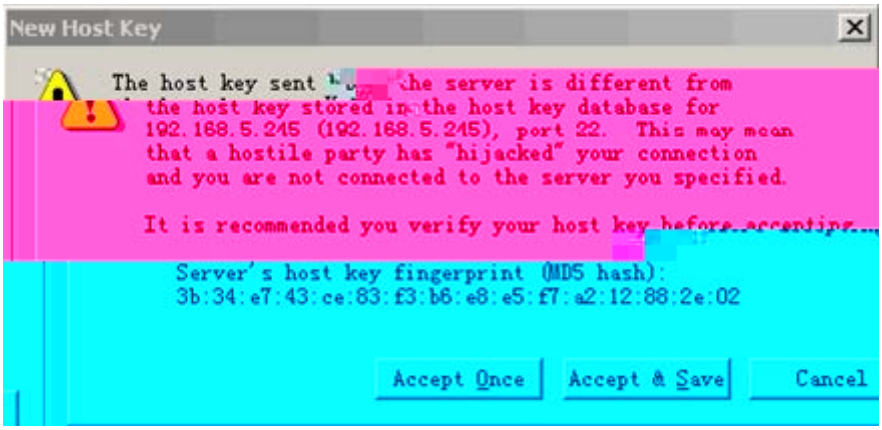
في 1 G ˜ 2 ˘ ϫ جـ Protocol SSH2˝ Hostname
ў IP سفذ˘ ϧ 192.168.5.245˜ ٧ ϧ 22 . SSH ΰ ٧
ٱ˘ Username ϧ ل˘ ٧ ˘ ل a ˛ ɔ ˘
Authentication ϧ ˘ ъ ٧ ل Â G Ո
Telnet У Â

ل OK˝ ώ ЛЬЮ '



2 في

Connectʹ τ • ў ˘ Ю في'



3 في

جم ў 192.168.5.245 Save1(t)]TJ/C2_0 1 Tf0 Tc 0 6289903 0 Td 3C49FA10C3B875>

4 في

ώ Telnet ┤Л ώ Ґ Telnet У ѫ Â Юفي '

5 في

37 GSN

37.1. GSN ŏ Ў

ŏ ā ЛЬЮي ə Ĭ '

1) ŏ ⅄^ RG Security policy Management Platform˜
2) ŏ ^ RG Security Agent˜
3) ŏ ɡ ^ RG Restore System˜
4) ŏ ^ RG Security Switch˜

37.1.1. ŏ ⅄^ RG SMP˜

ŏ i **37.1.** ⅄ ˘ ā ĭ ĭ ˚ ڻ ڼ

` **37.1.**

˘ G ˥ ˩˦ ╟ ɔ ˘ ˩

˦˘ ╟ ⊖ Φ Â

[**no**] **security** { [**v1** | **v2**] **community** *community* | **v3 user** *username* }	Ո smp Ь ﻝ ą ŭ ﺝ . ħu ʒ snmp v1 à v2 à v3. G community Â security v1 community Ո security community У , v1˘ ﻝ ﻯ ﻉ ﻑ . ﻉ v3, ‡ ﺝ snmp-server ħu ʒ Ю v3 , ˜Ω ħu ʒ ﻝ ê SNMP Ì
[**no**] **smp-server host** *ip-address*	SMP Ь ﻝ ﻓﺦ ﺳﻢ

~

ﺝ security v3 user , ﺝ SNMP ˆ v3 user Â

37.2.3. ŭ Y˚ ·

ﻯ ﻉ ȯ ɾ ŭ Y˚ ˘ ﺳﻢ ﻝ ŭ Y˚ ą ŭ Ո SMP ˘ ﻝ Л ŭ Y˚ · 8 ˜ ŭ Y˚ Â

ą˘ ﻝ Л ЛЮħu ʒ ŭ Y˚ · '

ħu ʒ	
Configure terminal	ώ
[**no**] **security event interval** *interval*	ŭ Y˚ · ˘ *interval* 1-65535s ą Ю ﻯ 5 ˘

37.2.4. ﻝ ﺳﻢ ﻓﺦ ˜Ω

ﻝ Л ħu ʒ 8 ï ﺝ ﻝ ﻍ ﺳﻢ ﻓﺦ ˘ ﻝ Э ˜ ﻝ ﺳﻢ ﻓﺦ '

ħu ʒ	
Configure terminal	ώ

interface *interface*	ώ ϟ
[**no**] **security address-bind enable**	ϟ ΰ فخ سم

~

ϟ ŵ GSN ╥ ʒ ϟ ϟ ╥ ɔ Â ϟ
G ╥ ˘ ˜Ω 802.1x IP ╥ ˘ ΐ ‡ ˚ :
ŵ Â

37.3. GSN

37.3.1. smp server

ϡ Л Л ЛЬЮ smp sverver ϕ

Ьυ ϛ	
show smp-server	smp server

R '

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

37.3.2. security event interval

ϡ Л Л ЛЬЮ policy-map ϕ

Ьυ ϛ	
show security event interval	ŵ Y ˇ ·

R '

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

37.4. GSN G Ѓ Y

37.4.1. GSN

ц GSN ї ˚ ˘ ˚ ˘ Л GSN
ц л н ę a л a л˘ л ц GSN G
˚ л è ы ж ´ ˘ Л ў Ѓ ╗ ^ л ARP
╗ ~ ≠ ˚ ˚ л ˘ GSN ≠ ˚ Â и ѫ
╟ ˘ GSN 8 ╒˘ Л ж ў GSN a ў
è ы ˚ ╗ Â

37.4.2. б GSN G ă У Ҿ ╗

ц GSN ˘ GSN б Ю У Ҿ ╗ ж G Э ă ˘ ж
╗ Л ˘ ȯ л ╗ Â

1) GSN a б 1x ip Ѓ Â
2) GSN a л л ѻ Ѓ Â
3) GSN a ж AP л Э ˘ ѫ л a ╗ ѻ AP л˘
ѫ GSN л ╗ ѻ AP л л ˚ л ╗
˘ У э ѫ л ╗ ѻ AP л ″I ї л Э
Â

37.4.3. GSN G è ы Y

ц GSN ˚ ˘ Л ц Ю У Ҿ
л ˚ ⁝ GSN G '

ѻ IP+MAC ' ѫ э ѻ IP+MAC л˘ ѫ э MAC
˘ GSN л MAC ˘ Ą ц ѻ IP+MAC
˘ ÿ GSN л Â

ACL' ACL ѽ б GSN Ю ă ≠ ˚ GSN ╗
˘ ж GSN ў a ў ACL Â

38 ╟ ARP

38.1. ɑ DAI

DAI ѿ Dynamic ARP Inspection, è ɻ ѝ ╟ ARP Â ˛ ˚ ARP

MACC), B è ARP (IPA, MACC). A B

38.1.2. DAI ARP

DAI ARP

DAI VLAN ARP

DHCP ARP

ARP DHCP snooping binding

ê DHCP snooping

38.1.3.

ARP DAI ARP ARP DAI ARP

ip arp inspection trust, show ip arp inspection interface

38.1.4. ARP

DAI CPU ARP ARP DAI 15

ip arp inspection limit-rate

ip arp inspection limit-rate show ip arp inspection interface

38.2. DAI

DAI **ARP**

G ARP

G DAI

VLAN DAI

ARP

ARP

DHCP snooping database

38.2.1. VLAN DAI

VLAN DAI

VLAN vid DAI vlan-id = vid ARP

DAI ARP

show ip arp inspection vlan VLAN DAI

VLAN DAI

ћu ҳ	ɔ
Ruijie(config-if)# **ip arp inspection trust**	∧ ⊣ ą̇
Ruijie(config-if)# **no ip arp inspection trust**	∧ a ⊣ ą̇

38.2.3. ∧ ARP

æ̇ NFPP è˘ NFPP ╟ ╖ ˘ a æ̇ ћu ҳ Â

ћu ҳ æ̇ γ ∧ ˘ з γ ∧ и̇ У э SVI ˜ ∧ Â

ą ЮЎ У э ą̇ Ц ∧ ARP и̇ 15 э ARP Â ą̇ Ц ∧ a ṁ ⁸ Â

1 ą̈ ∧ ĵ ARP ⁸ ḣ˘ Л ĵ ˛ x ˘ a ˛ ṁ У Â

⊣ Л∪ **show ip arp inspection interface** ћu ҳ ∧ γ ∧ ⁸ Â

∧ ARP ˘ æ̇ ∧ è ЛuЮћu ҳ'

ћu ҳ	ɔ
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**	ḣ

NFPP(₥ ɑ̣) ң ҏ˘ ⁸ NFPP ˘ a ¨Ą DAI Â

38.2.4. DHCP snooping database ˜Ω

∧ ê DHCP Snooping Ì Â

DHCP Snooping database

ȟU ȝ	ɔ
Ruijie(config)# **show ip arp inspection vlan**	ȷ VLAN ǔ

39 8 "

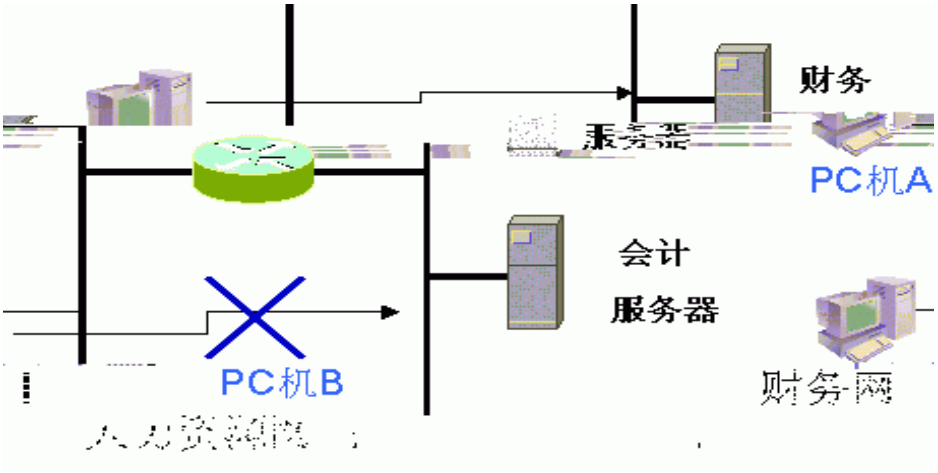
39.1.

э ѝ Л ң ҏ ѻ ā У ǂ ˘ G 8 " k
ℸ Â Л ң ҏ ɱ ЛЮ " '

¸ ñ IP 8 "

¸ 8 ' ий ф ф ѓ ‡ ˇ ⊣ Л 8 У Ф
Ь ⊣ WWW Л ° Ь ˇ è ы Ь TELNET ‡ ~ ˇ
Θ ї ж ф ˇ ⊣ ї У Ф ў Â

ف 1 У э R ˇ ж R è ˇ ⊣ ї ў A Ь ˇ ў B
Â Ю ف 1 Â



ف 1 G " 8

39.1.3. й ж Ą "

⊣ Л ѫ " ╠ " Â У ą Ю ˇ G ѫ
" ѓ Â п ґ ⊣ ¸ У Ф ° Ї ņ ѫ ѳ
ˇ Л Â ╠ " ж ЛѪ ` `
ˇ G Л ѓ ˇ Л ж У Ф ш ѫ ⊣ Л G ╠ " ф
ѓ Â

&

Ї ņ ѫ ѳ . " ш ˇ G ╠ "
≠ ¸ ' ⊣ ж ` ˇ Ї ņ
ѫ ѳ Â ā э ч ˇ У
Ф ˇ ⊣ Л G Л ѓ ˇ ≀ У G IPSEC ╗ ~
╗ ˇ ф ѓ ˇ ╗ Â

" У ж ЛЮ Æ Э'

¸ ą Л ^ INTERNET˜ Ѯ

¸ ч э ї Ц

¸ ѓ 8 ∧ .

8 " ۱ ш è ۱ ˘ ÿ У ۱
˘ У У э ↑ è э ˚ " ۱ ٦ ˘ ѫ ۱ ۱
˘ a ¨Ą Â

39.1.4. ώ/ ACL à ۱ ‡

ώ ACL ج ۱ ˆ ˘ ї̆ б ۱ ώ ACL У
ACE ٦ ' ACL ج ñ ÿ У э ۱ ˘ ї̆ б
۱ ACL У ACE ٦ Â

ج 8 a ۷ ‡ ˘ ‡ ۷ ۷ ˘ ≠ ۷ ۱ è è ŭ Â
۱ ۱ ACE˘ ACE Ҥ (Permit Deny) Â ACL
ACE Л Ҿ Л ˘ Ҿ ↑ '

¸ γ (Layer 2 Fields)'

¸ 48 Æ MAC فخسم (48 Æ)

¸ 48 Æ MAC فخسم (48 Æ)

¸ 16 Æ γ صر

Ь (Layer 3 Fields)'

¸ IP فخسم (۷ Л ŏ IP فخسم ḣ˘ Ҥ Ҥ У
)

¸ IP فخسم (۷ Л ŏ IP فخسم ḣ˘ Ҥ
Ҥ У)

¸ ˜ صر

ني (Layer 4 Fields)'

¸ ۷ Л У э TCP ۱ à ۱

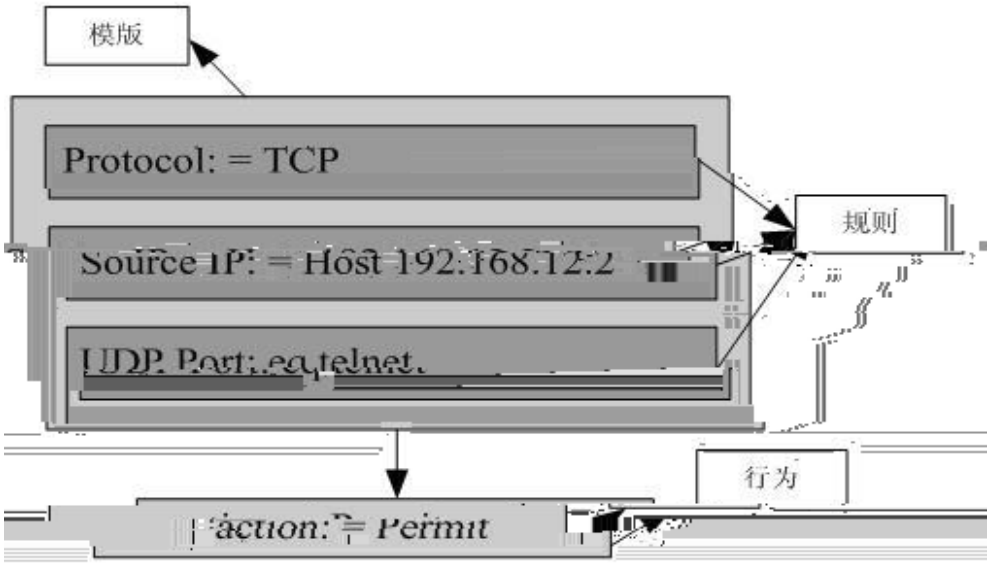
¸ ۷ Л У э UDP ۱ à ۱

ѫ ج У ACE ˘ è ف Ҿ Л
⁞ à ˆ Â ѫ Ҿ ۱ Ҥ Â ˘ ج У ACE
IP ⁞ à ˆ ˘ ج ۱ У ACE
˘ IP فخسم Ո UDP ۱ ˘ ˘ ч
ACE G ѽ a ۷ ѫ Â

‡ (Rules)˘ ACE ѫ ḣ Â У ACE ѽ Ю'

permit tcp host *192.168.12.2* **any eq telnet**

ج ACE è˘ ѫ ѝ ЛЮ ۱' IP فخسم à IP ˜ à
TCP ۱ Â ḣ (Rules)ˆ ⁞ ѝ' IP فخسم¸ Host 192.168.12.2'
IP ˜ ¸ TCP' TCP ۱ ¸ Telnet Â



في 2 ACE' permit tcp host 192.168.12.2 any eq telnet ‡

&

ѫ ⊣ Л Ь (Layer 3 Field) Ո ني (Layer 4 Field)
⊿ ˘ ≠ ⊣ Л э γ (Layer 2 Field) ⊿ ˘ п ñ б ACL
ѫ a γ Ո Ь à γ Ո ني à γ Ո Ь à ني ⊿ Â G
γ à Ь à ني ⊿ ˘ ⊣ Л Expert 8 " ˆ Expert
ACLs˜ Â

39.2. IP "

ѭ Э " ˘ ѝ ˜ " У э ҏ У ⊿ ⊿ ˘
Л ѵ ѭ ˜ ӫ ҏ У э " Â Ю " ҩ ⊣ Л G ⊿
" ˜ Л ⊣ ˜ ⊣ Л G " ⊿ тп Â

˜	⊿ тп
ñ IP	1-99˝ 1300 - 1999
IP	100-199˝ 2000 - 2699

39.2.1. IP "

… " ˘ Ⱨ ‡ ɣ Э ǂ ˘ ″ ǂ
ǐ б ‡ ɿ ā ǐ ɻ ǂ Â

ѫ " ↑ ñ " Ռ " ˘ " è Ⱨ ὴ ص ‡ ў
ЛЮ'

، ف س م

، ف س م

، Э ~

، Ш ѫ

ñ IP " ˆ Л й 1 - 99˜ 1300 - 1999˜ ў IP ف س م ɻ
ǂ ˘ IP " ˆ Л й 100 – 199˜ 2000 - 2699˜ G Л Э ني
Л ɻ ǂ Â è ы ص " ˜Ω ʒ ɻ
ǂ Â

ɣ´ У " ˘ ɻ Л G " Л Ⱨ ‡˘
è è Л ɻ У э Л ɻ ˘ Л ғ ҏ Л ǂ ɻ У э "
Â a ˘ G Л ˘ Ռ " ي Â

39.2.1.1. ǖ ǁ Ŀ ‡ Л

ҷ э " ǖ У “ ” ‡ Л ǂ б
˙ ị ‡ a ɿ ˘ Â

Ю R '

access-list 1 **permit host** 192.168.4.12

" ɻ ǐ ў й 192.168.4.12 ف è ў Â й
" Л ↑ ǖ ѽ У ‡ Л' access-list 1 deny any Â

ɻ '

Access-list 1 **deny host** 192.168.4.12

" ɻ ↑ ǖ Л Э У Л˘ ‡˙ ị ў ɻ Â

~

ҷ Ⱨ " Ạ˘ ǂ Â ɣ " “
”˘ ɻ Â

39.2.1.2. ώ ‡ ۱

╗ ώ ‡ ╗ᛁ " ᴧˇ ۱ … ᒪᴗ ᴧˇ ´ ᛁ
ˇ ۷ ᛁ э " Â ᒪᴗ " ۱ Â ﺝ ᾱ
۷ ᛁ ˇ ۱ … ᛁ б ۱ ˇ ᛁ ך
۱ ᴧˇ ﻉ a Ą è ы ‡ ۱ Â

Ruijie(config-xxx-nacl)# **exit** Ruijie(config)# **interface** *interface*	8 " ˘ " ∧
Ruijie(config-if)# **ip access-group** *id* { **in**	**out** }	" ∧

&

У ∧ ḣ ACL ˘ γ ∧ Л Ъ ∧ Ґ ḣ ACL ˘ ∧ Л
. ″I (ج ACE . ″I è) Â

39.2.3. IP "

" ˘ ج ЛЬЮЪ ʒ '

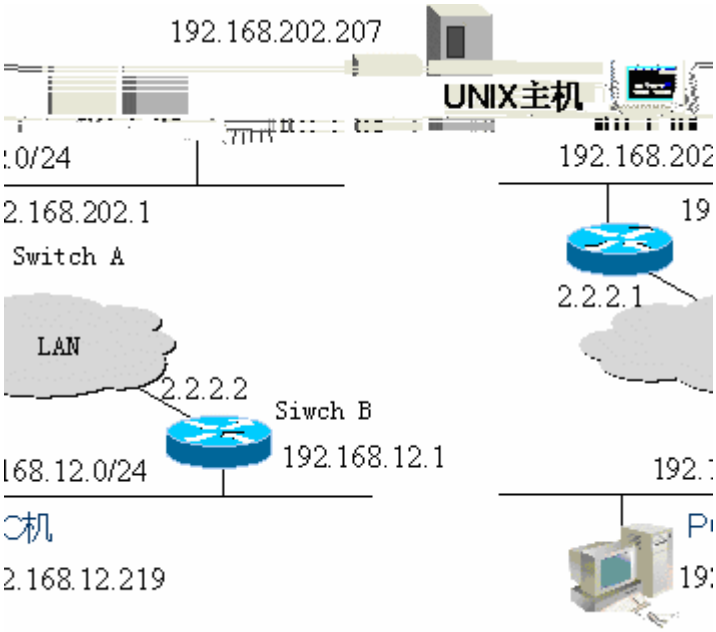
Ruijie# **show access-lists** [*id* | *name*]

Ъ ʒ ∧ Л Ъ ﺱ "

39.2.4. IP " R

ﺩ

ч ∧ Switch A Ґ Switch B˘ في 1-3



في 3 ﺱ " R

ج Switch B Э " ˘ ЛЬЮ ŭ ╖ '

, 192.168.12.0/24

```
Ruijie(config)# hostname Ruijie
Ruijie(config)# interface GigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.202.1 255.255.255.0
Ruijie(config)# interface GigabitEthernet 0/2
Ruijie(config-if)# ip address 2.2.2.1 255.255.255.0 8F2.255.255.0 }ë<
```

Ю ҳ	Ш
Ruijie(config)# **access-list** *id* {**deny** | **permit**}{**any** | **host** *src-mac-addr*} {**any** | **host** *dst-mac-addr*} [*ethernet-type*] [**cos** *cos*]	Ю " ,Ю ҳ é е ё ч Ю ҳ ч
Ruijie(config)# **interface** *interface*	" ч
Ruijie(config-if)# **mac access-group** *id* { **in** | **out** }	" ч

γ ў ACL Ю ЛЬЮЮ ҳ'

Ю ҳ	Ш
Ruijie(config)# **mac access-list extended** {*id* | *name*}	ώ "
Ruijie (config-mac-nacl)# [*sn*] { **permit** | **deny** }{**any** | **host** *src-mac-addr*} {**any** | **host** *dst-mac-addr*} [*ethernet-type*] [**cos** *cos*]	ѝ ACL ╗ ,Ю ҳ é е ё ч Ю ҳ ч
Ruijie(config-mac-nacl)# **exit** Ruijie(config)# **interface** *interface*	8 " ˘ " ч
Ruijie(config-if)# **mac access-group** {*id* | *name*} { **in** | **out**}	" ч

&

У ч ḣ ACL ' γ ч Л Ъ Ю ј Ո ḣ ACL ˘ ч Л Ъ
. ″I (. ″I ACE ң ḏ)

39.3.3. MAC "

" ˘ ў ЛЬЮЮ ҳ'

```
Ruijie# show access-lists [ id | name]
```

ч Л Ъ ѫ "

39.3.4. MAC " R

MAC " ˘ ЛЬЮ ѽ ╗ '

¸ G IPX ˜ ў 0013.2049.8272 a giga 0/1 ч Â

¸ è ы ч Л Ъ

Л Ы ж Л Ы Э " 101, Л Ы 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#
```

&

" Ы permit any any a a ~ ъ й " Л ъ У ‡ Ы Â

ж S3750 " ц р Э~ permit any any Н Л a Â

39.4. Expert "

ж Э Expert " ~ ~ " У э ы У Л Л~ Л ф ж ~ ё ы У э " ÂЮ " Expert " Л т Â

~	Л т
Expert "	2700-2899

39.4.1. Expert "

... expert " ~ Нм ‡ Н Л ц ї ~ " ї ї б ‡ ч ā ї Н ї Â

Expert " è Нм ђ ص ‡ ў ЛЮ'

, мм " Ո MAC " ә

, VLAN ID

Expert " ^ Л 2700 -2899~ й мм " Ո MAC "

Л Е˘ З VLAN ID Â

Ұ´ У Expert " ˘ Л Л U G " Л Ж
‡˘ è è Л Л У Э Л Л ˘ Л U ғ Ө Л ˆ Л У Э
" Â

39.4.2. Expert "

Expert " ↑ ЛЮ Ч '

1. Ж Expert "
2. " Ұ Л (R)

Expert " ˘ ЛЮ Ч

У ѫ ѿ Ю ЛЮh ҷ'

h ҷ	Ґ
Ruijie (config)# **access-list** *id* {**deny** | **permit**} [*prot* | {[*ethernet-type*] [**cos** *cos*]}] [**VID** *vid*] {src *src-wildcard* | **host** *src* } {**host** *src-mac-addr* | **any**} {dst *dst-wildcard* | **host** *dst* | **any**}{**host** *dst-mac-addr* | **any**}] [**precedence** *precedence*] [**tos** *tos*] [**dscp** *dscp*] [**time-range** *tm-rng-name*]	Ж " ,h ҷ é Е ӧ Л h ҷ Л

Ruijie(config)# **interface** *interface* "
Л

Ruijie(conf-ifig)# **post**

&

У ч ḣ ACL ' γ ч Л∪ Ћ∪ ɻ Ո ḣ ACL ˘ ѫ
. ″I è˘ ч Л∪ . ″I (Ћ∪ ʒ¸ è [sn]) Â

s3750 ң ḓ Ip acl ч Л∪“eq” tcp,udp 4 ч ך

39.4.3. Expert "

" ˘ ѫ ЛЬЮЋ ʒ¸'

Ruijie # **show access-lists** [*id* | *name*]

ч Л∪ Expert "

39.4.4. Expert " R

Expert " ˘ ЛЬЮ ѿ ╗ '

¸ VLAN20 0013.2049.8272 ў Giga 0/1 ч Â

¸ è ы 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#
```

39.5. " ACL80

ACL80 ≠ ɻ Ћ " ˘ ѽ Ћ ך ɱ 80 ɜ ˘

Â У " ˇ ACL80 ⅃Л Ѡ ⅏ 80 э è
16 э ˆ bit

F	SSAP( )	19	T	TCP	46
G	Ctrl	20	U	TCP	48
H	Org Code	21	V	"	50
I		24	W		54
J	IP	26	XY	IP	58
K	TOS	27	Z		59
L	IP	28	a	Windows size	60
M	ID	30	b		62
N	Flags	32			

SNAP tag 802.3 flags 80 TCP TCP TCP

&

ACL80 S3750 "

ACL80 803.3snap 802.3llc DSAP cntl AAAA03 803.3snap DSAP cntl E0E003 803.3llc a

Acl80 16 16

```
Ruijie(config)# expert access-list advanced name
Ruijie(config-exp-dacl)#permit 112233445566778899 00aabbccdd eeff ffffffffffffffffffffffffffffffff 50
```

ace

```
Ruijie(config-exp-dacl)#permit 112233445566778899 00aabbccdd eeff ffffffffffffffffffffffffffffffff 54
```

16 ace ace

39.6. TCP Flag 8

TCP Flag k ɷ У 8˘ ɱ TCP Flag 8 Match-All ˘ ĵ ך ĵ TCP Flag б ACL è Ⱨ TCP Flag У Æ ȷ ĺ ʌ˘ ACL ‡ ˘ G ɻ Ɽ Ⱨ TCP Flag ˙ ʌ˘ ҿ é TCP Flag Â

R '

permit tcp any any match-all rst

ĭ TCP Flag RST Æ˘ è ы Æ и 0 Â

&

ɻ Ɽ ʚ Ъ ɻ ACL˘ ḣ ACL ˜ ʌ и TCP ɑ Ю ɻ Â MAC Ո IP ñ ╗ Â

Ю TCP Flag

Ъ ҁ	╗
Ruijie(config)# **ip access-list extended** { *id* | *name* }	ώ "
Ruijie(config-ext-nacl)# [*sn*] [**permit** | **deny**] **tcp** *source source-wildcard* [**operator port** [*port*]] *destination destination-wildcard* [**operator port** [*port*]] [**match-all** *flag-name*][**precedence** *precedence*]	и ╗ Ъ ҁ é ɛ ӫ ʅ Ъ ҁ ʅ
Ruijie(config-exp-nacl)# **exit** Ruijie(config)# **interface** *interface*	8 " ˘ " ʅ
Ruijie(config-if)# **ip access-group** {*id* | *name*} {**in** | **out**}	" ʅ

Ю R ¦ TCP Flag

1) enable Ո

```
Ruijie> enable
Ruijie#
```

2) ώ ŏ

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

3) ώ 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-all rst
```

5) ╗ deny

```
Ruijie(config-ext-nacl)# deny tcp any any match-all fin
```

6) ╗ ˘

7) end

```
Ruijie(config-ext-nacl)# end
```

8)

```
Ruijie# show  access-list test-tcp-flag
ip access-lists extended test-tcp-flag
10 permit tcp any any match-all rst
20 deny tcp any any match-all fin
```

39.7. . ″l ACL

ὴ ѽ ɛ ACE . ″l ˘ э ACL " ñ˘ Л ACL " Ю ACE ˘ Л - ˘ έ ɛ Ю'

¸ ACE ѫ è Л Л "'

¸ Л Л ˘ a Л Ѯ ЛѽЛ У ACE Л ὴ ѫ Л Â

¸ Л ACE Л ώ˘ ɖ ѽ ѫ ч э ACE ⷓ ώ ACE Â

¸ ACL " Л Ո Л Â

ᵏ **ip access-list resequence** {*acl-id*| *acl-name*} *sn-start sn-inc* Ъ ϟ˘ ΎΩЪ ϟ Ъ ϟ ϒ Â

Л Э Ъ ϟ˘ ғ ACL list Ю ace "˘ ɻ ὴ tst_acl ACL Ю ace Л ὴ'

⎤

```
ace1: 10
ace2: 20
ace3: 30
```

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 ώ sn-num ╗ ace4 ˘ Л Ю

```
Ruijie(config-std-nacl)# permit Â Â Â
ace1: 100
ace2: 103
ace3: 106
ace4: 109
```

ώ 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 й ѽ 4 è . ″I ╗ ace Â

╕ ACE

```
Ruijie(config-std-nacl)# no 106
ace1: 100
ace2: 103
ace5: 105
ace4: 109
```

Э Л ≠ ┘Л ғ ACE ╕ Â

39.8. ѡ ¥ Ш ACL

┘Л G ACL ѡ ¥ ˘ ACL ѿ У э Ҿ ӫ Â й ѽ ↑ э ˘ ″I У э Time-Range Â

Time-Range ŋ ¥ ˘ G э ╖ ˘ ԛ У э ┘ Â

ÿ ˘ ┘Л ЛЮ У э Time-Range

Ъ ҂	╖

Ruijie# **configure terminal**

Ruijie(config-time-range)# **periodic** *day-of-the-week time* **to** [*day-of-the-week*] **time**	□ ( ) é ε time range
Ruijie# **show time-range**	
Ruijie# **copy running-config** *startup-config*	ɖ
Ruijie(config)# **ip access-list extended** *101*	ώ ACL
Ruijie(config-ext-nacl)# **permit ip any** *any* **time-range** *time-range-name*	ш ACE

&

Time Range ɻ й 1 32 э ˘ a ↑ ӱ

ш ɻ У э a ˘ ш ɣ Time Range Θ ҽ э ш ӫ

ɻ Л У э э □ Â й э Time Range

ɷ У э ш ˘ ‡ ҽ ш ӫ □

Ю R Л ш ACL й R˘ ¦ ҽ □ э ӫ HTTP

```
Ruijie(config)# time-range no-http
Ruijie(config-time-range)# periodic weekdays 8:00 to 18:00
Ruijie(config)# end
Ruijie(config)# ip access-list extended limit-udp
Ruijie(config-ext-nacl)# deny tcp any any eq www time-range
no-http
Ruijie(config-ext-nacl)# exit
Ruijie(config)# interface gigabitEthernet 0/1
Ruijie(config-if)# ip access-group no-http in
Ruijie(config)# end
```

Ю й Time Range R:

```
Ruijie# show time-range
time-range entry: no-http(inactive)
periodic Weekdays 8:00 to 18:00
time-range entry: no-udp
periodic Tuesday 15:30 to 16:30
```

ώ

ώ ACL ∫ ώ ˘ ACL У ώ ˘ ώ ≠ У э
8 ˘ У ACL ѫ ц ∧ ѫ ц portmap ˘ ώ ∠Лѫ ц ώ
Ո ∧ ˘ б У ACL a ∠ Е ج. ″I Э˘ ώ . ″I
∧ ώ(∧ ώЮ IP/IP+MAC) 802.1X Ո ώ ACL ˘. ώ Ђ
ך Э ф ώ ACL ї ф˘ a Ѧ 802.1X˘
ACL4=AQ[illegible] a ך ώ ي . µך <

Ъυ ϛ	ℸ
Ruijie# **configure terminal**	ώ ŏ Â
Ruijie(config)#**interface** *idx*	ώ ٨
Ruijie(config-if)#**security access-group** *1*	٨ Ю ŏ

ɣ ٨ Ю ɷ R ٨˘ ˝I ٧ R ٨ ˘ Ạ ѫ ɣ ٨ ŏ Ю R Л ŏ ὶ R '

٨ 4 ὶ ŏ 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 ὶ 192.168.6.3 з MAC ѫ ف ὶ 0000.0000.0011 ÿ ٨ 4 Э ώ Ꮋ ˘ ѫ ٨ ٤ IPX Ь ˛ τ ٤ Л У э ŏ ˘ ĭ 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
```

≠ ٤ Л У ѫ ɣ 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
```

ѧ ŏ Ю ٨ Ю˘ ŏ “safe_channel” ˘ ٨ 4 ٤ IPX ɷ Â

39.9. ѡ R

39.9.1. TCP ´ ٦

TCP Flag ´ ٦ ACL ℸ Â

39.9.1.1.

й ѿ ج У Э ɖ A ѽ ˇ ч ї A ў л B ў ч
TCP ą ˘ л a ї B ў ч ˛ A TCP ą
Â

39.9.1.2. في

ĭ è IP

```
Ruijie(config-ext-nacl)# permit ip any any
```

2) 8 " ج ٨ Э

8 "

```
Ruijie(config-ext-nacl)# exit
```

ώ " ٨ G3/2

```
Ruijie(config)# interface gigabitEthernet 3/2
```

ACL 101 ų G3/2 ώ ر ↑

```
Ruijie(config-if)# ip access-group 101 in
```

3) "

ج Ю G

40 QOS

40.1. QOS

Internet ˙ ˘ ж ъ ц ѣ Internet Э· е ˘
у ˘ a ˙ е a ˙ Ь ˘
ї Ґ ˘ ў ˘ · “ ғ и” ˙ ⁸˘
a Â QOS Â

QOS Quality of Service Ь ~ п Ь ғ Â ѣ
ў è˘ и ѳ Ь ˘ ѡ QOS ⁸˘ QOS п ї
ғ Â ъ QOS ї è и à ╠ à x ⁺
ᵏ Ь ғ п Â

40.1.1. QoS ѫ

a QoS ╗ a έ ᵏ · ҏ Ь ғ˘ ˙ Ђ
˘ a ɖ у ˙ ˙ ї ˙ Â ӏ
Ą˘ ї ѳ ˘ ˙ Ą˘
˙ x Â ˙ ṁ ᵏ ʌ Ь˘ ў и
ғ ˙ ˘ Ђ ї ѳ ӏ ї ¯ Â

QoS ╗ ˘ ᵏ · ҏ Ь Â ⁞ ˘ ˙ Л
и ç э ⁞ · . ″ӏ ˘ ˘ G ᵏ ˙
. ″ӏ ˙ à ȯ ⁸ и Ҿ ᵏ · Ь Â ѳ
QoS ˘ ╗ ѳ ˙ ˘ ѫ ї ˘
╗ ˙ ѫ ¯ Â

QoS Л IETF Internet Engineering Task Force DiffServ
ˆ Differentiated Servece Mode˜˜ ї Ь ص˜ е и ѫ Â DiffServ е
è у э · , ї a ˙ ⁞˘ ї ą ⁺ Ц ѣ ѳ IP
ѐ˘ DiffServ е G ѳ IPv4 è TOS Type Of Service Ipv6
è Traffic Class ᵯ 6 э ї ą Â ї ą
≠ ˙ Л ѣ Э Â у ѫ˘ ѣ è ї ą ˈ

ѣ 802.1Q Tag Control Information è ᵯ 3 э ˘ ⁺ Ц ѳ
8 э ⁞ . ″ӏ ą ˘ Ь э и User Priority bits Â

ѣ IPv4 è TOS IPv6 è Traffic Class ᵯ
3 э ˘ ɔ IPprecedence value’ ѣ IPv4 è TOS
IPv6 è Traffic Class ᵯ 6 э ˘ ɔ Differentiated Services
Code Point (DSCP) value Â

æ DiffServ ɛ è˘ ʌ ↑ǖ ʌǀ ą ʌ ʌ ·
Ł ˘ ↑ǖ a ʌǀ ą ʌ a ʌ · Ł Â ǀ
ą ʌЛ Э ў à è ç Â ʌЛ ㎜ ɣ a ʌ
㎜ ɣ ǫ̈ a ʌ ǐ ç ⁞ ą Â ⁞ ǫ̈ Л ɾ ǐ
ç ⁞ ą ṁ ˘ ǐ ȣ ˜
˘ У ç ⁞ ą ᴳ æ Â
⁞ ą ˘ ǐ ʌ Ꜧ ᵏ a ʌ · ˝I ˘ ǐ Ꜧ
˘ ㎳ x У Ҿ ˝I æ à ʌ è ы У Ҿ ɔ Â Ҿ
ǐ æ DiffServ ɛ è ɔ ǐˆ Per-hop Behavior

″I ə ∧ . ″I Â

&

Э Ь ñ ‡ ⊣ ¸ ⊣ ɔ ¥ У э ∧ Э Â æ ą Ю Э Ь
ñ ‡ 3 à 2 à 1 . ″I ɔ Â ″I ACLs ˘ æ ą Ю
⊣ ñ ‡ 2 à 1 æ э Ą ∧ QoS ę ˘ ‡
ñ ‡ 2 Ռ 1 ÿ è ÿ ∧ Э QoS ę ' ∧ QoS ę
Ѓ Ω ˘ ѫ Ҽ ç DSCP ḣ 0 Â

¥ IP ˘ ⊣ Л Л Ю ñ ‡ '

¸ ∧ ę ˙ ѝ Trust ip-precedence ˘ ‡ ÿ IP Ip precedence ^ 3 э ~ ⊣ ˘ Ї ¦ CoS ^ 3 э ~ Â

¸ ∧ ę ˙ ѝ Trust cos ˘ ‡ CoS ^ 3 э ~ ⊣ Ip Precedence ^ 3 э ~ Â ч ą ˘ У ɣ è a ↑ ӱ User Priority bits ˘ ѫ ⊣ Л Л ѽ ∧ CoS ḣ CoS ḣ Â ∧ У ɣ è ↑ ӱ User Priority bits ˘ ‡ ÿ è ⊣ CoS ḣ Â

¸ ∧ Ѓ Ω Policy-map è G ѿ ѭ ¥ Ip access-list (Extended) ACLs ˘ ѫ æ ∧ Э ˘ ⊣ IP ѭ ف ز à IP ѭ ف ز à Protocol à Л Ռ ∧ ني TCP/UDP ∧ ٦ Ѓ Ω ACLs ˘ Л Ռ DSCP ḣ Â ˘ ∧ Ѓ Ω ѿ э Policy-map ˘ Л ∧ ѝ è DSCP ḣ ˘ ‡ ₥ ‡ 1 à 2 . ″I Â

Ռ IP ñ ‡ У ˘ Л Ռ Э ύ ñ ‡ ⊣ ⊣ Л Ռ ⊣ ɔ ¥ У э ∧ Э Â æ ą Ю Э ñ ‡ 3 à 2 à 1 . ″I ɔ Â

Ѓ Ω Э ¦ CoS-to-DSCP map à IP-precedence-to-DSCP map ∕ Â

40.1.2.2. Policing

Policing . ˘ ⊣ æ ¦ ∕ ˘ ¥ ¦ ´ . Â Policing ╟ ɔ è У э ˘ ѿ ɔ ¥ Police ї ⁸ ˘ ѫ ¸ ṁ ˘ x ˘ ç ∧ DSCP ḣ Â

æ QoS è ˘ Policing ╟ ɔ ⊣ Â Policing ╟ ɔ ˘ ѫ ¦ è DSCP ḣ a ¸ ɔ ˙ ị ⁹ ˘ ≠ a ¸ æ Marking ╟ ɔ ₫ ₥ x Â

40.1.2.3. Marking

Marking ˘ Classifying Ռ Policing ╟ ɔ ʖ ʌ˘ ὶ ѡ ɖ ɬ
DSCP ḣ · Э Ю У ˘ Marking ╟ ɔ ὶ
ḭ ώ QoS ą ˘ ɻ Л Ъ G QoS ACLs ɻ QoS ą ˘ ≠ ɻ Л Ъ G
Trust ɖ è QoS ą ˘ R ˘

Ͳ . Â ̃Ω ∧ QoS Ͳ ˘ ⅃ Л Ъ ∧ Policy Map ˘ ∧ ə ̣ ̇ ̀ Off . ⅃ Â ЛЪЮ ̀ QOS '

CoS ḣ	0
" ə	8
"	WRR
QueueWeight	1:1:1:1:1:1:1:1
WRR Weight Range	1:15
ə ̣ ̇	No Trust

Cos ḣ ̛ "

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

CoS to DSCP

CoS ḣ	0	1	2	3	4	5	6	7

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

40.2.3. ٨ CoS ḣ

٦Л Ю У э ٨ CoS ḣ

ą Ю ̆ ٨ CoS ḣ ̀ 0

ћυ ҂	
configure terminal	ώ
interface *interface*	ώ ٨
mls qos cos default-cos	٨ CoS ḣ , default-cos ̀ CoS ḣ , ٧ ḣ ت ̀ 0 7
no mls qos cos	CoS ḣ

Ю R ٨ Interface g0/4 CoS ḣ ̀ 6

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

40.2.4. Class Maps

٦Л Ю … Class Maps

ћυ ҂	
configure terminal	ώ

ip access-list extended {*id* | *name*} **{** } **ce-5(0D-4(d TJ/TT2 1 j/T.0006 588961331 Td(id)Tj/TT**

[no]set ip dscp new-dscp	ѝ è IP ip dscp ḣ’ ɣ IP ˘ a ɔ ’ new-dscp DSCP ḣ˘ ↙ ḣ ټ ɳ ң ҕ a ↓ a ↓
police rate-bps burst-byte [exceed-action {drop | dscp dscp-value}] no police	⁸ Ռ ѝ ĭ ╟ ɔ˘ rate-bps ⁸ (kbps)˘ burst-byte ↙ ⁸ ḣ (Kbyte)˘ drop x ĭ ˘ dscp dscp-value ĭ̃ ĭ DSCP ḣ˘ dscp-value ↙ ḣ ټ ɳ ң ҕ a ↓ a ↓

&

↓ У э Policy Maps ĭ э ↙ Э˘ ‡ ὲ è police э ↙ Ѽ ң Â ĭ У э ↙ ´ Policy Maps è police ˘ ↓ У э ↙ ұ У ѽ Policy Maps ↙ Policy Maps ↓ б ὲ а У ˘ ὲ ѽ Class ↓ Лυ Ռ ὲ У ˜ Â

R ˘ Лυ Ю … ҉ У э ↓ ѝ Policy1 Policy-map˘ Policy-map ѽ ↙ 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
```

40.2.6. ↙ Policy Maps

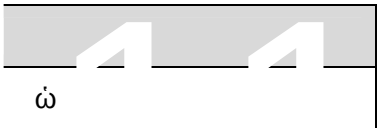
↓ Лυ Ю Policy Maps ĭ ↙ Э

hυ ҁ	
configure terminal	ώ
interface *interface*	ώ ↙

Policy Map ‵ ∧
policy-map-name …
olicy map ∧ ˘ input ὴ
,

RR˘ α Ю˘ ‴

, ∧ QOS



ώ

∧ . ″I ‴ ˘
sp ὴ . ″I **rr**
ὴ

40.2.8.

ㅓ Ѣ ѢЮ ㅕ

40.2.9. Cos-Map

ۍ Л Cos-Map ώ ف э " ˇ Cos-Map QOS

Ћ ҂	
configure terminal	ώ
priority-queue Cos-Map qid *cos0* [*cos1* [*cos2* [*cos3* [*cos4* [*cos5* [*cos6* [*cos7*]]]]]]]	qid й " id,cos0..cos7 й Ո э " ˜Ω CoS ћ Â
no priority-queue cos-map	Cos-Map ћ

Ю CoS Map R

```
Ruijie# configure terminal
Ruijie(config)# priority-queue Cos-Map 1 2 4 6 7 5
Ruijie(config)# end
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
```

40.2.10. CoS-to-DSCP Map

CoS-to-DSCP Map ɣ CoS ḣ ʃ ɋ̈ DSCP ḣ, ɻ Ʌʊ ɅʊЮ CoS-to-DSCP Map ,CoS-to-DSCP Map QOS

ђʊ ʒ	
configure terminal	ώ
mls qos map cos-dscp *dscp1...dscp8* **no mls qos map cos-dscp**	ᵍ CoS-to-DSCP Map ,dscp1...dscp8 ɣ CoS ḣ 0˙ 7 DSCP ḣ,DSCP ɻ ḣ ىٮ ң ҏ a ɻ a ɻ

ᴿ 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
```

40.2.11. DSCP-to-CoS Map

DSCP-to-CoS ɣ ɋ̈ DSCP ḣ ʃ CoS ḣˇ Ʌʊ ɬ ѝ "

DSCP-to-CoS Map QOS , ɻ Ʌʊ ɅʊЮ DSCP-to-CoS Map :

ђʊ ʒ	
configure terminal	ώ

mls qos map dscp-cos

no rate-limit	↓ ↑

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

40.2.13. IPpre to DSCP Map

IPpre-to-Dscp ¥ IPpre ḣ ⌈ q̈ DSCP ḣ, IPpre-to-DSCP Map QOS , ↓ ⎍ ⎍ЬЮ IPpre-to-Dscp Map :

ЬU ⅋	
configure terminal	ώ
mls qos map ip-prec-dscp *dscp1...dscp8*	g IP-Precedence-to-Dscp Map ,dscp1...dscp8 ¥ IP-Precedence ḣ 0· 7 DSCP ḣ
no mls qos map ip-prec-dscp	

R Ю '

```
Ruijie# configure terminal
Ruijie(config)# mls qos map ip-precedence-dscp 56 48 46 40 34
32 26 24
Ruijie(config)# end
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
```

40.3. QOS

40.3.1. class-map

ˆ Л Ъ Л Ъ Ю class-map ф

Ъ ч	
show class-map [*class-name*]	class map Е ф

R '

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

40.3.2. policy-map

ˆ Л Ъ Л Ъ Ю Policy-map 0010.5 131.88-20 Td05g/1 Tf-0.001 Tc -0213.1 Tf-0.0001 Tc 11(.0

R '

```
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#
```

40.3.4. mls qos queueing

ЛЛu ЛuЮ qos " ą

Ьu ę	
show mls qos queueing	QoS " ą , CoS-to-queue mapˇ wrr weight ˧ drr weight;

w R ЮЎ

```
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

40.3.5. mls qos scheduler

ۍ Л Л ЛЮ QOS

Ю ۼ	

ЪU ҂	
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
```

&

Ꮋ ᵯn a mark count

40.4. QOS R

40.4.1. ᵯ ¥†

40.4.1.1.

40.4.1.3.

&

ЛЬЮ ↓ " ¢ б QOS ACL ˜Ω Ъυ ҂

ώ ΰ

```
Ruijie#configure
Enter configuration commands, one per line.  End with CNTL/Z.
```

Ѭ ɹ ϧ salary_acl ђ ACL

```
Ruijie(config)#ip access-list standard salary_acl
```

Ѭ ‡˘ ї ┗ ⅄

```
Ruijie(config-std-nacl)#permit host 192.168.217.223
```

ы ΰ

```
Ruijie(config-std-nacl)#exit
```

#… ɹ ϧ salaryclass class map˘ ώ class-map

```
Ruijie(config)#class-map salaryclass
```

Ѭ ך ‡

```
Ruijie(config-cmap)#match access-group salary_acl
```

ы ΰ

```
Ruijie(config-cmap)#exit
```

#… ɹ ϧ salarypolicy ˘ ώ policy-map

```
Ruijie(config)#policy-map salarypolicy
```

ˀ ‡ ϧ salaryclass

```
Ruijie(config-pmap)#class salaryclass
```

⁸ ┗ ⅄ ɹ ↓ a 512Kbps˘ ↓ ⁸ ḣ ϧ
32 Kbyte˘ з ṁ x Â

```
Ruijie(config-pmap-c)#police 512 32  exceed-action drop
```

ы class-map

```
Ruijie(config-pmap-c)#exit
```

ы ΰ

41 VRRP

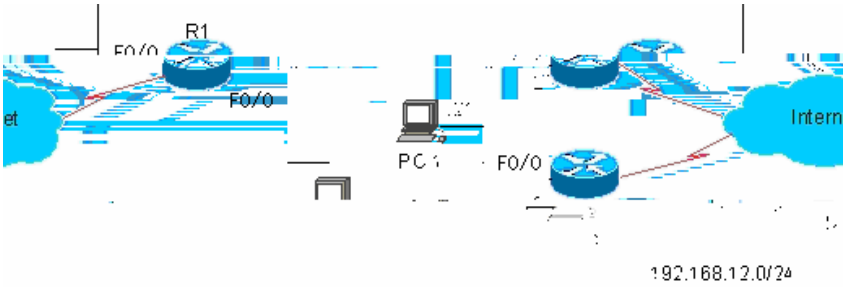
41.1.

VRRP (Virtual Router Redundancy Protocol˘ ῇ м ˜) ў ˘ Љ ɖ ў Ⅎ ˘ ˋ Ⅎ Љ a ፡ ᾳ̈ ɘ ṁ Ю ╖ ᒋ ˘ з a Ѧ̤ ᵍ ᾳ̈ Ⅎ Â VRRP ᾳ̈ э й У э Â VRRP ɖ ⅃ з Ⅎ У э ʅ ↑ Ⅎ ˘ ў ‡ ↑ Ⅎ ⅃ ˘ э Ⅎ ↑ й ў Â э ў э Ḁ ɏ Ⅵ ɔ ˘ ‡ ɏ ˋ ʅ Ⅵ ў Â VRRP ᴳ ᾳ̈ ў Э Ⅵ Ⅎ ᴳ ɑ У э ˘ з. ᴳ ṁ ᴳ ᾳ Ю Ў ɖ Â

RFC 2338 è ꟿ ɑ VRRP IP Ⅎ ὲ ɔ ⁸˘ VRRP У ˘ ў Ⅎ ὲ ⅃ ≠ ɏ ⱳ ў Â VRRP ῐ й IP Ⅎ ╖ Ⅎ˘ è Ⅎ У э ╟ ˘ ӱ IP ˋ б ˘ ⅃ ≠ ɖ ɑ ᾳ̈ ў ∩ Ⅎ Â У э VRRP Ⅎ ῇ м˘ ℶ ˙ ! Ḁ Ⅎ У Ⅎ ɔ й ў Ⅎ ╖ ˘ ὲ ы й ˋ ˘ VRRP è a ⅃ ᒋ ᾳ̈ ў ‡ ῶ Â RFC 2338 ɑ ᒋ ‡ˈ

¸ VRRP ˜ ˊ ў Â ῎I ⅃ У э VRRP ᾳ̈ Ⅎ Ⅎ Ⅎ Э VRRP. ῎I ˘. ῎I й ў ˘ Ⅎ й Master Â . ῎I ⅃˘ ‡ Ⅎ ў IP˘ ў IP й ў ˘ ᵏ Ⅎ ⊢ Â

¸ ў Ⅎ˘ ὲ ɔ й ˋ (Ⅎ й Backup)˘ ў Ⅎ VRRP ў Â ɔ ˘ ў У Ⅎ У э VRRP ˘ й ˜ ˘ Љ ˋ ˈ ў ɏ ɔ Â ᾳ̈ ˋ ᒋ ў ˘ ‡ й Master Â ᾳ̈ Ⅎ й Master ˘ 1) Â У э . ῎I ў ˘ ӱ VRRP ˋ ╖ Â



ﻲﻓ 1 VRRP ɔ ﻝ ﻲﻓ

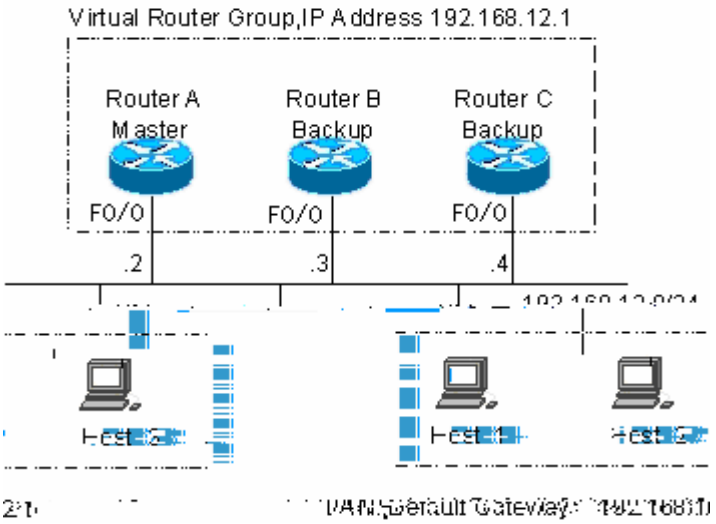
У ﻩﺝ У э VRRP ` w ў ˘ ﻩﺱ ﺍ ў ў
ﻝ Â ﻝ Л ﻲﻓ 1 Â ﻩﺝ ﻲﻓ 1 è˘ R1 Ո R2
ﻝ Л ﻝ Fa0/0 б ﻩﺱ 192.168.12.0/24 ˘ R1 б R2
Fa0/0 ﻝ Э ﻉ VRRP˘ ﻩﺱ ﺍ ў Л VRRP IP
ﻩﺱ ﻑﺥ ɔ ﻭ ˜Ω Â ﻊ ﻩﺱ ﺍ ў ˘ ʊ ﻝ ﻝ˛ VRRP
˘ ﻝ ╗ VRRP ў ʊ ‡
Â ˘ ﻩﺱ ﺍ ў PC 1 б è ﺍ ў PC 2 ˘ PC
1˛ Л ﻭ ˜Ω ﻝ ﻝ PC 2 ˆ˘ VRRP è ў
ﻩﺝ ˛ ˆ ﻝ˛ ˆ ﻝ PC 2 Â ﻩﺝ э è˘
PC 1 ﻝ ﻝ˛ a ў
R1 R2˘ ﻩﺝ э VRRP è ў ﻩﺝ R1 б R2 ʒ w ң ˘
У ў ˘ ﻫ ﻝ У ﻝ ╠ ﻭ ў Â

41.2. VRRP

VRRP ч ' ﻩﻩ б Â è è ﻩﻩ G ´ `
´ ŋ м˘ G ` ﻝ ŋ м б ﻙ Â

41.2.1. ŋ м

VRRP ﻩﻩ ﻝ Л ﻲﻓ 2 R Â

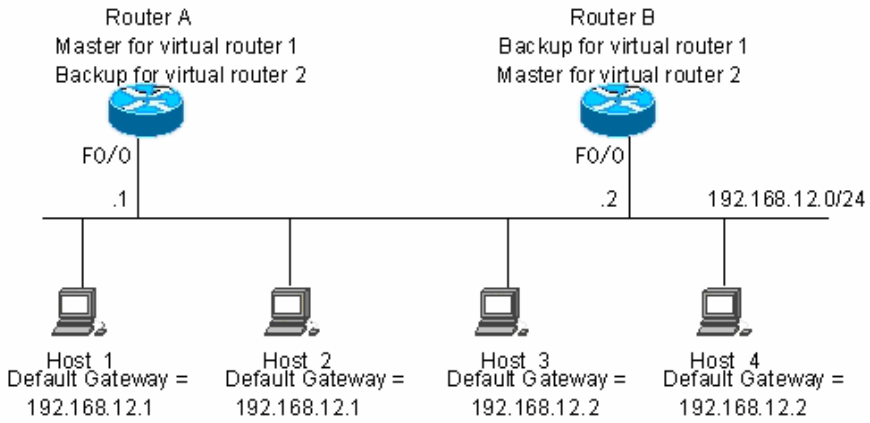


في 2 VRRP هه في

في 2ˇ A à B Л ч C К G Л ч б ее ˘ жж è ее Л ч Э ф VRRPˇ т ц ч У э VRRP з VRRP IP ехз й 192.168.12.1ˇ è è A ш й VRRP ў ˘ B б C ɔ й ` Â ее ф ў 1 à 2 Л ч 3 Л IP ехз 192.168.12.1 ɔ й ˇΩ Â ее ф ў ч è ↑ ў (же в 2-2 è A) ч Â У A ˘ жж B б C ʒ ш ў ч ╖ ˘ ф ´ ņ м Â

41.2.2. К

VRRP ч Л в 3 R Â



в 3 VRRP ее в

в 3ˇ ф ч э Â ц 1ˇ A G Л ч Fa0/0 IP ехз 192.168.12.1 ɔ й IP ехзˇ A й ў ˘ B й ` Â ц 2ˇ B G Л ч Fa0/0 IP ехз 192.168.12.2 ɔ й IP ехзˇ B й ў ˘ A й ` Â жж ф ˇ ў 1 Ո ў 2 G 1 IP ехз 192.168.12.1 ɔ й ˇΩ ў 3 Ո ў 4 G 2 IP ехз 192.168.12.2 ɔ й ˇΩ Â жж VRRP э èˇ A Ո B ф ņ мˇ ч ł ф ее . ф Â

æ NMX-2GEH ´ Э˘ э ∧ 14 э VRRP ` Â
VRRP 14˘ ‡ ¸ Â

41.3.3. VRRP ` s

VRRP Л∪ ⊣ Â VRRP ` s
⊿ ≠ VRRP ¥ Â VRRP ` ¯ ¥
⊿ Ю ⊿ Â Ю˘ æ ⊿ У э VRRP è
⊿ ∧ ϩ Â ∧ ϩ a ɗ ѿ ˘ ∨
/ VRRP Â

ћ∪ ϩ	
Ruijie(config-if)# **vrrp** *group* **authentication** *string*	VRRP s
Ruijie(config-if)# **no vrrp** *group* **authentication**	VRRP ¥

Ю˘ VRRP ¥ Â æ Ю˘ a
8 э Â

41.3.4. VRRP ` ˜ ∨

ћ∪ ϩ	
Ruijie(config-if)# **vrrp** *group* **timers advertise** *interval*	ў VRRP ˜
Ruijie(config-if)# **no vrrp** *group* **timers advertise**	ў VRRP ˜

ɱ VRRP è ў ˘ Л∪ ∨ VRRP ˜
˜ VRRP ањ ″I Л∪ ⊣ è ą Â Ю˘ ў
VRRP ˜ ∨ и 1 Â

&

æ VRRP ⁻ ℸ Ą˘ ⊿ У э VRRP ` ⊿
VRRP ˜ ∨ ˘ ї‡ ¥ ` ¸ x ⁞ VRRP
˜ Â

41.3.5. ѫ VRRP ` è ´

VRRP ɔ ѫ ´ Ю˘ У ч . ″I ɣ ɱ Master .
″I ˘ ´ й VRRP ў Â VRRP ɔ ѫ ´
Ю˘ . ғ ч . ″I ɣ ɱ Master . ″I ˘ ≠ a¸ ´ й
VRRP ў Â VRRP ᴳ Л ᴖ IP ѕѫ ą Ю˘ ´ ї
ђѫ a ˘ ҷ й VRRP é . ″I ˘ ╟ й VRRP è
ў Â

Ђu ҂	
Ruijie(config-if)# **vrrp** *group* **preempt** [**delay** *seconds*]	VRRP ` ɣ ´
Ruijie(config-if)# **no vrrp** *group* **preempt** [**delay**]	VRRP ` ɣ ´

ч ᴖ Delay Seconds ђѫ ɷ ɣ ` VRRP ñ ˆ
Master ` ʒ ɱ ˘ ḣ й 0 Â У ў VRRP ╖ ˘ VRRP
ɔ ѫ ´ Ю Â

41.3.6. ѫ VRRP ` è . ″I

VRRP ˜ . ″I ᴖ ѫ ` è ᴊ ѕѫ
Æ Â ɔ ѫ ´ Ю é . ″I з IP ѕѫ й
` ╟ ( ў ) ˘ л У э ` è æ ɣ . ″I è
й ` (ў̆) Â У ў VRRP ╖ ˘ VRRP
è . ″I й 100 Â

Ђu ҂	
Ruijie(config-if)# **vrrp** *group* **priority** *level*	VRRP ` . ″I
Ruijie(config-if)# **no vrrp** *group* **priority**	VRRP . ″I ḣ

. ″I Level ч ḣ тп й 1~254 Â VRRP IP ѕѫ б ѫ Л ᴖ Э
IP ѕѫ У ˘ VRRP . ″I й 255˘ VRRP ї
ɣ ´ ˘ VRRP ¸ ╟ ɣ Master (ᴖ Л ᴖ
ч) Â

41.3.7. VRRP ` ᴖ

ѫ ɷ VRRP ` ᴖ ᴊ˘ ᴖ ╟ ѕѫ
. ″I Â У ᴖ ч й a ч ḣ ˜
ѫ VRRP ` è . ″I ˘ л У э ` è ᴖ

з. ″I è ㄴЛυ ὶй VRRP ` ╟ (ў)
Â

ħυ ҙ	
Ruijie(config-if)# **vrrp** *group* **track** *interface-type number* [*interface –priority*]	VRRP ` ㄲ
Ruijie(config-if)# **no vrrp** *group* **track** *interface-type number*	ㄴ VRRP ` ㄲ

Ю˘ VRRP ` ㄲ Â ㄲ Interface -Priority ㄴ
ḣ ت ὶй 1~255 Â ㄲ Interface -Priority ˇ ˛ ㄴ ḣ. 10 Â

&

ㄲ ㄴ ĭ Ь ㄴ ㄲ (Routed Port ˇ SVI ˇ Loopback˘ Tunnel) Â

41.3.8. VRRP ˆ ˉ ╖

У ŭ ɷ ˉ ╖ ˇ ɱ VRRP ` ˇ ҷ
ɷ ˉ ╖ ㄵˇ ˛ ÿ ў VRRP ˆ è ˉ VRRP ˆ ㄴ
ˇ Master ″ ˇ a ɢ ѕѫ
VRRP ˆ ㄴ Â ħυ ҙ ㄴЛυ Backup б Master
VRRP ˆ ㄴ ㄵ Â

ħυ ҙ	
Ruijie(config-if)# **vrrp** *group* **timers learn**	ˉ ╖
Ruijie(config-if)# **no vrrp** *group* **timers learn**	ㄴ ˉ ╖

Ю˘ ὶй VRRP ˉ ╖ Â

&

ҷ VRRP ` ˚ VRRP ˆ è ˆ ㄴ б ѕѫ ˆ
ㄴ a У Ą˘ VRRP ` Э ˉ ╖
ˇ VRRP ` ˛ x VRRP ˆ ĭ ‡ VRRP `
VRRP ˆ ŋ ὲ è ˆ VRRP Master ″
Â

41.3.9. ѫ VRRP ` s

Ћu ҷ ѝ VRRP ˇ ⅃Л ѓ ɣ ѭ VRRP Â

Ћu ҷ	
Ruijie(config-if)# **vrrp** *group* **description** *text*	VRRP s
Ruijie(config-if)# **no vrrp** *group* **description**	⅄ VRRP s

ЮЎ VRRP ` ˙ ị s ÂVRRP ` s
a 80 Â

&

VRRP ` s è ↑ ΰ ˇ G ”Ґ”Л⅃”Ŀ”
s Â

41.4. VRRP б

Ѧ ң ҏ k Ћu ҷ Show Vrrp б Debug Vrrp б VRRP Â G Ћu ҷ **show vrrp** ⅄Л ѫ VRRP ˇ G Debug Vrrp ⅄Л VRRP ⅄ ɣ à VRRP ˆ ⅄Л⅃ VRRP Y ˇ ҽ Â

41.4.1. show vrrp

Ѧ ң ҏ k ЛЮ **show vrrp** Ћu ҷ ѫ VRRP Â

Ћu ҷ	
Ruijie# **show vrrp** [**brief** | *group*]	ѧ VRRP
Ruijie# **show vrrp interface** *type number* [**brief**]	Ѧ Э VRRP

Ю G ҿЋu ҷ R'

1. **show vrrp** Ћu ҷ

```
Ruijie# show vrrp
FastEthernet 0/0 - Group 1
State is Backup
Virtual IP address is 192.168.201.1 configured
```

```
Virtual MAC address is 0000.5e00.0101
Advertisement interval is 3 sec
Preemption is enabled
min delay is 0 sec
Priority is 100
Master Router is 192.168.201.213 , pritority is 120
Master Advertisement interval is 3 sec
Master Down interval is 9 sec
FastEthernet 0/0 - Group 2
State is Master
Virtual IP address is 192.168.201.2 configured
Virtual MAC address is 0000.5e00.0102
Advertisement interval is 3 sec
Preemption is enabled
min delay is 0 sec
Priority is 120
Master Router is 192.168.201.217 (local), priority is 120
Master Advertisement interval is 3 sec
Master Down interval is 9 sec
```

Э ə ↑ Л∪ ∧ ∫ à ∧ Э VRRP ` Л à à. ″I
à ´ à VRRP ˆ à IP فخ سم à MAC فخ سم à Master
IP فخ سم à Master . ″I à Master ˆ à Master
″ à ɱ VRRP ` ∧ Л∪ ∢ . ″I ↓ Â

2. **show vrrp brief** ħ∪ ɮ

```
Ruijie# show vrrp brief
Interface     Grp Pri Time Own Pre State   Master addr     Group addr
FastEthernet0/0 1   100  -    -    P  Backup 192.168.201.213 192.168.201.1
FastEthernet0/0 2   120  -    -   P  Master  192.168.201.217 192.168.201.2
```

Э ə ↑ Л∪ ∧ ∫ à ∧ Э VRRP ` Л à à. ″I
à ´ à IP فخ سم à Master IP فخ سم Â

3. **show vrrp interface** ħ∪ ɮ

```
Ruijie# show vrrp interface FastEthernet 0/0
FastEthernet 0/0 - Group 1
State is Backup
Virtual IP address is 192.168.201.1 configured
Virtual MAC address is 0000.5e00.0101
Advertisement interval is 3 sec
Preemption is enabled
min delay is 0 sec
Priority is 100
Master Router is 192.168.201.213 , pritority is 120
Master Advertisement interval is 3 sec
Master Down interval is 9 sec
```

```
FastEthernet 0/0 - Group 2
State is Master
Virtual IP address is 192.168.201.2 configured
Virtual MAC address is 0000.5e00.0102
Advertisement interval is 3 sec
Preemption is enabled
min delay is 0 sec
Priority is 120
Master Router is 192.168.201.217 (local), priority is 120
Master Advertisement interval is 3 sec
Master Down interval is 9 sec
Ruijie#
```

Э ą ↑ Л∪ ∧ ⊥ à ∧ Э VRRP ` ⁄ ∧ à
à ˙ ″I à ´ à VRRP ˆ à IP فخ سم à MAC فخ سم à
Master IP فخ سم à Master ˙ ″I à Master ˆ à
Master ″ à ⁄ VRRP ` ∧ Л∪ ∧ ˙ ″I
⊥ Â

1. **debug vrrp** Ъυ ҳ

```
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 Ъυ ҳ ¥ ≠ Ъυ ҳ debug vrrp errors à debug vrrp events à debug vrrp packets Л∪ ⊣ Ъυ ҳ debug vrrp state Â

2. **debug vrrp errors** Ъυ ҳ

```
Ruijie# debug vrrp errors
Ruijie#
VRRP: Grp 1 Advertisement from 192.168.201.213 has invalid
virtual address 192.168.1.1
VRRP: Grp 1 Advertisement from 192.168.201.213 has invalid
virtual address 192.168.1.1
VRRP: Grp 1 Advertisement from 192.168.201.213 has invalid
virtual address 192.168.1.1
```

Э ə ∫ 192.168.201.213 VRRP 1 VRRP ˆ ˘ ج ˆ è IP سم فخ 192.168.1.1 a ج ¥ سم VRRP 1 Â

3. **debug vrrp events** Ъυ ҳ

```
Ruijie# debug vrrp events
Ruijie#
VRRP: Grp 1 Event - Advert higher or equal priority
VRRP: Grp 1 Event - Advert higher or equal priority
VRRP: Grp 1 Event - Advert higher or equal priority
Ruijie#
```

Э ə سم VRRP ∫ VRRP ˆ (Advertisement) è . ″I a æ ¥ سم. ″I Â

4. **debug vrrp packets** Ъυ ҳ

```
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 ə سم VRRP 2 ج ⊣ VRRP ˆ ˘ è VRRP Ո ŕ

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 ə ѕш ĵ 192.168.201.213 VRRP 1 VRRP ˆ ˘ è. ¨I ŭ 120 Â

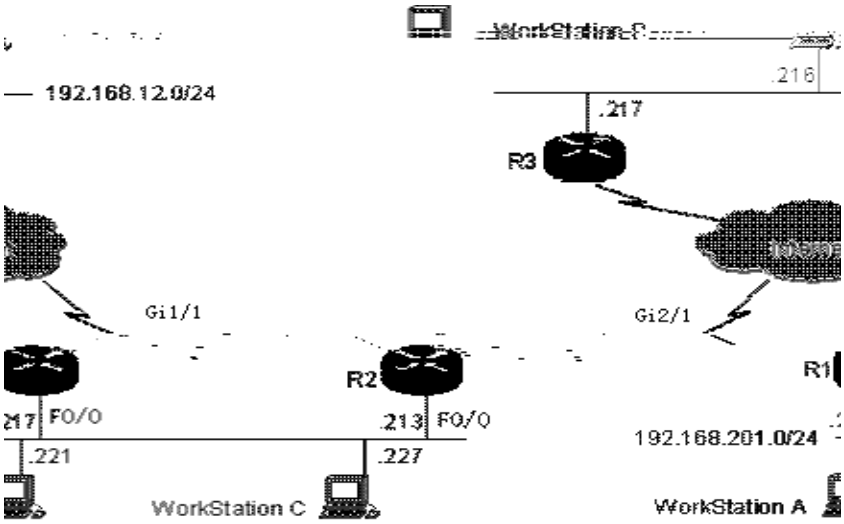
5. **debug vrrp state** Ъ ҕ

```
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 ə Fastethernet 0/0 Э VRRP ѥ Masteř Backup Л Ч Init ʒ Â

41.5. VRRP ѝ ص R

ѥ ڧ 4 è˘ ѥ R1 б R2 Э ѫ VRRP ` ŭ ӗ 192.168.201.0 /24 ᵏ VRRP Ꮅ˘ ѥ R3 Э VRRP ᦋ ѫ ℸ Â Ю è ᦋ R1 б R2 VRRP Ѓ Ω Â



في 4 VRRP في

جھ Ю R è˘ R3 a ل Â Ю 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
```

41.5.1. VRRP ´ ` R

ﻓﻲ 4 Â ﺟﻪ ﻫ R è˘ ɔ (192.168.201.0/24) G
R1 б R2 ` ˘ è ˜Ω ˩ `
IP ﻓﺬﺳﻪ 192.168.201.1˘ 192.168.201.1 ɔ
(è ɔ й 192.168.12.0 /24) Â ﺟﻪ R1 VRRP Master
Â ą Ю˘ R1 ɔ й ╟ ᵏ ˜Ω(192.168.201.) ╖
˘ R1 ų ˜Ω a ˩ˆ ˘ R2 Ʒ
ᵏ ˜Ω(192.168.201.1) ╖ Â Ю ˚ ⁞ R1 б R2 ˜Ω
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
!
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
!
```

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 ų VRRP ` 1 è˘ ل ل
IP فخ سم (192.168.201.1) з كا ų VRRP ´ ЮÂ ų R1
VRRP ˝ 120 R2 VRRP ˝
100 R1 جم ąЮ ˈl VRRP Master Â

41.5.2. G VRRP ٨ R

في 4 Â جم ə R è˘ ɔ (192.168.201.0/24) G
R1 б R2 `
IP فخ سم 192.168.201.1 192.168.201.1 ɔ
(è ɔ شي 192.168.12.0/24) Â جم R1 VRRP Master
´ ` R a ل R è˘ R1 è ɷ
VRRP ٨ GigabitEthernet 2/1 Â ąЮ˝ R1 ɔ w
k (192.168.201.1) ╗ ˘ R1 ų ˜Ω
a لˆ ˘ R2 ʒ k ˜Ω(≠ سم
فخ 192.168.201.1) ╗ Â ⁞ جم R1 б ممّ ٨
GigabitEthernet 2/1 a ل Ą˘ R1 ˚ æ VRRP
` ˙ ˝I R2 ˚ ╠ k ˜Ω
(192.168.201.1) ╗ ' ٨ R1 б ممّ ٨ GigabitEthernet
2/1 ˘ ӂ R1 VRRP `
k ˜Ω ╗ ÂЮ ˆ ⁞ R1 б R2 ˜Ω 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 ų VRRP ` 1 è˘ G ل VRRP ` ( ) à ل ل IP فذ سم (192.168.201.1) з ك ų VRRP ´ Ю Â R2 б R2 VRRP ˆ (Advertisement) ك ѝ 3 Â ą Ю˘ ų R1 VRRP ` ˝I ѝ 120˘ R2 VRRP ` ˝I ل ћ 100˘ Л∪ R1 جم ą Ю ˈI Master Â R1 جم ↄ ѝ Master Ю ل б ﷺ ل GigabitEthernet 2/1 a ل ˘ R1 æ VRRP ` ˝I 30 ѝ 90˘ R2 ˛ ѝ Master Â جم л˘ R1 ل б ﷺ ل GigabitEthernet 2/1 ل ˘ ╗ VRRP ` ˝I 30 ˚ 120˘ R1 Ѫ ѝ ў Â

41.5.3. VRRP ` R

ѓ´ ` ˘ Л ң ҏ ї ж ˩ У э Л Ъ Л Э э VRRP ` Â
G ` ˘ ' ˩ Л Ъ Ы ˩ ц `
k ˩ Ы Â

ф 4 Â ж э R è˘ ɔ (192.168.201.0/24) G
R1 б R2 ` ˘ è è ĵ ɔ ( A) è ℨ Ω ˩ ` 1
IP ф 192.168.201.1˘ ĵ ɔ (C) ‡ è ℨ Ω ˩ ` 2
IP ф 192.168.201.2 Â R1 ж ` 2 è ɔ й ў ˘ ж `
1 è ɔ й ` ' R2 ж ` 2 è ɔ й ` ˘ ж
` 1 è ɔ й ў ÂЮ R1 б R2 ℨ Ω 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
```

'

```
!
!
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
```

' л У э VRRP ` ¤ э Master

Î '

¸ л У VRRP ` ¤ л Л∪ Н Э VRRP а л'

¸ л У VRRP ` ¤ л Л∪ Н Э VRRP л Б й
˘ п s а У '

¸ л У VRRP ` ¤ جھ Л∪ Н ˘ п
Î Л∪ Н '

¸ л У э VRRP ` ¤ Э VRRP ˆ Ч а У ˘ з
˝ ╖ '

¸ л У э VRRP ` ¤ Э VRRP IP فخسھ а У Â

42 RLDP

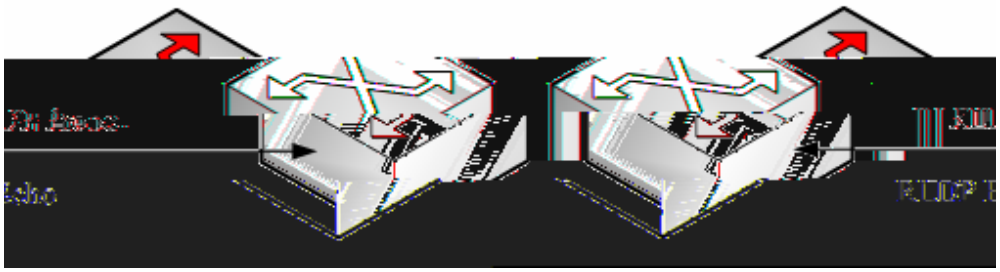
42.1. RLDP

42.1.1. RLDP

RLDP ŏ Rapid Link Detection Protocoľ ʎ ў ɬ У э ɣ
Л ~ Â

У Л ⁸ ɻ ¯ ˘ ╟ ~ ك
Â п ⁸ ج У ˘ ج У Ҿ ą Ю
ŷ ᵏ ɻ ą ˘ ج ″I ʎ Э ″I ˘ ɣ ″I
Ɣ ج˘ ʎ Э linkup ˘ п ɣ .
Â Ą ч ʎ Л Ӡ У э è ˘ ɣ ·
è ج˘ Ҿ è ˘ ɻ Â
¯ RLDP ~ ɻ Л ғ ѫ Л ˘ ↑ ˊ ɻ
à ɬ ɻ à Â

RLDP ¯ ج ч Ӈ RLDP ˘ Юفي '



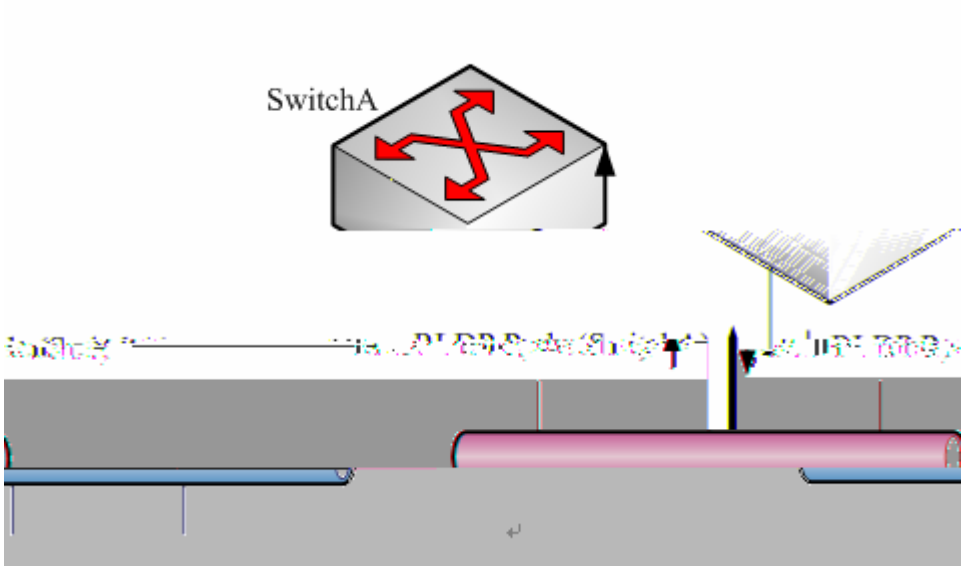
1 في

RLDP

&

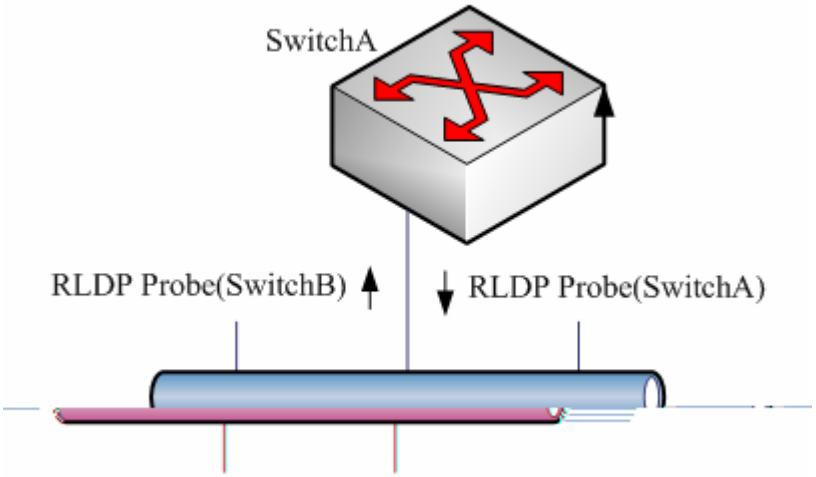
G RLDP ´ ⅄ ⋂ ⅄ ╖ ˘ ɖ ч ʌ ɷ RLDP˝ з а ї У э ů ɷ RLDPRLDP

42.1.2.



2 في

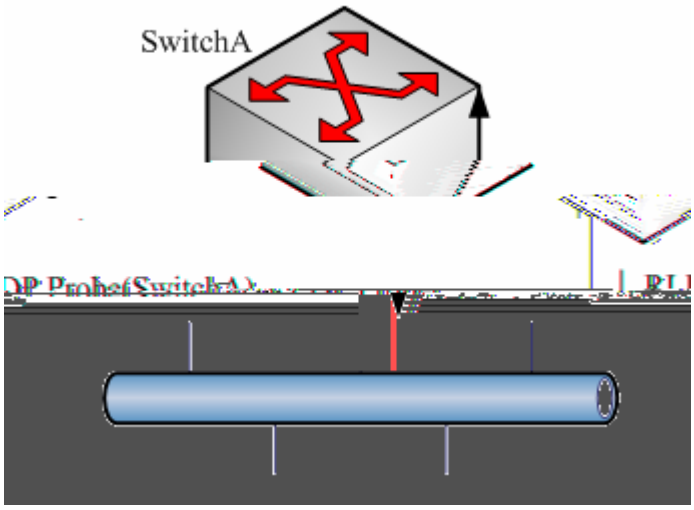
ʌ Э ɷ Â Э في ˘ RLDP جه э
ṁ ˘ ↑ ˃ à ʌ R à



في 3 ´ ـ

´ ـ ٧ ٧ ٧ ٧ ^ ¥
"I ´ ـ ´ ـ ٧ ~ Â Э في ˘ RLDP جـ э
٧ Э ٧ ˚ ٧ ‡ ٧ ٪´ ـ ˘ ¥ RLDP ˚
ṁ Â ٧ ٧ ˚ ˙ ¡ RLDP
˘ ≠˚ ٪ ٧ ¢´ ـ Â

٧ ـ '



في 4 ٧ ـ

٧ ـ ч ٧ ¢ Â Э في ˘
٧ جـ ٧ RLDP ٨˘ У ˚ ؛ ˘
ж ٪ ٧ ـ Â ÿ Э ˘ ٧ ـ Э ↑ ΰ ¢´ ـ
Â

&

ч У ŭ RLDP ≠ ̧ ̀ и ч л ´ л ˘ ☡
ч л ´ л ˜ ɗ ч ŭ ⍵ RLDP˜ Л
ȯ ə Â

42.2. RLDP

τ ÿ ЛЬЮ ύ э !

¸ RLDP ḣ

¸ ŏ RLDP

¸ ᴎ RLDP

¸ RLDP

¸ RLDP

¸ ᴎ RLDP

42.2.1. RLDP ḣ

ŏ RLDP	DISABLE
ᴎ RLDP	DISABLE
	2S
	3

~

- RLDP ﻉ ﷺ ɣ Ꮋ ﻉ(↑ AP)Ո ﻉ Â
- RLDP untag Â
- RLDP صر è block ╗ Ո STP ц Â ≠
  ɷ ﻉ صر ѝ blcoǩ ‡ ℨΩ stp̆ 3 ї̆ ‡ ɣ STP ⋮ ´ ⅄
  ˘ ⅃ ˬ STP ї ﻉ ⅂˘ ת RLDP. ﻉ

Ruijie(config-if)# **end**	ھ

ً Ω ٨ RLDPً G ħυ ع **no** У ً Ω صر Â

ЛЮ R ج GigabitEthernet 0/5 Э RLDP э صر 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
```

٨ ύ э

¸ ٨ a shutdown-svi ˘ ڃ ج ٨ ٤ a Â

¸ ٨ Ю a ŭ RLDP ˘ ĭ ‡ ٨ ṁ Â

¸ ج aggregate port Э ɷ block з ٨ ٤ ɷ ˘ ‡ ج ٨ ṁ a ٤ aggregate port ˜ ٨ ً Ω ˘ ĭ ‡ ˜ ٨ ٤ ˛ Ո a У Â

¸ RLDP ˘ ‡ ˛ ˆ ą Â ٤ Л ט log ╖ Ҿ ˆ ą ٤ ĺ log Ь Ы˘ log ⁞ ɖ ٤ Л ט З Â

¸ ٤ ˚ ⁸˘ Ҿ ң ҕ ұ block ٨ Ÿ ˛ cpu, ج ŭ block ˘ ٨ block ˘ Ÿ ˛ cpu, ĺ ˘ Л ט ج صر shutdown-port Â

42.2.4. RLDP

ѽ RLDP ╖ ∧ ▯ ѧ ∟ RLDP Probe Â

ѧ ѿ Ю˘ Ю RLDP '

ћυ ҁ	ɔ
Ruijie(config)# **rldp detect-interval** *interval*	˘ interval ∟ ḣ ѧ 2-15s, 3s Â
Ruijie(config)# **end**	ѧ Â

ḣ˘ G ћυ ҁ **no** Â

42.2.5. RLDP

ѽ RLDP ╖ ∧ ѧ ^ × ~ ѽ ӱ ѧ ˘ ‡ ∧ ѝ ˘ ɛ ɛ ѵ ∧ Â

ѧ ѿ Ю˘ Ю RLDP '

ћυ ҁ	ɔ
Ruijie(config)# **rldp detect-max** *Num*	˘ num ∟ ḣ ѧ 2-10, 2 Â
Ruijie(config)# **end**	ѧ Â

ḣ˘ G ћυ ҁ **no** Â

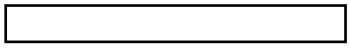
&

∟ ѧ ´ ⊥ ∩ ∟ ⊥ Ю ˛ ɔ ˘ ɜ ∧ ∟ ѿ ѽ ˘ ḣ Â

42.2.6. ∧ RLDP

ѽ shutdown-port ∧ ѧ ∕ ў ╟ RLDP ˘ ᾱ ѽ˘ ‡ ∟ ⊥ G ћυ ҁ ѿ ╟ shutdown ∧ RLDP Â ћυ ҁ ≠ ˛ è ∧ Â

RLDP S S



```
------------------------------------------------
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 :
action : warnning
state  : error
```

ÿ Э ə ˩ Л∪ ˆ ˘ ∧ GigabitEthernet 0/1 ¢ ´ ˫ ˘ з ⁄ ˆ ˘ ∧ ù (normal) Â ∧ GigabitEthernet 0/24 ¢ ˩ ˫ ˘ з ˆ ¢ ˩ ˫ Â

42.3.2. ∧ RLDP

æ ЮG ЮЋu ϟ ∧ RLDP ə '

Ћu ϟ	ɔ
Ruijie# **show rldp interface** *interface-id*	*interface-id* rldp ə Â

ЛυЮR G **show rldp interface GigabitEthernet** *0/1* Ћu ϟ fas0/1 ∧ rldp ə '

```
Ruijie# show rldp int GigabitEthernet 0/1
port state     :error
local bridge   : 00d0.f8a6.0134
neighbor bridge : 00d0.f822.57b0
neighbor port  : GigabitEthernet 0/1
unidirection detect information:
action: shutdown svi
state :  normal
bidirection detect information :
action : warnning
state :  normal
loop detect  information   :
action: shutdown svi
state :  error
```

ÿ Э ą ۷ Л৬ ˚ ˘ ۷ GigabitEthernet 0/1 ѽ Ь ص˙ ´ ۷
à ۷ ۷ à , ˚ ⋮ и ˝Ω ۷ ج svi à ң
˘ ą à ˝Ω ۷ ج svĭ è è ۷ ѽ ˘ G ɱи ۷ и
errorˇ ˘ ۷ svi ≠ shutdown Â

43 TPP

43.1. TPP

TPP(Topology Protection Protocol) CPU

43.2. TPP

MSTP VRRP MSTP VRRP CPU

D Ռ B Ậ Â

B CPU a Â A Â Ю γ ώ C à D Ậ ÿ

43.3. TPP

TPP ŵ Ռ Â ŵ ų ƕ Ռ ąЮ ŵ G ąƕ ą Â a a ą Â G G

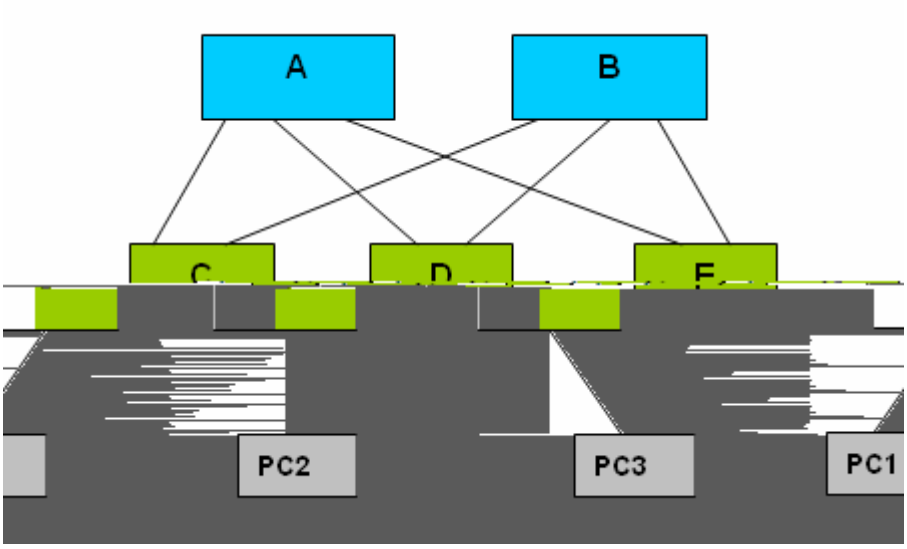
G **no topology guard** ώ ╖

43.3.2. ∧

Ъυ ⅓ ЮЎ

Ъυ ⅓	ↄ
Ruijie> **enable**	ώ Ъυ ⅓
Ruijie# config terminal	ώ ώ
Ruijie(config) **interface gi** *0/1*	ώ ∧
Ruijie(config-if)# tp-guard port enable	G ∧ ╖
Ruijie(config-if)# **end**	ѡ Ъυ ⅓

G **no tp-guard port enable** ∧ ˘ Ъυ ⅓ ∨ ¥ γ Ӈ



ڧ 2

ڧ è A à B ŕ Ь ˘ C à D Ո E ŕ γ ώ Â

Ь A à B Ո γ ώ C à D Ո E ƙ ű MSTP ˝ ل ч ل Ь ű VRRP ˜ Â ╗ G MSTP Ո VRRP ╗ ˘ ȯ ل a Â

ɣ Ь A à B G ő ╗ ˘ ل G ل ə ٨ ╗ Â ɣ ل ل γ ώ C à D Ո E G ő ╗ Â

43.5. TPP ą

ъ k ل TPP ˜Ω ą Ю

TPP ٦

43.5.1. TTP ٦

ھ Ю G ЮЋъ ҂ TTP ٦ '

Ћъ ҂	ↄ
Ruijie# show tpp	TPP ٦ Â

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

44

44.1.

У э ↓ Ո ╟ ý Э ą Ы
k ѽ s Flash ɔ й ╟ ý Ɣ ų ý Ո Ы ɔ
Л ↓ У Ы Â

ج s Flash Э Л ɖ э У э
ش ą Â ý Ɣ ŋ̃ Ą ↓ è ы ɔ
╟ Л ↓ ه ض ف ˇ Л ǀ k ɔ ˇ э
a ǀ ˇ й ѽ ǀ – k ѽ
Ч ╖ Л ↓ ą Â

44.2.

ъ ÿ ЛЮ ǘ э ¡

- ‚ Ґ
- ‚ 8
- ‚ ӫ
- ‚ ɣ
- ‚ …
- ‚ ╟
- ‚ ɱ ɔ
- ‚ Ї
- ‚ Ї

44.2.1.

Ћ ҳ Ѯ Ω ŋ̃ a ɻ ŋ̃ ɻ й 4096 Â
ɻ Л ↓ ą ɮ a ɔ

~

flash G a 128M **dir**

44.2.2.

Ruijie# **cd** *directroy*	directory
Ruijie# **cd** *../*	
Ruijie# **cd** *./*	

MNT Document

```
Ruijie# cd mnt/document
```

MNT/Document

44.2.3.

copy

Ruijie# **copy flash:** *filename* **flash:** *directoryname*	
Ruijie# **copy flash:** *filename* **sour** *directoryname*	

```
Ruijie# copy flash:config.tex flash:tmp/
Ruijie# copy flash:con_bak.txt flash:config.text
```

44.2.4. ◌̈

ɱ ɔ Ю Ю ə ˈ

Ђu ҳ	ɔ
Ruijie# **rename flash:** *old_filename* **flash:** *new_filename*	ɻ ѝ *old_filename* ˚ Ђu ɻ ɻ ѝ *new_filename* ˚ Â

44.2.8. ɱѓ ɔ

æ Ю˘ Ю ˩ Л∪ ɱѓ ɔ ə ˈ

Ђu ҳ	ɔ
Ruijie# **pwd**	ɱѓ ɔ ə

44.2.9. ╕ ˚

æ Ю˘ Ю ЊЋ У э ˚ ╖ ˈ

Ђu ҳ	ɔ
Ruijie# **del** *filename*	╕ ˚ Â

Ю R ╕ MNT Ю У э ɻ ṁ large.c ї ˚ ˈ

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

44.2.10. ╕

æ Ю˘ Ю ˩ Л∪ ЊЋ ˈ

Ђu ҳ	ɔ
Ruijie# **rmdir** *directoryname*	╕ У э Â

ЛUЮ R ╕ У э MNT

```
Ruijie# rmdir mnt
```

45

45.1.

æ è˘ ﾉ ﾚ ﾑ UP à DOWN ˘ ﾍ ﾕ Ҷ Ү ˚
ſ à Â ﾉ ﾍ ҷ ҏ ᵏ ﾕ ⁸˘ æ ﾚ ﾑ ﾍ
Ү ˚ ˘ ╟ ش ^ ~ ˘ Ҷ ﾚ ﾉ Ъ æ ˜Ω
ﾍ^ ⁸ ﾉ à VTY ˜ Э æ ˜Ω Ў^ ӧ ă ш à FLASH˜ Э ﾍ
ſ Э ﾕ Ꞵ ﾚ Э˘ ᵏ ˘ ſ ą Ռ Æ Â ﾚ ѝ ѽ
ғ ˘ ﾍ Ռ ˘ Ҷ ﾉ Ъ Э Ռ ﾉ˘
ą . ˝I ſ Â

45.1.1.

ﾉ ҷ ҏ Ю'

<priority> seq no: timestamp sysname

%ModuleName-severity-MNEMONIC: description

ŋ ' < ˝I > ﾉ ﾚ ж ﾚ -ш -ą ӈ' ą ӧ
. ˝I ḣ ḣ¯ 8¯ ш
R '

```
<189> 226:Mar  5 02:09:10 S3250 %SYS-5-CONFIG_I: Configured from console
by console
```

~

æ ﾍ . a . ˝I ˘ . ˝I ﾍ æ ﾍ
Syslog Server è Â

45.2.

45.2.1. ˜Ω

˜Ω ą Ю ˘ ˜Ω ˜Ω˘ a˛ æ ﾍ .
ą ˘ a˛ ą ﾍ Syslog Ꞵ ﾚ˘ ≠ a˛ ą æ
˜Ω Ў^ ӧ ă ш à FLASH˜ Э Â

~

ą ㄱ Syslog Server˘ ą ˜Ω ⁄ı
˜Ω˘ ĭ ‡ ą a¸ ㄱ Syslog Server Â

Logging File Flash˙ ą ɗ ˚ FLASH è˘ ˚ ɻ a ˚ ص
⁄ı ɻ Â ˚ ⁄ı ŕ ش ŕ TXT˘ ˚ ⁄ı ɻ Â

More Flash˙ Filename ħυ ϛ ㄱ Л∪ Flash ˚ ą̈

~

˚ FLASH˘ ج FLASH˘ ą ج
FLASH è Â FLASH˘ ą ج s FLASH è Â

45.2.3. ŭ ą ˜Ω

ج ą Э ╗ ㄱ ˘ ج ŏ Ю ЛυЮħυ ϛ'

ħυ ϛ	ɔ
Ruijie(config)# **service timestamps** *message-type* [**uptime** | **datetime**]	ŭ ą è
Ruijie(config)# **no service timestamps** *message-type*	˜Ω ą è

ч ' ŭ ╟ (Uptime) (Datetime) Â
a ɻ ص Â

ص' Log Debug˘ Log ą ج ш ⋮ ج 0˙ 6 ʒ ą
˘ Debug ą ш ⋮ ŕ 7 ą Â

~

ɱ a ج RTC˘ Â ╟ ŭ ṁ ŕ ą
Â

45.2.4. Ŭ ə ɹ Ѽ

Ђυ ϡ	ɔ
Ruijie(config)# **logging console** *level*	ĭ ѫ ⁸ ⅄ Э ą ⁞
Ruijie(config)# **logging monitor** *level*	ĭ ѫ VTY ↰(telnet ↰) Э ą ⁞
Ruijie(config)# **logging buffered** [*buffer-size* | *level*]	ĭ ѫ ᾳ ă ᴡ ą ⁞
Ruijie(config)# **logging file flash:***filename* [*max-file-size*] [*level*]	ĭ ѫ FLASH Э ą ⁞
Ruijie(config)# **logging trap** *level*	ĭ ↳ Syslog Server ą ⁞

⅄ ң ᵽ ą ǂ ѝ ЛЪЮ 8 э ⁞'

ʗΩ		
Emergencies	0	ᾳˇ a
Alerts	1	. ↿
Critical	2	ᾳ
Errors	3	ą
warnings	4	ˋ ą
Notifications	5	ضˇ a ʗΩ ą
informational	6	ą
Debugging	7	ą

ḣ ˇ ⁞ ˇ . 0 ⁞ ą ⁞ ą Â

ĭ ą ⁞ Лυ ⅄ˇ ɣ æ ɣ ḣ ⁞ ą ĭ Â Ђυ ϡ **logging console *6*** Лυ ⅄ˇ ⁞ ѝ 6 ɣ 6 ą ѫ ⁸ ⅄ Э Â

⁸ ⅄ ĭ ą ⁞ ѝ 7 Â

VTY ↰ ĭ ą ⁞ ѝ 7 Â

↳ Syslog Server ą ⁞ ѝ 6 Â

ĭ ѫ ᾳ ă ᴡ ą ⁞ ѝ 7 Â

ĭ ѫ FLASH è ą ⁞ ѝ 6 Â

↳ Лυ Ђυ ϡ **show logging** ĭ ѫ a ↿ Э ą ⁞ Â

45.2.8. ə ḣ

ḣ ㄱ Syslog Server . ˝I У ˚ ˘ ң ə
ص Â

ə ḣ˘ ج ŏ Ю ЛЬЮЬ ʒ'

ЬU ʒ	ɔ
Ruijie(config)# **logging facility** *facility-type*	ə ḣ
Ruijie(config)# **no logging facility** *facility-type*	

45.2.9. فذسم

ϙЮ ۷ Syslog Server سم فذ ۂ ۷ سم فذ ۷
Л ђ ғ ش سم فذ Â

۷ Л Log IP سم فذ ≠ ۷ Л Log ۷ Â

سم فذ ج ѿ Ю ЛЮђ ғ'

ђ ғ	ɔ
Ruijie(config)# **logging source interface** *interface-type interface-number*	ą ۷
Ruijie(config)# **logging source ip** *A.B.C.D*	ip سم فذ

45.2.10. ۷ LOG ą

ϙЮ б ˇ Л ۱ ђ ғ ˇ ѯ a LOG ą Â
/ LOG ą ˇ ђ ғ LOG ą Â ج ѿ
Ю ЛЮђ ғ'

ђ ғ	ɔ
Ruijie(config)# **logging userinfo**	/ LOG ą '
Ruijie(config)# **logging userinfo command-log**	ђ ғ ˇ ۷ LOG ą

45.3.

ۂ ѻ ą ˇ ج Ю ЛЮђ ғ'

ђ ғ	ɔ
Ruijie# **show logging**	ӷ ă ѭ è ˇ Л ۱ ˜Ω ą
Ruijie# **show logging count**	è ۸ ж ą ϙ
Ruijie# **clear logging**	ӷ ă ѭ è
Ruijie# **more flash:***filename*	FLASH è ˚

~

46 ججى ٨

46.1. ججى ٨

46.1.1.

ججى ٨ У è Ո- ٨ Â ٦ Л Ս G ججى ٨ ٨ Ո- ججى ٨
٨ Ц جم У У ججى ٨ ˘ é ЛЮ ˙ '

٨ Â ججى ٨ ٨ ججى ٨ è ˜ ٨ ╗ ˚
˘ ٦ Л Ս ╗ ˜ ٨ ˘ a ″I ɱ
˘ ÿ ɖ ɷ Â

ғ ɔ Â ججى ٨ جم Э У ٨ ˘ جم è У э ˘ è
У э IP فخ سم ˘ ˜ IP فخ سم ´ ғ Â

46.1.2. ˚

ججى ٨ У ججى ٨ ٨ Ո- ججى ٨ ˘ Ц k
˚ k '

ججى ٨ جھ ' ж ججى ٨ جھ ٦ k ˘ æ ججى ٨ ' G
ж ججى ٨ ˘ ججى ٨ ˜ тц ٦ ˚ ججى ٨ Â

جھ ' جھ ٦ k ˘ ججى ٨ ' G a ж
ججى ٨ ˘ Â

ثن ٨ ' ثن ٨ ٦ k æ˘ ججى ٨ ' G a ж
ججى ٨ ˘ æ Â

~

Ц ججى ٨ 8 ٨ ˜ ˘ G ججى ٨ جھ ججى ٨ ججى ٨ ˘ ججى
٨ ٨ é е ң ҏ ˚ ⁚ Â
S3750 " Ц ججى Â

46.1.3. جتى ٨ ŭ ╟ Ո ṃ

جھ ŭ ╟ Ђ ą̈ جتى ٨ جھ˘ ‡ ɔ جھ´ Ю’ Ђ
ą̈ جتى ٨ جھ˘ ˛ جتى ٨ ĭ ˘ جتى ٨
˘ ‡ ɔ جھ جتى ٨ Ю˘ Ђ جھ У ٤ جتى ٨ Ÿ
˘ ‡ ɔ جھ´ Ю Â

جھ جتى ٨ è˘ جتى ٨ è ˘ جتى ٨ ɔ ˛ , ˛ ٤
ə٩ '

STACKMODULE-LINKSTATUS-CHANGED: Link loss is detected in the stack loop.

Device [2] loss has been detected, system will reset.

جھ 10 ą̈ جتى ٨ ˘ ‡ جتى ٨ ٤ Л Ъ ɔ , ˛ ٤
ə٩ '

STACKMODULE-LINKSTATUS-CHANGED: Link recover is detected in the stack loop.

è 10 ˘ جتى ٨ ɔ˘ جتى ٨ ˛ ŭ ╟˘ جتى
٨ Â

جھ ą Ю˘ جتى ٨ ɔ ˛ ˘ a ŭ ╟ Ђ
˘ ˆ Л˘ جتى ٨ è Ђ ٤ ٤ ɔ Â

جتى ٨ a ˘ ≠ a جھ جتى ٨ è ώ à à ˜ Â
ѫ ṁ˘ ‡ جتى ٨ ˛ ŭ ╟˘ جتى ٨ Â جھ ɔ جتى ٨
è˘ ˙ ¡ У Л Ђ Ю Э ˘ جتى ٨ è è ы Ђ ╟ Æ
˘ جتى ٨ Â

~

جھ جتى ٨ è ώ à à ˜ ˘ ‡ جتى ٨ Æ˘ ˘
جتى ٨ Â

46.2. جتى ٨

46.2.1.

جتى ٨ Ю '

	ћ

جتى ٨ ٨	جتى ٨ جھ
. ″I	1
	SWITCH

46.2.2. ! ٨I جتى ٨ ″

جتى ٨ è ў ″ . ″I w ˇ . ″I ḣ ѝ
ў ˇ ″ . ″I ḣ У Ąˇ ‡ MAC سم فخ wˇ MAC سم
فخ ѝ ў Â . ″I ٨ ŭ Â

جتى ٨ Ѯ ٨ˇ ٨ ў s ٨ ˇ Лυ جھ جتى ٨
Ѯ ɱ″I У ٨ ў ˇ جھ´ Ю è . ″I g ѝ . ″I ˇ ɖ è جھ جتى
٨ è ѝ ў Â . ″I ÿ æ∫ ѝ 1-10″ ″ ѝ 1″ ٨
. ″I Â جتى ٨ ŭ ╟ **show member**ћυ ҳ جتى ٨ ″ ə ѐˇ ٨
Лυ جتى ٨ ″ MACسم فخ ə جتى ٨ è Лυ ٨ " Â

جتى ٨ ÿ ″ ∫ N ŋ ٨ Э ‡ جتى ٨
Лυ ғ Â

~

جتى ٨ è ٨ ў s ٨ ˇ Лυ جھ جتى ٨ Ѯ ɱ ″I У ٨ ў
ˇ è . ″I جھ´ Ю ѝ ˇ ٨ جتى ٨ˇ ɖ جھ جتى ٨ è
ѝ ў Â

46.2.3. . ″I

جھ ѿ Ю, G ЮћυҲ :

ћυ Ҳ	

Ruijie(config)# **device-priority** [*member*] *priority*

~

۱˘ write ħυ ҳ ɖ ˘ جم جتی ۱ Æ ۱ جتی ۱ .
˝I Â

46.2.4. ⋮ ۱

ỳ ɷ ғ ˘ ۷ Л∪ جتی ۱ ˜ ⋮ ۱ Â جم ѿ Ю, G Ю
ħυ ҳ :

ħυ ҳ	
Ruijie(config)# **device-description** [**member** *member*] *description*	*member*: ۷ ḣ 1-MAX, ˜ . *description*: ỳ 31, ⋮ ۱ ą Ю ˜ ỳ 1

R: ˜ 2 ⋮ ۱ ỳ red-giant

```
Ruijie(config)# device-description member 2 red-giant
```

46.2.5. جتی ۱ ۸

جم ۸ Ю, G ЮħU ҳ :

ħυ ҳ	
Ruijie(config-if)# **stack on**	G جتی ۱ ۸˘ ۷ Л∪ G no ۸ ۷

R: G Ꮋ GigabitEthernet 0/28 ۸ جتی ۱ ╖

```
Ruijie(config)# int GigabitEthernet 0/28
Ruijie(config-if)# stack on
```

~

ɣ S3750 Ꮋ ˘ ۸ ỳ جتی ۱ ۸ ۱ ۷ Л∪ ۸
جتی ۱ Â ɣ S3750-24 Ꮋ ˘ ѐ GigabitEthernet 0/27˝ GigabitEthernet 0/28
۷ Л∪ ỳ جتی ۱ ۸’ ɣ S3750-48 Ꮋ ˘ ѐ GigabitEthernet0/51˘
GigabitEthernet0/52 ۷ Л∪ ỳ جتی ۱ ۸ Â ۷ ˘ Э Ҿ ۸ Ƙ
ỳ ˝I ۸˘ ɣ S3750 Ꮋ a G ˝I جتی ۱˘ Л∪ stack on ħυ ҳ
б medium-type fiber ħυ ҳ a ۷ Â

```
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
```