RG-NBR

RGOS 10.3(4b11)

V .0

©2014

˘ ”Ą ˆ Â

˧˘ a ⊓ ”Ą ˆ ⁸ à à à à à
è à è ˆ Â

à à à à
® à ® à RGOS® à RGNOS® à
à Red-Giant® à à 锐捷®
”Ą ˘ a Â

"Ạ ˚ й ' RGOS 10.3 (4b11)p3

⁘ ⁄ Ю " ж˜

1) ƕ ʒ

ƕ ʒ ⱣⱣ Ю'

ᴇ' ƕ ʒ ̃Ω ˆ ƕ ʒ è ɖ a ˧˩ ˥ ˜ ╗ ᴇ Â

ᴇ' ƕ ʒ ˧˥ ˆ ƕ ʒ è ḣ ʒ ˥ ˜ ᴇ

[ ] ' [ ] ˥ ˘ جه ƕ ʒ ˧˩ Â

{ x | y | ... }' ÿ ч э э è ˧˩ У э Â

[x | y | ...]' ÿ ч э э è ˧˩ У э a Â

//' ˧˩ й Â

2) ˧˥

☼ ˧˥ جه ɔ è ⁞ سه ˘ Ҿ ⱣⱣ Ю'

~

---

3)

Ạ w ʀ ˥ ˧˥ صر ˧˩ ˧˩ a ˘ ɔ è ˧˥ ӈ ҽ ˧˥ صر Â

Ạ ˥ w ʀ ҽ è ˧˩ ǖ ɛ̀ ӈ ҽ " ɑ̈ ˆ ӈ ҽ صر ˧˥ ȁ ˜ ˘ ɛ́ ᴇ ҽ Ɲ ᴳ ҽ й ñ Â

Ạ è ˧˥ ⱡ ˧˥ ⱡ ӈ ҽ ضي ˘ ʒ ɑ У ⱣⱣ Ю ⱡ˘ Ɲ ˧˥ ɑ ˜ Ь Ӈ Â

Ruijie
Networks

Ƕ ʒ ˘ ˩ Ʊ Ƕ ʒ Â

ў ƱЮ ˈ

Ƕ ʒ

╟

Ƕ ʒ

Ƕ ʒ

CLI

˨˩ Ƕ ʒ

CLI

CLI

ǂ a ˩ ˘ Ƕ ʒ ᾱ ˩ Ʊ Ƕ ʒ Â

Ƕ ʒ Ю ˩˥ ˆ ?˜ ˩ Ʊ Ƕ ʒ Ƕ ʒ Â

˘ ˝I ˆ User EXEC

˜ ˘ ˩ Ʊ Ƕ ʒ Â Ю˘ ˨˩ ˩ Ʊ Ƕ ʒ˘ з Ƕ ʒ ╥ ≠ ˨˩

ˢ˘ show Ƕ ʒ Â Ƕ ʒ a Â

Ƕ ʒ˘ ˝I ˆ Privileged EXEC ˜ Â ˘

˨˩ ʒ Â Ю˘ ˩ Ʊ Ƕ ʒ˘ з

Â

ˆ ȁ ˨˩ ˜ Ƕ ʒ˘ ӈ Â

˘ Ƕ ʒ Ю ˘ ╟ ˝Ạ Â

˘ ˝I Â ÿ ˘ ˩ Ʊ ˨˩

Â

Ю Ƕ ʒ ȁ ȁ ȁ Â

˩ ѝ “Ruijie” Â

Ƕ ʒ ˈ

Ƕ ʒ			Ю	

Privileged EXEC ˆ ˜	Ю˘ ƚυ ʒ Â	Ruijie#	˘ ƚυ ʒ Â ˘ ƚυ ʒ Â	ƚυ ʒ Â έ ʌ ʒ Â
Global configuration ˆ ˜	Ю˘ ƚυ ʒ Â	Ruijie(config)#	˘ ƚυ ʒ ƚυ ʒ˘ Ctrl+C Â ʌ ˘ ƚυ ʒ Â ƚυ ʒ ʌ Â VLAN ˘ vlan_id ƚυ ʒ Â	ƚυ ʒ Â
Interface configuration ˆ ʌ ˜	Ю˘ ƚυ ʒ Â	Ruijie(config-if)#	˘ ƚυ ʒ˘ Ctrl+C Â ˘ ƚυ ʒ Â ƚυ ʒ ʌ Â	ʌ Â
Config-vlan ˆ VLAN ˜	Ю˘ *vlan_id* ƚυ ʒ Â	Ruijie(config-vlan)#	˘ ƚυ ʒ˘ Ctrl+C Â ˘ ƚυ ʒ Â	VLAN Â

˧ Ʌυ ˥ ` ʍ ɓ œ

	ƚƲ ʒ ƦO Â ʽ Ruijie#
	ƦO ˧˩ Â ʽ Ruijie(config)# WORD SNMP community string

ƚƲ ʒ˘ ˧˩ ƚƲ ʒ ˥ ˘ ˧˩ ˥ ƚƲ ʒ
. ˧˩ Â

show configuration ƚƲ ʒ ˧˩ Ɲ ʽ

Ruijie# **show conf**

ǘ ψ ƚƲ ʒ Â ˘ ˥ ˘ б ƚƲ ʒ
˧˩ Â ˧˥ ƚƲ ʒ ˧˥ ƚƲ ʒ ˧˩ ˘ .
˧˥ Â a Â
ƚƲ ʒ ˘ ƚƲ ʒ ƚƲ ʒ ǹ Â ƚƲ ʒ
˥ ˘ ƦO ˧˩ Â ˥ ƚƲ
ʒ ˥ ˘ ƦO˘ ˧˩ Â
ƚƲ ʒ ˥ ˘ ˧˩ ǹ Â

ƦO CLI ˧˩ Â
CLI ʽ

	⊠	˧˥ ╟

% Ambiguous command: "show c"-12.057 -1.869 0<140.10.00.5 562.423 5420A5104A112AFC>Tj22752087Tf-45

ԽՍ Ֆ

ƕ ʒ ╟ ᴧ

Ю '

╖		
╟ ˝I Â	⅃ Ctrl-B	˝I Â
	⅃ ⅃ Ctrl-F	˝I ⅃ Â
	Ctrl-A	˝I ƕ ʒ Â
	Ctrl-E	˝I ƕ ʒ Â
Â	Backspace	˝I Â
	Delete	˝I Â
╟ Â	Return	⅃ Э ╟ ˘ Ю ˘ Â
	Space	⅃ Э ╟ ˘ Ю ˘ Â

⅃ ⅄ ╖ ╟ ᴧ ˘ ƕ ʒ˘ ƕ ʒ ⅄ Â ˝I ⅃ ˘ ƕ ʒ ⅃ ╟ 20 ˘ Ÿ ⅃ ⅄ ˝I ƕ ʒ Â

ƕ ʒ ˝I ╟ Ю '

╖	
˝I ⅃	⅃ Ctrl-B
˝I	Ctrl-A
˝I ⅃ ⅃	⅃ ⅃ Ctrl-F
˝I ╟	Ctrl-E

ƕ ʒ ⅃ Â ˝I ˘ ƕ ʒ ⅃ ╟ 20 Â ƕ ʒ ǂ ⅄ˆ $˜ ʒ Â ⅃ ⅃ ╟ 20 Â

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

Ruijie# *any-command* *regular-expression*	show ƚʊ ʒ ˘ Ʌ Ʌ ˩ Â

1) Ю ƚʊ ʒ

2) Ɯ˥ ˘ ƛЮ ˩ Â

ƚʊ ʒ ˘ ˩ Ʌ ƛЮƚʊ ʒ'

ƚʊ ʒ	
Ruijie# *any-command* | *regular-expression*	show ƚʊ ʒ ˘ Ʌ ˘ ɛ̀ Â
Ruijie# *any-command* | *regular-expression*	show ƚʊ ʒ ˘ ˘ ɛ̀ Â

Ƕ ʒ ˘ ⁄ˆ ˘ "|"˜ Â
⁄ˇ ˧ ⁄ᴗ ‡ ˆ ˜ Â ɜ
Ɯ† Â

Ƕ ʒ ⁄ ╥ ˘ ˧ ⁄ᴗ ѝ Ƕ ʒ ⁄ˇ ' "mygateway" Ѭ ѝ "ip route 0.0.0.0 0.0.0.0 192.1.1.1" ⁄ˇ

‡ ⁄ Â

Ƕ ʒ ⁄ˇ ˧ ⁄ᴗ Ʒ Ƕ ʒ Â ˘ … ⁄ Ʒ Ƕ ʒ
† ˘ ⁄ ˧ ⁄ᴗ ⁄ † Â

⁄ Ʒ Ƕ ʒ Ƕ ʒ Ƕ ʒ ˘ Ю˘
˧ ⁄ᴗ ˧ ⁄ᴗ ⁄ Ƕ ʒ '

Ruijie(config)#**alias ?**

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

ƕ ʒ ɹ ╟ ˘ ɹ ʌˆ *˜ ˘ з ЛЬЮ ˈ

command-alias=original-command

˘ EXEC Ю˘ ƕ ʒ ɹ ”s” ”show” Â ‡ ”s?” ˨ Л ˧ ’s’ ɹ ╟ ˈ

Ruijie#**s?**

*s=show show start-chat start-terminal-service

ɹ ʒ ƕ ʒ a ˘ ‡ ʌ ƕ ʒ Â ˘ EXEC Ю ɹ ”sv” ʒ ƕ ʒ ”show version”˘ ‡ˈ

Ruijie#**s?**

*s=show *sv=”show version” show start-chat start-terminal-service

ɹ ÿ ƕ ʒ ˘ a Â Э ˘ ƕ ʒ ˘ a ɹˈ

Ruijie# **s?**

show start-chat start-terminal-service

ƕ ʒ ɹ ≠ ˨ Л ˧ ƕ ʒ ╟ ˘ ʌ Ю ƕ ʒ ɹ ”ia” ʒ ”ip address”˘ ‡ ʌ Юˈ

Ruijie(config-if)#**ia ?**

A.B.C.D IP address

dhcp IP Address via DHCP

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

” ”ƕ ʒ ɹ ˘ з ɹ ƕ ʒ Â

ƕ ʒ ɹ ˘ ĭ ‡ a Â

ƕ ʒ ˨ Л ɹ Â

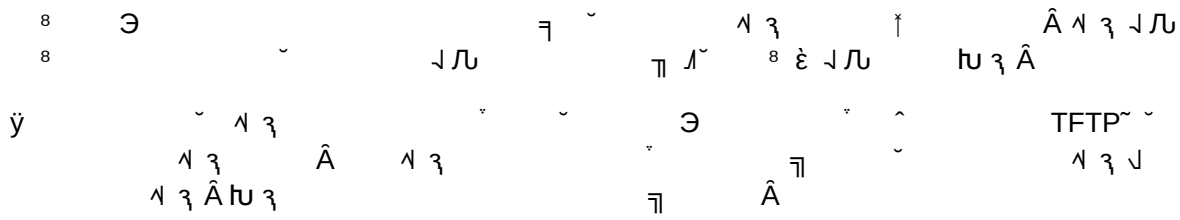
CLI ˘ PC Â ╟ ˘ ˘ ˘ у ɹ ˨ Л CLI Â ˧ ʌˆ Console˜ ˘ й ˆ Outband˜ Â ɹ˘ ˨ Л Telnet Â ч ˨ Л ƕ ʒ Â

CLI Ƕ ʒ ˘ ê Ƕ ʒ Ì Â

8 Э ╕ ˘ ᴧ ʒ ǂ Â ᴧ ʒ ˩ Ɲ
8 ˘ ˩ Ɲ ╖ ᴧ˘ 8 ὲ ˩ Ɲ Ƕ ʒ Â

ÿ ˘ ᴧ ʒ ˇ ˘ Э ˇ ˆ TFTP˜ ˘
ᴧ ʒ Â ᴧ ʒ ˇ ╗ ˘ ᴧ ʒ ˩
ᴧ ʒ Â Ƕ ʒ ╗ Â

ᴧ ʒ˘ 15 Â



ʜ Ю Ƕ ʒ ˩ ᴧ ʒ Â

Ƕ ʒ	

c 02(l)( )TjE4 98.762AFC06[14 38 443.1 1.5]JE2 10.98 56Ä7[(lena28138 443.level0001f5 20.7 refQ.72FC0616.38 44

ЮЎ ↓ ч ↓↑ ʒ ' ˆ 1 ˜ ˆ 15 ˜ Â ↓Л ѝ Ʊ ʒ ǂ 16 Â a ↓ ↑ ʒ˘ ↓ Л a ↓ a ↓ Ʊ ʒ Â

↑ ʒ ЮЎ Ӊ a ↑ ʒ Â ѝ ˘ ѝ ↑ ʒ Â

Ʊ ʒ

Ʊ ʒ˘ ‡ ↓Л Ʊ ʒ ç æ ' Ʊ ʒ ˘ ‡ ↓Л Ʊ ʒ ç Â

↓Л ЮƱ ʒ Ʊ ʒ '

Ʊ ʒ	
Ruijie#	
Ruijie(config)# *mode* [ ] { *level* | } *command-string*	Ʊ ʒ ǂ Â *mode*' ˙ Ʊ ʒ CLI Ʊ ʒ ˘ ' ' Ʊ ʒ ˘ ↑ Â ' Ʊ ʒ Ʊ ʒ ˘ ↓ ѝ ↓ Â *level*' ˘ ÿ 0 15 Â ' Ʊ ʒ ѝ Â *command-string*' Ʊ ʒ Â

Ʊ ʒ ˘ ↓Л ЮЎ *mode* [ ] *level* *command* Ʊ ʒ Â

Ʊ ʒ

ЮЎ Ʊ ʒ ѐ Ʊ ʒ ç 1 з 1 ѝ ˆ ↑ ʒ ѝ ” ”˜ '

```
Ruijie# configure terminal
Ruijie(config)# privilege exec all level 1 reload
Ruijie(config)# enable secret level
```

Ю reload ƚυ ʒ ὲ ƚυ ʒ ὴ ˈ

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

1 ˘ ƚυ ʒ ˈ

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

ɥ ˆ TELNET˜ ʌ ʒ ˘ ʌ ʒ ˘
Ю ЛЬЮƚυ ʒˈ

ƚυ ʒ	
Ruijie(config-line)# [|] *line*	ʌ ʒ 0ˈ Ль ʌ ʒ' 7ˈ Ль ʌ ʒ' Lineˈ ʌ ʒ '
Ruijie(config-line)#	ʌ ʒ

	˘ ˙ ʌ ʒ˘ ˘ **≠ a** **ʌ ʒ** Â Ю Ў Â

ɥ ƚυ ʒ ʙ˘ Ль Â ʙ ╗ ˘
Ю ╗ ˘ EXEC Ю˘
ƚυ ʒ ʙ ' ɹ˘ Ю ˘ ʌ ʒ˘ ʌ ʒ
╗ ɹ˘ ╟ Â

ƚυ ʒ	
Ruijie(config-line)#	ʙ ╗
Ruijie#	ʙ

ʌ ʒ ˢ Â ʌ ʒ
˘ AAA ˘ ‡ ˘ ˨
Ль ╘ ɹ ˘
RADIUS ╘ ɹ ˢ Â

˘ Ю˘ ɛ́ ЛЮЮ ʒ'

Ю ʒ	
Ruijie(config-line)#	AAA ˘
Ruijie(config-line)# { | *list-name*}	AAA ˘ AAA Â AAA ˘ Radius ȁ ȁ Â

	AAA ȁ Radius ⊾ Л ˘ AAA Â

˧˥ ˘ ɛ́ (ȁ ȁ) (ȁ˥ ȁ)Л
Â ˧˥ ˘ ˝I ѝ
Â ˘ ˘ ≠ ˧˩ Л Â ў
Y ˚ Â

˧˩ Л Э Â ˧˥˘
Л ѝ Ю ˘ . Ю ˘ Ÿ Â
Л ˧˥˘ ‡ Э a ˝Ạ ˘ Э Â

˚ ˘ Э Э ˧˩ ˚ ˘
˘ Ю ˧˥˘ Â

Ю ʒ	
Ruijie# hh:mm:ss month day year	Â

2003-6-20˘ 10:10:12

```
Ruijie# clock set 10:10:12 6 20 2003      //
Ruijie# show clock                        //
clock: 2003-6-20 10:10:54
```

˧˩ Л Ю Ю ʒ ˘ Ю'

```
Ruijie# show clock                    //
clock: 2003-5-20 11:11:34
```

⅄ ˇ ˆ calendar˜ 'I ˇ ˘ ˇ a ˘ ѝ ˇ
˘ . Ю ≠ Â

ˇ ˇ a ⅃ ˘ ˇ ˘ Ѣ ʒ ˇ
8 ˇ Â

ˇ ˇ ˘ Ю Ѣ ʒ˘ ˇ
ˇ Â

Ѣ ʒ	
Ruijie#	ˇ ˇ

ЮѢ ʒ ⅃ Ɲ ˇ 8 ˇ ˈ

Ruijie# **clock update-calendar**

[modifiers]Ѣ ʒ 8 ˆ scheme˜ ˘ Ɲ Â
╗ ˘ Ю(ὲ) ⅃ Ɲ ѝ Э Â
modifers Ѣ ʒ ˘ ⅃ Ɲ Ѣ ʒ ╗ Â ⅃ modifiers
ȁ ȁ Â έ Ю'

mmm | *hhh:mm* [*string*]

⅄ Â *mmm* *hhh:mm* ᾱ ˘ Ɲ˛ ѝ
Æ˘ ⅃ Ɲ Â *string* ╠ ˘ ⅃ Ɲ ѝ
╠ ⅄˘ Ɲ ⅃ ˘ ˘ 10˛ ⅄ ˘
⅃ Ɲ *10* *test* Â

hh:mm month day year [string]

Â Â year ⅃
, ˘ ‡ ˘ 8 a 31
˘ Ɲ ˘ 1 1 11 30 ˘ ‡
Â ˘ ѝ 12 ˘ ⅃ ʒ 1
˘ Ю˘ 1 a
ӭ 1 ˘ ˘ ‡ ѝ ӭ 1 ˘ ÿ Â string
⅃ Э Â 2005-01-10 14:31˘ Э ˘ ⅃ Ɲ
08:30 11 1 *newday* Â 2005-12-10 14:31˘
2006-01-01 12:00 ˘ ⅃ Ɲ *12:00 1 1 2006* *newyear* Â

reload cancel

Ѣ ʒ Â 8 30 ˘
⅄˘ Â

˘ ‡ ╖ Â ˝I ˘ Ʌ ⌈ Â ˘ ‡ ⅄ ¨Ạ Â ˘ ˘ ‡ Â б a 31 з Â ⅃ ⅄ a ¨Ạ , ï ‡ ⅃ ˘ ⅄ Â	

Ю˘ ЮЮ ҙ˘ ⅃ Ʌ ˈ

Ю ҙ	

ƚʊ ʒ	
Ruijie#	

˘ ‡ ╟ Â

ѝ ˘ ˧ Ƶ ѝ ˧ ˨ (System Name) Â ˨
ѝ CLI ƚʊ ʒ ˘ ‡ ˨ ˆ ˨ 32 ˘ ‡ ˧ ὲ 32 ˜
ѝ ƚʊ ʒ ˘ ˨ ˧ ע ˧ ע Â Ю˘ ˨ ѝ ľ Ruijie ĿÂ

ӊ Ю ƚʊ ʒ ˨ '

ƚʊ ʒ	
Ruijie(Config)# *name*	˨ ˘ ˨ ˧ . ˘ a 32 Â (System

˧˩ ⎍… ˘ ˘ Â
˧˩ ⎍ ⎍Ю ƕ ʒ ˈ

ƕ ʒ	
Ruijie(config)# *c message c*	(message of the day) Âc ˥ ˘ ˥ ˧˩ ⎍ ('&') Â ˥ ˩˥˘ ˩˥ ˘ ˧˩ ⎍ ˘ ˥ ˘ ˘ ˥ ˩˥ Ÿ ˘ ‡ Â ˘ a ѝ˥ ˘ a 255 Â

˧˩ ⎍ Ю ÂЮ ˘ (#) ѝ˥ ˘ ѝ "Notice: system will shutdown on July 6th."˘ Ю˙

```
Ruijie(config)# banner motd #                    //   ˥
Enter TEXT message.  End with the character '#'.
Notice: system will shutdown on July 6th.#       //   ˥    Ruijie(config)#
```

˧˩ ⎍ ⎍Ю ƕ ʒ ˈ

ƕ ʒ	
Ruijie(config)# *c message c*	Â *c* ˥ ˘ ˥ ˧˩ ⎍ ('&') Â ˥ ˩˥˘ ˩˥ ˘ ˧˩ ⎍ ˘ ˥ ˘ ˘ ˥ ˩˥ Ÿ ˘ ‡ Â ˘ a ѝ˥ ˘ a 255 Â

˧˩ ⎍ Ю Â

Ю ˘ П . `

```
Notice:  system will shutdown on July 6th.
Access for authorized users only. Please enter your password.
User Access Verification
Password:
```

ὲ “Notice' system will shutdown on July 6th.” ὴ ˘ “Access for authorized users only. Please enter your password.” ὴ Â

˧ ⅃ ƚυ ʒ ƚυ ʒ ˘ ў ˘ Â

ў ˘ Э ˘ ˘ ˘ ˘ ˘ Ctrl ˘ ˘ Boot ˘ Â ˧ ⅃ Â ˧ ⅃ Ю Ю ƚυ ʒ '

ƚυ ʒ	
Ruijie#	ȁ

/ǀ ў Э ˧ ⅃ ƚυ ʒ ' show version SYSTEMUPTIME˘ ὴ ' DD:HH:MM:SS Â	
˘ ╟ ˘ ˧ ɥ ˘ ˘ a Â ƚυ ʒ ў Boot/Ctrl ˘ flash Â	

˘ ў Э Â ' ˘ ' ' Э /ǀ˘ Э ˆ ˘ ‡ ὴ ˜ ˘ ˧ ˘ ˧ ˧ ˆ ˧ ˜ ˧ ⅃ Ю Ю ƚυ ʒ '

ƚυ ʒ	
Ruijie#	
Ruijie#	

⁸ ⅄ ⅄ˆ Console˜ ˘ ⁸ ⅄ ⅄˘ ⅃ Ƨ Â
˘ ⁸ ⅄ ⅄ ὲ Â ⅃ Ƨ ⅃
⅄ Â ˘ ⁸
⅄ Â

Ю˘ ⅃ Ƨ ƦЮƦ ʒ ⁸ ⅄ ˈ

Ƨ ʒ	
Ruijie(config-line)# *speed*	⁸ ⅄ ˘ Æ bps Â ⅄˘ ⅄ ѝ 9600 à 19200 à 38400 à 57600 à 115200 ˘ 9600 Â

Ю ⅄ ѝ 57600 bpsˈ

```
Ruijie# configure terminal                    //
Ruijie(config)# line console 0          //          ⁸
Ruijie(config-line)# speed 57600        //      ⁸ ⅄    ѝ 7600
Ruijie(config-line)# end                        //
Ruijie# show line console 0                    //
CON    Type   speed  Overruns
* 0    CON    57600  0
Line 0, Location: "", Type: "vt100"
Length: 25 lines, Width: 80 columns
Special Chars: Escape  Disconnect  Activation
            ^^x    none       ^M
Timeouts:     Idle EXEC   Idle Session
            never       never
History is enabled, history size is 10.
Total input: 22 bytes
Total output:  115 bytes
Data overflow:  0 bytes
stop rx interrupt:  0 times
Modem: READY
```

Telnet TCP/IP ˘ ⅂
Â Telnet Client ⊾ ѝ Э
Telnet Client Э ὲ ⊾ Â Ю ف Э
Telnet б A ⅄˘ ⅃ telnet Ƨ ʒ ̈Ạ B˘
ὲ Â

˧ Ɲ Э telnet ƕ ʒ Э ˈ

ƕ ʒ	
Ruijie# *host* [*port*] [{ *A.B.C.D interface-name*}] [*vrf-name*]	telnet ˘ ˧ Ɲ IPV4 ў ˩ IPV4 Â Telnet ƕ ʒ ˧ ˘ ƕ ʒ Telnet ƕ ʒ Â

Ю б Telnet Â

IP 192.168.65.119ˈ

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

˧ Ɲ ƛЮƕ ʒ˘ Telnet Server ⊾ˈ

ƕ ʒ	
Ruijie#	Telnet Server ⊾ˈ ƕ ʒ IPV4 ⊾ Â

˧ Ɲ ˘ 8 ˆ ˧ ˘ Ɲ ˜ ˘ ˘ ˘ Â

˧ ˘ ˘ ˘ ⊾ Â

Ҥ LINE Ю ƕ ʒ ˈ

ƕ ʒ	

Ruijie(config-line)# *minutes* [*seconds*]	LINE Э˘ ˅˩ ˘ ˘ ˘ Â *minutes*ʻ ˆ ʼ *seconds*ʻ ʼ

˧˩ ⅄ LINE Ю ƕ ʒ˘ ˅˩ LINE Ю Â

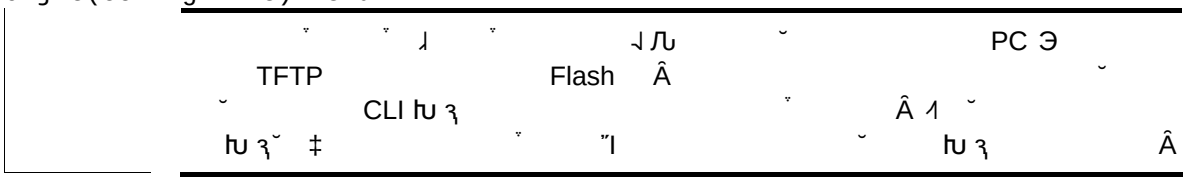
```
Ruijie# configure terminal                    //
Ruijie# line vty 0                           //    LINE
Ruijie(config-line)# exec-timeout 20        //          й 20min
```

LINE Э ˘ ˘ ˘
Â з й Â

ɥ LINE Ю ƕ ʒ ʼ

ƕ ʒ _	**⅝** **P**

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# line vty 1 16
Ruijie(config-line)# transport input all
Ruijie(config-line)# no exec
Ruijie(config-line)# end
```



ƚʊ ʒ	
Ruijie(Config)# *number*	HTTP ╘ ˄ˇ 80
Ruijie(Config)# { | }	web ˇ ѝ enable Â ʻ enable password enable secret ƚʊ ʒ ˄ ʒ ˇ ˄ ʒ 15 ʼ ʻ username ƚʊ ʒ ˩ ˄ ʒ ˇ 15 ʼ

˩ ⅄ Ю˘ ⅄ Э ƚʊ ʒ ˇ ѝ Â ⅄ Ю Э
Http Serveř ╘ ˄ ѝ 8080˘ ˩ ʻ

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

Юƚʊ ʒ HTTPS ╘ ˄

ƚʊ ʒ	
Ruijie(Config)# *number*	HTTPS ╘ ˄ˇ 443

˩ ⅄ Ю˘ ⅄ Э ƚʊ ʒ no ˇ https ╘ ˄ ѝ Â ⅄ Ю
Э Https Serveř ╘ ˄ ѝ 4443

```
Ruijie# configure terminal                    //
Ruijie(config)# enable service web-server https //    https Server
Ruijie(Config)# ip http secure-port 4443
```

Юƚʊ ʒ web ╘

```
Ruijie# show web-server status
http server status : enabled
http server port : 8080
https server status:  enabled
https server port: 4443
```

	http ╘ https ╘ ˩ ˄ Â http ╘ Ю˘ ¨Ạ https ╘, з а ˄ http ╘ ˄ ˇ ‡ ˄ ˄ https ╘ˇ http ╘ ˇ https ╘ ˄ ˩ ╘ ˇ http ╘ Â

Flash

flash Э˘ ˇ a 128M ’ ĭ ‡˘
╟ ˘ ˧ ˘ Ю ˇ ƕ ʒ Â ˘
ˇ ˧˘ ╟ ˇ Â
flash ˆ a flash ˜ ѝ 32M Э˘ ⅓ æ 512K ˘ ѝ
˧ flash ˇ ˘ ╟ ˇ Â
ˈ USB ˘ flash ˇ Â USB ˇ a
ʒ flash⅓ æ 512K ˘ ╟ ˇ ˧ ˇĄ Â
flash ˆ a flash ˜ ѝ 512M Э˘ ⅓ æ 4M ˘ ѝ
˧ flash ˇ ˘ ╟ ˇ Â
ˈ USB ˘ flash ˇ Â USB ˇ a
ʒ flash⅓ æ 4M ˘ ╟ ˇ ˧ ˇĄ Â
flash ⅓ æ ˇ 110% ˘ ѝ ╖ ˘ ╟
ˇ Â
ˈ 10MB ˇ ˘ ǂ flash ѝ 10MB
˘ flash ⅓ æ 11MB ˘ ╟ ˇ ˧ ˇĄ Â

ÿ ↱ Â

Ю̆ Ю ƕ ʒ'

ƕ ʒ	
Ruijie# *directroy*	directory Â
Ruijie# *../*	Э
Ruijie# *./*	

ЛЬЮ Ю MNT Document '

Ruijie# **cd** *mnt/document*

ʌ ̈Ạ MNT/Document Ю

8 ˇ ˇ Â

Ю̆ Ю ƕ ʒ ˧ Л ˇ ˇ ˇ '

ƕ ʒ	
Ruijie# *filename directoryname*	ˇ 8 Â
Ruijie# *filename directoryname*	8 ˇ ˇ Â

ЛЬЮ ↱ ˇ '

Ruijie# **copy flash:***config.tex* **flash:***tmp/*
Ruijie# **copy flash:***con_bak.txt* **flash:***config.text*

Ю Ю '

ƕ ʒ	
Ruijie#	Ю Â
Ruijie# *directory*	Â

ЛЬЮ '

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

Ю̆ Ю ƕ ʒ ˧ Л ע ˇ '

ƕ ʒ	

Ruijie# *devname* *fs_name*	ѝ ⅄ ѝ *fs_name* ˇ У ⅄ ѝ Â

ЛЬЮ У dev Ю MTD ˘ JFFS2 ˇ '

Ruijie# **makefs dev**/*dev/mtd/mtdblock/1* **fs** *jffs2*

Э ѝ JFFS2 ˇ У MTDBLOCK Ю ˘
ˇ Â

Ю˘ Ю Æ … '

ƕ ʒ	
Ruijie# *directoryname*	…

ЛЬЮ Ю … BAK '

Ruijie# **mkdir** *bak*

Ю˘ ˇ ╟ ˇ '

ƕ ʒ	

Ruijie# **delete recursive** *aaa*

Ю̆ Ю ˧ Ɲ ˈ

Ƕ ʒ	
Red-Giant# *directoryname*	Â

ƝЮ MNTˈ

Ruijie# **rmdir** *mnt*

˘ ƕ ʒ Ю ў CTRL ˘ ˚ Э Ю ˘ ч ' TFTP ˄ ˘ ˘ ˅ Xmodem ˄ ˘ Â

ÿ ЉЮ ύ ˘ ˚

TFTP ˚

XMODEM ˚

ÿ ў Ю ˚ ˘ ˅ ÿ Э ˚ ў Â

CLI ƕ ʒ Ю˘ Ю ˚ Ю '

Ю ˘ ˝I ў TFTP Server ˚ ' ˅ Ю ˚ ' ˅ ˘ Ю ЉЮƕ ʒ Ю ˚ ˘ Location ‡ TFTP Server IP Â

ƕ ʒ	
Ruijie# *//location/ filename* *filename* [vrfname]	Ю ў URL ˚ *filename* Â

CLI ƕ ʒ Ю˘ Ю ˚ Э '

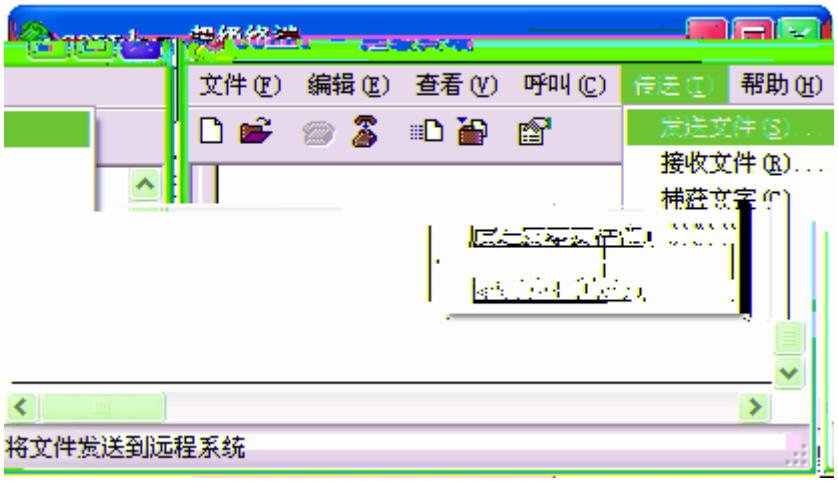
Э ˘ ˝I ў TFTP Server ˚ ' ˅ ў Э ˚ ˘ ˅ Ю ЉЮƕ ʒ Э ˚ Â

ƕ ʒ	
Ruijie# *filename* *//loca tion/filename* [vrfname]	ÿ Э ˚ *filename* ў URL Ю˘ ˧ ˚ ˩ Â

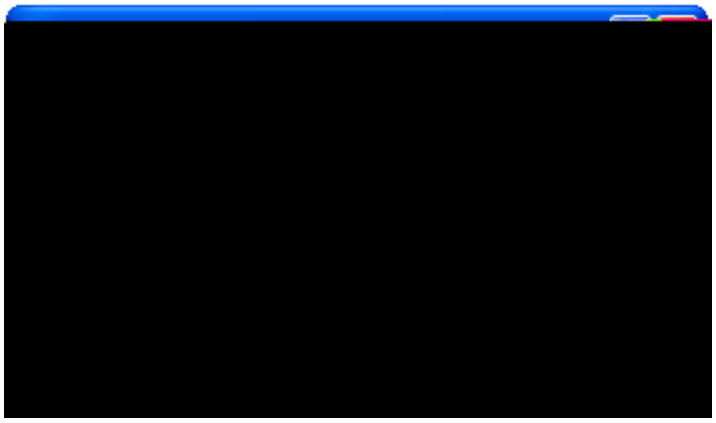
˘

˚ ˚ ⅄ ˘ ‡ tftp ╗ Э /⅃˘ Ю'
"//localtion/filename" filename [vrfname]
⅄ ˘ ˚ ⅄ ˘ ≠ ˚ ⅄ ╗ Э /⅃˘ Ю'
//localtion/filename "filename" [vrfname]

ÿ ў Ю ˚ ˘ ⅃ ÿ Э ˚ ў Â
CLI ѣ ҇ Ю˘ Ю ˚ Ю '
Ю ˘ "I Windows ' ⅄ Ю ЛЮ
ѣ ҇ Ю ˚ ' ⅄ ў Windows ˘ " " " ˚ "╗ ˘
Юفي '



˘ ˩ ў Ю ˘ ˘ “Xmodem”˝ “ ”˝ ‡
Windows Ѫ Â Юفي ˈ

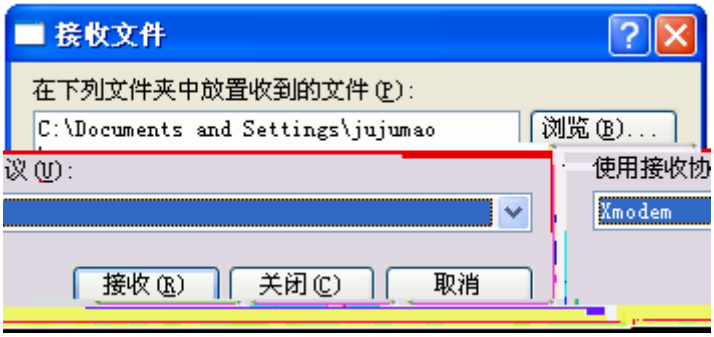


ƕ ʒ	
Ruijie# :*filename*	ÿ ў Ю ˘ ƕ ˩ ѝ *filename* Â

CLI ƕ ʒ Ю˘ Ю ˘ Э ˈ

Э ˘ ”I Windows ˈ ˩ Ю ѪЮ
ƕ ʒ Э ˘ ˈ ˩ ў Windows ˘ “ ” “ ˘ ”˥ Â
Юفي ˈ

Э ˇ Æ ˘ “Xmodem”˘ “ ”˘
˘ ˩ ˘ “ ” ˩ ˘ Â Ю في ˈ



ƚʊ ʒ	
Ruijie# :*filename*	ÿ Э ˇ *filename* ў

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

3˜ ˘ ɅЛ˘ Ю ˈ

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

4˜ ˘ ̤ Л ╟ Æ˘ Ю ˈ

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

5˜ Ӓ̤ ╟ Л˘ ˘ ˘ Л╗ ˘ ̤ ˘
5 6 ˘ a 7 ˘ ⅃ Ʒ ˈ

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

ÿ ˘ ̤ ╗ ў

6˜ ў Л˘ ╟ ˘ ╖ ╟˘ ÿ ἐ
Ю ˈ

```
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 ˈ

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

ἐ .

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

ἐ .

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

Э ч ˘ ˊ ⅃ a Ӓ̤ ╟ ˘ ˘ Ⅎ ˊ ˘
╟ ˘ ˘ Л ˘ Â

ÿ Э Â

˘ ˘ ⅃ Â

˘ ╟ ˘ ˘ a ˘ ˘ ╘ a
Æ ˘ ≠ a è Â

˛ ╟ ˘ Â

˘ ˚ ˘ ˛

˘ ˛ Э 1˙ 7˝ ˛ Æ ˛ Â

˘ في

˘

HTTP ˘ WEB ˘ ˚ Э ˘ Э ˚ ˘ Â

RFC1945 - Hypertext Transfer Protocol -- HTTP/1.0

RFC2616 - Hypertext Transfer Protocol -- HTTP/1.1

RFC1867 - Form-based File Upload in HTML

˧ ˥ ч ˊ ȁ ѝ ˥ ˘ Ю
˥ ȁ ˩ Â γ ȁ ˘
˧ Ѫ Â

˧ ˥ ╟ ˩ ˘ ˧
╟ ˚ Â

˧

˧ ˚ Â ˚ ˧Ɲ ˘ Â

˧ '

˚ ˧ ȁ ȁ ȁ ˆ ˚ HTTP Э ˜ Â ѝ'

1. 1 ⊨ ˚ ,
2. 2 ⊨˘ ˚ ȁ ╗ ˘ ⅄ ˚ HTTP Э ˧ Â

˧ '

˧ ȁ ὲ Â ѝ'

1. ╗ ˘ ˧
2.

HTTP Э HTTP POST

ƕ ʒ	
Ruijie#	˘
Ruijie# { | *string*}	˘ ˇ

'

╟ HTTP ˘

```
Ruijie# http check-version
files need to be updated: web, config, character-db, normal.
bin:
support identification of 31 kinds of popular games.
Ruijie# http update web character-db // ˘ WEB ˇ
updating files, please wait...
update success!
```

Ю˘ HTTP ˘ ╘ 0.0.0.0˘ ˄ /˅ 80˘ ╘ ˘ ˘ ЛЬЮ '

ƕ ʒ	
Ruijie#	
Ruijie(config)# *host* [*port-value*]	˘ ╘
Ruijie#	

	╘ ┘ a ˘ ˘ ˇ ┘ ˘ ╘ Â

'

˘ ╘

```
Ruijie# configure terminal
```

Ю˘ HTTP ˘ ÿ ˆ ˘ Â ÿ ˆ ˘ ˘
˘ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)#	ÿ ˆ ˘
Ruijie#	

˘ ˨ Л Ю ƕ ʒ Â

ˈ

ÿ ˆ HTTP ˘

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# http update set oob
Ruijie(config)# exit
```

Ю˘ HTTP ˘ ѝ ╟ ˘ Â ˨ Л ѝ ╟ ˘ ╟ ˘ . ╟ ˘ Â
˨ Л Ю ƕ ʒ Â

˘ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)#	˘
Ruijie(config)# *string*	╟ ˘ ˙
Ruijie(config)#	
Ruijie#	

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# http update mode auto-update
Ruijie(config)# http update auto-update url-db character-db route-db
Ruijie(config)# exit
```

Ю˘ HTTP ╟ ˘ Â ╟ ˘ ˘ ˘ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)# *mm:ss*	╟ ˘ Â
Ruijie#	

˘ ˨ Л Ю ƕ ʒ Â

ˈ

3 HTTP ╟ ˘

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# http update time daily 03:00
Ruijie(config)# exit
```

Ю˘ HTTP ˘ ÿ ˧ ˘ Â ÿ ˧ ˘ ˘ ˘ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)#	ÿ ˧ ˘
Ruijie#	

˘ ˨ Л Ю ƕ ʒ Â

ˈ

ÿ ˧ HTTP ˘

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

```
Ruijie(config)# http update set oob
Ruijie(config)# exit
```

3. √ ╗
4. ˆ ┘ ˜ ╟ √
5. ˆ ┘ ˜ ˇ
6. ˆ ┘ ˜
7. ˆ ┘ ˜
8. ˆ ┘ ˜ √

Ю˘ √ ╗ ' √ ╗ ˘ ЛЬЮ '

ЂЬ ʒ	
Ruijie#	
Ruijie(config)# [no]	√ ╗
Ruijie(config)# [no]	√ ╗
Ruijie(config)#	
Ruijie#	

√ ╗ ˘ ┘Л Ю ЂЬ ʒ Â

'

```
#                √ ╗
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# feedback enable
Ruijie(config)# end
```

Ю˘ √ ˇ ' ˇ ˘ ┘ √ ˘ ЛЬЮ '

ЂЬ ʒ	
Ruijie#	√

'

#

```
Ruijie# feedback update
```

Ruijie#	
Ruijie(config)# *mail-addr*	6
Ruijie(config)#	
Ruijie#	

#

```
Ruijie# configure terminal
Ruijie(config)# feedback subscriber test@qq.com
Ruijie(config)# feedback subscriber test@163.com
Ruijie(config)# end
Ruijie# show running
```

Ruijie#	
Ruijie(config)# *string1* *string2* *string3*	

Ruijie(config)#

˘ ˨˩ ˘ . a ˚ Â

Ю'

ƚƱ ʒ	
Ruijie#	
Ruijie#	

˧ ˋ 5˥ ˈ

```
Ruijie#config
Ruijie(config)#                    5
Ruijie(config)#
   Ruijie#
```

5. ˇ ˪˥
6. ˆ ˧ ˜ SMTP ˪

Ю˘ ˇ ˪˥ ˈ ˇ ˪˥ ˘ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)#	ˇ ˪˥
Ruijie(config)#	
Ruijie#	

ˇ ˪˥ ˘ ˧Л Ю ƕ ʒ Â

ˈ

ˇ ˪˥

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# no mail-service enable
Ruijie(config)# end
```

Ю˘ SMTP ˪ /ˈ ˋ Â ˧ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)# *host* [*value*]	SMTP ˇ ˪
Ruijie(config)# *username* [|] *password*	SMTP /ˈ ȁ

Ruijie(config)#	
Ruijie#	
Ruijie#	ĭ

SMTP	╘	⁄ı	⁄ı˘	╟	ˇ	Â

'

SMTP ╘

Ruijie#
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# *smtp.qq.com*
Ruijie(config)# *test@qq.com* ***password*** *test*
Ruijie(config)#
Ruijie#
...
!
mail-client smtp-server smtp.qq.com
mail-client username test@qq.com password 093b10013
...
Ruijie#
Connect to SMTP server. OK!
Login to SMTP server. OK!
Send a test mail. OK!
Check SMTP OK!

ᚨ ᚹᚷ ᚢ ᛋ ᚢ ᛇ ᛈ ᛉ ᛊ ᛏ

1. ᛋ
2. ᛋ
3. ᛋ
4.
5. γ Ь ᛋ ᛚ
6. Port VLAN
7. Native VLAN
8. ᛋ
9. ip/mac
10. LINE
11.
12. ᛚ

Ruijie ч ᄉ' ᄉ ᄉ Â ᄉ ᄉ Э
à ˚ ᄉ˘ ' Ɲ ᄉ Â

ᄉ ᄉ Э à ˚ ᄉ˘ ᄉ ˩ Ɲ б ᄉ
˘ ≠ ˩ Ɲ ᄉ Â ' Dialer ᄉ à NULL ᄉ à Loopback ᄉ à ᄉ Â
Э ˘ ᄉ ᄉ˘ Â

Ruijie έ ᄉ Ю '

ᄉ	ᄉ ˩	
Ɲ ᄉ	GigabitEthernet tenGigabitEthernet	IEEE802.3 à RFC894
Dialer ᄉ	dialer	—
Loopback ᄉ	Loopback	—
NULL ᄉ	NULL	—
ᄉ	GigabitEthernet 0/0.10( )	—

ᄉ˘ ˝I ˘ ˩ ˝Ạ ᄉ ˘ Ƕ ʒ Ю'

Ƕ ʒ	
Ruijie(config)# *interface-type* *interface-number*	ᄉ Â ᄉ˘ ᄉ a ‡ ˝I … ˩ Â
Ruijie(config)# *interface-type* *interface-number*	ᄉ Â ᄉ a ˩ Â

' Ɲ ᄉ 0 0 ᄉ˘ '

```
Ruijie# config terminal
Ruijie(config)# interface GigabitEthernet 0/0
```

NULL ᄉ˘ ˩ Ɲ ѝ ᄉ IP ˘ Ƕ ʒ Ю'

Ƕ ʒ	

Ruijie(config-if)# *ip-address ip-mask*	ㅅ
Ruijie(config-if)#	ㅅ

IP ê IP б ㄴ Ì Â

ㅅ ㅅ Ʌ ㅅ Â

ㅅ ˘ ㅅ ƛЮƚυ ʒ'

ƚυ ʒ	
Ruijie(config-if)# *interface-description*	ㅅ ˘ 80
Ruijie(config-if)#	ㅅ

ĩ MTU IP ˘ ㅅ 64˙ 65535 ˘ a ㅅ ㅅ Э ㅅ ㅅ a ㅅ Â ƚυ ʒ Ю '

ƚυ ʒ	
Ruijie(config-if)# *bytes*	MTU
Ruijie(config-if)#	MTU

BandWidth ў ˆ OSPF ˜ RSVP Â ㅅ a ㅅ Â

ㅅ ˘ ㅅ ƛЮƚυ ʒ'

ƚυ ʒ	
Ruijie(config-if)# *kilobits*	Bandwidth
Ruijie(config-if)#	ㅅ Bandwidth

ㅅ ㄴ Ю '

ㅅ 8

Æ ㅅ

ㅅ

ㅂㅁ ㅋ	
Ruijie# [*interface-type interface-number*]	

ㅅ a Ю ˩ Ʌ Â Ƕ ʒ ㅅ˘ Ƕ ʒ
╟ ㅅ Â

Ƕ ʒ	
Ruijie(config-if)#	ㅅ
Ruijie(config-if)#	ㅅ

Ю Ʌ ㅅ ╖ ˈ

```
Ruijie(config)# interface GigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.12.1 255.255.255.0
```

ㅅ a ˘ ˩ Ʌ ㅅ Â Ю ˈ

```
Ruijie(config)# Interface
Ruijie(config-if)# shutdown
```

ᴧ ᴧ ˘ ᴧ VLAN Â

ᴧ ᴧ˘ ᴸ ў '

ᴧ ᴧ

IP

ᴧ ˆ ˩ ˜

ᴧ ȳ ˆ ˩ ˜

ᴧ ȁ ˧ ˆ ˩ ˜

ᴧ MTƯ ˩ ˜

˩ Ю interface ƕ ʒ ᴧ Â

ƕ ʒ	
Ruijie(config)# *interface-type interface-number*	Ю interface ƕ ʒ˘ ᴧ Â ≠ ˩ ᴧ Ю interface range interface range macro ƕ ʒ ᴧ Â ᴹ ᴧ ˩ ɛ́ ˩

Ю Gigabitethernet 0/1 ᴧ '

```
Ruijie(config)# interface gigabitethernet 0/1
Ruijie(config-if)#
```

ᴧ Ю ˩ ᴧ Â

ᴧ

ᴧ ᴧ Ю ᴧ ᴧ ᴧ Â
ᴧ Â

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

ᴧ ᴧ range '

ᴧ '

slot/{

Ruijie(config)# *macro_name* *interface-range*	macro_name a 32
Ruijie(config)# *macro_name*	

Ruijie# configure terminal
Ruijie(config)# define interface-range *resource*
GigabitEthernet *0/1-4*
Ruijie(config)# end

Ruijie# configure terminal
Ruijie(config)# define interface-range *ports1to2N5to7*
GigabitEthernet *0/1-2, 0/5-7*
Ruijie(config)# end

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

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

****	

Ruijie (Config-if)#

Ruijie(config-if)#	

Ю Gigabitethernet 0/2

```
Ruijie# configure terminal
Ruijie(config)# interface gigabitethernet 0/2
Ruijie(config-if)# shutdown
Ruijie(config-if)# end
```

```
Ruijie(config)# interface gigabitethernet 0/1
Ruijie(config-if)# speed 100
Ruijie(config-if)# duplex full
Ruijie(config-if)# end
```

IEEE ˘ ˝I ᴺ ᴺ Master Slave ..

ᴺ ᴊ ˘ ˧ Ƶ ˘ ѝ jumbo Â ˧ Ƶ ᴺ MTU ⁸ ᴺ Â

MTU ˘ a Ƶ Â

ᴺ MTU ᴺ Â a MTU Â ᴺ ˘ MTU˘ Â

Ƶ ᴺ MTU ѝ 64~1500 ˘ ѝ 4 ˘ ѝ 1500 Â

Ƕ ʒ ᴺ ᴺ Â SVI ᴺ a MTU Â

ƕ ʒ	
Ruijie(config-if)# *num*	ᴧ MTU Num' <64-1500>

Ю ᴧ Gigabitethernet 0/1 MTU'

```
Ruijie# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruijie(config)# interface gigabitethernet 0/1
Ruijie(config-if)# mtu 64
Ruijie(config-if)# end
```

Ɲ ᴧ ƕ ʒ ў '

Ɲ ᴧ

Ɲ ᴧ

ᴧ ˘ Â ˩ Ю ƕ ʒ ˩ ᴧ Â

Ю ˩ ƜЮƕ ʒ ᴧ '

ƕ ʒ	
Ruijie# [*interface-id*]	ᴧ Â
Ruijie# [*interface-id*]	ᴧ ᴧ Â

ƜЮ ˝I Ɲ ᴧ '

```
Ruijie# show interface GigabitEthernet 0/0
GigabitEthernet0/0 is up, line protocol is up
Hardware is PQ3 TSEC GIGABIT ETHERNET CONTROLLER GigabitEthernet, address
is 0a0b.0c0d.0e0e (bia 0a0b.0c0d.0e0e)
Internet address is 192.168.200.1/24
MTU 1500 bytes, BW 1000000 Kbit
Encapsulation protocol is Ethernet-II, loopback not set
Keepalive interval is 10 sec˘ set
Carrier delay is 2 sec
RXload is 1 ,Txload is 1
Queueing strategy: FIFO
Output queue 0/40, 0 drops;
Input queue 0/75, 0 drops
5 minutes input rate 281 bits/sec, 0 packets/sec
5 minutes output rate 0 bits/sec, 0 packets/sec
82 packets input, 7947 bytes, 0 no buffer
Received 76 broadcasts, 0 runts, 0 giants
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
0 packets output, 0 bytes, 0 underruns
0 output errors, 0 collisions, 3 interface resets
Link Mode: 1000M/Full-Duplex, media-type is twisted-pair.
Output flowcontrol is off;Input flowcontrol is off.
```

```
Ruijie(config)#          interface      gigabitethernet          0/1
Ruijie(config-if)#           speed 100
Ruijie(config-if)#           duplex     full
Ruijie(config-if)#           end
```

a _ É !

B IEEE ,Ì G Û š È + · ™NOEîE› # ,X • ã 9.B n0Ã ·,X Master ê Slave (Š Õ..

2.1.5 ´ / L éMTU

'0Ã ·E¯> û ò äG£ D B x 6 Ê È Ã6Ñ îF û b ¹ þ5% Û š ûKS z,X û ÈE-/¡ û>•/Ä jumbo û Ä*ü Ã ¹EîE›A'5B0Ã ·,X MTU 9 { A¹0Ã · AŒ ¥,X Ô û ûKS Ä

MTU Û û Ý D B!‰,XKS z È á Ù À ¹ þ5% Õ>™,X ÔJÔ Ä

0Ã ·,X MTU " ¹ ¾ üEg 9 ÊE¯> ÄEg Î Ê á î " ¹ MTU Ä0Ã · ,X û È V pKS zCYE›A'5B,X MTU È Ú>• ö × Ä

¹ þ · MTU AŒA'5B,X8× È 64~1500 +8V È2f z 4 +8V È5 ,Õ 1500 +8V Ä

!8G!5B Q ¸ ¾ Í(=)Ú0Ã · Ý ÄSVI y · V Ê á Õ MTU A'5B Ä

```
Ruijie(config)#          interface      gigabitethernet          0/1
Ruijie(config-if)#           speed 100
Ruijie(config-if)#           duplex     full
Ruijie(config-if)#           end
```

a _ É !

B IEEE ,Ì G Û š È + · ™NOEîE› # ,X • ã 9.B n0Ã ·,X Master ê Slave (Š Õ..

2.1.5 ´ / L éMTU

'0Ã ·E¯> û ò äG£ D B x 6 Ê È Ã6Ñ îF û b ¹ þ5% Û š ûKS z,X û ÈE-/¡ û>•/Ä jumbo û Ä*ü Ã ¹EîE›A'5B0Ã ·,X MTU 9 { A¹0Ã · AŒ ¥,X Ô û ûKS Ä

MTU Û û Ý D B!‰,XKS z È á Ù À ¹ þ5% Õ>™,X ÔJÔ Ä

0Ã ·,X MTU " ¹ ¾ üEg 9 ÊE¯> ÄEg Î Ê á î " ¹ MTU Ä0Ã · ,X û È V pKS zCYE›A'5B,X MTU È Ú>• ö × Ä

¹ þ · MTU AŒA'5B,X8× È 64~1500 +8V È2f z 4 +8V È5 ,Õ 1500 +8V Ä

!8G!5B Q ¸ ¾ Í(=)Ú0Ã · Ý ÄSVI y · V Ê á Õ MTU A'5B Ä

ä ᵛ ᵗ Ɱ

ᴧ

˨ Ɲ Ю ƕ ᴝ ᴧ ᴧ Â
˘ ᴧ Â

ƕ ᴝ	
Ruijie(config)# {port-range macro_name}	ᴧ Â ƕ ᴝ ᴧ Ɲ Â macro ᴧ Ɲ ƕ˜ ᴧ ƕ Â ᴧ Ɲ /ˆ ,˜ Â ᴧ ƕ ᴝ ᴧ ᴧ Â

ƕ ᴝ ˘ range ˈ

ᴧ ˈ

slot/

2.1.1.2„ Ðinterface rangeW

2.1.1.2.1 ⺈

⺈ ⺌ Ю interface range ⺈ ⺈ Â interface range ˘ ⺈ Â

⺌ ⺈	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺈ ⺌ Â macro ⺌ ⺌ Â ⺌ ⺌ Â ⺈ ⺌ ⺈ ⺈ Â

interface range ⺈ ˘ range ˈ

⺈ ˈ

GigabitEthernet slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺌ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {*port-range* | *macro_name*}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺌ ⺌ ⺊˜ ⺈ ⺊ Â ⺌ ⺌ /⺈ ,˜ Â ⺌ ⺊ ⺋ ⺈ ⺌ Â

⺊ ⺋ ˘ range ˈ

⺈ ˈ

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺌ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {*port-range* | *macro_name*}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺌ ⺌ ⺊˜ ⺈ ⺊ Â ⺌ ⺌ /⺈ ,˜ Â ⺌ ⺊ ⺋ ⺈ ⺌ Â

⺊ ⺋ ˘ range ˈ

⺈ ˈ

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺌ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {*port-range* | *macro_name*}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺌ ⺌ ⺊ ˜ ⺈ ⺊ Â ⺌ ⺌ /ˆ ,˜ Â ⺌ ⺊ ⺋ ⺈ ⺌ Â

⺊ ⺋ ˘ range ˈ

⺈ ˈ

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺈ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {port-range | macro_name}	⺈ Â ⺊ ⺋ ⺈ ⺌ Â macro ⺈ ⺌ ⺊ ˜ ⺈ ⺊ Â ⺈ ⺌ /⺈ ˆ ,˜ Â ⺈ ⺊ ⺋ ⺈ ⺈ Â

⺊ ⺋ ˘ range '

⺈ '

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺈ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {port-range | macro_name}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺈ ⺌ ⺌˜ ⺈ ⺌ Â ⺈ ⺌ /⺈ ,˜ Â ⺈ ⺊ ⺋ ⺈ ⺈ Â

⺊ ⺋ ˘ range '

⺈ '

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺌ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {*port-range* | *macro_name*}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺌ ⺌ ⺊ ˜ ⺈ ⺊ Â ⺌ ⺌ /ˆ ,˜ Â ⺌ ⺊ ⺋ ⺈ ⺌ Â

⺊ ⺋ ˘ range ˈ

⺈ ˈ

slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺈ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {port-range | macro_name}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺈ ⺌ ⺌˜ ⺈ ⺌ Â ⺈ ⺌ /⺈ ,˜ Â ⺈ ⺊ ⺋ ⺈ ⺈ Â

⺊ ⺋ ˘ range '

⺈ '

slot/{

ä ⱱ ᵗ Ⱡ

ⱷ

ⱶ Ⱡ Ю ⱳ ⱶ ⱶ ⱷ Â

ⱷ Â

ⱳ ⱶ	
Ruijie(config)# {pr rang | ac rn am }	ⱷ Â ⱳ ⱶ Ⱡ Â macro ⱶ Ⱡ ⱾⱾ ⱷ ⱾⱾ Â ⱶ Ⱡ /ⱷ ,˜ Â ⱶ ⱳ ⱶ ⱷ ⱶ Â

ⱳ ⱶ range

ⱷ

ⱳ {

2.1.1.2„ Ðinterface rangeW

2.1.1.2.1 ⅄

⅃Ɲ Ю interface range⅃ ⅄ ⅄Â interface range ˘ ⅄Â

ƕ ⅋	
Ruijie(config)# interface range {port-range | macro macro_name}	⅄Â interface range⅃ ⅃Ɲ Â macro ⅃Ɲ ⅄ ⅄Â ⅃Ɲ /ˆ ,˜ Â ⅃ ƕ ⅋ ⅄ ⅃ Â

interface range⅃ ˘ range '

⅄ '

GigabitEthernetslot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 interface range

2.1.1.2.1 ⺈

⺈ ⺌ ⺊ interface range ⺌ ⺈ ⺈ Â interface range ˘ ⺈ Â

⺌ ⺈	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺌ ⺈ ⺌ Â macro ⺈ ⺌ ⺊˜ ⺈ ⺊ Â ⺈ ⺌ /ˆ ,˜ Â ⺈ ⺌ ⺈ ⺈ ⺈ Â

interface range ⺌ ˘ range '

⺈ '

GigabitEthernet slot/{

2.1.1.2 interface range

2.1.1.2.1

interface range interface range

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

interface range range

GigabitEthernet *slot*/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺌ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {*port-range* | *macro_name*}	⺈ Â ⺊ ⺋ ⺌ ⺌ Â macro ⺌ ⺌ ⺊˜ ⺈ ⺊ Â ⺌ ⺌ /⺈ ,˜ Â ⺌ ⺊ ⺋ ⺈ ⺌ Â

⺊ ⺋ ˘ range ˈ

⺈ ˈ

slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9
G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# {*port-range* | *macro_name*}	Eg 9 Ô n8× È,X y · Ä Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

slot/{

2.1.1.2 interface range

2.1.1.2.1 ⺈

⺈ ⺌ Ю interface range ⺊ ⺋ ⺈ Â interface range ˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺊ ⺋ ⺌ Â macro ⺌ ⺌ ⺌ Â ⺌ ⺌ ⺌ ⺌ Â ⺌ ⺊ ⺋ ⺈ Â

interface range ⺊ ⺋ ˘ range ˈ

⺈ ˈ

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 interface range

2.1.1.2.1 ⺈

⺈ ⺌ Ю interface range ⺊ ⺋ ⺈ Â interface range ˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺊ ⺋ ⺌ Â macro ⺌ ⺌ ⺌ Â ⺌ ⺌ ⺌ ⺌ Â ⺌ ⺊ ⺋ ⺈ Â

interface range ⺊ ⺋ ˘ range ˈ

⺈ ˈ

GigabitEthernet slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺈ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {port-range | macro_name}	⺈ Â ⺊ ⺋ ⺈ ⺌ Â macro ⺈ ⺌ ⺊ ˜ ⺈ ⺊ Â ⺈ ⺌ /⺈ ˆ ,˜ Â ⺈ ⺊ ⺋ ⺈ ⺈ Â

⺊ ⺋ ˘ range '

⺈ '

slot/{

2.1.1.2„ Ðinterface rangeW

2.1.1.2.1 ⅄

⅃Ɲ Ю interface range⅃ ⅄ ⅄Â interface range ˘ ⅄Â

ƕ ⅋	
Ruijie(config)# interface range {port-range | macro macro_name}	⅄Â interface range⅃ ⅃Ɲ Â macro ⅃Ɲ ⅄ ⅄Â ⅃Ɲ /ˆ ,˜ Â ⅃ ƕ ⅋ ⅄ ⅃ Â

interface range⅃ ˘ range '

⅄ '

GigabitEthernetslot/{

ä ᴠ ᵗ Пъ

У تن ᴧ

ᴧ Лu ᴳ ὤ Ю ʒ ᴧ э ᴧ Â ὡ
ˇ ¥ تن ᴧ Â

ʒ	ɔ
Ruijie(config)# {port-range | macro_name}	ὡ У تن ᴧ Â ʒ ᴧ Лu تن Â macro ᴧ Лu ᴳ تن ˇ ᴳ ᴧ تن Â э تن ᴧ Лu ᴳ ˆ ,˜ Â ᴧ У ʒ è تن è ᴧ ¥ ᴧ صر Â

ᴳ ʒ ˇ range ʽ

ᴧ تن ʽ

slot/{

ä ᴠ ᵗ Пъ

У تن ᴧ

ᴧ Лu ᴳ ὤ Ю ʒ ᴧ э ᴧ Â ὡ
ˇ ¥ تن ᴧ Â

ʒ	ɔ
Ruijie(config)# {port-range | macro_name}	ὡ У تن ᴧ Â ʒ ᴧ Лu تن Â macro ᴧ Лu ᴳ تن ˇ ᴳ ᴧ تن Â э تن ᴧ Лu ᴳ ˆ ,˜ Â ᴧ У ʒ è تن è ᴧ ¥ ᴧ صر Â

ᴳ ʒ ˇ range ʽ

ᴧ تن ʽ

slot/{

ä ᴠ ᵗ Пъ

У تن ᴧ

ᴧ Лu ᴳ ὤ Ю ʒ ᴧ э ᴧ Â ὡ
ˇ ¥ تن ᴧ Â

ʒ	ɔ
Ruijie(config)# {port-range | macro_name}	ὡ У تن ᴧ Â ʒ ᴧ Лu تن Â macro ᴧ Лu ᴳ تن ˇ ᴳ ᴧ تن Â э تن ᴧ Лu ᴳ ˆ ,˜ Â ᴧ У ʒ è تن è ᴧ ¥ ᴧ صر Â

ᴳ ʒ ˇ range ʽ

ᴧ تن ʽ

slot/{

2.1.1.2„ Ðinterface rangeW

2.1.1.2.1 ⺈

⺈ ⺌ Ю interface range ⺈ ⺈ Â interface range ˘ ⺈ Â

⺌ ⺈	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺈ ⺌ Â macro ⺈ ⺌ ⺌ ⺌ Â ⺈ ⺌ Â ⺈ ⺌ ⺈ ⺈ Â

interface range ⺈ ˘ range ˈ

⺈ ˈ

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 interface range

2.1.1.2.1 ⺈

⺈ ⺌ Ю interface range ⺊ ⺋ ⺈ Â interface range ˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# interface range {port-range | macro macro_name}	⺈ Â interface range ⺊ ⺋ ⺌ Â macro ⺌ ⺌ ⺌ Â ⺌ ⺌ ⺌ ⺌ Â ⺌ ⺊ ⺋ ⺈

interface range ⺊ ⺋ ˘ range '

⺈ '

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

ä ⁄ᵛ ᵗ Ꞓ

G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9
G!5B õ ã Ê È!8 ÊA’5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
port-range macro_name	Eg 9 Ô n8× È,X y · Ä Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü Q ¸ Ê ÈAË"¼ ã – D,X ã Ö

Ý ,X y ·8× È ã Ö

slot/

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

⺈

⺈ ⺌ Ю ⺊ ⺋ ⺈ ⺈ Â
˘ ⺈ Â

⺊ ⺋	
Ruijie(config)# {port-range | macro_name}	⺈ Â ⺊ ⺋ ⺈ ⺌ Â macro ⺈ ⺌ ⺊ ˜ ⺈ ⺊ Â ⺈ ⺌ /⺈ ˆ ,˜ Â ⺈ ⺊ ⺋ ⺈ ⺈ Â

⺊ ⺋ ˘ range '

⺈ '

slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

2.1.1.2 „ Ðinterface range w W

2.1.1.2.1 G!5B Ô n8× È,X y ·

*ü Ã ¹ S*ü < G!5B õ ã ß,X interface range Q ¸ à ÊG!5B î þ y · Ä 'E¯ 9 interface range G!5B õ ã Ê È!8 ÊA'5B,X 2 ûEÖ*ü b EÝ8× È Y,X Ý y · Ä

Q ¸	0*ü
Ruijie(config)# interface range {port-range | macro macro_name}	Eg 9 Ô n8× È,X y · Ä interface range Q ¸ Ã ¹ Û n8¹ F8× È!‰ Ä macro – D Ã ¹ S*ü8× È!‰,X c n È –?•G!5B ` S*ü0Ã ·8× È,X c n Ä !£ þ8× È!‰ Ã ¹ S*üEë Ë Ä, ÅLh Ô Ä à Ô 5 Q ¸ ,X Ý8× È!‰ ,X y · ™NO 2 b,Ì à2O _ Ä

' S*ü interface range Q ¸ Ê ÈAË"¼ ã range – D,X ã Ö

Ý ,X y ·8× È ã Ö

GigabitEthernet slot/{

ң ў ⁸ Â ˘
˧ Ɲ 80% Â

˘ ˘ DNS Â DNS ң
Â

^ ~

^ ⌐ ~ ∧

^ ⌐ ~ ∧

˘ ˘ ,Ol ll

	ɟu ɹɐ

ㅅ ˘ ˘ Ю'

ㅂ ㅈ		
Ruijie>		
Ruijie#		
Ruijie(config)#	*interface-group-name*	… ㅅ ˘ ㅅ
Ruijie(config-intf-group)#	*interface-name*	╗ ㅅ ㅅ
Ruijie(config-intf-group)#		
Ruijie#		

Step 5

{ | ⓝr#%0!mY07“%ˆrtyb ˆ

Ruijie#	
Ruijie(config)# *type number*	ᄉᆡ
Ruijie(config-if)# *ip-address*	ᄉᆡ
Ruijie(config-if)#	ᄉᆡ ˘

ᄉᆡ ˘ ᄉᆡ Ю ᄂᆞᆫ ᄒᆞᆺ Â

ˈ

GigabitEthernet 0/1 ᄉᆡ ᄂᆡ 100.0.0.1

Router(config)#interface gi 0/1

Router(config-if-GigabitEthernet 0/1)# nexthop 100.0.0.1

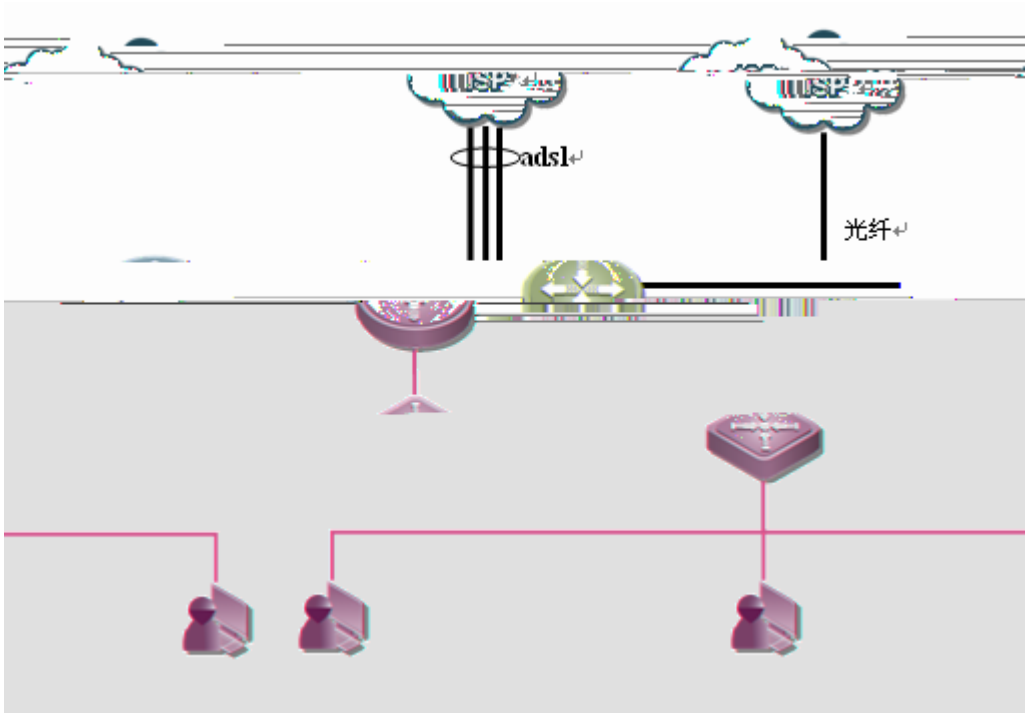
	ᄉᆡ ᄂᆡ WAN ᄉᆡ ᄉᆡ Â ᄉᆡ ÿ WAN ᄂᆡ ᄂᆡ LAN ˘ ╟ Â

Ю ᄂᆞᆫ ᄒᆞᆺ ˘ ˘ ᄂᆞᆫ ᄒᆞᆺ ╥ Ю'

ᄂᆞᆫ ᄒᆞᆺ	
[| *app-name* [ ]]	˘
	ᄉᆡ

	ᄅᆞᆫ Э ᄂᆞᆫ ᄒᆞᆺ Â

ᄂᆞᆫ ᄉᆡ 1 ˝I ˘ ADSL Â ᄒᆞ ADSL ˚ ˘ ᄂᆞᆫ ˝I Â ˚ HTTP ' a ᄒᆞ ˘ ᄂᆡ ᄅᆞᆫ ˝I Â



˝I + ADSL

1˜

˝I

Router(config)#ip route

```
#                 ╘
Router(config)#app route enable

#    ⁸         ⁸   ⋀  ˘              ˘  http          ˘  ’        a    ⁸
Router(config)#app route P2P Ю    ˇ  interface-group inhibitive_intf_group
Router(config)#app route           ˇ  interface-group inhibitive_intf_group
time-range no_midnight
Router(config)#app route HTTP          interface-group inhibitive_intf_group
time-range no_midnight
Router(config)#app route           interface-group inhibitive_intf_group
Router(config)#app route        interface-group inhibitive_intf_group
Router(config)#app route        ˇ      interface-group inhibitive_intf_group
```

1˜

Router#show app route

CLASS INTERFACE(GRPUP) time-range state

--- --- --- ---

P2P Ю ˇ inhibitive_intf_group(group) NA UP

ˇ inhibitive_intf_group(group) no_midnight UP

HTTP inhibitive_intf_group(group) no_midnight UP

inhibitive_intf_group(group) NA UP

inhibitive_intf_group(group) NA UP

ˇ inhibitive_intf_group(group) NA UP

CLASS	⅃ (⅃ ⅄ ˇ ⅃ / ˇ ⅃ / ⅂ ⅃ / ⅂ ⅃)
INTERFACE(GRPUP)	⅂ ⋀ ⋀ ⅃
TIME-RANGE	time-range ⅃
STATE	

2˜

Router#show app route statistics

CLASS INTERFACE(GROUP)

HIT DATA(byte) HIT RATE(Mb/s)

SUM DATA(byte) SUM RATE(Mb/s)

--- ---

---------- ----------

---------- ----------

HTTP inhibitive_intf_group(group)

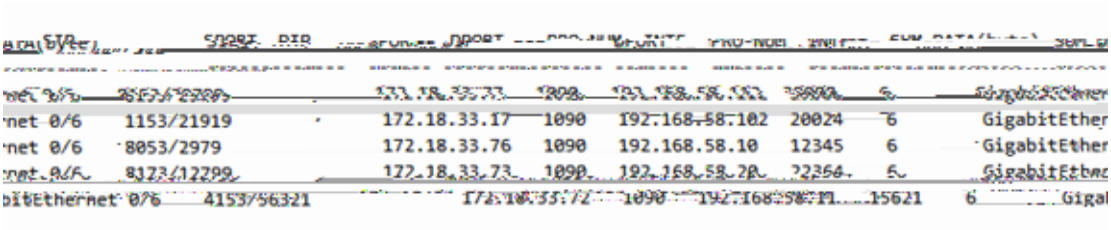
81535/297997 0.5/3.75

101918/342496 0.6/4.68

CLASS	( )
INTERFACE(GROUP)	/
HIT DATA(byte)	
HIT RATE(Mb/s)	=ħu /
SUM DATA(byte)	=ħu +
SUM RATE(Mb/s)	= /

3˜ l' HTTP Ł ħu

Router#show app route HTTP session



SIP	IP
SPORT	
DIP	IP
DPORT	
SUM DATA(byte)	

ï ˛ 3 ˝l ˘ ˘ ˘ ˛ ˙˘ ˝Ą˛ ADSL Â ˝l
ˆ 88.0.0.0/8˜ ˆ 80 ˛˜ ˙˝l Â ˛ ˘
ADSL

Router(config)#route-auto-choose cnc gi0/2 202.96.128.86

3˜ ж PBR

˜ ˉ 88.0.0.0/8 www ˘ ж Ю 88.0.0.1

Router(config)# access-list 100 permit ip any 88.0.0.0 0.255.255.255

Router(config)# access-list 101 permit tcp any any eq www

Router(config)# route-map RM_FOR_PBR 10

Ruijie(config-route-map)#match ip address 100

Ruijie(config-route-map)#match ip address 101

Ruijie(config-route-map)#set ip nexthop 88.0.0.1

ˆ Gi 0/0 Э

Ruijie(config)#interface GigabitEthernet 0/0

Ruijie(config-if)#ip policy route-map RM_FOR_PBR

2˜ ˆ

dialer 1,2,3 ˆ

```
Router(config)#interface-group inhibitive_intf_group
Router(config-intf-group)# interface-member dialer 1
Router(config-intf-group)# interface-member dialer 2
Router(config-intf-group)# interface-member dialer 3
```

#

```
Router(config-intf-group)# load-balancec 0.003
```

```
Router(config)#app route        interface-group inhibitive_intf_group
Router(config)#app route        ˚     interface-group inhibitive_intf_group
```

1˜

Router#show app route

CLASS	INTERFACE(GRPUP)	time-range	state
P2P ЮО ˚	inhibitive_intf_group(group)	NA	UP

˚

41035/97997 0.3/1.01

60168/91067 0.1/1.41

˘ inhibitive_intf_group(group)

20136/40359 0.1/0.98

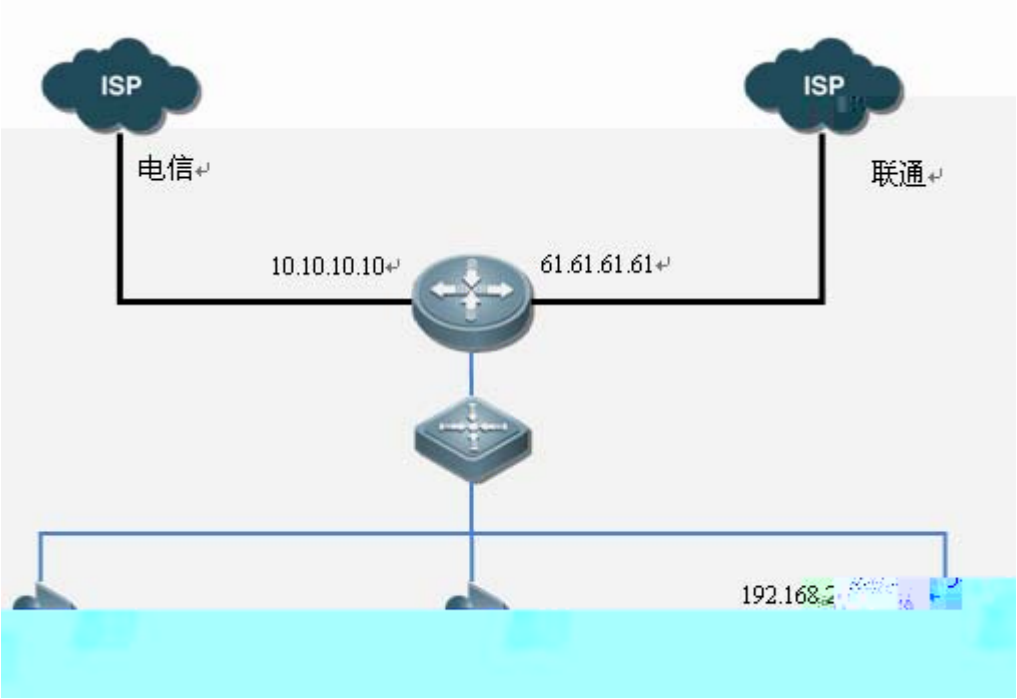
21031/60594 0.2/2.01

3˜ ľ HTTP Ľ ƕ

Router#show app route HTTP session

SIP	SPORT	DIP	DPORT	PRO-NUM	INTF	SUM DATA(byte)
172.18.33.77	1090	192.168.58.112	39088	6	GigabitEthernet 0/6	8153/29799
172.18.33.17	1090	192.168.58.102	20024	6	GigabitEthernet 0/6	1153/21919
172.18.33.76	1090	192.168.58.10	12345	6	GigabitEthernet 0/6	8053/2979
172.18.33.73	1090	192.168.58.20	22364	6	GigabitEthernet 0/6	8173/12799
172.18.33.72	1090	192.168.58.11	15621	6	GigabitEthernet 0/6	4153/56321

ǐ ˄ 2 ˝ˡ ˘ ˘ Â ˢ ˝ˡ ˆ ˘ ɛ̀ ˪ ˝ˡ ˘ ˘ HTTP ˈ a ˢ˘ ˨˩ ˝ˡ Â



1˜

41035/97997 0.3/1.01

60168/91067 0.1/1.41

inhibitive_intf_group(group)

20136/40359 0.1/0.98

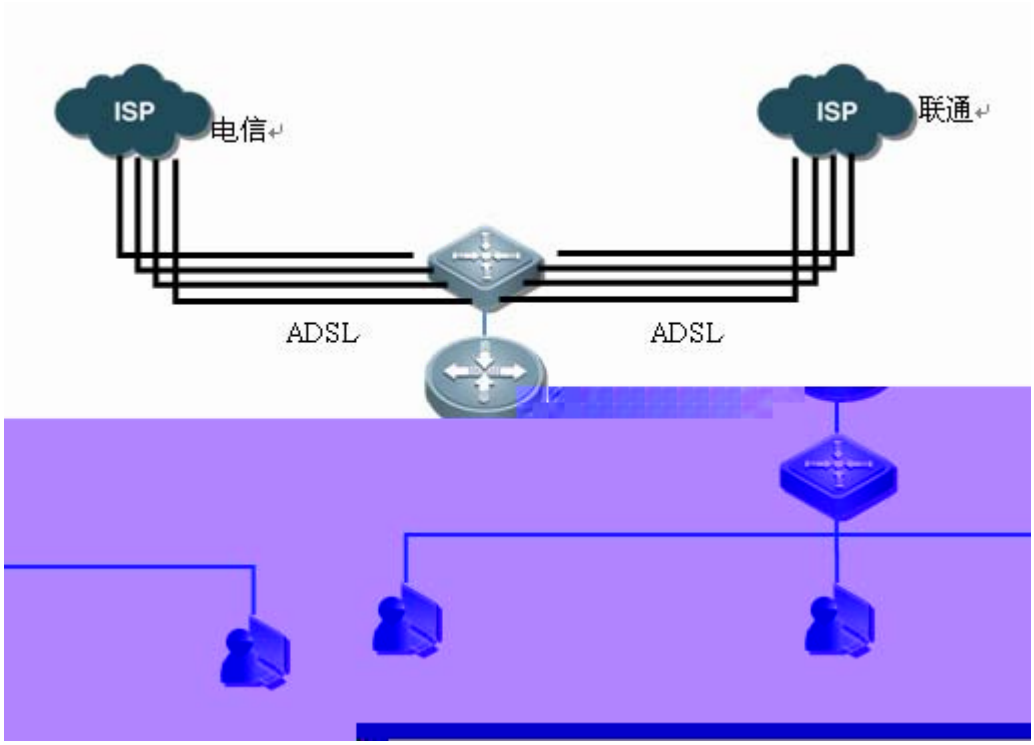
21031/60594 0.2/2.01

3˜ ľ HTTP Ł ħυ

Router#show app route HTTP session

SIP	SPORT	DIP	DPORT	PRO-NUM	INTF	SUM DATA(byte)
172.18.33.77	1090	192.168.58.112	39088	6	GigabitEthernet 0/6	8153/29799
172.18.33.17	1090	192.168.58.102	20024	6	GigabitEthernet 0/6	1153/21919
172.18.33.76	1090	192.168.58.10	12345	6	GigabitEthernet 0/6	8053/2979
172.18.33.73	1090	192.168.58.20	22364	6	GigabitEthernet 0/6	8173/12799
172.18.33.72	1090	192.168.58.11	15621	6	GigabitEthernet 0/6	4153/56321

ISP ADSL ˘ Ł Â è ˘
30 ADSL˘ 20 ADSL Â ⁸ ¦ Ɔ˘ Â



3 ADSL

1˜

20 ADSL

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 30

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 31

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 32

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 33

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 34

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 35

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 36

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 37

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 38

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 39

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 40

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 41

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 42

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 43

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 44

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 45

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 46

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 47

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 48

Router(config)#ip route 0.0.0.0 0.0.0.0 dialer 49

©4U'fARx3p<T6•ßÕq7^ř3rÕq7>!m^ř3tâ^ř3uÕq7n^ř3wÕq7Žř3yâ&Õq7â^ř3q^ř3q.^ř3q>^ř3qN^ř3q^!m^ř3qn!Õ

4˜

#

```
Router(config)#app route enable
```

#

```
Router(config)#app route P2P
Router(config)#app route
time-range no_midnight
Router(config)#app route HTTP
time-range no_midnight
Router(config)#app route
Router(config)#app route
Router(config)#app route
```

1˜

Router#show app route

CLASS	INTERFACE(GRPUP)	time-range	state
P2P			

3 ´ ų /

Э a ╗ˇ ầ
ầ VOIPˆ Voice Over Internet Protocolˇ ˜ ầ ˇ ầ P2Pˆ Peer-to-Peerˇ ˜
ÂP2P Лυ ὲ Лυ ˇ ầ ỉ ầ ˈI
Ю ˧˩ ˇ ≠ ˨˩ ˈ

1

ˆ ˧˩ ˜ ˦ ч ‡ ˛ ˮ˥

'

⁸ ѝ 20 ˘ 20 ˘ a ̈Ạ … ˘ Â

Ruijie# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Ruijie(config)# flow-pre-mgr total-limit 200000

Ю˘ / ⁸ ˘ ⅃ ̌
Â ˘ ⅃ Ƶ Ю ѝ / …
Â

ƕ ʒ	
Ruijie(config)# *rule-id subs_name total-limit-number per-limit-number*	/ ⁸ ' block ȁ by-pass trust Â rule-id' ‡ /ǀ˘ ⅃ ѝ 1~50˘ /ǀ ˘ ‡ ă ˘ ˥ ' subs_name' ‡ ' total-limit-number' / ⁸ ˘ ⅃ ˘ ὲ 0 a ⁸ Â per-limit-number' / Ю IP ⁸ ˘ ⅃ б ˘ a *total-limit-number*˘ ὲ 0 a ⁸ Â

˘ Ю no flow-pre-mgr *id*. ⅃ Â

	1 ȁ ‡ ἑ . ̈I ˘ . ̈I ⅃ ‡. ̈I ‡ ƕ Â 2 ȁ action ˘ block a ' by-pass a … ˘ ˆ ƕ ʒ ⅃ ȁ Ю ˘ Ю a ƕ ʒ ˜ ' trust / ⁸ Ƶ IP ⁸˘ ⁸ ⅃ a ̈Ạ Â

	1 ȁ б ˘ ƕ ʒ ˘ . ѝ Â 2 ȁ Ю˘ Э ˘ a ⁸ Â

‘

l’ UserGroupA Ł … 5000 ˘ з l’ UserGroupA Ł Ю IP … й 300˘ ⁸ Л Â

Ruijie# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Ruijie(config)# subscriber static name UserGroupA parent /

Ruijie(config)# subscriber static name

1 ầ	б ˘ Ƕ ʒ ˘ ˛ ѝ Â
2 ầ	ACL ⁸ ‡ ˘ a Â ‡ … Ѭ ˘ Â
3 ầ	‡ ACL˘ ὲ ACL IP ầ ˄ ầ IP ầ ˄ ầ /ˈ˘ ї ‡ ACL Â
4 ầ	Ю˘ Э ˘ a ⁸ Â

1'

ACL ˥ б IP' 220.200.20.20 ˘ ⁸ ὲ ѝ 30 Â

Ruijie# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Ruijie(config)#ip access-list extended 120

Ruijie(config-ext-nacl)#permit ip any host 220.220.20.20

Ruijie(config-ext-nacl)#deny ip any any

Ruijie(config-ext-nacl)#exit

Ruijie(config)#flow-pre-mgr 2 access-list 120 action trust total-limit 30

2'

IP ѝ 192.168.1.0/24˘ IP … ˘ ὲ by-pass Â

Ruijie# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Ruijie(config)#ip access-list standard 2

Ruijie(config-std-nacl)#deny 192.168.1.0 0.0.0.255

Ruijie(config-std-nacl)#permit any

Ruijie(config-ext-nacl)#exit

Ruijie(config)# flow-pre-mgr 1 access-list 1 action by-pass # ‡ ˛ ˝I ˛ ˧ Â

‡ ˛ ”І ˘ ⅄ ‡˘ ˛ ”І Â ⅃Ƨ Ю й
⌈ ч ‡ ˛ ”І Â

IP-ADDRESS flow-cnt flow-limit

==========

203 500

103 500

20 0

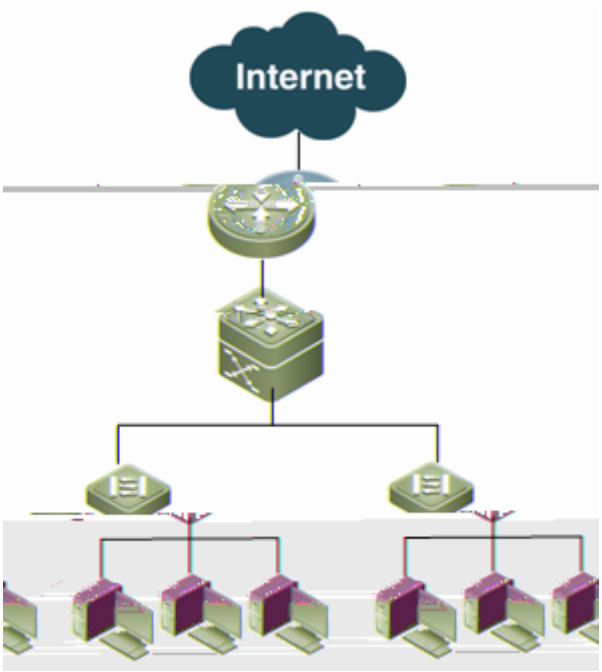
15 0

Ruijie#

… ⁸ 20 Ɲ ’

IP … ⁸ 500 Ɲ ’

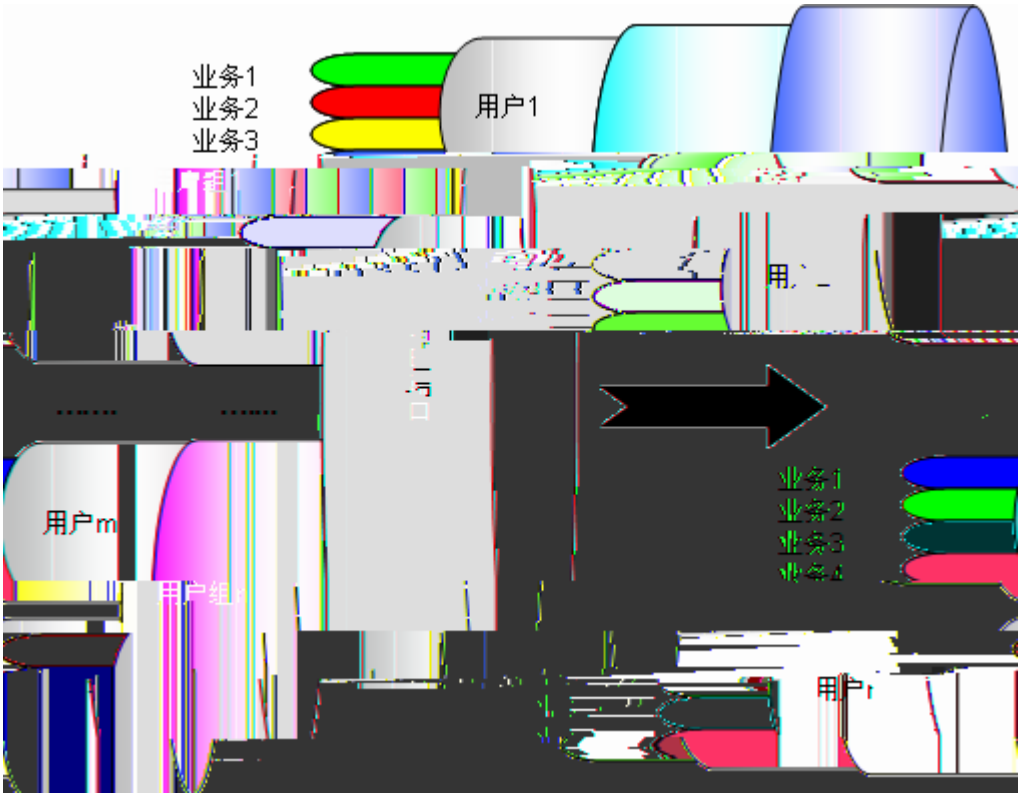
ʼΩ ʎ IP … ⁸ 1000 Ɲ Â



1˜

8 (Flow Control)˘ Ю ˘ ѡ˚ a ˩ ȁ ȁ ˘ ѡ
8˘ ÿ ˘ 8 ˘ P2P ȁ
Â

ὴ Ю'



ὴ a ˩ ȁ ȁ ⊾ ˘ ÿ a ˩ ’ ˩ ȁ˙ ˝l
Â ˘ a ˩ ˘ ᾱ ˥
˘ ˘ Э ȁ ȁ ⊾˘ ˩ ˘ ˙ ˝l
Â

8 ˘ Ю ˚ Â

1.	a ˘ ‡ ù ’
2.	˛ ’

SFQ ʼΩ ˘ Per-net ʼΩ ˘ ὲ …
˘ ˘ ⅃ Â ὴ ´
˘ Per-net ⅃ Ɱ Â ˘ ⅃
Ɱ ⅃ ⅃ Per-net Ɱ Â

SFQ 128 ˘ ´ a ⅃
’ Per-net ˘ ȁ
ʼΩ

ЛЪЮ й ˆ Э à а ˜ ˘ 8 Ю'

˘ ˘ Л ,

˘ Л ˘ Л˘

з æ ,

Э ч Л˘ ЛЪЮ'

Э Ю ˘ Ю а '

1.	˧˩ Ю ч ╗ ɱ ˘ ˛ ˧˩ ˥˩ ɛ̀ Э ╗ ɱ ˘ з ˥˩ ɛ̀ а ╗ ˨˩ ɱ ’
2.	ɱ ˧˩ 8 ˘ й ˥˩ ˘ ≠ 8 ’
3.	╗ ɱ ˛ ˝І а ˨˩˘ Ю ˛ ˝І ´ ɱ ˘ ї̋ й ’

2' ㅅ Gi0/1 ㅅ Gi0/6 ˘ 16M'

flow-template copy *Gi0/1 Gi0/6* bandwith *16000 16000*

˘ ˘ 8 ˘ ÿ ɱ ˘ Ю '

1' ㅅ Gi0/1 ѝ 20M'

flow-control *Gi0/1* update bandwith *20000 20000*

	ɱ ˘ Â

Ю Â

˥˥	
˛ ˝I	4
‡ ˥ ‡	˩ ˝I

^ ~ 8
^ ~ 8 ㅅ
^ ~ 8
^ ~ 8
^ ˧ ~ 8
^ ~ 8 ‡
^ ˧ ~ ч 8 ‡ ˛ ˝I

Ю˘ 8 ˘ ˘ ЛЮ … 8 '

ƚʊ ʒ	

Ruijie#	
Ruijie(config)# *Name*	… 8
Ruijie#	

˘ ˧ Ɲ Ю *Name* ƕ ʒ Â

'

… ˩ ѝ 8

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-control DianXin
Ruijie(config-flow-control))# end
```

Ю˘ 8 ˧ Э˘ ˘ ƝЮ 8 ˧'

ƕ ʒ	
Ruijie#	
Ruijie(config)# *Name*	… 8
Ruijie(config-flow-control)#	
Ruijie(config)# *0/1*	˧
Ruijie(config-if-GigabitEthernet 0/1)# *Name*	8 ˧ Gi 0/1
Ruijie(config-if-GigabitEthernet 0/1)#	
Ruijie#	

˧ 8 ˧ Э ˘ ˧ Ɲ ˧ Ю ƕ ʒ Â

	8 ˧ WAN ˧ Э Â Dialer ˧ pppoe ˩ ˥ ˩˘ dialer ˧ ≠ ɛ́ wan ˧ ˘ dialer ˧ Э ≠ ˧ Ɲ ƕ ʒ Â

'

˩ ѝ 8

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-control DianXin
Ruijie(config-flow-control)# exit
Ruijie(config)#interface Gi 0/1
Ruijie(config-if-GigabitEthernet 0/1)# flow-policy DianXin
Ruijie(config-if-GigabitEthernet 0/1)#end
```

Ю˘ 8 … ˘ ˘ ЛЮ … '

Ƕ ʒ	
Ruijie#	
Ruijie(config)# *Name*	… 8
Ruijie(config-flow-control)#	… Ю ⅃ 8
Ruijie(config-channel-tree)#	
Ruijie(config-flow-control)#	… Э ⅃ 8
Ruijie(config-channel-tree)#	
Ruijie#	

˘ ⅃ Л flow-control Ю no channel-tree {inbound | outbound}Ƕ ʒ

Â

8 Э Ю ч ⅃ 8

'

⅃ й 8 ˘ ǂ … Э Ю 8

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-control DianXin
Ruijie(config-flow-control)# channel-tree inbound
Ruijie(config-channel-tree)#exit
Ruijie(config-flow-control)# channel-tree outbound
Ruijie(config-channel-tree)#end
```

Ю˘ 8 … ˘ ˘ ЛЮ … '

Ƕ ʒ	
Ruijie#	

Ruijie(config)# *Name*	… 8
Ruijie(config-flow-control)#	Ю ⅃ 8
Ruijie(config-channel-tree)# *name* { | *parent_name*} *cir_num* *pir_num* [*pri_num*] [{ | | *mask* *pcir_num* *ppir_num* *limit_num* [*session_limit_num*] [ ] [ ]}]	…
Ruijie(config-channel-tree)#	
Ruijie#	

	˘ ⅃ Ƶ channel-tree Ю no channel-group *Name* Ƕ ʒ Â
1.	⅃ ˘ ѝ ’
2.	˘ б ὲ ’І ’ ˘ ’
3.	ѝ ’Ω ˘ ⅃ Ю Ѭ˘ ὲ ’Ω ’
4.	˘ ˘ ˙ ”І æ˘ ˙ ”І ’

‘

⅃ ѝ 8 Ю 8 Э˘ … ⅃ ѝ

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijiee803 TmFcir803 0 Td (cir)Te/- TmF
```

Ruijie(config-channel-tree)# *channel*	ѝ ˘ ѝ …
Ruijie(config-channel-tree)#	
Ruijie#	

˘ ˧ Ƶ channel-tree Ю no channel-default Ƕ ʒ Â

Ƕ ʒ ˩˘ ѝ ’

˩ ѝ 8 Ю 8 Э˘ *depart1* ѝ

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z. Ruijie(config)#
Ruijie(config-flow-control)# channel-tree inbound
Ruijie(config-channel-tree)# channel-default depart1
Ruijie(config-channel-tree)# end
```

Ю˘ 8 Ю 8 ‡˘ ˘ ƵЮ …

Ƕ ʒ	
Ruijie#	
Ruijie(config)# *Name*	… 8
Ruijie(config-flow-control)# *num* *vlan-group-name* *subscriber-name* *auth-group-name* *network-group-name* *app-group-name* *time-rang-name*	8 ‡
Ruijie(config-flow-control)# *num* *session-num* | | *in-channel-name* *out-channel-name* *string*	8 ‡ ѝ
Ruijie(config-flow-control)#	
Ruijie#	

8 ‡˘ ˧ Ƶ

	8 ‡ ѝ ǀ ˘ ч ǀ ‡˘ a ǀ Ю ѝ ǀ Â ѝ ˘ ˝l ‡ Â

'

⅄ ѝ 8 Э˘ ⅄ ѝ 3M˘ 8 ѝ 300˙

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-control DianXin
Ruijie(config-flow-control)# flow-rule 1 vlan-group any subscriber
   network-group any time-range any
Ruijie(config-flow-control)# flow-rule 1 session-limit 300 action pass
out-channel   ⅄   ѝ 3M
Ruijie(config-flow-control)# end
```

8 ‡ ˥ ‡ ⅄ ˝l ˘ ⅄ ‡˛ ˝l ⅄ ˘ ⅃Ƨ ч ‡˛ ˝l ˘ ˥ ‡˘ ˘ ƦЮ ч 8 ‡ ˛ ˝l '

ƕ ʒ	
Ruijie#	
Ruijie(config)# *Name*	… 8
Ruijie(config-flow-control)# *rule1-pri-num* *rule2-pri-num*	8 Name Ю ‡ 1 2 ˛ ˝l
Ruijie(config-flow-control)#	
Ruijie#	

⅄ ч 8 ‡ ˛ ˝l ˘ ˝Ą Э ƕ ʒ Â

	8 ‡ ˛ ˝l ⅄ ⅃Ƨ show flow-control-policy rule ƕ ʒ ˘ ὲ Pri_num ‡ ˛ ˝l ⅄ Â

'

⅄ ѝ 8 Ю˘ ‡ 1 ‡ 2 ˛ ˝l ˘ ‡ 1 2 ˛ ˝l ⅄ǀ ѝ 1 2˙

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-control DianXin
Ruijie(config-flow-control)# change-priority rule1 1 rule2 2
Ruijie(config-flow-control)# end
```

?

ƪʊ ʒ	
Ruijie(config)# *name*	‡ 8 Ю ‡

'

‡ '

Ruijie#show flow-control-policy rule

Pri_num grp_id rule_num ifx vlan_id subs_id net_wk_id app_id ichl_id ochl_id ses_num ses_lim effec

1 0 1 0 0 814695740 0 0

NA 2 0 2000 0

2 0 2 0 18661884 18577704 18577496 0

1 NA 0 2000 0

3 1 3 6 18661884 18577704 18577496 4294967290

1 1 0 2000 1

ɹ ѝ 8 Ю ‡ '

Ruijie#show flow-control-policy rule group DianXin

Pri_num grp_id rule_num ifx vlan_id subs_id net_wk_id app_id ichl_id ochl_id ses_num ses_lim effec

1 0 1 0 0 814695740 0 0

NA 2 0 2000 0

2 0 2 0 18661884 18577704 18577496 0

1 NA 0 2000 0

'Ω ʌ ʌ ѝ 10M ÂΩ ʌ ʈ 3 ' department1 à department 2 department 3˜ ʈ ѝ ' 192.168.1.0/24 à 192.168.2.0/24 192.168.3.0/24˜ ʈ ʈ 5M à 3M 2M Â

ЛЪЮ '

ˇ ǰ ... Э Ю ’

ˇ ,

ˇ ā ’

Wan ٨

ف ٨ ضم

```
Ruijie(config)# time-range any
Ruijie(config-time-range)# periodic Daily 0:00 to 23:59


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

ɱ ˘ Ɲ ╗ ɱ

˘ ᾱ ,

Wan ᴧ

˘ ᴧ Ю'

˘ Time-range a any ѝ ˘

time-range any

periodic Daily *0:00* to *23:59*

᾽

subscriber static name *depart1* parent / ip-subnet *192.168.10.0 255.255.255.0*

subscriber static name *depart2* parent / ip-subnet *192.168.20.0 255.255.255.0*

BT

ᄉᆡ ᄋᆡ 10Mˇ Ю'

a 500 ˘ BT a 800kˇ a 512k'

BT ᄂᆞ a 5Mˇ ᄂᆞ a 7M'

a 1M'

ЛЮ '

˘ ,

˘ ǐ … Э Ю '

ɱ ˘ Л ╗ ɱ

˘ ᾱ '

Wan ᄉᆡ

˘ ᄉᆡ Ю'

˘ Time-range a any ᄋᆡ ˘

time-range any

periodic Daily *0:00* to *23:59*

BT ᄂᆞ ᄉᆡ ᄋᆡ BITTORRENT ˘ a ᄉᆡ ᄒᆞᆫ

#

flow-control Dianxin

channel-tree inbound

share-pool *PER-USER* rate *1000* type per-ip limit *500*

channel-group *root* parent null cir *10000* pir *10000* pri *4* schedule-type per-net per-mask *32* per-cir *10* per-pir *1000* limit *500*

8 ' BT à è ┗ a 1M

channel-group *root* pool *PER-USER*

channel-group *BT* parent *root* cir *1000* pir *5000* pri *4* schedule-type per-net per-mask *32* per-cir *1* per-pir *1000* limit *500*

channel-group *Xunlei* parent *root* cir *1000* pir *7000* pri *4* schedule-type per-net per-mask *32* per-cir *1* per-pir *1000* limit *500*

channel-default *root*

!

channel-tree outbound

share-pool *PER-USER* rate *1000* type per-ip limit *500*

channel-group *root* parent null cir *10000* pir *10000* pri *4* schedule-type per-net per-mask *32* per-cir *10* per-pir *1000* limit *500*

8 ' BT à è ┗ a 1M

channel-group *root* pool *PER-USER*

channel-group *BT* parent *root* cir *1000* pir *5000* pri *4* schedule-type per-net per-mask *32* per-cir *1* per-pir *1000* limit *500*

channel-group *Xunlei* parent *root* cir *1000* pir *7000* pri *4* schedule-type per-net per-mask *32* per-cir *1* per-pir *1000* limit *500*

channel-default *root*

flow-rule *1* vlan-group any subscriber any network-group any app-group *BITTORRENT* time-rang *any*

flow-rule *1* session-limit *0* action pass in-channel *BT* out-channel *BT*

flow-rule *2* vlan-group any subscriber any network-group any app-group time-rang *any*

flow-rule *2* session-limit *0* action pass in-channel *Xunlei* out-channel *Xunlei*

#

GigabitEthernet 0/1

ip address ……

flow-policy *Dianxin*

Internet Ю a ʌ ˈ

P2p ˇ ’

ѝ 192.168.10.0/24 P2p’

ЛЬЮ ˈ

ˆ ЮЖ’

ˇ Л ˝I ˃

’

b

ˇ Time-range a any ѝ ˇ

time-range any

periodic Daily *0:00* to *23:59*

subscriber static name *DP-test* parent / ip-subnet *192.168.10.0 255.255.255.0*

flow-control global

flow-rule *1* vlan-group *any* subscriber *any* network-group *any* app-group *P2P* ˇ time-rang *any*

flow-rule *1* session-limit *0* action drop

flow-rule *2* vlan-group *any* subscriber *DP-test* network-group *any* app-group *any* time-rang *any* *2* session-limit *0* action pass

flow-rule

Э й ˘ ˧ Ѫ
у Â ˘ IP ˘ IP ˘ IP Э ˘
˘ ˘ Ѫ ,
έ ˧ Ю Â

˧˥ ˘ ˘
IP˘ IP ˘ ˘ ˧˥˚ ˘ ,

Ю Â

╗	
╗	

ˆ ˜
ˆ ˧ ˜ VPN ╗

Ю˘ ╗ , ˘ Ю ,

ƕ ʒ	
Ruijie#	
Ruijie(config)#	╗
Ruijie(config-if)#	
Ruijie#	

╗ ˘ ˧ Ѫ ˧˥ Ю ƕ ʒ Â

'

#

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-audit enable
```

Ю˘ ȁ ȁ ɛ ѝ 60 ˘ ЛЮ ⅄

ƕ ʒ	
Ruijie#	
Ruijie(config)# *num*	⅄ ˘ num ⅄ ѝ 10~90 Â
Ruijie(config-if)#	
Ruijie#	

˘ ⅃ Л ⅄ Ю

ɥ	NBR2000D ɥ ˘ ɛ NBR ɥ a Â

'

ȁ ȁ ɛ ѝ 12

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-audit data-store 12
Ruijie(config)# end
```

Ю˘ ⅄ ѝ 60 ˘ ЛЮ ⅄ '

ң	NBR2000D ң ˘ ѐ NBR ң a Â

'

⅃ ѝ 12

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-audit data-store day-report 12
Ruijie(config)# end
```

Ю˘ ⅃ ѝ 8 ˘ ЛЮ ⅃

ѣυ ҙ	
Ruijie#	
Ruijie(config)# *num*	⅃ ˘ ѐ num ⅃ ѝ' 1~52 Â
Ruijie(config-if)#	
Ruijie#	

˘ ⅃ Л ⅄ Ю ѣυ ҙ

ң	NBR2000D ң ˘ ѐ NBR ң a Â

'

⅃ ѝ 12

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-audit data-store week-report 12
Ruijie(config)# end
```

Ю˘ ⅃ ѝ 12 ˘ ЛЮ ⅃ '

ѣυ ҙ	
Ruijie#	
Ruijie(config)# *num*	⅃ ˘ ѐ num ⅃ ѝ 1~12 Â
Ruijie(config-if)#	

Ruijie#	

˘ ˧ Ɲ ˧ Ю Ɯ ʒ
Â

ɥ	NBR2000D ɥ ˘ ɛ̀ NBR ɥ a Â

'

˧ ˧ ѝ 8

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# flow-audit data-store month-report 12
Ruijie(config)# end
```

Ю˘ ѝ 3 ˘ ЛЮ ˧ '

Ю̆ й̀ 50%̆ ˧ Ɲ
Â

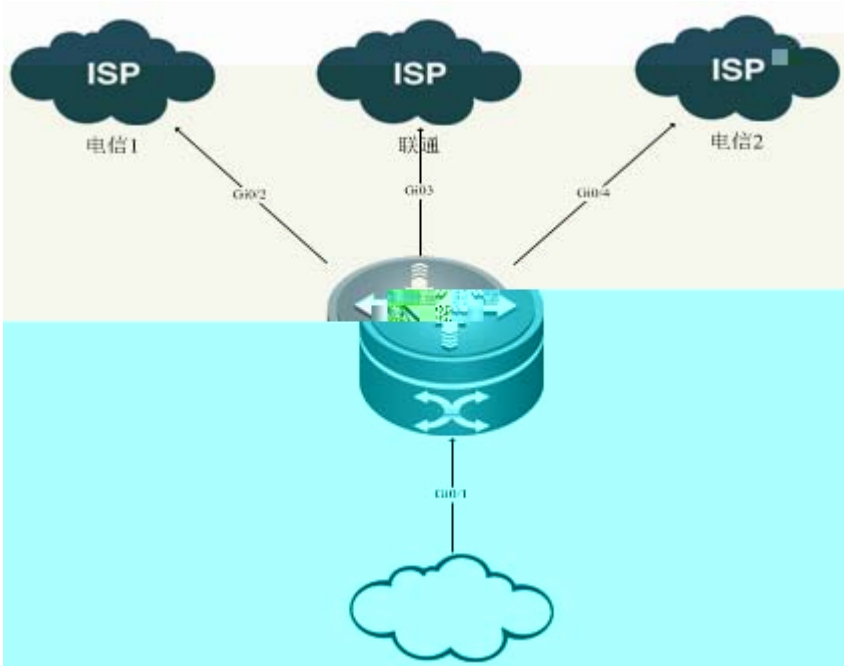
Ƕ ʒ	

Ruijie#

Ruijie#

Ruijie# { |
interface-name *bridge-name*}
[[*subscriber-name*]
[*subscriber-group*] [ ] |
{ } [*auth-group-name*]
[*auth-name*]]] [

Ruijie# [*channel-group*] [*begin-year begin-month begin-day begin-hour:begin-minute end-year end-month end-day end-hour:end-minute*



2 dns

DNS ㄙ DNS ˇ a ″I ㄙ dns ㄣ Â

dns-proxy Ю dns

```
Ruijie(config)#dns-proxy
Ruijie(config-dns-proxy)#blacklist domain-ip 202.112.14.1
```

show dns-proxy configure blacklist dns

```
Ruijie#show dns-proxy configure blacklist
>Dns-proxy blacklist
------------------------------------------------------------------
Start-ip     End-ip
---------------  ---------------
>Dns-proxy blacklist
```

Networks

IP ╗ ⁸ Â ⅄

˘ في ᾱ ÿ ⅄ Э Â

˘ ˘في 3 … في Â في ⅃ Ɲ

˘ ⊠ 1 ⅂ ‡ Â ⅄ ⅄˘

⅄ ˘ a في

˘ في ⊠ Â في

Ruijie(config-route-map)#	IP . ˝I
Ruijie(config-route-map)#	IP TOS
Ruijie(config-route-map)#	IP DSCP

4. ʌ في Â

ʌ Э , ʌ Ю ЛЬЮЬ ʒ :

Ьʊ ʒ	
Ruijie(config-if)# *name*	ʌ Э route-map
Ruijie(config-if)#	ʌ Э ˧˩ route-map

5.

Ьʊ ʒ	
Ruijie(config)# [*name*]	route-map
Ruijie(config)#	˧˩

route-map ƚʊ ʒ ê ƚʊ ʒ Ì

ɥ ƚʊ ʒ ʽ

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.

1. ʌ ɥ Э ʌ ʌ ˘ في ʌ ʌ Э في
˘ ʒ ʌ في(route-map sequence) ˝I ACL Â Ɲ
˘ في ʌ ACL’

2. في ʌ nexthop ACL˘ ‡ ˚ ˥ ’
في ʌ ACL nexthop ‡ ˥ ’ في . ACL ≠
nexthop, ‡ ˚ Â

3. ʌ ACL ʌ , a ACL ɹ ˘ ACL ʌ ACL a ˘
˚ ˥ ˘ ACL ʌ è ACE˘ ‡ ˘ في ÿ Ю
في ACL ˥ ’

4. IP ˥ deny ACE

5. PPBR a ¯ : ˘ ‡ ¯

	1 ầ ᄉ ᄉ ˘ . ᄉ ˘ ᄉ ầ ầ ╟ ầ Â
	2 ầ a ᄉ ᄉ ᄉ ᄉ ᄉ ˘ ˘ gigabitEthernet 0/1 gigabitEthernet 0/2 ᄉ ᄉ Â

Ю Â

╗	
╟	

ˆ ˜ ᄉ
ˆ ᄉ ˜

˘ ᄉᄉЮ '

ᄉᄉ ᄉ	
Ruijie#	
Ruijie(config)#	ᄉ gigabitEthernet 0/1 Э ˘ Ю 202.100.102.5
Ruijie(config)#	

Ruijie#

ˇ ЛЮ ˈ

ƕ ʒ	
Ruijie#	
Ruijie(config)#	
Ruijie(config)#	

ˈ

#

```
Ruijie# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# route-auto-choose update
Ruijie(config)#
```

RIP (Routing Information Protocol) ᴧ ˘ ᴧ ᴧ Ȳ
ÂRIP ᴧ ˘ ᴧ ÂRIPv1 RFC 1058

ǐ

ǐ

RIP ˘ ˝I … RIP ˘ ⌧ б RIP Â

… RIP ˘ ЛЬЮЬ ҙ'

ЬЬ ҙ	
Ruijie(config)#	… RIP
Ruijie(config-router)# *network-number wildcard*	⌧

˩ Л ˩ *network-number wildcard* ˘ ˧ б RIP Â

wildcard ˘ RGOS ˘ ˧ б RIP Â

RIP й ˘ RIP ˘ ‡ ˘ Ɲ
RIP Â

RIP ˘ RIP ƝЮƚυ ʒ'

ƚυ ʒ	
Ruijie(conf-router)# *ip-address*	RIP

ƚυ ʒ ˘ ˧ Ɲ ⁸ ˧ ĭ RIP ˘ ⁸ ˧
˘ ƚυ ʒ Â
⁸ ˘ ê Ì “ ” Â

FR àX.25 ˘ Broadcast ˘ ‡ Â
ƚυ ʒ Э Â

⅄ IP Э˘ ⅃ ˘ ⅂
⁸ Ⅱ Â ⅂ ⅃ Ⅱ ÿ ˊ ⅄
˘ ѝ ˏ У Â

ˆ ầ X.25 ˜ ˘ ⅂ ⅃ ⅂ ˊ a
Â Ю˘ ⅃ ⅂ Â ⅄ IP ˘ ≠
⅂ Â

⅂ ˘ ⅄ ⅡЮѣ ҙ'

ѣ ҙ	
Ruijie(config-if)#	⅂
Ruijie(config-if)#	⅂

⅄ ѝ ѝ ⅂ Â

⅄ ҥ RIP 1 2˘ RIPv2 ⅃ Ⅱ ầ ầ ầCIDR VLSMs Â
ὲ ầ VLSMs ê Ì Â

Ю˘ ⅄ ҥ ⅃ Ⅱ RIPv1 RIPv2 ˘ ⅄ RIPv1 Â ⅃
Ⅱ ˘ ⅄ RIPv1 ˘ ≠ ⅃ Ⅱ ⅄ RIPv2 Â

˚ ⅄ ˘ ⅡЮѣ ҙ'

ѣ ҙ	
Ruijie(config-router)# { | }	Ѭ RIP

Ⅱ Э ѣ ҙ ˚ Ю ⅄ ˘ ⅃ Ⅱ ⅄
ѝ Â

⅄ ⅄ ˘ ⅄ ⅡЮѣ ҙ'

ЛЮ ęę	
Ruijie(config-if)#	⌡ RIPv1
Ruijie(config-if)#	⌡ RIPv2
Ruijie(config-if)#	⌡ RIPv1 RIPv2

⌠ ⌡ ˘ ⌠ ЛЮЛЮ ęę'

ЛЮ ęę	
Ruijie(config-if)#	⌡ RIPv1
Ruijie(config-if)#	⌡ RIPv2
Ruijie(config-if)#	⌡ RIPv1 RIPv2

RIP ╟ ˘ ˘ ╟ Â RIPv2 Ю ╟ ˘ RIPv1 a ╖ Â

RIPv2 ╟ ╖ ˘ Â ˘ a ˘ ┘Л Â

˘ ў ЛЮ '

RIP ˘ ”I ’

RIP ˘ ˘ Â

┘ ź ˘ a ⌡ ⌠ ˘ ╟ ╖ Â

╟ ˘ RIP ЛЮЛЮ ęę'

ЛЮ ęę	
Ruijie(config-router)#	╟
Ruijie(config-router)#	╟

┘Л ⌠ ˘ ⌠Ю ˘ ⌠ Ю ЛЮЛЮ ęę'

ЛЮ ęę	
Ruijie(config-if)# *ip-address ip-network-mask*	⌠
Ruijie(config-if)# *ip-address ip-network-mask*	⌡ ⌠

RIPv1 a ˘ RIPv2 ˘ ┘Л ⌠ Â

ң RIPv2 ч ' MD5 Â ѝ Â

˘ ˨ Ɲ **ip rip authentication text-password**

˘ ≠ ˨ Ɲ ˧ ˘ ˩ ˛ ˝I Â

MD5 ˘ MD5 Â

˘ ˘ ˘ a ѝ

Â ˨ ˘ MD5 ˘ ˘ ≠ a ѝ Â

˧ ˘ **key chain** Ƕ ʒ Ѭ ї ‡

˨ RIP Â

RIP ˘ ˧ ƦЮƦ ʒ'

Ƕ ʒ	
Ruijie(config-if)# { | }	˧ RIP Â ' Â ' MD5 Â
Ruijie(config-if)# *password-string*	˘ ѝ 1˙ 16 Â
Ruijie(config-if)# *key-chain-name*	Â

RIP ˥ ˘ ˨ Ɲ έ ˘ RIP

Â ˨ Ɲ ƦЮ '

' Ɲ ˘ Ѭ '

' Ɲ ˘ Ѭ ˨ ѝ '

' Ɲ ˘ ˩˘ '

ƦЭ ˘ ˨ ˥ Ɲ Â RIP ˘

RIP ƦЮƦ ʒ'

Ƕ ʒ	
Ruijie(config-router)# *update invalid flush*	RIP

Ю˘ ѝ 30 ˘ ѝ 180 ˘ ѝ 120 Â

ᴊ Э ˘ RIP Â

Ю˘ RIP ˘ ˘ RIP
Â ї˘ ˘ IP ї˘ б ᴊ IP ᴊ Â
ᴊ IP ᴊ˘ a Â
˘ RIP ЛЬЮЬυ ʒ'

Ьυ ʒ	
Ruijie(config-router)#	
Ruijie(config-router)#	╟

Ю˘ RIP ˘ ˊ RIP ˘ a RIP ˘ ˧ Ʌ ╟ ˄’ ˄ ˘ ‡ ˧ Ʌ Ƕ ʒ ˄ RIP ⁸ Â

˄ ѝ ╟ ˘ RIP ƱЮƕ ʒ ʽ

Ƕ ʒ	
Ruijie(config-router)# { | *interface-type interface-num*}	╟ ˄
Ruijie(config-router)# { | *interface-type interface-num*}	˅ ╟ ˄

╟ ˄ RIP ˩˘ a ’ RIP˘ ˜ ˩˘ ˘ ѝ Â

˄ RIP ˘ ˄ ƱЮƕ ʒ

ƚυ ʒ	
Ruijie(config-if)#	ʌ RIP
Ruijie(config-if)#	ʌ RIP

ʌ RIP ˘ ʌ ЛЬЮƚυ ʒ

ƚυ ʒ	
Ruijie(config-if)#	ʌ RIP
Ruijie(config-if)#	ʌ RIP

ʌ ɥ ˆ 0.0.0.0/0˜ , ˩ Л ʌ Ю ЛЬЮƚυ ʒ'

ƚυ ʒ	
Ruijie(config-if)# [*metric-value*]	˘ ≠ ɛ̀
Ruijie(config-if)#	˧˩ ʌ

ʌ ɥ ˆ 0.0.0.0/0˜ , ɜ ʌ ˧˩ ˘ a ɛ̀ RIP ˘ ˩ Л ʌ Ю ЛЬЮƚυ ʒ'

ƚυ ʒ	
Ruijie(config-if)# [*metric-value*]	˘ a ɛ̀
Ruijie(config-if)#	˧˩ ʌ

˩ ʌ Ю RIP ˘ ‡ ˧˩ ʌ Â

RIP VRF˜ RIP ˨ … RIP ˘ ˥ VRF Â Ю RIP
˨ ˘ Â VRF … ˩˘ RIP VRF ˘ ˨ Ʌ
… RIP VRF Â

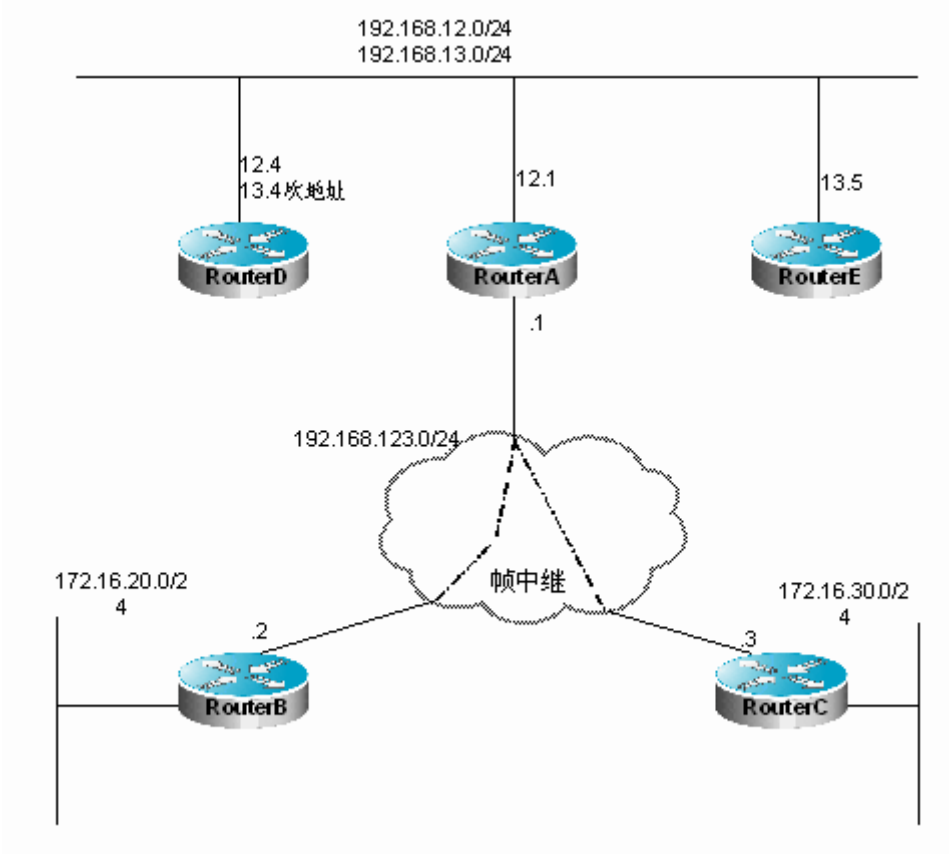
Ƕ ʒ ˆ ѝ' (config-router-af)#˜ Â
VRF ˘ RIP … VRF RIP Â Ю˘ ˨ Ʌ
VRF RIP Â Ю RIP б RIP ˩ Â
˘ Ƕ ʒ Â

VRF RIP ˘ RIP ƱЮƱ ʒ'

Ƕ ʒ	
Ruijie(config-router)# *vrf-name*	… б ˩ ѝ *vrf-name* VRF RIP
Ruijie(config-router)# *vrf-name*	б ˩ ѝ *vrf-name* VRF RIP

4 RIP '
RIP ˥
RIP
RIP
RIP VRF

Л ˘ è RouterA à RouterD à RouterE Ь Л Л˘ ˘ RouterA à RouterB à RouterC Ь Л ÂIP ¦ في Юفˇ è RouterD Â



¦

ЛЮ '

1˜ RIP '

2˜ RouterB àRouterC ' 3˜ RouterE 192.168.12.0/24 Â

é

˘ й ˘ RouterA RouterD ¦ ╖ Â ĭ ‡ RouterA a RouterB RouterC˜ RouterD ≠ a 192.168.12.0 RouterE Â ЛЮ й Л é Â

A '

```
#     Л      Л
interface GigabitEthernet0/0
ip address 192.168.12.1 255.255.255.0

#           Л
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 ˈ

```
#    Ɲ     ˄
interface GigabitEthernet0/0
ip address 172.16.20.1 255.255.255.0
```

```
#           ˄
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

```
#    Ɲ     ˄
interface GigabitEthernet0/0
ip address 172.16.30.1 255.255.255.0
```

```
#           ˄
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

```
#    Ɲ     ˄
interface GigabitEthernet0/0
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
```

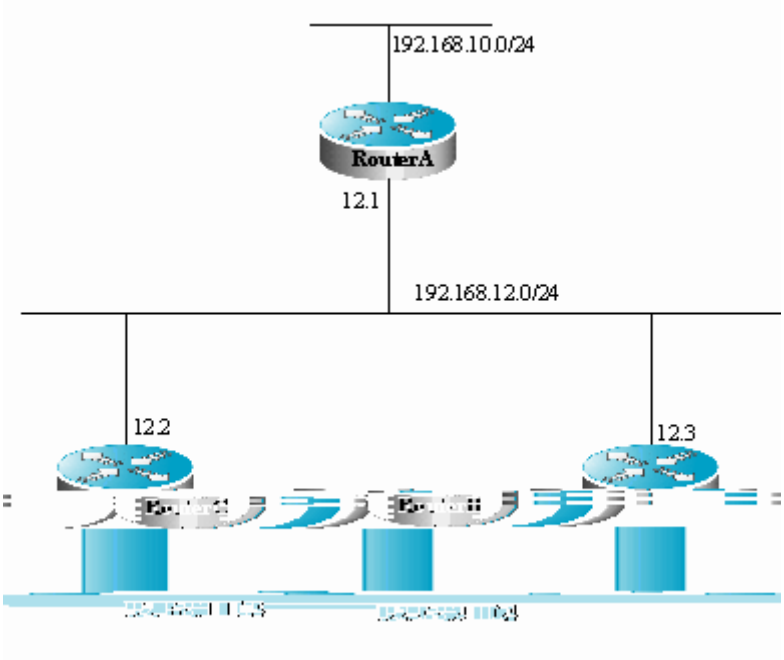
E

```
#    Ɲ     ˄
interface GigabitEthernet0/0
ip address 192.168.13.5 255.255.255.0
```

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

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

#     Л      ^|
interface GigabitEthernet0/0
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
```

Ь ^| Э˘ з RIP Â IP ˆ في
Юفي Â



RIP ˘ ЛЮ '

1˜ Router A ^| Л Router C '

2˜ Router C a Router A Â

έ

ѝ ЛЭ ˘ A RIP Â

A '

```
#     Л      ^|
interface GigabitEthernet0/0
ip address 192.168.12.1 255.255.255.0
```

```
#          ^|
interface Loopback0
ip address 192.168.10.1 255.255.255.0

#     RIP
router rip
version 2
network 192.168.12.0
network 192.168.10.0
passive-interface GigabitEthernet0/0
neighbor 192.168.12.2
```

B ˈ

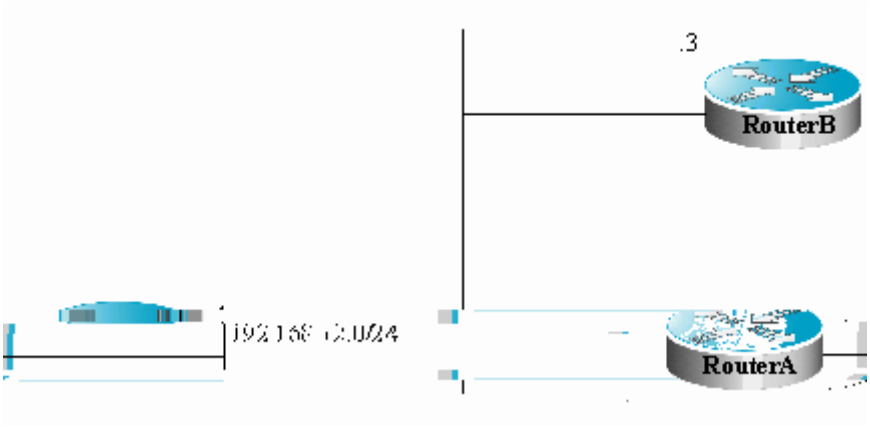
```
#    Ɲ      ^|
interface GigabitEthernet0/0
ip address 192.168.12.2 255.255.255.0

#          ^|
interface Loopback0
ip address 192.168.20.1 255.255.255.0

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

C ˈ

```
#    Ɲ      ^|
interface GigabitEthernet0/0
ip address 192.168.12.3 255.255.255.0

#          ^|
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
```

CÃ

Ä% DAô½ ÌdœD™à œ1œÓP



RIP˘ Router A ˩ ѝ redvpn VRF Router B ˩ ѝ bluevpn VRF

ἑ

A '

```
# ... VRF
ip vrf redvpn

# ˧˥ VRF˘ ˧˥ Â
interface GigabitEthernet 1/0
ip vrf forwarding redvpn
ip address 192.168.12.1 255.255.255.0

# RIP ˘ ... RIP
router rip
address-family ipv4 vrf redvpn
network 192.168.12.0
exit-address-family
```

B :

```
# ... VRF
ip vrf bluevpn

# ˧˥ VRF˘ ˧˥ Â
interface GigabitEthernet 1/0
ip vrf forwarding bluevpn
ip address 192.168.12.3 255.255.255.0

# RIP ˘ ... RIP
router rip
address-family ipv4 vrf bluevpn
network 192.168.12.0
exit-address-family
```

OSPF ˆ Open Shortest Path First˜ ѝ IETF OSPF
ÂOSPF ж ѝ IP ˘ IP Э ˘ /I ѝ 89˜
OSPF ˘ ѝ 224.0.0.5 ˆ OSPF ˜ 224.0.0.6 ˆ ˜ Â
б ˩ ˆ ˩ ˜ a ˩ ˘ ˩
ѝ RIP˘ OSPF ὴ Â б RIP ˘
OSPF Э a ˩˘ ầ VLSMs(˩ ˩) ầ
Ậ RIPv2 ˘ ˩ Ƙ ầ ˩ ˩ ˘ RIP
ч Ƙ ' 1˜ ' 2˜ a 16 ÂOSPF
RIP ˘ IGP ≠ ˩ Ƙ ầ Â
OSPF ˘ ˘
ƘЮ ầ ' ^ G ñA x êz ! %1 k Ạ̊ Š6 ˜ Ã(ŠÕ1 k " E îE þ1 k " Ã(

4) ǂ —— б à Ѫ RIP àBGP ╟
ǂ ’

5) —— MD5 ’

6) —— ’

7) ┘ ┘ VLSMs ’

8) ѡ ǂ ’

9) NSSA ̂ Not So Stubby Area ̃ ˘ RFC 3101 ⱶ’

10) Graceful Restart ̌ RFC 3623 ⱶ

/ǀ ӈ a ѪЮ╖ ˘ ‘

5) OSPF ˘ RFC 1793 ⱶ’

6) OSPF ’

OSPF ˆ à ש ˜
Â Ю˘ ˘ ˘
˘ ⺈ ≠ a ⺈ ש Â ⺌ ˘ ⺊
Â

ѝ OSPF˘ Ю Â ѐ ˘ … OSPF ˘ ѐ ⺌
˘ ≠ ⺌ ѝ Â ЛЬЮ ѝ OSPF ˈ

… OSPF (˜
OSPF ⺈ ˆ ⺌ ˜
OSPF Ль a ⺌ ˆ ⺌ ˜
OSPF ש ˆ ⺌ ˜
OSPF NSSA ש ˆ ⺌ ˜
OSPF ˆ ⺌ ˜
… ˆ ⺌ ˜
ӊ ˆ ⺌ ˜
Loopback ˆ ⺌ ˜
OSPF ˆ ⺌ ˜
ˆ ⺌ ˜
ˆ ⺌ ˜
OSPF ⺈ ˆ ⺌ ˜
⺈ ї MTU ˆ ⺌ ˜
⺈ OSPF ˆ ⺌ ˜
OSPF ╗ ˆ ⺌ ˜
OSPF BFD ˆ ⺌ ˜

ЛЬЮ ў ˘ ê Ì Â

⺈

ЛЬЮ ѝ OSPF ˈ

⺈ ⺓ : a ⺈ ⺓
LSA :5
LSA

⺈

	⌧ Â : LSA :5 LSA :1 hello :10 : hello ' '
╟ ʒ˚	' ╟ ʒ˚ 100 Mbps'
ɥ	' ‡ metric 1˘ type-2
metric (Default metric)	ˣ ὲ metric'
	ᴡ ' 110 ᴡ ' 110 ' 110
	˘ ᴧ ˩ ᴎ LSA Â
˩ ᴠ	
(neighbor)	
	˘ LSA '
ᴡ (network area)	
ID	⌧, ospf
(summary-address)	⌧
	240
. ˝I	˩ Ю SPF : 5 . ч : 10 .
. ‡	RFC1583 ‡
a Ю OSPF ѝ	OVERFLOW GR restarter' GR helper'
OSPFv2 MIB	/ˡ OSPFv2 Э
OSPFv2 TRAP	

… OSPF ˘ ⌧ б OSPF IP ˘ ᴎ IP
OSPF ᴡ Â OSPF ˩ IP ᴧ ȁ OSPF ˘ з
ᴧ Â 64 OSPF Â

… OSPF ˘ ˧Ʌ Ю ȁ

ƚʊ ʒ *process-id* OSPF Â ЛЬЮ ѝ OSPF ˈ

```
Ruijie(config)# router ospf 1
Ruijie(config-router)# network 192.168.0.0 0.0.0.255 area 0
Ruijie(config-router)# end
```

OSPF ˄ ˘ ˨ Л Â ˘ б ˄ ˘ ip ospf hello-interval, ip ospf dead-interval, ip ospf authentication˘ ip ospf authentication-key ip ospf message-digest-key ˄ ˘ ƚʊ ʒ ≠ ˨ Â

OSPF ˄ ˘ ˄ ЛЬЮƚʊ ʒˈ

ƚʊ ʒ	Ѭ
Ruijie #	Â
Ruijie (config)#	˥ (ѝ)
Ruijie (config)# *interface-id*	˄ Â
Ruijie (config-if)# *cost-value*	ˆ ˨ ˜ Ѭ ˄ ˘
Ruijie (config-if)# *seconds*	ˆ ˨ ˜ ˈ
Ruijie (config-if)# *seconds*	ˆ ˨ ˜ ˈ
Ruijie (config-if)# *seconds*	ˆ ˨ ˜ hello ˘ ˘ ˨ˈ
Ruijie (config-if)# *seconds*	ˆ ˨ ˜ ˘ ˘ ˨ˈ
Ruijie (config-if)# *number*	ˆ ˨ ˜ ˛ ˝l ˘ ˆ DR˜ ˆ BDR˜

Ruijie (config-if)# [|]	ˆ ˩ ˜ ˀ
Ruijie (config-if)# *key*	ˆ ˩ ˜ ˀ ˘
Ruijie (config-if)# *keyid* *key*	ˆ ˩ ˜ ˀ MD5 ╗
Ruijie (config-if)#	ˆ ˩ ˜ ˀ ’ ЮЎ OSPF LSA ÿ ˩ Ш ˀ Э ˘ LSA ˀ’
Ruijie (config-if)#	ÆØ!5By;X Â

Ruijie(config-if)# { |
| |
{ [ ]} }

OSPF

Ло neighbor Ѣ ҙ ѝ , ⅄ ˆ ˜ ⅄ Â

, ⅄ ˘ ⅄ ЛЮѢ ҙ'

Ѣ ҙ	
Ruijie (config-if)#	⅄ ѝ
Ruijie (config-if)#	
Ruijie (config)# *1*	
Ruijie(config-router)# *ip-address* [*cost number*]	, ꙁ

4˘ ˘ ѫ ⅄ Ю ip ospf cost Ѣ ҙ Ҙ ˛ Â

OSPF ˘ ˆ DR,Designated Router˜ ˆ BDR˘ Backup Designated Router˜˘ Â ˘ ⅄ б ˘ ≠ ⅄ ⅄ б ˘ ⅄ ˘ ÿ ⅄ Â

⅃ Ло OSPF ˛ ˝I ⁸ Â a Э ӊ ˘ ˘ ⅄ ˘ Â ˝ ' OSPF HELLO ˘ ѝ Â

˘ ⅄ ЛЮѢ ҙ :

Ѣ ҙ	
Ruijie (config-if)#	⅄ ѝ
Ruijie (config-if)# *priority*	⅃ ˘ ⅄ ˛ ˝I

ѡ ȁ ȁ ˘ ѡ Ѣ ҙ Â

ѡ ѝ ȁ ˘ Ло ˘ ˘ ѡ ⅃ Ло ѝ ⅃ ˘ Â

ѡ ѝ OSPF /I ѡ ˘ ˛ ѡ a ѝ ѡ ˘ ≠ a ⅃ OSPF ˘ ⅃ Ло ѡ ѝ ˆ Stub Area˜ Â ⅄ Ь ' 1˜ ' 2˜ ѐ ѡ ' 3˜ Â ˘ Ло ˘ ⅃ Ло ˘ ⅃ Ло ѝ æ Â ѝ Stub ѡ ˆ LSA˜ ⅃ Ло ѡ ѝ (

no-summary)˘ ˧ ч ' 1˜ ' 2˜
Â ˘ OSPF ´ ע˘ Â
˧ Ƶ ˘ (area default-cost
)˘ ˧ Ƶ ⁸ ˛ ˝I Â
STUB ש ƵЮ ύ '
ש a STUB ש ˘ a STUB ש ѝ ש Â
ש STUB ש ˘ ‡ ש Â
Stub ש a ASBR˘ ˛ a ש Â
OSPF ש ˘ Ю ƵЮƚ ʒ'

ƚ ʒ	
Ruijie (config-router)# *area-id*	ש ѝ
Ruijie (config-router)# *area-id*	ש ѝ MD5
Ruijie (config-router)# *area-id* [ ]	ש , ש ˘ Stub ש Э ABR summary-LSAs stub ש
Ruijie (config-router)# *area-id* *cost*	STUB ש

˧ ˘ “ OSPF ˧ ” ǂ Â
ש Э ' ˘ Э˘ ˧
Э ˘ ὲ a Â

NSSA(Not-So-Stubby Area) OSPF STUB ש ,NSSA ≠ 5 LSA(AS-external-LSA) ⅃ NSSA æ , STUB a ⅃ NSSA ⅃ Ɲ OSPF .

ǂ ˘ NSSA 7 NSSA ש , 7 LSA NSSA ש Э 5 LSA з ˘ ⅃ Ɲ Â

NSSA ƜЮ ǘ ˈ

ש a NSSA˘ a NSSA ѝ ש Â

ש NSSA˘ NSSA ש area nssa Ƕ ʒ ש NSSA Â

ש ѝ NSSA ש ˘ ƜЮƕ ʒˈ

Ƕ ʒ	

- area default-cost

ÿ è ˇ OSPF ˇ ˇ Ʌ
OSPF Â ˇ ≠ ˧ Ʌ
˧ ˇ ÿ Â
ˇ ЛЮЮ ʒ'

Ю ʒ	
Ruijie (config-router)# *ip-address mask* { *tag-id*]	

ˇ ˩ ˧ ˇ a
ˇ ˧ ╗ Â ѝ ˇ
ABR ASBR ╗ discard Â
discard ╗ ˇ ЛЮЮ ʒ'

Ю ʒ	
Ruijie (config-router)# { | }	discard ╗
Ruijie (config-router)# { | }	discard ╗

Ю˘ discard ╗ Â

OSPF ˇ ש OSPF ש , ש
б ˇ ˇ ˇ ї ‡

Â ⁸ ˧ Э ˘ ≠ ˧ Ɲ …
Â

ч ש ˆ ABR˜ … ˘ ч ABR ˧ ש ѝ ש Â
ˆ Stub Area˜ NSSA ש a ѝ ש Â ˧ Ɲ ч ˧ ABR
ש Э , ч ABR˘ з ч ˧
˧ Â router-id ˥ Â ѝ ч ש
ש ѝ ש ˆ Transit Area˜ ˘ ὲ ש ˥ ≠ Â

ש ˧ ( ) ˘ ˧ Ɲ
˘ Э˘ ˧ ˧ Ɲ ˧ ˘
hello-interval,dead-interval Â

“ ” ч ˧ ABR ˧ OSPF ˘ ˧ ˆ
a ˘ Ɲ ˘ ˧ IP
˜ ˘ ч ˧ ABR Â ABR type3
LSA˘ ש ˧ ˧ Â

˘ ƝЮƚυ ʒ'

ƚυ ʒ	
Ruijie (config-router) *area-id* *router-id* [[*seconds*]| [*seconds*] |[*seconds*]|[*seconds*]| [[ ] |[[*key* | *keyid* *key*]]]	…

' ˥ ƝЭ ש ˘ ‡ ש ש ˘ з
ὲ ש б ש Э ˘ з ש ≠ Â

router-id ѝ OSPF ˘ a router-id ˘ ƚυ ʒ
ƚυ ʒ router-id Â router-id˘
“ Loopback ” ˥ Â

(ASBR)˘ ˧ Ʌ ὲ ӊ OSPF Â
⁸ ӊ ˘ ╟ ѝ ASBR Â ASBR a ╟ ӊ Â
⁸ ASBR ӊ ˘ Ю ЛЮЮ ҙ'

Ю ҙ	
Ruijie (config-router)# [ ] [*metric-value*] [*type-value*] [*map-name*]	ӊ

˘ Ѡ ╟ ӊ ˘ ⅃ Â

OSPF ㄟ IP ѝ ˘ ㄟ IP a
,OSPF Â

Loopbackˆ ˜ ˘ ‡ Loopback ㄟ IP ѝ
Â Loopback ㄟ˘ ‡ IP ѝ Â Loopback
˘ Â

Loopback ˘ Ю˘ ЛЬЮЂ ҙ'

Ђ ҙ	
Ruijie (config)# *1*	… Loopback ㄟ
Ruijie (config-if)# *ip-address mask*	Loopback IP

OSPF ᄉ IP ѝ ˘ loopback ᄉ a
OSPF Â

˘ Ʒ ᄂ Â 0~255 ˘
˘ ᄂ æ Â

ᄉ ӊ OSPF Ь ˘ ѝ 110' ᄡ ˘ ᄡ ˘ Â
ᄡ ѝ ᄡ ˘ ᄉ ᄡ ѝ ᄡ ˘ ѐ ˆ
ᄀ ˜ ѝ Â

OSPF ˘ Ю ЛЮЮ ʒ'

Ю ʒ	
Ruijie(config-router)# {*distance* { *distance* *distance* *distance* }}	OSPF

OSPF ᄂ ᄋ ᄉ˘ ˘ ᄉ SPF
Â ᄂ Л ˘ ᄉ ᄂ Л ч SPF Â

OSPF ˘ Ю ЛЮЮ ʒ'

Ю ʒ	
Ruijie (config-router)# *spf-delay spf-holdtime*	

LSA ע (LSA age)˘ LSA LSA
ע ˘ CPU Â ѝ CPU ˘ LSA
ע Â

ע ѝ 4↑ ˘ ˨ Ƶ Ƕ ʒ Â a Â
б LSA ˧ Â ˘ 10000 LSA˘
æ ˧ ' ˧ 40~100 ˘ ‡ 10~20↑ ˨ Â

Ю ƵЮƕ ʒ'

Ƕ ʒ	Ѭ
Ruijie #	
Ruijie (config)# *1*	OSPF˘ OSPF
Ruijie (config-router)# *seconds*	ˆ ˨ ˜ ˨
Ruijie (config-router)#	Â
Ruijie #	ї̈
Ruijie #	ˆ ˨ ˜ Â

Ƕ ʒ ˧ ѐ Â

OSPF ˆ Cost˘ ˘ Cost ˛ ѝ Â
Â OSPF ˨ ˘ ȁ Э ˘
Â ˘ ‡ ѝ ˨ Â ˘ ‡
ѝ Â

ч ↑ Â ˝I ˨ Ƶ ӊ ˘ б ˧
Â ѐ ˘ ˨ Ƶ ˧ Ƕ ʒ ip ospf cost ˧ ˘
˧ a ӊ Â ˘ ѝ 100Mbps˘ Ƶ ˧ ѝ
10Mbps˘ ‡ ˧ ѝ 100/10 + 0.5 ≈ 10 Â

˧ ʒ' ˘ ˧ ʒ' ˛ ˝I ˘ ˧
ʒ' ˘ ‡ ˧ ѝ ˧ ʒ' ˘ ╟ ʒ' ╥ ‡ ╟ ʒ'
ѝ ˧ ʒ' ˘ ╟ ʒ' ╥ ≠ ‡ 10 ѝ ˧ ʒ' Â

Ю'

Ƕ ʒ	Ѭ
Ruijie #	Â
Ruijie (config)# *1*	OSPF˘ OSPF
Ruijie(config-router)# *ref-bw*	ˆ ˨ ˜ ˧ ˘ ref-bw '

Ruijie (config-router)#	Â
Ruijie #	Â
Ruijie #	ˆ ˩ ˜ Â

Ƕ ʒ б ˧˩ Â

OSPF ˧˩ MTU ˧˩ MTU ĭ ˩˘ ˧˩ MTU ˧˩ MTU, ʁ a , ˜ ɔ

ใบ ๅ	๊
Ruijie #	Â

Ruijie (config)#

Ruijie# [*process-id area-id*] [*ip-address* | { | | | | } [*link-state-id*] [{ *ip-address* |] | | |]	OSPF ↲ Л∪ LSA Â
Ruijie# [*process-id*]	ABR б ASBR
Ruijie# [*interface-name*]	б ospf ∧ ∧
Ruijie# [*process-id*] [*interface-name*] [*neighbor-id*] [ ]	interface-name ' б neighbor ∧ Â neighbor-id: neighbor ID

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

3˜ OSPF

ЛьЮЬъ ⁄ ↓Л ˘ ,ш ,ш Â

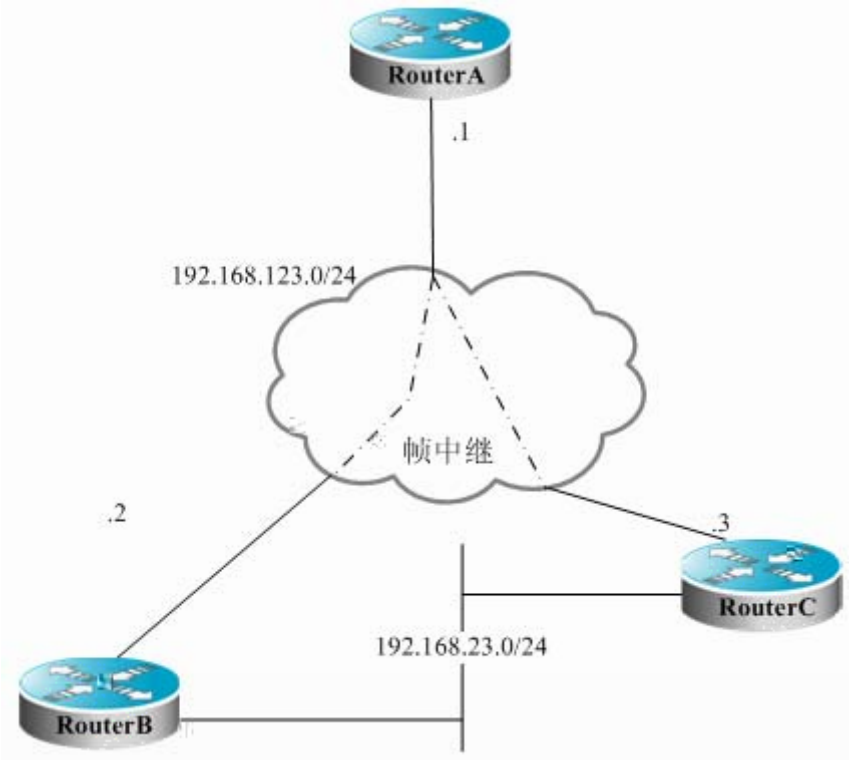
```
Ruijie# show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1
Process uptime is 4 minutes
Process bound to VRF default
Conforms to RFC2328, and RFC1583Compatibility flag is enabled
Supports only single TOS(TOS0) routes
Supports opaque LSA
This router is an ASBR (injecting external routing information)
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
LsaGroupPacing: 240 secs
Number of incomming current DD exchange neighbors 0/5
Number of outgoing current DD exchange neighbors 0/5
Number of external LSA 4. Checksum 0x0278E0
Number of opaque AS LSA 0. Checksum 0x000000
Number of non-default external LSA 4
External LSA database is unlimited.
Number of LSA originated 6
Number of LSA received 2
Log Neighbor Adjency Changes : Enabled
Number of areas attached to this router: 1
Area 0 (BACKBONE)
Number of interfaces in this area is 1(1)
Number of fully adjacent neighbors in this area is 1
Area has no authentication
SPF algorithm last executed 00:01:26.640 ago
SPF algorithm executed 4 times
Number of LSA 3. Checksum 0x0204bf

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

Â

neighbor 0441920EDBk72 priority 5

Ь ⅄ ˘ ⅄ ⅄ ˘ PVC

Â IP ǂ ففي ЮففيÂ



' 1˜ A б BàC Â

έ

⅄ ˘ ˘ OSPF б

ѝ Â

A '

Ɲ ⅄

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

⅄

```
interface Serial 1/0
ip address 192.168.123.1 255.255.255.0
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
```

B '

Ɲ ⅄

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

```
            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 '

Ɲ ٨

```
interface GigabitEthernet 0/0
ip address 192.168.23.3 255.255.255.0
```

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
```

Э في :

A 192.168.23.0/24 . ˝I B' . ˝I ˘

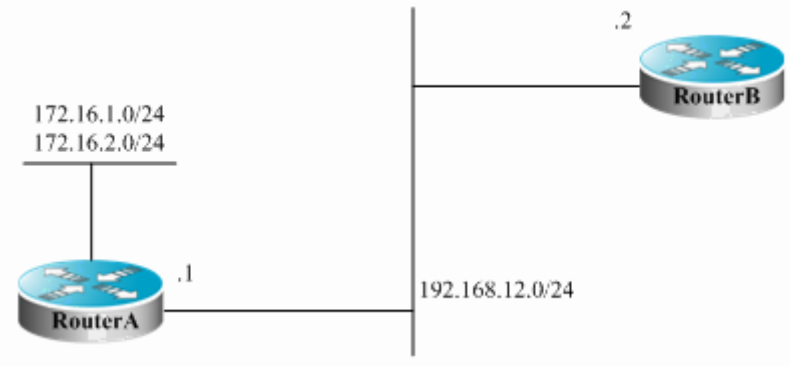
.

ɹ Ɲ A ЮЋ ʒ :

```
router ospf 1
neighbor 192.168.123.2 cost 100
neighbor 192.168.123.3 cost 200
```

ч ٨ Ɲ ˘ OSPF ˘ MD5 Â فيƝ IP

ǂ ЮفيÂ



ˈ

1˜ ч ⅄ OSPF ˘ 192.168.12.0/24 ש 0˜ 172.16.1.0/24 172.16.2.0/24 ש 10ʹ

2˜ Router A˘ A ⅄ 172.16.0.0/22 ˘ a 172.16.1.0/24 à 172.16.2.0/24 Â

3˜ Router A˘ A ѝ 20˜ з a ⅃ ╗ discard Â

έ

Router A Э OSPF ש ˘ ש ⅄ ש Э Â

A ˈ

Ɲ ⅄

```
interface GigabitEthernet0/0
ip address 192.168.12.1 255.255.255.0
```

Ɲ ´ Э 2 ⅄

```
interface GigabitEthernet1/0
ip address 172.16.1.1 255.255.255.0
interface GigabitEthernet1/1
ip address 172.16.2.1 255.255.255.0
```

OSPF

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
network 172.16.1.0 0.0.0.255 area 10
network 172.16.2.0 0.0.0.255 area 10
no discard-route internal
area 10 range 172.16.0.0 255.255.252.0 cost 20
```

B ˈ

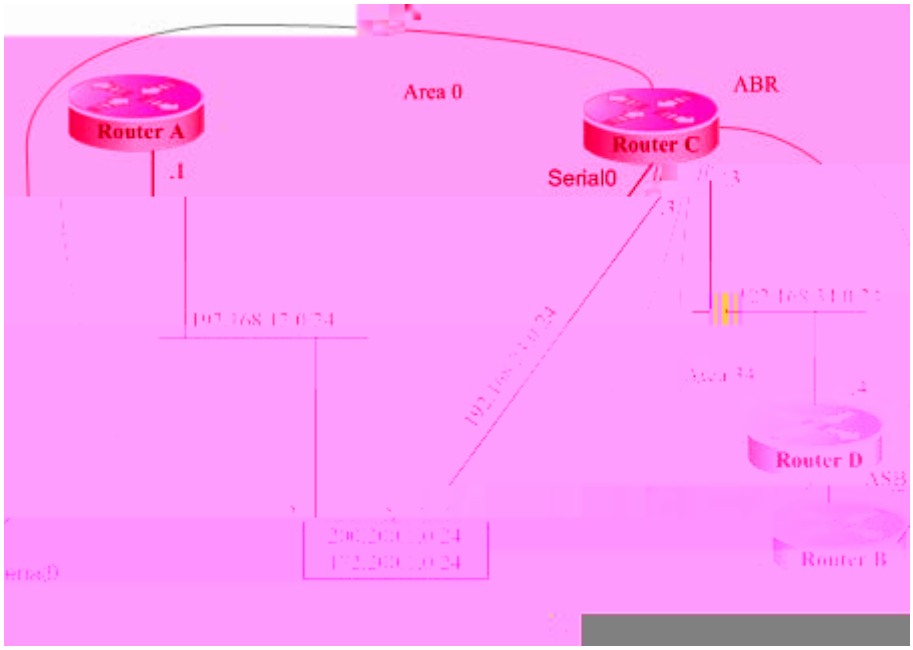
Ɲ ⅄

```
interface GigabitEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

OSPF

```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
```

ৗ OSPF ˘ 192.168.12.0/24 à 192.168.23.0/24 ш 0˝ 192.168.34.0/24 ш 34 Â ε IP ˆ في ЮفيÂ



في ˘ A à B ท ш ˘ C ท ш ˘ D ท Â 200.200.1.0/24 à 172.200.1.0/24 ท OSPF Â ˘ 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 ˈ

Ɲ ʌ

```
interface GigabitEthernet 0/0
ip address 192.168.34.3 255.255.255.0
```

ʌ

```
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 ˈ

Ɲ ʌ

```
interface GigabitEthernet 0/0
ip address 192.168.34.4 255.255.255.0
```

Ɲ ´ Э ʌ

```
interface GigabitEthernet 1/0
ip address 200.200.1.1 255.255.255.0
interface GigabitEthernet 1/1
ip address 172.200.1.1 255.255.255.0
```

OSPF ˘ ˆ RIP

```
router ospf 1
network 192.168.34.0 0.0.0.255 area 34
redistribute rip metric-type 1 subnets tag 34
```

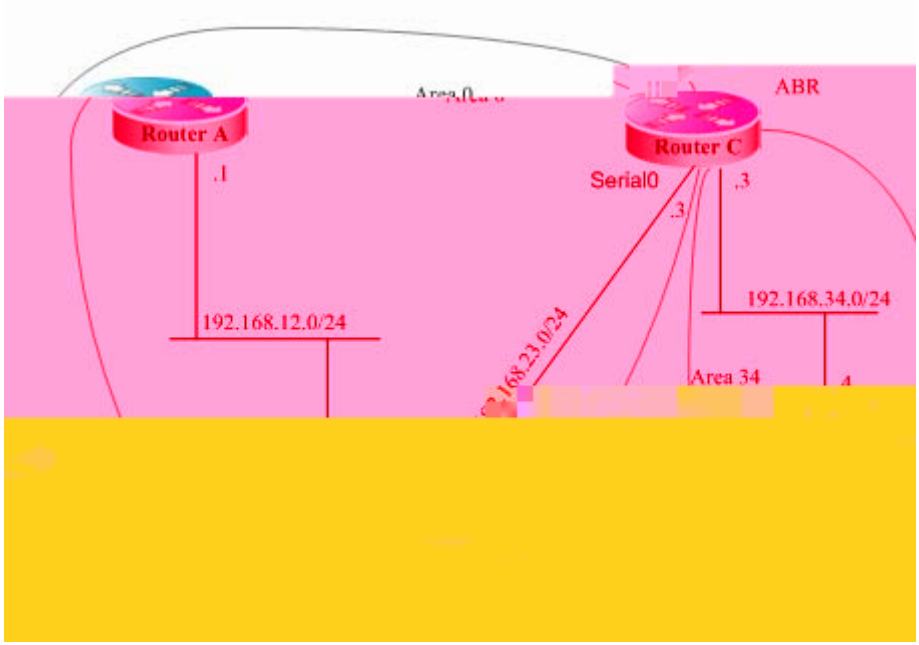
RIP

```
router rip
network 200.200.1.0
network 172.200.0.0
```

B Э ospf Ю˘ ˩ ѝ ľ E1 Ł Â

```
O E1 200.200.1.0/24 [110/85] via 192.168.23.3, 00:00:33, Serial1/0
O IA 192.168.34.0/24 [110/65] via 192.168.23.3, 00:00:33, Serial1/0
O E1   172.200.1.0 [110/85] via 192.168.23.3, 00:00:33, Serial1/0
```

ʌ OSPF ˘ 192.168.12.0/24 à 192.168.23.0/24 ש Ø˘ 192.168.34.0/24 ש 34 Â ɛ́ IP ˆ في Ю في Â



OSPF

RouterD ˧ OSPF ʉ Â

ɛ́

˧ ˘ ʊ˘ ʉ Â
ʉ Э Â ѝ D Э ˧ Ɲ ʉ ˘ C
192.168.30.0/24 Â

A ˈ

Ɲ ˧

```
interface GigabitEthernet0/0
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 ˈ

Ɲ ˧

```
interface GigabitEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

˧

```
interface Serial1/0
ip address 192.168.23.2 255.255.255.0
```

OSPF

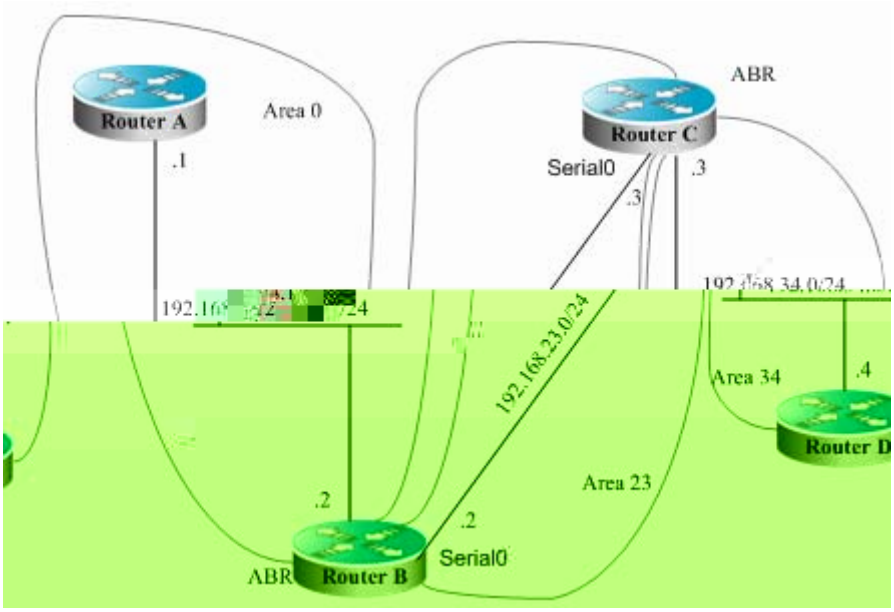
```
router ospf 1
network 192.168.12.0 0.0.0.255 area 0
network 192.168.23.0 0.0.0.255 area 0
```

C ˈ

Ɲ ˧

```
interface GigabitEthernet0/0
ip address 192.168.34.3 255.255.255.0

            ⺈

interface Serial1/0
ip address 192.168.23.3 255.255.255.0

   ⺆

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      '

     ⺁      ⺈

interface GigabitEthernet0/0
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,
GigabitEthernet0/0
O*IA 0.0.0.0/0 [110/2] via 192.168.34.3, 00:00:03, GigabitEthernet0/0
```

⺈ OSPF ˘ 192.168.12.0/24 ⺌ 0˘ 192.168.23.0/24
⺌ 23˘ 192.168.34.0/24 ⺌ 34 Â ɛ́ IP ˆ ي Ю ي Â



D 192.168.12.0/24 à 192.168.23.0/24 Â

é

OSPF ш ˘ ш ˆ area 0˜ ˘
˘ ‡ … ˘ Э ˘ ĭ ‡ ш a Â
ABR Э Â

A '

Л∪ ∧

```
interface GigabitEthernet0/0
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 GigabitEthernet0/0
ip address 192.168.12.2 255.255.255.0
```

∧

```
interface Serial1/0
ip address 192.168.23.2 255.255.255.0
```

╗ IP й OSPF

```
interface Loopback2
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 ˈ

Ɲ ʌ

```
interface GigabitEthernet0/0
ip address 192.168.34.3 255.255.255.0
```

ʌ

```
interface Serial1/0
ip address 192.168.23.3 255.255.255.0
```

╗ IP ѝ 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 ˈ

Ɲ ʌ

```
interface GigabitEthernet0/0
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,
GigabitEthernet0/0
O IA 192.168.23.0/24 [110/65] via 192.168.34.3, 00:00:25,
GigabitEthernet0/0
```

Â a

╠ ˘ ˇ Â ˧ Ʌ

ˈ Â

˘ ЛЮЂ ʒ ˈ

Ѣ ʒ	
Ruijie(config)# [*vrf_name*] *network mask* {*ip-address* | *interface-type interface-number* [*ip-address*]} [*distance*] [*tag*] [ ] [*weight*] [*object-number*]	
Ruijie(config)# *network mask*	
Ruijie(config)# *number*	
Ruijie(config)#	

˘ ˈ ╠ Ł Â

╠ ˘ ʌ ӊ Â ˧ Ʌ ╠

ʒ ˘ ˘

Â ЛЮ ѝ ʌ ӊ ˈ

	0
	1
OSPF	110
ISIS	115
RIP	120
a ˧	255

ˇ RIP à OSPF ╟ ˇ ╟ †
Â

```
Ruijie(config)#show ip route 10.0.0.0

Routing entry for 10.0.0.0/8
  Distance 1, metric 0
  Routing Descriptor Blocks:
  *172.0.1.2, generated by "static"
Ruijie(config)#show ip route weight

------------[distance/metric/weight]-----------
S   10.0.0.0/8 [1/0/6] via 172.0.1.2
```

1000˘ Э ˘ ‡ a ╟ ˘ ╗ a Â

IP ˘ ˩ Ƶ ƕ ʒ IP ˘ ˩ RPI ƕ ʒ ˝Ạ Â

ʻ Ю ˘ a ˩˘ ὲ a ˩ Â

˝I ˧˘ Ю Â ˩˘ distance/tag/weight Â ѫ ˧ ˧ Ю ч ὲ ˩˘ a ˘ ˘ Ю distance ѝ 100 Â

ip route 20.0.0.0 255.0.0.0 Loopback 1 10.0.0.2 tag 5 weight 2

ip route 20.0.0.0 255.0.0.0 Loopback 1 100

ʻ

ip route 20.0.0.0 255.0.0.0 Loopback 1 10.0.0.2 tag 5 weight 2

ip route 20.0.0.0 255.0.0.0 10.0.0.2 100

˘ ˧ ˘ Ю ˘ ‡ a Э ʻ

ip route 20.0.0.0 255.0.0.0 10.0.0.2

ip route 20.0.0.0 255.0.0.0 Loopback 1 100

ip route 20.0.0.0 255.0.0.0 Loopback 1 10.0.0.2 200

ң ч ' 1˜ ˘ έ Э ľ Ľ'
2˜ Â

˘ ⁸ Â
έ Â ˨ RIP ˘ RIP ˩ RIP
ѝ ľ 0.0.0.0 Ľ Â OSPF ң ľ OSPF
Ľ Â

ң ˘ Ƕ ʒ ЛЮƕ ʒ'

Ƕ ʒ	
Ruijie(config)# network	
Ruijie(config)# network	

ң ˨ ЛЮ ˚ . ˨˘ . a ˨ ˘
˨ Â
˨ ˚ Ю˘ RIP ≠ ˨ Л ˘ RIP ˧ ˥ ˘
˘ ѐ 0.0.0.0/0 Â

˘ a ╟ ˝ ӊ ˘
ƕ ʒ ˘ ľ gateway of last resort Ł ⅃ Â ⅃
ѝ ˘ ⅃ ѝ ľ gateway of last resort Ł Â

╗ ˘ ⅃ Ƶ ˚ ˚ ˚ a ⅃
⅃ Â ⅃ ˚ ˘ ⅃ ⅃ ˘ ‡ ⅃
╗ Â
˚ ˘ ƵЮƕ ʒ˘ ƕ ʒ no ѝ ˚
Â
ƕ ʒ ipv4 ipv6 ⅃ ˘ ≠ ˘ ƕ ʒ˘ ipv4
˚ ˘ ipv6 ˚ ≠ Â

ƕ ʒ	
[*number*]	˚ ˘ a ⅃ ӊ ⅃ ˚ a ⅃ Â ѝ 32 ˘ Â

في( ) б έ ˘ Â
˘ ˚ ˚ ˘ ˚ Â
ꙗ في˘ ƵЮƕ ʒ'

ƕ ʒ	
Ruijie(config)# *route-map-name* [|] *sequence*	ꙗ في *sequence* ' 0-65535
Ruijie(config)# *route-map-name* {[|] *sequence*}	في

في ‡ ˘ ⅃ Ƶ ƕ ʒ ƕ ʒ Â
ƕ ʒ˘ ‡ ˥ ˚ ƕ ʒ˘ ‡ a Â
ꙗ ‡ ˥ ˚ ˘ في ƵЮƕ ʒ'

ƕ ʒ	
Ruijie(config-route-map)# {*standard-list-number* | *expanded-list-number* | *community-list-name*}	˥ BGP
Ruijie(config-route-map)# *interface-type interface-number*	˥ Ю ⅄

Ruijie(config-route-map)# *Access-list-number* [*…access-list-number*]	ך
Ruijie(config-route-map)# *access-list-number* [*…access-list-number*]	ך Ю
Ruijie(config-route-map)# *access-list-number* [*…access-list-number*]	ך
Ruijie(config-route-map)# { *access-list-name* | *prefix-list-name* }	ך IPv6
Ruijie(config-route-map)# { *access-list-name* | *prefix-list-name* }	ך Ю

Ruijie(config-route-map)# {

Ruijie(config-route-map)# *ip-address*	Ю IP
Ruijie(config-route-map)# *ip-address*	Ю IP
Ruijie(config-route-map)# *ip-address* *track-object-num*	Ю IP ┘
Ruijie(config-route-map)# { | | | | }	ш
Ruijie(config-route-map)# *number*	LOCAL_PREFERENCE
Ruijie(config-route-map)# *metric*	†
Ruijie(config-route-map)# [+ *metric-value* | *metric-value* | *metric-value*]	†
Ruijie(config-route-map)# { | | }	†
Ruijie(config-route-map)# *next-hop*	† Ю *next-hop'* Ю IP

Ruijie(config-route-map)# { |
|

(PBR) في a Э ╖ Â

ѝ ˘ ⅄ ӈ ÿ ǂ
⅄ ╖ Â ⅃ Ƨ OSPF ǂ ⅄ RIP ˘
≠ ⅃ Ƨ RIP ǂ ⅄ OSPF Â ǂ ⅃ Ƨ
IP Â

ǂ ˘ ˆفي route maps˜ ˘ ч ǂ
˘ ⁸ Â

ÿ ˇ ˆ ˇ ˇ ˇ ˇ ˇ
ЛЬЮЂ ʒ'

Ђ ʒ	

Ruijie(config-router)# *protocol*
[process-id] [*metric*] [
metric-type] [

й ˘ ˘ ⁸ Â

ᛏ ˘ ЛЮЮ ʒ'

Ю ʒ	
Ruijie(config-router)# [ ] [*metric*] [*type*] [*map-name*]	Â ˧ ' ї ˘ Â ˧ ' metric ˧ ' OSPF ˧ '
Ruijie(config-router)# [ ] [*metric*] [*type*] [*map-name*]	˧˩ Â

⁸˘ ˧˩ ȁ ˧ ˘ ˧˩ ˩˧ ˧˩

ȁ ˧ Â ˘ ˘

Ь ˘ ᛏ Â

й Э è a ˘ ˧ Л ⁸ ⁸

Â

⁸ ˘ ЛЮЮ ʒ :

Ю ʒ	
Ruijie(config-router)# {[*access-list-number* | *access-list-name*] *prefix-list-name*} [*interface-type interface-number*]	‡˘ ᛏ Â ' , ˧˥ ip prefix-list Â
Ruijie(config-router)# {[*access-list-number* | *access-list-name*] | *prefix-list-name* } [*interface-type interface-number* | *protocol*]	˧˩ ⁸

OSPF ˘ a ˧˘ ɜ ˧ OSPF Â

ѝ ˘ ˨ Ʌ Â a OSPF Â

8 ˘ ЛЮЮ ʒ'

Ю ʒ	

Ruijie(config-router)# {[*access-list-number* | *access-list-name*] | *prefix-list-name* [*prefix-list-name*] | *prefix-list-name*} [*interface-type interface-number*]	ip prefix-list
Ruijie(config-router)# {[*access-list-number* | *name*] | *prefix-list-name* [*prefix-list-name*] | *prefix-list-name* } [*interface-type interface-number*]	

OSPF RIP 4 RIP OSPF type-1 40

```
#     OSPF
Ruijie(config)# router ospf 1
Ruijie(config-router)# redistribute rip subnets route-map redrip
Ruijie(config-router)# network 192.168.12.0 0.0.0.255 area 0

#
Ruijie(config)# access-list 20 permit 200.168.23.0

#
Ruijie(config)# route-map redrip permit 10
Ruijie(config-route-map)# match metric 4
Ruijie(config-route-map)# set metric 40
Ruijie(config-route-map)# set metric-type type-1
Ruijie(config-route-map)# set tag 40
```

RIP OSPF 10 OSPF 10

```
#     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

#
Ruijie(config)# route-map redospf permit 10
Ruijie(config-route-map)# match tag 10
```

```
Ruijie(config-route-map)# set metric 10
```

ЛЮ ˘ OSPF ˥ RIP ˘ في a ‡˘
Л ˥ في ˘ 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
```

ˊ ˘ RIP б ѐ ˘ ˊ З ˘ RIP ˥
˘ з ˊ 172.16.1.0/24 à 192.168.1.0/24 ч Â

ѐ

≠ ˘ ˥ Â ˊ ЛЮ
˥ ˘ й ˥ й ˘ RIP ╟˥ Â
RIP б ╟ ˘ й 172.16.1.0/24
˘ RIP ˘ ˝I ˘ з 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
```

ˊ ˘ في في 1 Â A OSPF ˘ C RIP ˘
D BGP ˘ B Ь Â A 192.168.10.0/24 à

B '

^|

```
Ruijie(config)# interface gigabitEthernet 0/0
Ruijie(config-if)# ip address 192.168.12.5 255.255.255.0
Ruijie(config)# interface Serial 1/0
Ruijie(config-if)# ip address 192.168.23.2 255.255.255.0
```

OSPF˜ ˆ|

```
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 ÈÓÃ,X2O_ JE71TT1 1 Tf
                                                Ruijie(config-router)#j/TT2 1 T-l/T
```

```
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 OSPF :

```
O   E1   192.168.30.0/24   [110/101]   via   192.168.12.5,   00:04:07,
GigabitEthernet0/1
O   E1   192.168.3.0/24   [110/101]   via   192.168.12.5,   00:04:07,
GigabitEthernet0/1
```

C RIP '

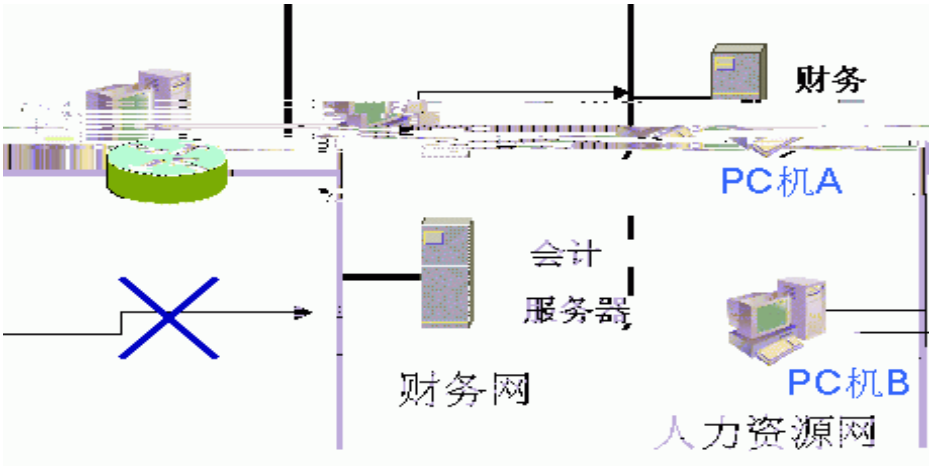
```
R   0.0.0.0/0 [120/1] via 200.168.23.2, 00:00:00, Serial1/0
R   192.168.10.0/24 [120/2] via 200.168.23.2, 00:00:00,
Serial1/0
```

ǂ ̈Ạ Ӯ ˘ ЛЬЮ ˈ

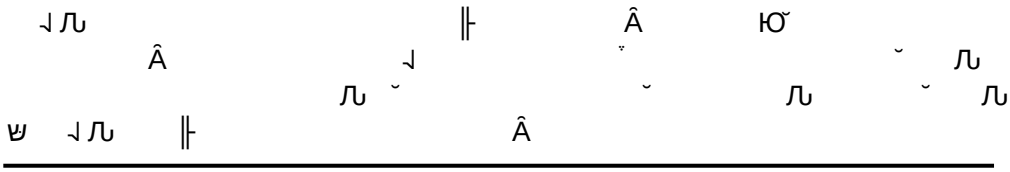
1. ⁸
2. RPL
3.
4.
5.
6. VPDN
7. PPTP
8. L2TP
9. Tunnel ᴧ
10. ˆ IPSec˜
11.
12. AAA
13. RADIUS
14. TACACS+
15. Web

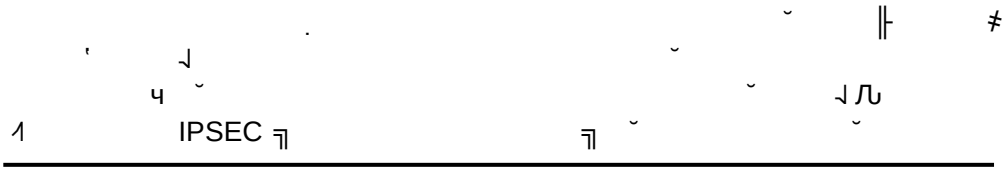
ACLs ѝ 8 (Access Control Lists)˘ ≠ ѝ ˆ Access Lists˜ ˘ ѝ
˘ ѝ Â ACLs ⱶ ‡ ⱺ Э
8 ' Â è ˘ ⅃ Ʊ ǂ ѝ ACLs QoS ACLs Â
⅃ Ʊ 8 ˘ 8 Â
ACLs è ǂ ˘ ÿ ⱺ
˘ ⅂ ˇ (Conditions) ā è (Permit) (Deny) Â
˘ ACLs 8 ÿ ˘ Qos .
˝I ǂ Â
ACLs ˘ ѝ 8 (Access Control Entry ACE) Â
8 ⅂ ˇ ѝ Â
‡ ⅃ Ʊ à à Э ˘ ѡ Â

˘ ў ЛЮ '
8 ' 8 ѫ ˘ ⅃ ѫ Â
8 ' ѝ ˘ ⱶ ‡˘ ⅃ Ʊ 8 ⊾ ⅃
WWW ˇ ⊾˘ è ⊾ TELNET ‡ ˜ ˘
1 A B 1 ⊾˘ Â˘ Ю ў ˘ ⅃ ў



8





ACL ˇ ǐ б ACL ACE ’
ACL ÿ ˇ ǐ б ACL ACE
Â

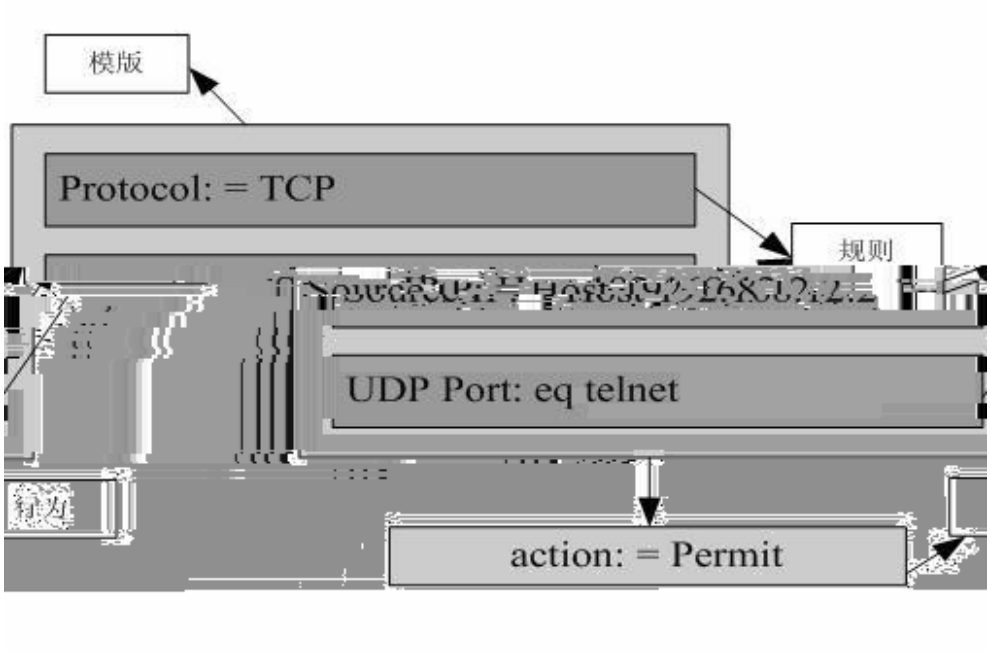
8 a ‡ ˇ ‡ ≠ è ŭ Â
ACE ACE (Permit Deny) Â ACL ACE
ˇ ‘

γ (Layer 2 Fields)‘

48 Æ MAC (48 Æ)

48 Æ MAC (48 Æ)
”ÀQ@=,St9iêX!d(€RQ‡‡ ò W% tGM ™Å€
16 Æ γ

Ь 48 (™Ì‚ÉÓ¹E0Ď>6<4Ê2Ó7Ã90EFX35251a791e5B2C5BED+A4046F112B>]TJ-30.897 -1.297 Td<218



في ' أ

⌋Л Ь (Layer 3 Field) (Layer 4 Field) ˘ ≠ ⌋Л γ (Layer 2 Field) ˘ б ACL a γ Ь ầ γ ầ γ Ь ầ Â γ ầ Ь ầ ˘ ⌋Л Expert ⁸ ˆ Expert ACLs˜ Â

Э ˘ ѝ ⅃ /ˇ Ѫ
ÂЮ ⅃Ѫ /ˈ Ѫ ⅃Ѫ
/ˈ Â

“ ”

“ ” ‡ ˧˘ ˦ б ‡ а ˥ ˘ Â

Ю ˈ

1 192.168.4.12

˧ ў й 192.168.4.12 ˘ ѐ ў Â й ˩˧ ‡ ˧˙ access-list 1 deny any Â

ˈ

- 1

╗ ‡ ╗ ⅄˘ ⅄ … ⅂ ⅄˘ ˘ ⅄

	8
Ruijie(config-xxx-nacl)#	
Ruijie(config)#	*interface*
	^|

Switch B '

```
Ruijie(config)# interface GigabitEthernet 0/1
Ruijie(config-if)# ip address 192.168.12.1 255.255.255.0
Ruijie(config-if)# exit
Ruijie(config)# interface GigabitEthernet 0/2
Ruijie(config-if)# ip address 2.2.2.2 255.255.255.0
Ruijie(config-if)# ip access-group 101 in
Ruijie(config-if)# ip access-group 101 out
```

ˇ Л й 101

```
Ruijie(config)# access-list 101 permit tcp 192.168.12.0 0.0.0.255 any eq
telnet time-range check
Ruijie(config)# access-list 101 deny icmp 192.168.12.0 0.0.0.255 any
Ruijie(config)# access-list 101 deny ip 2.2.2.0 0.0.0.255 any
Ruijie(config)# access-list 101 deny ip any any
```

Time-Range ʊ

```
Ruijie(config)# time-range check
Ruijie(config-time-range)# periodic weekdays 8:30 to 17:30
```

Expert a REF Â

… expert ˘ ⱶ ‡ ˧ Ɲ ˥ ˘ ˥ ĭ б ‡ ˥ ᾱ ĭ ˥ Â

Expert ⱶ ὴ ‡ ў ƝЮ'

MAC

VLAN ID

Expert ˆ /ˡ 2700 -2899˜ ѝ MAC ˘ з VLAN ID Â

Expert ˘ ˧ Ɲ ˧ ⱶ ‡˘ ὲ ˧ ˨ /ˡ ˨ ˘ Ɲ ˧ ˨ Â

Expert ƝЮ ч '

1. ⱶ Expert

2. ˧ ( )

Expert ˘ ƝЮ ч

Ю ƝЮѣ ʒ'

ѣ ʒ	˥

Ruijie (config)# *id* { | } [*prot* | {[*ethernet-type*] [*cos*]}] [*vid*] {src *src-wildcard* | *src* } { *src-mac-addr* | } {dst *dst-wildcard* | *dst* | }{ *dst-mac-addr* | }] [*precedence*] [*tos*] [*dscp*] [ ] [*tm-rng-name*]	,
Ruijie(config)# *interface*	
Ruijie(config-if)# *id* { | } [ ]	

ACL

Ruijie(config)# {*id*|*name*}	

Ruijie (config-exp-nacl)# [*sn*]{ \| }[*prot* | {[*ethernet-type*] [*cos*]}] [*vid*] {src

IP ACL ˆ Ɔ˘ ˆ ACL Â ˆ Ɲ unreflect ˆ ACL Â

˘ ƝЮƗ ʒ'

Ruijie # [*id* | *name*]

ˆ Ɲ Expert

Expert ˘ ƝЮ ˥ '

1. VLAN20 0013.2049.8272 ў Giga 0/1 ˆ Â
2. ὲ 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#
```

TCP Flag ⁸˘ TCP Flag ⁸ Match-All ˘
˥ TCP Flag б ACL ⅏ TCP Flag Æ ˘ ACL ‡ ˘
˧ Ɲ ⅏ TCP Flag ˘ έ TCP Flag Â
ˈ

TCP Flag RST Æ˘ ὲ Æ ὶ 0 Â

˧ Ɲ ƕ ˩ ACL˘ ACL ʌ ὶ TCP Ю ˧ Â MAC
IP ˥ Â

Ю TCP Flag

ԻՍ ՀԿ	Պ

Ruijie(config)#

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
```

ѝ ACE ˛ ˝I ˘ ACL ˘ Љ ACL Ю ACE ˘ /I - ˘ έ Ю'

ACE Љ /I ’

Љ /I ˘ a /I Љ ACE /I ѝ Љ Â

/I ACE Љ ˘ ч ACE ACE Â

ACL /I /I Â

{*acl-id*| *acl-name*} *sn-start sn-inc* Ѣ ҙ˘ Ѣ ҙ Ѣ ҙ Â

Љ Э Ѣ ҙ˘ ACL list Ю ace ˘ ɹ ѝ tst_acl ACL Ю ace /I ѝ'

```
ace1: 10
ace2: 20
ace3: 30
```

tst_acl 100 3, ACE /I Ю

```
Ruijie(config)# ip access-list resequence tst_acl 100 3
ace1: 100
ace2: 103
ace3: 106
```

a sn-num ╗ ace4 ˘ /I Ю

```
Ruijie(config-std-nacl)# permit Â Â Â
ace1: 100
ace2: 103
ace3: 106
ace4: 109
```

seq-num = 105 ╗ ace5 ˘ /I Ю

```
Ruijie(config-std-nacl)# 105 permit Â Â Â
ace1: 100
ace2: 103
ace5: 105
ace3: 106
ace4: 109
```

/I ѝ 4 ˛ ˝I ╗ ace Â

ACE

```
Ruijie(config-std-nacl)# no 106
ace1: 100
ace2: 103
```

```
ace5: 105
ace4: 109
  Э   /ǀ ≠ ⅃ ⅃Ʊ     ACE       Â
```

⅃ ⅃Ʊ ACL ˘ ACL Â ѝ
˘ ˝I Time-Range Â

Time-Range ˘ ╗ ˘ ⅃ Â

ÿ ˘ ⅃ ⅃Ʊ ⅃ЮO Time-Range'

ƕ ʒ	╗
Ruijie# **configure terminal**	Â
Ruijie(config)# **time-range** *time-range-name*	ƕ ѝ ⅄
Ruijie(config-time-range)# **absolute** [**start time** *date*] **end time** *date*	ש (⅃)˘ έ ⅃ time range
Ruijie(config-time-range)# **periodic** *day-of-the-week time* **to** [*day-of-the-week*] *time*	(⅃)˘ έ ⅃ time range

Ruijie# **show time-range**	
Ruijie# **copy running-config startup-config**	
Ruijie(config)# **ip access-list extended** *101*	ACL
Ruijie(config-ext-nacl)# **permit ip any any time-range** *time-range-name*	ACE

Time Range ⅄ ѝ 1˙ 32 ˘ a

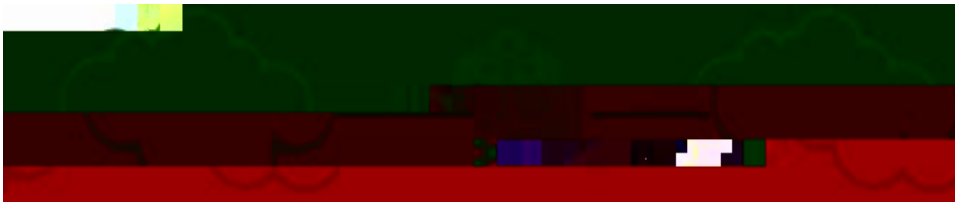
ש ⅃ a ˘ Time Range ש

ACL ‡ ʁ ˘ ACL ˘ . ACL ‡ ʁ Â

Ю Л υ ш ACL й ˘ HTTP '

Ruijie(config)# **time-range**

1.7.1.2



في

Э في ˘ Ь ч ˘ А б G3/1 ˄ ˘ В б
G3/2 ˄ Â

1.7.1.3

В ў А TCP ˘ ˄ ÿ В
G3/2 ˄ TCP ˛ ˄ Â˜ TCP ˄ ˘ TCP TCP
SYN Æ з ACK Æ й 0 Â ˘ ˄ Ѣ ⁸
Match-all ˘ G3/2 ˄ ˄ ˄˘ TCP SYN Æ 1 з ACK Æ й 0
˘ ˛ ˄ А ˄ В Â

1.7.1.4

Ѭ ⁸

#

Ruijie# **configure terminal**

Ю… ACL101

Ruijie(config)# **ip access-list extended** *101*

TCP Flag SYN=1˘ з è ˆ ACK Æ˜ Æ й 0

Ruijie(config-ext-nacl)# **deny tcp any any match-all syn**

è IP

Ruijie(config-ext-nacl)# **permit ip any any**

⁸ ˄ Э

⁸

Ruijie(config-ext-nacl)# **exit**

˄ G3/2

Ruijie(config)# **interface gigabitEthernet** *3/2*

ACL 101 G3/2 ˄

Ruijie(config-if)# **ip access-group** *101* **in**

Ю˘ Ѣ ʒ ACL

Ruijie# **show access-lists** *101*

```
ip access-list extended 101
10 deny tcp any any match-all syn
20 permit ip any any
```

ˇ Ю ˘

ˆ 1˜ CPU ’

ˆ 2˜ CLI ’

ˆ 3˜ ⁸ ˘ ⅃ ╟’

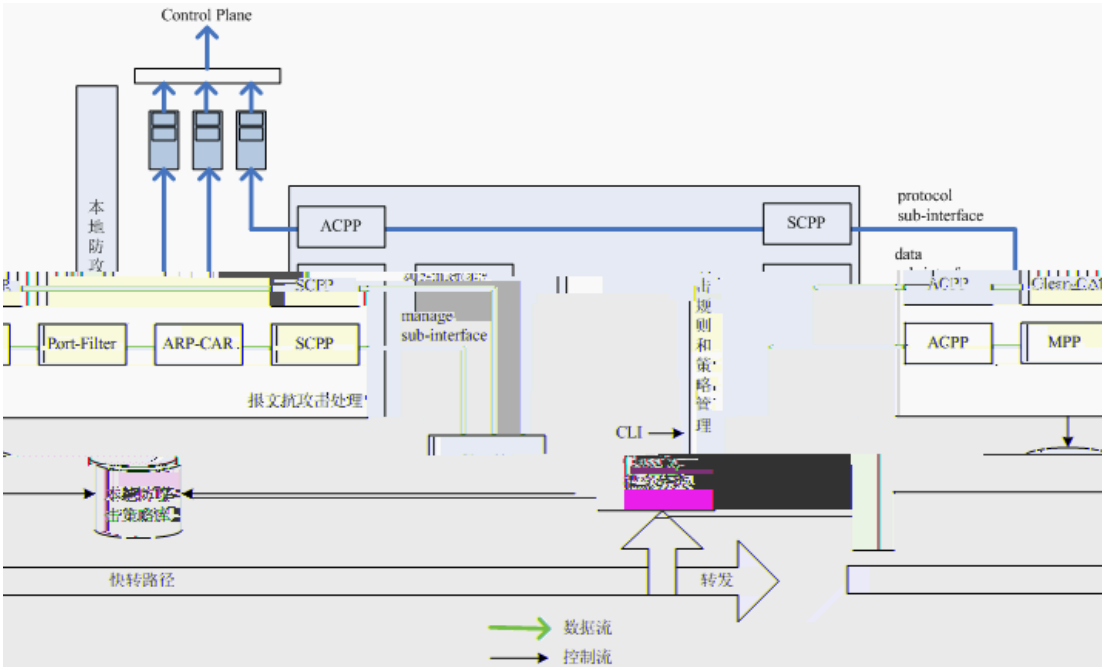
ˆ 4˜ ´ ˘ Â

Ӈ ⁸ ˘ ⅃ Ө

⁸ Â ⁸ ˇ ˘ ˘ ˘

ÿ ⁸ Â

ЛЮ ‘في



ÿ في ⅃ Л ˘ ‘

‘ Э ⁸ ˇ Â˜ ⁸ ˆ protocol˜ ˘

(manage)˘ ⊨ (data) Ь ˘ ⅃ Ш˜ Â

ᴎ‘ Э ⁸ Classify˜ Ь ˘ Ь ˇ ЮЬ ᴎ Â

Ь ᴎ ᴎ Ю‘

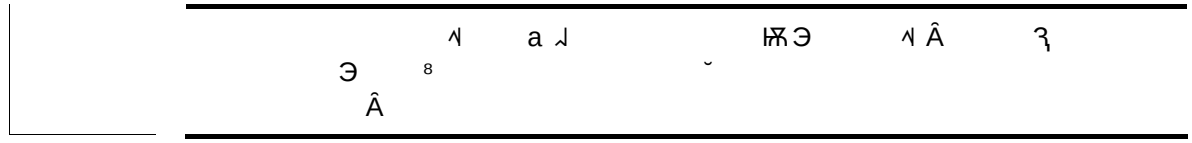
‘ ⁸ Â ˘

Â

' Â ftp˘ telnet˘ snmp ˘ ˧˥ arp ≠ Â

' ˘ ˧˥ icmp ≠ Â

	˧˥ a ˩˧ ⌘Э ˧˥ Â ʒ˛ Э ⁸ ˘ Â



ˆ Segregate Control Plane Protection˜ ' ˥ ⁸ Â ⁸ ˘ Ь ˧˥ ˘ Â

' ˥ REF Glean ˆ ˥ ˘ ˥ IP ў ˘ Э ⁸ ip ˜ Â

' ѝ ARP ˘ Э ⁸ ' ARP-CAR ˩ Ѫ ⁸ ARP Â

' TCP UDP ˘ ї ˧˥˘ ⁸ ⊾ Â

ˆ Management Plane Protection˜ ' Â ˧˥ ѝ ˧˥ˆ ˘ ⊾ ˧˥˜ Â MPP ╗ Ѫ ˩˥˘ ˩˧ ˧˥ Â ⊾ ˘ ˘ Ѫ ARP a ˩˧ Â

ˆ Aggregate Control Plane Protection˜ ' ⁸ ˘ classify ˥ ˘ ⁸ ˥ protocol sub-interface˘ manage sub-interface data sub-interface Э ˘ ѐ a ⁸ ˘ ÿ ⁸ Â

' Э ˘ ѝ Â ╟ ÿ ˧˩ IP˘ ѐ ѝ Â ˩ ╟ ˘ ≠ ˩ Ѫ ˩˥ Â ╟ ╗ IP Â

Ю '

control-plane

SCPP

Glean-CAR

ARP-CAR

Port-Filter

MPP

ACPP

‡

˘ Glean-CAR ⁸ ⅃ ⅂ Glean
Â Aˆ 192.168.52.57˜ Bˆ 192.168.60.57˜ ч ˆ ⅃˜ ⅃ б
ў Cˆ 172.16.0.5˜ ˘ 172.16.0.5 ARP ╖ ˘
glean-car 5˜ ‡ A B ˘ ⅂ ⅃ 5 ⁸ ˘
⁸ IP ARP Â

˘ Glean-CAR ˘ Glean-CAR ‡ ⅃ Â

ARP ARP-CAR ˘ Юѣ ʒ'

ѣ ʒ	
Ruijie(config-cp)# *packet_rate_per_group*	⅃ ˆ ˜ ⅂ ARP *packet_rate_per_group*' ˆ Æ ѝ pps˜
Ruijie(config-cp)#	ARP-CAR ‡

ARP-CAR ╖ ⅃ manage ⅃ Э Â

⅃ æ N Æˆ N ӈ ᾱ ˜ Â

˘ ARP-CAR ⁸ ⅃ ARP Â A
ˆ 192.168.52.57˜ B 192.168.60.57˜ ч ˆ ⅃˜ ⅃ 192.168.52.1
ARP ˘ arp-car 5˜ ‡ A B ˘ ⅂ ⅃ 5
⁸ ˘ ⁸ ARP Â

˘ ARP-CAR ˘ ARP-CAR ‡ ⅃ Â

Port-Filter ⊾ ˘ Юѣ ʒ'

Ruijie(config-cp)# *interface* { | | | | | | }	ˆ˘ ˆ Э *Interface*' ˆ Â
Ruijie(config-cp)# - *interface*	ˆ ˆ˘ ‡ MPP ╗ .

MPP ╗ ˆ manage ˆ Э Â

˙ Л 16 ˆ˘ ˆ Э ˙ Л Â

MPP ╗ Л ˆ˘ ˆ Э ≠ a ˘ ˆ ˆ Â

˘ MPP ˘ MPP ‡ ˆ Â

ping web ' ЮЮ ʒ'

Ю ʒ	
Ruijie(config-cp)#security deny lan-ping | lan-web | wan-ping | wan-web'	ping web
Ruijie(config-cp)# security deny lan-ping | lan-web | wan-ping | wan-web'	ping web

security web permit

security deny web˘ IP ˙ Л web˘ ˙ Л Ю ʒ web permit ip ˆ ╗ IP ˘ Ю ʒ IP ˙ Л web^ a ˆ ˆ ˆ a ˆ deny Ю ʒ ˜ Â ≠ ˙ Л Ю ʒ ˆ IP '

Ю ʒ	
Ruijie(config-cp)# security web permit *low-ip-address* [*high-ip-address*]	web IP *low-ip-address*' IP IP *high-ip-address*' IP
Ruijie(config-cp)# no security web permit *low-ip-address*	web IP

Ю ʒ ˙ Л 32 IP IP Â

ѝ ǂ Э ⁸ ACPP ˆ ⁸ ˜ ˘ ЮЂ ʒ'

Ѣ ʒ	
Ruijie(config-cp)# *rate* *burst-rate*	⅄ Э ACPP ‡ *rate*' ⁸ˆ Æ ѝ pps˜ *burst-rate*' ⁸ˆ Æ ѝ pps˜
Ruijie(config-cp)#	ACPP ‡

Ь ⅄ Э ⅃ Ɲ ὲ Э ACPP Â

Ю˘ ACPP ˘ ACPP ‡ ⅄ Â

ARP ╗ ˘ Ѣ ʒ˘ ARP ˘ Ю ѝ ARP ˘ ╗ ARP ' ў ARP (10s 200 ARP)' ў MAC IP' ARP في MAC б MAC a ⅃'

Ѣ ʒ no ARP ╗ ' ЮЂ ʒ'

Ѣ ʒ	
Ruijie(config-cp)#anti-arp-spoof	ARP ╗
Ruijie(config-cp)# no anti-arp-spoof	ARP ╗

Ю˘ ╗ Â

pps ˆ . ˜ ˘ ѝ

,

Ѣ ʒ	
Ruijie(config-cp)#attack threshold 500	

Ѣ ʒ	
Ruijie(config-cp)#anti-arp-spoof	ARP ╗

Ruijie(config-cp)# no anti-arp-spoof	ARP ╗

╗

ƕ ʒ	
Ruijie#	
Ruijie(config)#	╗
Ruijie(config)# *time*	ѝ ╟ ˘ Â ѝ ˘ Â
Ruijie(config)# *value1* *value2*	Â IP ˘ ‡ Â
Ruijie#	
Ruijie# *ip-addr time*	╟ ╗ IP
Ruijie# clear [*ip-addr*]	╟ IP Â a έ IP ˘ IP Â

Ruijie(config-cp)#anti-arp-spoof scan 10	ARP
Ruijie(config-cp)#no anti-arp-spoof scan	ARP

pps ˆ . ˜ ˘ й
,

ƕ ʒ	
Ruijie(config-cp)#attack threshold 500	

ef-rnfp enable

ƕ ʒ ˧ Ƶ ╖ Â ‡˘ ‡
‡ ˘ ‡˘ ‡ ‡
Â ˘ control-plane Ю Юƕ ʒ'

ƕ ʒ	
Ruijie(config-cp)#	
Ruijie(config-cp)#	

‡ a ˧ ӈ ˧ Â ˧ Ƶ ‡
Â

˘ ˧ Ƶ Ю ƕ ʒ '

ƕ ʒ	
Ruijie# { | | - | - | - | | }	˘ ˘

show ef-rnfp {acpp | scpp | glean-car | arp-car | port-filter | mpp}ƕ ʒ ˧ Ƶ ╖ ,
' show ef-rnfp all ‡

˘ ˧ Ƶ Ю ƕ ʒ '

ƕ ʒ	

˘ Â ↓ Land ↰ a ↓˘ UNIX
ў ˘ Windows NT ў ↓ è Â

2 à Smurf

Smurf ˘ Â ICMP ˘
ѝ ↓ ˘ ў ICMP ˘
Â Smurf ў ў Â Э ICMP ѝ
↓ ў ˘ ↓ ў Â ˘
Â Э ˘ ў ˘ ÂSmurf ↑ ↓ ѝ Fraggle
Â

3 à Winnuke

WinNuke ↓ Windows NetBIOS ↰ˆ 139˜ OOB
ˆ out-of-band˜ ˘ NetBIOS ˘ ў Â

4 à SYN Flood

8˘ TCP/IP

SYN ≠ ˧˩ ˘ æ ˘ ˘ Ю'

ƕ ʒ	
Ruijie (config)#	SYN
Ruijie (config)#	SYN ˆ ˜

SYN Flood ˜ Э l' ὴ L Â

SYN Flood ˘ IP SYN ╗ ˘ IP SYN ˘ Â Ю'

ƕ ʒ	
Ruijie(config)# *acl-number* | *acl-name*} *rate-num*	SYN Flood ╗ ˘ ˩˥ TCP-Proxy ⁸ Â *acl-number:* ˥ acl ˆ 1-99˜ Â *acl-name:* ˥ acl ˩ Â ' acl ˥ ip Â *rate-num'* ˘ Æ' pps
Ruijie(config)# *acl-number* | *acl-name*} *rate-num*	SYN Flood ╗ Â *acl-number:* ˥ acl ˆ 1-99˜ Â *acl-name:* ˥ acl ˩ Â ' acl ˥ ip Â *rate-num'* ˘ Æ' pps

UDP Flood ˜ Э l' ὴ L Â

Ю ˘ ˧˩ Ƙ Â

ƕ ʒ	
Ruijie(config)# *acl-number* | *acl-name*} *rate-num*	UDP Flood ╗ Â *acl-number:* ˥ acl ˆ 1-99˜ Â *acl-name:* ˥ acl ˩ Â ' acl ˥ ip Â *rate-num'* ˘ Æ' pps

ƚʊ ʒ̧	
Ruijie(config)#	ICMP ⅃ ╖ ˘ icmp ⅃
Ruijie(config)#	ICMP ⅃ ╖ Â

WinNuke l' L˘ ⅄˘ ⅄ 139˘
з URG Æ ѝ 1˘ ˛ ÂWinNuke Windows ˘ ⅃
⅄ TCP ˆ OOB˜ ˘ б OOB
a ⅃ ˘ ѐ б Æ a ˘ ˛ Â Windows Σ

a ⅃ ICMP a ⅃ a ⅃˘ ˆ ʒ ѝ 0˜ ў ˆ ʒ ѝ
1˜ a ⅃ ICMP ⅄˘ ⅄ ѝ a ⅃ ˘ ⌈
б ў ˘ Â Ю ˘ ⅃ Ƶ Â

Q¸	
Ruijie(config)#	ICMP a ⅃ ╖ ˘ icmp a ⅃
Ruijie(config)#	ICMP a ⅃ ╖

Fraggle б Smurf ˘ ⅃ UDP Â ˘ ⅃
UDP ˘ ў 7 ⅄ ⅃ —— ≠ Echo ⅃˘
⅄ Ю . Chargen ⅃˘ ⅃ Ƶ ⁸ ч ⅃ ң
Â Ю ˘ ⅃ Ƶ Â

Q¸	
Ruijie(config)#	Fraggle ╖
Ruijie(config)#	Fraggle a ⅃ ╖

LAND ˜ Э ľ ὴ Ł Â Ю ˘ ⅃ Ƶ
Â ˆ BFD˜ ⅃ IP IP
˘ Land ╖ Â

Q¸	
Ruijie(config)#	Land ╖ ˆ ˜
Ruijie(config)#	Land a ⅃ ╖

έ / Ł˘ / Ł ť ˘
/ Ł з Э Â ˘ ⅃ Ƶ
╖ ў / Ł Â TCP UDP ⅃
Ł˘ ⅃ ⅃ ╟ ⅃ Â ў icmp ˘
⅃ tcp Â ÿ Э ˘ ⅃ ⅃ ⅃ ˘ ⅃ Â
⅃ ť ˘ ⅃ Ƶ Ƶ ὲ Â ⅃
⅃ TCP ⅃ Э˘ Ƶ ⅃ Â

10.3ˆ 4b6˜ Ƶ ʒ ˘ ˘
Ƶ ʒˆ a ˜ ˘ ╟ ע
˘ ip ˘ æ Â

Ю ˘ ˧ Ɲ Â

Ƕ ʒ	
Ruijie(config)# *high|low|medium time-interval*	˧ ˘ ѝ ╖ a ˧ ˘ 3 ѝ Â Æ' second ' 1˙ 2000
Ruijie(config)# *icmp|ip|tcp|udp*	˧ ˘ ѝ ╖ a ˘ Â
Ruijie(config)# *high|low|medium acl time-num*]	╖ Â sense-level' ѝ ˘ ǂ ѝ *high|low|medium* ˘ low ˧ Â *acl* ' ˥ ⁸ *time-num* ' IP ╖ ˩ ˘ Æ' min˘ ˩ IP IP ˘ Â
Ruijie(config)# *icmp|ip|tcp|udp high|low|medium con-num pri-num ip-num port-num*	╖ ѝ ˘ ˧ ˘ 3 ѝ ˘ ˘ ˧ Ƕ ʒ Â protocol' ˘ ѝ *icmp|ip|tcp|udp* sense-level' ˘ ѝ *high|low|medium* *con-num'* ˘ ѝ 0˙ 2000˘ 0 a ˧ ⁸ *pri-num'* a ˧ ˘ ѝ 0~2000˘ 0 a ˧ ⁸ *ip-num'* ip ˘ ѝ 1˙ 2000 *port-num'* ˧ ˘ ѝ 1˙ 2000 ƛ Э Ѭ ѝ' *con-num* a ˧ *pri-num* ˩˘ ў *ip-num* ˘ ‡ ѝ ip ˘ a ˩ ˧ *port-num* ˘ ‡ ѝ ˧ Â

Ь ѝ ˘ ˧ ˘ ˧ ƛЮƕ ʒ Â

Ruijie(config)# *icmp | ip | tcp | udp*	╖ Â
Ruijie(config)# *icmp | ip | tcp | udp*	╖ Â

╖ Ю'

```
scan tracker clear interval default:
      low:30 s
      medium:60 s
```

```
       high:300 s
tcp scan default config:
low
        connection count is:0
        priority count is:100
        ip count is:30
        port count is:50
medium
        connection count is:50
        priority count is:20
        ip count is:7
        port count is:10
high
        connection count is:50
        priority count is:3
        ip count is:3
        port count is:10

udp scan default config:
low
        connection count is:0
        priority count is:100
        ip count is:30
        port count is:50
medium
        connection count is:50
        priority count is:10
        ip count is:5
        port count is:20
high
        connection count is:50
        priority count is:3
        ip count is:3
        port count is:10

icmp scan default config:
low
        connection count is:0
        priority count is:30
        ip count is:50
medium
        connection count is:20
        priority count is:10
        ip count is:5
high
        connection count is:10
        priority count is:3
        ip count is:3

ip scan default config:
low
        connection count is:0
        priority count is:100
        ip count is:50
        protocol count is:50
medium
        connection count is:30
        priority count is:15
        ip count is:15
        protocol count is:15
high
```

```
connection count is:30
priority count is:3
ip count is:3
protocol count is:7
```

ICMP ˜ Э ľ ὴ Ł Â

Ю ˘ ˧ ⅃ Ⅎ Â

ƕ ʒ	
Ruijie(config)# [*icmp-length*]	ICMP ˥ *icmp-length* ' ˧ 28-65499˘ *icmp-length* 4000.
Ruijie(config)# [*icmp-length*]	ICMP ˥ *icmp-length* ' ˧ 28-65499˘ *icmp-length* 4000.

˩ ˘ IP Â ˩ ACL ˥ ˘
˩ ˥ ˘ ˧ ⅃ Ⅎ ⅃ ˘ ÿ

Ruijie# ***all | global***	˘ ⁸ ˧˩˧ й 0 Â *all* *global* ˆ ˜ ˘ ˧˩ Ю ˧˩ Â

ƕ ʒ	
Ruijie# ***global***	ˆ ˜ Â *global* Â

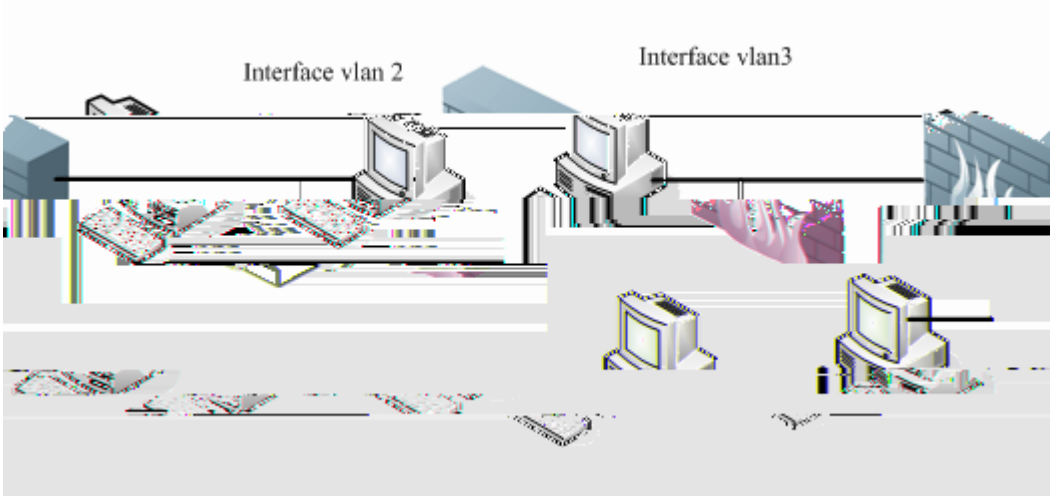
ƕ ʒ	
Ruijie#	˘ ȁ ddos Â

╟ ă ʉ ˩ ў Э Â
˧˩ Ƶ
Â Ƶ RLOG RG-SNC Ƶ SYSLOG
SYSLOG ╘ Â

Ю ˈ

╖	
SYN Flood	
UDP Flood	
ICMP Flood	
IP↑ Flood	

ใบ ๅ	
Ruijie(config)#	



ICMP FLOOD

```
Ruijie#config terminal
```

! ʌ a ip access-group

 interface vlan 2 interfacevlan 3 ʌ IP

```
Ruijie(config)#interface vlan 2
Ruijie(config-if)#ip address 202.1.1.1 255.255.255.0
Ruijie(config-if)#exit
Ruijie(config)#interface vlan 3
Ruijie(config-if)# ip address 101.1.1.1 255.255.255.0
Ruijie(config-if)#exit
Ruijie(config)#ip access-list standard 10
Ruijie(config-std-nacl)#permit 101.1.1.0 0.0.0.255
Ruijie(config-std-nacl)#exit
       ip      101.1.1.0/24      ў        ICMP FLOOD     Â
Ruijie(config)#firewall defend icmp-flood 10 300
Ruijie(config)#
```

ftp˘ mms˘ h.323 ˘ ƕ ʒ ⁸ б ˣ ˘ з
˧ ⁸ ˧ /˧ Â Э acl
‡ ˧ ⁸ ˧ ˘ ѫ ˘ Â
Ѫ й ⁸ Â
˥ Â

' MMS ȁ H.323 ȁ SIP ȁ FTP ȁ RTSP ȁ TFTP˘ Ю

ƕ ʒ	
Ruijie(config)#	

ـلـ ـپ

/ا ҥ VPDN й' L2TP PPTP Â

L2TP(Layer Two Tunneling Protocol)'

PPTP(Point-to-Point Tunneling Protocol) Â

ч VPDN ˅˅ б ˅ ÂPPTP

MicroSoft Windows ҥ ˘ L2TP Cisco Э Â й ˘ L2TP

Windows 2000/XP Â

˘ ЖЭ Â

Point-to-Point-Tunneling Protocol (PPTP) VPN ˘
Microsoft Windows NT® Workstation à Windows® 95 à Windows® 98 à Windows® 2000 Ʌ
è é PPP ╖ ISP˘ Internet Ώ ⁄ Â è
ѝ RFC 2637˘ Microsoft ΰ ˝I ⅃ ˘
Internet Engineering Task Force(IETF) Â

PPTP ⊠ IP

Ruijie(config)# *poolname*	⅃

ѐ *poolname* … / ⅃ ˘ *first-ip* ˘ *last-ip* Â

PPTP ⊾ ˘ ⅃ Â ˘ ѝ في PPTP Â ⅄ ӊ Ю ƕ ʒ Â

ƕ ʒ	
Ruijie(config)# *user-name* *password*	
Ruijie(config)# *user-name*	

ѐ *user-name* ⅃ ˘ *password* ⅄ ʒ Â ( ) ⅃ б ⅄ ʒ Â

PPTP VPDN B –

/ ɦ Ю ƕ ʒ ˧ Ƙ VPDN-group ˧ Â

ƕ ʒ	
Ruijie(config)# *name*	… / VPDN-group ĩ
Ruijie(config)# *name*	VPDN-group ĩ

ɛ̀ *name* VPDN-group ˩ Â.. VPDN-group ĩ
Â

/ ɦ Ю ƕ ʒ ˧ Ƙ Â

ƕ ʒ	
Ruijie (config-vpdn)#	˧
Ruijie (config-vpdn)#	˧

PNS ˥ ˧ Â

/ ɦ Ю ƕ ʒ ˧ Ƙ Â

ƕ ʒ	
Ruijie(config-vpdn-acc-in)#	10 02 62 -in)#4PDN-gro{virtua|-temlateie(co3.02 0 0-acc4PD74 504Bgronum07(ber/TT1 1 Tf-0.00 | }
Ruijie(config-vpdn-acc-in)#	˧

˘ ˝I Â PNS ˥
Â

/ ɦ Ю ƕ ʒ ˧ Ƙ VPDN-group Â

VPDN-group˘ ˨˩ Ʌ ѝ VPDN ˡ Â VPDN-group
˩ ˘ ‡ ˚ VPDN-group ˨˩ Â

ƕ ʒ	
Ruijie(config-vpdn)# *name*	ў ˩
Ruijie(config-vpdn)#	˨˩ ˩

ѐ *name* ѝ ў ˩ Â

ᵋ

Ʌ ӈ Ю ƕ ʒ ˨˩ Ʌ ˩ ˘ ˩ ѝ
Â

ƕ ʒ	
Ruijie(config-vpdn)# *name*	˩
Ruijie(config-vpdn)#	˨˩ ˩

ѐ *name* ѝ ˩ Â Ю˘ Ʌ ӈ ˩ ѝ ˩
ў Â

Ʌ ӈ Ю ƕ ʒ ˨˩ Ʌ VPDN-group Â
б ˥ ˘ VPDN-group Â

ƕ ʒ	
Ruijie(config-vpdn)# *src-ip*	VPDN-group
Ruijie(config-vpdn)#	˨˩ VPDN-group

ѐ *src-ip* ѝ VPDN-group ĭ

ѐ *winsize* ѝ PPTP ⅄ ˘ *interval* ѝ ACK Â

⅄ ӊ Ю ƕ ʒ ⅃ Ƨ PPTP Â ˘ ⅃ Ƨ a Â

ƕ ʒ	
Ruijie(config-vpdn)# *interval*	PPTP ў ╟ echo ˘ ⅄ 0˙ 1000
Ruijie(config-vpdn)#	⅄ PPTP echo ˘ 60

ѐ *interval* ѝ PPTP ў ╟ ECHO ˘ ѝ 0 a ў ╟ ECHO˘ a ѝ 0 ⅃ ў ╟ ECHO Â

⅄ ӊ Ю ƕ ʒ ⅃ Ƨ ⅃ Â ╟ ⅃˘ ƕ ʒ ˘ ⅄ ˥ ˘ a ˥ ⅄ vpdn group ˥ Â ˥ group ѝ Â

ƕ ʒ	
Ruijie(config-vpdn)# *domain-name vrf-name*	⅃ Ƨ vrf
Ruijie(config-vpdn)# domain-name	⅄

ѐ *domain-name* ѝ ⅃˘ vrf-name ѝ vrf ⅃

⅄ ӊ Ю ƕ ʒ ⅃ Ƨ ⅃ Â ƕ ʒ vpdn-domain ƕ ʒ Ю Â vpdn ⅃˘ ƕ ʒ ˘ PPP ╖ ↑ ↑ Â a ƕ ʒ virtual-template ⅄ Ю ↑ Â

ƕ ʒ	
Ruijie(config-vpdn)# *domain-name vrf-name* Ruijie(config-vpdn-doamin)# *pool-name*	⅃ pool
Ruijie(config-vpdn-domain)#	⅄

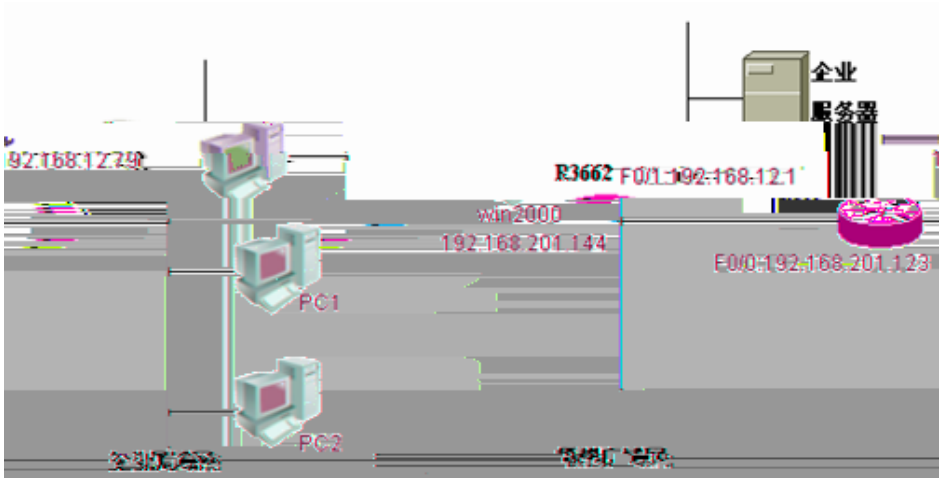
ѐ domain-name ѝ ⅃˘ vrf-name ѝ vrf ⅃˘ pool-name ѝ ⅃ Â

⺈ ӈ Ю ƕ ʒ ⺌ Ƙ ⺕ ⺇ PPP DNS Â ƕ ʒ
vpdn-domain ƕ ʒ Ю Â vpdn ⺇˘ ƕ ʒ PPP
DNS ˘ PPP DNS Â a ƕ ʒ
virtual-template ⺈ Ю PPP DNS Â

ƕ ʒ	
Ruijie(config-vpdn)# *domain-name vrf-name* Ruijie(config-vpdn-doamin)# *A.B.C.D A.B.C.D*	⺇ PPP DNS
Ruijie(config-vpdn-domain)#	⺌ dns

ὲ domain-name ὴ ⺇˘ vrf-name ὴ vrf ⺇˘ *A.B.C.D* ὴ dns Â

Ю في Â RUIJIE ˘ PPTP
VPDN ⺊ Â ⺈ Win2000 PC ὴ VPDN … RUIJIE PPTP
˘ ⺊ Â ὴ ˘ RUIJIE Ƙ
IP Â IP ⺮ في Â



PPTP
Ю ⺈ RUIJIE ⺈ Â

```
protocol pptp
virtual-template 1
!
username pc password 0 1111
!
ip local pool pptp 1.1.1.2 1.1.1.254
interface FastEthernet 0/0
ip address 192.168.201.123 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.12.1 255.255.255.0
duplex auto
speed auto
!
interface Virtual-Template 1
ppp authentication pap
ip unnumbered FastEthernet 0/1
peer default ip address pool pptp
!
ip route 0.0.0.0 0.0.0.0 FastEthernet0/0
!
line con 0
session-timeout 0
escape-character 29
line aux 0
session-timeout 0
escape-character 29
password 1
line vty 0
login
terminal-type ANSI
escape-character 29
line vty 1 4
login
escape-character 29
!
!
end
RUIJIE#
```

2).Windows 2000 '

```
F:\>ver
Microsoft Windows 2000 [Version 5.00.2195]
F:\>ipconfig /all
Windows 2000 IP Configuration
Host Name . . . . . . . . . . . . : topding
Primary DNS Suffix  . . . . . . . :
Node Type . . . . . . . . . . . . : Hybrid
IP Routing Enabled. . . . . . . . : Yes
WINS Proxy Enabled. . . . . . . . : No
Ethernet adapter       :
Connection-specific DNS Suffix  . :
Description . . . . . . . . . . . : STAR 901 Family Fast Ethernet
r (ACPI)
Physical Address. . . . . . . . . : 00-D0-F8-00-68-E5
DHCP Enabled. . . . . . . . . . . : No
IP Address. . . . . . . . . . . . : 192.168.201.144
Subnet Mask . . . . . . . . . . . : 255.255.255.0
Default Gateway . . . . . . . . . : 192.168.201.123
```

```
DNS Servers . . . . . . . . . . . : 202.101.143.141
Primary WINS Server . . . . . . . : 192.168.9.7
F:\>route print
===========================================================
Interface List
0x1 ........................... MS TCP Loopback interface
0x2 ...00 d0 f8 00 68 e5 ...... PCI Bus Master Adapter
===========================================================Active Routes:
Network Destination  Netmask   Gateway      Interface  Metric
0.0.0.0    0.0.0.0  192.168.201.123  192.168.201.144     1
127.0.0.0  255.0.0.0       127.0.0.1      127.0.0.1      1
192.168.201.0  255.255.255.0  192.168.201.144 192.168.201.144     1
192.168.201.144  255.255.255.255 127.0.0.1   127.0.0.1    1
192.168.201.255  255.255.255.255  192.168.201.144  192.168.201.144     1
224.0.0.0  224.0.0.0  192.168.201.144  192.168.201.144  1
255.255.255.255  255.255.255.255  192.168.201.144  192.168.201.144     1
Default Gateway:   192.168.201.123
===========================================================
Persistent Routes:
None
```

Win2000 “ /| ” ˘ “ ” “ Internet ж ”˘ “ Ώ ” “ a ”˘ ѝ 192.168.201.123˘ Ѣυ ⅃ ⅃ ѝ Vpdnconnect Â Vpdnconnect ˘ VPDN ╘ ѝ PPTP˘ Ѣ PAP ⅃ ╗ Â L ⅃ ˘ ⅃ pc 1111 Â

˘ Win2000 ⅃˘ . ⅃ Ώ /| ╘ ˘ ╘

```
0x2 ...00 d0 f8 00 68 e5 ...... PCI Bus Master Adapter
0x30000004 ...00 53 45 00 00 00 ...... WAN (PPP/SLIP) Interface
===========================================================
Active Routes:
Network Destination       Netmask         Gateway      Interface  Metric
0.0.0.0       0.0.0.0      192.168.12.1     1.1.1.4    1
1.1.1.4  255.255.255.255    127.0.0.1     127.0.0.1    1
1.255.255.255  255.255.255.255    1.1.1.4    1.1.1.4    1
127.0.0.0     255.0.0.0     127.0.0.1    127.0.0.1    1
192.168.201.0   255.255.255.0  192.168.201.144  192.168.201.144     1
192.168.201.123  255.255.255.255  192.168.201.144  192.168.201.144     1
192.168.201.144  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.201.200  255.255.255.255  192.168.201.100  192.168.201.144     1
192.168.201.255  255.255.255.255  192.168.201.144  192.168.201.144     1
224.0.0.0     224.0.0.0       1.1.1.4        1.1.1.4    1
224.0.0.0  224.0.0.0  192.168.201.144  192.168.201.144  1
255.255.255.255  255.255.255.255  192.168.201.144  192.168.201.144     1
Default Gateway:         192.168.12.1
===========================================================
Persistent Routes:
None
F:\>
F:\>ping 192.168.12.1
Pinging 192.168.12.1 with 32 bytes of data:
Reply from 192.168.12.1: bytes=32 time<10ms TTL=255
Reply from 192.168.12.1: bytes=32 time<10ms TTL=255
Reply from 192.168.12.1: bytes=32 time<10ms TTL=255
Reply from 192.168.12.1: bytes=32 time<10ms TTL=255
Ping statistics for 192.168.12.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  0ms, Average =  0ms
F:\>ping 192.168.12.79
Pinging 192.168.12.79 with 32 bytes of data:
Reply from 192.168.12.79: bytes=32 time=10ms TTL=127
Reply from 192.168.12.79: bytes=32 time<10ms TTL=127
Reply from 192.168.12.79: bytes=32 time<10ms TTL=127
Reply from 192.168.12.79: bytes=32 time<10ms TTL=127
Ping statistics for 192.168.12.79:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  10ms, Average =  2ms
```

Э Ю

```
RUIJIE#sh ip route
Codes: C - connected, S - static,  R - RIP
O - OSPF, IA - OSPF inter area
E1 - OSPF external type 1, E2 - OSPF external type 2
Gateway of last resort is 0.0.0.0 to network 0.0.0.0
1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      1.1.1.0/24 is directly connected, Virtual-Access1
C      1.1.1.4/32 is directly connected, Virtual-Access1
C   192.168.12.0/24 is directly connected, FastEthernet0/1
C   192.168.201.0/24 is directly connected, FastEthernet0/0
S*  0.0.0.0/0 is directly connected, FastEthernet0/0
RUIJIE#
```

˘ ѝ VPDN ╘ ˘ ╘ ┘Ѫ
Â Ю˘ ┘ ╘ ѝ ┘
Ѫ ˘ ˛ ѝ 192.168.12.1 Â

⺈ ɥ	ƕ ʒ ⺌ ⺎ …	Â
ƕ ʒ		
Ruijie#		VPDN Tunnel
Ruijie#		VPDN Session
Ruijie#		VPDN Tunnel Session
Ruijie#	*locid*	id PPTP

˘ ⺌ Ю ˈ

```
RUIJIE# sh vpdn
%No active L2TP tunnels
```

Ruijie# [[|] [*remote name*]]	ȁ ў ⅃ ὲ

remote name ѝ ў ⅃ Â ˘ … ⅃
‡ ˘ ƕ ʒ ⅃'

```
RUIJIE# show vpdn
%No active L2TP tunnels
%No active PPTP tunnels
```

˘ ⅄ ɥ ƕ ʒ ⅃ ⅃ PPTP Â ⅃
˘ L ⅃ ≠ ѝ ˘ ɛ́ PPP Â

ƕ ʒ	
Ruijie# { | | }	VPDN … ÂError ˘ Event Y˚ ˘ Packet ‡ ⁸

	Debug ⅄ ɥ ⅃ a ⅃ Â

… PPTP Ю '

```
VPDN: Pptp recv start-control-connection-request from host 192.168.200.114
PPTP: New tunnel socket id =9
VPDN: Pptp get tunnel info for 192.168.200.114 ok!
VPDN: Pptp send start-control-connection-reply, ok
VPDN: Pptp tunnel id 0 state change: idle --> estbed
PPTP: Add send-echo-request timer, interval = 60
VPDN: Pptp tunnel id 0 recv outgoing-call-request!
Pptp: Tunnel to 192.168.200.114 get config para. from vpdn-group pptp!
VPDN: Must process using ACCEPT_DIALIN parameters
Pptp: Session va0 get config para. from vpdn-group pptp!
VPDN: Pptp session va0 state change: idle --> connected
PPTP: Receive outcall request,process ok!assign local call id = 1
VPDN: Pptp tunnel id 0 send out-call reply
%LINK CHANGED: Interface virtual-access 0, changed state to up
VPDN: Pptp tunnel to 192.168.200.114 peer callid 1 recv set-linkinfo
VPDN: Pptp tunnel to 192.168.200.114 peer callid 1 recv set-linkinfo
%LINE PROTOCOL CHANGE: Interface virtual-access 0, changed state to UP
```

… PPTP Ю '

```
PPTP: I Start-Control-Connection-Request len 156 Magic Cookie 0x1A2B3C4D
Protocol Version 0x100
Framing Type 0x1
Bearer Type 0x1
Maximum Channels 0x0
Firmware Revision 0x893
Host Name:
Vendor String: Microsoft Windows NT
PPTP: O Start-Control-Connection-Reply len 156 Magic Cookie 0x1A2B3C4D
Protocol Version 0x100
Framing Type 0x2
Bearer Type 0x3
Maximum Channels 0x0
Firmware Revision 0x100
Host Name: Dingjs
Vendor String: Ret-Giant Network Operating System
```

```
PPTP: I Outgoing-Call-Request len 168 Magic Cookie 0x1A2B3C4D
Call Id 0x4000
Call Serial Number 0x96A5
Min BPS 0x12C
Max BPS 0x5F5E100
Bearer Type 0x3
Framing Type 0x3
Rec Window Size 0x40
Proc Delay 0x0
Phone Number Length 0x0
Phone Number:
Subaddress:
PPTP: O Outgoing-Call-Reply len 32 Magic Cookie 0x1A2B3C4D
Call Id 0x1
Peer Call Id 0x4000
Result Code 0x1
Error Code 0x0
Cause Code 0x0
Connect Speed 0xFA00
Rec Window Size 0x10
Physical Channel Id 0x0
PPTP: I Set-Link-Info len 24 Magic Cookie 0x1A2B3C4D
Peer Call Id 0x1
Send ACCM 0xFFFFFFFF
Recv ACCM 0xFFFFFFFF
%UPDOWN: Interface Virtual-Access1, changed state to up
Vi1 VPDN PROCESS Into tunnel: Sending 54 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 64 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
PPTP: I Set-Link-Info len 24 Magic Cookie 0x1A2B3C4D
Peer Call Id 0x1
Send ACCM 0xFFFFFFFF
Recv ACCM 0xFFFFFFFF
Vi1 VPDN PROCESS Into tunnel: Sending 45 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 46 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 187 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 56 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 64 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
Vi1 VPDN PROCESS Into tunnel: Sending 52 byte pak
Лu                                  й ˘                          Ю'
VPDN: PPTP session Virtual-Access1 wait pak ack timeout(wait seq=37, ack=36),
de
crease send window to half of current = 33!
VPDN: PPTP session Virtual-Access1 adjust ATO to 220 ms!
VPDN: PPTP session Virtual-Access1 wait pak ack timeout(wait seq=38, ack=36),
de
crease send window to half of current = 16!
VPDN: PPTP session Virtual-Access1 adjust ATO to 280 ms!
VPDN: PPTP session Virtual-Access1 wait pak ack timeout(wait seq=39, ack=36),
de
crease send window to half of current = 8!
VPDN: PPTP session Virtual-Access1 adjust ATO to 400 ms!
VPDN: Pptp EGRE encap fail, err=-4!
VPDN: PPTP session Virtual-Access1 wait pak ack timeout(wait seq=40, ack=36),
de
crease send window to half of current = 4!
VPDN: PPTP session Virtual-Access1 adjust ATO to 640 ms!
```

PPTP VPDN ╘ ˘ ЛЮ '

Windows2000 … ⁄⁄ ӊ PPTP ⁄⁄ Â ⁄⁄ ˘
“ ” “ ὴ ˆ ˜ ˆ T˜ ”˘ ὶ “ ˆ Ѭ ˜ ˆ D˜ ”˘ “
” “ ╗ ” ὶ “ ┘ ╗ ˆ ╗ ≠ ┘ Л ˜ ”˘ ⁄⁄ ӊ PPTP
Virtual-template PAP ȁ CHAP MS-CHAP Â ⁄ ˘
⁄⁄ “ ” ˘ VPN ╘ “ ╟ ”˘
Windows2000 ˝I … L2TP ˘ ⁄ … PPTP ˘ ÿ
Â Л˘ VPN ╘ ὶ “ ˆ PPTP˜ ”˘ ┘ Л …
Â
⁄⁄ ӊ ὲ ⁄ ˘ TCP 1723 ⁄⁄ Â

Layer 2 Tunnel Protocol(L2TP) Internet Engineering Task Force(IETF) ч
. Cisco Ώ ⅄ Layer 2 Forwarding(L2F) б Point-to-Point Tunneling Protocol (PPTP) έ Ѭ RFC 2661 Â

L2TP Point-to-Point Protocol(PPP) ˘ PPP
Â б PPTP a ⅃ ˘ L2TP UDP й ⁸ б Â

L2TP ≠ VPN Â VPN Ώ ⅄ б
˘ ⅄ è ⅃ Ƙ VPN Â

⅄ ң ч L2TP

L2TP Â Ю ˈl L2TP ў ╟ б
L2TP ╘

L2TP Â Ю ⅃ L2TP

ч R26 à R36 à SecVPN ⅃ Э ˘ NBR ⅃ Э
L2TP Â

… L2TP-class ⅄ (⅃);
… Pseudowire-class ⅄ (⅃);
… Virtual-ppp ⅄ ( );

L2TP ˝Ω L2TP ⁸
Â L2TP-class ˈ
L2TP-class ĩ
L2TP ⁸
L2TP ⁸
L2TP ⁸

⅄ ң Ю Ѣ ҙ ⅃ Ƙ Ƙ L2TP ⁸ L2TP-class ĩ Â

ƕ ʒ	
Ruijie(config)# *l2tp-class-name*	… / ⅄ L2TP-class ⅄
Ruijie(config)# *l2tp-class-name*	⅄ L2TP-class ⅄

ὲ L2TP-class-name … / L2TP-class ĩ ⅄ ˘ … L2TP-class ⅃ Ɲ Pseudowire-class ὲ ⅄ Â

⅄ ɥ Ю ƕ ʒ L2TP ⁸ Â

ƕ ʒ	
Ruijie(config-l2tp-class)# *size*	⁸ ⅃ ⅄
Ruijie(config-l2tp-class)#	⁸ ⅃ ⅄
Ruijie(config-l2tp-class)# { { *initial-retries* | { | } *initial-timeout*} | *retries* | { | } *timeout*}	⁸
Ruijie(config-l2tp-class)# { { | { | } }| | { | } }	⁸
Ruijie(config-l2tp-class)# *seconds*	⁸ ⅃
Ruijie(config-l2tp-class)#	⁸ Э ѝ

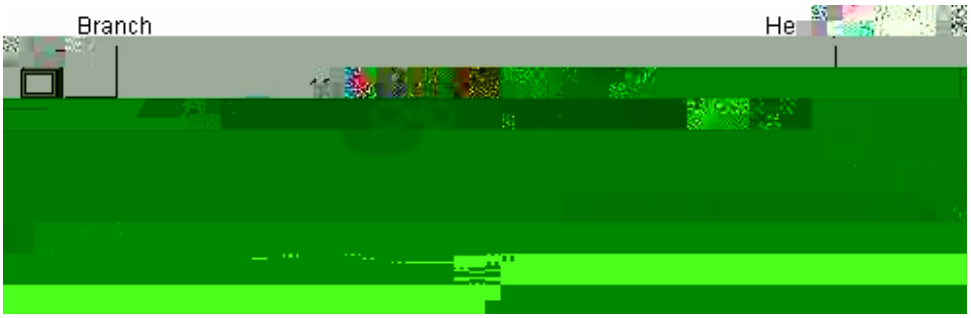
ὲ ˘ *size* ѝ ⅃ ⅄ ˘ ѝ 8’ *initial-retries* ѝ SCCRQ ˘ ѝ 2’ *initial-timeout* SCCRQ ˘ ѝ 1 ˘ ѝ 8 ’ *retries* ⁸ ˘ 5’ *timeout* ⁸ ˘ ѝ 1 ˘ ѝ 8 ’ *seconds* ⁸ (Tunnel) Э ˘ ѝ 120

Л ң ЛЬЮЬ ҳ L2TP IP Â

Ƕ ʒ ᴬ Ю ' ip vrf forward Ƕ ʒ Â virtual-ppp ᴬ Э vrf ˘ ᴬ vrf ˘ ᴬ vrf vrf a ˘ ᴬ vrf ᴶ ᴬ ˘ vrf ╖ Â

Ю ч Â Windows 2000 Server ѝ L2TP Serveř Windows 2000 Server ˘ a Â ᴬ Cisco 2620 ѝ L2TP Serveř Â

Ю Ruijie б Windows 2000 Server L2TP ˘ Ю Â



Windows 2000 Server(LNS) L2TP

Ю ˆ RUIJIE б Windows 2000 Server '

1).RUIJIE '

```
RUIJIE# show running-config
Building configuration...
Current configuration : 868 bytes
!
hostname Ruijie
access-list 101 permit ip any 192.168.207.0 0.0.0.255
access-list 102 deny   ip any 192.168.207.0 0.0.0.255
access-list 102 permit ip any any
!
l2tp-class l2x
hostname branch
!
pseudowire-class pw
encapsulation l2tpv2
protocol l2tpv2 l2x
ip local interface FastEthernet 0/1
!
!
!
!
!
!
interface FastEthernet 0/0
ip address 192.168.201.1 255.255.255.0
ip nat inside
duplex auto
speed auto
```

```
!
interface FastEthernet 0/1
ip address 192.168.12.217 255.255.255.0
ip nat outside
duplex auto
speed auto
!
interface Null 0
!
interface Virtual-ppp 1
pseudowire 192.168.12.213 12 pw-class pw
ppp pap sent-username rgnos password 7 072C04211A01
ip mtu 1460
ip address negotiate
ip nat outside
!
ip nat inside source list 102 interface FastEthernet0/1 overload
ip nat inside source list 101 interface Virtual-PPP1 overload
ip route 0.0.0.0 0.0.0.0 FastEthernet 0/1 192.168.12.1
ip route 192.168.207.0 255.255.255.0 Virtual-ppp 1
!
line con 0
line aux 0
line vty 0 4
!
!
end
```

˘ ˆ ”Branch” ɱ(NAT ╗) ˆ virtual-ppp 1 … б ”Headquarters” L2TP Tunnel ˘ ”Branch” ɱ(NAT ╗) ˆ interface FastEthernet 0/1 . Internet˘ ˆ ACL(Access Control List) ⁸ Â

```
Subnet Mask . . . . . . . . . . . . : 255.255.255.255
Default Gateway . . . . . . . . . . :
DNS Servers . . . . . . . . . . . . :

C:\>route print
===========================================================
Interface List
0x1 ........................... MS TCP Loopback interface
0x1000002 ...00 53 45 00 00 00 ...... WAN (PPP/SLIP) Interface
0x1000003 ...00 10 88 01 a5 c3 ...... Novell 2000 Adapter.
===========================================================
Active Routes:
Network Destination       Netmask         Gateway      Interface  Metric
0.0.0.0    0.0.0.0    192.168.12.1  192.168.12.213    1
127.0.0.0    255.0.0.0     127.0.0.1    127.0.0.1    1
192.168.12.0    255.255.255.0   192.168.12.213  192.168.12.213      1
192.168.12.213  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.12.217  255.255.255.255   192.168.12.213  192.168.12.213      1
192.168.12.255  255.255.255.255   192.168.12.213  192.168.12.213      1
192.168.103.2  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.103.6  255.255.255.255    192.168.103.2   192.168.103.2      1
224.0.0.0  224.0.0.0  192.168.12.213  192.168.12.213  1
255.255.255.255  255.255.255.255   192.168.12.213  192.168.12.213
1
Default Gateway:     192.168.12.1
===========================================================
Persistent Routes:
None
C:\>
```

Windows 2000 Server Э ╟” ╖ ” ╛ VPDN
ˇ ⁸ (ACL à à IP ˇ Ɲ ╗)ˇ
Â ⅄ ” /ˈ ” ” ” ” ╛ ” ╛
L2TP ╛ L2TP Â

Windows 2000/XP Э L2TP б IPSec/IKE Â ╗
ˇ ѝ L2TP (Cisco à Quidway ’Ω /ˈ)
L2TP б IPSec/IKE ˇ . Windows 2000/XP L2TP ≠
”I Â ˇ ┘Ɲ Windows
2000/XP ”Ą ' ”I ” ”ˇ ⅄ ” ”ˇ
”regedit” ”Ą ˇ “HKEY_LOCAL_MACHINE/
SYSTEM / CurrentControlSet / Services / RasMan /
Parameters”ˇ ⅄ Ю… ⅄ ѝ ” ProhibitIpSec” ┤ ὲ
ѝ 1ˇ F5 ⁹ ”Ą ˇ ⅄ Windows 2000 Â ÿ a
L2TP ”Ą IPSec/IKE Â
ˇ ῥ Windows 2000/XP L2TP ˇ ˇ ΐ
‡ IPSec/IKE Â

```
IP Routing Enabled. . . . . . . . : No
WINS Proxy Enabled. . . . . . . . : No
Ethernet adapter        :
Connection-specific DNS Suffix  . :
Description . . . . . .: Realtek RTL8139(A)-based PCI Fast Ethernet Adapter
Physical Address. . . . . . . . . : 00-10-60-75-BD-7A
DHCP Enabled. . . . . . . . . . . : No
IP Address. . . . . . . . . . . . : 192.168.201.78
Subnet Mask . . . . . . . . . . . : 255.255.255.0
Default Gateway . . . . . . . . . : 192.168.201.1
DNS Servers . . . . . . . . . . . : 202.101.143.141
                                    202.101.98.55
C:\WINNT\system32>route print
===========================================================Interface List
0x1 ........................... MS TCP Loopback interface
0x1000003 ...00 10 60 75 bd 7a ...... NDIS 5.0 driver
===========================================================Active Routes:
Network Destination       Netmask         Gateway      Interface  Metric
0.0.0.0    0.0.0.0    192.168.201.1  192.168.201.78    1
127.0.0.0    255.0.0.0    127.0.0.1    127.0.0.1    1
192.168.201.64  255.255.255.192   192.168.201.78  192.168.201.78    1
192.168.201.78  255.255.255.255       127.0.0.1      127.0.0.1     1
192.168.201.255  255.255.255.255   192.168.201.78  192.168.201.78      1
224.0.0.0   224.0.0.0   192.168.201.78  192.168.201.78   1
  255.255.255.255  255.255.255.255   192.168.201.78  192.168.201.78      1
Default Gateway:    192.168.201.1
===========================================================
Persistent Routes:
Network Address         Netmask  Gateway Address  Metric
192.168.2.0    255.255.255.0     192.168.1.1      1
192.168.9.0    255.255.255.0    192.168.12.1      1
61.154.22.0    255.255.255.0    192.168.12.1      1
C:\WINNT\system32>ping 192.168.12.1
Pinging 192.168.12.1 with 32 bytes of data:
Reply from 192.168.12.1: bytes=32 time=50ms TTL=254
Reply from 192.168.12.1: bytes=32 time=20ms TTL=254
Reply from 192.168.12.1: bytes=32 time<10ms TTL=254
Reply from 192.168.12.1: bytes=32 time=60ms TTL=254
Ping statistics for 192.168.12.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  60ms, Average =  32ms
C:\WINNT\system32>ping 192.168.103.2
Pinging 192.168.103.2 with 32 bytes of data:
Reply from 192.168.103.2: bytes=32 time<10ms TTL=128
Reply from 192.168.103.2: bytes=32 time<10ms TTL=128
Reply from 192.168.103.2: bytes=32 time<10ms TTL=128
Reply from 192.168.103.2: bytes=32 time<10ms TTL=128
Ping statistics for 192.168.103.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  0ms, Average =  0ms
C:\WINNT\system32>
```

ل ¦ ”Branch” ў ”DENGL-NECBOOK” ل Л Internet Л ”Headquarters” ˘ ў VPDN ˘ ل ¦ (192.168.201.78) è й 192.168.201.1 . ل Â ≠ ل Л ÿ RUIJIE Э NAT ل Л '

```
RUIJIE# show ip nat translations
Pro Inside global     Inside local      Outside local     Outside global
```

```
icmp 192.168.103.6:512 192.168.201.78:512 192.168.207.2:512
192.168.207.2:512
icmp 192.168.12.217:512 192.168.201.78:512 192.168.12.1:512
192.168.12.1:512
RUIJIE# show ip route
Codes: C - connected, S - staticRu(w):GS0 gs/!IP02( )]TJ0 -1.132 (Os/OSPF, IAs/OSPF
```

```
encapsulation PPP
ip address 202.101.93.21 255.255.255.192
ip nat outside
!
interface serial 1/1
clock rate 64000
!
interface serial 1/2
clock rate 64000
!
interface serial 1/3
clock rate 64000
!
interface FastEthernet 0/0
ip address 192.168.201.1 255.255.255.0
ip nat inside
duplex auto
speed auto
!
interface FastEthernet 0/1
duplex auto
speed auto
!
interface Null 0
!
interface Virtual-ppp 1
pseudowire 202.101.93.23 7 pw-class pw
ppp pap sent-username rgnos password 7 072C04211A01
ip mtu 1460
ip address 192.168.103.3 255.255.255.0
!
router ospf
network 192.168.103.0 0.0.0.255 area 0.0.0.1
network 192.168.201.0 0.0.0.255 area 0.0.0.1
!
ip nat inside source list 1 interface Serial1/0 overload
ip route 0.0.0.0 0.0.0.0 serial 1/0
ip route 192.168.19.0 255.255.255.0 Virtual-ppp 1
!
line con 0
line aux 0
line vty 0 4
!
!
end
RUIJIE#
```

˘ ˆ ”Branch” ɱ( ) ˆ Virtual-ppp 1 … б ”Headquarters” L2TP Tunnel ˘ ”Branch” ɱ(NAT ╗) ˆ interface Serial 0 . Internet

```
C      192.168.103.2 is directly connected, Virtual-PPP1
S    192.168.19.0/24 is directly connected, Virtual-PPP1
C    192.168.201.0/24 is directly connected, FastEthernet0/0
     202.101.93.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.101.93.23/32 is directly connected, Serial1/0
C       202.101.93.0/26 is directly connected, Serial1/0
202.ther di conn Serial1/0 RUIJIE#show arp
```

```
ip address 192.168.103.2 255.255.255.0
ppp authentication pap
!
router ospf 100
log-adjacency-changes
network 192.168.103.0 0.0.0.255 area 1
!
ip classless
ip http server
!
!
voice-port 1/0/0
!
voice-port 1/0/1
!
dial-peer cor custom
!
!
gatekeeper
shutdown
!
!
line con 0
exec-timeout 0 0
line aux 0
privilege level 15
line vty 0 4
privilege level 15
no login
line vty 5 15
login
!
end
```

б Windows 2000 a ˇ Cisco 2620 Э L2TP б IPSec/IKE ˇ
Ю Cisco L2TP ˇ Windows 2000 L2TP a
Â Cisco2620 ╟ OSPF 192.168.201.0/24 ˇ ÿ
Л

```
Cisco2620# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B – BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E – EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
O    192.168.201.0/24 [110/20] via 192.168.103.3, 00:06:26, Virtual-Access1
192.168.103.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.103.3/32 is directly connected, Virtual-Access1
C       192.168.103.0/24 is directly connected, Virtual-Access1
202.101.93.0/24 is variably subnetted, 2 subnets, 2 masks
C       202.101.93.21/32 is directly connected, Serial0/0
C       202.101.93.0/26 is directly connected, Serial0/0
C    192.168.19.0/24 is directly connected, FastEthernet0/0
Cisco2620#
```

Ю ”Branch” ” BLIZZARD” Internet Л
”Headquarters”

```
Microsoft Windows 2000 [Version 5.00.2195]
```

```
(C)        1985-2000 Microsoft Corp.
C:\>ipconfig /all
Windows 2000 IP Configuration
Host Name . . . . . . . . . . . . : BLIZZARD
Primary DNS Suffix  . . . . . . . :
Node Type . . . . . . . . . . . . : Broadcast
IP Routing Enabled. . . . . . . . : No
WINS Proxy Enabled. . . . . . . . : No
Ethernet adapter         2:
Connection-specific DNS Suffix  . :
Description . . . . . . . . . . . : NE2000 Compatible
Physical Address. . . . . . . . . : 00-10-88-01-A5-C3
DHCP Enabled. . . . . . . . . . . : No
IP Address. . . . . . . . . . . . : 192.168.201.213
Subnet Mask . . . . . . . . . . . : 255.255.255.0
Default Gateway . . . . . . . . . : 192.168.201.1
DNS Servers . . . . . . . . . . . : 202.101.143.141
C:\>route print
===========================================================
Interface List
0x1 ........................... MS TCP Loopback interface
0x3000003 ...00 10 88 01 a5 c3 ...... Novell 2000 Adapter.
===========================================================
===========================================================Active Routes:
Network Destination       Netmask         Gateway      Interface  Metric
0.0.0.0   0.0.0.0   192.168.201.1  192.168.201.213   1
127.0.0.0   255.0.0.0    127.0.0.1   127.0.0.1      1
192.168.201.0   255.255.255.0  192.168.201.213  192.168.201.213     1
192.168.201.213  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.201.255  255.255.255.255  192.168.201.213  192.168.201.213     1
224.0.0.0  224.0.0.0  192.168.201.213  192.168.201.213   1
255.255.255.255  255.255.255.255  192.168.201.213  192.168.201.213     1
Default Gateway:    192.168.201.1
===========================================================
Persistent Routes:
None
C:\>ping 192.168.103.2
Pinging 192.168.103.2 with 32 bytes of data:
Reply from 192.168.103.2: bytes=32 time=10ms TTL=0
Reply from 192.168.103.2: bytes=32 time<10ms TTL=0
Reply from 192.168.103.2: bytes=32 time<10ms TTL=0
Reply from 192.168.103.2: bytes=32 time<10ms TTL=0
Ping statistics for 192.168.103.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  10ms, Average =  2ms
C:\>ping 192.168.19.1
Pinging 192.168.19.1 with 32 bytes of data:
Reply from 192.168.19.1: bytes=32 time<10ms TTL=254
Reply from 192.168.19.1: bytes=32 time<10ms TTL=254
Reply from 192.168.19.1: bytes=32 time<10ms TTL=254
Reply from 192.168.19.1: bytes=32 time<10ms TTL=254
Ping statistics for 192.168.19.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  0ms, Average =  0ms
C:\>ping 202.101.93.23
Pinging 202.101.93.23 with 32 bytes of data:
Reply from 202.101.93.23: bytes=32 time<10ms TTL=254
Reply from 202.101.93.23: bytes=32 time<10ms TTL=254
Reply from 202.101.93.23: bytes=32 time<10ms TTL=254
```

```
Reply from 202.101.93.23: bytes=32 time<10ms TTL=254
Ping statistics for 202.101.93.23:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum =  0ms, Average =  0ms
C:\>
```

┘ ↑ ”Branch” ў ”BLIZZARD” ┘Ѫ Internet Ѫ ”Headquarters” ˘ ў VPDN ˘ ┘ ↑ (192.168.201.213) ѐ ѝ 192.168.201.1. ┘ Â ≠ ┘Ѫ ÿ Э NAT ┘Ѫ ˈ

```
RUIJIE# show ip nat translations
Pro Inside global     Inside local      Outside local      Outside global
icmp 202.101.93.21:1024 192.168.201.213:1024 202.101.93.23:1024
202.101.93.23:1024
RUIJIE#
```

Ruijie Windows 2000 PC ˘ PC ˆ б windows 2000 ˜

PC hostname DNS ╘ Э ”Ą˘ Ruijie ”I DNS client ╖ Â ȝ ˘ Ruijie ┘Ѫ ping DNS ╘

Ruijie LAC ˈ

```
l2tp-class 1
!
pseudowire-class 1
 encapsulation l2tpv2
!
no service password-encryption
!
ip name-server 192.168.5.119
ip name-server 61.154.22.41
!
no ip ref load-sharing original
!
interface FastEthernet 0/0
 ip ref
 ip address 192.168.52.90 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet 0/1
 duplex auto
 speed auto
!
interface Virtual-ppp 1
 pseudowire hostname mm.hxs.meibu.com 1 encapsulation l2tpv2
 ppp pap sent-username user1 password  11
 ip address negotiate
!
ip route 0.0.0.0 0.0.0.0 192.168.52.1
!
ref parameter 75 400
line con 0
line aux 0
line vty 0 4
```

login

( )

( )

VPDN ( )

Virtual-template ( )

Vpdn-group( )

L2TP LNS

L2TP VPN IP IP

IP

Ruijie(config)# *poolname first-ip* [*last-ip*]	… /
Ruijie(config)# *poolname*	

poolname … / *first-ip* *last-ip*

L2TP

L2TP

Ruijie(config)# *user-name password*	
Ruijie(config)# *user-name*	

user-name *password*

( ) б

L2TP VPDN VPDN

/ VPDN

ƕ ʒ	
Ruijie(config)#	ǂ ˘ ɹ
Ruijie(config)#	ɤ VPDN

Ю˘ a Â

ʌ ɥ Ю ƕ ʒ VPDN ˘ ɹ Ɲ ǐ

ƕ ʒ	
Ruijie(config)#	˘
Ruijie(config)#	

Ю˘ a

ƕ ʒ a RFC L2TP ᵘ ˘ ɹ Ɲ
Â

ƕ ʒ	
Ruijie(config-vpdn)#	
Ruijie(config-vpdn)#	ш

Ю˘ ш ˥ Â

ʌ ɥ Ю ƕ ʒ ᵘ VPDN ˘ ɹ Ɲ ᵘ VPDN

ƕ ʒ	
Ruijie(config)# *rate_num*	˥ ˘ *rate_num* ѝ ɹ Ɲ ˘ 5 100
Ruijie(config)#	˥

Ю˘ a ˥

L2TP ˘ Â ѝ L2TP
Virtual-access ʌ Â Virtual-template '
Virtual-template ʌ ( )
IP ( )

(↵)

IP (↵)

è ˘ IP ˘ б IP

ʌ ɥ Ю ƕ ʒ ˧ Ɲ Â

ƕ ʒ	
Ruijie(config-vpdn)#	˧
Ruijie(config-vpdn)#	˧

LNS ˥ ˧ Â

ʌ ɥ Ю ƕ ʒ ˧ Ɲ Â

ƕ ʒ	
Ruijie(config-vpdn-acc-in)# { | | }	
Ruijie(config-vpdn-acc-in)#	˧

˘ ˝I Â

ʌ ɥ Ю ƕ ʒ ˧ Ɲ VPDN-group Â

ƕ ʒ	
Ruijie(config-vpdn-acc-in)# *number*	
Ruijie(config-vpdn-acc-in)#	˧

VPDN-group ˘ ˝I Â

ʌ ɥ Ю ƕ ʒ ˧ Ɲ ˩ Â ˩ ˘ ѫ VPDN-group ˧ ў ˩ б ˥ Â ˩ ˘ ѫ VPDN-group ѝ VPDN-group˘ ˧ Ɲ ѝ VPDN ˪ Â

ƕ ʒ	
Ruijie(config-vpdn)# *name*	ў ˩
Ruijie(config-vpdn)#	˧ ˩

ѐ *name* ѝ ў ˩ Â

Λ н ц Ю Ъυ ч Λυ л ˘ л ѝ
Â

Ъυ ч	
Ruijie(config-vpdn)# *name*	л
Ruijie(config-vpdn)#	ч л

è *name* ѝ л Â Ю˘ Λ н ц л ѝ л
ў Â

Λ н ц Ю Ъυ ч Λυ VPDN-group Â
б ч ˘ VPDN-group Â

Ъυ ч	
Ruijie(config-vpdn)# *src-ip*	VPDN-group
Ruijie(config-vpdn)#	ч VPDN-group

è *src-ip* ѝ VPDN-group Â

Λ н ц Ю Ъυ ч Λυ L2TP 8 Â

Ъυ ч	
Ruijie(config-vpdn)#	
Ruijie(config-vpdn)#	
Ruijie(config-vpdn)# *interval*	Hello
Ruijie(config-vpdn)#	ч Hello
Ruijie(config-vpdn)# *pass-word*	Λ ч
Ruijie(config-vpdn)#	ч Λ ч
Ruijie(config-vpdn)# *size*	8 ч Λ
Ruijie(config-vpdn)#	8 ч Λ
Ruijie(config-vpdn)# { *number* | { | } *seconds*}	8
Ruijie(config-vpdn)# { | { | }}	8

Ruijie(config-vpdn)# { | } *seconds*	/ ⁸
Ruijie(config-vpdn)# { | }	/ ⁸
Ruijie(config-vpdn)#	╗ Ю ˘ Ѣυ ʒ ⅃ ╗ ⅃ VPDN Â
Ruijie(config-vpdn)#	a ⁸ ╗
Ruijie(config-vpdn)#	RFC2661 AVP Hidden
Ruijie(config-vpdn)#	Cisco AVP Hidden Â

Ю˘ L2TP a (Cisco Ю) Â
Hello ⁸ ѝ 60 ˘ ⁸ ⅃ ⅄ ѝ 4˘ ⁸
ѝ 5˘ ⁸ ѝ 1 ˘ ⁸ ѝ 8 ˘
ѝ 600 ˘ ⁸ ѝ 300
Â L2TP ˘ L2TP ч ⅃ ⅄ ʒ˘
Ю˘ ѝ L2TP ⅄ ʒ˘ ≠ Â ѐ ˘ *interval*
Hello ˘ Æ ѝ ' *seconds* Æ ≠ Â a ⁸ ipsec ╗
' AVP Hidden Cisco ˘ RFC2661
AVP Hidden ⅃˘ RFC2661 AVP Â

⅄ ӈ Ю Ѣυ ʒ ⅃ Ѫ L2TP IP/UDP Â

Ѣυ ʒ	
Ruijie(config-vpdn)#	UDP
Ruijie(config-vpdn)#	UDP ѝ
Ruijie(config-vpdn)# *tos-value*	IP TOS
Ruijie(config-vpdn)#	⅄ IPTOS
Ruijie(config-vpdn)# *value*	IP Precedence
Ruijie(config-vpdn)#	⅄ IP Precedence

ѐ *tos-value* ѝ L2TP IP TOS ˘ *value* ѝ IP Precedence Â
Ю˘ ⅄ ӈ L2TP L2TP UDP Checksum ѝ ˘
L2TP IP TOS ѝ 0 з IP Precedence ≠ ѝ 0 Â

tos˘ precedence ⅄ L2TP ˘ PPTP ⅃ Ѫ ˘ a

⅄ ӈ Ю Ѣυ ʒ ⅃ Ѫ l2tp vrf˘ VT ⅄ Ю ' ip vrf forward ˘ vrf

ƕ ʒ	
Ruijie(config-vpdn)# *vrf-name*	vrf
Ruijie(config-vpdn)#	˧˩ vrf

ɛ̀ vrf-name ѝ vrf ˩

˥˧ ɥ Ю ƕ ʒ ˨˩ ʃʊ ˩ Â ╟ ˩˥˘ ƕ ʒ ˘ ˧˩ ˥ ˘ a ˥ ˧˥ vpdn group ˥ Â ˥ group ѝ Â

ƕ ʒ	
Ruijie(config-vpdn)# *vrf-name*	˩ ʃʊ vrf Q
Ruijie(config-vpdn)# domain-name	˧˩

ɛ̀ *domain-name* ѝ ˩˥˘ vrf-name ѝ vrf ˩

˥˧ ɥ Ю ƕ ʒ ˨˩ ʃʊ ˩ Â ƕ ʒ vpdn-domain ƕ ʒ Ю Â vpdn ˩˥˘ ƕ ʒ ˘ PPP ╥˥˧ ˥˧ Â a ƕ ʒ virtual-template ˧˩ Ю ˥˧ Â

ƕ ʒ	

Ruijie(config-vpdn-domain)#	ⅵ dns

ὲ domain-name ὶ ⅃˘ vrf-name ὶ vrf ⅃˘ *A.B.C.D* ὶ dns Â

ƕ ʒ ⁸ PPP ˘ Client LAC /ǀ ˘ LAC Ʒ LNS Client ˘ ƕ L2TP ⅃ Client Â ƕ ʒ ⅵ LNS Э Â

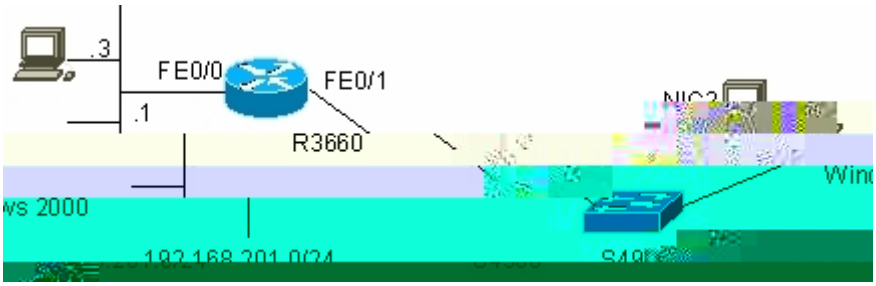
ƕ ʒ	
Ruijie(config-vpdn)#	⁸ PPP
Ruijie(config-vpdn)#	a PPP

ƕ ʒ a RFC L2TP ⁸ ˘ ⅃ Ʌ Â

ƕ ʒ	
Ruijie(config-vpdn)#	
Ruijie(config-vpdn)#	⁸ ĭ RFC

Cis

Ю Ь Â Windows 2000 Server



Windows 2000(LAC) L2TP

Ю ¦ RUIJIE б Windows 2000 Server '

1)RUIJIE '

```
RUIJIE# show running-config
Building configuration...
Current configuration : 708 bytes
!
hostname Ruijie
!
vpdn enable
!
vpdn-group 1
! Default L2TP VPDN group
accept-dialin
protocol l2tp
virtual-template 1
!
!
!
username rgnos password 7 04251F083110
!
ip local pool vpdnusers 192.168.101.3 192.168.101.253
!
interface FastEthernet 0/0
ip address 192.168.201.1 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.12.217 255.255.255.0
duplex auto
speed auto
!
interface Loopback 1
ip address 192.168.101.2 255.255.255.0
!
interface Null 0
!
interface Virtual-Template 1
ppp authentication pap
ip unnumbered Loopback 1
peer default ip address pool vpdnusers
!
!
line con 0
line aux 0
line vty 0 4
!
!
end
```

```
RUIJIE#
```

2)Windows 2000 '

```
Microsoft Windows 2000 [Version 5.00.2195]
(C)        1985-2000 Microsoft Corp.
C:\>ipconfig /all
Windows 2000 IP Configuration
Host Name . . . . . . . . . . . . : BLIZZARD
```

```
E1 - OSPF external type 1, E2 - OSPF external type 2
Gateway of last resort is not set
192.168.101.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.101.8/32 is directly connected, Virtual-Access1
C      192.168.101.0/24 is directly connected, Loopback1
C    192.168.12.0/24 is directly connected, FastEthernet0/1
C    192.168.201.0/24 is directly connected, FastEthernet0/0
RUIJIE#ping 192.168.101.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.101.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
RUIJIE#show vpdn tunnel
L2TP Tunnel Information Total tunnels 1
LocID RemID Remote Name   State  Remote Address  Port  Sessions L2TP Class/
                                                      VPDN Group
7    8    BLIZZARD     est    192.168.12.213  1701  1      1
%No active PPTP tunnels
JIE#show vst  Smat1.8 LSt  Smatnel Information Tost  Smannels 1
```

```
===========================================================
===========================================================
Active Routes:
Network Destination       Netmask         Gateway      Interface  Metric
0.0.0.0    0.0.0.0    192.168.12.1  192.168.12.213    2
0.0.0.0    0.0.0.0   192.168.101.8   192.168.101.8     1
127.0.0.0    255.0.0.0     127.0.0.1    127.0.0.1    1
192.168.12.0    255.255.255.0   192.168.12.213  192.168.12.213      1
192.168.12.213  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.12.217  255.255.255.255   192.168.12.213  192.168.12.213      1
192.168.12.255  255.255.255.255   192.168.12.213  192.168.12.213      1
192.168.101.2  255.255.255.255    192.168.101.8   192.168.101.8      1
192.168.101.8  255.255.255.255       127.0.0.1      127.0.0.1      1
192.168.101.255  255.255.255.255    192.168.101.8   192.168.101.8      1
224.0.0.0    224.0.0.0   192.168.12.213  192.168.12.213   1
224.0.0.0   224.0.0.0    192.168.101.8   192.168.101.8    1
255.255.255.255  255.255.255.255   192.168.12.213  192.168.12.213      1
Default Gateway:    192.168.101.8
===========================================================
Persistent Routes:
None
C:\>ping 192.168.101.2
Pinging 192.168.101.2 with 32 bytes of data:
```

C:\>

Ю Ruijie б Cisco 3640 L2TP ّفي Юفي Â

Cisco 3640(LAC) L2TP

Ю ↑ RUIJIE# б Cisco 3640 '

1)RUIJIE '

```
RUIJIE# show running-config
Building configuration...
Current configuration : 766 bytes
!
hostname Ruijie
!
vpdn enable
!
vpdn-group 1
! Default L2TP VPDN group
accept-dialin
protocol l2tp
virtual-template 1
l2tp tunnel authentication
l2tp tunnel password share
!
!
!
username rgnos password 7 025144391715
!
ip local pool vpdnusers 192.168.101.3 192.168.101.253
!
interface FastEthernet 0/0
ip address 192.168.201.1 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.12.217 255.255.255.0
duplex auto
speed auto
!
interface Loopback 1
ip address 192.168.101.2 255.255.255.0
!
interface Null 0
!
interface Virtual-Template 1
ppp authentication pap
ip unnumbered Loopback 1
peer default ip address pool vpdnusers
```

```
!
!
line con 0
line aux 0
line vty 0 4
!
!
end
RUIJIE#
```

2)Cisco3640

```
C3640# show running-config
Building configuration...
Current configuration : 2096 bytes
!
version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
no service dhcp
!
hostname C3640
!
!
ip subnet-zero
!
l2tp-class l2x
authentication
password 0 share
!
pseudowire-class pw
encapsulation l2tpv2
protocol l2tpv2 l2x
ip local interface FastEthernet2/0
!
no mpls ldp logging neighbor-changes
no scripting tcl init
no scripting tcl encdir
!
no voice hpi capture buffer
no voice hpi capture destination
!
controller E1 3/0
channel-group 1 timeslots 1-2
!
!
!
interface Loopback0
ip address 132.11.10.2 255.255.255.0
!
interface FastEthernet2/0
ip address 192.168.12.242 255.255.255.0
speed auto
duplex auto
!
interface FastEthernet2/1
ip address 192.168.203.1 255.255.255.0
duplex auto
speed auto
!
interface Serial3/0:1
```

```
ip address 192.168.1.2 255.255.255.0
!
interface Virtual-PPP1
ip address negotiated
no cdp enable
ppp pap sent-username rgnos password 0 rgnos
pseudowire 192.168.12.217 11 pw-class pw
!
no ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 FastEthernet2/0 192.168.12.1
!
!
dial-peer cor custom
!
dial-peer voice 111 voip
session protocol sipv2
codec g711alaw
!
!
line con 0
exec-timeout 0 0
line aux 0
line vty 0 4
privilege level 15
no login
line vty 5 871
login
!
!
end
```

ЮЎ L2TP Л Лъ '

1)RUIJIE '

```
RUIJIE# show ip route
Codes: C - connected, S - static,  R - RIP
O - OSPF, IA - OSPF inter area
E1 - OSPF external type 1, E2 - OSPF external type 2
Gateway of last resort is not set
192.168.101.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.101.9/32 is directly connected, Virtual-Access1
C      192.168.101.0/24 is directly connected, Loopback1
C   192.168.12.0/24 is directly connected, FastEthernet0/1
C   192.168.201.0/24 is directly connected, FastEthernet0/0
RUIJIE# show vpdn
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name  State  Remote Address  Port  Sessions L2TP Class/
                                                      VPDN Group
9    21511 C3640        est    192.168.12.242  1701  1       1
LocID     RemID     TunID     Username, Intf/     State  Last Chg
                              Vcid, Circuit
1      14        9         ,Vi1           est    00:18:06
%No active PPTP tunnels
RUIJIE#ping 192.168.101.9
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.101.9, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
RUIJIE#
```

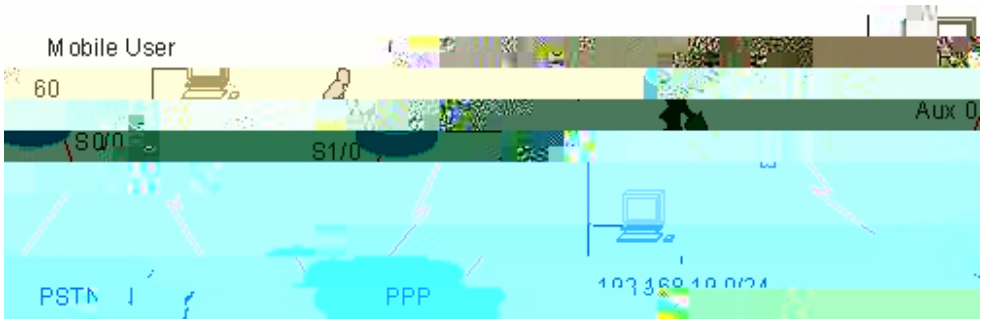
↓ L2TP ╖ Â

2)Cisco 3640

```
C3640# show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route
Gateway of last resort is 192.168.12.1 to network 0.0.0.0
C    192.168.12.0/24 is directly connected, FastEthernet2/0
     132.11.0.0/24 is subnetted, 1 subnets
C       132.11.10.0 is directly connected, Loopback0
C    192.168.1.0/24 is directly connected, Serial3/0:1
192.168.101.0/32 is subnetted, 2 subnets
C       192.168.101.9 is directly connected, Virtual-PPP1
C       192.168.101.2 is directly connected, Virtual-PPP1
S*   0.0.0.0/0 [1/0] via 192.168.12.1, FastEthernet2/0
C3640# show vpdn
%No active L2F tunnels
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name   State  Remote Address  Port  Sessions L2TP Class/
                                                      VPDN Group
21511 9     R3660       est    192.168.12.217  1701  1     l2x
LocID      RemID      TunID      Username, Intf/      State  Last Chg Uniq ID
                                 Vcid, Circuit
14      1       21511      11, Vp1       est    00:23:58   2
%No active PPTP tunnels
C3640# ping 192.168.101.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.101.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
C3640#
```

Cisco 3640 L2TP

Ruijie Cisco 2620 L2TP Cisco2620 (Access Server) LAC ISP Cisco AS5300 Cisco AS5800 Cisco 2620 L2TP L2TP Cisco 2620 RUIJIE PPP (Mobile User) RUIJIE Mobile User L2TP a Mobile User



Cisco 2620(LAC) L2TP

Ю ¦ RUIJIE б Cisco 2620 '

1)RUIJIE '

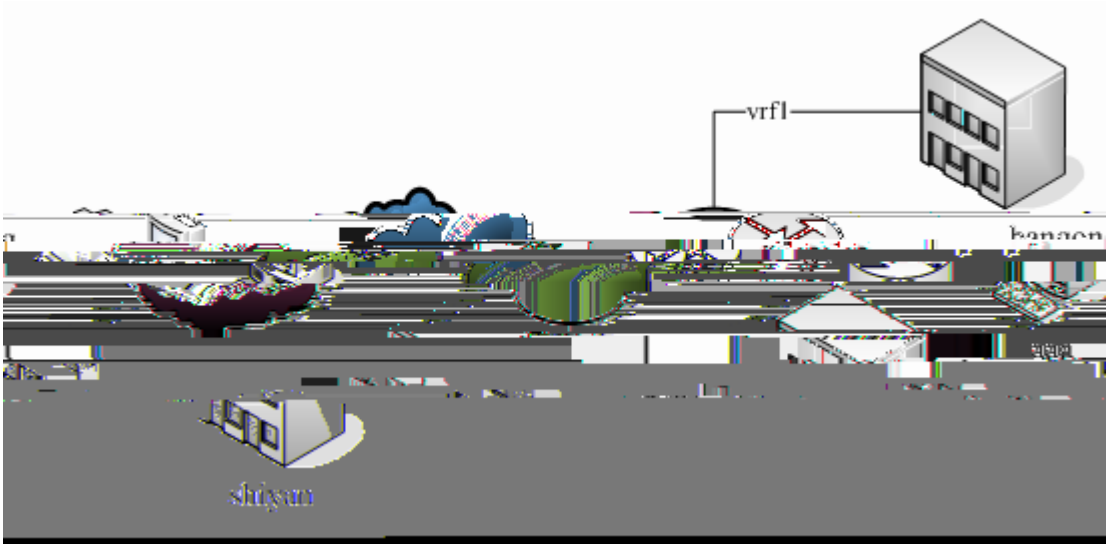
```
RUIJIE# show running-config
Building configuration...
Current configuration : 989 bytes
!
hostname Ruijie
!
vpdn enable
!
vpdn-group 1
! Default L2TP VPDN group
accept-dialin
protocol l2tp
virtual-template 1
l2tp tunnel authentication
l2tp tunnel password share
!
!
!
username rgnos password 7 025144391715
username pc@i-net.com.cn password 7 127654431B
!
ip local pool vpdnusers 192.168.101.3 192.168.101.253
!
interface serial 1/0
encapsulation PPP
ip address 202.101.93.21 255.255.255.0
!
interface serial 1/1
clock rate 64000
!
interface serial 1/2
clock rate 64000
!
interface serial 1/3
clock rate 64000
!
interface FastEthernet 0/0
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.19.1 255.255.255.0
duplex auto
speed auto
!
interface Loopback 1
```

```
ip address 192.168.101.2 255.255.255.0
!
interface Null 0
!
interface Virtual-Template 1
ppp authentication pap
ip unnumbered Loopback 1
peer default ip address pool vpdnusers
!
!
line con 0
line aux 0
line vty 0 4
!
!
end
RUIJIE#
```

2)Cisco2620

```
Cisco2620# show running-config
Building configuration...
Current configuration : 1677 bytes
!
version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
no service dhcp
!
hostname Cisco2620
!
!
username pc password 0 1111
username 163 password 0 163
no aaa new-model
ip subnet-zero
!
!
!
vpdn enable
!
vpdn-group 1
request-dialin
protocol l2tp
domain i-net.com.cn
initiate-to ip 202.101.93.21
l2tp tunnel password 7 0832444F1B1C
!
interface FastEthernet0/0
ip address 192.168.7.1 255.255.255.0
duplex auto
speed 10
!
interface Serial0/0
ip address 202.101.93.23 255.255.255.0
encapsulation ppp
fair-queue
clockrate 2000000
!
interface Serial0/1
no ip address
```

```
shutdown
!
interface Async65
ip address 5.5.5.5 255.255.255.0
encapsulation ppp
dialer in-band
dialer idle-timeout 30000
dialer string 8435
dialer-group 1
async mode dedicated
peer default ip address 5.5.5.6
ppp authentication pap
!
no ip http server
ip classless
!
dialer-list 1 protocol ip permit
!
!
line con 0
exec-timeout 0 0
line aux 0
login local
modem InOut
transport input all
Z
```




```
ip vrf vrf1
ip vrf vrf2
!
vpdn enable
vpdn domain-delimiter @/%#-\ suffix
vpdn authorize domain split
!
vpdn-group 1
! Default L2TP VPDN group
accept-dialin
  protocol l2tp
  virtual-template 1
domain bangong vrf vrf1   /*      */
domain shiyan vrf vrf2   /*      */
!
!
username rgnos password 7 025144391715
username pc@i-net.com.cn password 7 127654431B
!
ip local pool vpdnusers 192.168.101.3 192.168.101.253
!
interface FastEthernet 0/1
ip address 192.168.19.1 255.255.255.0
duplex auto
speed auto
!
interface Loopback 1
ip vrf forward vrf1
ip address 192.168.101.2 255.255.255.0
!
interface Loopback 2
ip vrf forward vrf2
ip address 192.168.101.2 255.255.255.0
!
interface Null 0
!
interface Virtual-Template 1
ppp authentication pap
ip unnumbered Loopback 1
peer default ip address pool vpdnusers
!
!
line con 0
```

```
line aux 0
line vty 0 4
!
!
end
```

ˈ

˩ ˨˩ Э ˩ LNS˘ a ˩ ˘ VP ˨˥ ≠ ˥ a ˩ VRF Â
ĭ ‡ ˩ ч VP ˨˥˥ ˩ ˘ ч VP ˨˥ ˘ ˨˥
Â LNS ˘ ч VA ˨˥ a ˩ VRF ˘ a ˩ a ˩ VRF˘ ÿ LNS
VP ˨˥ ˘ ˩ ÿ ˨˥ VP ˨˥ ˘ a Â Ю˘
a ˨˩ ˘ ˩ ÿ LNS ping ping Â

˨˥ ӈ L2TP б ╖ Â

˨˥ ӈ ЛЮЂ ҙ L2TP˙

ЂЈ ҙ	
Ruijie# [[*locid*]]	vpdn Л ˈ id
ˈ Ruijie> [[*locid*]]	
Ruijie#	vpdn error
Ruijie#	vpdn error
Ruijie#	vpdn event
Ruijie#	vpdn event
Ruijie#	vpdn packet
Ruijie#	vpdn packet
Ruijie#	vpdn l2x-data
Ruijie#	vpdn l2x-data
Ruijie#	vpdn l2x-errors
Ruijie#	vpdn l2x-errors
Ruijie#	vpdn l2x-events
Ruijie#	vpdn l2x-events
Ruijie#	vpdn l2x-packets
Ruijie#	vpdn l2x-events

```
Ruijie# debug vpdn packet
vpdn packet debugging is on
Ruijie# show debug
VPDN:
vpdn events debugging is on
vpdn protocol errors debugging is on
vpdn packet debugging is on
Ruijie#
VPDN PROCESS From tunnel: Received 158 byte pak
L2X: UDP socket write 168 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
L2X: UDP socket write 40 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
VPDN PROCESS From tunnel: Pak consumed
VPDN PROCESS From tunnel: Received 70 byte pak
L2X: UDP socket write 40 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
VPDN PROCESS From tunnel: Pak consumed
VPDN PROCESS From tunnel: Received 76 byte pak
Get virtual-access from free queue: Virtual-Access1
Clone virtual-access from interface Virtual-Template1
L2X: UDP socket write 56 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
L2X: UDP socket write 40 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
VPDN PROCESS From tunnel: Pak consumed
VPDN PROCESS From tunnel: Received 76 byte pak
L2X: UDP socket write 40 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
Vi1 Tnl/Sn 3/1 L2TP: Virtual interface created for unknown, bandwidth 1024
Kbps
Vi1 Tnl/Sn 3/1 L2TP: VPDN session up
VPDN PROCESS From tunnel: Pak consumed
VPDN PROCESS From tunnel: Received 50 byte pak
```

```
L2X: UDP socket write 45 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
L2X: UDP socket write 50 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
VPDN PROCESS From tunnel: Received 50 byte pak
Vi1 VPDN PROCESS From tunnel: Queue 14 byte pak to ppp parse and iqueue
Vi1 VPDN PROCESS From tunnel: Pak send successful
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
L2X: UDP socket write 50 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
VPDN PROCESS From tunnel: Received 50 byte pak
Vi1 VPDN PROCESS From tunnel: Queue 14 byte pak to ppp parse and iqueue
Vi1 VPDN PROCESS From tunnel: Pak send successful
VPDN PROCESS From tunnel: Received 50 byte pak
Vi1 VPDN PROCESS From tunnel: Queue 14 byte pak to ppp parse and iqueue
Vi1 VPDN PROCESS From tunnel: Pak send successful
Vi1 VPDN PROCESS Into tunnel: Sending 50 byte pak
L2X: UDP socket write 50 bytes, 192.168.12.217(1701) to 192.168.12.242(1701)
%UPDOWN: Line protocol on Interface Virtual-Access1, changed state to up
Ruijie# show ip route
Codes: C - connected, S - static,  R - RIP
O - OSPF, IA - OSPF inter area
E1 - OSPF external type 1, E2 - OSPF external type 2
Gateway of last resort is not set
192.168.101.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.101.5/32 is directly connected, Virtual-Access1
C      192.168.101.0/24 is directly connected, Virtual-Access1
C   192.168.12.0/24 is directly connected, FastEthernet0
C   192.168.201.0/24 is directly connected, Ethernet0
Ruijie#
```

L2TP ï ╖ ⁸ ˘ ┘Ƶ L2TP ÂЮ
Юˇ LNS ↓ (б)
L2TP '

```
Ruijie# show vpdn
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name  State  Remote Address  Port  Sessions L2TP Class/
                                                      VPDN Group
20    26656 C3640      est    192.168.12.242  1701  1     1
LocID   RemID    TunID   Username, Intf/    State  Last Chg
                           Vcid, Circuit
1      1279      20        rgnos,Vi1       est    00:00:38
%No active PPTP tunnels
Ruijie#
```

Ю Ю˘ LAC L2TP Server

(б) ˘ ╖ Â

```
Ruijie# no debug all
All possible debugging has been turned off
Ruijie# debug vpdn l2x-events
L2X protocol events debugging is on
Ruijie# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Ruijie(config)# interface virtua5hppp 1
Ruijie(config-if)# no shut
Ruijie(config-if)# end
Ruijie#
Tnl 21 L2TP: SM State idle
Tnl 21 L2TP: O SCCRQ
Tnl 21 L2TP: Control channel retransmit delay set to 1 seconds
Tnl 21 L2TP: Tunnel state change from idle to wait-ctl-reply
Tnl 21 L2TP: SM State wait-ctl-reply
Tnl 21 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 96, tnl 0, ns 0, nr 0
Tnl 21 L2TP: Control channel retransmit delay set to 1 seconds
Tnl 21 L2TP: I SCCRP from
Tnl 21 L2TP: O SCCCN  to BLIZZARD tnlid 40
Tnl 21 L2TP: Control channel retransmit delay set to 1 seconds
Tnl 21 L2TP: Tunnel state change from wait-ctl-reply to established
Tnl 21 L2TP: SM State established
Vi1 Tnl/Sn 21/1 L2TP: O ICRQ to BLIZZARD 40/0
Vi1 Tnl/Sn 21/1 L2TP: Control channel retransmit delay set to 1 seconds
Vi1 Tnl/Sn 21/1 L2TP: Session state change from wait-for-tunnel to wait-reply
Vi1 Tnl/Sn 21/1 L2TP: I ICRP from BLIZZARD
Vi1 Tnl/Sn 21/1 L2TP: O ICCN to BLIZZARD 40/1
Vi1 Tnl/Sn 21/1 L2TP: Control channel retransmit delay set to 1 seconds
Vi1 Tnl/Sn 21/1 L2TP: Session state change from wait-reply to established
%UPDOWN: Interface Virtua5hPPP1, changed state to up
%UPDOWN: Line protocol on Interface Virtua5hPPP1, changed state to up
Ruijie# show vpdn
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name  State  Remote Address  Port  Sessions L2TP Class/
                                                      VPDN Group
21    40    BLIZZARD     est    192.168.12.213  1701  1
LocID    RemID   TunID    Username, Intf/    State  Last Chg
                            Vcid, Circuit
1      1        21        13,Vi1          est    00:00:27
%No active PPTP tunnels
Ruijie#
```

L2TP ж Л L2TP ⁸ Â

Ю Ю˘ LNS ↓ (

б) ˘ ╖ Â

```
Ruijie# no debug all
All possible debugging has been turned off
Ruijie# debug vpdn l2x-packets
L2X control packets debugging is on
Ruijie# show vpdn
%No active L2TP tunnels
%No active PPTP tunnels
Ruijie#
L2TP: I SCCRQ from C3640 tnl 18889
L2X: Parse  AVP 0, len 8, flag 0x8000 (M)
L2X: Parse SCCRQ
L2X: Parse  AVP 2, len 8, flag 0x8000 (M)
L2X: Protocol Ver 1
L2X: Parse  AVP 6, len 8, flag 0x0
L2X: Firmware Ver 0x1130
L2X: Parse  AVP 7, len 11, flag 0x8000 (M)
L2X: Hostname C3640
L2X: Parse  AVP 8, len 25, flag 0x0
L2X: Vendor Name Cisco Systems, Inc.
L2X: Parse  AVP 10, len 8, flag 0x8000 (M)
L2X: Rx Window Size 800
L2X: Parse  AVP 11, len 22, flag 0x8000 (M)
L2X: Chlng
       98 20 4E 34 6A 4C E1 E7 FA CF 58 07 FF 4E 56 A3
L2X: Parse  AVP 9, len 8, flag 0x8000 (M)
L2X: Assigned Tunnel ID 18889
L2X: Parse  AVP 3, len 10, flag 0x8000 (M)
L2X: Framing Cap 0x3
L2X: Parse  AVP 4, len 10, flag 0x8000 (M)
L2X: Bearer Cap 0x3
L2X: No missing AVPs in SCCRQ
L2X: I SCCRQ, flg TLS, ver 2, len 130, tnl 0, ns 0, nr 0 contiguous pak, size
130
C8 02 00 82 00 00 00 00 00 00 00 80 08 00 00
00 00 00 01 80 08 00 00 00 02 01 00 00 08 00 00
00 06 11 30 80 0B 00 00 00 07 43 33 36 34 30 00
19 00 00 00 08 43 69 73 63 6F 20 53 79 73 74 65
6D 73 2C 20 49 6E 63 2E ...
Tnl 22 L2TP: O SCCRP  to C3640 tnlid 18889
Tnl 22 L2TP: O SCCRP, flg TLS, ver 2, len 140, tnl 18889, ns 0, nr 1
C8 02 00 8C 49 C9 00 00 00 00 00 01 80 08 00 00
00 00 00 02 80 08 00 00 00 02 01 00 80 0A 00 00
00 03 00 00 00 01 80 0A 00 00 00 04 00 00 00 00
00 08 00 00 00 06 11 30 80 0A 00 00 00 07 52 36
32 31 00 0E 00 00 00 08 ...
Tnl 22 L2TP: O ZLB ctrl ack, flg TLS, ver 2, len 12, tnl 18889, ns 1, nr 1
C8 02 00 0C 49 C9 00 00 00 01 00 01
Tnl 22 L2TP: Parse  AVP 0, len 8, flag 0x8000 (M)
Tnl 22 L2TP: Parse SCCCN
Tnl 22 L2TP: I SCCCN from C3640 tnl 18889
Tnl 22 L2TP: Parse  AVP 13, len 22, flag 0x8000 (M)
Tnl 22 L2TP: Chlng Resp
5C D5 A4 37 36 A6 7D 0F FE EF 22 48 B8 DF F5 12
Tnl 22 L2TP: No missing AVPs in SCCCN
Tnl 22 L2TP: I SCCCN, flg TLS, ver 2, len 42, tnl 22, ns 1, nr 1 contiguous
pak, size 42
C8 02 00 2A 00 16 00 00 00 01 00 01 80 08 00 00
00 00 00 03 80 16 00 00 00 0D 5C D5 A4 37 36 A6
7D 0F FE EF 22 48 B8 DF F5 12
Tnl 22 L2TP: O ZLB ctrl ack, flg TLS, ver 2, len 12, tnl 18889, ns 1, nr 2
C8 02 00 0C 49 C9 00 00 00 01 00 02
```

```
Vi1 Tnl/Sn 21/1 L2TP: Parse ICRP
Vi1 Tnl/Sn 21/1 L2TP: Parse  AVP 14, len 8, flag 0x8000 (M)
Vi1 Tnl/Sn 21/1 L2TP: Assigned Call ID 1
Vi1 Tnl 21/1 L2TP: No missing AVPs in ICRP
Vi1 Tnl/Sn 21/1 L2TP: I ICRP, flg TLS, ver 2, len 28, tnl 21, lsid 1, rsid
1, ns 1, nr 3 contiguous pak, size 28
C8 02 00 1C 00 15 00 01 00 01 00 03 80 08 00 00
00 00 00 0B 80 08 00 00 00 0E 00 01
Vi1 Tnl/Sn 21/1 L2TP: O ICCN to BLIZZARD 41/1
Vi1 Tnl/Sn 21/1 L2TP: O ICCN, flg TLS, ver 2, len 40, tnl 41, lsid 1, rsid
1, ns 3, nr 2
C8 02 00 28 00 29 00 01 00 03 00 02 80 08 00 00
00 00 00 0C 80 0A 00 00 00 18 00 98 96 80 80 0A
00 00 00 13 00 00 00 01
Tnl 21 L2TP: O ZLB ctrl ack, flg TLS, ver 2, len 12, tnl 41, ns 4, nr 2
C8 02 00 0C 00 29 00 00 00 04 00 02
Tnl 21 L2TP: I ZLB ctrl ack, flg TLS, ver 2, len 12, tnl 21, ns 2, nr 4
%UPDOWN: Interface Virtual-PPP1, changed state to up
%UPDOWN: Line protocol on Interface Virtual-PPP1, changed state to up
Ruijie# show vpdn
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name   State  Remote Address  Port  Sessions L2TP Class/
                                                        VPDN Group
21    41    BLIZZARD     est    192.168.12.213  1701  1
LocID     RemID     TunID     Username, Intf/     State  Last Chg
                            Vcid, Circuit
1         1         21        13,Vi1             est    00:00:13
%No active PPTP tunnels
Ruijie#
```

ʎ ɥ Ю ƕ ʒ ˧ Ʌ L2TP Â

ƕ ʒ	
Ruijie# [{ | } [*remote-host-name*]]	

ɛ̀ *remote-host-name* ў ɹ Â ˘ ʎ ɥ L2TP ƕ ʒ
˙ ˙ ˘ ˧ Ʌ ˧ L2TP Â Ю
˛

```
Ruijie# show vpdn
L2TP Tunnel and Session Information Total tunnels 1 sessions 1
LocID RemID Remote Name   State  Remote Address  Port  Sessions L2TP Class/
                                                    VPDN Group
22    18889 C3640     est    192.168.12.242  1701  1       1

LocID   RemID    TunID    Username, Intf/    State  Last Chg
                            Vcid, Circuit
1      1280      22        ,Vi1            est    00:14:52
%No active PPTP tunnels
Ruijie# clear vpdn tunnel
Ruijie#
%UPDOWN: Line protocol on Interface Virtual-Access1, changed state to down
%CHANGED: Interface Virtual-Access1, changed state to administratively down
Ruijie# show vpdn
%No active L2TP tunnels
%No active PPTP tunnels
```

Ruijie#

Ю /ʍ ӊ L2TP ὲ ʽ

б Windows Ɲ L2TP Â ˘ MicroSoft Windows 2000

L2TP˘ ˧ PPTP Ậ L2TP Windows

2000 Ɲ Windows XP ≠ L2TP б IPSec/ IKE ˘ Windows

2000/XP б ὲ MicroSoft ӊ L2TP ὲ ”Ą MicroS Ţf-0.0771 Ɪ

ʌ˘ Ʌ Э ч ˘ ʌ L2TP
0.0.0.0/0 Â

Tunnel ᴧ ╖ ˘ ᴧ Â Tunnel ᴧ a
˘ Â

Tunnel ᴧ Â

Tunnel ╖ Ю Ь ў ǂ ʽ

ʽ Tunnel ( ) Â ᴧ ң ˇ Tunnel ᴧ Э
ᴧ IP й ’

ʽ γ Â ᴧ ң

Tunnel ᄉ ˘ Э ˘ Ю ЛЮ ᄂ У Â

Tunnel ˘ ᄉ ˆ hop˜ ˘ ᄂ Э ᄂ ὲ
a Â Tunnel Tunnel б a Â

Tunnel ˘ ⁸ (ACL) ˘
’ ᄂ (MTU) ≠ Â

Ю ᄉ Ӯ Tunnel ᄉ ˘ ὲ (IP Ѫ ὲ ȁ
) Â

Tunnel ᄉ ᄂ :

Tunnel ᄉ ’
Tunnel ᄉ ’
Tunnel ᄉ ’
Tunnel ’
Tunnel ˆ ᄂ ˜ ’
Tunnel ᄉ Keyˆ ᄂ ˜ ’
Tunnel ‡ˆ ᄂ ˜ ’
Tunnel TOSˆ ᄂ ˜ ’
Tunnel TTLˆ ᄂ ˜ ’
Tunnel ᄉ PMTUD ╥ ˆ ᄂ ˜ ’
Tunnel ╥ ˆ ᄂ ˜ ’
Tunnel VRFˆ ᄂ ˜ ’

… Tunnel ᄉ ᄉ ˘ ЛЮѢ ʒ'

Ѣ ʒ	
Ruijie(config)# *tunnel-number*	Tunnel ᄉ
Ruijie(config)# *tunnel-number*	… Tunnel ᄉ

ᄂ ὲ ᄉ ˘ Tunnel ᄉ … Tunnel ᄉ Â

Tunnel ᄉ ˘ ѝ ᄉ ˘
Loopback ѝ Â tunnel ᄉ ˘
Â

Tunnel ᄉ ˘ tunnel ᄉ ЛЮѢ ʒ'

Ѣ ʒ	

Ruijie(config-if)# {*ip-address* | *interface-number*}	Tunnel ʌ
Ruijie(config-if)#	↓ Tunnel ʌ

Ъυ ʒ Tunnel ʌ ˘ ≠ Tunnel æ Â

tunnel ʌ ˘ tunnel ʌ ЛьЮЪυ ʒ'

Ъυ ʒ	
Ruijie(config-if)# { *ip-address* }	Tunnel ʌ
Ruijie(config-if)#	↓ Tunnel ʌ

Ъυ ʒ Tunnel ʌ ˘ ≠ Tunnel æ Â

↓ ʌ Э˘ ↓ ˘ … ч ↓ Tunnel ʌ Â

Tunnel Tunnel Â Tunnel ʌ GRE Â ˘ ≠ ↓Л υ ā Tunnel ʌ Â

Ъυ ʒ	
Ruijie(config-if)# { | }	Tunnel
Ruijie(config-if)#	↓ Tunnel ʌ ˘

Ъυ ʒ б ʌ ˘ Лυ й Â

ЮЎ Tunnel

Ъυ ʒ	
Ruijie(config-if)#	Tunnel
Ruijie(config-if)#	↓ Tunnel

ЮЎ Tunnel ʌ a Â

Ruijie(config-if)#	⺈ Tunnel TOS

Ю˘ б IPv4 ˘ ‡ IPv4 tos
IPv4 Â ὲ ˘ IPv4 tos ὴ Â

⺈ ⺈ ⺈ MTU˘ ⺈ ˘ .
IP DF˘ Don't Fragment˜ Æ Â ≠ ⺈ ⺈ ˘
PMTU ⺈ ˘ ⺈ Â ⺈ ӊ ⺈ Ю tunnel
path-mtu-discovery ƕ ʒ˘ ╟ PMTU˘ tunnel ⺈ mtu
˘ ÿ ⺈ Â

ƕ ʒ	

Ruijie(config-if)#

Ruijie(config-if)#	[*seconds* [*retries*]]	Tunnel	╖
Ruijie(config-if)#		ᴧ Tunnel	╖

ƕ ʒ a б tunnel vrf ip vrf forward ƕ ʒ Â

IPv4 VRF Â Юƕ ʒ'

ƕ ʒ	
Ruijie(config-if)# *vrf-name*	Tunnel VRF
Ruijie(config-if)#	ᴧ Tunnel VRF

Ю˘ IPv4 VRF Â IP б IP
ᴧ VRF Â VRF ˘ IP ᴧ ˘ ѫ ᴧ down
Â

tunnel vrf ╖ ˘ ᴧ

```
tunnel source 179.208.12.221
tunnel destination 179.208.12.55
!
interface FastEthernet0/0
ip address 179.208.12.221 255.255.255.0
!
interface FastEthernet0/1
ip address 202.126.101.2 255.255.255.0
!
```

R2 ˈ

```
interface Tunnel0
ip address 21.21.21.5 255.255.255.0
tunnel source 179.208.12.55
tunnel destination 179.208.12.221
!
interface FastEthernet0/0
ip address 179.208.12.55 255.255.255.0
!
interface FastEthernet0/1
ip address 67.151.69.202 255.255.255.0
!
```

ÿ Э ˧ Ɲ ˘ R1 б R2 Ɲ ʌ f0/0 Tunneľ Ɲ ʌ f0/1 б й Â

ʌ ɥ ƕ ʒ show interfaces tunnel Ɲ ƕ ʒ debug [gre/ip | ipip] б ʌ Â

ƕ ʒ	
Ruijie# *tunnel-number*	Tunnel ʌ
Ruijie#	GRE Â
Ruijie#	Tunnel
Ruijie#	Tunnel

Ю ˥ ƕ ʒ show interfaces tunnel Ɲ ƕ ʒ debug Â

show interfaces tunnel ƕ ʒ

```
Ruijie# show interfaces tunnel 1
Tunnel 1 is UP  , line protocol is UP
Hardware is  Tunnel
Interface address is: 1.1.1.1/24
MTU 1500 bytes, BW 9 Kbit
Encapsulation protocol is Tunnel, loopback not set
Keepalive interval is 0 sec , no set
Carrier delay is 0 sec
RXload is 1 ,Txload is 1
Tunnel source 192.168.200.200 (FastEthernet 0/0), destination 192.168.200.100
Tunnel protocol/transport GRE/IP, key 0xea
```

```
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
0 packets output, 0 bytes, 0 underruns
```

' ⊾˘ ⅃Ƨ ⅄ ˘ Ƨ a Â
IKE ⊾ Â

... a ╗ ˘ ⅄ IKE
Â

' ƧЮ ч '

' ĭ Â

' ĭ Â

' a Â

' . ˘ / ȁ / ȁ IP Ю ȁ
⅄ Â ⅄ ⅃Ƨ any Â ˘ ⅂ Э ˚
ѝ Â ⅃ Ʒ ч ў TCP ˘ ≠ ⅃ Ʒ ч
Â

' б IPSec ὲ Â

ˆ ˜ ѝ ⊾ ˘
⊾ ˘ ˘ ˘ Ƨ Â IPSec
IKE ч ˘ IPSec IPSec ╗ ˘ ⅃Ƨ
˘ ⅃Ƨ IKE ' IKE IKE Â

ˆ

IPSec й ч IPSec ˘ ч л ˘ Â Ђ
˘ ˘ з Ђ
˘ IPSec ˘ ˘
Â

Ђ л Л ˘
Л л Â ˘ ╗
л Э˘ л Л л Â

╗ л Л ˘ а л ˘ б
ה ˆ في ה ˜ Â ה
permit ˘ ╗ й ipsec-manualˇ ‡ IPSec ˘
, ╗ й ipsec-isakmpˇ IPSec ˘
‡ IPSec ˘ ї ‡ ╠ IKE ң IPSec Â
IPSec IKE ˘ ˘ Â

˘ IPSec ╗ л ˘ ,
й ˘ ˘ à л Â

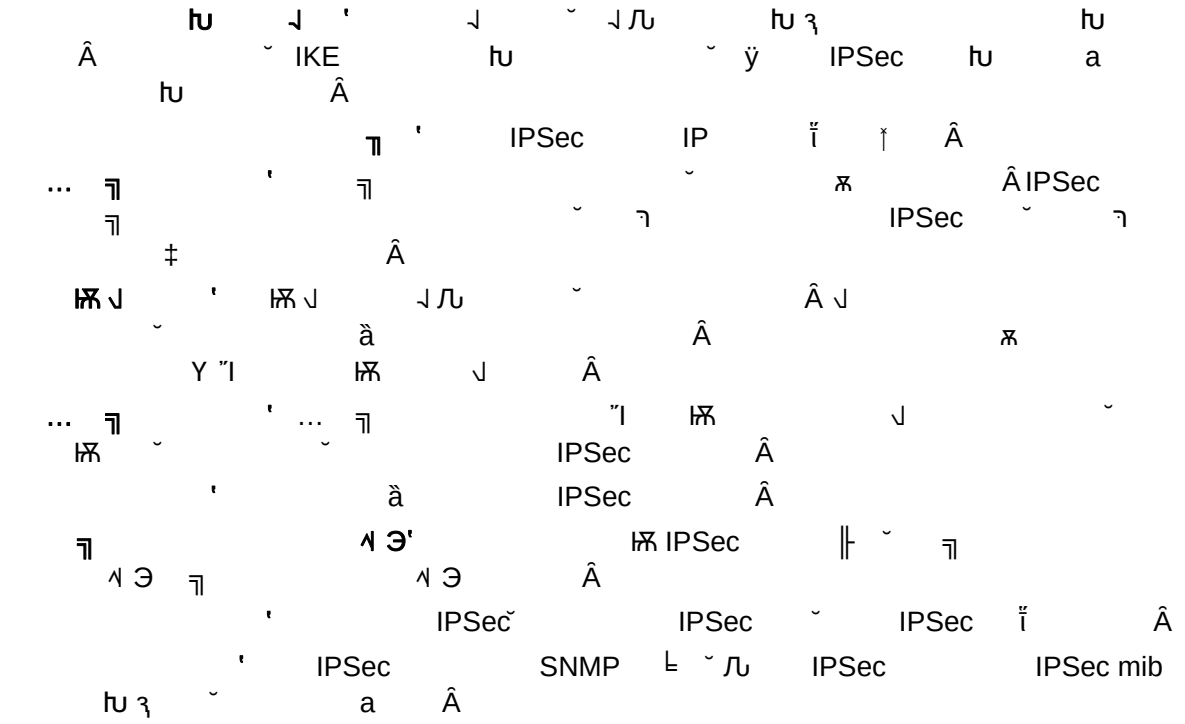
╗ л ˘ л Ђ IPSec à Â ч
IPSec ˘ Â

Юفي IPSec '

IPSec

IPSec Ь й IPSec ˘ IPSec л Л ≠
л Л IKE Â IKE Ў ˘ ˘ æ’ IKE
IPSec IKE ˘ Â

IPSec ЛЮ Ь'

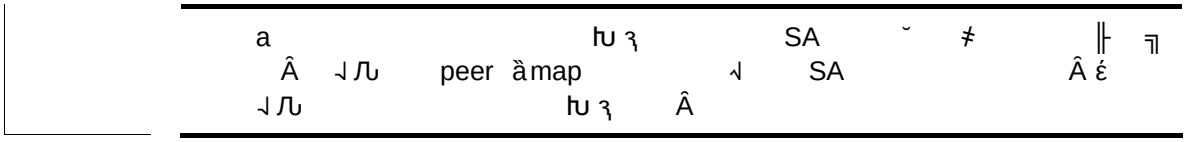


ƕ ⅃ ' ⅃ ˘ ⅃ ⅄ ƕ ʒ ƕ
Â ˘ IKE ƕ ˘ ÿ IPSec ƕ a
ƕ Â
╗ ' IPSec IP ĭ ǂ Â
… ╗ ' ╗ ˘ ѫ Â IPSec
╗ ˘ ˥ IPSec ˘ ˥
‡ Â
ѭ ⅃ ' ѭ ⅃ ⅃ ⅄ ˘ Â ⅃
˘ ȁ Â ѫ
Y ˝I ѭ ⅃ Â
… ╗ ' … ╗ ˝I ѭ ⅃ ˘
ѭ ˘ ˘ IPSec Â
' ȁ IPSec Â
╗ ⅄ Э' ѭ IPSec ╟ ˘ ╗
⅄ Э ╗ ⅄ Э Â
' IPSec˘ IPSec ˘ IPSec ĭ Â
' IPSec SNMP ╘ ˘ ⅄ IPSec IPSec mib
ƕ ʒ ˘ a Â

IKE UDP ⅄ 500 Â IPSec ESP AH ⅄ 50 ȁ 51 Â Э ˆ ˜ ˘ ѫ IPSec ⅄ ˘ IPSec ⅄ Э 50 ȁ51 ⅄ UDP ⅄ 500 Â ⅃ Ю˘ ⅃ ⅄ ╗ ⅄ Â	

ƕ ˘ Ю ⅄ Ю ƕ ʒ'

ƕ ʒ	
Ruijie(config)# *seconds*	⅃ IPSec SA ƕ ⁸ Â ƕ ʒ ⅄ ˘ Â
Ruijie(config)# *kilobytes*	⅃ IPSec SA ƕ Â ƕ ʒ IPSec ˆ ⅄ KB ˜ ⅄ ˘ Â
Ruijie#	Â ' ⅄ ˘ ƕ ˘ ĭ ‡˘ ƕ Â
' Ruijie#	{*ip-address* | *peer-name*}
' Ruijie#	*map-name*



a ƕ ʒ SA ˘ ≠ ╟ ╗ Â ⅃ ⅄ peer ȁ map ⅃ SA Â ɛ́ ⅃ ⅄ ƕ ʒ Â	

Ъυ й 1 ˆ 3600

```
!
!
interface FastEthernet0/0
ip address 192.168.10.38 255.255.255.0
ip broadcast-address 0.0.0.0
crypto map armadillo
crypto ipsec df-bit copy
!
interface FastEthernet0/1
ip address 192.168.11.75 255.255.255.0
ip broadcast-address 0.0.0.0
crypto map basilisk
!
```

╗ ⌧ ╗ ˘ a ╗ Â ˘ ┘ Ʌ… ╗
Aˆ 192.168.202.0/24˜ Bˆ 192.168.12.0/24˜ IP ˆ
120˜ ˘ ў A ў B IP ˆ 101˜ ˈ

access-list 120 permit ip 192.168.12.0 0.0.0.255 192.168.202.0 0.0.0.255

access-list 101 permit ip host 2.2.2.2 host 2.2.2.1

IPSec ╗ ╗ ЛЮ ў ╗ ˈ
IPSec ╗ ˆ permit= ˜ Â
IPSec ˘ ѫ ˆ
permit ˜ Â
˘ ὲ ┘ IPSec Â
IPSec IKE ˘ ᾱ ĭ ┘ Ʒ IPSec
ˆ ┘ ipsec-isakmp ╗ ˜ Â ч ┐ ˘
˘ ч Â

╗ ˘ Ю ЛЮЮ ʒˈ

Ю ʒ	
Ruijie(config)# *access-list-number* { | } *protocol source source-wildcard destination destination-wildcard* [ ]	ÿ ὲ ȁ ┘ Â permit ˚ IP ┘ ╗ ╗ Â deny ┘ Ʌ ┘ ╗ ╗ Â
Ruijie(config-exp-nacl)#	⁸

permit ˚ IP ┘ ╗ ╗
Â deny ┘ Ʌ ┘ ╗ ╗ Â

	˘ Э ⌧ ╗ ˘ Э ⌧ ╗ ˘ ĭ ‡˘ a Â acl ˛ ˝I ˘ ace ˘ ă ˘ ˛ ˝I Â

ah-md5-hmac	AH ˇ MD5 HMAC
ah-sha-hmac	AH ˇ SHA HMAC
esp-des	ESP ˇ DES ╗
esp-3des	ESP ˇ 3DES ╗
esp-aes-128	ESP ˇ aes ╗ ˇ 128
esp-aes-192	ESP ˇ aes ╗ ˇ 192
esp-aes-256	ESP ˇ aes ╗ ˇ 256
esp-sm1	ESP ˇ SM1 ╗ ˇ 128
ah-md5-hmac esp-des	AH ˇ MD5 HMAC ’ ESP ˇ DES ╗
ah-sha-hmac esp-des	AH ˇ SHA HMAC ’ ESP ˇ DES ╗
ah-md5-hmac esp-des esp-md5-hmac	AH ˇ MD5 HMAC ’ ESP ˇ DES ╗ MD5 HMAC
ah-md5-hmac esp-null esp-md5-hmac	AH ˇ MD5 HMAC ’ ESP ˇ ╗ MD5 HMAC
ah-md5-hmac esp-des esp-sha-hmac	AH ˇ MD5 HMAC ’ ESP ˇ DES ╗ SHA HMAC
ah-md5-hmac esp-null esp-sha-hmac	AH ˇ MD5 HMAC ’ ESP ˇ ╗ SHA HMAC
ah-sha-hmac esp-des esp-md5-hmac	AH ˇ SHA HMAC ’ ESP ˇ DES ╗ MD5 HMAC
ah-sha-hmac esp-null esp-md5-hmac	AH ˇ SHA HMAC ’ ESP ˇ ╗ MD5 HMAC
ah-sha-hmac esp-des esp-sha-hmac	AH ˇ SHA HMAC ’ ESP ˇ DES ╗ SHA HMAC
ah-sha-hmac esp-null sp-sha-hmac	AH ˇ SHA HMAC ’ ESP ˇ ╗ SHA HMAC
esp-des esp-md5-hmac	ESP ˇ DES ╗ MD5 HMAC
esp-null esp-md5-hmac	ESP ˇ ╗ MD5 HMAC
esp-des esp-sha-hmac	ESP ˇ DES ╗ SHA HMAC
esp-null esp-sha-hmac	ESP ˇ ╗ SHA HMAC
esp-3des	ESP ˇ 3DES ╗

esp-3des esp-sha	ESP ˘ 3DES ╗ SHA HMAC
esp-3des esp-md5	ESP ˘ 3DES ╗ MD5 HMAC
ah-md5-hmac esp-des	AH ˘ MD5 HMAC ’ ESP ˘ 3DES ╗
ah-sha-hmac esp-des	AH ˘ SHA HMAC ’ ESP ˘ 3DES ╗
ah-md5-hmac esp-3des esp-sha	AH ˘ MD5 HMAC ’ ESP ˘ 3DES ╗ SHA HMAC
ah-sha-hmac esp-3des esp-sha	AH ˘ SHA HMAC ’ ESP ˘ 3DES ╗ SHA HMAC
ah-md5-hmac esp-3des esp-md5	AH ˘ MD5 HMAC ’ ESP ˘ 3DES ╗ MD5 HMAC
ah-sha-hmac esp-3des esp-md5	AH ˘ SHA HMAC ’ ESP ˘ 3DES ╗ MD5 HMAC

	Ю˘ esp-desˆ ˜ ┘ Л ˘ ˘ ┘ Л esp-des esp-md5-hmac esp-des esp-sha-hmac Â

IPSec mib ˘ ầ ╗ ˘ IPSec ┘ Â ˘ IPsec mib ╗ Ю Â IPSec mib ˘ ƕ ʒ CLI ƕ ʒ IPSec MIB ╗ Â

ʔ

˧˩ IPSec ' IPSec Â
IPSec ' ╗ ˧˥ Э˘ IPSec ˧˥
ѝ Â
IPSec ' ÿ ˧˩ Â
Ѣ Â
IKE Â

έ ˩ ╗ ˩ˆ ˧˥ a ˩˜ ╗ ╗ Â ╗
˧˥ Э˘ ˧˥ IP ˧˥ Э ╗
Â ╗ ˧˩ IP ˘ з ╗ IKE˘
╗ б ' ╗
˘ ѫ Â
IKE ˘ ˧˥ ╗ ˘ ╗ ˘ ˘
Â

╗ ˘ ѝ ч IPSec
IPSec ˘ ч ╗ ˧˥ Â ч
ففي ˘ ˧˩ ╗ ╗
ЛЬЮ ˚ '

╗ ╗ ˆ ˜ Â
˧˩ ╗ ˆ ╟ ╗ ˜ Â
╗ ˩ ˧˩ Â

˧˥ ˧˩ ╗ Â ╗ IPSec/IKE˘ IPSec/
Â ѝ ˧˥ … ╗ ˘ ѫ seq- num
' seq-num ˘ ˛ ˝I Â

Ю ύ ˘ ѝ ˧˥ … ╗ '
˧˥ Э a ˩ a ˩ IPSec Â
a ˩ ˆ ˩ a ˩ ˜ a ˩ IPSec ' ˘
˘ ˧˥ ╗ Â Ю˘
a ˩ ч a ˩ Ѭ˘ з ѝ ╗ …
╗ Â

…

… ˘ Ю˘ ЛЬЮѢ ҙ'

Ѣ ҙ	
Ruijie(config)# *map-name* *seq-num*	… ╗ ˘ Ѣ ҙ ╗ Â
Ruijie(config-crypto-map)# *access-list-id*	ѝ ╗ Â ᾱ ˧˩ IPSec ˘ a ˧˩ ╗ Ѭ IPSec Â
Ruijie(config-crypto-map)# {*hostname* | *ip-address*}	IPSec Â ˧˩ IPSec Â ike a ˧˩ peer Â

```
!
access-list 101 permit ip 192.168.202.0 0.0.0.255 192.168.12.0 0.0.0.255
```

16 ⁸ ˘ ˙Ω ƕυ ʒ̧ cipher ⅄ ƕυ ʒ̧

╗ ˆ IPSec DES˘ 3DES˘ AES˘ SM1 3DES ╗ ˜ ᾱ Â ˙Ω ƕυ ʒ̧ authenticator ⅄ hex-key-data

ˆ sha ȁ md5

ЛЭ è ╗ Â

Ю IKE '

ˆ A˜ '

ЖЖ myset

crypto ipsec transform-set myset esp-des

ЖЖ IKE mymap

```
crypto map mymap 3 ipsec-isakmp
set peer 2.2.2.2
set transform-set myset
match address 101
access-list 101 permit ip 192.168.12.0 0.0.0.255 192.168.202.0 0.0.0.255
```

ˆ B˜ '

ЖЖ ╜ myset

crypto ipsec transform-set myset esp-des

ЖЖ IKE mymap

```
crypto map mymap 3 ipsec-isakmp
set peer 2.2.2.1
set transform-set myset
match address 101
!
access-list 101 permit ip 192.168.202.0 0.0.0.255 192.168.12.0 0.0.0.255
```

╭ ʌ ҥ ˘ ≠ IKE ˘ ╜Л ч
╗ ╜ ╗ Â

IKE ˘ des ╗ a a ╜ ˘ ˘
des ╗ ╜ ˘ Л˘ ˘
‡ ˘ IKE Ѣ ˘ ˘
Â

… ╟ ╗

╟ ╗ ˆ ike˜ ˘ ip ˘ ‡ ╟ ╗
╗ Â ˘ ╟ ╟ ╢ ip Â ”I ╟ a ip
è ike ˘ ╜ Â ˘ ╟ ╗
˘ ╟ ╗ ╜Л ╜ Â

╟ ╗

╟ ╗ ╜ ike Â ╟ ╗ 'I ˘ ╜ ╟
ˆ IPSec ˜ Л Â IPSec ˘ .
╗ Â

╟ ╗ a IPSec ˘ IPSec
Â

╟ ╕ ѝ ╕ ǂ Â ╕ ╟ ѝ ╕
æ˛ ˝I ╕ ˆ ≠ ⁄I˜ ˘ è ╕ ˝I
˘ è ╕ a ˥ ╟ ╕ Â

˧˩ ˘ … IPSec ˘ ɜ ╕
˘ 'I Â Э ╕ ╕
Â ˘ ╕ Â

╟ ╕ ˘ access list permit ˘
a ˧˩ IPSec Â

╕ ˘ access list permit ˘ ɜ SA
˘ SA Â ╟ ╕ ˘ SA a ˘
ˆ ╟ ╕ a SA ˜ Â

╟ ╕ permit any Â permit ˧˩
˘ Ʌ deny ˘ è a ˧˩ IPSec ≠
Â

╟ ╕ ╕ Â ╕
˧˩ ╕ ˧˩ ˘ a ˧˩ ⁄I Â

… ╟ ╕ ˘ Ƕ ʒ Ю Ƕ ʒ'

SA

Ruijie(config-crypto-map)#	╗ ˘ Â

╗ ╟ ╗ ˆ ˜ ╗

┘ Л∪ ╗ ╗ ╗ ˘ ╟ ╗ ╗
Â ╗ ╟ ╗ и ╗ æ. ″I Â

╗ ╟ ╗ ╗ ˘ Ю ЮЋ ч'

Ћ ч	
Ruijie (config)# *map-name* *seq-num* *dynamic-map-name*	╗ ╟ ╗ ╗

╗ ┘˘ ┘ Ю ЛЮЋ ч'

Ћ ч	
Ruijie(config-if)# *map-name*	╗ ┘

IPSec ┘˘ и ╗ Â ╗
┘ ˘ Â

	┘ ┘ ┘ ╗ Â ╗ ‡ ┘ ┘
	Э Â ┘ IPSec ˘ ┘ IP и Â

IKE Profile ╗ ˘ Ю ЛЮЋ ч'

Ћ ч	
Ruijie(config)# *profile-name*	… Profile ╗ ˘ Ћ ч ╗ Â
Ruijie(config-crypto-map)# *transform-set-name1* [*transform-set-name2…transform-set-name6*]	┘ ˘ . ″I ┘ ы ˆ . ″I . ″I ˜
Ruijie(config-crypto-map)# *seconds*	ˆ ┘ ˜ и ╗ ¾ '

Ruijie(config-crypto-map)# *length*	Ю ˆ
Ruijie(config-crypto-map)#	╗ ˘ Â

ЛЭ ѐ ╗ Â

Ю IKE '

ˆ A˜ '

ЖЖ myset

```
crypto ipsec transform-set myset esp-des
```

ЖЖ IKE profile-name

```
crypto ipsec profile profile-name
  set transform-set myset
```

ˆ B˜ '

ЖЖ ˧ myset

```
crypto ipsec transform-set myset  esp-des
```

ЖЖ IKE mymap

```
crypto ipsec profile profile-name
  set transform-set myset
```

IPV6 àIPSEC-IPV4 àIPSEC-IPV6 ˘ profile-name ' match any Ѣ ҙ Â з match any Profile map ˧ IPIP àIPV6 Tunnel Â	

Profile ╗ Tunnel ˧˘ ˧ Ю ЛЮѢ ҙ'

Ѣ ҙ	
Ruijie(config-if-Tunnel 1)# *profile-name*	╗ Tunnel ˧

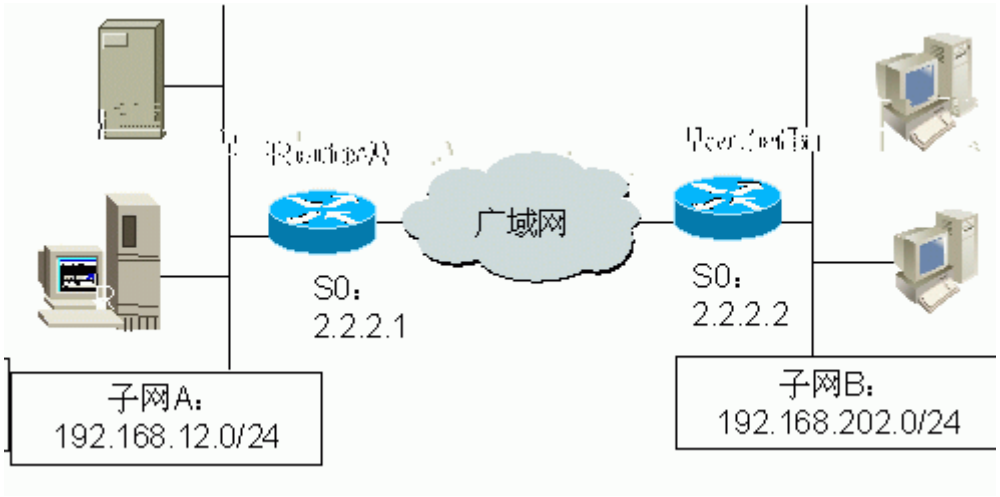
IPSec ˧˘ ѝ ╗ Â ╗ ˧ Э ╗ Â

Profile ╗ ˧ Tunnel ˧˘ Tunnel ˧ Э ˘ з ˧ GRE à IPIP à IPV6 Tunnel Э Profile ╗ Â match any˘ ‡ ˧ IPIP à IPV6 Tunnel Â	

˅ ˄ ˀ Â . ˘
˘ Â ˘ ˘
ї ‡ ˅ a Â IPSec ˘ ѫ ˅ ˄
˅ ˅ ї ˆ . ˄ ╕
˜ Â ˄ ˅˘ IPSec ˘
Â

ˆ ˜ IPSec ˘ Ю ЛЬЮЬu ʒ'

Ьu ʒ	
Ruijie#	˘ ≠ ╟ Â
Ruijie# {*ip-add*	



IPSec

й ч ў

IPSec ˘ ÿ IPSec ╖ Â IKE ˘
ˆ ISAKMP˜ Oakley Skeme ˆ ISAKMP à
Oakley Skeme IKE ˜ Â

IKE ˘ IPSec (IKE IPSec)˘ ﾍ Â ﾍ Э
˘

' SHA-1 MD5 ÂMD5 ˘ ѝ SHA-1 Â
MD5 بم Rs ' Ɱ ч ч طمي

IKE Â ˘ ˘
ê ˙Ω Ì ˆ Â

IKE ê IPSEC VPN Ì Â ˘
˘ Ш ˝I Â

˘ ΰ Ю'

Ƕ ʒ	
Router(config)# *address*	
Ruijie(config)# *Priority*	… ˘ ˛ ˝I Â
Ruijie(config-isakmp)#	

ɱ б IKE ч ˩ ˘ ɱ
IKE Â Э б ɱ ˩ ' й ˘
а ˩ а ˩ Â

ɱ ˘ Ю ЛЬЮƕ ʒ'

Ƕ ʒ	
Router(config)# *hostname address*	hostname ˘ hostname ip Â
Ruijie(config)# *keystring* { *peer-hostname* | *peer-address* }	б IKE ɱ Â 0 й й 7 й й
Router(config)# *keystring* *peer-address* [*mask*]	IKE ɱ Â peer-address mask 0.0.0.0 0.0.0.0 ɱ Â

˧ Э ˩ ɱ Â

1. RGOS 8.31 ⅄ CISCO ˘ IKE ⅃ Â
ɱ ˘ ╗ IKE Â Ю '
crypto isakmp policy 1
authentication pre-share
!
RGOS ⅃ ɱ
2. ike hostname DNS Э ̈Ạ˘ Э γ
⅃ Ɲ Â
3. CISCO Э hostname ɱ ‡
Â

DPD Э ч ⁸ ' ȁ on-demand ⁸ ˘ ⁸
˘ ˘ DPD Â γ ȁ periodic ⁸ ˘ ⁸
⅄ ў ╟ DPD Â 5 Âˆ DPD 8.2
˜

ƕ ʒ Ю'

ƕ ʒ	
Router(config)# *seconds*	seconds—— ѝ 5 ˘ on-demand ⁸
Router(config)# *seconds retries*	seconds—— retries—— on-demand ⁸
Router(config)# *seconds retries*	seconds—— retries—— on-demand——on-demand ⁸
Router(config)# *seconds*	seconds—— periodic——periodic ⁸ ѝ 5
Router(config)# *seconds retries*	seconds—— retries—— periodic——periodic ⁸

RFC3947˝ IPSEC NAT-t˝ ╗ UDP ˘ ᾱ nat Â ѝ nat
˘ Ɲ keepalive Â a Ю 5˥

ƕ ʒ Ю'

ƚʊ ʒ	
Router(config)# *seconds*	seconds——keepalive ѝ 5ˆ

KE ˘ a ˘ ˧ Ƶ ƚʊ ʒ
Â

ƚʊ ʒ	
Router(config)#	vendor id

IKE ˈ SM1 ˘ Â

ƚʊ ʒ	
Router(config)#	˘ ὲ ˈ IKE

IKE

IKE ˘ Ю ƸЮƚʊ ʒ'

ƚʊ ʒ	
Ruijie#	IKE ˘ Ю Â
Ruijie# [*connection-id*]	IKE ˘ connection-id ˘ IKE Â
' Ruijie#	IKE Â

IKE

IKE ˧ ╟˘ Ю ƸЮ ƚʊ ʒ'

ƚʊ ʒ	
Ruijie#	IKE Â
Ruijie#	IKE Â
Ruijie#	IKE Y˘ debug Â

Ю IKE '

```
crypto isakmp enable
crypto isakmp policy 4
group 1
encryption 3des
crypto isakmp policy 5
authen pre-share
group 2
lifetime 1000
crypto isakmp policy 6
authen rsa-sig
group 1
lifetime 1000
```

˘ Ю ЛЬЮЋ ʒ'

```
Ruijie# show crypto isakmp policy
Protection suite of priority 4
encryption algorithm:   3DES - Data Encryption Standard (56 bit keys).
hash algorithm:         Secure Hash Standard
authentication method:  Rsa-Sig
Diffie-Hellman group:   #1 (1024 bit)
lifetime:               1000 seconds
Protection suite of priority 5
encryption algorithm:   DES - Data Encryption Standard (56 bit keys).
hash algorithm:         Secure Hash Standard
authentication method:  Pre-Shared Key
Diffie-Hellman group:   #2 (1024 bit)
lifetime:               1000 seconds
Protection suite of priority 6
encryption algorithm:   DES - Data Encryption Standard (56 bit keys).
hash algorithm:         Secure Hash Standard
authentication method:  Rsa-Sig
Diffie-Hellman group:   #1 (768 bit)
lifetime:             1000 seconds
Default protection suite
encryption algorithm:   DES - Data Encryption Standard (56 bit keys).
hash algorithm:         Secure Hash Standard
authentication method:     Rsa-Sig
Diffie-Hellman group:   #1 (768 bit)
lifetime:               86400 seconds
```

ǂ

ч IP ˘ Cisco й ˘ A˘ ⅃

й ˘ B Â ЛЬЮ '

3des ╗

й ESP-DES-MD5ˆ ╗ ╘˜ Â

Ю ˘ Cisco ˘ ǂ Â Юفي:

IPSec

˘ . RouterA IKE ˘
˩ ˘ й Э ˘ ≠ Cisco Â

IKE

RouterA ˈ

```
!
hostname "RouterA"
```

IKE

```
crypto isakmp enable
crypto isakmp policy 1
authentication pre-share
encrytiong 3des
!
```

ɱ ˩

```
crypto isakmp key 0 preword address 2.2.2.1
crypto ipsec transform-set myset  esp-des esp-md5-hmac
```

⊠ ╗

```
crypto map mymap 5 ipsec-isakmp
set peer 2.2.2.1
set transform-set myset
match address 101
!
interface FastEthernet0
ip address 192.168.202.1 255.255.255.0
```

╗ ˧˥

```
interface Serial0
ip address 2.2.2.2 255.255.255.0
encapsulation ppp
crypto map mymap
!
ip route 0.0.0.0 0.0.0.0 Serial0
```

⊠╗ ˘

Cisco ˈ

```
!
hostname Cisco
#   ⌘ IkE   ˘        ѝ    ɱ   ˘  ὲ
crypto isakmp policy 1
authentication pre-share
encryption 3des
#        ɱ
crypto isakmp key 0 preword address 2.2.2.2
#   ⌘ ⌟
crypto ipsec transform-set myset esp-des esp-md5-hmac
#   ⌘ ╗
crypto map mymap 5 ipsec-isakmp
set peer 2.2.2.2
set transform-set myset
match address 101
!
interface FastEthernet0/0
ip address 192.168.12.1 255.255.255.0
#   ╗            ⋀ Э
interface Serial0
ip address 2.2.2.1 255.255.255.0
encapsulation ppp
crypto map mymap
!
ip route 192.168.202.0 255.255.255.0 Serial0
#  ⌘ ╗        ˘   192.168.12.0/24   192.168.202.0/24         IP
access-list 101 permit ip 192.168.12.0 0.0.0.255 192.168.202.0 0.0.0.255
!
end
```

RouterA ˈ

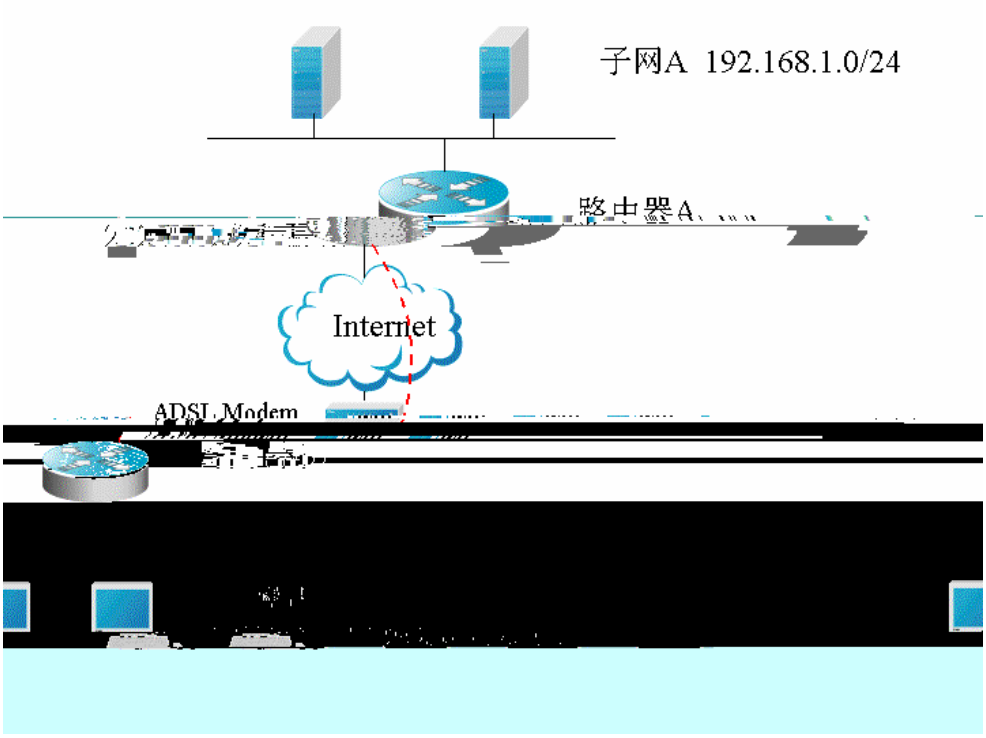
```
!
hostname "RouterA"
#   ⌘ ⌟
crypto ipsec transform-set myset  esp-des esp-md5-hmac
#   ⌘    ╗
crypto map mymap 5 ipsec-manual
set peer 2.2.2.1
set session-key inbound esp 300 cipher abcdef1234567890
authenticator abcdef1234567890abcdef1234567890  //б Э    ⌟         ⋀
set session-key outbound esp 301 cipher abcdef1234567890
authenticator abcdef1234567890abcdef1234567890  //б Э    ⌟         ⋀
set transform-set myset
match address 101
!
interface FastEthernet0
ip address 192.168.202.1 255.255.255.0
#   ╗            ⋀
```

```
interface Serial0
ip address 2.2.2.2 255.255.255.0
encapsulation ppp
crypto map mymap
!
ip route 0.0.0.0 0.0.0.0 Serial0
```

𝄀╗ ˘ 192.168.202.0/24 192.168.12.0/24 IP

```
Get acquire: 192.168.202.0/0.0.0.255 -> 192.168.12.0/0.0.0.255 , prot 0, port
0/0
Acquire negotiate with 2.2.2.1
(36) Beginning Quick Mode exchange, M-ID of 4445127
(36) sending packet to 2.2.2.1 (I) QM_SI1_WR1
ipsec_output:423, get item acclist 101
ipsec_output:429, match  3
(36) received packet from 2.2.2.1 (I) QM_SI1_WR1
payload format: <Hdr>,<hash> <sa> <nonce> <id>
(36) processing SA payload. message ID = 4445127
(36) Creating IPSec SAs.
```

```
sa timing: remaining key lifetime (k/sec): (4607999/3577)
//            Ƕ          ' 4607999     /3577
IV size: 8 bytes                                //IV ɹ      ѝ 8
Replay detection support:Y                         //
ÿ        ˧Ɲ    ˘ IPSec                            Â



                                  ˘ a       ˘                ˘ ˧
     '

RouterA# show crypto ipsec sa
Interface: Serial0
```



IPSec

˘ . RouterB RouterA Â

RouterB '

```
!
hostname "RouterB"
```

IKE

```
crypto isakmp enable
```

ᴍ, ˧˩

```
crypto isakmp policy 1
authentication pre-share
crypto isakmp key 0 preword address 202.1.1.2
crypto ipsec transform-set myset  esp-des esp-md5-hmac
```

ᴘᴍ ╗

```
crypto map mymap 5 ipsec-isakmp
set peer 202.1.1.2
set transform-set myset
match address 101
!
interface FastEthernet0
ip address 192.168.12.1 255.255.255.0
interface FastEthernet1
no ip addrsss
pppoe enable
pppoe-client 1 dial-pool-number 1 dial-on-demand
```

╗ ᴬ

```
interface Dialer0
mtu 1488
ip address negotiate
encapsulation ppp
```

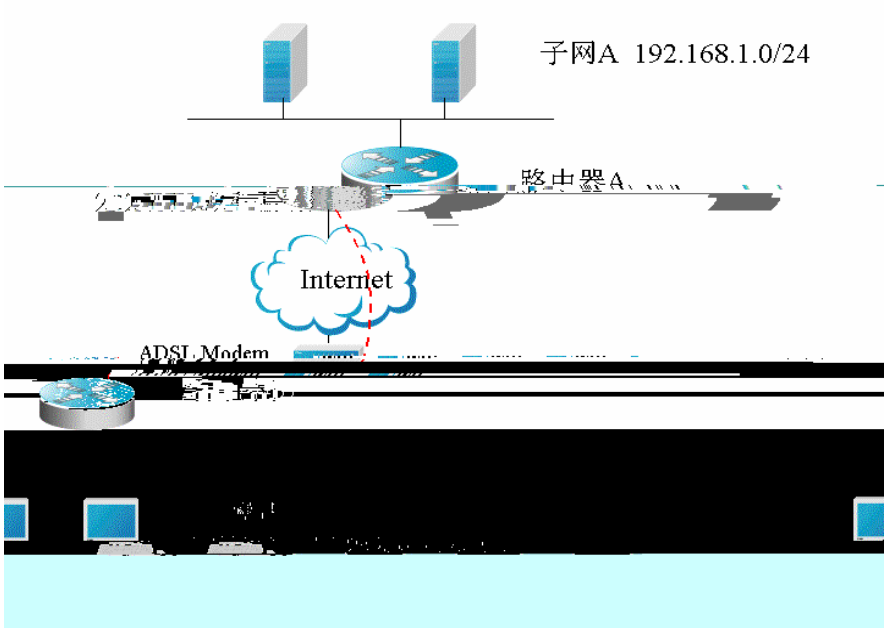
й ESP-DES-MD5ˆ ╗ ╘˜ Â

A ᐱ ip :202.1.1.2/24˜ ж Internet

B ADSL pppoe Internet ˇ ip ISP ╟ ↑

ᴍ ˇ з ў ˩ ᴍ

IKE



ˇ . RouterB RouterA Â

RouterB '

```
!
hostname "RouterB"
#     IKE
crypto isakmp enable
#
self-identity fqdn www.google.com
#        ᴍ      ˩
crypto isakmp key 0 preword address 202.1.1.2
crypto ipsec transform-set myset  esp-des esp-md5-hmac
#   ⊠     ╗
crypto map mymap 5 ipsec-isakmp
set peer 202.1.1.2
set exchange-mode aggressive
set transform-set myset
match address 101
!
interface FastEthernet0
ip address 192.168.12.1 255.255.255.0
interface FastEthernet1
no ip addrsss
pppoe enable
pppoe-client 1 dial-pool-number 1 dial-on-demand
```

╕ ∧

```
interface Dialer0
mtu 1488
ip address negotiate
encapsulation ppp
ppp pap sent-username xxx password xxx
crypto map mymap
dialer idle-timeout 2400
dialer pool 1
dialer-group 1
!
dialer-list protocol ip permit
ip route 0.0.0.0 0.0.0.0 Dialer0 permanent
```

ћ╕ ˘ 192.168.12.0/24 192.168.1.0/24 IP

```
access-list 101 permit ip 192.168.12.0 0.0.0.255 192.168.1.0 0.0.0.255
!
end
```

RouterA '

```
!
hostname “RouterA”
```

ћ IkE ˘ й м ˘ è

```
crypto isakmp policy 1
authentication pre-share
```

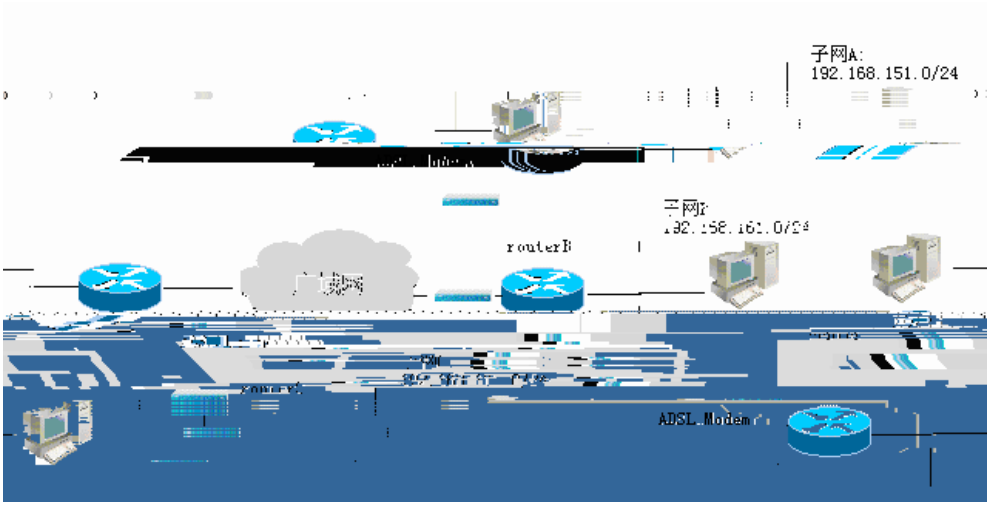
м ˘ ip ╟ ˘ hostname м

```
crypto isakmp key 0 password hostname www.google.com
```

ˆ

╠ ╗ ˇ IKE ˩ ˇ ˆ l2tp ˇ l2tp
IKE ˇ ipsec ╗ ˩˘ l2tp ˇ ˩ l2tp ospf˘
ˆ ˝ Â '

ѝ ESP-DES˘ ╗ ╘˜ Â
ᴧ ip :63.23.12.212/29˘ ж Internet Â
ˆ ADSL pppoe Internet ˇ ip ISP ╠ ˆ
IKE ˇ Â



Center '

```
hostname center
!
!
route-map static-ospf permit 10
 match ip address 1
!
access-list 1 permit 0.0.0.0 255.255.255.0
!
vpdn enable
!
vpdn-group 1
! Default L2TP VPDN group
accept-dialin
protocol l2tp
virtual-template 1
l2tp tunnel force_ipsec
source-ip 63.23.12.212
!
username RGOS password 0 RGOS
!
```

#

```
4E310F30 0D060355 04081306 46754A69 616E310F 300D0603 55040713 0646755A
686F7531 20301E06 0355040A 13175265 6769616E 74204E65 74776F72 6B20436F
2E204C74 64311D30 1B060355 040B1314 52657365 61726368 20417061 72746D65
6E742035 31173015 06035504 03130E43 41207465 73742073 65727665 72301E17
0D303530 32323530 38343630 325A170D 30373033 30313032 33363233 5A3081AC
3121301F 06092A86 4886F70D 01090116 1264696E 676A7340 73746172 2D6E6574
2E636E31 0B300906 03550406 1302434E 310F300D 06035504 08130646 754A6961
6E310F30 0D060355 04071306 46755A68 6F753120 301E0603 55040A13 17526567
69616E74 204E6574 776F726B 20436F2E 204C7464 311D301B 06035504 0B131452
65736561 72636820 41706172 746D656E 74203531 17301506 03550403 130E4341
20746573 74207365 72766572 305C300D 06092A86 4886F70D 01010105 00034B00
30480241 00D91F1A C60EF951 924CDC96 4D4443FA DABE53F2 DDF513B6 34B5A6A1
9FFD57A1 6C6F7AF4 A113C159 3D0C4C3E 8E62DE76 D8A24CF2 2CF8DA82 AA17D3E8
CC80C295 8F020301 0001A381 D33081D0 300B0603 551D0F04 04030201 C6300F06
03551D13 0101FF04 05300301 01FF301D 0603551D 0E041604 14724384 1C2B0345
2D8258F5 844377F5 21AA4B2C 21307F06 03551D1F 04783076 3038A036 A0348632
68747470 3A2F2F7A 6A2D726F 75746572 2F436572 74456E72 6F6C6C2F 43412532
30746573 74253230 73657276 65722E63 726C303A A038A036 86346669 6C653A2F
2F5C5C7A 6A2D726F 75746572 5C436572 74456E72 6F6C6C5C 43412532 30746573
74253230 73657276 65722E63 726C3010 06092B06 01040182 37150104 03020101
300D0609 2A864886 F70D0101 05050003 41007F2E 7D1676B5 560EDD1E D80B4205
3B39A742 B8E06813 786E9992 2E4C5860 AB4AF193 63A34170 50BD756A AEA7086A
7A9FC2AC D1D8A3A0 CC6779D0 76CE7D1A 7F4C
quit
!
certificate 1FFC97F0000100000029
308204B3 3082045D A0030201 02020A1F FC97F000 01000000 29300D06 092A8648
86F70D01 01050500 3081AC31 21301F06 092A8648 86F70D01 09011612 64696E67
6A734073 7461722D 6E65742E 636E310B 30090603 55040613 02434E31 0F300D06
03550408 13064675 4A69616E 310F300D 06035504 07130646 755A686F 75312030
1E060355 040A1317 52656769 616E7420 4E657477 6F726B20 436F2E20 4C746431
1D301B06 0355040B 13145265 73656172 63682041 70617274 6D656E74 20353117
30150603 55040313 0E434120 74657374 20736572 76657230 1E170D30 35303332
31303632 3335395A 170D3036 30333231 30363333 35395A30 81A63122 30200609
2A864886 F70D0109 0116137A 68616F6A 756E4073 7461722D 6E65742E 636E310B
30090603 55040613 02434E31 0F300D06 03550408 13064675 4A69616E 310F300D
06035504 07130646 755A686F 75312030 1E060355 040A1317 52656769 616E7420
4E657477 6F726B20 436F2E20 4C746431 1D301B06 0355040B 13145265 73656172
63682041 70617274 6D656E74 20353110 300E0603 55040313 077A6861 6F6A756E
305C300D 06092A86 4886F70D 01010105 00034B00 30480241 00BB70FF 351D18F5
7735FE4F C890AF42 8E8744BA D946C4B8 61F046DF 614E4A37 D8A3BA80 7003D7E1
BC5394F3 58DDE033 4ABA82D1 AEAD4C10 3135C2AE BB58FA2F 75020301 0001A382
02633082 025F300E 0603551D 0F0101FF 04040302 06C03013 0603551D 25040C30
0A06082B 06010505 08020230 1D060355 1D0E0416 0414420E 87E0F7C1 B744AFE3
2C1EFD64 E03E2144 844C3081 E8060355 1D230481 E03081DD 80147243 841C2B03
452D8258 F5844377 F521AA4B 2C21A181 B2A481AF 3081AC31 21301F06 092A8648
86F70D01 09011612 64696E67 6A734073 7461722D 6E65742E 636E310B 30090603
55040613 02434E31 0F300D06 03550408 13064675 4A69616E 310F300D 06035504
07130646 755A686F 75312030 1E060355 040A1317 52656769 616E7420 4E657477
6F726B20 436F2E20 4C746431 1D301B06 0355040B 13145265 73656172 63682041
70617274 6D656E74 20353117 30150603 55040313 0E434120 74657374 20736572
76657282 1056AE07 3C10A17E 8C45AE8D 3F155233 57307F06 03551D1F 04783076
3038A036 A0348632 68747470 3A2F2F7A 6A2D726F 75746572 2F436572 74456E72
6F6C6C2F 43412532 30746573 74253230 73657276 65722E63 726C303A A038A036
86346669 6C653A2F 2F5C5C7A 6A2D726F 75746572 5C436572 74456E72 6F6C6C5C
43412532 30746573 74253230 73657276 65722E63 726C3081 AC06082B 06010505
07010104 819F3081 9C304B06 082B0601 05050730 02863F68 7474703A 2F2F7A6A
2D726F75 7465722F 43657274 456E726F 6C6C2F7A 6A2D726F 75746572 5F434125
32307465 73742532 30736572 76657228 31292E63 7274304D 06082B06 01050507
30028641 66696C65 3A2F2F5C 5C7A6A2D 726F7574 65725C43 65727445 6E726F6C
6C5C7A6A 2D726F75 7465725F 43412532 30746573 74253230 73657276 65722831
```

```
292E6372 74300D06 092A8648 86F70D01 01050500 034100AF 173B4A23 E95C8042
ED4F2F97 0D869C1E 715800E6 F64F505F 1A6F291C 4B8C95C8 2FE04F9C CA81778F
07A2DE20 C9640A8B DD36BCC0 359C26BB D5A5E434 B5F46B
quit
!
!
# IKE
!
#     ↵
crypto ipsec transform-set myset  esp-des
#     ╟  ╖
crypto dynamic-map dy 1
set transform-set myset
!
!
crypto map mymap 1 ipsec-isakmp dynamic dy
!
interface FastEthernet 0/0
ip address 63.23.12.212 255.255.255.248
crypto map mymap
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.216.1 255.255.255.0
ip address 192.168.217.1 255.255.255.0 secondary
ip address 192.168.218.1 255.255.255.0 secondary
ip address 192.168.219.1 255.255.255.0 secondary
duplex auto
speed auto
!
interface Null 0
!
interface Virtual-Template 1
mtu 1400
ip ospf mtu-ignore
ip unnumbered FastEthernet 0/1
ip mtu 1360
!
!
router ospf
redistribute static subnets route-map static-ospf
network 192.168.216.0 0.0.0.255 area 0.0.0.0
network 192.168.217.0 0.0.0.255 area 0.0.0.0
network 192.168.218.0 0.0.0.255 area 0.0.0.0
network 192.168.219.0 0.0.0.255 area 0.0.0.0
!
line con 0
exec-timeout 0 0
line aux 0
disconnect-character 240
line vty 0 4
exec-timeout 0 0
privilege level 15
no login
!
!
end
```

routerA '

```
hostname routerA
!
#
access-list 101 permit ip interface dialer 0 host 63.23.12.212
access-list 177 deny icmp any any unreachable
access-list 177 permit ip any any
dialer-list 1 protocol ip permit
!
l2tp-class l2x
hostname rg36_1
!
pseudowire-class pw
encapsulation l2tpv2
protocol l2tpv2 l2x
ip local interface dialer 0
!
!
#                à
crypto pki certificate chain
certificate ca 56AE073C10A17E8C45AE8D3F15523357
3082032E 308202D8 A0030201 02021056 AE073C10 A17E8C45 AE8D3F15 52335730
0D06092A 864886F7 0D010105 05003081 AC312130 1F06092A 864886F7 0D010901
16126469 6E676A73 40737461 722D6E65 742E636E 310B3009 06035504 06130243
4E310F30 0D060355 04081306 46754A69 616E310F 300D0603 55040713 0646755A
```

```
2A864886 F70D0109 01161264 696E676A 73407374 61722D6E 65742E63 6E310B30
09060355 04061302 434E310F 300D0603 55040813 0646754A 69616E31 0F300D06
03550407 13064675 5A686F75 3120301E 06035504 0A131752 65676961 6E74204E
6574776F 726B2043 6F2E204C 7464311D 301B0603 55040B13 14526573 65617263
68204170 6172746D 656E7420 35310F30 0D060355 04031306 64696E67 6A73305C
300D0609 2A864886 F70D0101 01050003 4B003048 024100CD 2C3B2981 FF9BF7E6
F9DFFCF9 495FE6AA 6691FD76 BB5EBEC3 5A1E48F8 8B75DD68 9E79AC5A 36C0B4F4
AA959323 49EEEB7F 24B546B8 74421F17 401033AE EC3F4102 03010001 A3820263
3082025F 300E0603 551D0F01 01FF0404 030204F0 30130603 551D2504 0C300A06
082B0601 05050802 02301D06 03551D0E 04160414 216567F3 E72263B2 4990E14D
ECC22471 1596A71F 3081E806 03551D23 0481E030 81DD8014 7243841C 2B03452D
8258F584 4377F521 AA4B2C21 A181B2A4 81AF3081 AC312130 1F06092A 864886F7
0D010901 16126469 6E676A73 40737461 722D6E65 742E636E 310B3009 06035504
06130243 4E310F30 0D060355 04081306 46754A69 616E310F 300D0603 55040713
0646755A 686F7531 20301E06 0355040A 13175265 6769616E 74204E65 74776F72
6B20436F 2E204C74 64311D30 1B060355 040B1314 52657365 61726368 20417061
72746D65 6E742035 31173015 06035504 03130E43 41207465 73742073 65727665
72821056 AE073C10 A17E8C45 AE8D3F15 52335730 7F060355 1D1F0478 30763038
A036A034 86326874 74703A2F 2F7A6A2D 726F7574 65722F43 65727445 6E726F6C
6C2F4341 25323074 65737425 32307365 72766572 2E63726C 303AA038 A0368634
66696C65 3A2F2F5C 5C7A6A2D 726F7574 65725C43 65727445 6E726F6C 6C5C4341
25323074 65737425 32307365 72766572 2E63726C 3081AC06 082B0601 05050701
0104819F 30819C30 4B06082B 06010505 07300286 3F687474 703A2F2F 7A6A2D72
6F757465 722F4365 7274456E 726F6C6C 2F7A6A2D 726F7574 65725F43 41253230
74657374 25323073 65727665 72283129 2E637274 304D0608 2B060105 05073002
86416669 6C653A2F 2F5C5C7A 6A2D726F 75746572 5C436572 74456E72 6F6C6C5C
7A6A2D72 6F757465 725F4341 25323074 65737425 32307365 72766572 2831292E
63727430 0D06092A 864886F7 0D010105 05000341 00148479 89448BB7 E6D3A7A7
34376464 C8D857C2 D9075263 9E278FC3 2D6C5041 036B66C7 F59ADCA5 39C9F824
A40A4C57 05373965 66671538 921FF39C B95C90F4 3F
quit
!
crypto pki revocation-check none
!

#     DPD ѝ

crypto isakmp keepalive 20 periodic

#     ↓

crypto ipsec transform-set myset  esp-des

#     ╕

crypto map mymap 1 ipsec-isakmp
set peer 63.23.12.212
set transform-set myset
match address 101
!
!
!
interface FastEthernet 0/0
pppoe enable
pppoe-client dial-pool-number 1 no-ddr
duplex auto
speed auto
!
interface FastEthernet 0/1
ip address 192.168.161.1 255.255.255.0
duplex auto
speed auto
!
interface dialer 0
```

```
mtu 1488
encapsulation PPP
ppp chap hostname abcd@163.com
ppp chap password 0 123456
ppp pap sent-username abcd@163.com password 0 123456
ip access-group 177 in
ip address negotiate
crypto map mymap
dialer pool 1
dialer idle-timeout 1200
dialer-group 1
bandwidth 2048
!
interface Null 0
!
interface Virtual-ppp 1
pseudowire 63.23.12.212 20 encapsulation l2tpv2 pw-class pw
mtu 1400
ppp pap sent-username RGOS password 0 RGOS
ip ospf mtu-ignore
no ip route-cache policy
ip unnumbered FastEthernet 0/1
ip mtu 1360
!
!
router ospf
network 192.168.161.0 0.0.0.255 area 0.0.0.0
!
ip route 0.0.0.0 0.0.0.0 dialer 0
!
!
line con 0
line aux 0
line vty 0 4
exec-timeout 0 0
privilege level 15
no login
!
!
end
```

routerB routerC routerA Â

	ѝ	˘	˚	˘	Ѫ˘ Ѫ Э
		⁸ ˛	Ѣ ʒ	˚	
	˚ config.text˘	Ѫ Э	Â	˘	
	Ѣ ʒ	Â	˩	Â	

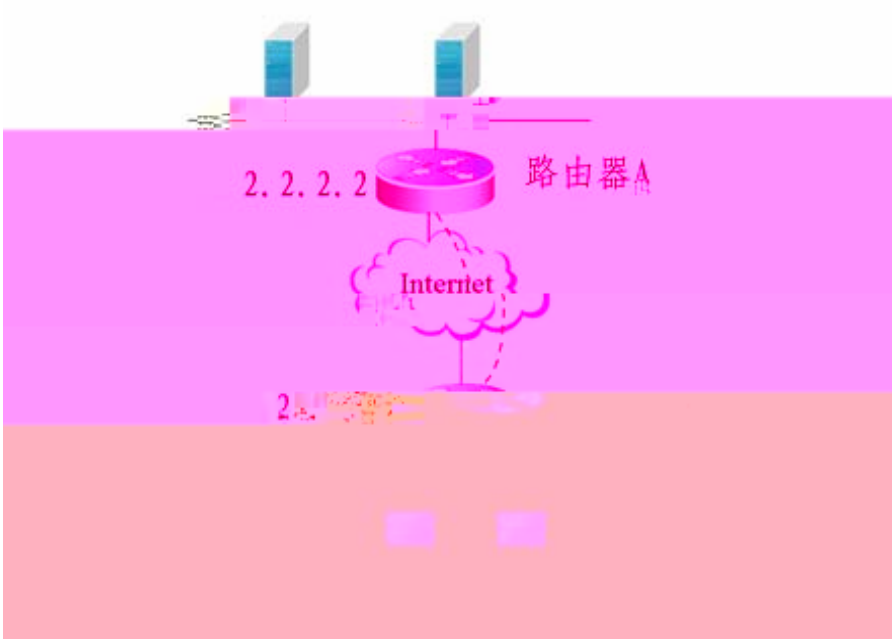
ˆ

ч ў IP ˘ A ѝ ˘ ˛

B ѝˆ ˘ Юفي Â ѪЮ '

3des ╗

ѝ esp-3desˆ ╗ ╚˜ Â Юفي:



A'

```
ip host peerhost 2.2.2.2
ip access-list extended 110
  10 permit ip host 2.2.2.3 host 2.2.2.2
crypto isakmp policy 1
  authentication pre-share
!
!
crypto isakmp key 7 01334b46391e033004 address 0.0.0.0 0.0.0.0
crypto ipsec transform-set myset    esp-3des
crypto dynamic-map dymap 100
  set transform-set myset
  reverse-route
  match address 111
!
!
crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0
  ip ref
```

```
 ip address 2.2.2.3 255.255.255.0
 crypto map mymap
 duplex auto
 speed auto
end
        B'
ip access-list extended 110
 10 permit ip host 2.2.2.2 host 2.2.2.3
crypto isakmp policy 1
 authentication pre-share
crypto isakmp key 7 0424100330052a1b15 address 0.0.0.0 0.0.0.0
crypto ipsec transform-set myset   esp-3des
crypto map mymap 10 ipsec-isakmp
 set peer 2.2.2.3
 set transform-set myset
 match address 110
interface FastEthernet 0/0
 ip address 2.2.2.2 255.255.255.0
 crypto map mymap
 duplex auto
 speed auto
!
interface FastEthernet 0/1
 ip address 200.1.1.10 255.255.255.0
 duplex auto
 speed auto
end
```

ˇ

⌿ ⌊ ˘ ⌿ ⌊ a ⌟ Â peeř Â

è Â ЮفيÂ ЛЮ

⁄ vpn ˘ a ⁄

Э a ⁄

⌈

A'

// policy

!

crypto ipsec transform-set myset esp-3des

crypto dynamic-map dymap 100

set transform-set myset

reverse-route

!

!

crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0

ip ref

ip address 2.2.2.3 255.255.255.0

crypto map mymap

duplex auto

speed auto

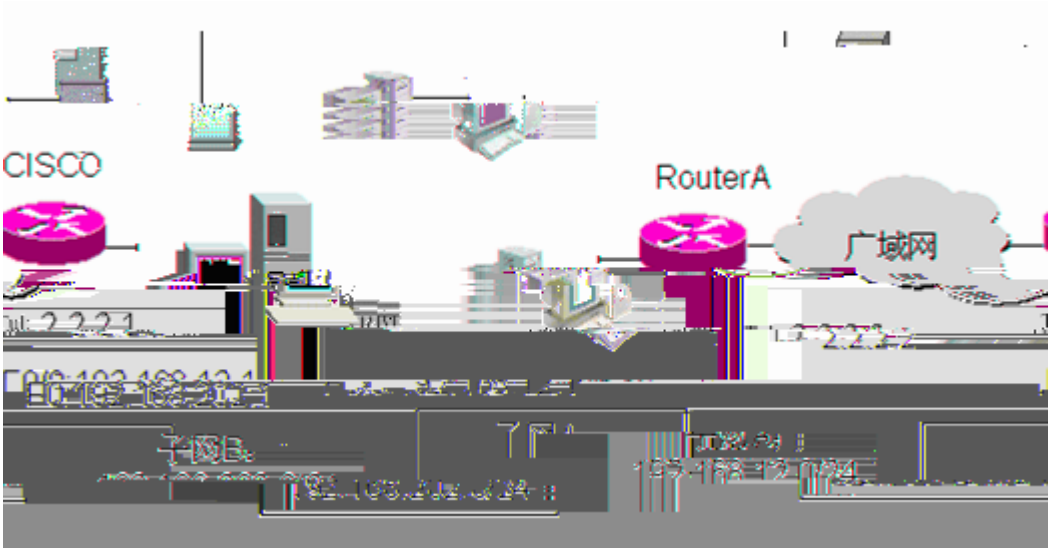
```
end
                B˘        ˅                a ˩        a ˩'
//              policy
!
crypto ipsec transform-set myset    esp-3des
crypto dynamic-map dymap 100
  set transform-set myset
  reverse-route
!
!
crypto map mymap 7 ipsec-isakmp dyna/TT0 .0022Eroah>terface GigabitEthernorm1/0/0 Tf( )Tj-0.0003 Tc
c                r                y                p                t                o
```

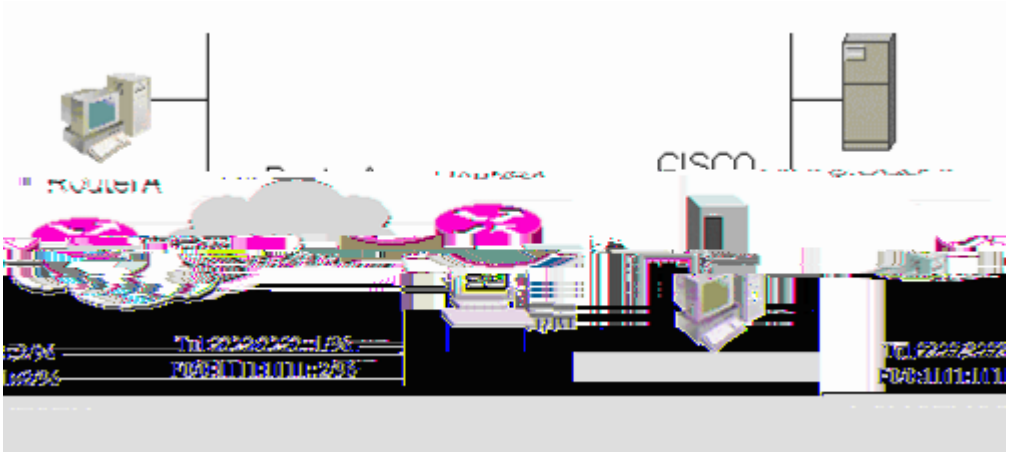
```
set peer 2.2.2.3 trustpoint backup
set transform-set myset
match address 100

interface GigabitEthernet 1/0/0
 ip ref
 ip address 2.2.2.1 255.255.255.0
 crypto map mymap
 duplex auto
 speed auto
end
```

ˆ

ч IP ˘ Cisco ѝ ˘ A˘ ⅄
ѝ ˘ B Â ЛЮ '
3des ╗

ѝ ESP-DES-MD5ˆ ╗ ╘˜ Â
Ю ˘ Cisco ˘ ˆ Â Юفي:





Э

RouterA ˈ

```
!
hostname "RouterA"
```

IKE

```
crypto isakmp enable
  crypto isakmp policy 1
  authentication pre-share
  encrytiong 3des
```

ɱ ˩

```
crypto isakmp key 0 123 address 192.168.12.1
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
```

ᚻ ╗

```
crypto ipsec profile profi-map
  set transform-set t1
!
interface FastEthernet0
ip address 192.168.202.1 255.255.255.0
```

╗ GRE Tunnel ˧˥

```
interface tunnel 1
  tunnel source  192.168.202.1
  tunnel destination 192.168.12.1
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.2 255.255.255.0
!
ip route 0.0.0.0 0.0.0.0 tunnel 1
```

Cisco ˈ

```
!
hostname Cisco
```

ᚻ IkE ˘ ѝ ɱ ˘ ὲ

```
crypto isakmp policy 1
  authentication pre-share
  encryption 3des
```

```
#        ᴍ
crypto isakmp key 0 123 address 192.168.202.1
#   ᴈᴛ ᴗ
crypto ipsec transform-set t1 esp-des esp-md5-hmac
  mode transport
#   ᴈᴛ ᴛ
crypto ipsec profile profile-name
  set transform-set t1
!
interface FastEthernet0/0
  ip address 192.168.12.1 255.255.255.0
#   ᴛ            Tunnel   ᴧ Э
interface tunnel 1
  tunnel source  192.168.12.1
  tunnel destination 192.168.202.1
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.1 255.255.255.0
!
```

Э

```
RouterA      '
!
hostname "RouterA"
#     IKE
crypto isakmp enable
  crypto isakmp policy 1
  authentication pre-share
  encrytiong 3des
#        ᴍ      ᴗ
crypto isakmp key 0 123 address 192.168.12.1
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
#   ᴈᴛ    ᴛ
crypto ipsec profile profi-map
  set transform-set t1
  match any
!
interface FastEthernet0
  ip address 192.168.202.1 255.255.255.0
#   ᴛ           GRE   Tunnel
```

```
!
hostname Cisco
#   ⌘ IkE    ˘         ѝ    ɱ    ˘  ὲ
crypto isakmp policy 1
  authentication pre-share
  encryption 3des
#        ɱ
crypto isakmp key 0 123 address 192.168.202.1
#   ⌘ ⌋
crypto ipsec transform-set t1 esp-des esp-md5-hmac
  mode transport
#   ⌘ ╗
crypto ipsec profile profile-name
  set transform-set t1
!
interface FastEthernet0/0
  ip address 192.168.12.1 255.255.255.0
#   ╗            Tunnel   ⋀ Э
interface tunnel 1
  tunnel mode ipsec ipv4
  tunnel source  192.168.12.1
  tunnel destination 192.168.202.1
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.1 255.255.255.0
```

Э

RouterA ˈ

```
!
hostname "RouterA"
#     IKE
crypto isakmp enable
  crypto isakmp policy 1
  authentication pre-share
  encrytiong 3des
#        ɱ      ⌋
crypto isakmp key 0 123 ipv6  ::/0
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
#   ⌘    ╗
crypto ipsec profile profi-map
  set transform-set t1
  match any
!
interface FastEthernet0
  ipv6 address 1111:1111::2/96
#   ╗           GRE   Tunnel   ⋀
interface tunnel 1
  tunnel mode ipv6
```

```
  tunnel source  1111:1111::2
  tunnel destination 1111:1111::1
  tunnel protection ipsec profile profile-map
  ipv6 address 2222:2222::2/96
!
ipv6 route ::/0 tunnel 1
```

Cisco ˈ

```
!
hostname Cisco
#   ЖЖ IkE   ˘        ѝ    ɱ   ˘  ὲ
crypto isakmp policy 1
  authentication pre-share
  encryption 3des
  #       ɱ
crypto isakmp key 0 123 ipv6  ::/0
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
#   ЖЖ    ╗
crypto ipsec profile profi-map
  set transform-set t1
!
interface FastEthernet0
  ipv6 address 1111:1111::1/96
#   ╗          GRE   Tunnel   ⋀
interface tunnel 1
  tunnel mode ipv6
  tunnel source  1111:1111::1
  tunnel destination 1111:1111::2
  tunnel protection ipsec profile profile-map
  ipv6 address 2222:2222::1/96
```

Ю Э

RouterA ˈ

```
!
hostname "RouterA"
#     IKE
crypto isakmp enable
  crypto isakmp policy 1
  authentication pre-share
  encrytiong 3des
#       ɱ      ⋃
crypto isakmp key 0 123 address 192.168.12.1
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
#   ЖЖ    ╗
crypto ipsec profile profi-map
  set transform-set t1
!
interface FastEthernet0
```

```
  ip address 192.168.202.1 255.255.255.0
#   ╗           GRE   Tunnel   ⺀
interface tunnel 1
   tunnel mode ipip
  tunnel source  192.168.202.1
  tunnel destination 192.168.12.1
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.2 255.255.255.0
!
ip route 0.0.0.0 0.0.0.0 tunnel 1
```

NAT ˈ

```
hostname "NAT"
```

#NAT ACL

ip access standard 1

10 permit any

б Router A

interface FastEthernet 0/0

ip address 192.168.202.2 255.255.255.0

ip nat inside

!

б Router B

interface FastEthernet0/1

ip add 192.168.12.2 255.255.255.0

ip nat outside

!

#NAT ‡˘ F0/0 ⺀ ˘ IP ѝ F0/1 ⺀

ip nat inside source list 1 interface fastEthernet 0/1

!

Cisco ˈ

```
!
hostname Cisco
```

⺮ IkE ˘ ѝ ϻ ˘ ѐ

```
crypto isakmp policy 1
  authentication pre-share
  encryption 3des
```

ϻ

```
crypto isakmp key 0 123 address 192.168.202.1
#   ㄏ╣√
crypto ipsec transform-set t1 esp-des esp-md5-hmac
  mode transport
#   ㄏ╣╗
crypto ipsec profile profile-name
  set transform-set t1
!
interface FastEthernet0/0
  ip address 192.168.12.1 255.255.255.0
#   ╗            Tunnel   ^ Э
interface tunnel 1
   tunnel mode ipip
  tunnel source  192.168.12.1
  tunnel destination 192.168.12.2
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.1 255.255.255.0
!
```

Ю Э

RouterA '

```
!
hostname "RouterA"
#     IKE
crypto isakmp enable
  crypto isakmp policy 1
  authentication pre-share
  encrytiong 3des
#        м,      √
crypto isakmp key 0 123 address 192.168.12.1
crypto ipsec transform-set t1  esp-des esp-md5-hmac
  mode transport
#   ㄏ╣    ╗
crypto ipsec profile profi-map
  set transform-set t1
  match any
!
interface FastEthernet0
  ip address 192.168.202.1 255.255.255.0
#   ╗            GRE   Tunnel   ^
interface tunnel 1
   tunnel mode ipip
  tunnel source  192.168.202.1
  tunnel destination 192.168.12.1
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.2 255.255.255.0
!
ip route 0.0.0.0 0.0.0.0 tunnel 1
```

ˆ IPSec˜

```
  ip address 192.168.12.1 255.255.255.0
# ╗            Tunnel ᴧ Э
interface tunnel 1
  tunnel mode ipsec ipv4
  tunnel source  192.168.12.1
  tunnel destination 192.168.12.2
  tunnel protection ipsec profile profile-map
  ip address 2.2.2.1 255.255.255.0
!
```

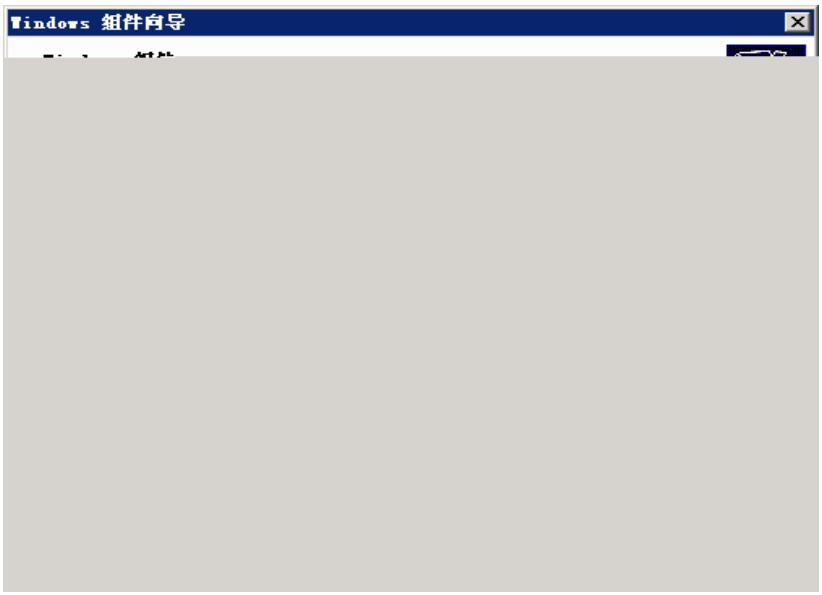
' Ю ˘ Юفي˘ CA '

' ⅃ˇ Ю ˘ Юفي˘ ˆ ˩ ˜ '

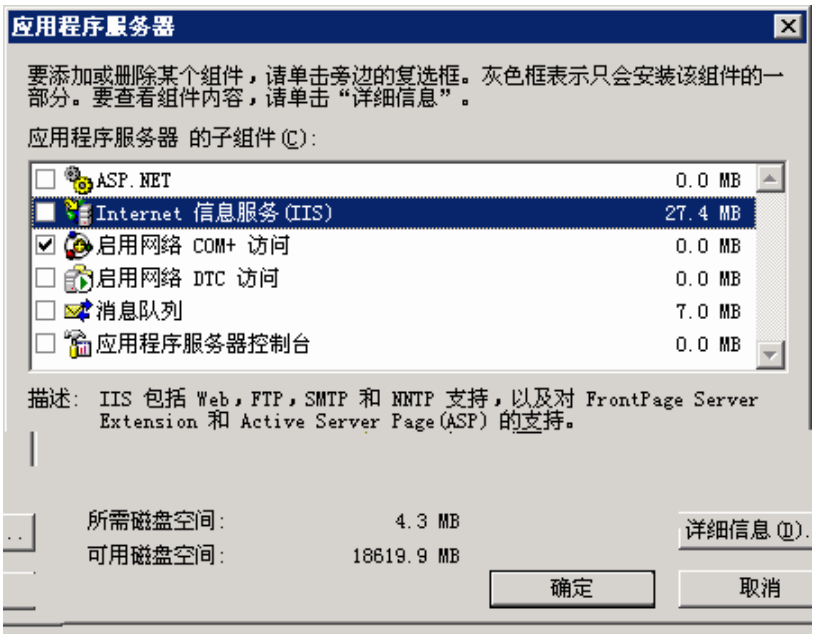
Ό ' Ю ˘ Ь Â

' “ ╗/ ” “ ╗/ Windows ˚ ”Â

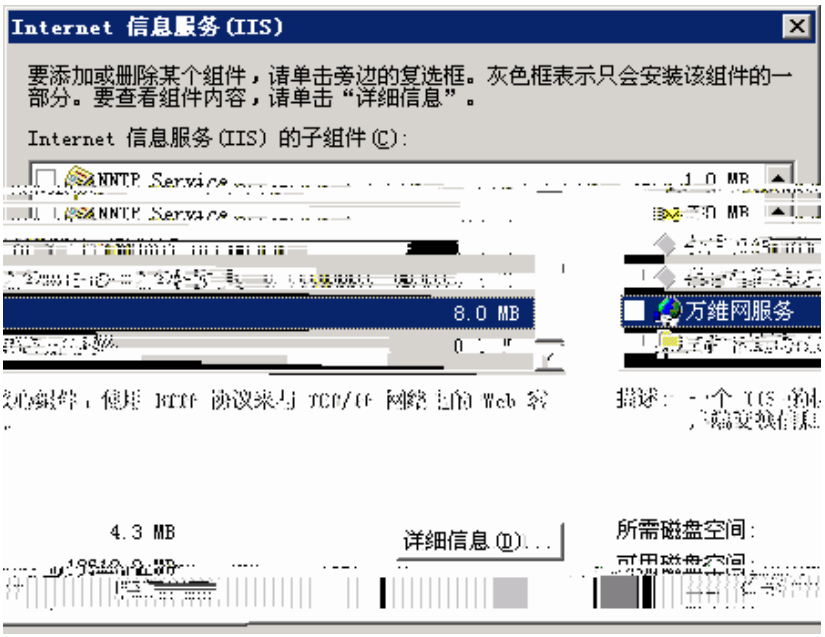
γ ' “ Ь ” “ ”Â



Ь ' Ю ˘ “Internet Ь” “ ”Â

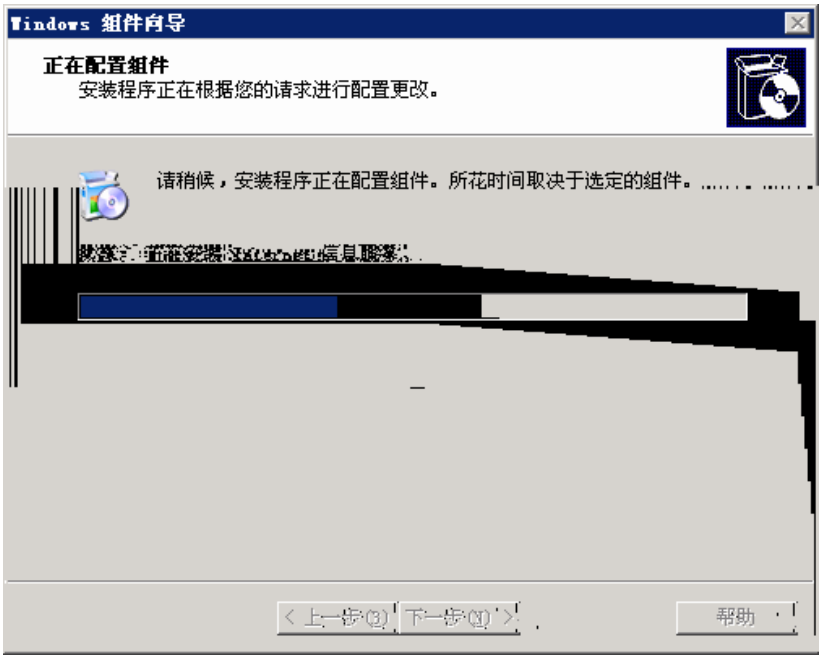


ˈ Ю ˘ “ ╘” “ ”Â

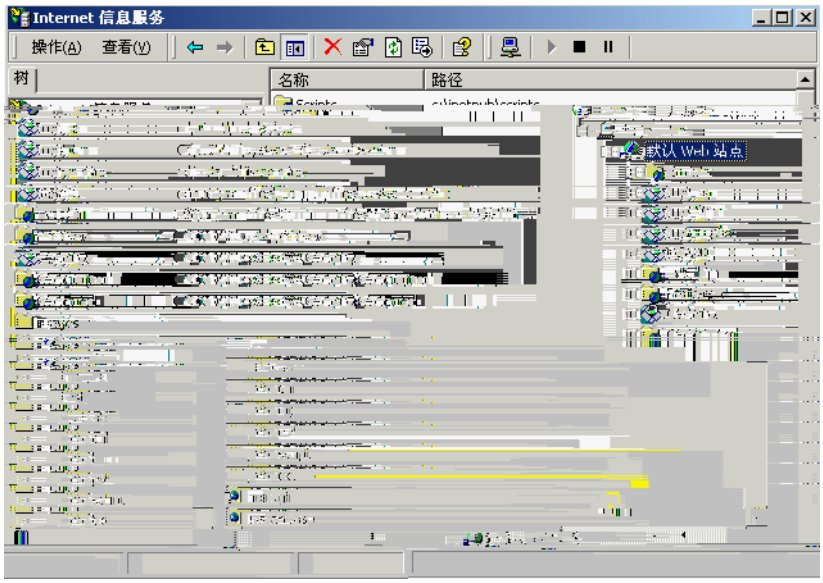


ˈ Ю ˘ “Active Server Pages” “ ╘” ⅄ Ь “ ”Â “ ╘” ‡ ≠ “Ω ˇ ” “Internet ╘ ”Â

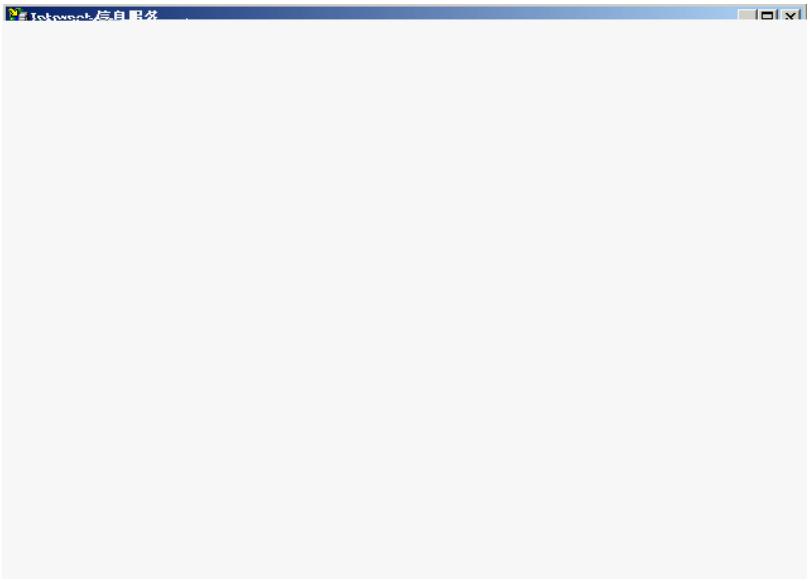
Ώ ' ў Л˘ “Ю ” Â



' 8 ˘ έ˘ Internet Ь ˘ Юفي'



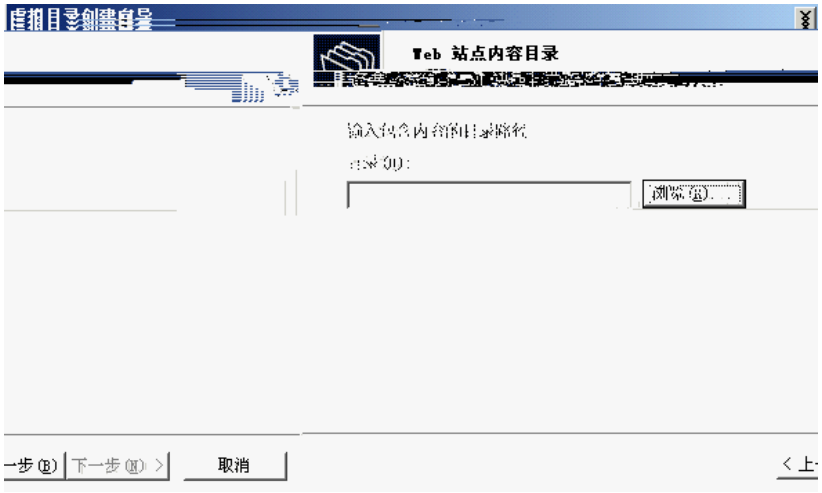
ὦ ' ˩ Web ˘ Ю في'



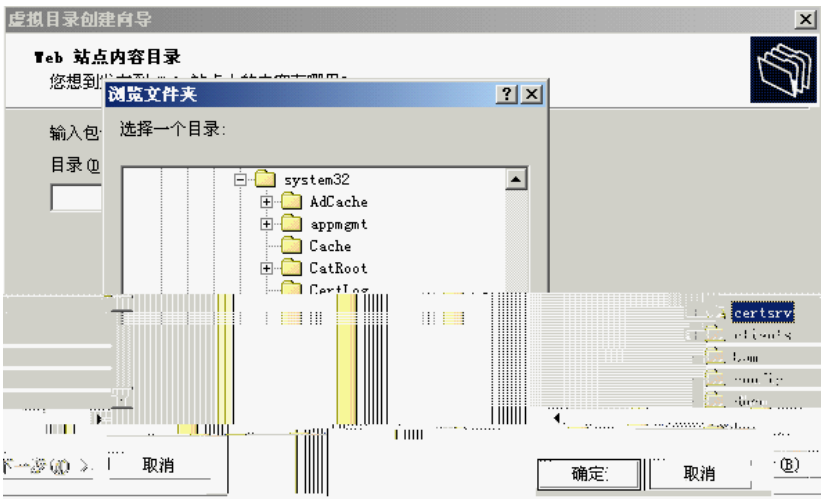
' ˘ Ю في'

' Ю ˘ ˩ ˘ Ю في'

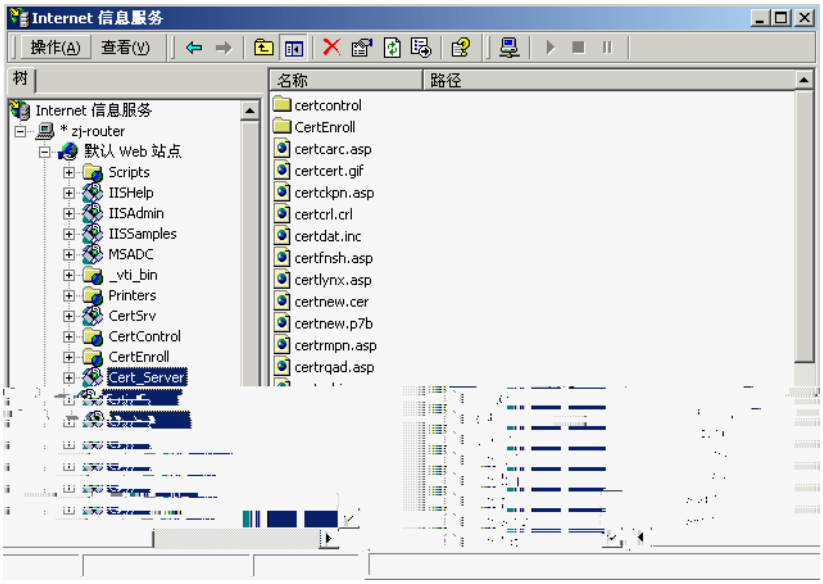
' Ю ˘ ˘ Юفي'



γ ' ˘ Ь ˘ Юفي'



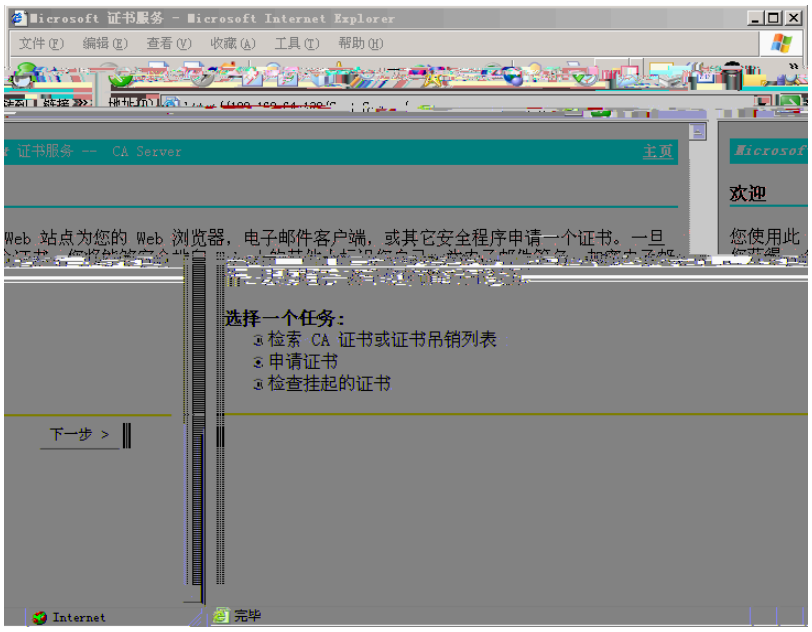
' Лυ win2003 й ˘ Ь ˘ Юفي'



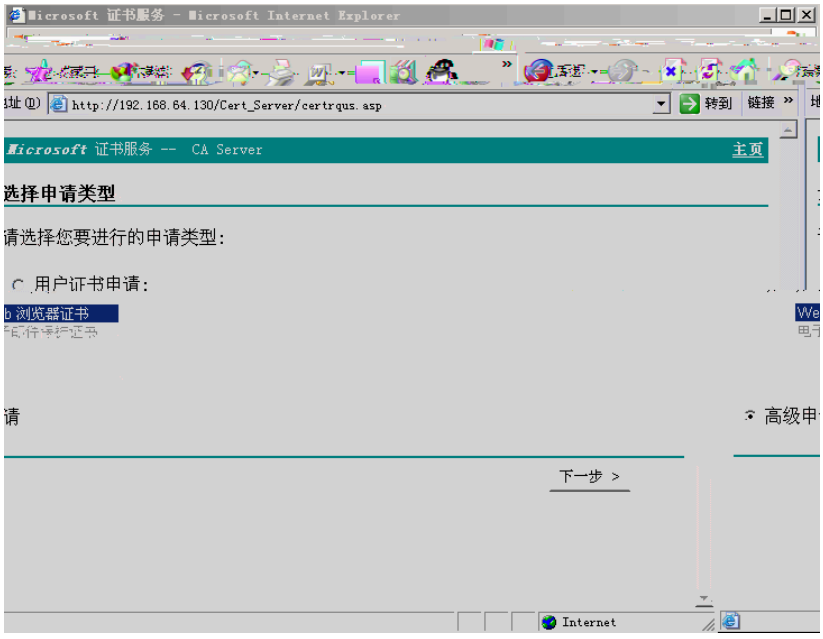
CA server Internet 127.0.0.1/Cert_Server

PC ˘ CA server ip й 192.168.64.130˜
Ю '

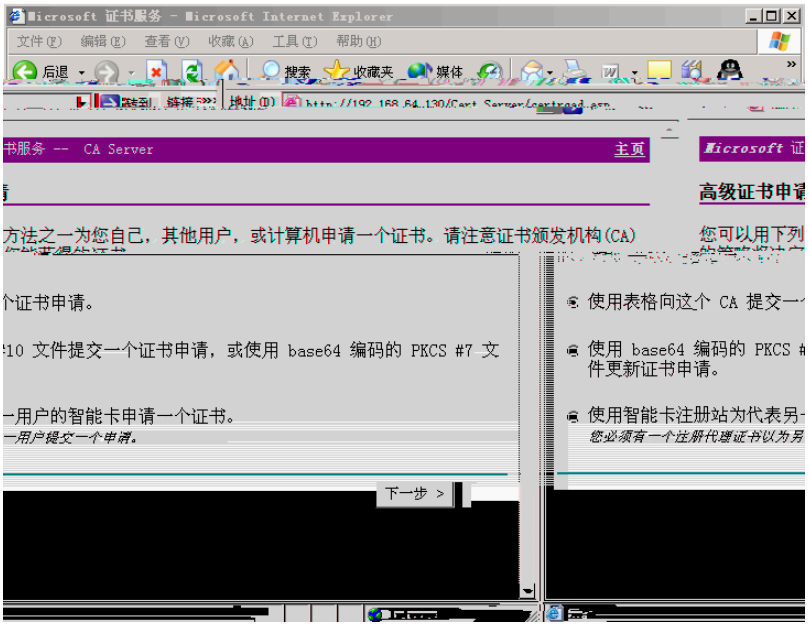
' ˆ PC˜ Internet ˘ 192.168.64.130/Cert_Server, Юفي'



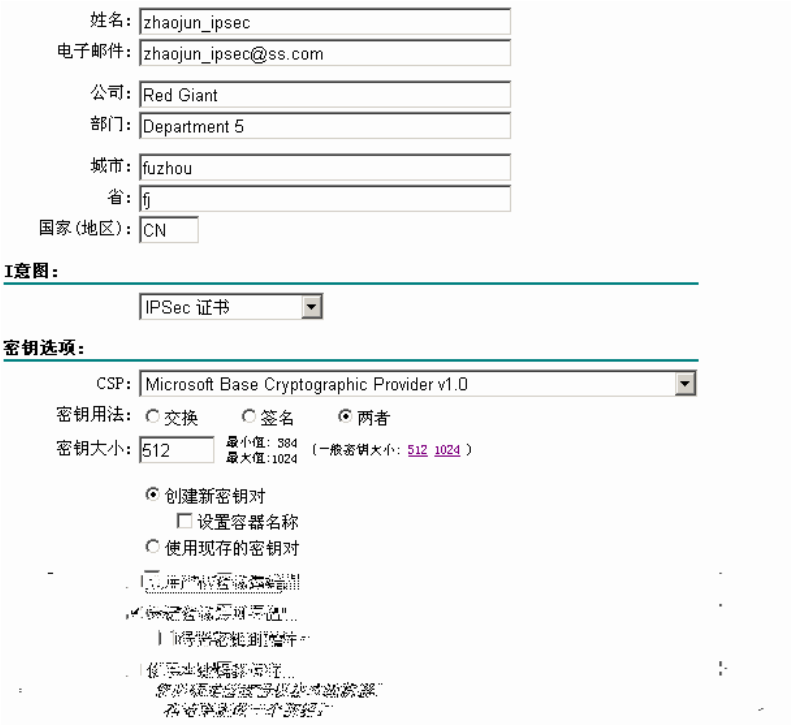
γ ' Ю ˘ ˆ ˜ ˘ Юفي'



Ь ' Ю ˘ ˆ ˜ ˘ Юفي'



' Ю ˘ ˘ Юفي'



' ل Э˘ й RSA CA server ˘

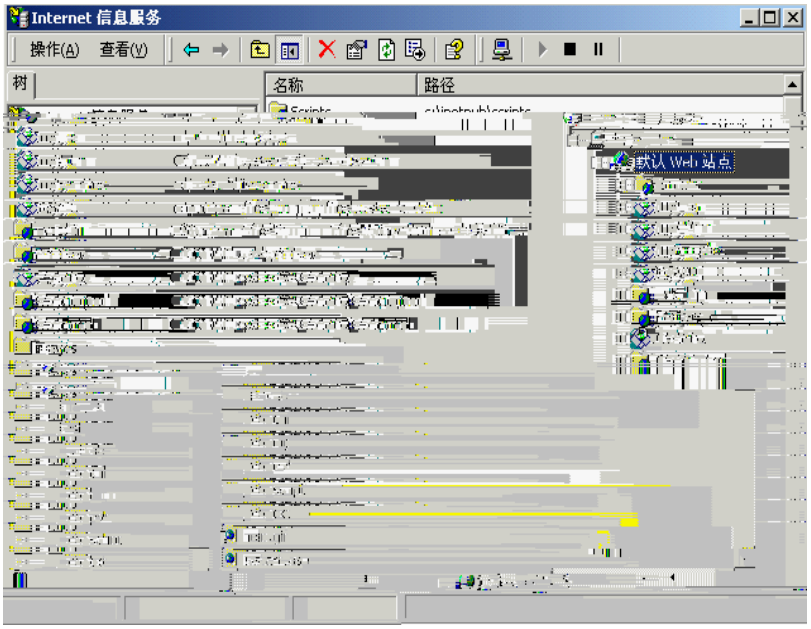
' ˘ Â

Ώ ' ў ˘ ˘ Юفي'

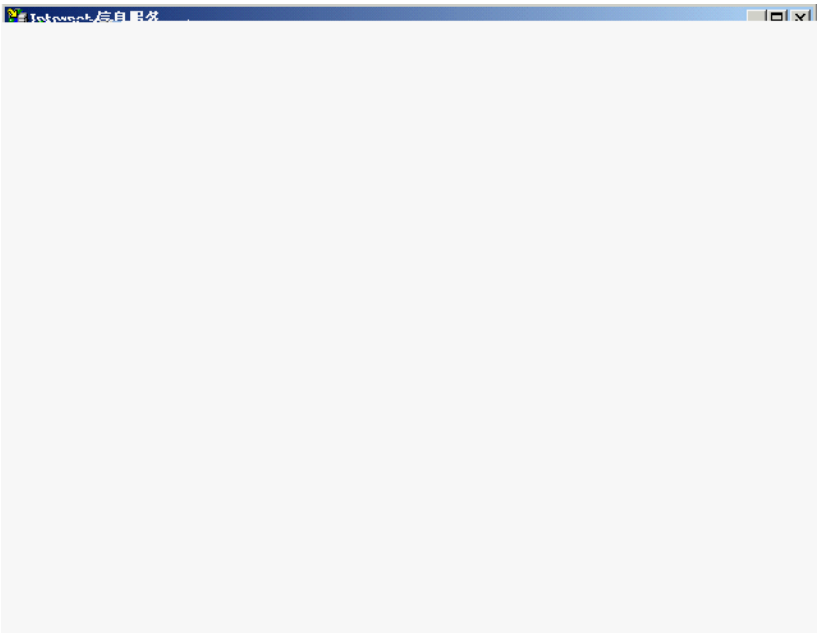
11.2.3 i / Ó { x , Þ

PC ˘ CA server ip ѝ 192.168.64.130˝
Ю '

' ^ PC˜ Internet ˘ 192.168.64.130/Cert_Server, Юفي'



γ ' Ю ˘ ^ ~ ˘ Юفي'



Ь ' Ю ˘ ^ ~ ˘ Юفي'

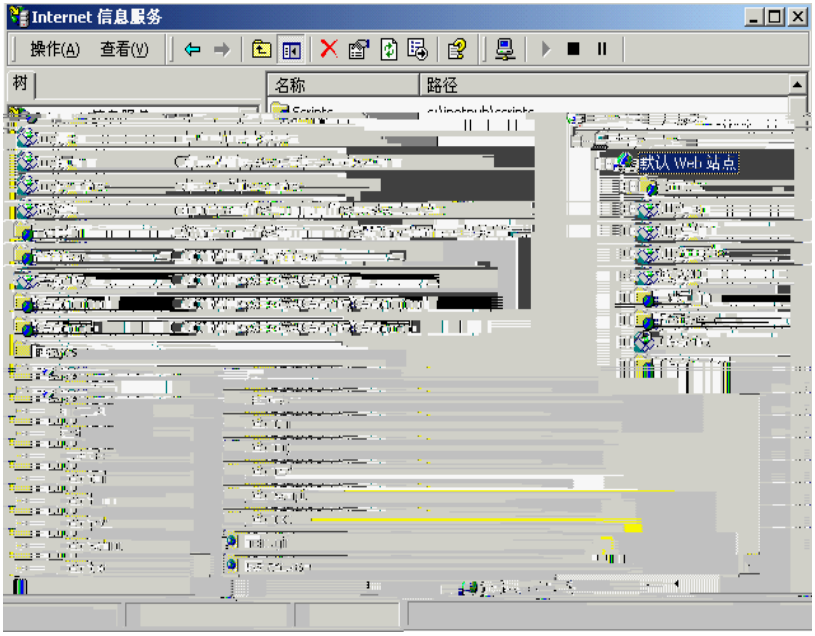
11.2.3 i / Ó { x , Þ

,Â ! å À,XCÃ+ <A• : EîE› PC + AË9‹ k,X È A’ CA server ,X ip 192.168.64.130 ÈA• :,X + AË ` Ð 9 Ý V ß!9Px Ö

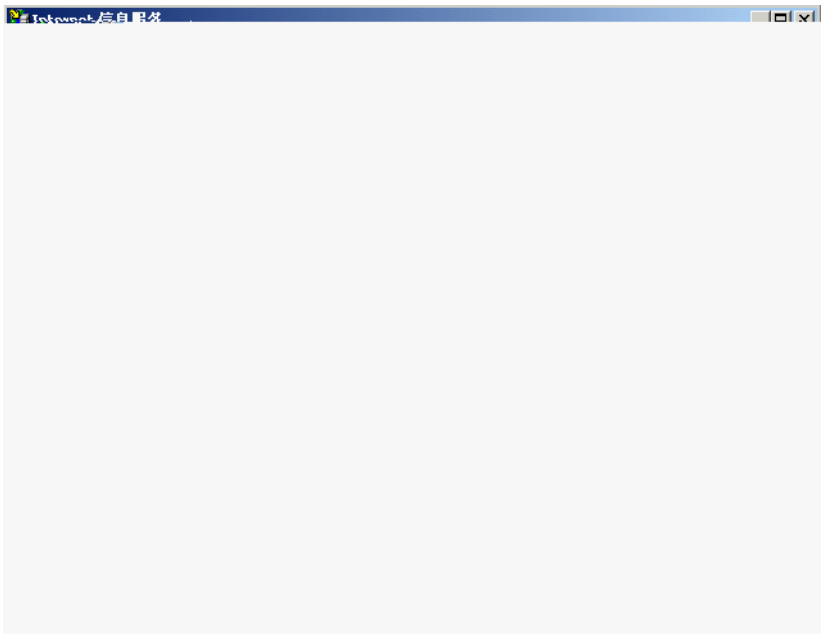
1 Ô!9 Ö ' Ô v 0Ã ÄPC Å,X Internet ##?œ < ÈEg 9192.168.64.130/Cert_Server, V ß Ò Ö

1 `!9 Ö&• Ï ß Ô!9 ÈEÝ ½+ AË2O _ ÄEÝ ½P¬4{+ AË Å È V ß Ò Ö

1 Ý!9 Ö&• Ï ß Ô!9 ÈEÝ ½ ¤ x+ AË,X 6 ã ÄEÝ ½EîE›>< 6 ã Å È V ß Ò Ö



1 ¯!9 Ö ü ß Ô þ ÍA± ÈEÝ ½“ Û4È5% á u”J) Ï“ Aº4š µ C” Ä



1 h!9 Ö ü ß Ô þ ÍA± ÈEÝ ½“Active Server Pages” ÈEÝ ½“ Û4È5% á u”È' â) Ï Ý õ“ .B n” Ä V pEÝ ½ Z“ Û4È5% ¥ × á u” È í 3 îT¬AxEÝ ½“ @ E [Ê” `“Internet á u1u)Ú < ” Ä

1 Ô!9 Ö&• Ï ß Ô!9 ÈA’5B Y •,Â) È V ß Ò Ö

1 `!9 Ö&• Ï##?œ ÈEÝ ½]>™A• : á u ü,X,Â) È V ß Ò Ö

"¼ Ö ¹ win2003 2Ï4³ _ ÈA• : á u,X]>™CÃ X È V ß Ò Ö

CÃ+ <A Ö

```
ip host peerhost 2.2.2.2
ip access-list extended 110
  10 permit ip host 2.2.2.3 host 2.2.2.2
crypto isakmp policy 1
  authentication pre-share
!
!
crypto isakmp key 7 01334b46391e033004 address 0.0.0.0 0.0.0.0
crypto ipsec transform-set myset    esp-3des
crypto dynamic-map dymap 100
  set transform-set myset
  reverse-route
  match address 111
!
!
crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0
  ip ref
```

AÈ â

1. RGOS 8.31 â4Á(` CISCO A' Û Ô È IKE 1*+9 T¬AxG›*ü D +1R áAxA• Ä VLÔ?UG›*üNX E • šJy È ™NO r tIKE 1*+9G!5B Ä V ß _ Ö

```
crypto isakmp policy 1
authentication pre-share
!
```

5Õ(,X RGOS ¾ ÕNX E • šJyAxA•

2. V p ¤E°/ß,X ike # Í1 ' hostname ü DNS Þ Æ4£"¼ ` ÈÞEÄ,X1 `!9 Ã ¹,Õ+9 Ä
3. CISCO Þ V p Í0ÃG›*ü hostname 9E¯> ÛAšNX E • šJy í ¥CK •G›*ü/Ã U õ ã ¥CK # Ä

10.3.2.10 ´DPD ó Z

,Â ! DPD r)„ ÞG›*ü Z ø/¡ Ö Ô Ã on-demand ÈA¹ üL{F'KÆ5B ÊKÈCYE›G!5B,X Ê KÈ È!8 Ê Ý y [¥EÕ È î %" ¥EÕ DPD v# #\ C Ä ` Ã periodic ÈA¹ üCYE›G!5B,X Ê KÈ â î | ¥EÕ DPD v# #\ C Ä Ô ûG¡ ô õ D 5 õ Ä Ä »(,X DPD G!5B –?• 8.2 (G!5B Û Ð Å

Q ¸ V ß Ö

Q ¸	0*ü
Router(config)# crypto isakmp keepalive seconds	seconds——L{F'KÆ5B ÊKÈ T¬AxG¡ ¥KÈLh ÊKÈ 5 /¦ ÈG›*ü on-demand
Router(config)# crypto isakmp keepalive seconds retries	seconds——L{F'KÆ5B ÊKÈ retries——G¡ ¥KÈLh ÊKÈ T¬AxG›*üon-demand
Router(config)# crypto isakmp keepalive seconds retries on-demand	seconds——L{F'KÆ5B ÊKÈ retries——G¡ ¥KÈLh ÊKÈ on-demand——on-demand
Router(config)# crypto isakmp keepalive seconds periodic	seconds——L{F'KÆ5B ÊKÈ periodic——periodic T¬AxG¡ ¥KÈLh ÊKÈ 5 /¦
Router(config)# crypto isakmp keepalive seconds retries periodic	seconds——L{F'KÆ5B ÊKÈ retries——G¡ ¥KÈLh ÊKÈ periodic——periodic

10.3.2.11 ´nat A - ¬ • ? d

Õ RFC3947 ÈIPSEC NAT-t È S*ü r t UDP • ã È?· ‡ nat 0SEãKÂNl Ä ZFS ! nat E² y CY Ê È ¹LÔ?U S*ü keepalive • ã ¥EÕ y [Ä áG!5B,X ™ ‰ ß S*üT¬Ax ÊKÈ 5 ÚJs

Q ¸ V ß Ö

CÃ+ <A Ö

ip host peerhost 2.2.2.2

ip access-list extended 110

10 permit ip host 2.2.2.3 host 2.2.2.2

crypto isakmp policy 1

authentication pre-share

!

!

crypto isakmp key 7 01334b46391e033004 address 0.0.0.0 0.0.0.0

crypto ipsec transform-set myset esp-3des

crypto dynamic-map dymap 100

set transform-set myset

reverse-route

match address 111

!

!

crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0

ip ref

G›*üEîF' õ ã

± x • ã ESP-DES-MD5 Ä ¤ o t š `P`A• á u Å Ä

CÃ+ <A ,X S ³ · ip Î n,X:202.1.1.2/24 ÈEîE› ç4“ y 9 Internet

CÃ+ <B EîE› ADSL 4“CÃ*üpppoe #A, ¼ 9 Internet Èip + ISP | Õ ÚG!

G›*üNX E • šJy È è —CÃ+ <EîE› á Û nNX E • šJy

G›*ü IKE Î0Ÿ] <6(,³

CÃ+ <G!5B

ü 8V È Ú4- ÎJä KCÃ+ < G RouterB ` RouterA S*ü Î0Ÿ] <6(,³,XG!5B Ä

RouterB ,XG!5B Ö

```
!
hostname "RouterB"
# Ô IKE
crypto isakmp enable
# G!5B D• Ñ
self-identity fqdn www.google.com
# G!5BNX E • šJy ` ¬ 6Lš Ü
crypto isakmp key 0 preword address 202.1.1.2
crypto ipsec transform-set myset esp-des esp-md5-hmac
# n Ô þ t š ô ØLš Ü
crypto map mymap 5 ipsec-isakmp
set peer 202.1.1.2
set exchange-mode aggressive
set transform-set myset
match address 101
!
interface FastEthernet0
ip address 192.168.12.1 255.255.255.0
interface FastEthernet1
no ip addrsss
pppoe enable
pppoe-client 1 dial-pool-number 1 dial-on-demand
```

CÃ+ <A Ö

ip host peerhost 2.2.2.2

ip access-list extended 110

10 permit ip host 2.2.2.3 host 2.2.2.2

crypto isakmp policy 1

authentication pre-share

!

!

crypto isakmp key 7 01334b46391e033004 address 0.0.0.0 0.0.0.0

crypto ipsec transform-set myset esp-3des

crypto dynamic-map dymap 100

set transform-set myset

reverse-route

match address 111

!

!

crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0

ip ref

CÃ+ <A Ö

ip host peerhost 2.2.2.2

ip access-list extended 110

10 permit ip host 2.2.2.3 host 2.2.2.2

crypto isakmp policy 1

authentication pre-share

!

!

crypto isakmp key 7 01334b46391e033004 address 0.0.0.0 0.0.0.0

crypto ipsec transform-set myset esp-3des

crypto dynamic-map dymap 100

set transform-set myset

reverse-route

match address 111

!

!

crypto map mymap 7 ipsec-isakmp dynamic dymap

interface GigabitEthernet 1/0/0

ip ref

ĭ ”Ą Ӯ ˘ ЛЮ ˈ

1.

2. RLOG

3. SNMP

4. MIB

5. ╟

˘ ⌋ ע UP àDOWN ˘ Y˚ à
Â ⁄ı ӊ ⁸˘ ⌋ ע Y˚ ˘ ╟
ˆ ˜˜ ⌋ Ɲ ⁄ˆ ⁸ ⌋ àVTY ˜ Э Ў˜
ă ѡ àFLASH˜ Э Э ╘ Э˘ ǂ Æ Â
⌋ ѝ ⌋ ˘ ⌋ Ɲ Э ⁄ı˘
˙ ˝I ǂ Â

⁄ı ӊ Ю'

' <˙ ˝I > ⁄ı ⌋ ⌋-ш - '
˙ ˝I ¯ 8¯ ш
'

<189> 226:Mar 5 02:09:10 S3250 %SYS-5-CONFIG_I: Configured from console by console

⁄ı ˙ a ˙ ˝I ˘ ˙ ˝I ⌋ Syslog Server
Â

Ю˘ a ˘ . ˘ ‡ ˧ Л a ˧
. Â

Л ˧˘ a ˧ Л ⁸ ˧ Э ˘ ≠ ˧ Л a ˧ Â
a ˧ ˘ Ю ЛЮЮ ʒ'

Ю ʒ	
Ruijie(config)# [*buffer-size* | *level*]	ă ʉ
Ruijie#	VTY ˧ Э
Ruijie(config)# *host*	Э Syslog Sever
Ruijie(config)# *filename* [*max-file-size*] [*level*]	FLASH Э

Logging Buffere' ă ʉ Â ă ʉ ˘ .
ă ʉ Л ˧˘ Â ă ʉ ˘
Ю ʒ Â ă ʉ ˘ Ю ʒ
Â

Termninal Monitor' VTY(Telnet ˧) Э Â
Logging Host' Syslog Server ˘ ˧ ʜ 5 Syslog
Server Â ˧ ˥ Syslog Server Â

ǂ FLASH˘ FLASH˘ FLASH Â
FLASH˘ FLASH Â

Э ╗ ˧˩ ˘ Ю ЛЬЮЂ ʒ'

Ѣ ʒ	
Ruijie(config)# *message-type* [|]	
Ruijie(config)# *message-type*	

ч ' ╟ (Uptime) (Datetime) Â a ˩˧
Â

ˈ Log Debugˇ Log ш 0̇ 6 ˇ Debug
ш й 7 Â

a RTCˇ Â ╟ й Â

Юˇ a ⅃ Â ╗ Э ⅵ ⅃ˇ Ю Ѫ
Юѣ ʒˈ

ѣ ʒ	
Ruijie(config)#	ⅵ ⅃ Â
Ruijie(config)#	╗ ⅃ Â

Ю˘ ╗ Â ╗ ˘ Ю
ЛЮЂ ʒ'

Ѣ ʒ	

Ruijie(config)# ╗ ˘
Â

[illegible] a [illegible] Э [illegible] [illegible] a [illegible] Э ш
Â

[illegible] Ю [illegible]

[illegible]	
Ruijie(config)# *level*	[illegible] Э
Ruijie(config)# *level*	VTY [illegible] (telnet [illegible]) Э
Ruijie(config)# [*buffer-size* | *level*]	[illegible]
Ruijie(config)# *filename* [*max-file-size*] [*level*]	FLASH Э
Ruijie(config)# *level*	Syslog Server

[illegible] [illegible] [illegible] 8 '

	0	[illegible] a
	1	. [illegible]
	2	
	3	
	4	A:#S[illegible]mA:[illegible].[illegible]cy[illegible]H6R#S[illegible]d"57# r"hBxcr2[illegible]Xp'[illegible]2O_[illegible]L 7b[illegible]d•[illegible]

FLASH ѝ 6 Â

˧ Ɲ Ƕ ʒ a ˧ Э Â

Syslog Server ˛ ˝l ˥ ˘ ɥ Â

˘ Ю ƛЮƕ ʒ ʽ

Ƕ ʒ	
Ruijie(config)# *facility-type*	
Ruijie(config)# *facility-type*	ѝ Â

Ю Ѭ ʽ

Numerical Code	Facility
0	kernel messages
1	user-level messages
2	mail system
3	system daemons
4	security/authorization messages
5	messages generated internally by syslogd
6	line printer subsystem
7	network news subsystem

Ruijie(config)# *interface-type interface-number*	ᴧ
Ruijie(config)# *A.B.C.D*	ip

Ю˘ б ˘ Ʌ ƕ ʒ˘ a LOG Â
/ LOG ˘ ƕ ʒ LOG Â Ю ƛЮƕ ʒ'

ƕ ʒ	

ƛƱЮ ╥ ǹ ˈ

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

Ruijie(config)# service timestamps log datetime  //     log        ˘

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

Э ˘ rlog Э ⊾ ˘ ⊾
⅃ Â Â

rlog nat Ɲ ˘ ὲ Â

⅂ '

⊾˘ Ɲ

╟ ⊾ ⅃ ⅃ ⊾

web ⊾

/NAT ˘ ≠ ' '

⊾ ѝ ƕ ʒ Â ⊾ Ю˘ a
⊾ Â

⊾ ƕ ʒ ⅃ ˘ ╟ ˘ Ɲ udp Â

⊾ ˘ Ю ƛЮƕ ʒ'

ƕ ʒ	
Ruijie(config)# [*vrf-name* |] [*port-num*]	⊾ ip VRF ⅃ ÿ ⅄ ˘ ⊾˘ ⅄ 20000
Ruijie(config)# *server-ip*	⅄ ⊾ ˘ ⊾˘

⊾ ƕ ʒ ⅃ ⊾˘ ˘ ƕ
ʒ a Â ˘ Â

⊾ ⊾ ˘ ⊾ ⅄ ⅄ Â

ƕ ʒ˘ ⅃ Ɲ ⊾ ˘ ⊾ б ὲ ⊾ ᾰ

ᒪ ˘ Ю ЛЮЮ ᚷ'

ᚢ ᚷ	
Ruijie(config)# *number*	ᒪ ˆ ˜
Ruijie(config)#	ᛋ ᒪ ˘ 1000
ᚢ ᚷ	
Ruijie(config)# *n server-ip prio*	ᒪ Э ˘ ˙ ˝I
Ruijie(config)# *n server-ip*	ᒪ Э
ᚢ ᚷ	
Ruijie(config)#	nat ᒥ ' ᛇ ᛋ NAT a
Ruijie(config)#	nat ᒥ ' ᛇ NAT '

ᒪ a Э ˘ ᒪ Â ᒪ ᛁ Л
ᒪ Â
˘ ᒪ ˘ ᛁ Л й Â
'

ᛇ й 16

	XLOG_PRIORITY_INFO, XLOG_PRIORITY_DEBUG, . ”I ’

Ь ˘ ˘ ˘ ˘ Ɲ

Â

Ь ˘ Ю ƝЮƚ ʒ'

ƚ ʒ	

Â

4000 Э Â Э ˘ 8k Â
ѝ 50 Â

8k*50=400k

400k * 60 * 60 * 24 = 34.5G

34.5 * 30 1T

˘ ѫ ≠ ╗ Â

	˧˩ a ˘ ╘ ˧˩ Â Â
	˧˩ 15 ˘ ˧˩ ⅄ ╗ 12 15 Â
	˘ ˘
	a ≠ ˧˩ ⅄ ╗ ѝ 0 ˛ ע Â
	╟ ╘ Â

web ˘ ˆ ˘ ˩˘ ˜
web Â

╘ web ˝I Â

SNMP Simple Network Manger Protocol 1988 8
RFC1157 SNMP Y
SNMP

SNMP

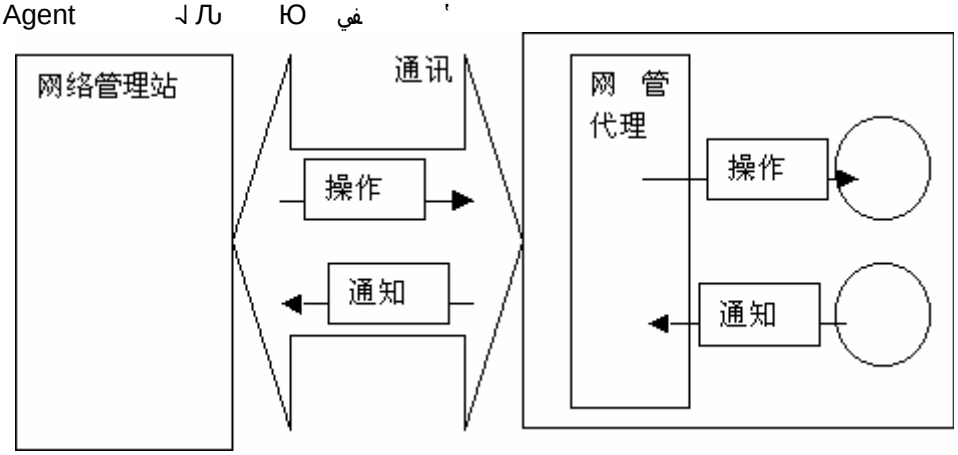
SNMP

MIB

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

SNMP SNMP Agent NMS NMS

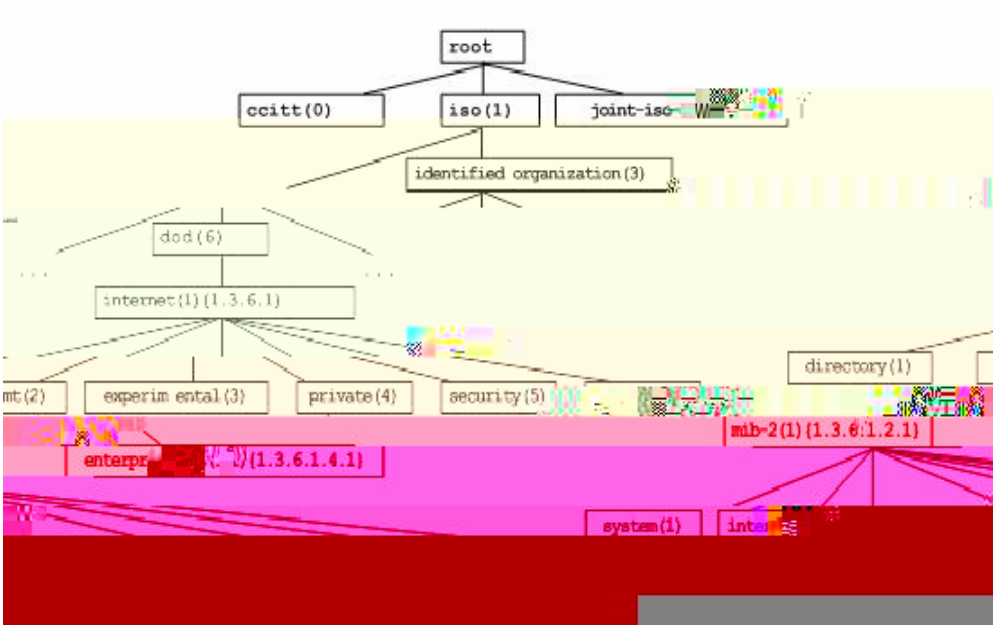
NMS Agent



MIB Management Information Base

SNMP MIB MIB MIB System

{1.3.6.1.2.1.1} Object Identifier MIB



SNMP ЛЬЮ '

SNMPv1 ' ˘ RFC1157 ЮЖ Â

SNMPv2C' ˩ ˆ Community-Based˜ SNMPv2 , RFC1901 ЮЖ Â

SNMPv3 ' ╗ ˘ ЛЬЮ '

1. a '
2. ÿ '
3. ╗ ˘ '

SNMPv1 SNMPv2C ˩ ˆ Community-based˜ Â ЮЖ ў Л ˩ (Commumity String) Ҙ MIB Â

SNMPv2C ╗ Get-bulk ⁸ з ╗ Â Get-bulk ˧˩ ˧˩

˘ ÿ - ÂSNMPv2C 'I Ҙ ЛЬЕ˜ a ˩ ˘ SNMPv1 Ҙ Â Ҙ ˩ЛЬЕ˜ Â Э ˩ ˩ SNMPv1 SNMPv2C ˘ SNMP Ҙ SNMPv1 SNMPv2C ˘ з Â

SNMP NMS Agent ˘ ЮЖ 6 '

1. Get-request ' NMS ÿ Agent ˧˩ Â
2. Get-next-request ' NMS ÿ Agent ˧˩ Ю Â

3. Get-bulk ' NMS ÿ Agent ↓ '
4. Set-request ' NMS Agent Â
5. Get-response ' Agent ˇ Agent NMS 3 Â
6. Trap

SNMPv3	authNoPriv	MD5 SHA		HMAC-MD5 HMAC-SHA ⁸
SNMPv3	authPriv	MD5 SHA	DES	HMAC-MD5 HMAC-SHA ⁸ CBC-DES ╗ ⁸

SNMP Â SNMP SNMP ˘
SNMP Â ˘ ѝ SNMPv3 Ʒ
˘ . SnmpEngineID Â

ѝ OCTET STRING˘ ѝ 5˙ 32 Â RFC3411 Ѭ
:

4 /ˡˆ IANA˥ ˜ ˘ HEX Â

5 ⅓Ю '

0'
1' ⅄ 4 Ipv4 Â
2' ⅄ 16 Ipv6 Â
3' ⅄ 6 MAC Â
4' ˘ 27 ˘ Ѭ Â
5' 16 ⁸ ˘ 27 ˘ Ѭ Â
6-127' Â
128-255' Â

SNMP Ю ˘ SNMP ˘ ”I
Â

SNMPv1/SNMPv2C ⅃ ˆ Community-based˜ ˘ SNMP Ʒ ⅃ ⅃
⅃ ⅃ˆ Community-String˜ ˘ б ⅃ a SNMP a
˘ Â ⅃ NMS Agent Â

⅃ Ɲ ˘ ⅃ IP NMS ⅃ Ɲ '

⅃ Ɲ ⅃ ˘ ReadOnlyˆ ⅃ ˜ ReadWriteˆ ˜ '

ف ⅃ ˘ ف Â ف˘ . MIB '

⅃ Ɲ ⅃ IP Â a ˘ ‡ a ⁸ ⅃
IP Â ѝ a ⁸ ⅃ IP '

SNMP ⅃˘ Ю ЮЂ Ʒ'

Ruijie(config)# *string* [*view-name*] [|] [*host-ip*] [*num*]	⅄ Â

Agent Ю ≠ ў ╟ ⅃ NMS ˘ Agent ў ╟ NMS ў
˘ Ю Ю ʒ'

ƚʊ ʒ	

Ruijie(config)# { *host-addr*
| ipv6-addr} [*vrfname*] [
{ | | [| |]}]
community-string [*udp-port port-num*] [ ] SNMP ў ˘ ў
ʌ˘ vrf ˘ ˘
ʎ SNMPv3 Ю ⅃ ˜ à
ˆ SNMPv3

a ⅃ ƕ ʒ˘ ⅄ ɥ snmp ʒ ƕ ʒ˘ ƕ ʒ snmp ⊥˘
a ʒ ' SNMP ʒ ⊥˘ Ю˘ Ю ʒ'

ƕ ʒ	
Ruijie(config)#	SNMP ʒ ⊥

Trap Agent a ў ╟ ⅃ NMS ˘ Y˘ Â
a Agent ў ╟ Trap ˘ ˘ Ю˘ Ю ʒ'

ƕ ʒ	
Ruijie(config)# [*type*] [*option*]	Agent ў ╟ Trap
Ruijie(config)# [*type*] [*option*]	Agent ў ╟ Trap

⅃ ⅄ ⅄ ĭ ⅄ LinkTrap˘ ╖ ˘ ⅄ Link
⅃ ע˘ SNMP LinkTrap, ⅃ ‡ a Â Ю˘ ╖ Â

ƕ ʒ	
Ruijie(config)# *interface-id*	⅄
Ruijie(config-if)# [ ]	⅄ link trap ╖ ·

Ю ⅄ ѝ a Link trap:

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

⅃ ⅄ Agent Trap ˘ Ю ʒ '

ƕ ʒ	
Ruijie(config)# *interface*	Trap ⅄
Ruijie(config)# *length*	Trap
Ruijie(config)# *seconds*	Trap

ÿˆ ˜ ⅃ ⅄ a ⅃˘ Â ⅃
⅄ a ⅃ ÿ˘ ЮЂ ʒ'

Ѣ ʒ	
Ruijie(config)#	⅄ ╗

╗ ˘ no snmp-server if-index persist Ѣ ʒ Â Ю˘ ╗ Â

Ю ⅄ ╗ '

Ruijie(config)# snmp-server if-index persist

й SNMP SNMP ˘ ⅄ ӊ SNMP ʒ˘ ⅃

Unknown community name	a ⅃
Illegal operation for community name supplied	
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 ĩ
Bad values errors	
General errors	

```
writeview: default
notifyview:
groupname: public
securityModel: v1
securityLevel:noAuthNoPriv
```

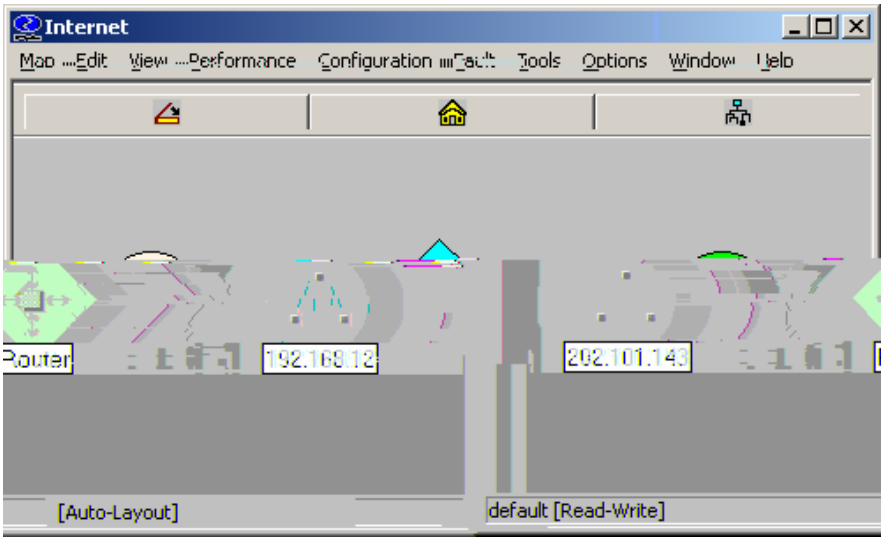
ЛЮ SNMP Ʒ ˘ NMS ˧ Л
˘ ѝ ˧ '

```
Ruijie(config)# snmp-server location fuzhou
Ruijie(config)# snmp-server contact wugb@i-net.com.cn
Ruijie(config)# snmp-server chassis-id 1234567890
0987654321
```

ЛЮ ˘ ў ╟ ˩ NMS Trap ˘ ѝ ˧ '

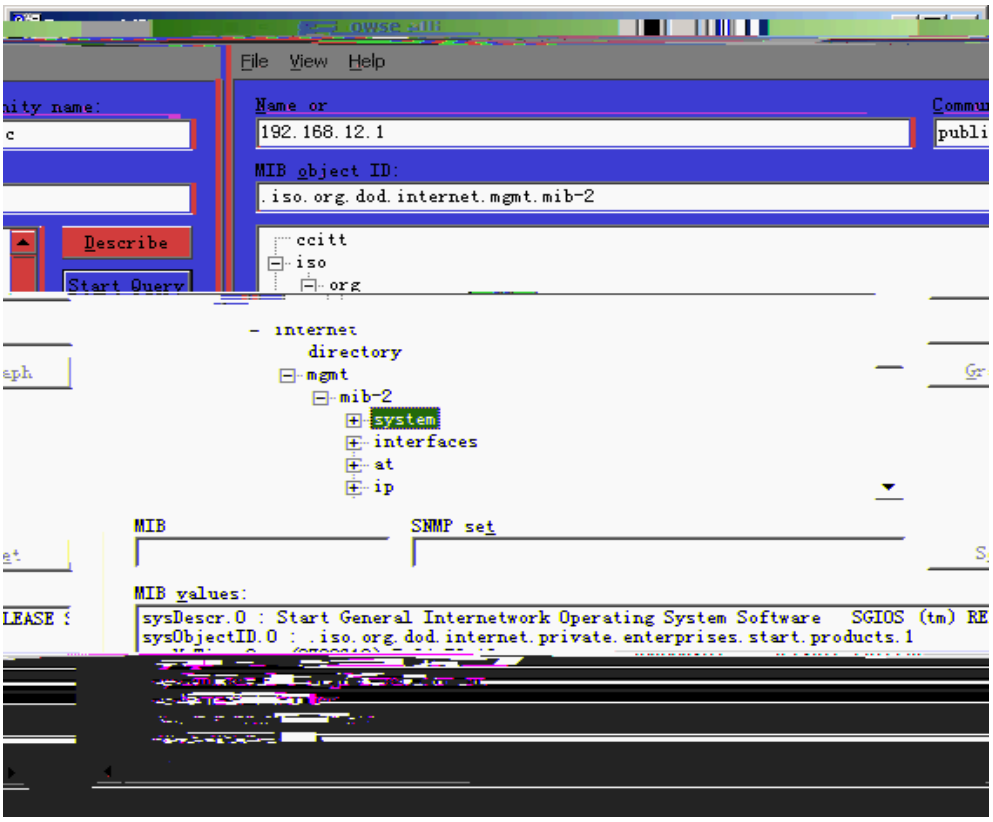
```
Ruijie(config)# snmp-server enable traps
Ruijie(config)# snmp-server host 192.168.12.181 public
```

Э ˘ SNMP Ʒ ˘ NMS ˧ Л
˘ Л HP OpenView ѝ ˘ ˧ Л ӊ ˘ Ю ˘ في '

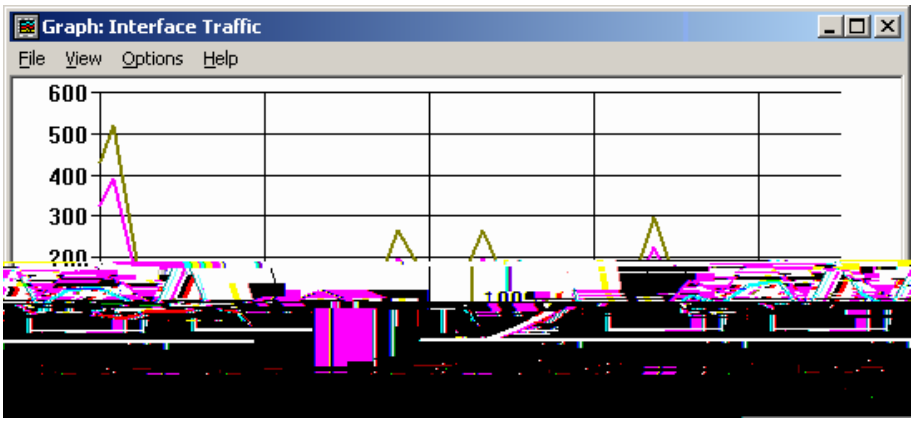


في

˧ Л Ї ˘ HP OpenView TOOL->SNMP MIB Brower ˘ Ю ˘ Name IP 192.168.12.1˘ Community Name Public˘ MIB έ Ї ˘ Ю في System Â Start Query˘ MIB ˘ έ MIB Values ˄ '



HP OpenView



NMS SNMP Agent

NMS SNMP

Â

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

Э ˘ ˧˩ IP й 192.168.12.181 ў SNMP
Â

ЛЬЮ SNMPv3 ¯ ╗ ˩ v3user MIB-2(1.3.6.1.2.1)
Ю ˧˩ Â й MD5˜ й MD5-Auth

MIB˜ Ю '

MIB

√ MIB ˇ

MIB'

BRIDGE-MIB (RFC1493)

EtherLike-MIB(RFC1643)

IF-MIB(RFC2863)

RFC1213-MIB

RMON1-MIBˆ RMON etherStats, etherHistory,alarms, events ˜

SNMPv2-MIB

SNMPv3-MIBˆ USM à VACM˜

MIB'

RUIJIE-AAA-MIB

RUIJIE -ENTITY-MIB

RUIJIE -RIP-MIB

RUIJIE -MEMORY-MIB

MIB'

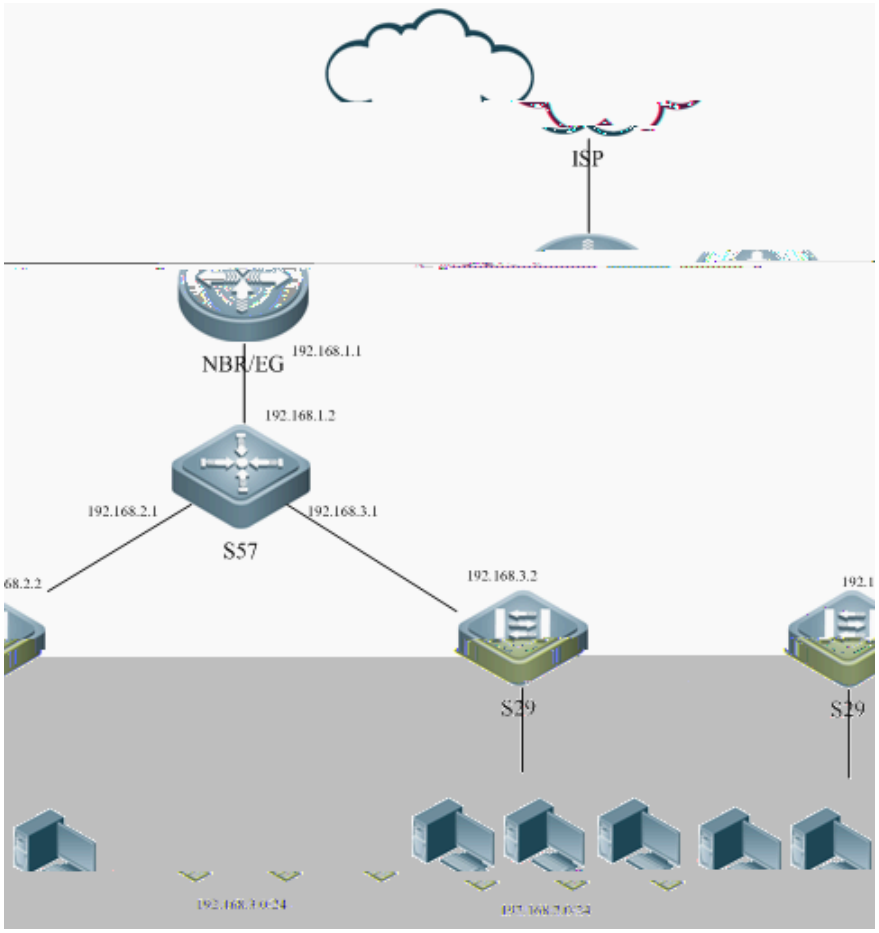
√ Л ƕ ʒ MIB'

```
Ruijie# show snmp mib
sysDescr
sysObjectID
sysUpTime
sysContact
sysName
sysLocation
sysServices
sysORLastChange
ifNumber
ifEntry
ifEntry.ifIndex
ifEntry.ifDescr
ifEntry.ifType
ifEntry.ifMtu
ifEntry.ifSpeed
ifEntry.ifPhysAddress
ifEntry.ifAdminStatus
ifEntry.ifOperStatus
ifEntry.ifLastChange
ifEntry.ifInOctets
```

```
ifEntry.ifInUcastPkts
ifEntry.ifInNUcastPkts
ifEntry.ifInDiscards
ifEntry.ifInErrors
ifEntry.ifInUnknownProtos
ifEntry.ifOutOctets
ifEntry.ifOutUcastPkts
ifEntry.ifOutNUcastPkts
ifEntry.ifOutDiscards
ifEntry.ifOutErrors
ifEntry.ifOutQLen
ifEntry.ifSpecific
......
```

┘ ⎍ http://ietf.org/rfc.html ⎷ MIB Â

┘ ⎍ ⎷ MIB Â



╟ ⅄ NBR ╟˘ ў
ip-address ╖ ˘ arp ╖ ˘ ⅄ Э
╖ з ip-addr ѝ IP ˘ ⅄ ˈI arp Â
⅃

╟ ў ЛЮ╖ ˈ

NBR WEB Э ╖ ’

⅄ Э ARP Ѣ ҙ˘ ╟ ˈI ˘ ⅃Л ╟ ╘
˘ Л ARP Â

ARP ╖ (*ip-address*) ˘ IP ѝ ip-address
ARP ˘ ˘ IP ѝ PC IP˘ ‡ ⅄ Ю PC IP ѝ IP
ARP ˘ ÿ ⅄ Ю ˈI ARP Â

╟ ╟ ⅄˘ Ю ⅄ Э ARP ƕ ʒ˘ Ю
PC ˈI arp ˘ Э ⅄ a ƕ ʒ (
ƕ ʒ Ю PC a Э)˘ ˘ Э
⅄˘ ╘ ˝I ╟˘ ĭ ‡ ⅃ Ю PC a Э
Â

NBR б HTTP ⁸˘ . NBR ƕ ʒ HTTP POST ˘
P web server Â I

Ruijie(config)# { | } *ip-address* { } *line*	б ╟ Æ IP Â branch ˘ center ˘ Ю Â ' web/enable Â
Ruijie#	

' Æ ˘ Э NBR Э ˘ Ю (a ĭ) ˘ Ю ≠ PC ˘ ≠ Â ' 1 à б NBR ' 2 à б 2 ⅃ 2 ⅃ Ʌ Э Â

' Æ ˘ Э ˘ Ю PC Â

NBR ╟ ╗ ˘ '

1 à IP '

1 à ˝I ip http authentication enable ˘ ⌈ HTTP ѝ enable ˘ Ƕ ʒ ˘ ‡ ѝ enable ˘ ὲ Â

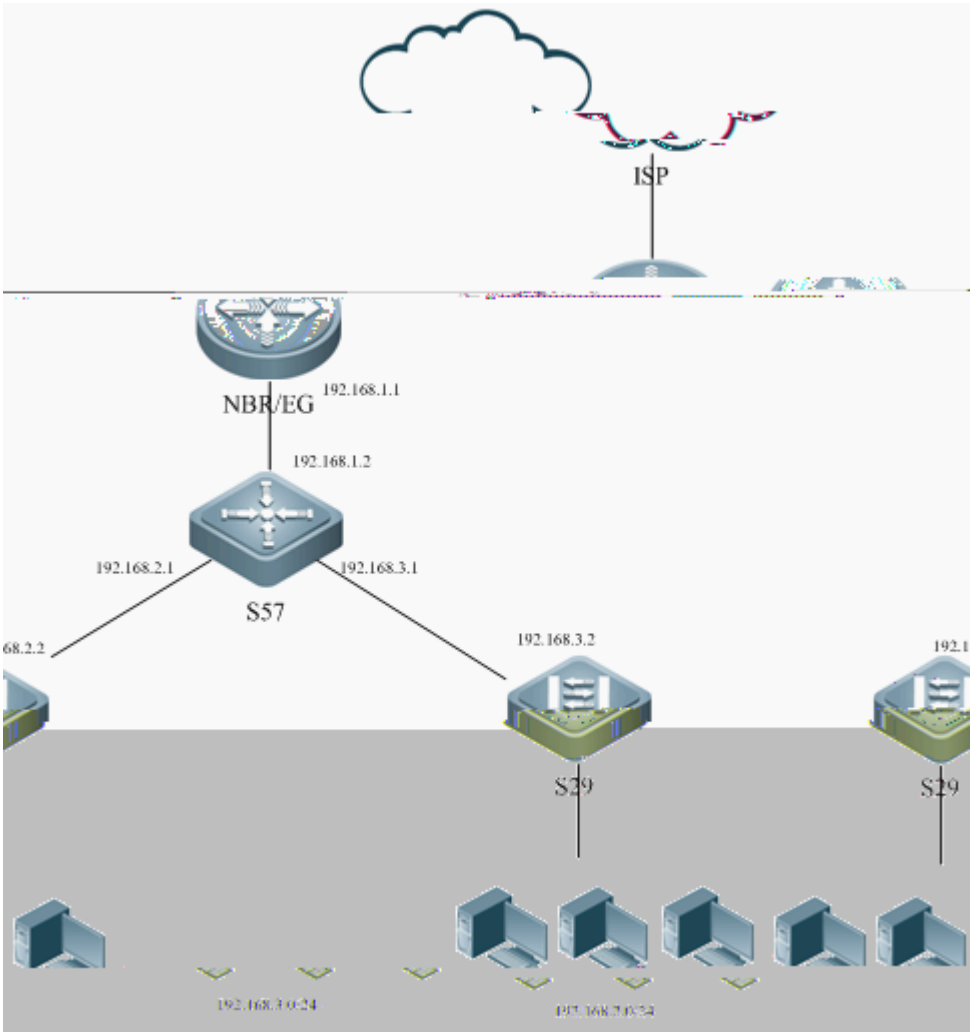
2 à ˘ enable secret Ƕ ʒ ˘ з ╟ ˘ ĭ ‡ ╟ '

3 à ╟ web ╗ ˘ Ƕ ʒ ' enable service web-server Â

Ƕ ʒ	
Ruijie#	/ ╟ ╗

Ƕ ʒ	
Ruijie# *ip-address*	╟ , ⅃ ip ˘ ⅃ Â *ip-address* : ip Â
Ruijie# show co-operv2 topo	б ╟ Э ⅃

NBR+S5750+S2924G ˘ ″I IP ˘ з ╠ web server ╘ Â



NBR Э ˘ Л ″I IP ˘ ╠ web ╘ Â

1˜ (ip ˘ ╠ web ╘˘ Лυ S5750 й)

ip

```
Ruijie# configure terminal
Ruijie(config)# interface vlan 1
Ruijie(config-if)# ip address 192.168.1.2 255.255.255.0
Ruijie(config)# interface vlan 2
Ruijie(config-if)# ip address 192.168.2.1 255.255.255.0
Ruijie(config)# interface vlan 3
Ruijie(config-if)# ip address 192.168.3.1 255.255.255.0
```

web web

```
Ruijie(config)# enable service web-server
Ruijie(config)# enable secret 0 admin
```

S2924G S5750 ip a Â

2 NBR

3

```
Ruijie# configure terminal
Ruijie(config)# co-oper entity center 192.168.1.2 0 admin
Ruijie(config)# co-oper entity branch 192.168.2.2 0 admin
Ruijie(config)# co-oper entity branch 192.168.3.2 0 admin
```

#

```
Ruijie# co-oper enable
```

state COOPER OK a Â

```
Ruijie#sho co-operv2 entity
type   hostname       ip             position   mode    state
------ -------------- -------------- ---------  ----    ----------
S5750  S5750          192.168.1.2    center     LAYER3  COOPER OK
S2924G S2924G         192.168.2.2    branch     LAYER2  COOPER OK
S2924G S2924G         192.168.3.2    branch     LAYER2  COOPER OK
```