

# RSR04E/08E

**2005-8**

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	**%& 6; D Dc` ] Wn 5dd' ] Wn] cb"..... *)	
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RSR

JUNOS 7.3

RSR JUNOS

>| BCG XcW/aYbhUh] cb 78

## RSR JUNOS

### JUNOS Configuration Guides

Feature Guide

JUNOS-FIPS

MPLS Applications

Multicast

Network Interfaces and Class of Service

Network Management

Policy Framework

Routing and Routing Protocols

Services Interfaces

System Basics

VPNs

# 1 JUNOS

Junos      FreeBSD  
MPLS

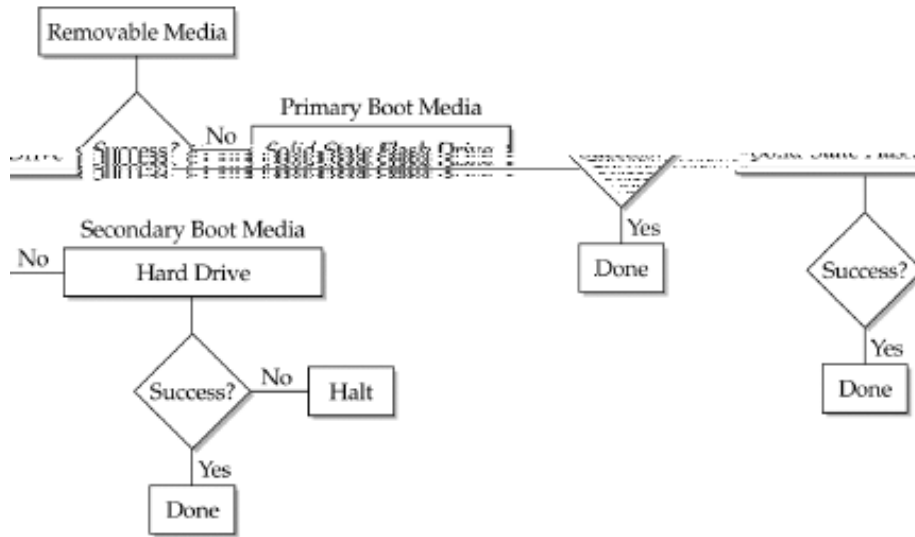
IPv6

1-1

## 1.1

Flash Disk  
, IDE

PC-card    PCMCIA



1-2

RSR

IDE

flash disk pc-card

IDE

## 1.2

### 1.2.1 RSR

```
*** FINAL System shutdown message from root ***  
System going down IMMEDIATELY
```

```
Shutdown NOW!  
[pid 4050]
```

```
The operating system has halted.  
Please press any key to reboot.
```

```
1,      "The operating system has halted."  
2                               Please press any key to reboot.
```

```
(2)  
root>request system reboot  
Reboot the system ? [yes,no] (no)y
```

## 1.2.3

```
Junos          .tgz          jinstall-7.1r1.4-domestic.taz  
1             FTP          RSR          /var/home/admin/  
admin  
2             request system software add <path-and-name-for-package>
```

```
admin@rsr04e>request system software add jinstall-7.1r1.4-domestic.taz  
installing package '/var/home/admin/ jinstall-7.1r1.4-domestic.taz' ....  
....  
Restarting cli  
cli
```

## 1.3 junos

```
admin@rsr04E> help reference | topic  
example: admin@1> help topic interfaces lo0
```

Configuring the Loopback Interface

On the routing platform, you can configure one physical loopback interface, lo0, and one or more addresses on the interface. To do this, include the following statements at the [:

```
RSR04/08E
```

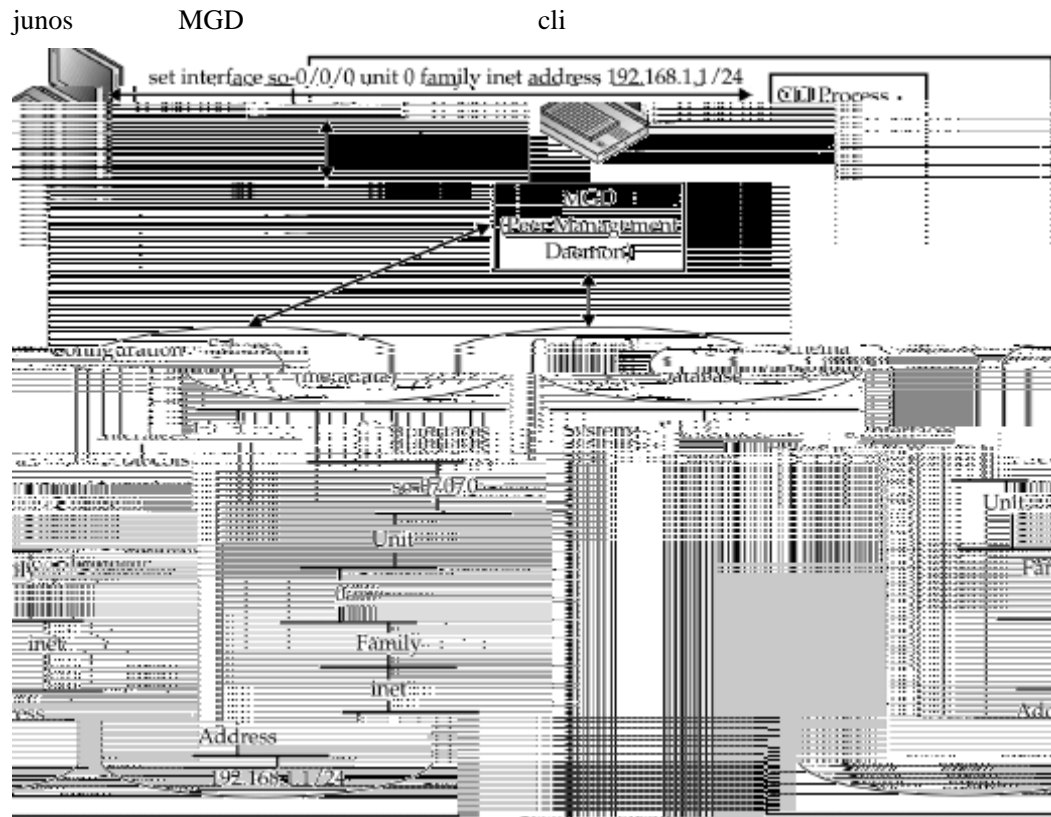
```
[edit interfaces]
lo0 {
  unit 0 {
    family inet {
      address loopback-address;
      address <loopback-address2>;
      ...
    }
  }
}
```

When do not include a destination prefix.

Also, in most cases, do not specify a loopback address on any unit other than unit 0.

```
+-----+
| | NOTE: For Layer 3 vyou can |
| | configure multiple logical units for the loopback interface. |
---(more)---
```

## 2. JUNOS CLI



2-1

### Example

```
set interfaces fe-0/0/0 unit 0 family inet address 192.168.1.1/24
delete interfaces fe-0/0/0 unit 0 family inet address 192.168.1.1/24
```

### 2.1 CLI

1

2

test@lab2>

interface

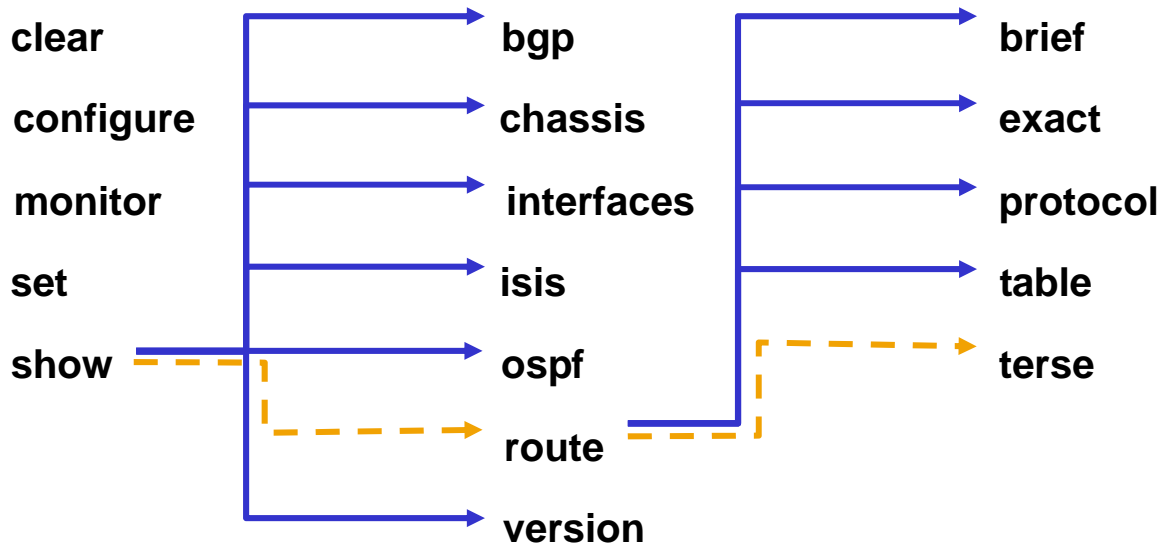
test@lab2> configure

[edit]

test@lab2#

## 2.1.1 CLI

1  
tu



2-2

2

admin@RSR> ?

Possible completions:

clear	Clear information in the system
configure	Manipulate software configuration information
file	Perform file operations
help	Provide help information
monitor	Show real-time debugging information
mtrace	Trace multicast path from source to receiver
ping	Ping remote target
quit	Exit the management session
request	Make system-level requests
restart	Restart software process
set	Set CLI properties, date/time, craft interface message
show	Show system information
ssh	Start secure shell on another host
start	Start shell

RSR04/08E



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```
root@lab2> sh<space>ow i<space>
'i' is ambiguous.
```

Possible completions:

igmp	Show information about IGMP
interfaces	Show interface information
isis	Show information about IS-IS

```
root@lab2> show i
```

7

```
lab@omaha> ?
```

Possible completions:

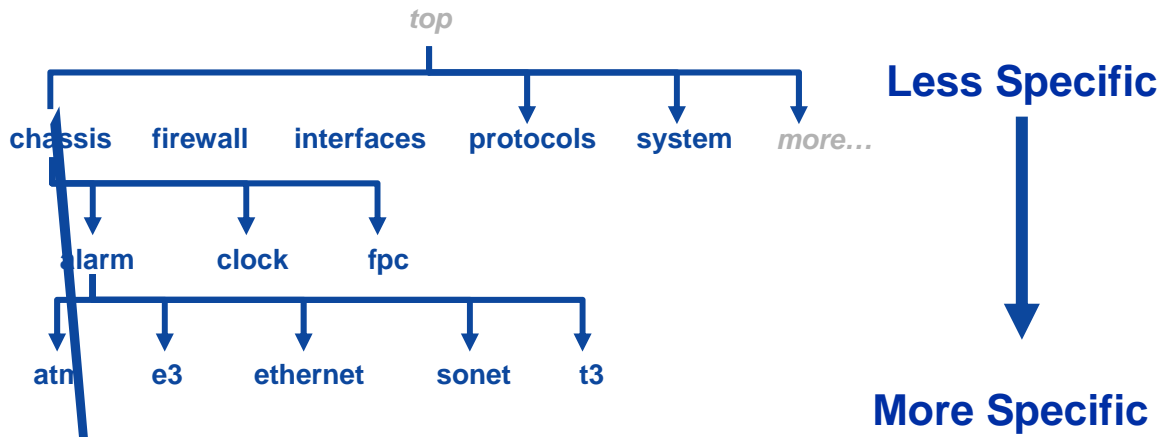
clear	Clear information in the system
configure	Manipulate software configuration information
file	Perform file operations
help	Provide help information
...	

## 2.1.2

1

```
root@lab2> configure
Entering configuration mode
[edit]
```

2



2-3

3

edit cd

2-4

edit chassis alarm ethernet

ethernet

set chassis alarm ethernet

4

up top

```

user@host# up
[edit chassis alarm]
user@host# top
[edit]
    
```

2-5

```
sonet {  
+      lol red  
      los red;  
-      pll yellow;  
      }  
}  
,
```

```
user@host# s2i*D26(o | compa(r)11( )TJ/T30 1 Tf0.0006 Tc 0 Tw76.086 0 Td[filens)8ame
```

9

```
'          commit          rollback
ser@host#commit
and-quit
at          commit
check      c o m m i t
```



## 3

### 3.1 Root

#### 3.1.1

```
router root
login: root
Password:

--- JUNOS 7.3B1.1 built 2005-04-22 22:04:30 UTC
Terminal type? [vt100]

root% cli
root>

root> configure
Entering configuration mode

[edit]
Root#
```

#### 3.1.2 root

```
(1)
root# set root-authentication plain-text-password
root# new password : star
root# retype new password: star
(2)
root# show
    root-authentication {
        encrypted-password "$1$xavDeUe6$fNM6oIGU.8.M7B62u05D6."; # SECRET-DATA
    }
3          root user
root# set root-authentication encrypted-password character-string
```

## 3.2 user

Junos user

### 3.2.1 user

```
root# set login user robert
```

```
root# set login user robert authentication plain-text-password
```

routing	Can view routing configuration
routing-control	Can modify routing configuration
secret	Can view secret configuration
secret-control	Can modify secret configuration
security	Can view security configuration
security-control	Can modify security configuration
shell	Can start a local shell
snmp figuration	
snmp-control	Can modify SNMP configuration
system	Can view system configuration
system-control	Can modify system configuration
trace	Can view trace file settings
trace-control	view Can view current values and statistics
view-configuration	Can view all configuration (not including secrets)

[edit system]

Example : root@RSR04E-1# **set login class test permissions** [ *clear network reset trace view configure interface-control* ]

2 class

root@RSR04E-1#**set login class test permissions** [ *clear network reset trace view configure interface-control* ] **allow-commands** “*system request reboot*” **deny-commands** “(*show system | show chassis | show version*)”

3, session timeout

root@RSR04E-1# **set login class class-name idle-timeout** minutes;

4, RADIUS TACACS+

## 3.3 services and processes

### 3.3.1 host name dns domain-name

Hostname

root@RSR04E# set system host-name RSR04E-1

[edit]

root@RSR04E# commit

commit complete

[edit]

root@RSR04E-1#

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[edit]

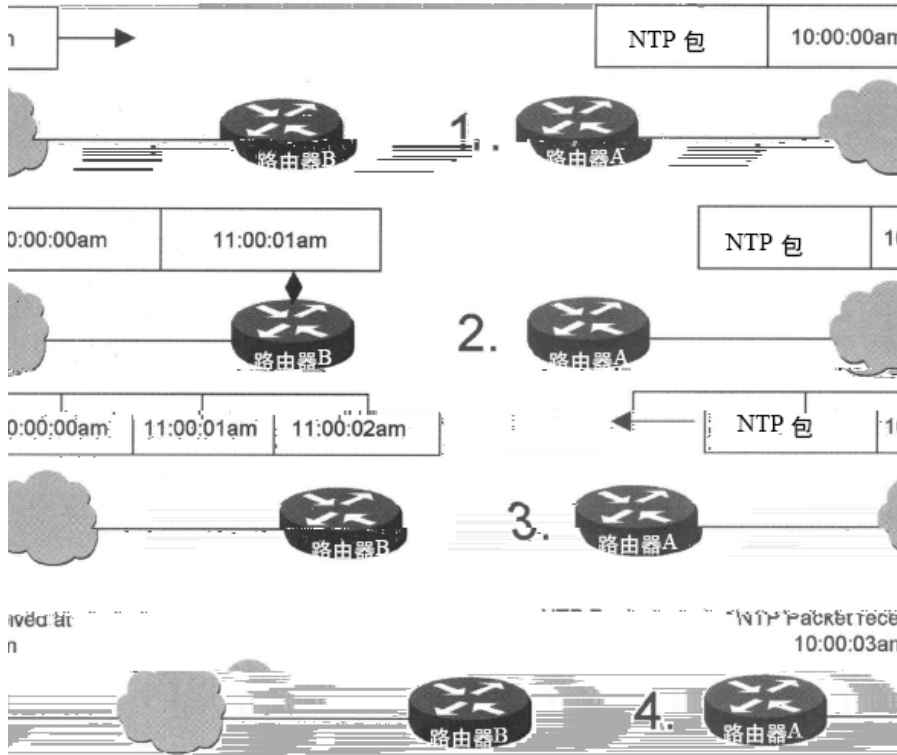
2 ssh 2 ssh 1 2

root@RSR04E-1#



---

---



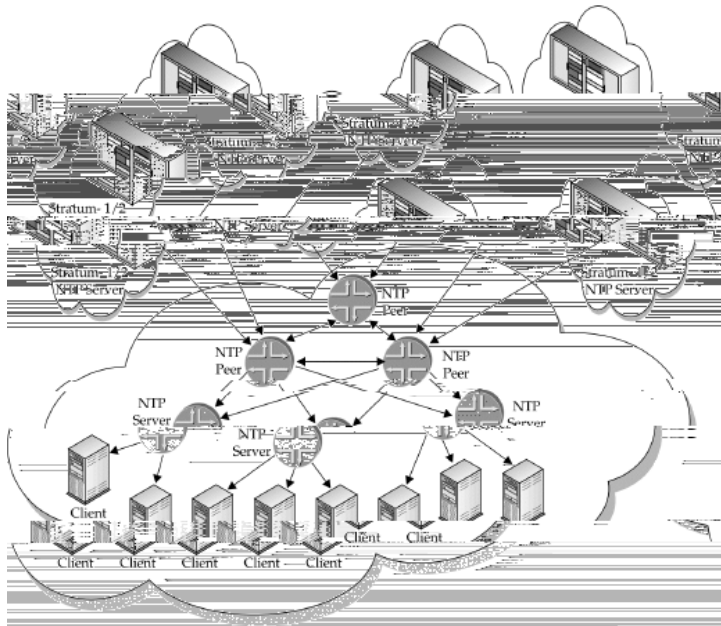
3 - 4

- 1)     A           NTP           B                           A  
 10:00:00 a.m.
- 2)     NTP           B           B                           11:00:01 a.m.
- 3)     NTP           B           B                           11:00:02 a.m.
- 4)     A   10:00:03 a.m.  
       A

• NTP

- A           B  
       A                           B  
       NTP                           RFC 1305           NTP

NTP JUNOS RFC 1305<sup>8</sup> version3



3 - 4

(1) JUNOS NTP

- Configuring the NTP Boot Server
- Specifying a Source Address for an NTP Server
- Configuring the NTP Time Server and Time Services
- Configuring NTP Authentication Keys
- Configuring the Router to Listen for Broadcast Messages
- Configuring the Router to Listen for Multicast Messages

(2) Syntax

[edit system]

Syntax

```
ntp {
```

Syntax

```
server address <key key-number> <version value> <prefer>;  
authentication-key key number type type value password;  
boot-server address;  
trusted-key [ key-numbers ];
```

**example :**

```
[edit system ntp]
```

```
authentication-key 1 type md5 value "$9$EgfcvX7VY4ZEcwgoHjkP5Q3CuREyv87";
```

```
boot-server 10.1.1.1;
```

```
server 10.1.1.1 key 1 prefer;
```

```
trusted-key 1;
```

#### 4 Symmetric Active

```
symmetric active router system
```

```
[edit system ntp]
```

```
peer address <key key-number> <version value> <prefer>
```

#### 5 NTP server

```
router ntp server
```

Syntax

```
[edit system ntp]
```

```
authentication-key key number type type value password;
```

```
server address <key key-number> <version value> <prefer>;
```

```
trusted-key [ key-numbers ];
```

**example**

```
[edit system ntp]
```

```
authentication-key 1 type md5 value "$9$txERuBEreWx-wtuLNdboaUjH.T3AtOESe";
```

```
server 172.17.17.27.46 prefer;
```

```
trusted-key 1;
```

#### 6 NTP

```
Lab@RSR> show ntp status
```

```
Lab@RSR>show ntp associations
```

```
ntp services
```

### 3.3.4 SNMP

JUNOS SNMP version 3

#### (1) SNMP Agent

Syntax

```
community community-name {
    authorization authorization;
    clients {
        address restrict;
    }
    view view-name;
}
```

Example:

```
admin@RSR04E-1# set snmp community tester authorization read-only clients 192.168.0.1/24
```

```
admin@RSR04E-1# set snmp community tester authorization read-only clients 10.10.10.0/24 restrict
```

```
snmp {
    community tester {
        authorization read-only;
        clients {
            192.168.0.1/24;
            10.10.10.0/24 restrict /**** 10.10.10.0/24 router snmp ****/
        }
    }
}
```

#### (2) SNMP trap-group

Syntax

```
trap-group group-name {
    categories [ categories ]; /**** trap ****/
    destination-port <port-number>;
    targets {
        address; /**** ****/
    }
    version (all | v1 | v2); /**** *****/
}
```

Example:

```
Snmp{
    trap-group tester {
        categories {
```

```
link;    /***          trap          ***/  
}
```

**Junos**                    **syslog**                    console                    -

'    **facilities and Severity levels**

**JUNOS system logging Facilities (logging                    )**

**Facility                    Type of Event or Error**

Syntax :

```
syslog {
    archive {
        files number;
        size size;
        (world-readable | no-world-readable);
    }
    console {
        facility severity;
    }
    file facility;
        explicit-priority;
        match "regular-expression";
        archive {
            files number;
            size size;
            (world-readable | no-world-readable);
        }
    }
    host (hostname | other-routing-engine | scc-master) {
        facility severity;
        explicit-priority;
        facility-overrde facility;
        log-prefix string;
        match "regular-expression";
    }
    ce-address;
        time-format (year | millisecond | year millisecond);
        user (username | *) {
            facility severity;
            match "regular-expression";
        }
    }
```

## Syslog Files

```
'
    log
admin@RSR04E-1# edit system

[edit system]
admin@RSR04E-1# set syslog file messages any notice
'
    log
    log          128k          10
admin@RSR04E-1# edit system

[edit system]
admin@RSR04E-1# set syslog archive size 1m files 20
    1M          20

'
    syslog server          udp 514
[edit system]
admin@RSR04E-1# set syslog host 192.168.0.1 any alert
    localX facility name
admin@RSR04E-1# set syslog host 192.168.0.1 facility-override local0
```

## 4 Traceoptions

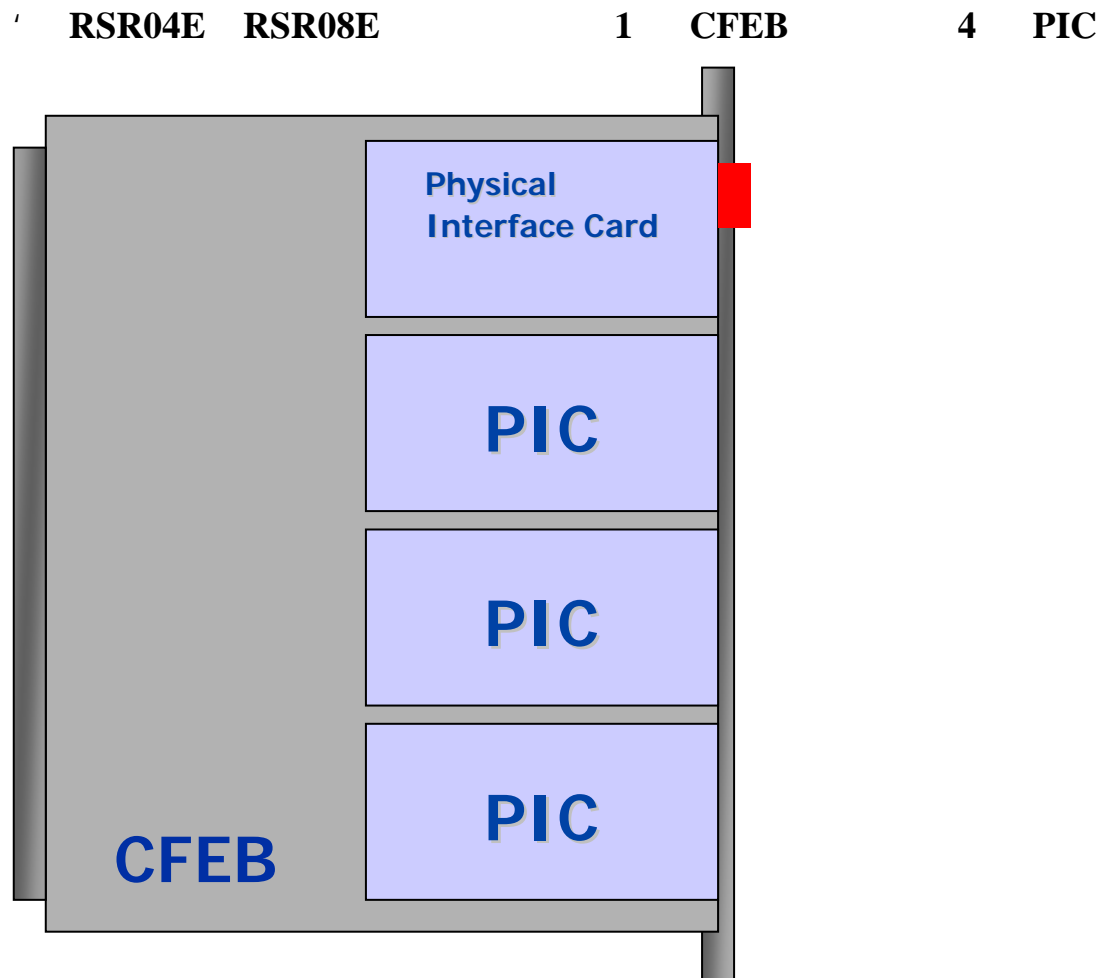
```

    log
admin@RSR04E-1# set traceoptions file interface.log size 1m files 10
admin@RSR04E-1# set traceoptions flag change-events
example
interfaces {
    traceoptions {
        file interface.log size 1m files 10;
        flag change-events;
    }
}
)

admin@RSR04E-1>Show log
```

**Log**                    **/var/log/**

## 4 interface



4-1

### 4.1

show interfaces terse

Interface type-CFEB # / PIC Slot Port #

#### Interface Media Type

- > at—ATM over SONET/SDH ports
- > e1—E1 ports
- > e3—E3 ports
- > fe—Fast Ethernet ports

RSR04/08E





```
admin@RSR04E-1> configure
Entering configuration mode
admin@RSR04E-1# set interfaces fe-0/0/0 mtu 1514
```

```
[edit]
admin@RSR04E-1# commit
commit complete
```

```
[edit]
```

```
admin@RSR04E-1# set fe-0/0/0 unit 0 family inet address 192.168.11.1/24
```

```

unit number
1          unit
          ATM vc  frame- rely DLCI
2          unit          unit          0
3          unit
```

## 4.2 Ethernet interface : GE and FE

RSR	GE	FE	VLAN tagging	MTU
-----	----	----	--------------	-----

### 4.4.1 MAC

1024	16	16
------	----	----

Public count 1008  
Private base address 00:12:1e:01:33:f0  
Private count 16

## 4.4.2 VLAN Tagging

**RSR 802.1Q VLAN tagging. Vlan IDs 0 4095**

**Example:**

**1, RSR04E RG—6806E trunk 802.1Q FE trunk**

### (1) RSR config

```
interfaces {  
    fe-0/0/0 {  
        description to-RG6808-4/5;  
        vlan-tagging;  
        unit 11 {  
            vlan-id 11;  
            family inet {  
                address 10.10.11.2/24;  
            }  
        }  
        unit 12 {  
            vlan-id 12;  
            family inet {  
                address 10.10.12.2/24;  
            }  
        }  
    }  
}
```

### (2) RG-6806E

```
interface GigabitEthernet 4/5  
    speed 100  
    duplex full  
    description "to-RSR04E-fe-0/0/0"  
    switchport mode trunk
```

**2, RSR04E RG—6806E trunk 802.1Q GE trunk**

#### 1 RG-6806E

```
interface GigabitEthernet 4/9  
    RSR04/08E
```

```
medium-type fiber
speed 1000
description "to-RSR04E-ge-1/3/0"
switchport mode trunk
```

## (2) RSR04E

```
interfaces {
  ge-1/3/0 {
    description to-RG-6808E;
    vlan-tagging;
    unit 13 {
      vlan-id 13;
      family inet {
        address 10.10.13.2/24;
      }
    }
    unit 14 {
      vlan-id 14;
      family inet {
        address 10.10.14.2/24;
      }
    }
  }
}
```

## 4.2.3 Source Filtering

### mac

```
interfaces {
  ge-1/3/0 {
    description to-RG-6808E;
    vlan-tagging;
    together-options {
      source-filtering; /****          *****/
      source-address-filter {
        00:90:69:6e:b8:01; /*****          *****/
      }
    }
  }
}
```

## 4.3 VRRP RFC 2338

### 4.3.1

```

VRRP                VRID                0—255
MAC                 00-00-5E-00-01-[VRID]    ARP        MAC
                                      IP        MAC

VRRP                VRRP (advertisement) IP
224.0.0.18          VRID
                    VRRP

VRRP                VRRP                0                VRRP
VRRP                IP                VRRP                0—255    VRRP
IP                  IP                IP                VRRP        IP
IP                  255                0                IP
                    1—254

VRRP                IP
                    IP                VRRP

VRRP                VRRP                IP
                    VRRP                VRID
                                      IP
  
```

### 4.3.2 RSR

#### Syntax:

```

vrrp-group group-number {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
        hold-time seconds;
    }
    priority number;
    track {
        interface interface-name priority-cost cost;
    }
}
  
```

```

}
virtual-address [ addresses ];
}

```

## Exaple

### Router A

```

fe-0/0/1 {
  unit 0 {
    family inet {
      address 10.10.11.2/24 {
        vrrp-group 10 {
          virtual-address 10.10.11.1;
          priority 105;
          accept-data;
        }
      }
    }
  }
}

```

### Router B

## 4 -6

admin@RouterA # **show vrrp detail**

```

Physical interface: fe-0/0/1, Unit: 0, Address: 10.10.11.2/24
Index: 65, SNMP ifIndex: 31, VRRP-Traps: disabled
Interface state: up, Group: 10, State: backup
Priority: 105, Advertisement interval: 1, Authentication type: none
Preempt: yes, Accept-data mode: yes, VIP count: 1, VIP: 10.10.11.1
Dead timer: 2.921s, Master priority: 150, Master router: 10.10.11.3
Virtual router uptime: 00:21:53
Tracking: disabled

```

admin@RouterB>**show vrrp detail**

```

Physical interface: fe-0/0/1, Unit: 0, Address: 10.10.11.3/24
Index: 65, SNMP ifIndex: 25, VRRP-Traps: disabled
Interface state: up, Group: 10, State: master
Priority: 150, Advertisement interval: 1, Authentication type: none
Preempt: yes, Accept-data mode: no, VIP count: 1, VIP: 10.10.11.1
Advertisement timer: 0.779s, Master router: 10.10.11.3
Virtual router uptime: 00:20:41, Master router uptime: 00:20:37
Virtual MAC: 00:00:5e:00:01:0a
Tracking: disabled

```

**accept-data**

**vip ICMP**

**clear vrrp**

**vrrp**

## 4.4 Aggregated Interfaces

Junos                      Ethernet                      full-duplex mode with VLAN tagging    Sonet





```
port-group 1
speed 100
duplex full
!
interface GigabitEthernet 4/2
port-group 1
speed 100
duplex full
!
interface Vlan 100
ip address 10.10.11.2 255.255.255.0
!
```

## 4.5 Troubleshooting interface

### 4.5.1 monitor interface

```
monitor interface <interface>
monitor traffic interface
```

#### Example:

```
dmin@RSR04E-1> monitor traffic interface fe-0/0/1
```

verbose output suppressed, use <detail> or <extensive> for full protocol decode

Listening on fe-0/0/1, capture size 96 bytes

```
08:32:23.253227 In IP 10.10.11.3 > 224.0.0.18: VRRPv2-advertisement 20: vrid=10 prio=150 authtype=simple intvl=1
```

```
08:32:24.583251 In IP 10.10.11.3 > 224.0.0.18: VRRPv2-advertisement 20: vrid=10 prio=150 authtype=simple intvl=1
```

```
08:32:26.073227 In IP 10.10.11.3 > 224.0.0.18: VRRPv2-advertisement 20: vrid=10 prio=150 authtype=simple intvl=1
```

```
^C
```

```
3 packets received by filter
```

```
0 packets dropped by kernel
```

### 4.5.1 show interfaces fe-0/0/0 extensive

### 4.5.2 E-1 Loopback

```
admin@RSR# set loopback ?
```

```
possible completions:
```

```
local          local loopback  
remote        remote loopback
```

## 5. protocol-Independent Routing

### 5.1

routing-options

#### Syntax

[edit]

f ci h] b[! cdh] cbg o

ghUh] Wo

XYZUi ` hg o

*ghUh] Wcdh] cbg/*

q

f ci hY *XYgh] bUh] cb! dfYZ] /* o

bYI h! \cd *bYI h! \cd/*

ei U ] Z] YX! bYI h! \cd *UXXfYgg* o

aYhf] W *aYhf] W*

dfYZYfYbW *dfYZYfYbW/*

q

*ghUh] Wcdh] cbg/*

q

q

q

9 Uad` Y.

OYX] h]

i gYf 4\cgh. g\ck

f ci h] b[! cdh] cbg o

ghUh] Wo

f ci hY "\$" "\$" "\$" "\$#\$ bYI h! \cd % &" %\*, "\$" %/

q

q

' Discard Reject

cisco null 0

Reject

ICMP

Destination Host Unreachable

Discard

ICMP

routing-options {

static {

route 143.172.0.0/6 discard;

}

RSR04/08E

}

```
GmbhUl
OYX] h]
f ci h] b[! cdh] cbg o
  [YbYfUhY o
    XYZUi ` hg o
      [YbYfUhY! cdh] cbg/
    q
    f ci hY XYgh] bUh] cb! dfYZ] l o
      dc` ] V`n dc` ] V`n bUaY/
        [YbYfUhY! cdh] cbg/
      q
9 Uad` Y
```

```
routing-options {
  generate {
    defaults {
      metric 5;
    }
    route 172.16.64.0/20;
    route 172.16.80.0/20 discard;
  }
}
```

## 5.3 Martian Routes

```
5gg] [ bYX Bi aVYfg 5i h\cf] hm fl=5B5k"
```

```
\hhd. ##kkk" \] UbU" cf \[ #Ugg\] \[ baYbhg#\] dj \(! UXXfYgg! gdUWV"
```

```
H\Y XYZUi ` h ` ] gh cZ aUf h] Ub f ci hYg ] b h\Y >l BCG gcZhkUfY ] g.
```

- DfYZ] l V] hg cZ "\$"\$"\$"\$ #, UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ %&+" "\$"\$"\$ #, UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ %&, "\$"\$"\$ #0% UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ % %&)" "\$"\$ #0% UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ % &" "\$"\$"\$ #&( UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ &&" &)" &)" "\$ #&( UbX acfY gdYV\Z] Wfci hYg
- DfYZ] l V] hg cZ &("\$"\$"\$"\$ # ( UbX acfY gdYV\Z] Wfci hYg

```
>i bcg
```

GnbtbU

f ci h] b[! cdh] cbg o

aUf h] Ubg o

dfYZ]I #dfYZ]I! `Yb[h\ aUhVX! hndY U `ck/

q

q

AUhVX! hndY YI UWh `cb[Yf cf`cb[Yf dfYZ]I! `Yb[h\! fUb[Y h\fc i [\ i dhc

i gYf 4F] Yg` ] b[ 2 g\ck fci hY aUf h] Ubg

] bYh" \$.

\$" "\$ "\$#\$ YI UWh !! U `ckYX

\$" "\$ "\$#, cf`cb[Yf !! X]gU `ckYX

%&+" "\$ "\$#\$, cf`cb[Yf !! X]gU `ckYX

%&," "\$ "\$#\$% cf`cb[Yf !! X]gU `ckYX

%%"&)" "\$#\$% cf`cb[Yf !! X]gU `ckYX

%&" "\$#\$&( cf`cb[Yf !! X]gU `ckYX

&&"&)"&)"#\$&( cf`cb[Yf !! X]gU `ckYX

&("\$ "\$ "\$#\$ ( cf`cb[Yf - X]gU `ckYX

## 5.4 JUNOS

junos

- ] bYh" \$ ! ghcfY =Dj ( i b] WUgh fci hYg
- ] bYh" % ! ghcfY =Dj ( ai `h] WUgh fci hYg
- ] bYh" & ! ghcfY =Dj ( ai `h] WUgh fci hYg Fci hYg ] b h\Y ] bYh" & hUV Y UfY i gYX Vmai `h] WUgh fci h] b[ dfchcVt`g hc dfY] Ybh fci h] b[ `ccdg
- ] bYh"' ! H\Y ] bYh"'

## 5.5 JUNOS software Preference Values

```
JUNOS      preference                cisco
Gci fW cf Df chcVc` BUaY AYUb] b[           DFYZYfYbW
                                                JU iY
```

## 5.6

```
[edit]
routing-options {
  rib fbf-north.inet.0 {
    static {
      route 0.0.0.0/0 next-hop 172.16.1.1;
    }
  }
  rib fbf-south.inet.0 {
    static {
      route 0.0.0.0/0 next-hop 172.16.2.1;
    }
  }
  static {
    route 0.0.0.0/0 next-hop 192.168.0.1;
  }
}
```

### ' Rib-groups

inet.0      inet.2      ospf-rib      ospf

#### Example:

```
routing-options {
  rib-groups {
    ospf-rib {
      import-rib [ inet.0 inet.2 ];
    }
  }
}
protocols {
  ospf {
    rib-group ospf-rib;
  }
}
```

## 5.7 Load Balancing

JUNOS                      Load Balancing

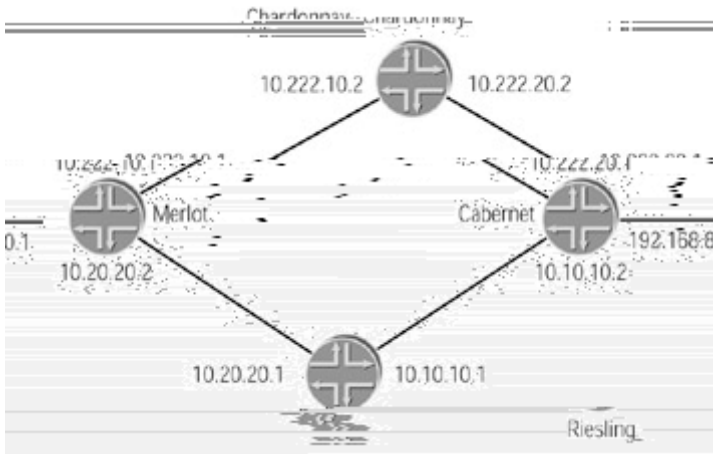
#### Example:

```
routing-options {
  forwarding-table {
    export load-balance;
  }
}
RSR04/08E
```

```

    }
}
policy-options {
    policy-statement load-balance {
        then {
            load-balance per-packet;
            accept;
        }
    }
}

```



(1)

i gYf 4AYf` ch2 g\ck fci hY %&"%\*, ", \$#&( hYfgY

]bYh"\$ ( XYgh]bUh]cbgž ( fci hYg fl( UVM]j Yž \$ \c`XXckbz \$ \]XXYbk  
 Ž 1 5VM]j Y Fci hYž ! 1 @Ugh 5VM]j Yž † 1 6ch\

5 8Ygh]bUh]cb D DfZ AYhf]W% AYhf]W& BYI h \cd 5G dUh\  
 † %&"%\*, ", \$"%"# & = % &\$ %\$" &&&"%\$" &  
 29%" &\$ &\$" %

fI&L

i gYf 4AYf` ch2 g\ck fci hY ZcfkUFX]b[!hUV`Y aUHVX]b[ %&"%\*, ", \$#&(

Fci h]b[ hUV`Y. . ]bYh  
 =bhYfbYh.

8Ygh]bUh]cb HndY FhFYZ BYI h\cd HndY =bXYI B\FYZ BYh]Z  
 %&"%\*, ", \$"%"# & i gYf \$ %\$" &\$" &\$" \$ i Vgh &\* ' \$gc! \$#\$#" \$

OYX]h]

i gYf 4F]Yg` ]b[ . g\ck

dc` ]VM]cdh]cbg o

dc` ]VM]ghUhYaYbh d` YUgY!`cUX! VU`UbW! hf UZZ]Wo

h\Yb o

`cUX! VU`UbW` dYf! dUW`Yh/

q  
q  
q  
@unyf`

- =bVt[a] b[ ] bhYf ZUW
- Gci fVW =D UXXfYgg
- 8Ygh] bUh] cb =D UXXfYgg

- DfchcVt` fIH7D cf I 8DL
- Gci fVW dcf h bi aVYf
- 8Ygh] bUh] cb dcf h bi aVYf

(  
i gYf 4AYf` ch2 g\ck fci hY ZcfkUFX] b[! hUV` Y aUhVX] b[ %&%" , " , \$#&(

Fci h] b[ hUV` Y. . ] bYh  
=bhYfbYh.

8Ygh] bUh] cb	HndY FhFYZ BYl h\cd	HndY =bXYl B\FYZ BYh] Z
%&%" , " , \$#%# &	i gYf \$	i`gh '\$ %
	%\$" &&&" %\$"\$	i Vgh &\$ % gc! \$#\$"\$ \$
	%\$" &\$" &\$"\$	i Vgh &* && gc! \$#\$#" "\$

) =bhYfbYh DfcVWggcf 5G=7g UbX @cUX 6U UbV]b[

=bhYfbYh DfcVWggcf 5G=7 ZcfkUFXg dUW\_Yhg UWcg , Yei U ! Vtgh bYl h \cdg  
=bhYfbYh DfcVWggcf 5G=7 ZcfkUFXg dUW\_Yhg cb U dyf! dUW\_Yh VUg] g cb` m

=bhYfbYh DfcVWggcf == 5G=7z \ckYj Yfz ] g UV` Y hc ZcfkUFX UWcg %\* Yei U ! Vtgh  
bYl h \cdg" =bhYfbYh DfcVWggcf == 5G=7 ] g VUgYX cb U a] VcZ` ck"

## 5.8 Features

```

Router-ID          Lo0
[edit]
routing-options {
  router-id 172.168.1.1;

  RSR04/08E

```

}

' Autonomous system number

BGP

[edit]

routing-options {

autonomous-system 65001;

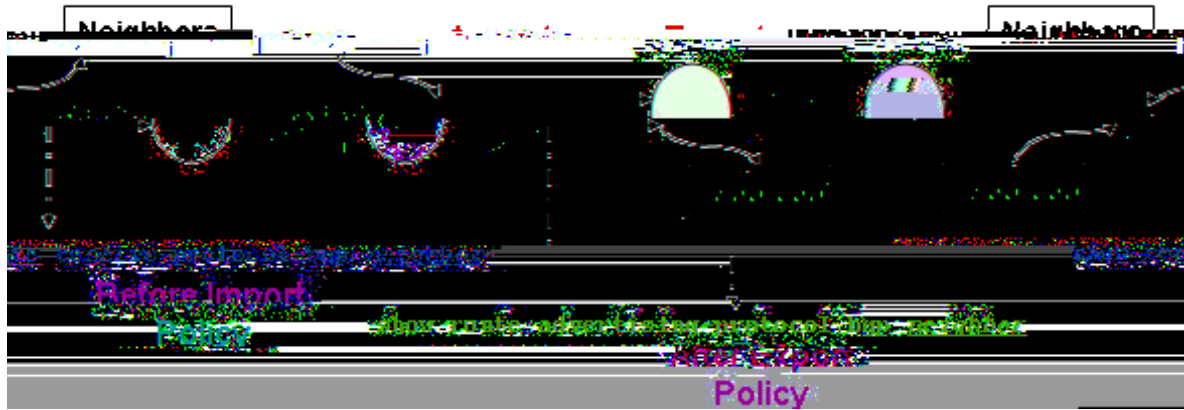
}

## 6 Route policy

BGP

## 6.4

show route receive-protocol    show route receive-protocol



6-2

## 6.5

### 6.5.1

#### Syntax

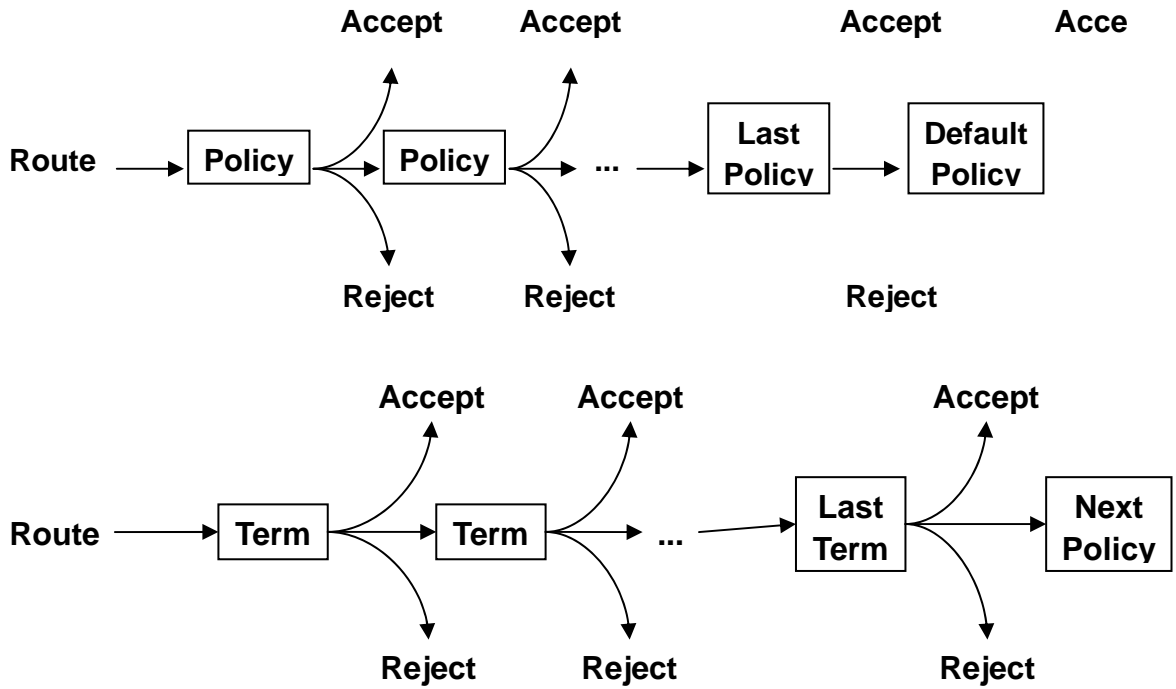
```

policy-options {
  policy-statement policy-name {
    term term-name {
      from {
        match-conditions;   /***/
      }
      then {
        action;           /***/
      }
    }
    term term-name {
      from {
        match-conditions;
      }
      then {
        action;
      }
    }
  }
}

```

}  
}

**Routing Policy Flow**



6-3

**6.6**

1. Neighbor address
2. Protocol (source of information)
  - BGP, direct, DVMRP, IS-IS, local, MPLS, OSPF,
  - PIM, RIP, static, aggregate
- 3 Routing protocol information
  - OSPF area ID
  - IS-IS level number
  - BGP attributes

From and To

— : fca UfYU UfYU! ] X Ug! dUh\ bUaY Wtaai b] hmCbUaYg] `Yj Y` `Yj Y`  
 `cW! dfYZYfYbW j U i Y aYhf] WaYhf] W bY] [\Vcf UXXfYgg bYI h! \cd UXXfYgg  
 cf][ ] b j U i Y dfYZYfYbW dfYZYfYbW dfchcW` dfchcW` f] V fci h] b[! hUV Y

```
hc      `Yj Y` `Yj Y`  f]V fci h]b[! hUV Y
```

```
q Uad` Y.
```

```
dc` ] Wm cdh] cbg o
```

```
dc` ] Wm ghUhYaYbh ]g]g! Yl dcfh o
```

```
hYfa gYbX]b[! hc! bY][\Vcf5 o
```

```
hc `Yj Y` &/
```

```
h\Yb UWWdh/
```

```
q
```

```
q
```

```
q
```

## 6.7

### Actions:

- **Terminate**
  - § **Accept route**
  - § **Reject (or suppress) route**
- **Flow control**
  - § **Skip to next policy**
  - § **Skip to next term**
- **Modify attributes**
  - § **Metric**
  - § **Preference**
  - § **Color**
  - § **Next-hop address**

## 6.8 default policy

```
IS—IS OSPF and RIP
```

```
> Import all routes
```

```
> Export all routes learned by that protocol and all interface routes on which the protocol is configured explicitly (except RIP)
```

```
BGP
```

```
> Import all routes learned from BGP neighbors
```

```
> Export all active routes learned from BGP neighbors to all BGP neighbors
```

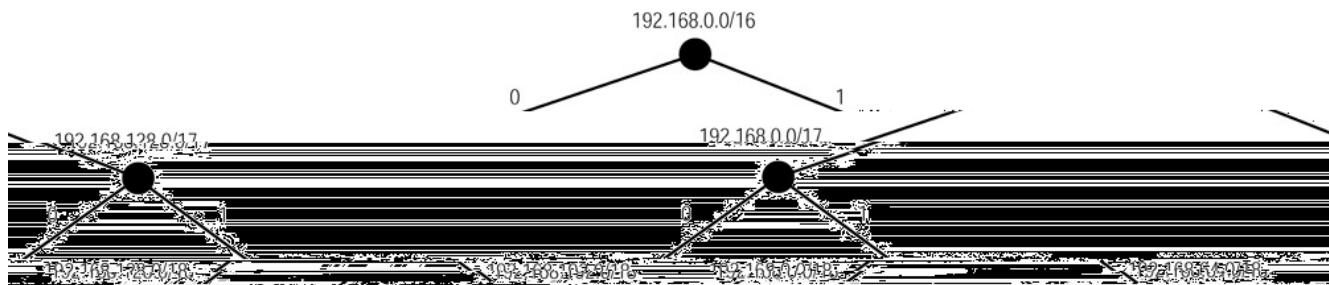
```
— EBGP-learned routes are exported to all BGP peers
```

```
— IBGP-learned routes are exported to all EBGP peers (logical full-mesh)
```

## 6.9 Route Filters

cisco ip prifex

GntbhUl fci hY! Z]` hYf dfYZ]! #dfYZ]!! `Yb[h\ aUhVX! hmøY UWh] cbg/



\* ! (

- **Exact**

route-filter 192.168.0.0/16 exact;

- **orlonger;**

route-filter 192.168.0.0/16 orlonger;

- **longer**

route-filter 192.168.0.0/16 longer;

- **upto**

route-filter 192.168.0.0/16 upto /18;

- **prefix-length-range**

route-filter 192.168.0.0/16 prefix-length-range /17-/18;

- **through**

route-filter 192.168.0.0/16 through 192.168.128.0/19;

192.168.0.0 /16

192.168.0.0 /16

6 - 5

## 6.10 Route Filters and Other Match Criteria

Route Filters    Route Filter

```
policy-options {
    policy-statement hbm-export {
```

0 6-6

## 6.11 Applying Routing Policies

### z RIP Policy Application

```
SURWRFROV ^
  ULS ^
    LPSR USR O L S'R O L F \ @
    JURXS WHVW ^
      H[S'R USR O L S'R O L F \ @
      QHLJKERU IH ^
        LPSR S'R O L S'R O L F \ @
```

### z Link-State IGP Policy Application

```
SURWRFROV ^
  LVLV ^
    H[S'R USR O L S'R O L F \ @
  RVSI ^
    H[S'R USR O L S'R O L F \ @
```

## 6.12 BGP Policy Application

```
dfchcVt`g o
V[d o
]adcfh O dc`]Vt% dc`]Vt& """/
Yl dcfh O dc`]Vt% dc`]Vt& """/
[ fci d Yl hYfbU ! dYyf g o
hndY Yl hYfbU /
]adcfh O dc`]Vt% dc`]Vt& """/
Yl dcfh O dc`]Vt% dc`]Vt& """/
dYyf! Ug *) )&%/
bY][\Vcf %'%'%'%' o
]adcfh O dc`]Vt% dc`]Vt& """/
Yl dcfh O dc`]Vt% dc`]Vt& """/
q
q
q
q
```

# 7 Routing Information Protocol RIP

## 7.1 RIP

```

F = D          I B D 8 5 H 9 G t          fl F 9 E I 9 G H G t
F = D          ' $      I 8 D ) & $
                                = D
F = D
    
```



7-1 RIP

```

F = D
                                %      , ! %          7          7
                                6          %) & " %" $ " $          %
$      6          %      &          , ! %          5          6          5 %) & " %" $ "
                                , ! &          5          6 F = D          ) * ? 6 D G
                                %" ) A V d g          % ) * ? 6 D G          & %" ) A
V d g
    
```



)七

F = D

%\*

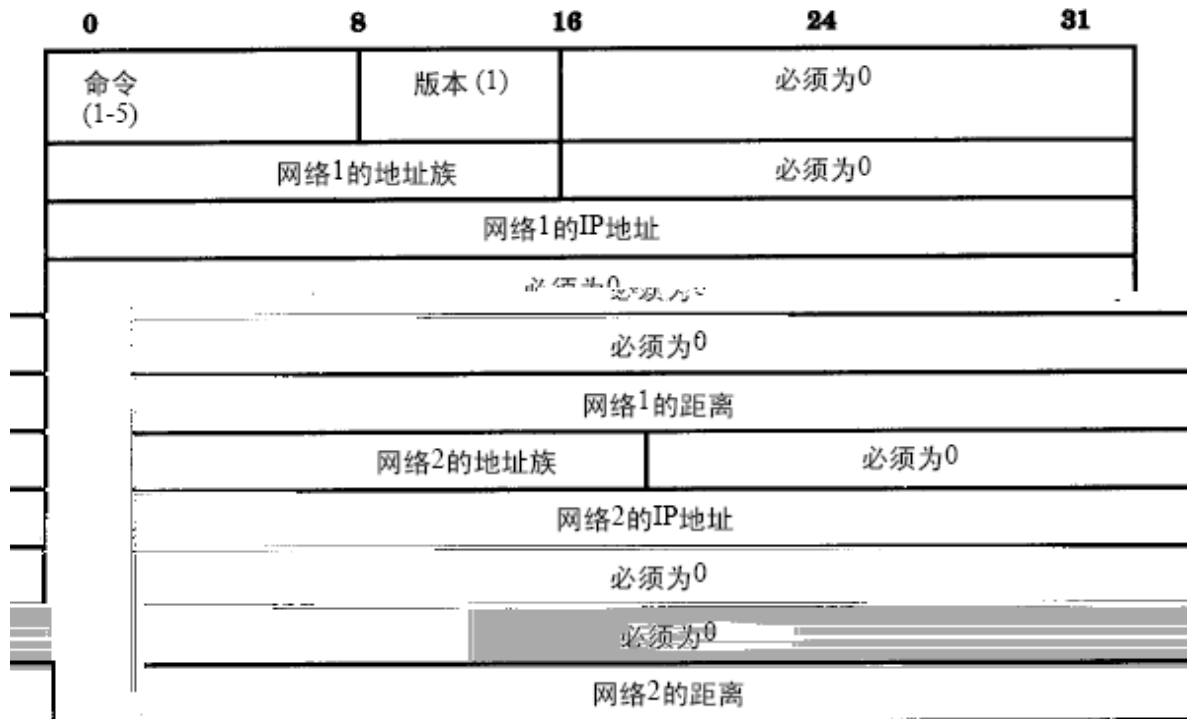
] ]

B

U

## 7.2.2 RIP

命令格式：  
 F = D [ &lt; > ]  
 = D [ 7caalUbXg fl 7. ]  
 F = D [ % &lt; > ] ( < > )  
 G b A] Wcgmg hYag JY f g ] c b  
 F = D 5XXf Ygg : Ua] ` m=XYbh] Z] Yf  
 F = D = D = D = D  
 &lt; > =D 5XXf Ygg = D = D = D ( < > )  
 Must Be Zero RIP 1 2 IP 1 2  
 4 8 8] ghUbW hc BYh % \*



+!) F=D

F: 7

- F: 7 %\$, ž "Fci h] b[ =bZcfaUh] cb DfchcVt`"
- F: 7 &\$, &ž "F=D! & A8) 5i h\Ybh] WWh] cb"
- F: 7 &() ' ž "F=D JYfg] cb &"

## 7.3 RIP

```

— RIP
[edit protocol]
protocols {
  rip {
    group group-name {
      neighbor interface-name;
    }
  }
}

```

```

— RIP Export
policy-options {
  policy-statement statics-to-rip {
    from protocol static;
    then accept;
  }
}

```

```

—
protocols {
  rip {
    group rip-neighbors {
      export statics-to-rip;
      neighbor fe-0/0/0.0;
      neighbor fe-0/0/1.0;
    }
  }
}

```

## 7.3 Monitoring RIP

### 7.3.1 RIP

```

i gYf 47UWYfbYh2 g\ck f]d bY][\Vcf
                                Gci fW          8Ygh] bUh] cb          GybX  FYW]j Y  =b
BY][\Vcf          GhUhY  5XxfYgg          5XxfYgg          AcXY  AcXY          AYh
!!!!!!!!!!!!      !!!!!  !!!!!!!          !!!!!!!!!!!!!          !!!!!  !!!!!          !!!

```

```
ZY! $$$$ $ Id %&"%"%'& &&("$"$"- aW\gh Vch\ %
ZY! $$$% $ Id %&"%"%'& &&("$"$"- aW\gh Vch\ %
```

### 7.3.2 RIP

```
i gYf 4F] Yg` ] b[ 2 g\ck fci hY dfchcW` f] d
```

```
] bYh" $. &+ XYgh] bUh] cbgž &+ fci hYg fl&+ UMh] j Yž $ \c` XXckbž $ \] XXYbk
Ž 1 5VM] j Y Fci hYž ! 1 @Ugh 5VM] j Yž † 1 6ch\
```

```
%&"%"%'& "$#&( † CF=D#%$$] $$$. $+. &) ž aYhf] W&
2 hc %&"%"%'& j ] U ZY! $$$ $
% &"% , " , "%# & † CF=D#%$$] $$$. $+. &) ž aYhf] W&
2 hc %&"%"%'& j ] U ZY! $$$ $
% &"% , "& (" %# & † CF=D#%$$] $$$. $$$. &) ž aYhf] W'
2 hc %&"%"%'& j ] U ZY! $$$ $
```

### 7.3.3 RIP

```
lab@sf-pe> show route advertising-protocol rip 10.0.21.1
```

```
inet.0: 12 destinations, 12 routes (11 active, 1 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
3.0.0.0/8 * [Static/5] 00:10:56
Reject
30.0.0.0/16 * [Static/5] 00:12:20
Reject
```

### 7.3.4 RIP

```
lab@p1> show route receive-protocol rip 10.100.3.2
```

```
inet.0: 17 destinations, 18 routes (17 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
172.20.4.0/24 * [RIP/100] 00:01:01, metric 2
> to 10.100.3.2 via fe-0/0/0.0
192.168.28.0/24 * [RIP/100] 00:01:01, metric 2
> to 10.100.3.2 via so-0/0/0.0
```

## 7.3.5 RIP statistics

lab@sf-pe> **show rip statistics**

RIP info: port 520; update interval 30s; holddown 180s; timeout 120s.

rts learned	rts held down	rqsts dropped	resps dropped
1	1	0	0

fe-0/0/0.0: 1 routes learned; 3 routes advertised

Counter	Total	Last 5 min	Last minute
Updates Sent	28	11	2
Triggered Updates Sent	1	0	0
Responses Sent	0	0	0
Bad Messages	0	0	0
RIPv1 Updates Received	0	0	0
RIPv1 Bad Route Entries	0	0	0
RIPv1 Updates Ignored	0	0	0
RIPv2 Updates Received	14	11	3
RIPv2 Bad Route Entries	0	0	0
RIPv2 Updates Ignored	0	0	0
Authentication Failures	0	0	0
RIP Requests Received	0	0	0
RIP Requests Ignored	0	0	0

## 7.3.5 RIP log

### — Log file-related configuration options

[edit protocols rip]

```
traceoptions {
    file name <replace> <size size> <files number> <no-stamp>
}
```

[edit protocols rip]

lab@p1# show traceoptions file ?

Possible completions:

<[Enter]>	Execute this command
files	Maximum number of trace files (2..1000)
no-stamp	Don't timestamp trace file
no-world-readable	Don't allow any user to read the log file





```
neighbor fe-0/0/1.0;
neighbor fe-0/0/0.0;
}
}
admin@RSR04E-1# run show rip neighbor
```

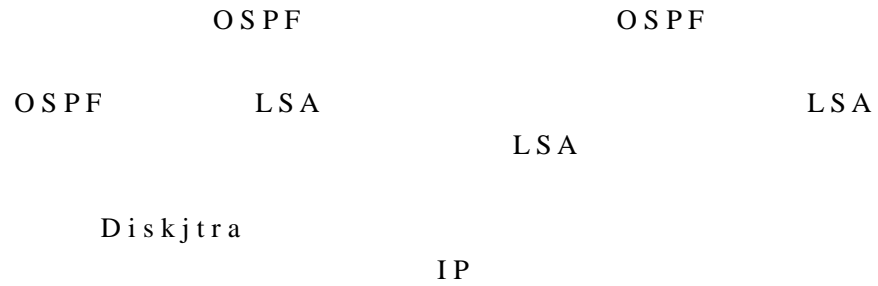
Neighbor	State	Source Address	Destination Address	Send Mode	Receive Mode	In Met
ge-1/3/0.0	Up	192.168.100.5	224.0.0.9	mcast	both	1
fe-0/0/1.0	Up	192.168.100.1	224.0.0.9	mcast	both	1

```
admin@RSR04E-2> show rip neighbor
```

Neighbor	State	Source Address	Destination Address	Send Mode	Receive Mode	In Met
fe-0/0/0.0	Up	192.168.100.13	224.0.0.9	mcast	both	1
fe-0/0/1.0	Up	192.168.100.2	224.0.0.9	mcast	both	1



## 8.2 OSPF



## 8.2.4

OSPF

AS

9-1

LSA

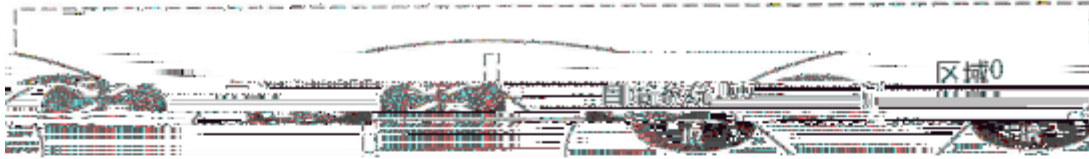
IR

(ABR)

AS

AS

(ASBR)



8-1 OSPF

## 8.2.5

0

OSPF

0

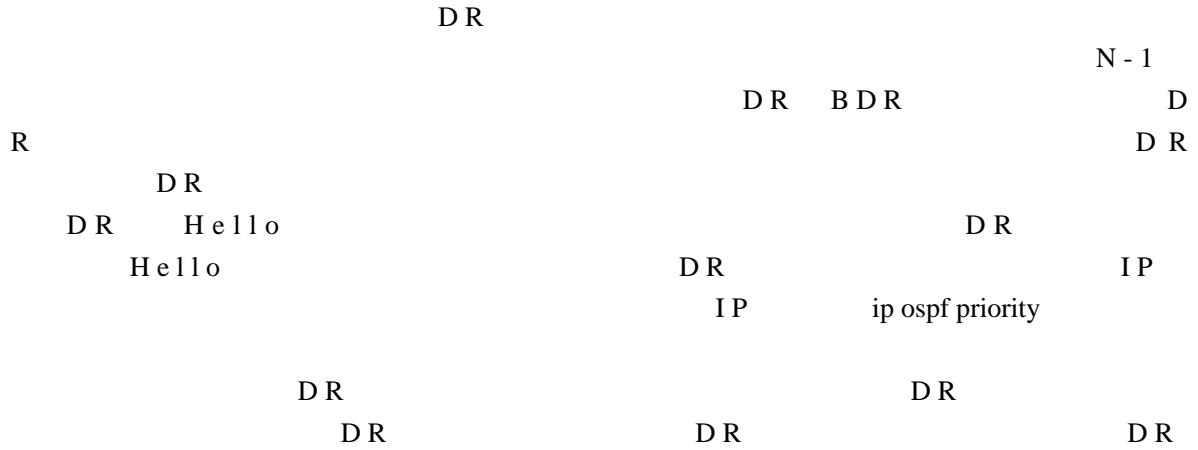
0

0

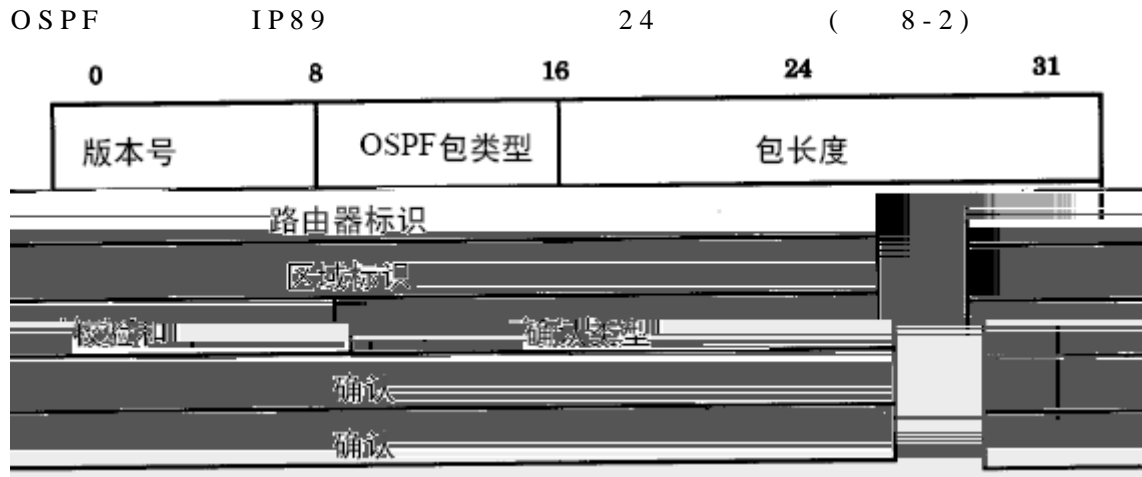
## 8.2.6

DR DR

OSPF



## 8.2.7 OSPF



9-2 OSPF

5 OSPF ( 9-3)

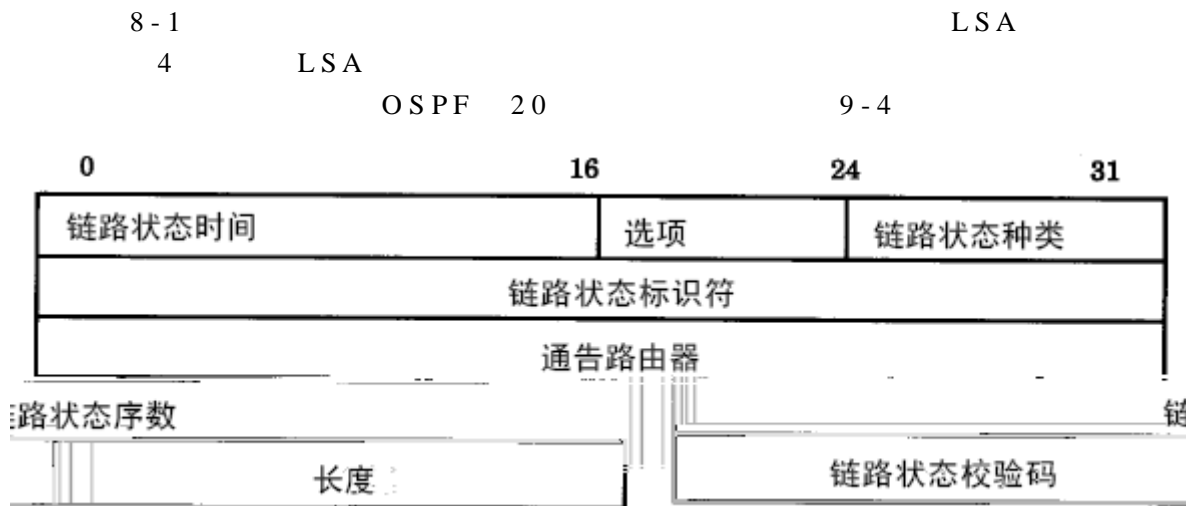
类型	包名称	协议功能
	Hello	发现并维持邻居
2	数据库描述	概括数据库容量
3	数据库请求	请求数据库信息

9-3 OSPF

1) Hello Hello Hello DR DR

- 2) OSPF
- 3) OSPF
- 4) OSPF
- LSA LSA
- 5) OSPF OSPF LSA

## 8.2.8



9-4

20

1.

LSA 1 LSA

LS

A LSA

2.

RSR04/08E

```

2 LSA DR
DR
3.
3 4 LSA ABR LSA AS
LSA
4.
ASBR 5 LSA AS AS 5
LSA AS
2 1 2
1 2 1
5.
OSPF Hello 224.0.0.
5 OSPF Hello 10 NBMA ATM
Hello 30
Hello
DR
Hello
LSA
LSA
6.
OSPF RSR show ospf neighbor
B 10.0.1.1 A
i gYf 47\UfXcbbUm2 g\ck cgdZ bY] [\Vcf
5XXfYgg =bhYfZUW GhUHY =8 Df]
8YUX
%$ "$" % ( * Uh! $#%#"$" %$ $ : i `` %$ "$" % %$ %& ' *
%$ "$" % % gc! $#$#" "$ $ : i `` %$ "$" % & %& ' -
5

```



,!)

## 8.2.9 OSPF

OSPF 4

OSPF

OSPF

1.

LAN

2.

3.

3

```
[edit]
user@host# show protocols ospf
ospf {
  area 0.0.0.0 {
    interface ge-0/0/0.0;
  }
}
```

## 8.3.2 OSPF

```
[edit]
user@host# show protocols ospf
ospf {
  area 0.0.0.0 {
    interface ge-0/0/0.0;
  }
}
```

```
[edit]
user@host# set protocols ospf area 1 interface at-0/1/1.100
[edit]
user@host# show protocols ospf
ospf {
  area 0.0.0.0 {
    interface ge-0/0/0.0;
  }
  area 0.0.0.1 {
    interface at-0/1/1.100;
  }
}
```

## 8.3.2 a Stub Area

```
[edit protocols ospf area area-id]
stub <default-metric metric> <(no-summaries | summaries)>;
```

## 8.3.3 a Not-So-Stubby Area

```
[edit protocols ospf area area-id]
nssa {
```

```
area-range network/mask-length <restrict>;
default-lsa {
default-metric metric;
metric-type type;
type-7;
}
(no-summaries | summaries);
}
```

## 8.4.4 OSPF Virtual Link

```
3 area virtual Link
[edit protocols ospf area 0.0.0.0]
virtual-link neighbor-id router-id transit-area area-id;
```

## 8.3.5 OSPF Router Interfaces

**Configuring an Interface on a Broadcast or Point-to-Point Network**  
[edit protocols ospf area *area-id* ]

```
interface interface-name;
```

**Configuring an Interface on a Point-to-Multipoint Network**

```
[edit protocols ospf area 0.0.0.0]
```

```
interface interface-name {
neighbor address;
}
```

**Configuring an Interface on a Nonbroadcast, Multiaccess Network**

```
[edit protocols ospf area 0]
interface interface-name {
interface-type nbma;
neighbor address <eligible>;
poll-interval seconds;
}
```

## 8.3.6

**simple MD5**

```
[edit protocols ospf area area-id ]
```

authentication-type authentication;

```
[edit protocols ospf area area-id interface interface-name]
authentication {
md5 key-id {
key [ key-values ];
}
simple-password key-id;
}
```

## 8.4 JUNOS Troubleshooting

### 8.4.1

### OSPF

### show ospf interface

```
i gYf 47\UfXcbbUm2 g\ck cgdZ ]bhYfZUW
=bhYfZUW GhUy 5fYU 8F =8 68F =8 BVfg
Uh! $#%#"$ %$$ DhHcDh "$" "$" $ "$" "$" $ "$" "$" $ "$" "$" $
gc! $#$#%" $ DhHcDh "$" "$" "$" $ "$" "$" $ "$" "$" $ "$" "$" $
gc! $#$#"$ $ DhHcDh "$" "$" "$" %$ "$" "$" $ "$" "$" $ "$" "$" $
gc! $#$#&" $ DhHcDh "$" "$" "$" %$ "$" "$" $ "$" "$" $ "$" "$" $
gc! $#$#" "$ DhHcDh "$" "$" "$" %$ "$" "$" $ "$" "$" $ "$" "$" $
```

5fYU — H\]g Z]Y`X X]gd`Um g h\Y WffYbh UfYU =8 Ugg] [bYX hc h\Y ]bhYfZUW"

8F =8 — H\Y fci hYf =8 cZ h\Y WffYbh XYg] [bUHYX fci hYf ]g X]gd`UmYX ]b h\]g V` i ab" Dc]bh! hc! dc]bh ]bhYfZUWg i gY U j U i Y cZ "\$" "\$" "\$" "\$"

68F =8 — H\Y fci hYf =8 cZ h\Y WffYbh VUW]i d XYg] [bUHYX fci hYf ]g X]gd`UmYX ]b h\]g V` i ab" Dc]bh! hc! dc]bh ]bhYfZUWg i gY U j U i Y cZ "\$" "\$" "\$" "\$"

BVfg — H\Y j U i Y ]b h\]g V` i ab fYdfYgYbhg h\Y hchU` bi aYf cZ CGD: bY] [\Vcf g X]gV`j YfYX UWcg g h\]g ]bhYfZUW"

### 8.4.2

### OSPF

```
i gYf 47\UfXcbbUm2 g\ck cgdZ bY] [\Vcf
5XXfYgg =bhYfZUW GhUy =8 Df] 8YUX
%$" "$" %' (* Uh! $#%#"$ %$$ : i `` %$" "$" %' %$' %&, ' *
%$" "$" %' ( gc! $#$#%" $ : i `` %$" "$" %' %$& %&, ' )
%$" "$" %' - gc! $#$#"$ $ : i `` %$" "$" %' %$ %&, ' ,
```



```
' Fci hYf! HrdY % fci hYf @G5  
' BYhkcf_! HrdY & bYhkcf_ @G5  
' Gi aaUf m! HrdY ' bYhkcf_ gi aaUf m @G5  
' 5G6FGi a! HrdY ( 5G6F gi aaUf m @G5  
' 9l hYfb! HrdY ) 5G Yl hYfbU @G5  
' BGG5! HrdY + BGG5 Yl hYfbU @G5
```

```
=8 H\]g Z]Y`X g\ckg h\Y @]b_! GhUhY =8 Z]Y`X Zfca h\Y @G5" H\]g jU`iY ]g i gYX  
hc dfcj ]XY i b]ei YbYgg Zcf YUW @G5" 9bhf]Yg aUf_YX k]h\ Ub UghYf]g_ fl l UfY  
@G5g [YbYfUhYX Vm h\Y `cWU` fci hYf"
```

```
5Xj Fhf H\Y fci hYf =8 cZ h\Y cf][ ]bUh]b[ fci hYf Zcf YUW @G5 ]g X]gd` UmYX ]b  
h\]g Z]Y`X"
```

```
GYe H\Y gYei YbW bi aVYf Ugg] ghg h\Y fci hYf hc XYhYfa] bY h\Y acgh fYWbh j Yf]g] cb  
cZ h\Y @G5"
```

```
5[Y H\]g Z]Y`X X]gd` Umg h\Y WffYbh U[Y cZ h\Y @G5" 5` @G5g VY[]b k]h\ U  
` ]ZYh]aY cZ $ UbX ]bWYaYbh hc U XYZ] bYX AUl 5[Y cZ ' *$$ gYVtbXg" 9UW @G5 ai gh  
WY fYZfYg\YX WZcfY h\Y AUl 5[Y jU`iY ]g fYUWYX"
```

```
Cdh H\Y Cdh]cbg Z]Y`X Zfca h\Y CGD: \YUXYf ]g X]gd` UmYX ]b h\]g Wt`i ab" H\Y  
dcgg]V`Y V]h jU`iYg UfY X]gWggYX ]b h\Y "<Y`c DUW_Yh" gYVh]cb YUf` ]Yf ]b  
h\]g W\UdhYf"
```

```
7_gi a H\Y W W` UhYX WYW_gi a jU`iY cZ h\Y @G5 ]g ghcfYX ]b h\]g Z]Y`X" 9UW  
fci hYf W W` UhYg U bYk WYW_gi a k\Yb h\Y @G5 ]g fYW]j YX UbX j Yf]Z]Yg h\Y  
jU`iY U[U]bgh h\Y fYW]j YX jU`iY hc Ybgi fY dUW_Yh ]bhY[f]hm!
```

```
@/b H\]g Z]Y`X X]gd` Umg h\Y hchU` `Yb[h\ cZ h\Y @G5"
```

### 8.4.3 OSPF

```
clear ospf database
```

```
i gYf 4G\]fUn2 WYUf cgdZ XUhUWUgY di f[Y
```

```
CGD: Z`ccXg
```

```
@Ugh ] bghUbWV cZ YUWV Yj Ybh hndY
K\Yb          HndY          9 UdgYX
$. %. &-      GD:          $" $$$$+'
$. %. &-      Ghi V          $" $$$$* +
$. %. &-      =bhYfUfYU        $" $$$$(
$. %. &-      9l hYfbU          $" $$$$'
$. %. &-      BGG5          $" $$$$'
$. %. &-      7 YUbi d          $" $$$$, '
```

```
AUI ] ai a `Yb[h\ cZ YUWV Yj Ybh hndY
K\Yb          HndY          9 UdgYX
% % . ) +     GD:          $" $$$%&
$. && ( %     Ghi V          $" $$$' *)
&$. $. %     =bhYfUfYU        $" $$$% &
% % . ( '     9l hYfbU          $" $$$$( &
% . % . &-    BGG5          $" $$$$(
% . % . &-    7 YUbi d          $" $$$+%)
```

```
@Ugh %$$ Yj Ybhg
K\Yb          HndY          9 UdgYX
% % . ( ,     HchU          $" $$$% &
% % . ( '     GD:          $" $$$- $
% % . ( '     Ghi V          $" $$$, *
% % . ( '     =bhYfUfYU        $" $$$' $
% % . ( '     9l hYfbU          $" $$$$( &
% % . ( '     BGG5          $" $$$$(
""""Oci hdi h hfi bW[hYX]
```

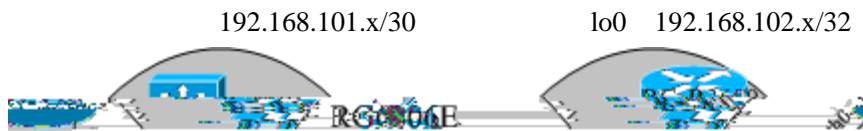
## 8.4.6 OSPF statistics

```
i gYf 4G\] fUn2 g\ck cgdZ ghUh] gh] Wg
```

DUW_Yh hndY	HchU	@Ugh ) gYWtbXg
	GYbh	FYW]j YX
	GYbh	FYW]j YX
<Y `c	&(	(
8V8	&(	%*
@GFYe	*	+
@G dXUhY	' +)	&&*\$
@G5W	&&' *	' *,
		\$
		\$
		\$
		\$
		\$
		\$
...		



## 8.5 OSPF



8 - 6

### RSR04E-1

```
interfaces {
  fe-0/0/0 {
    description to-RSR04E-2-fe-0/0/0;
    unit 0 {
      family inet {
        address 192.168.101.5/30;
      }
    }
  }
  fe-0/0/1 {
    description to-RG-R3600-eth0;
    unit 0 {
      family inet {
        address 192.168.101.9/30;
      }
    }
  }
}
RSR04/08E
```

```
}  
}  
fe-0/0/2 {  
    description "to-RG-S3550-fa 0/25";  
    unit 0 {  
        family inet {  
            address 192.168.101.13/30;  
        }  
    }  
}  
ge-1/3/0 {  
    description to-RG-S6806E-g4/9;  
    unit 0 {  
        family inet {  
            address 192.168.101.1/30;  
        }  
    }  
}  
lo0 {  
    description RID;  
    unit 0 {  
        family inet {  
            address 192.168.102.1/32;  
        }  
    }  
}  
}  
routing-options {  
    router-id 192.168.102.1;  
}  
protocols {  
    ospf {  
        area 0.0.0.0 {  
            interface lo0.0 {  
                passive;  
            }  
            interface ge-1/3/0.0;  
            interface fe-0/0/0.0;  
        }  
        area 0.0.0.1 {  
            interface fe-0/0/1.0;  
            interface fe-0/0/2.0;  
        }  
    }  
}
```

}

## RSR04E-2

```
interfaces {
    fe-0/0/0 {
        description to-RSR04E-1-fe-0/0/0;
        speed 100m;
        link-mode full-duplex;
        unit 0 {
            family inet {
                address 192.168.101.6/30;
            }
        }
    }
    fe-0/0/1 {
        description to-RG6806E-g4/1;
        unit 0 {
            family inet {
                address 192.168.101.17/30;
            }
        }
    }
    lo0 {
        description RID;
        unit 0 {
            family inet {
                address 192.168.102.2/32;
            }
        }
    }
}
routing-options {
    router-id 192.168.102.2;
}
protocols {
    ospf {
        area 0.0.0.0 {
            interface lo0.0 {
                passive;
            }
        }
    }
}
```

RSR04/08E

```
interface fe-0/0/0.0;  
interface fe-0/0/1.0;  
}  
}  
}
```

### RG-6806E

```
interface GigabitEthernet 4/1  
no switchport  
description "to-RSR04E-2-fe-0/0/1"  
ip address 192.168.101.18 255.255.255.252  
!  
interface GigabitEthernet 4/9  
medium-type fiber  
no switchport  
speed 1000  
description "to-RSR04E-ge-1/3/0"  
ip address 192.168.101.2 255.255.255.252  
!  
interface Loopback 0  
description "RID"  
ip address 192.168.102.5 255.255.255.255  
!  
router ospf  
area 0.0.0.0  
network 192.168.101.0 255.255.255.252 area 0.0.0.0  
network 192.168.101.16 255.255.255.252 area 0.0.0.0  
network 192.168.102.5 255.255.255.255 area 0.0.0.0  
!  
End
```

### RG3660

```
!  
interface FastEthernet 0/0  
ip address 192.168.101.10 255.255.255.252  
duplex auto  
speed auto  
description to-RSR04E-1-fe-0/0/1  
!  
interface FastEthernet 0/1  
ip address 192.168.101.22 255.255.255.252  
duplex auto  
speed auto
```

RSR04/08E

```
no keepalive
description to-RG-S3550-fa-0/25
!
interface Loopback 0
 ip address 192.168.102.3 255.255.255.255
 description RID
!
router ospf
 passive-interface Loopback 0
 network 192.168.101.8 0.0.0.3 area 0.0.0.1
 network 192.168.101.20 0.0.0.3 area 0.0.0.1
 network 192.168.102.3 0.0.0.0 area 0.0.0.1
!
```

### RG-S3550

```
interface FastEthernet 0/25
 no switchport
 description "to-RSR04E-1-fe-0/0/2"
 ip address 192.168.101.14 255.255.255.252
!
interface FastEthernet 0/26
 no switchport
 description "to-RG-R3600-fa0/1"
 ip address 192.168.101.21 255.255.255.252
!
interface Loopback 0
 description "RID"
 ip address 192.168.102.4 255.255.255.255
!
router ospf
 area 0.0.0.1
 network 192.168.101.12 255.255.255.252 area 0.0.0.1
 network 192.168.101.20 255.255.255.252 area 0.0.0.1
 network 192.168.102.4 255.255.255.255 area 0.0.0.1
!
End
```

## 8.5.1 RSR ospf

```
admin@RSR04E-1> show route protocol ospf
```

```
inet.0: 18 destinations, 18 routes (18 active, 0 holddown, 0 hidden)
  RSR04/08E
```

+ = Active Route, - = Last Active, \* = Both

```

192.168.101.16/30 *[OSPF/10] 00:35:03, metric 2
                  > to 192.168.101.6 via fe-0/0/0.0
                  to 192.168.101.2 via ge-1/3/0.0
192.168.101.20/30 *[OSPF/10] 00:27:05, metric 2
                  > to 192.168.101.10 via fe-0/0/1.0
                  to 192.168.101.14 via fe-0/0/2.0
192.168.102.2/32  *[OSPF/10] 00:35:03, metric 1
                  > to 192.168.101.6 via fe-0/0/0.0
192.168.102.3/32  *[OSPF/10] 00:27:05, metric 2
                  > to 192.168.101.10 via fe-0/0/1.0
192.168.102.4/32  *[OSPF/10] 00:46:39, metric 2
                  > to 192.168.101.14 via fe-0/0/2.0
192.168.102.5/32  *[OSPF/10] 00:46:50, metric 2
                  > to 192.168.101.2 via ge-1/3/0.0
224.0.0.5/32      *[OSPF/10] 01:13:33, metric 1
                  MultiRecv

```

## 8.5.2 OSPF

admin@RSR04E-1> **show ospf neighbor**

Address	Interface	State	ID	Pri	Dead
192.168.101.6	fe-0/0/0.0	Full	192.168.102.2	128	35
192.168.101.2	ge-1/3/0.0	Full	192.168.102.5	1	39
192.168.101.10	fe-0/0/1.0	Full	192.168.102.3	1	30
192.168.101.14	fe-0/0/2.0	Full	192.168.102.4	1	30

## 8.5.3 ospf

admin@RSR04E-1> **show ospf interface**

Interface	State	Area	DR ID	BDR ID	Nbrs
fe-0/0/0.0	DR	0.0.0.0	192.168.102.1	192.168.102.2	1
ge-1/3/0.0	DR	0.0.0.0	192.168.102.1	192.168.102.5	1
lo0.0	DRother	0.0.0.0	0.0.0.0	0.0.0.0	0
fe-0/0/1.0	BDR	0.0.0.1	192.168.102.3	192.168.102.1	1
fe-0/0/2.0	BDR	0.0.0.1	192.168.102.4	192.168.102.1	1

## 8.5.4

```
admin@RSR04E-1> show route protocol ospf | match /32
192.168.102.2/32    *[OSPF/10] 00:55:06, metric 1
192.168.102.3/32    *[OSPF/10] 00:55:06, metric 2
192.168.102.4/32    *[OSPF/10] 00:55:06, metric 2
192.168.102.5/32    *[OSPF/10] 00:55:06, metric 2
224.0.0.5/32        *[OSPF/10] 02:31:34, metric 1
```

## 8.5.5

```
admin@RSR04E-1> show route forwarding-table destination 192.168.101.16/30
```

```
Routing table: inet
```

```
Internet:
```

Destination	Type	RtRef	Next hop	Type	Index	NhRef	Netif
192.168.101.16/30	user	0	192.168.101.6	ucst	341	3	fe-0/0/0.0

```
jun.e1 Tf0.0003 Tc 0.67600006 [<54AC4178>6<1C0322751CDD2C5897C809C304B9199768 797C85(30)4( 08214D
```

## 8.5.7 OSPF Authentication

JUNOS MD5 Simple

### Example:

```
8.5-1 Area 0 MD5 Area 1
dmin@RSR04E-1# show
ospf {
  area 0.0.0.0 {
    authentication-type md5;
    interface lo0.0 {
      passive;
    }
    interface ge-1/3/0.0 {
      authentication {
        md5 10 key "$9$nj7z9tOhSeX7V1R7VwYZG69A"; ## SECRET-DATA
      }
    }
    interface fe-0/0/0.0 {
      authentication-type simple;
      authentication {
        md5 10 key "$9$tXIZ01hevLVwgSrwgoJHkp0B"; ## SECRET-DATA
      }
    }
  }
  area 0.0.0.1 {
    interface fe-0/0/1.0 {
      authentication {
        simple-password "$9$WIEXNb4aU.PQaZ6A"; ## SECRET-DATA
      }
    }
    interface fe-0/0/2.0 {
      authentication {
        simple-password "$9$ZSDHmz39O1h36lM"; ## SECRET-DATA
      }
    }
  }
}
```

RG-6806E#show run

Building configuration...

Current configuration : 1005 bytes

!

RSR04/08E

```
version 1.0
install 4 12sfp/gt
ip routing algorithm CRC32_UPPER
!
hostname RG-6806E
enable secret level 1 5 $2lowNq&3h`@IOrJ4imLMp]KQknAxB^"
enable secret level 15 5 $2,1u_;C3&-8U0<D4'.tj9=GQ+/7R:>H
!
interface GigabitEthernet 4/1
  no switchport
  description "to-RSR04E-2-fe-0/0/1"
  ip address 192.168.101.18 255.255.255.252
ip ospf authentication message-digest
ip ospf message-digest-key 10 md5 juniper
!
interface GigabitEthernet 4/9
  medium-type fiber
  no switchport
  speed 1000
  description "to-RSR04E-ge-1/3/0"
  ip address 192.168.101.2 255.255.255.252
ip ospf authentication message-digest
ip ospf message-digest-key 10 md5 juniper
!
interface Loopback 0
  description "RID"
  ip address 192.168.105ft-.105ft-.255.25per
```

```
enable password 7 1316064b1f
!  
interface FastEthernet 0/0  
  ip ospf authentication-key junos  
  ip address 192.168.101.10 255.255.255.252  
  duplex auto  
  speed auto
```



Listening on fe-0/0/1.0, capture size 96 bytes

07:12:19.423729 In (tos 0xc0, ttl 1, id 16641, offset 0, flags [none], proto: OSPF (89), length: 68)

192.168.101.10 > 224.0.0.5: OSPFv2, Hello (1), length: 48

Router-ID: 192.168.102.3, Area 0.0.0.1, **Authentication Type:** unknown (1)junos^@^@^@"

Options: [External]

Hello Timer: 10s, Dead Timer 40s, Mask: 255.255.255.252, Priority: 1

Designated Router 192.168.101.9, Backup Designated Router 192.168.101.10

Neighbor List:

192.168.102.1

07:12:20.892801 Out 0:12:1e:1:30:1 1:0:5e:0:0:5 ip 82: (tos 0xc0, ttl2(1)5168.101 18(fse5(Prio4Pri3-6((101 21 0.0

8-7

RSR04E-1                    200.0.0.0/24    ospf            ospf            LSA 5 type 2

```
admin@RSR04E-1# set routing-options static route 200.0.0.0/24 reject
[edit]
```

```
policy-options {
  policy-statement static {
    term static {
      from {
        protocol static;
        route-filter 200.0.0.0/24 exact;
      }
      then {
        metric 111;
        external {
          type 2;
        }
        accept;
      }
    }
    term deny-any {
      then reject;
    }
  }
}
```

---

RG-R2600-2# 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

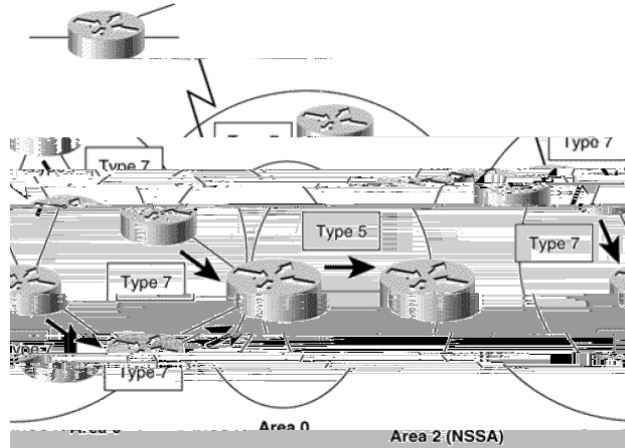
Gateway of last resort is 192.168.101.26 to network 0.0.0.0

192.168.101.0/30 is subnetted, 10 subnets



## 8.7 Not-So-Stubby Areas (NSSA)

No type 5 or type 3 LSAs in area  
NSSA ABR LSA type 7 LSA 5



8-8

NSSA

YX] h dfchcVt` g cgdZ UfYU \$" \$" \$" %\$]

UXa] b4FGF\$(9! & g\ck

bggU o

XYZUi ` h! ` gU o

XYZUi ` h! aYhf] WQj U i Y2/

aYhf] W hndY Qj U i Y2/

hndY! +/

q

bc! gi aaUf] Yg/

q

] bhYf ZUW Oj bhYf ZUW! bUaY2/

q

## 8.8 Virtual Links

Virtual Links — backbone area area 0  
RSR04E-2 RSR04E-1 RSR04E-2 lo0:  
area 0 8.8-1 8.8-2

**Syntax:**

RSR04/08E



```
authentication-type md5;
virtual-link neighbor-id 192.168.102.5 transit-area 0.0.0.10 {
    authentication {
        md5 10 key "$9$FFE56CuRhr8X-O1X-VwaJ369"; ## SECRET-DATA
    }
}
interface lo0.0 {
    passive;
}
interface fe-0/0/0.0 {
    authentication {
        md5 10 key "$9$oGZDk5Qnp0I.P0IEcvMaZU"; ## SECRET-DATA
    }
}
}
area 0.0.0.10 {
    interface fe-0/0/2.0;
    interface fe-0/0/1.0;
}
}
```

#### RG-R6806E

```
admin@RSR04E-1# run telnet 192.168.102.5
Trying 192.168.102.5...
Connected to 192.168.102.5.
Escape character is '^'.
```

#### User Access Verification

Password:

RG-6806E>en

Password:

RG-6806E#sho run

Building configuration...

Current configuration : 1501 bytes

!

version 1.0

install 4 12sfp/gt

ip routing algorithm CRC32\_UPPER

!

hostname RG-6806E

enable secret level 1 5 \$2-aeH`@31'dfimL4t{bcknAQ7zyglow

End

backbone AREA 0 MD5 Virtual Links MD5

' Virtual Links

admin@RSR04E-2> show ospf interface

Interface	State	Area	DR ID	BDR ID	Nbrs
fe-0/0/0.0	DR	0.0.0.0	192.168.102.2	192.168.102.1	1
lo0.0	DRother	0.0.0.0	0.0.0.0	0.0.0.0	0
<b>vl-192.168.102.5</b>	<b>PtToPt</b>	<b>0.0.0.0</b>	<b>0.0.0.0</b>	<b>0.0.0.0</b>	<b>1</b>
fe-0/0/1.0	DR	0.0.0.10	192.168.102.2	192.168.102.5	1
fe-0/0/2.0	DR	0.0.0.10	192.168.102.2	192.168.102.6	1

admin@RSR04E-2> show ospf neighbor

Address	Interface	State	ID	Pri	Dead
192.168.101.5	fe-0/0/0.0	Full	192.168.102.1	128	38
<b>192.168.101.18</b>	<b>vl-192.168.102.5</b>	<b>Full</b>	<b>192.168.102.5</b>	<b>1</b>	<b>35</b>
192.168.101.18	fe-0/0/1.0	Full	192.168.102.5	1	36
192.168.101.37	fe-0/0/2.0	Full	192.168.102.6	1	36

' Disable

admin@RSR04E-2> set interfaces fe-0/0/0.0 disable

' ospf

admin@RSR04E-2> show ospf neighbor

Address	Interface	State	ID	Pri	Dead
<b>192.168.101.18</b>	<b>vl-192.168.102.5</b>	<b>Full</b>	<b>192.168.102.5</b>	<b>1</b>	<b>30</b>
192.168.101.18	fe-0/0/1.0	Full	192.168.102.5	1	30
192.168.101.37	fe-0/0/2.0	Full	192.168.102.6	1	31

## 9. Firewall Filters

Route policy

firewall filters

### 9.1 firewall Filters Overview

3 4

### 9.2

```

aUhVX! VtbX] h] cbg/
q
h\Yb o
UMh] cbg/
UMh] cb! acX] Z] Yfg/
q
q
hYfa hYfa! bUaY o
Zfca o
aUhVX! VtbX] h] cbg/
q
h\Yb o
UMh] cbg/
UMh] cb! acX] Z] Yfg/
q
q
q
q
q
q

```

## 9.2.2

firewall filter

diccard

```

hYfa ]ad`] VWh! fi `Y o
h\Yb o
X] gWUf X/
q
q

```

## 9.2.3

### JUNOS

```

hY` bYh
,
OYX] h Z] fYkU`` ZUa]` m] bYh]
i gYf 4G\] fUn, g\ck
Z]` hYf dcfh! bi aVYf o
hYfa XYbmi hY` bYh o
Zfca o

```

dfchcVt` \*/  
dcfh & /  
q  
h\Yb o  
fY^YVh/  
q  
q  
q  
' KY` `!\_bckb

OYX]h Z]fYkU` ZUa]`m]bYh]  
i gYf 4G\]fUn. g\ck  
Z]`hYf Yl Uad` Y! Z]`hYf! % o  
hYfa XYbnt`hY` bYh o  
Zfca o  
dfchcVt` hVd/  
dcfh hY` bYh/  
q  
h\Yb o  
fY^YVh/  
q  
q  
q  
,

OYX]h Z]fYkU` ZUa]`m]bYh]  
i gYf 4G\]fUn. g\ck  
Z]`hYf Yl Uad` Y! Z]`hYf! & o  
hYfa U`ck! hY` bYh o  
Zfca o  
dfchcVt` hVd/  
dcfh hY` bYh/  
q  
h\Yb UWVYdh/  
q  
hYfa U`ck! aU]` o  
Zfca o  
dfchcVt` hVd/  
dcfh gahd/  
q

h\Yb UWWdh/

q

q

,

OYX]h Z]fYkU` ZUa]`m]bYh]

i gYf 4G\]fUh. g\ d

f

a

f

q h\V4aUW Ê U U WU

q h hT 4chcYc`h\W /

q h hT 3 4dZCh\V Ò h]hV\hT q] /

q h

q h\Yb UWWdh/

q

<p>AUhW 7cbX] h] cb</p>	<p>8YgW] dh] cb</p> <p>U gc ` ]ghYXŁ. H\Y 9l dYX] hYX : cfkUfX] b[ F: 7 XYZ] bYg cbY VŁXYdc] bh. YZ fl(*Ł" H\Y 5ggi fYX : cfkUfX] b[ F: 7 XYZ] bYg ( WUggYgž k] h\ ' Xfcd dfYVXYbWYg ] b YUW WUggž Zcf U hchU cZ %&amp; VŁXYdc] bhg. UZ%% fP\$Łž UZ%&amp; fP&amp;Łž UZ% fP%Łž UZ&amp;% fP% Łž UZ&amp;&amp; fl&amp;\$Łž UZ&amp;' fl&amp;&amp;Łž UZ' % fl&amp;*Łž UZ' &amp; fl&amp; Łž UZ' ' fl' \$Łž UZ(% fl' (Łž UZ(&amp; fl' *Łž cf UZ(' fl' , Ł"</p>
<p>ZfU[ aYbh! cZZgYh <i>bi aVYf</i></p>	<p>H\Y ZfU[ aYbh cZZgYh Z] Y' X"</p>
<p>] VŁd! VŁXY <i>bi aVYf</i></p>	<p>H\Y =7AD VŁXY Z] Y' X" H\] g j U i Y cf _YnkcfX dfcj ] XYg acfY gdYVZ] W] bZcfaUh] cb h\Ub h\Y ] VŁd! hŁdY VŁbX] h] cb" 6YVU] gY h\Y j U i Yfig aYUb] b[ XYdYbXg cb h\Y UggcVYU hYX ] VŁd! hŁdYž ] h ai gh U gc VY gdYVZ] YX U cb[ k] h\ h\Y ] VŁd! VŁXY"</p>
<p>] VŁd! hŁdY <i>bi aVYf</i> d"</p>	<p>H\Y =7AD dUWYh hŁdY Z] Y' X" BcfaU` nž ņci h gdYVZ] h\] h] SaUhW ] b VŁb^i bVh] cb k] h\ h\Y dfchcVŁ` aUhW VŁbX] h] cb hc XYhYfa] bY k\] VŁ dfchcVŁ` ] g VY] b[ i gYX cb h\Y dcfh" =b d' UWV cZ h\Y bi aYf] W ] g</p>



q  
h\Yb o  
fY^YwW/

q

q

q

AUhW\ 7cbX] h] cb	8YgW\] dh] cb
UXXfYgg dfYZ]!	H\Y =D gci fW\ cf XYgh] bUh] cb UXXfYgg Z] Y` X" Mti W\bbch gdYW\ZmVch\ h\Y UXXfYgg UbX h\Y XYgh] bUh] cb! UXXfYgg cf gci fW\! UXXfYgg aUhW\ V\`bX] h] cbg ] b h\Y gUaY hYfa"
XYgh] bUh] cb! UXXfYgg dfYZ]!	H\Y =D XYgh] bUh] cb UXXfYgg Z] Y` X" Mti W\bbch gdYW\Zmh\Y XYgh] bUh] cb! UXXfYgg UbX UXXfYgg aUhW\ V\`bX] h] cbg ] b h\Y gUaY hYfa"
XYgh] bUh] cb! dfYZ]! !` ]gh dfYZ]! !` ]gh	H\Y =D XYgh] bUh] cb dfYZ]! !` ]gh Z] Y` X" Mti W\bbch gdYW\Zmh\Y XYgh] bUh] cb! dfYZ]! !` ]gh UbX dfYZ]! !` ]gh aUhW\ V\`bX] h] cbg ] b h\Y gUaY hYfa"
dfYZ]! !` ]gh dfYZ]! !` ]gh	H\Y =D gci fW\ cf XYgh] bUh] cb dfYZ]! !` ]gh Z] Y` X" Mti W\bbch gdYW\ZmVch\ h\Y dfYZ]! !` ]gh UbX h\Y XYgh] bUh] cb! dfYZ]! !` ]gh cf gci fW\! dfYZ]! !` ]gh aUhW\ V\`bX] h] cbg ] b h\Y gUaY hYfa"
gci fW\! UXXfYgg dfYZ]!	H\Y =D gci fW\ UXXfYgg Z] Y` X" Mti W\bbch gdYW\Zm h\Y gci fW\! UXXfYgg UbX UXXfYgg aUhW\ V\`bX] h] cbg ] b h\Y gUaY fi`Y"
gci fW\! dfYZ]! !` ]gh dfYZ]! !` ]gh	H\Y =D gci fW\ dfYZ]! !` ]gh Z] Y` X" Mti W\bbch gdYW\Zm h\Y gci fW\! dfYZ]! !` ]gh UbX dfYZ]! !` ]gh aUhW\ V\`bX] h] cbg ] b h\Y gUaY hYfa"

## 9.2.4

### terminating, flow-control, and action modifiers

#### 9.2.4.1 terminating Actions

accept, discard, and reject

Discard

reject

reject

ICMP

## 9.2.4.2 Flow-Control Actions

### Flow-Control Actions next term

```
%                `c[
OYX]h Z]fYkU` ZUa]`m]bYh]
i gYf 4G\]fUh. g\ck
Z]`hYf Yl Uad`Y! Z]`hYf! -o
  hYfa `c[!U`!dUW_Yhg o
    h\Yb `c[/

q
hYfa XYbnt`hY`bYh o
  Zfca o
    dfchcVt` hVd/
    dcfh hY`bYh/

q
h\Yb o
  fY^YVh/

q
hYfa UWWYdh! Yj Yfntm\]b[!Y`gY o
  h\Yb UWWYdh/

q
q
&                `c[                hYfa
YX]h Z]fYkU` ZUa]`m]bYh]
i gYf 4G\]fUh. g\ck
Z]`hYf Yl Uad`Y! Z]`hYf! -o
  hYfa `c[!U`!dUW_Yhg o
    h\Yb o
      `c[/
      bYl h hYfa/

q
hYfa XYbnt`hY`bYh o
  Zfca o
    dfchcVt` hVd/
    dcfh hY`bYh/

q
h\Yb o
  fY^YVh/

q
hYfa UWWYdh! Yj Yfntm\]b[!Y`gY o
  h\Yb UWWYdh/
```

q

q

### 9.2.4.2 Action Modifiers

```
count                10.0.0/24
OYX]h Z]fYkU` ZUa]`m]bYh]
i gYf 4G\]fUn, g\ck
Z]`hYf ]bVci bX! Zfca! dYYf o
    hYfa Vti bh! hfUZZ]Wo
        Zfca o
            gci fW! UXXfYgg o
                %$"$ $" $#&(/
                    q
                        h\Yb o
                            Vti bh hfUZZ]WVti bhYf/
                                UWWWdh/
                                    q
                                        q
```

```
q
Log                memory-resident buffer that is 500 lines      show firewall log
OYX]h Z]fYkU` ZUa]`m]bYh]
i gYf 4G\]fUn, g\ck
Z]`hYf `c[! hVd! Z`ck! ghUf h o
    hYfa Vti bh! gntb o
        Zfca o
            dfchcVt` hVd/
                hVd! ]b]h]U /
                    q
                        h\Yb o
                            `c[/
                                UWWWdh/
                                    q
                                        q
```

```
q
Sample
OYX]h Z]fYkU` ZUa]`m]bYh]
i gYf 4G\]fUn, g\ck
Z]`hYf gUad` Y! dYYf! hfUZZ]Wo
    hYfa dYYf! VtbbYVh]cbg o
        Zfca o
            gci fW! UXXfYgg o
                %$"%$"$ $" $#0%/
                    %t&"' $" ()" $#&(/
```

% & "%, "% (" \$#&\$ /

q

q

h\Yb o

gUad` Y/

UWVdh/

q

q

q

Gng` c[

`c[

OYX] h Z] fYkU` ZUa]` m] bYh]

i gYf 4G\] fUn. g\ck

Z]` hYf `c[! hVd! Z` ck! ghUf h o

hYfa Vti bh! gntb o

Zfca o

dfchcVt` hVd/

hVd! ]b]h] U /

q

h\Yb o

gng` c[ /

UWVdh/

q

q

q

## 9.2.3 Applying Firewall Filters

### firewall filters to interface

OYX] h ] bhYf ZUWg ZY! \$\$\$#\$]

i gYf 4G\] fUn. g\ck

XYgW] dh] cb ``7cbbYVh] cb hc 5G \*) \$\$\$` /

i b]h \$ o

ZUa]` m] bYh o

Z]` hYf o

] bdi h 5G\*) \$\$\$! ] bVci bX! Z]` hYf /

ci hdi h 5G\*) \$\$\$! ci hVci bX! Z]` hYf /

q

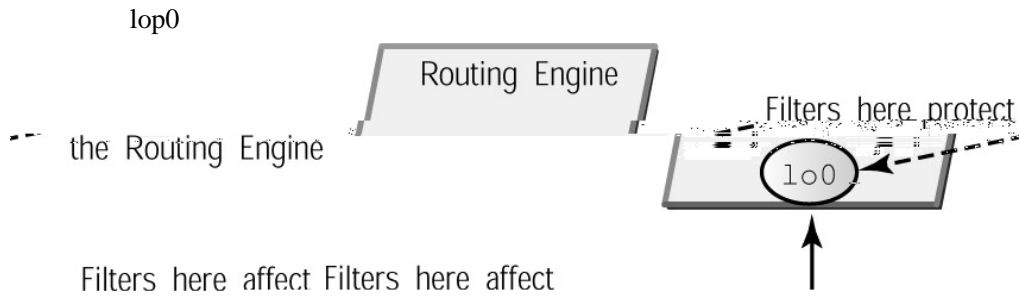
UXXfYgg %\$ "%\$ "%\$ "%#&(/

q

RSR04/08E

q

### 9.3 Protecting the Routing Engine



9-1

```

YX] h ] bhYfZUWg `c$]
i gYf4G\]fUn. g\ck
i b]h $ o
  ZUa]\`m]bYh o
  Z]\`hYf o
    ] bdi h dfchYVW! fci h] b[! Yb[] bY/
  q
  UXXfYgg % &"%*, "%%# ' &/
  
```

q  
q

### 9.4 Rate Limits

bandwidth-limit burst-size-limit,

dc` ]Wf dc` ]Wf! % o  
]Z! Yl WYX]b[ o  
VUbXk]Xh\!` ]a]h (\$\$/ #t #  
Vi fgh! g]nY!` ]a]h %\$/ #t #  
q  
h\Yb X]gWfX/ #t # )\$\$\_ #t #  
q  
hYfa Zhd o  
Zfca o  
gci fW! UXXfYgg o  
%\$" &"' #&(/  
q  
dfchcVt` hWd/  
XYgh]bUh]cb! dcfh QZhd Zhd! XUhU] /  
q  
h\Yb o  
dc` ]Wf dc` ]Wf! %/ #t # :HD #t #  
UWVdh/  
q  
q  
hYfa UWVdh! U` o  
h\Yb UWVdh/  
q  
q

interface  
OYX]h Z]fYkU` ]  
i gYf 4G\]fUh\_ g\ck  
dc` ]Wf dc` ]W! U` ! hfUZZ]Wo  
]Z! Yl WYX]b[ o  
VUbXk]Xh\!` ]a]h %\$a/  
Vi fgh! g]nY!` ]a]h %\$/  
q  
h\Yb o  
X]gWfX/  
q  
q  
OYX]h ]bhYfZUWg ZY! \$##\$]  
i gYf 4G\]fUh\_ g\ck  
XYgW]dh]cb "7cbbYW]cb hc 7i ghcaYf! 5"/  
i b]h \$ o  
ZUa]`m]bYh o  
dc` ]Wf o  
]bdi h dc` ]W! U` ! hfUZZ]W



& fl& dUW\_Yhgk

### 9.5.3 show interfaces filters

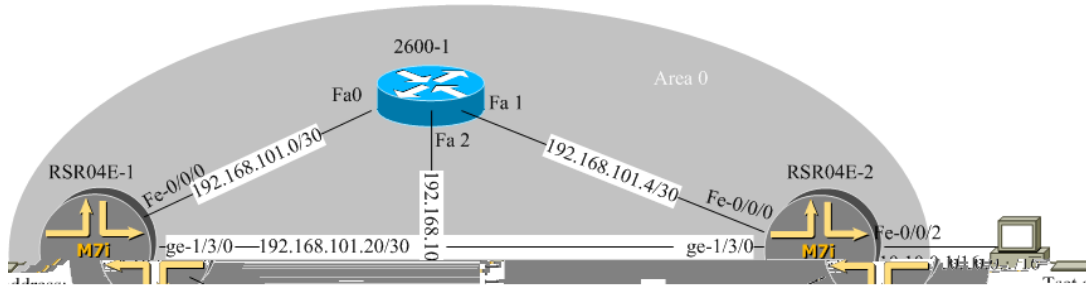
```
i gYf 4G\] fUn2 g\ck ]bhYfZUWg Z]\`hYfg
=bhYfZUW 5Xa]b @]b_ Dfchc =bdi h :]`hYf Ci hdi h :]`hYf
ZY! $$$$ i d i d
ZY! $$$"$ $ i d i d ]bYh Z]\`hYf! %
Z]\`hYf! &
ZY! $$$% i d i d
ZY! $$$%" $ i d i d ]bYh Z]\`hYf!'
Z]\`hYf! (
ZY! $$$& i d Xckb
ZY! $$$' i d Xckb
```

```
i gYf 4G\] fUn2 g\ck ]bhYfZUWg dc`]Wf g
=bhYfZUW 5Xa]b @]b_ Dfchc =bdi h Dc`]Wf Ci hdi h Dc`]Wf
ZY! $$$$ i d i d
ZY! $$$"$ $ i d i d ]bYh ZY! $$$"$ $!] b! dc`]Wf
ZY! $$$"$ $!] ci h! dc`]Wf
ZY! $$$% i d i d
ZY! $$$%" $ i d i d ]bYh ZY! $$$%" $!] b! dc`]Wf
ZY! $$$%" $!] ci h! dc`]Wf
```

```
ZY! $$$& i d Xckb
ZY! $$$' i d Xckb
```

```
i gYf 4G\] fUn2 g\ck dc`]Wf
Dc`]Wf. gc! &&&" $!] b! dc`]Wf
gc! &&&" $!] b! dc`]Wf
$ dUW_Yhg
Dc`]Wf. gc! &&&" $!] ci h! dc`]Wf
gc! &&&" $!] ci h! dc`]Wf
& , dUW_Yhg
```

### 9.6 Configuring Filter-Based Forwarding



9-2

```

FGF$(9! &
%
% " % % % FGF$(9! &
&
% " % % % FGF$(9! &
,
% & " % , "%$% &$
FGF$(
% fci h] b[! ] bghUbWg
fci h] b[! ] bghUbWg o
fci hY! gci fW! Z] ` hYf% o #! ! ! ! ! ! #
] bghUbW! hndY ZcfkUfX] b[ / #! ! ! ! ! ! #
fci h] b[! cdh] cbg o
ghUh] Wo
fci hY "$ "$ "$ "$#$ bYl h! \cd % & " % , "%$% - /
q
q
q
fci hY! gci fW! Z] ` hYf & o #! ! ! ! ! ! #
] bghUbW! hndY ZcfkUfX] b[ / #! ! ! ! ! ! #
fci h] b[! cdh] cbg o
ghUh] Wo
fci hY "$ "$ "$ "$#$ bYl h! \cd % & " % , "%$% ) /
q
q
q
q
fci h] b[! cdh] cbg o
    
```

]bhYfZUW! fci hYg o  
f]V! [fci d ]bYh gci fW! Z]`hyf/  
q  
f]V! [fci dg o  
gci fW! Z]`hyf o  
]adcfh! f]V O fci hY! gci fW! Z]`hyf%]bYh" \$  
fci hY! gci fW! Z]`hyf&"]bYh" \$ ]bYh" \$ ]/  
q  
q  
q  
&ž  
Z]fYkU` o  
ZUa]`m]bYh o  
Z]`hyf WUgg]Zn!gci fW o  
hYfa ]gd% o  
Zfca o  
gci fW! UXXfYgg o  
%\$" %\$" \$" &# &/  
q  
q  
h\Yb fci h]b[!] bghUbW fci hY! gci fW! Z]`hyf%/  
q  
hYfa ]gd& o  
Zfca o  
gci fW! UXXfYgg o  
%\$" %\$" \$"' #' &/  
q  
q  
h\Yb fci h]b[!] bghUbW fci hY! gci fW! Z]`hyf&/  
q  
hYfa XYZUi`h o  
h\Yb UWVdh/  
q  
q  
q  
q  
(  
]bhYfZUWg o  
ZY! \$#\$#& o  
i b]h \$ o  
XYgW] dh] cb hc! ' )) \$! ZUS#(, /  
ZUa]`m]bYh o  
Z]`hyf o  
] bdi h WUgg]Zn!gci fW/

q  
UXXfYgg %\$"%\$"\$%#%/%  
q  
q  
q  
q  
) hfUWfci hY  
)"% %\$"%\$"\$& hfUWfci hY  
F;!G))\$.hfUWfci hY %' "%'%%%  
% %&ag %ag %ag %\$"%\$"\$%  
& %ag (ag %ag %&"%\*, "%\$%!  
' %ag &ag %ag %' "%'%%%  
HFUW Vtad` YhY gi VWYggZi `` m'  
)"& %\$"%\$"\$' hfUWfci hY  
F;!G))\$.hfUWfci hY %' "%'%%%  
% &- ag %ag %ag %\$"%\$"\$%  
& %ag %ag %ag %&"%\*, "%\$%!  
' &ag %ag (ag %' "%'%%%  
HFUW Vtad` YhY gi VWYggZi `` m'  
)"' %\$"%\$"\$' hfUWfci hY  
F;!G))\$.hfUWfci hY %' "%'%%%  
% ' ag %ag %ag %\$"%\$"\$%  
& %ag %ag ' ag %' "%'%%%  
HFUW Vtad` YhY gi VWYggZi `` m'

FGF\$(9! &  
UXa]b4FGF\$(9! & g\ck  
j Yfg]cb +"' 6%/%  
gnqghYa o  
 \cgh! bUaY FGF\$(9! &/  
fcch! Ui h\Ybh] WWh]cb o  
 YbWVmlhYX! dUggkcfX ``~%(`GGf' fE`Xk\_5K8g8\*<Nbg[X<+`"Nj %/ ..  
G97F9H! 85H5  
q  
`c[]b o  
 i gYf UXa]b o  
 i ]X &\$\$(/  
WUgg gi dYf! i gYf/



q  
[Y! %# # \$ o  
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