show ip ospf

To display general information about Open Shortest Path First (OSPF) routing processes, use the **show ip ospf** command in EXEC mode.

show ip ospf [*process-id*]

Syntax Description

process-id	(Optional) Process ID. If this argument is included, only information for the specified routing process is included.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(4)T	This command was modified to show packet pacing timers in the displayed output.
12.2(15)T	This command was modified to show additional information if the OSPF Forwarding Address Suppression in Type-5 LSAs feature is configured.

Examples

The following is sample output from the **show ip ospf** command when entered without a specific OSPF process ID:

```
Router# show ip ospf

  Routing Process "ospf 201" with ID 10.0.0.1 and Domain ID 10.20.0.1
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  LSA group pacing timer 100 secs
  Interface flood pacing timer 55 msecs
  Retransmission pacing timer 100 msecs
  Number of external LSA 0. Checksum Sum 0x0
  Number of opaque AS LSA 0. Checksum Sum 0x0
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  External flood list length 0
     Area BACKBONE(0)
         Number of interfaces in this area is 2
         Area has message digest authentication
         SPF algorithm executed 4 times
         Area ranges are
         Number of LSA 4. Checksum Sum 0x29BEB
         Number of opaque link LSA 0. Checksum Sum 0x0
         Number of DCbitless LSA 3
         Number of indication LSA 0
         Number of DoNotAge LSA 0
         Flood list length 0
     Area 172.16.26.0
         Number of interfaces in this area is 0
```

```
Area has no authentication
SPF algorithm executed 1 times
Area ranges are
   192.168.0.0/16 Passive Advertise
Number of LSA 1. Checksum Sum 0x44FD
Number of opaque link LSA 0. Checksum Sum 0x0
Number of DCbitless LSA 1
Number of indication LSA 1
Number of DoNotAge LSA 0
Flood list length 0
```

Table 52 describes the significant fields shown in the display.

Table 54 show ip ospf Field Descriptions

Field	Description
Routing process “ospf 201” with ID 10.0.0.1	Process ID and OSPF router ID.
Supports...	Number of types of service supported (Type 0 only).
SPF schedule delay	Delay time of SPF calculations.
Minimum LSA interval	Minimum interval between link-state advertisements.
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of...	Number and type of link-state advertisements that have been received.
Number of external LSA	Number of external link-state advertisements.
Number of opaque AS LSA	Number of opaque link-state advertisements.
Number of DCbitless external and opaque AS LSA	Number of demand circuit external and opaque link-state advertisements.
Number of DoNotAge external and opaque AS LSA	Number of do not age external and opaque link-state advertisements.
Number of areas in this router is	Number of areas configured for the router.
External flood list length	External flood list length.

The following is an excerpt of output from the **show ip ospf** command when the OSPF Forwarding Address Suppression in Type-5 LSAs feature is configured:

```
Router# show ip ospf

.
.
.
Area 2
   Number of interfaces in this area is 4
   It is a NSSA area
   Perform type-7/type-5 LSA translation, suppress forwarding address
.
.
.
Routing Process "ospf 1" with ID 192.168.0.1
 Supports only single TOS(TOS0) routes
```

```
Supports opaque LSA
Supports Link-local Signaling (LLS)
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Incremental-SPF disabled
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Number of external LSA 0. Checksum Sum 0x0
Number of opaque AS LSA 0. Checksum Sum 0x0
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 0. 0 normal 0 stub 0 nssa
External flood list length 0
```

Table 53 describes the significant fields shown in the display.

Table 55 show ip ospf Field Descriptions

Field	Description
Area	OSPF area and tag.
Number of interfaces...	Number of interfaces configured in the area.
It is...	Possible types are internal, area border, or autonomous system boundary.
Routing process “ospf 1” with ID 192.168.0.1	Process ID and OSPF router ID.
Supports...	Number of types of service supported (Type 0 only).
Initial SPF schedule delay	Delay time of SPF calculations at startup.
Minimum hold time	Minimum hold time between consecutive SPF calculations.
Maximum wait time	Maximum wait time between consecutive SPF calculations.
Incremental-SPF	Status of incremental SPF calculations.
Minimum LSA...	Minimum time interval (in seconds) between link-state advertisements, and maximum arrival time (in milliseconds) of link-state advertisements,
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of...	Number and type of link-state advertisements that have been received.
Number of external LSA	Number of external link-state advertisements.
Number of opaque AS LSA	Number of opaque link-state advertisements.
Number of DCbitless external and opaque AS LSA	Number of demand circuit external and opaque link-state advertisements.

Table 55 show ip ospf Field Descriptions (continued)

Field	Description
Number of DoNotAge external and opaque AS LSA	Number of do not age external and opaque link-state advertisements.
Number of areas in this router is	Number of areas configured for the router listed by type.
External flood list length	External flood list length.

show ip ospf border-routers

To display the internal OSPF routing table entries to an Area Border Router (ABR) and Autonomous System Boundary Router (ASBR), use the **show ip ospf border-routers** command in privileged EXEC mode.

show ip ospf border-routers

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip ospf border-routers** command:

```
Router# show ip ospf border-routers

OSPF Process 109 internal Routing Table

Codes:  i - Intra-area route, I - Inter-area route

i 192.168.97.53   [10] via 172.16.1.53,   Serial0, ABR,  Area 0.0.0.3, SPF 3
i 192.168.103.51  [10] via 192.168.96.51, Serial0, ABR,  Area 0.0.0.3, SPF 3
I 192.168.103.52  [22] via 192.168.96.51, Serial0, ASBR, Area 0.0.0.3, SPF 3
I 192.168.103.52  [22] via 172.16.1.53,   Serial0, ASBR, Area 0.0.0.3, SPF 3
```

Table 54 describes the significant fields shown in the display.

Table 56 show ip ospf border-routers Field Descriptions

Field	Description
192.168.97.53	Router ID of the destination.
[10]	Cost of using this route.
via 172.16.1.53	Next hop toward the destination.
Serial0	Interface type for the outgoing interface.
ABR	The router type of the destination; it is either an ABR or ASBR or both.
Area	The area ID of the area from which this route is learned.
SPF 3	The internal number of the shortest path first (SPF) calculation that installs this route.

show ip ospf database

To display lists of information related to the OSPF database for a specific router, use the **show ip ospf database** command in EXEC mode. The various forms of this command deliver information about different OSPF link-state advertisements (LSAs).

show ip ospf [*process-id* [*area-id*]] **database**

show ip ospf [*process-id* [*area-id*]] **database** [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**asbr-summary**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**asbr-summary**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**asbr-summary**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**database-summary**]

show ip ospf [*process-id* [*area-id*]] **database** [**external**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**external**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**external**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**network**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**network**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**network**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**nssa-external**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**nssa-external**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**nssa-external**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-area**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-area**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-area**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-as**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-as**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-as**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-link**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**opaque-link**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id [area-id*]] **database** [**opaque-link**] [*link-state-id*] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**router**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**router**] [**adv-router** [*ip-address*]]

show ip ospf [*process-id [area-id*]] **database** [**router**] [**self-originate**] [*link-state-id*]

show ip ospf [*process-id* [*area-id*]] **database** [**self-originate**] [*link-state-id*]

show ip ospf [*process-id [area-id*]] **database** [**summary**] [*link-state-id*]

show ip ospf [*process-id [area-id*]] **database** [**summary**] [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id* [*area-id*]] **database** [**summary**] [*link-state-id*] [**self-originate**] [*link-state-id*]

Syntax Description

process-id	(Optional) Internal identification. It is locally assigned and can be any positive integer. The number used here is the number assigned administratively when enabling the OSPF routing process.
area-id	(Optional) Area number associated with the OSPF address range defined in the **network** router configuration command used to define the particular area.
adv-router [*ip-address*]	(Optional) Displays all the link-state advertisements (LSAs) of the specified router. If no IP address is included, the information is about the local router itself (in this case, the same as the **self-originate keyword**).
asbr-summary	(Optional) Displays information only about the Autonomous System Boundary Router (ASBR) summary LSAs.
link-state-id	(Optional) Portion of the Internet environment that is being described by the advertisement. The value entered depends on the type of the LSA. The value must be entered in the form of an IP address. When the LSA is describing a network, the *link-state-id* argument can take one of two forms: • The network IP address (as in Type 3 summary link advertisements and in autonomous system external link advertisements). • A derived address obtained from the link-state ID. (Note that masking a network will link the advertisement link-state ID with the network subnet mask yielding the network IP address.) When the LSA is describing a router, the link-state ID is always the OSPF router ID of the described router. When an autonomous system external advertisement (Type 5) is describing a default route, its link-state ID is set to the default destination (0.0.0.0).
database-summary	(Optional) Displays how many of each type of LSA for each area there are in the database, and the total.
external	(Optional) Displays information only about the external LSAs.
network	(Optional) Displays information only about the network LSAs.
nssa-external	(Optional) Displays information only about the not so stubby area (NSSA) external LSAs.
opaque-area	(Optional) Displays information about the opaque Type 10 LSAs. Type 10 denotes an area-local scope. Refer to RFC 2370 for more information on the opaque LSA options.
opaque-as	(Optional) Displays information about the opaque Type 11 LSAs. Type 11 denotes that the LSA is flooded throughout the autonomous system.
opaque-link	(Optional) Displays information about the opaque Type 9 LSAs. Type 9 denotes a link-local scope.
router	(Optional) Displays information only about the router LSAs.
self-originate	(Optional) Displays only self-originated LSAs (from the local router).
summary	(Optional) Displays information only about the summary LSAs.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
11.0	The **database-summary** keyword was added.
12.0	The following keywords were added: • **self-originate** • **adv-router**
12.1	The following keywords were added: • **opaque-area** • **opaque-as** • **opaque-link**

Examples

The following is sample output from the **show ip ospf database** command when no arguments or keywords are used:

```
Router# show ip ospf database

OSPF Router with ID(192.168.1.11) (Process ID 1)

                Router Link States(Area 0)

 Link ID           ADV Router        Age         Seq#       Checksum Link count
 192.168.1.8       192.168.1.8       1381      0x8000010D    0xEF60   2
 192.168.1.11      192.168.1.11      1460      0x800002FE    0xEB3D   4
 192.168.1.12      192.168.1.12      2027      0x80000090    0x875D   3
 192.168.1.27      192.168.1.27      1323      0x800001D6    0x12CC   3

                Net Link States(Area 0)

 Link ID          ADV Router        Age         Seq#       Checksum
 172.16.1.27      192.168.1.27      1323      0x8000005B    0xA8EE
 172.17.1.11      192.168.1.11      1461      0x8000005B    0x7AC

                Type-10 Opaque Link Area Link States (Area 0)

  Link ID         ADV Router        Age         Seq#       Checksum Opaque ID
 10.0.0.0         192.168.1.11      1461      0x800002C8    0x8483     0
 10.0.0.0         192.168.1.12      2027      0x80000080    0xF858     0
 10.0.0.0         192.168.1.27      1323      0x800001BC    0x919B     0
 10.0.0.1         192.168.1.11      1461      0x8000005E    0x5B43     1
```

Table 55 describes the significant fields shown in the display.

Table 57 show ip ospf database Field Descriptions

Field	Description
Link ID	Router ID number.
ADV Router	Advertising router ID.
Age	Link-state age.
Seq#	Link-state sequence number (detects old or duplicate LSAs).
Checksum	Fletcher checksum of the complete contents of the LSA.

Table 57 show ip ospf database Field Descriptions (continued)

Field	Description
Link count	Number of interfaces detected for router.
Opaque ID	Opaque LSA ID number.

The following is sample output from the **show ip ospf database** command with the **asbr-summary** keyword:

```
Router# show ip ospf database asbr-summary

OSPF Router with id(192.168.239.66) (Process ID 300)

                Displaying Summary ASB Link States(Area 0.0.0.0)

LS age: 1463
Options: (No TOS-capability)
LS Type: Summary Links(AS Boundary Router)
Link State ID: 172.16.245.1 (AS Boundary Router address)
Advertising Router: 172.16.241.5
LS Seq Number: 80000072
Checksum: 0x3548
Length: 28
Network Mask: 0.0.0.0 TOS: 0  Metric: 1
```

Table 56 describes the significant fields shown in the display.

Table 58 show ip ospf database asbr-summary Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (ASBR).
Advertising Router	Advertising router ID.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the LSA.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link-state metric.

The following is sample output from the **show ip ospf database** command with the **external** keyword:

```
Router# show ip ospf database external

OSPF Router with id(192.168.239.66) (Autonomous system 300)

                Displaying AS External Link States

LS age: 280
Options: (No TOS-capability)
LS Type: AS External Link
Link State ID: 143.105.0.0 (External Network Number)
Advertising Router: 10.187.70.6
LS Seq Number: 80000AFD
Checksum: 0xC3A
Length: 36
Network Mask: 255.255.0.0
     Metric Type: 2 (Larger than any link state path)
     TOS: 0
     Metric: 1
     Forward Address: 0.0.0.0
     External Route Tag: 0
```

Table 57 describes the significant fields shown in the display.

Table 59 show ip ospf database external Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Autonomous system	OSPF autonomous system number (OSPF process ID).
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (external network number)**.**
Advertising Router	Advertising router ID.
LS Seq Number	Link-state sequence number (detects old or duplicate LSAs).
Checksum	Checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the LSA.
Network Mask	Network mask implemented.
Metric Type	External type.
TOS	Type of service.
Metric	Link-state metric.
Forward Address	Forwarding address. Data traffic for the advertised destination will be forwarded to this address. If the forwarding address is set to 0.0.0.0, data traffic will be forwarded to the originator of the advertisement.
External Route Tag	External route tag, a 32-bit field attached to each external route. This is not used by the OSPF protocol itself.

The following is sample output from the **show ip ospf database** command with the **network** keyword:

```
Router# show ip ospf database network

 OSPF Router with id(192.168.239.66) (Process ID 300)

                Displaying Net Link States(Area 0.0.0.0)

LS age: 1367
Options: (No TOS-capability)
LS Type: Network Links
Link State ID: 10.187.1.3 (address of Designated Router)
Advertising Router: 192.168.239.66
LS Seq Number: 800000E7
Checksum: 0x1229
Length: 52
Network Mask: 255.255.255.0
        Attached Router: 192.168.239.66
        Attached Router: 10.187.241.5
        Attached Router: 10.187.1.1
        Attached Router: 10.187.54.5
        Attached Router: 10.187.1.5
```

Table 58 describes the significant fields shown in the display.

Table 60 show ip ospf database network Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID 300	OSPF process ID.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID of designated router.
Advertising Router	Advertising router ID.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the link-state advertisement.
Network Mask	Network mask implemented.
AS Boundary Router	Definition of router type.
Attached Router	List of routers attached to the network, by IP address.

The following is sample output, carrying Multiprotocol Label Switching (MPLS) traffic engineering specification information, from the **show ip ospf database** command with the **opaque-area** keyword:

```
Router# show ip ospf database opaque-area adv-router 192.168.1.12

OSPF Router with id(192.168.1.11) (Process ID 1)

                Type-10 Opaque Link Area Link States (Area 0)

LS age: 224
   Options: (No TOS-capability, DC)
```

```
LS Type: Opaque Area Link
Link State ID: 10.0.0.0
Opaque Type: 1
Opaque ID: 0
Advertising Router: 192.168.1.12
LS Seq Number: 80000081
Checksum: 0xF659
Length: 132
Fragment number : 0

  MPLS TE router ID : 192.168.1.12

  Link connected to Point-to-Point network
    Link ID : 192.168.1.11
    Interface Address : 172.16.1.12
    Neighbor Address : 172.16.1.11
    Admin Metric : 10
    Maximum bandwidth : 193000
    Maximum reservable bandwidth : 125000
    Number of Priority : 8
    Priority 0 : 125000      Priority 1 : 125000
    Priority 2 : 125000      Priority 3 : 125000
    Priority 4 : 125000      Priority 5 : 125000
    Priority 6 : 125000      Priority 7 : 100000
    Affinity Bit : 0x0

  Number of Links : 1
```

Table 59 describes the significant fields shown in the display.

Table 61 show ip ospf database opaque-area Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID.
Opaque Type	Opaque link-state type.
Opaque ID	Opaque ID number.
Advertising Router	Advertising router ID.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the LSA.
Fragment number	Arbitrary value used to maintain multiple traffic engineering LSAs.
Link ID	Link ID number.
Interface Address	ID address of the interface.
Neighbor Address	IP address of the neighbor.
Admin Metric	Administrative distance metric value used by Multiprotocol Label Switching traffic engineering (MPLS-TE).

Table 61 show ip ospf database opaque-area Field Descriptions (continued)

Field	Description
Maximum bandwidth	Specifies maximum bandwidth.
Maximum reservable bandwidth	Specifies maximum reservable bandwidth.
Number of Priority	Priority number.
Affinity Bit	Used by MPLS-TE.

The following is sample output from the **show ip ospf database** command with the **router** keyword:

```
Router# show ip ospf database router

OSPF Router with id(192.168.239.66) (Process ID 300)


                Displaying Router Link States(Area 0.0.0.0)

LS age: 1176
Options: (No TOS-capability)
LS Type: Router Links
Link State ID: 10.187.21.6
Advertising Router: 10.187.21.6
LS Seq Number: 80002CF6
Checksum: 0x73B7
Length: 120
AS Boundary Router
155   Number of Links: 8

Link connected to: another Router (point-to-point)
(link ID) Neighboring Router ID: 10.187.21.5
(Link Data) Router Interface address: 10.187.21.6
Number of TOS metrics: 0
TOS 0 Metrics: 2
```

Table 60 describes the significant fields shown in the display.

Table 62 show ip ospf database router Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID.
Advertising Router	Advertising router ID.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the LSA.
AS Boundary Router	Definition of router type.

Table 62 show ip ospf database router Field Descriptions (continued)

Field	Description
Number of Links	Number of active links.
link ID	Link type.
Link Data	Router interface address.
TOS	Type of service metric (Type 0 only).

The following is sample output from **show ip ospf database** command with the **summary** keyword:

```
Router# show ip ospf database summary

       OSPF Router with id(192.168.239.66) (Process ID 300)

                Displaying Summary Net Link States(Area 0.0.0.0)

LS age: 1401
Options: (No TOS-capability)
LS Type: Summary Links(Network)
Link State ID: 10.187.240.0 (summary Network Number)
Advertising Router: 10.187.241.5
LS Seq Number: 80000072
Checksum: 0x84FF
Length: 28
Network Mask: 255.255.255.0   TOS: 0  Metric: 1
```

Table 61 describes the significant fields shown in the display.

Table 63 show ip ospf database summary Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (summary network number).
Advertising Router	The ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the link-state advertisement.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link-state metric.

The following is sample output from **show ip ospf database** command with the **database-summary** keyword:

```
Router# show ip ospf database database-summary

          OSPF Router with ID (172.19.65.21) (Process ID 1)

Area ID     Router    Network    Sum-Net    Sum-ASBR    Subtotal    Delete    Maxage
202         1         0          0          0           1           0         0
AS External                                            0           0         0
Total       1         0          0          0           1
```

Table 62 describes the significant fields shown in the display.

Table 64 show ip ospf database database-summary Field Descriptions

Field	Description
Area ID	Area number.
Router	Number of router LSAs in that area.
Network	Number of network LSAs in that area.
Sum-Net	Number of summary LSAs in that area.
Sum-ASBR	Number of summary ASBR LSAs in that area.
Subtotal	Sum of Router, Network, Sum-Net, and Sum-ASBR for that area.
Delete	Number of LSAs that are marked “Deleted” in that area.
Maxage	Number of LSAs that are marked “Maxaged” in that area.
AS External	Number of external LSAs.

show ip ospf flood-list

To display a list of OSPF link-state advertisements (LSAs) waiting to be flooded over an interface, use the **show ip ospf flood-list** command in EXEC mode.

show ip ospf flood-list *interface-type interface-number*

Syntax Description

interface-type	Interface type over which the LSAs will be flooded.
interface-number	Interface number over which the LSAs will be flooded.

Command Modes

EXEC

Command History

Release	Modification
12.0(1)T	This command was introduced.

Usage Guidelines

Use this command to observe OSPF packet pacing.

Examples

The following is sample output of the **show ip ospf flood-list** command:

```
Router# show ip ospf flood-list ethernet 1

 Interface Ethernet1, Queue length 20
 Link state flooding due in 12 msec

 Type  LS ID            ADV RTR           Seq NO      Age    Checksum
    5  10.2.195.0       192.168.0.163     0x80000009  0      0xFB61
    5  10.1.192.0       192.168.0.163     0x80000009  0      0x2938
    5  10.2.194.0       192.168.0.163     0x80000009  0      0x757
    5  10.1.193.0       192.168.0.163     0x80000009  0      0x1E42
    5  10.2.193.0       192.168.0.163     0x80000009  0      0x124D
    5  10.1.194.0       192.168.0.163     0x80000009  0      0x134C
```

Table 63 describes the significant fields shown in the display.

Table 65 show ip ospf flood-list Field Descriptions

Field	Description
Interface Ethernet1	Interface for which information is displayed.
Queue length	Number of LSAs waiting to be flooded.
Link state flooding due in	Length of time before next link-state transmission.
Type	Type of LSA.
LS ID	Link-state ID of the LSA.
ADV RTR	IP address of advertising router.
Seq NO	Sequence number of LSA.

Table 65 show ip ospf flood-list Field Descriptions (continued)

Field	Description
Age	Age of LSA (in seconds).
Checksum	Checksum of LSA.

show ip ospf interface

To display OSPF-related interface information, use the **show ip ospf interface** command in EXEC mode.

show ip ospf interface [*interface-type interface-number*] [**brief**]

Syntax Description

interface-type	(Optional) Interface type.
interface-number	(Optional) Interface number.
brief	(Optional) Displays brief overview information for OSPF interfaces, states, addresses and masks, and areas on the router.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(25)S	The **brief** keyword was added.
12.2(15)S	The **brief** keyword was added.
12.2(15)T	The **brief** keyword was added.

Examples

The following is sample output of the **show ip ospf interface** command when Ethernet interface 0 is specified:

```
Router# show ip ospf interface ethernet 0

Ethernet 0 is up, line protocol is up
Internet Address 192.168.254.202, Mask 255.255.255.0, Area 0.0.0.0
AS 201, Router ID 192.168.99.1, Network Type BROADCAST, Cost: 10
Transmit Delay is 1 sec, State OTHER, Priority 1
Designated Router id 192.168.254.10, Interface address 192.168.254.10
Backup Designated router id 192.168.254.28, Interface addr 192.168.254.28
Timer intervals configured, Hello 10, Dead 60, Wait 40, Retransmit 5
Hello due in 0:00:05
Neighbor Count is 8, Adjacent neighbor count is 2
  Adjacent with neighbor 192.168.254.28  (Backup Designated Router)
  Adjacent with neighbor 192.168.254.10  (Designated Router)
```

Table 64 describes the significant fields shown in the display.

Table 66 show ip ospf interface Field Descriptions

Field	Description
Ethernet	Status of physical link and operational status of protocol.
Internet Address	Interface IP address, subnet mask, and area address.
AS	Autonomous system number (OSPF process ID), router ID, network type, link-state cost.

Table 66 show ip ospf interface Field Descriptions (continued)

Field	Description
Transmit Delay	Transmit delay, interface state, and router priority.
Designated Router	Designated router ID and respective interface IP address.
Backup Designated router	Backup designated router ID and respective interface IP address.
Timer intervals configured	Configuration of timer intervals.
Hello	Number of seconds until next hello packet is sent out this interface.
Neighbor Count	Count of network neighbors and list of adjacent neighbors.

show ip ospf neighbor

To display OSPF-neighbor information on a per-interface basis, use the **show ip ospf neighbor** command in EXEC mode.

show ip ospf neighbor [*interface-type interface-number*] [*neighbor-id*] [**detail**]

Syntax Description

interface-type	(Optional) Interface type.
interface-number	(Optional) Interface number.
neighbor-id	(Optional) Neighbor ID.
detail	(Optional) Displays all neighbors given in detail (lists all neighbors).

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip ospf neighbor** command showing a single line of summary information for each neighbor:

```
Router# show ip ospf neighbor

   ID           Pri   State         Dead Time     Address         Interface
10.199.199.137  1    FULL/DR        0:00:31    192.168.80.37      Ethernet0
172.16.48.1     1    FULL/DROTHER   0:00:33    172.16.48.1        Fddi0
172.16.48.200   1    FULL/DROTHER   0:00:33    172.16.48.200      Fddi0
10.199.199.137  5    FULL/DR        0:00:33    172.16.48.189      Fddi0
```

The following is sample output showing summary information about the neighbor that matches the neighbor ID:

```
Router# show ip ospf neighbor 10.199.199.137

Neighbor 10.199.199.137, interface address 192.168.80.37
    In the area 0.0.0.0 via interface Ethernet0
    Neighbor priority is 1, State is FULL
    Options 2
    Dead timer due in 0:00:32
    Link State retransmission due in 0:00:04
 Neighbor 10.199.199.137, interface address 172.16.48.189
    In the area 0.0.0.0 via interface Fddi0
    Neighbor priority is 5, State is FULL
    Options 2
    Dead timer due in 0:00:32
    Link State retransmission due in 0:00:03
```

If you specify the interface along with the neighbor ID, the system displays the neighbors that match the neighbor ID on the interface, as in the following sample display:

```
Router# show ip ospf neighbor ethernet 0 10.199.199.137

Neighbor 10.199.199.137, interface address 192.168.80.37
    In the area 0.0.0.0 via interface Ethernet0
    Neighbor priority is 1, State is FULL
    Options 2
    Dead timer due in 0:00:37
    Link State retransmission due in 0:00:04
```

You can also specify the interface without the neighbor ID to show all neighbors on the specified interface, as in the following sample display:

```
Router# show ip ospf neighbor fddi 0

   ID           Pri   State        Dead Time     Address         Interface
172.16.48.1      1    FULL/DROTHER  0:00:33    172.16.48.1       Fddi0
172.16.48.200    1    FULL/DROTHER  0:00:32    172.16.48.200     Fddi0
10.199.199.137   5    FULL/DR       0:00:32    172.16.48.189     Fddi0
```

The following is sample output from the **show ip ospf neighbor detail** command:

```
Router# show ip ospf neighbor detail

Neighbor 192.168.5.2, interface address 10.225.200.28
    In the area 0 via interface GigabitEthernet1/0/0
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 10.225.200.28 BDR is 10.225.200.30
    Options is 0x42
    LLS Options is 0x1 (LR), last OOB-Resync 00:03:08 ago
    Dead timer due in 00:00:36
    Neighbor is up for 00:09:46
   Index 1/1, retransmission queue length 0, number of retransmission 1
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

Table 65 describes the significant fields shown in the displays.

Table 67 show ip ospf neighbor detail Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
interface address	IP address of the interface.
In the area	Area and interface through which the OSPF neighbor is known.
Neighbor priority	Router priority of the neighbor, neighbor state.
State	OSPF state.
state changes	Number of state changes since the neighbor was created.This value can be reset using the **clear ip ospf counters neighbor** command.
DR is	Router ID of the designated router for the interface.
BDR is	Router ID of the backup designated router for the interface.
Options	Hello packet options field contents. (E-bit only. Possible values are 0 and 2; 2 indicates area is not a stub; 0 indicates area is a stub.)

Table 67 show ip ospf neighbor detail Field Descriptions (continued)

Field	Description
LLS Options..., last OOB-Resync	Link-Local Signalling and out-of-band (OOB) link-state database resynchronization performed hours:minutes:seconds ago (NSF information). The field indicates the last successful out-of-band resynchronization with the NSF-capable router.
Dead timer due in	Expected time before Cisco IOS software will declare the neighbor dead.
Neighbor is up for	Number of hours:minutes:seconds since the neighbor went into two-way state.
Index	Neighbor location in the area-wide and autonomous system-wide retransmission queue.
retransmission queue length	Number of elements in the retransmission queue.
number of retransmission	Number of times update packets have been re-sent during flooding.
First	Memory location of the flooding details.
Next	Memory location of the flooding details.
Last retransmission scan length	Number of link state advertisements (LSAs) in the last retransmission packet.
maximum	Maximum number of LSAs sent in any retransmission packet.
Last retransmission scan time	Time taken to build last retransmission packet.
maximum	Maximum time taken to build any retransmission packet.

show ip ospf request-list

To display a list of all link-state advertisements (LSAs) requested by a router, use the **show ip ospf request-list** command in EXEC mode.

show ip ospf request-list [*neighbor*] [*interface*] [*interface-neighbor*]

Syntax Description

neighbor	(Optional) Displays the list of all LSAs requested by the router from this neighbor.
interface	(Optional) Displays the list of all LSAs requested by the router from this interface.
interface-neighbor	(Optional) Displays the list of all LSAs requested by the router on this interface from this neighbor.

Command Modes

EXEC

Command History

Release	Modification
10.2	This command was introduced.

Usage Guidelines

The information displayed by the **show ip ospf request-list** command is useful in debugging OSPF routing operations.

Examples

The following is sample output from the **show ip ospf request-list** command:

```
Router# show ip ospf request-list serial 0

            OSPF Router with ID (192.168.1.11) (Process ID 1)

  Neighbor 192.168.1.12, interface Serial0 address 172.16.1.12

  Type  LS ID           ADV RTR         Seq NO      Age    Checksum
     1  192.168.1.12      192.168.1.12      0x8000020D  8      0x6572
```

show ip ospf retransmission-list

To display a list of all link-state advertisements (LSAs) waiting to be re-sent, use the **show ip ospf retransmission-list** command in EXEC mode.

show ip ospf retransmission-list [*neighbor*] [*interface*] [*interface-neighbor*]

Syntax Description

neighbor	(Optional) Displays the list of all LSAs waiting to be re-sent for this neighbor.
interface	(Optional) Displays the list of all LSAs waiting to be re-sent on this interface.
interface-neighbor	(Optional) Displays the list of all LSAs waiting to be re-sent on this interface, from this neighbor.

Command Modes

EXEC

Command History

Release	Modification
10.2	This command was introduced.

Usage Guidelines

The information displayed by the **show ip ospf retransmission-list** command is useful in debugging OSPF routing operations.

Examples

The following is sample output from the **show ip ospf retransmission-list** command:

```
Router# show ip ospf retransmission-list serial 0

            OSPF Router with ID (192.168.1.12) (Process ID 1)

  Neighbor 192.168.1.11, interface Serial0 address 172.16.1.11
  Link state retransmission due in 3764 msec, Queue length 2

  Type  LS ID            ADV RTR           Seq NO      Age    Checksum
     1  192.168.1.12      192.168.1.12      0x80000210  0      0xB196
```

show ip ospf sham-links

To display information about all sham-links configured for a provider edge (PE) router in the Virtual Private Network (VPN) backbone, use the **show ip ospf sham-links** command in EXEC mode.

show ip ospf sham-links

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.2(8)T	This command was introduced.

Usage Guidelines

Use this command to display Open Shortest Path First (OSPF) information about the sham-links configured on a PE router.

Examples

The following example shows sample output from the **show ip ospf sham-links** command for a PE router in the VPN backbone:

```
Router1# show ip ospf sham-links

Sham Link OSPF_SL0 to address 10.44.0.1 is up
 Area 120 source address 10.0.0.1
   Run as demand circuit
   DoNotAge LSA allowed., Cost of using 1
   Transmit Delay is 1 sec, State POINT_TO_POINT,
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     Hello due in 00:00:09
     Adjacency State FULL (Hello suppressed)
     Index 2/2, retransmission queue length 0, number of retransmission 27
     First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
     Last retransmission scan length is 0, maximum is 2
     Last retransmission scan time is 0 msec, maximum is 0 msec
```

show ip ospf summary-address

To display a list of all summary address redistribution information configured under an OSPF process, use the **show ip ospf summary-address** command in EXEC mode.

show ip ospf [*process-id*] **summary-address**

Syntax Description

process-id	(Optional) OSPF area ID.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The *process-id* argument can be entered as a decimal number or as an IP address format.

Examples

The following is sample output from the **show ip ospf summary-address** command:

```
Router# show ip ospf summary-address

OSPF Process 2, Summary-address

10.2.0.0/255.255.0.0 Metric -1, Type 0, Tag 0
10.2.0.0/255.255.0.0 Metric -1, Type 0, Tag 10
```

show ip ospf virtual-links

To display parameters and the current state of OSPF virtual links, use the **show ip ospf virtual-links** command in EXEC mode.

show ip ospf virtual-links

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The information displayed by the **show ip ospf virtual-links** command is useful in debugging OSPF routing operations.

Examples

The following is sample output from the **show ip ospf virtual-links** command:

```
Router# show ip ospf virtual-links

Virtual Link to router 192.168.101.2 is up
Transit area 0.0.0.1, via interface Ethernet0, Cost of using 10
Transmit Delay is 1 sec, State POINT_TO_POINT
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 0:00:08
Adjacency State FULL
```

Table 66 describes the significant fields shown in the display.

Table 68 show ip ospf virtual-links Field Descriptions

Field	Description
Virtual Link to router 192.168.101.2 is up	Specifies the OSPF neighbor, and if the link to that neighbor is up or down.
Transit area 0.0.0.1	The transit area through which the virtual link is formed.
via interface Ethernet0	The interface through which the virtual link is formed.
Cost of using 10	The cost of reaching the OSPF neighbor through the virtual link.
Transmit Delay is 1 sec	The transmit delay (in seconds) on the virtual link.
State POINT_TO_POINT	The state of the OSPF neighbor.
Timer intervals...	The various timer intervals configured for the link.
Hello due in 0:00:08	When the next hello is expected from the neighbor.
Adjacency State FULL	The adjacency state between the neighbors.

show ip policy

To display the route map used for policy routing, use the **show ip policy** command in EXEC mode.

show ip policy

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Examples

The following is sample output from the **show ip policy** command:

```
Router# show ip policy

Interface      Route map
local          equal
Ethernet0      equal
```

The following is sample output from the **show route-map** command, which relates to the preceding sample display:

```
Router# show route-map

route-map equal, permit, sequence 10
  Match clauses:
    length 150 200
  Set clauses:
    ip next-hop 10.10.11.254
  Policy routing matches: 0 packets, 0 bytes
route-map equal, permit, sequence 20
  Match clauses:
    ip address (access-lists): 101
  Set clauses:
    ip next-hop 10.10.11.14
  Policy routing matches: 144 packets, 15190 bytes
```

Table 67 describes the significant fields shown in the display.

Table 69 show ip policy Field Descriptions

Field	Description
route-map equal	The name of the route map is equal.
permit	The route map contains permit statements.
sequence	Sequence number of the route map, which determines in what order it is processed among other route maps.

Table 69 show ip policy Field Descriptions (continued)

Field	Description
Match clauses:	Clauses in the route map that must be matched to satisfy the permit or deny action.
Set clauses:	Set clauses that will be put into place if the match clauses are met.
Policy routing matches: packets	Number of packets that meet the match clauses.
bytes	Number of bytes in the packets that meet the match clauses.

Related Commands

Command	Description
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

show ip policy-list

To display information about a configured policy list and policy list entries, use the **show ip policy-list command in user** EXEC mode.

show ip policy-list *policy-list-name*

Syntax Description

policy-list-name	Displays information about the specified policy list with this argument.

Command Modes

EXEC

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.2(15)T	This command was integrated into 12.2(15)T.

Examples

The following is sample output from the **show ip policy-list** command. The output of this command will display the policy-list name and configured match clauses. The following sample output is similar to the output that will be displayed:

```
Router> show ip policy-list
policy-list POLICY-LIST-NAME-1 permit
  Match clauses:
    metric 20
policy-list POLICY-LIST-NAME-2 permit
  Match clauses:
    as-path (as-path filter): 1
```

Related Commands

Command	Description
show route-map	Displays configured route maps and information about referenced policy maps.

show ip prefix-list

To display information about a prefix list or prefix list entries, use the **show ip prefix-list** command user and privileged EXEC mode.

show ip prefix-list [**detail | summary**] *prefix-list-name* [*network/length*] [**seq** *sequence-number*] [**longer**] [**first-match**]

Syntax Description

detail | summary	(Optional) Displays detailed or summarized information about all prefix lists.
prefix-list-name	(Optional) The name of a specific prefix list.
network/length	(Optional) The network number and length (in bits) of the network mask.
seq	(Optional) Applies the sequence number to the prefix list entry.
sequence-number	(Optional) The sequence number of the prefix list entry.
longer	(Optional) Displays all entries of a prefix list that are more specific than the given *network/length.*
first-match	(Optional) Displays the entry of a prefix list that matches the given *network/length.*

Command Modes

EXEC

Command History

Release	Modification
12.0	This command was introduced.

Examples

The following example shows the output of the **show ip prefix-list** command with details about the prefix list named test in privileged EXEC mode:

```
Router# show ip prefix-list detail test

ip prefix-list test:
Description: test-list
 count: 1, range entries: 0, sequences: 10 - 10, refcount: 3
 seq 10 permit 35.0.0.0/8 (hit count: 0, refcount: 1)
```

Related Commands

Command	Description
clear ip prefix-list	Resets the hit count of the prefix list entries.
distribute-list in (BGP)	Filters networks received in updates.
distribute-list out (BGP)	Suppresses networks from being advertised in updates.
ip prefix-list	Creates an entry in a prefix list.
ip prefix-list description	Adds a text description of a prefix list.

Command	Description
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
neighbor prefix-list	Distributes BGP neighbor information as specified in a prefix list.

show ip protocols

To display the parameters and current state of the active routing protocol process, use the **show ip protocols** command in EXEC mode.

show ip protocols

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(15)T	Support for the route-hold timer was integrated into the output.

Usage Guidelines

The information displayed by the **show ip protocols** command is useful in debugging routing operations. Information in the Routing Information Sources field of the **show ip protocols** output can help you identify a router suspected of delivering bad routing information.

Examples

EIGRP Example

The following is sample output from the **show ip protocols** command that shows Enhanced Interior Gateway Routing Protocol (EIGRP) process information:

```
Router# show ip protocols

Routing Protocol is "eigrp 77"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: eigrp 77
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.81.28         90      0:02:36
    192.168.80.28         90      0:03:04
    192.168.80.31         90      0:03:04
  Distance: internal 90 external 170
```

Table 68 describes the significant fields shown in the display.

Table 70 show ip protocols Field Descriptions for EIGRP Process 77

Field	Description
Routing Protocol is “eigrp 77”	Name and autonomous system number of the currently running routing protocol.
Outgoing update filter list for all interfaces...	Indicates whether a filter for outgoing routing updates has been specified with the **distribute-list out** command.
Incoming update filter list for all interfaces...	Indicates whether a filter for incoming routing updates has been specified with the **distribute-list in** command.
Redistributing: eigrp 77	Indicates whether route redistribution has been enabled with the **redistribute** command.
Automatic network summarization...	Indicates whether route summarization has been enabled with the **auto-summary** command.
Routing for Networks:	Networks for which the routing process is currently injecting routes.
Routing Information Sources:	Lists all the routing sources that the Cisco IOS software is using to build its routing table. The following is displayed for each source: • IP address • Administrative distance • Time the last update was received from this source
Distance: internal 90 external 170	Internal and external distances of the router. Internal distance is the degree of preference given to EIGRP internal routes. External distance is the degree of preference given to EIGRP external routes.

IS-IS Example

The following is sample output from the **show ip protocols** command that shows Intermediate System-to-Intermediate System (IS-IS) processes:

```
Router# show ip protocols

Routing Protocol is "isis"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: isis
  Address Summarization:
    None
  Routing for Networks:
    Serial0
  Routing Information Sources:
  Distance: (default is 115)
```

Table 69 describes the significant fields shown in the display.

Table 71 show ip protocols Field Descriptions for an IS-IS Process

Field	Description
Routing Protocol is “isis”	Specifies the routing protocol used.
Sending updates every 0 seconds	Specifies the time between sending updates.

Table 71 show ip protocols Field Descriptions for an IS-IS Process

Field	Description
Invalid after 0 seconds	Specifies the value of the invalid parameter.
hold down 0	Specifies the current value of the hold-down parameter.
flushed after 0	Specifies the time (in seconds) after which the individual routing information will be thrown out (flushed).
Outgoing update ...	Specifies whether the outgoing filtering list has been set.
Incoming update ...	Specifies whether the incoming filtering list has been set.
Default networks	Specifies how these networks will be handled in both incoming and outgoing updates.
Redistributing	Lists the protocol that is being redistributed.
Routing	Specifies the networks for which the routing process is currently injecting routes.
Routing Information Sources	Lists all the routing sources the Cisco IOS software is using to build its routing table. For each source, you will see the following displayed: • IP address • Administrative distance • Time the last update was received from this source

RIP Example

The following is sample output from the **show ip protocols** command that shows Routing Information Protocol (RIP) processes:

```
Router# show ip protocols

Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 2 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface        Send  Recv   Key-chain
    Ethernet0        2     2      trees
    Fddi0            2     2
  Routing for Networks:
    172.19.0.0
    10.2.0.0
    10.3.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 120)
```

Table 70 describes the significant fields shown in the display.

Table 72 show ip protocols Field Descriptions for a RIP Process

Field	Description
Routing Protocol is “rip”	Specifies the routing protocol used.
Sending updates every 30 seconds	Specifies the time between sending updates.
next due in 2 seconds	Precisely when the next update is due to be sent.
Invalid after 180 seconds	Specifies the value of the invalid parameter.
hold down for 180	Specifies the current value of the hold-down parameter.
flushed after 240	Specifies the time (in seconds) after which the individual routing information will be thrown (flushed) out.
Outgoing update ...	Specifies whether the outgoing filtering list has been set.
Incoming update ...	Specifies whether the incoming filtering list has been set.
Default version control:	Specifies the version of RIP packets that are sent and received.
Redistributing	Lists the protocol that is being redistributed.
Routing	Specifies the networks for which the routing process is currently injecting routes.
Routing Information Sources	Lists all the routing sources the Cisco IOS software is using to build its routing table. For each source, you will see the following displayed: • IP address • Administrative distance • Time the last update was received from this source

EIGRP NSF Awareness Verification Example

The following is sample output from the **show ip protocols** command. The output shows that the router is running EIGRP, is NSF-aware, and that the route-hold timer is set 240 seconds, which is the default value for the route-hold timer.

```
Router# show ip protocols
Routing Protocol is "eigrp 101"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: eigrp 101
  EIGRP NSF-aware route hold timer is 240s
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    10.4.9.0/24
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: internal 90 external 170
```

Table 71 describes the significant fields shown in the display.

Table 73 show ip protocols Field Descriptions for IGRP Processes

Field	Description
Routing Protocol is “eigrp 101”	Specifies the routing protocol used.
Outgoing update ...	Specifies whether the outgoing filtering list has been set.
Incoming update ...	Specifies whether the incoming filtering list has been set.
Default networks...	Specifies how these networks will be handled in both incoming and outgoing updates.
EIGRP...	Specifies the value of the K0-K5 metrics, and the maximum hop count.
Redistributing	Lists the protocol that is being redistributed.
EIGRP NSF-Aware...	Displays the route-hold timer value.
Automatic network summarization...	Specifies that automatic summarization is enabled.
Routing	Specifies the networks for which the routing process is currently injecting routes.
Routing Information Sources	Lists all the routing sources the Cisco IOS software is using to build its routing table. For each source, you will see the following displayed: • IP address • Administrative distance • Time the last update was received from this source

show ip rip database

To display summary address entries in the Routing Information Protocol (RIP) routing database entries if relevant are routes being summarized based upon a summary address, use the **show ip rip database** command in EXEC mode.

show ip rip database [*ip-address* {*mask*}]

Syntax Description

ip-address	(Optional) Address about which routing information should be displayed.
mask	Argument for the subnet mask. The subnet mask must also be specified if the IP address argument is entered.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.0(6)T	This command was introduced.

Usage Guidelines

Summary address entries will appear in the database only if relevant child routes are being summarized. When the last child route for a summary address becomes invalid, the summary address is also removed from the routing table.

The RIP private database is populated only if triggered extensions to RIP are enabled with the **ip rip triggered** command.

Examples

The following output shows a summary address entry for route 10.11.0.0/16, with three child routes active:

```
Router# show ip rip database

 10.0.0.0/8    auto-summary
 10.11.11.0/24    directly connected, Ethernet2
 10.1.0.0/8    auto-summary
 10.11.0.0/16    int-summary
 ^^^^^^^^^^^^^^^^^^^^^^^^^^
 10.11.10.0/24    directly connected, Ethernet3
 10.11.11.0/24    directly connected, Ethernet4
 10.11.12.0/24    directly connected, Ethernet5
```

The following is sample output from the **show ip rip database** command with a prefix and mask:

```
Router# show ip rip database 172.19.86.0 255.255.255.0

172.19.86.0/24
    [1] via 172.19.67.38, 00:00:25, Serial0
    [2] via 172.19.70.36, 00:00:14, Serial1
```

Table 72 describes the fields in the displays.

Table 74 show ip rip database Field Descriptions

Field	Description
10.0.0.0/16 auto-summary	Summary address entry.
10.11.11.0/24 directly connected, Ethernet0	Directly connected entry for Ethernet 0.
172.19.65.0/24 [1] via 172.19.70.36, 00:00:17, Serial0 [2] via 172.19.67.38, 00:00:25, Serial1	The destination 172.19.65.0/24 is learned via RIP. There are two sources advertising it. One is 172.19.70.36 via Serial interface0, and it was updated 17 seconds ago. The other source is 172.19.67.38 via Serial interface 1, and it was updated 25 seconds ago.

Related Commands	Description
ip rip triggered	Enables triggered extensions of RIP.
ip summary-address rip	Configures a Cisco router running RIP Version 2 to advertise a summarized local IP address pool on a network access server so that the address pool can be provided to dialup clients, and specifies the IP address and network mask that identify the routes to be summarized.
show ip protocols	Displays the parameters and current state of the active routing protocol process.

show ip route

To display the current state of the routing table, use the **show ip route** command in EXEC mode.

show ip route [[*ip-address* [*mask*] [**longer-prefixes**]] | [*protocol* [*process-id*]]]

Syntax Description

ip-address	(Optional) Address about which routing information should be displayed.
mask	(Optional) Argument for a subnet mask.
longer-prefixes	(Optional) Specifies that only routes matching the *ip-address* and *mask* pair should be displayed.
protocol	(Optional) The name of a routing protocol, or the keyword **connected**, **static**, or **summary**. If you specify a routing protocol, use one of the following keywords: **bgp**, **egp**, **eigrp**, **hello**, **igrp**, **isis**, **ospf**, and **rip**.
process-id	(Optional) The number used to identify a process of the specified protocol.

Command Modes

EXEC

Command History

Release	Modification
9.2	This command was introduced.
10.0	The “D—EIGRP, EX—EIGRP, N1—OSPF NSSA external type 1 route” and “N2—OSPF NSSA external type 2 route” codes were added to the command output.
10.3	The *process-id* argument was added.
11.0	The **longer-prefixes** keyword was added.
11.1	The “U—per-user static route” code was added to the command output.
11.2	The “o—on-demand routing” code was added to the command output.
11.3	The output from the **show ip route** *ip-address* command was enhanced to display the origination of an IP route in Intermediate System-to-Intermediate System (IS-IS) networks.
12.0(1)T	The “M—mobile” code was added to the command output.
12.0(3)T	The “P—periodic downloaded static route” code was added to the command output.
12.0(4)T	The “ia—IS-IS” code was added to the command output.
12.2(2)T	The output from the **show ip route** *ip-address* command was enhanced to display information on the multipaths to the specified network.

Examples

The following is sample output from the **show ip route** command when entered without an address:

```
Router# show ip route

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is 10.119.254.240 to network 10.140.0.0

O E2 10.110.0.0 [160/5] via 10.119.254.6, 0:01:00, Ethernet2
E    10.67.10.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
O E2 10.68.132.0 [160/5] via 10.119.254.6, 0:00:59, Ethernet2
O E2 10.130.0.0 [160/5] via 10.119.254.6, 0:00:59, Ethernet2
E    10.128.0.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.129.0.0 [200/129] via 10.119.254.240, 0:02:22, Ethernet2
E    10.65.129.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.10.0.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.75.139.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    10.16.208.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.84.148.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    10.31.223.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.44.236.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    10.141.0.0 [200/129] via 10.119.254.240, 0:02:22, Ethernet2
E    10.140.0.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
```

The following is sample output that includes IS-IS Level 2 routes learned:

```
Router# show ip route

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is not set

     10.89.0.0 is subnetted (mask is 255.255.255.0), 3 subnets
C       10.89.64.0 255.255.255.0 is possibly down,
          routing via 0.0.0.0, Ethernet0
i L2    10.89.67.0 [115/20] via 10.89.64.240, 0:00:12, Ethernet0
i L2    10.89.66.0 [115/20] via 10.89.64.240, 0:00:12, Ethernet0
```

Table 73 describes the significant fields shown in the displays.

Table 75 show ip route Field Descriptions

Field	Description
O	Indicates the protocol that derived the route. It can be one of the following values: I—Interior Gateway Routing Protocol (IGRP) derived R—Routing Information Protocol (RIP) derived O—Open Shortest Path First (OSPF) derived C—connected S—static E—Exterior Gateway Protocol (EGP) derived B—Border Gateway Protocol (BGP) derived D—Enhanced Interior Gateway Routing Protocol (EIGRP) EX—EIGRP external i—IS-IS derived ia—IS-IS M—mobile P—periodic downloaded static route U—per-user static route o—on-demand routing
E2	Type of route. It can be one of the following values: *—Indicates the last path used when a packet was forwarded. It pertains only to the nonfast-switched packets. However, it does not indicate which path will be used next when forwarding a nonfast-switched packet, except when the paths are equal cost. IA—OSPF interarea route E1—OSPF external type 1 route E2—OSPF external type 2 route L1—IS-IS Level 1 route L2—IS-IS Level 2 route N1—OSPF not so stubby area (NSSA) external type 1 route N2—OSPF NSSA external type 2 route
172.150.0.0	Indicates the address of the remote network.
[160/5]	The first number in the brackets is the administrative distance of the information source; the second number is the metric for the route.
via 10.119.254.6	Specifies the address of the next router to the remote network.
0:01:00	Specifies the last time the route was updated (in hours:minutes:seconds).
Ethernet2	Specifies the interface through which the specified network can be reached.

When you specify that you want information about a specific network displayed, more detailed statistics are shown. The following is sample output from the **show ip route** command when entered with the address 10.0.0.1:

```
Router# show ip route 10.0.0.1

Routing entry for 10.0.0.1/32
    Known via "isis", distance 115, metric 20, type level-1
    Redistributing via isis
    Last update from 10.191.255.251 on Fddi1/0, 00:00:13 ago
    Routing Descriptor Blocks:
    * 10.22.22.2, from 10.191.255.247, via Serial2/3
       Route metric is 20, traffic share count is 1
       10.191.255.251, from 10.191.255.247, via Fddi1/0
       Route metric is 20, traffic share count is 1
```

When an IS-IS router advertises its link-state information, it includes one of its own IP addresses to be used as the originator IP address. When other routers calculate IP routes, they can store the originator IP address with each route in the routing table.

The following example shows the output from the **show ip route** command when looking at an IP route generated by IS-IS. Each path that is shown under the Routing Descriptor Blocks report displays two IP addresses. The first address (10.22.22.2) is the next hop address. The second is the originator IP address from the advertising IS-IS router. This address helps you determine where a particular IP route has originated in your network. In the example the route to 10.0.0.1/32 was originated by a router with IP address 10.191.255.247.

```
Router# show ip route 10.0.0.1

Routing entry for 10.0.0.1/32
    Known via "isis", distance 115, metric 20, type level-1
    Redistributing via isis
    Last update from 10.191.255.251 on Fddi1/0, 00:00:13 ago
    Routing Descriptor Blocks:
    * 10.22.22.2, from 10.191.255.247, via Serial2/3
       Route metric is 20, traffic share count is 1
       10.191.255.251, from 10.191.255.247, via Fddi1/0
       Route metric is 20, traffic share count is 1
```

Table 74 describes the significant fields shown when using the **show ip route** command with an IP address (previous displays).

Table 76 show ip route with Address Field Descriptions

Field	Description
Routing entry for[*ip-address* [*mask*]	Network number and mask.
Known via...	Indicates how the route was derived.
Tag	Integer that is used to implement the route.
type	Indicates the IS-IS route type (Level1 or Level2).
Redistributing via...	Indicates the redistribution protocol.
Last update from *ip-address*	Indicates the IP address of a router that is the next hop to the remote network and the router interface on which the last update arrived.
Routing Descriptor Blocks:	Displays the next hop IP address followed by the information source.

Table 76 show ip route with Address Field Descriptions (continued)

Field	Description
Route metric	This value is the best metric for this routing descriptor block.
traffic share count	Number of uses for this routing descriptor block.

The following is sample output using the **longer-prefixes** keyword. When the **longer-prefixes** keyword is included, the address and mask pair becomes the prefix, and any address that matches that prefix is displayed. Therefore, multiple addresses are displayed.

In the following example, the logical AND operation is performed on the source address 10.0.0.0 and the mask 10.0.0.0, resulting in 10.0.0.0. Each destination in the routing table is also logically ANDed with the mask and compared to that result of 10.0.0.0. Any destinations that fall into that range are displayed in the output.

```
Router# show ip route 10.0.0.0 10.0.0.0 longer-prefixes

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is not set

S    10.134.0.0 is directly connected, Ethernet0
S    10.10.0.0 is directly connected, Ethernet0
S    10.129.0.0 is directly connected, Ethernet0
S    10.128.0.0 is directly connected, Ethernet0
S    10.49.246.0 is directly connected, Ethernet0
S    10.160.97.0 is directly connected, Ethernet0
S    10.153.88.0 is directly connected, Ethernet0
S    10.76.141.0 is directly connected, Ethernet0
S    10.75.138.0 is directly connected, Ethernet0
S    10.44.237.0 is directly connected, Ethernet0
S    10.31.222.0 is directly connected, Ethernet0
S    10.16.209.0 is directly connected, Ethernet0
S    10.145.0.0 is directly connected, Ethernet0
S    10.141.0.0 is directly connected, Ethernet0
S    10.138.0.0 is directly connected, Ethernet0
S    10.128.0.0 is directly connected, Ethernet0
     10.19.0.0 255.255.255.0 is subnetted, 1 subnets
C       10.19.64.0 is directly connected, Ethernet0
     10.69.0.0 is variably subnetted, 2 subnets, 2 masks
C       10.69.232.32 255.255.255.240 is directly connected, Ethernet0
S       10.69.0.0 255.255.0.0 is directly connected, Ethernet0
```

Related Commands

Command	Description
show interfaces tunnel	Displays a list of tunnel interface information.
show ip route summary	Displays the current state of the routing table in summary format.

show ip route profile

To display routing table change statistics, use the **show ip route profile** command in EXEC mode.

show ip route profile

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
12.0	This command was introduced.

Usage Guidelines

Use this command in combination with the **ip route profile** global configuration command to validate the routing table change statistics.

Examples

The following example shows the frequency of routing table changes in a 5-second sampling interval. In this example, the Prefix add change occurred 22 times in one interval and 24 times in another interval. The output represents this with a Fwd-path change value of 2 and a Prefix add value of 2:

```
Router# show ip route profile
-----------------------------------------------------------------------
Change/     Fwd-path     Prefix     Nexthop     Pathcount     Prefix
interval    change        add        Change       Change         refresh
-----------------------------------------------------------------------
0            87            87          89           89             89
1            0             0           0            0              0
2            0             0           0            0              0
3            0             0           0            0              0
4            0             0           0            0              0
5            0             0           0            0              0
10           0             0           0            0              0
15           0             0           0            0              0
20           2             2           0            0              0
25           0             0           0            0              0
```

Table 75 describes the significant fields shown in the display.

Table 77 show ip route profile Field Descriptions

Field	Description
Change/interval	Represents the frequency buckets. A Change/interval of 20 represents the bucket that is incremented when a particular event occurs 20 times in a sampling interval. It is very common to see high counters for the Change/interval bucket for 0. This counter represents the number of sampling intervals in which there were no changes to the routing table. Route removals are not counted in the statistics, only route additions.
Fwd-path change	Number of changes in the forwarding path. This value represents the accumulation of Prefix add, Nexthop change, and Pathcount change.
Prefix add	A new prefix was added to the routing table.
Nexthop change	A prefix is not added or removed, but the next hop changes. This statistic is only seen with recursive routes that are installed in the routing table.
Pathcount change	The number of paths in the routing table has changed. This change is the result of an increase in the number of paths for an Interior Gateway Protocol (IGP).
Prefix refresh	Indicates standard routing table maintenance. The forwarding behavior was not changed.

Related Commands

Command	Description
ip route profile	Enables IP routing table statistics collection

show ip route summary

To display the current state of the routing table, use the **show ip route summary** command in EXEC mode.

show ip route summary

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip route summary** command:

```
Router# show ip route summary

Route Source    Networks    Subnets     Overhead    Memory (bytes)
connected       0           3           126         360
static          1           2           126         360
eigrp 109       747         12          31878       91080
internal        3                                   360
Total           751         17          32130       92160
```

Table 76 describes the significant fields shown in the display.

Table 78 show ip route summary Field Descriptions

Field	Description
Route Source	Routing protocol name, or the **connected, static,** or **internal** keyword. “Internal” indicates those routes that are in the routing table that are not owned by any routing protocol.
Networks	Number of prefixes that are present in the routing table for each route source.
Subnets	Number of subnets that are present in the routing table for each route source, including host routes.
Overhead	Any additional memory involved in allocating the routes for the particular route source other than the memory specified in the Memory field.
Memory	Number of bytes allocated to maintain all the routes for the particular route source.

Related Commands

Command	Description
show ip route	Displays the current state of the routing table.

show ip route supernets-only

To display information about supernets, use the **show ip route supernets-only** privileged command in EXEC mode.

show ip route supernets-only

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip route supernets-only** command. This display shows supernets only; it does not show subnets.

```
Router# show ip route supernets-only

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived
       C - connected, S - static, E - EGP derived, B - BGP derived
       i - IS-IS derived, D - EIGRP derived
       * - candidate default route, IA - OSPF inter area route
       E1 - OSPF external type 1 route, E2 - OSPF external type 2 route
       L1 - IS-IS level-1 route, L2 - IS-IS level-2 route
       EX - EIGRP external route

Gateway of last resort is not set

B    172.160.0.0 (mask is 255.255.0.0) [20/0] via 172.160.72.30, 0:00:50
B    192.0.0.0 (mask is 255.0.0.0) [20/0] via 172.160.72.24, 0:02:50
```

Table 77 describes the significant fields shown in the display.

Table 79 show ip route supernets-only Field Descriptions

Field	Description
B	Border Gateway Protocol (BGP) derived, as shown in list of codes.
172.160.0.0 (mask is 255.255.0.0)	Supernet IP address.
[20/0]	Administrative distance (external/internal).
via 172.160.72.30	Next hop IP address.
0:00:50	Age of the route (how long ago the update was received).

show isis database

To display the IS-IS link-state database, use the **show isis database** command in EXEC mode.

show isis *area-tag* **database** [**level-1**] [**level-2**] [**l1**] [**l2**] [**detail**] [**lspid**]

Syntax Description

area-tag	Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area. Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration.
level-1	(Optional) Displays the IS-IS link-state database for Level 1.
level-2	(Optional) Displays the IS-IS link-state database for Level 2.
l1	(Optional) Abbreviation for the **level-1** option.
l2	(Optional) Abbreviation for the **level-2** option.
detail	(Optional) When specified, the contents of each link-state packet (LSP) are displayed. Otherwise, a summary display is provided.
lspid	(Optional) Link-state protocol data unit (PDU) identifier. When specified, the contents of a single LSP are displayed by its ID number.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Each of the options for this command can be entered in an arbitrary string within the same command entry. For example, the following are both valid command specifications and provide the same output: **show isis database detail l2** and **show isis database l2 detail**.

Examples

The following is sample output from the **show isis database** command when it is issued with no keywords or arguments:

```
Router# show isis database

IS-IS Level-1 Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.00-00  0x0000000C   0x5696        792           0/0/0
0000.0C00.40AF.00-00* 0x00000009   0x8452        1077          1/0/0
0000.0C00.62E6.00-00  0x0000000A   0x38E7        383           0/0/0
0000.0C00.62E6.03-00  0x00000006   0x82BC        384           0/0/0
0800.2B16.24EA.00-00  0x00001D9F   0x8864        1188          1/0/0
0800.2B16.24EA.01-00  0x00001E36   0x0935        1198          1/0/0
```

```
IS-IS Level-2 Link State Database
LSPID                 LSP Seq Num    LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.03-00  0x00000005     0x04C8        792           0/0/0
0000.0C00.3E51.00-00  0x00000007     0xAF96        758           0/0/0
0000.0C00.40AF.00-00* 0x0000000A     0x3AA9        1077          0/0/0
```

Table 78 describes the significant fields shown in the display.

Table 80 show isis database Field Descriptions

Field	Description
LSPID	The LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is zero, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in Open Shortest Path First (OSPF). The LSP will describe the state of the originating router. For each LAN, the designated router for that LAN will create and flood a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP will be divided into multiple LSP fragments. Each fragment will have a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.
LSP Holdtime	Amount of time the LSP remains valid (in seconds). An LSP hold time of zero indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP will stay in the LSDB before being completely removed.
ATT	The Attach bit. This indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers will use the attach bit to find the closest Level 2 router. They will point a default route to the closest Level 2 router.
P	The P bit. Detects if the intermediate systems is area partition-repair capable. Cisco and other vendors do not support area partition repair.
OL	The Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers will not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router will be sent to this router.

The following is sample output from the **show isis database detail** command:

```
Router# show isis database detail

IS-IS Level-1 Link State Database
```

```
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.00-00  0x0000000C   0x5696        325           0/0/0
  Area Address: 47.0004.004D.0001
  Area Address: 39.0001
  Metric: 10   IS 0000.0C00.62E6.03
  Metric: 0    ES 0000.0C00.0C35
 --More--
0000.0C00.40AF.00-00* 0x00000009   0x8452        608           1/0/0
  Area Address: 47.0004.004D.0001
  Metric: 10   IS 0800.2B16.24EA.01
  Metric: 10   IS 0000.0C00.62E6.03
  Metric: 0    ES 0000.0C00.40AF

IS-IS Level-2 Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.0C35.03-00  0x00000005   0x04C8        317           0/0/0
  Metric: 0    IS 0000.0C00.0C35.00
 --More--
0000.0C00.3E51.00-00  0x00000009   0xAB98        1182          0/0/0
  Area Address: 39.0004
  Metric: 10   IS 0000.0C00.40AF.00
  Metric: 10   IS 0000.0C00.3E51.05
```

As the output shows, in addition to the information displayed with the **show isis database command**, the **show isis database detail** command displays the contents of each LSP.

Table 79 describes the significant fields shown in the display.

Table 81 show isis database detail Field Descriptions

Field	Description
Area Address:	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area to which this route belongs.
Metric:	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an end system [ES], or a CLNS prefix).

The following is additional sample output from the **show isis database detail** command.This is a Level 2 LSP. The area address 39.0001 is the address of the area in which the router resides.

```
Router# show isis database detail l2

IS-IS Level-2 Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.1111.00-00* 0x00000006   0x4DB3        1194          0/0/0
  Area Address: 39.0001
  NLPID:        0x81 0xCC
  IP Address:   172.16.64.17
  Metric: 10   IS 0000.0C00.1111.09
  Metric: 10   IS 0000.0C00.1111.08
  Metric: 10   IP 172.16.65.0 255.255.255.0
  Metric: 10   IP 172.16.64.0 255.255.255.0
  Metric: 0    IP-External 10.0.0.0 255.0.0.0
```

Table 80 describes the significant field shown in the display.

Table 82 show isis database detail Field Descriptions Displaying IP Addresses

Field	Description
Various addresses	The IP entries are the directly connected IP subnets the router is advertising (with associated metrics). The IP-External entry is a redistribute route.

show isis hostname

To display the router-name-to-system-ID mapping table entries for an Intermediate System-to-Intermediate System (IS-IS) router, use the **show isis hostname** command in privileged EXEC mode.

show isis hostname

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0	This command was introduced.
12.0S	This command was integrated into Cisco IOS Release 12.0(S).

Usage Guidelines

In the IS-IS routing domain, the system ID is used to represent each router. The system ID is part of the network entity title (NET) that is configured for each IS-IS router. For example, a router with a configured NET of 49.0001.0023.0003.000a.00 has a system ID of 0023.0003.000a. Router-name-to-system-ID mapping is difficult for network administrators to remember during maintenance and troubleshooting on the routers. Entering the **show isis hostname** command displays the entries in the router-name-to-system-ID mapping table.

If the dynamic hostname feature has not been disabled by entering the **no dynamic hostname** command, the mapping will consist of a dynamic host mapping table. However, if the **clns host** command has been entered to create a mapping between the router name and the system ID, this locally defined mapping will take precedence over the dynamicly learned one from the dynamic hostname feature.

Examples

The following example changes the hostname to RouterA and assigns the NET 49.0001.0000.0000.000b.00 to RouterA.

```
Router> enable
Router# configure terminal
Router(config)# hostname RouterA
RouterA(config)# router isis CompanyA
RouterA(config-router)# net 49.0001.0000.0000.000b.00
RouterA(config-router)# hostname dynamic
RouterA(config-router)# end
```

Entering the **show isis hostname** command displays the dynamic host mapping table. The dynamic host mapping table displays the router-name-to-system-ID mapping table entries for Router-b, Router-c and for the local router named Router-a. The command output shows that the local router is running the IS-IS process named CompanyA. The table also shows that the neighbor router Router-b is a Level-1 router,

and its hostname is advertised by the Level-1 (L1) link-state protocol (LSP). Router-b is a Level-2 router and its hostname is advertised by the L2 LSP. The * symbol that appears under Level for the local router Router-a signifies that this is the router-name-to-system-ID mapping information for the local router.

```
Router-a# show isis hostname

Level  System ID      Dynamic Hostname    (CompanyA)
   1   3333.3333.333b Router-b
   2   3131.3131.313b Router-c
   *   3232.3232.323b Router-a
```

Related Commands

Command	Description
clns host	Defines a name-to-NSAP mapping that can then be used with commands that require NSAPs.
hostname	Specifies or modifies the hostname for the network server.
hostname dynamic	Enables dynamic hostname capability.
net	Configures an IS-IS NET for a CLNS or IS-IS routing process.

show isis spf-log

To display how often and why the router has run a full shortest path first (SPF) calculation, use the **show isis spf-log** EXEC command in EXEC mode.

show isis *area-tag* **spf-log**

Syntax Description

area-tag	Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area. Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show isis spf-log** command:

```
Router# show isis spf-log

                Level 1 SPF log
  When   Duration  Nodes  Count     Last trigger LSP   Triggers
00:15:46    3124     40      1          milles.00-00  TLVCODE
00:15:24    3216     41      5          milles.00-00  TLVCODE NEWLSP
00:15:19    3096     41      1          deurze.00-00  TLVCODE
00:14:54    3004     41      2          milles.00-00  ATTACHFLAG LSPHEADER
00:14:49    3384     41      1          milles.00-01  TLVCODE
00:14:23    2932     41      3          milles.00-00  TLVCODE
00:05:18    3140     41      1                        PERIODIC
00:03:54    3144     41      1          milles.01-00  TLVCODE
00:03:49    2908     41      1          milles.01-00  TLVCODE
00:03:28    3148     41      3           bakel.00-00  TLVCODE TLVCONTENT
00:03:15    3054     41      1          milles.00-00  TLVCODE
00:02:53    2958     41      1          mortel.00-00  TLVCODE
00:02:48    3632     41      2          milles.00-00  NEWADJ TLVCODE
00:02:23    2988     41      1          milles.00-01  TLVCODE
00:02:18    3016     41      1          gemert.00-00  TLVCODE
00:02:14    2932     41      1           bakel.00-00  TLVCONTENT
00:02:09    2988     41      2           bakel.00-00  TLVCONTENT
00:01:54    3228     41      1          milles.00-00  TLVCODE
00:01:38    3120     41      3            rips.03-00  TLVCONTENT
```

Table 81 describes the significant fields shown in the display.

Table 83 show isis spf-log Field Descriptions

Field	Description
When	How long ago (in hours: minutes: seconds) a full SPF calculation occurred. The last 20 occurrences are logged.
Duration	Number of milliseconds required to complete this SPF run. Elapsed time is wall clock time, not CPU time.
Nodes	Number of routers and pseudonodes (LANs) that make up the topology calculated in this SPF run.
Count	Number of events that triggered this SPF run. When there is a topology change, often multiple link-state packets (LSPs) are received in a short time. A router waits 5 seconds before running a full SPF run, so it can include all new information. This count denotes the number of events (such as receiving new LSPs) that occurred while the router was waiting its 5 seconds before running full SPF.
Last trigger LSP	Whenever a full SPF calculation is triggered by the arrival of a new LSP, the router stores the LSP ID. The LSP ID can provide a clue as to the source of routing instability in an area. If multiple LSPs are causing an SPF run, only the LSP ID of the last received LSP is remembered.
Triggers	A list of all reasons that triggered a full SPF calculation. For a list of possible triggers, see Table 29.

Table 82 lists possible triggers of a full SPF calculation.

Table 84 Possible Triggers of Full SPF Calculation

Trigger	Description
ATTACHFLAG	This router is now attached to the Level 2 backbone or it has just lost contact to the Level 2 backbone.
ADMINDIST	Another administrative distance was configured for the IS-IS process on this router.
AREASET	Set of learned area addresses in this area changed.
BACKUPOVFL	An IP prefix disappeared. The router knows there is another way to reach that prefix but has not stored that backup route. The only way to find the alternative route is through a full SPF run.
DBCHANGED	A **clear isis *** command was issued on this router.
IPBACKUP	An IP route disappeared, which was not learned via IS-IS, but via another protocol with better administrative distance. IS-IS will run a full SPF to install an IS-IS route for the disappeared IP prefix.
IPQUERY	A **clear ip route** command was issued on this router.
LSPEXPIRED	Some LSP in the link-state database (LSDB) has expired.
LSPHEADER	ATT/P/OL bits or is-type in an LSP header changed.
NEWADJ	This router has created a new adjacency to another router.
NEWAREA	A new area (via NET) was configured on this router.
NEWLEVEL	A new level (via is-type) was configured on this router.

Table 84 Possible Triggers of Full SPF Calculation (continued)

Trigger	Description
NEWLSP	A new router or pseudonode appeared in the topology.
NEWMETRIC	A new metric was configured on an interface of this router.
NEWSYSID	A new system ID (via network entity title (NET)) was configured on this router.
PERIODIC	Typically, every 15 minutes a router runs a periodic full SPF calculation.
RTCLEARED	A **clear clns route** command was issued on this router.
TLVCODE	TLV code mismatch, indicating that different TLVs are included in the newest version of an LSP.
TLVCONTENT	TLV contents changed. This normally indicates that an adjacency somewhere in the area has come up or gone down. Look at the "Last trigger LSP" column to get an indication of where the instability may have occurred.

show isis topology

To display a list of all connected routers in all areas, use the **show isis topology** command in EXEC mode.

show isis *area-tag* **topology**

Syntax Description

area-tag	Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area. Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

Use the **show isis topology** EXEC command to verify the presence and connectivity between all routers in all areas.

Examples

The following example shows output from the **show isis topology** command in a dual CLNS-IP network:

```
Router# show isis topology

Area L2BB:
IS-IS paths to level-1 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.0005 --
0000.0000.0009  10      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0017  20      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0053  30      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0068  20      0000.0000.0009  Tu529           *Tunnel*

IS-IS paths to level-2 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.0005  --
0000.0000.0009  10      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0017  20      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0053  30      0000.0000.0009  Tu529           *Tunnel*
0000.0000.0068  20      0000.0000.0009  Tu529           *Tunnel*
Area A3253-01:
IS-IS paths to level-1 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.0003  10      0000.0000.0003  Et1             0000.0c03.6944
0000.0000.0005  --
0000.0000.0053  10      0000.0000.0053  Et1             0060.3e58.ccdb
```

```
Area A3253-02:
IS-IS paths to level-1 routers
System Id       Metric  Next-Hop        Interface       SNPA
0000.0000.0002  10      0000.0000.0002  Et2             0000.0c03.6bc5
0000.0000.0005  --
0000.0000.0053  10      0000.0000.0053  Et2             0060.3e58.ccde
```

Related Commands

Command	Description
show clns es-neighbors	Lists the ES neighbors that this router knows.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.
show clns neighbors	Displays both ES and IS neighbors.
show clns neighbor areas	Displays information about IS-IS neighbors and the areas to which they belong.
show clns route	Displays one or all of the destinations to which the router knows how to route CLNS packets.

show key chain

To display authentication key information, use the **show key chain** command in EXEC mode.

show key chain [*name-of-chain*]

Syntax Description

name-of-chain	(Optional) Name of the key chain to display, as named in the **key chain** command.

Defaults

Information about all key chains is displayed.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Examples

The following is sample output from the **show key chain** command:

```
Router# show key chain

Key-chain trees:
    key 1 -- text "chestnut"
        accept lifetime (always valid) - (always valid) [valid now]
        send lifetime (always valid) - (always valid) [valid now]
    key 2 -- text "birch"
        accept lifetime (00:00:00 Dec 5 1995) - (23:59:59 Dec 5 1995)
        send lifetime (06:00:00 Dec 5 1995) - (18:00:00 Dec 5 1995)
```

Related Commands

Command	Description
accept-lifetime	Sets the time period during which the authentication key on a key chain is received as valid.
key	Identifies an authentication key on a key chain.
key chain	Enables authentication for routing protocols.
key-string (authentication)	Specifies the authentication string for a key.
send-lifetime	Sets the time period during which an authentication key on a key chain is valid to be sent.

show route-map

To display all route maps configured or only the one specified, use the **show route-map** command in EXEC mode.

show route-map [*map-name*]

Syntax Description

map-name	Name of a specific route map.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(22)S	An additional counter collect policy routing statistics was integrated in Cisco IOS Release 12.0(22)S.
12.2(15)T	An additional counter collect policy routing statistics was integrated in Cisco IOS Release 12.2(15)T.

Examples

The following is sample output from the **show route-map** command:

```
Router# show route-map

route-map sid, permit, sequence 10
Match clauses:
    tag 1 2
Set clauses:
    metric 5
route-map sid, permit, sequence 20
Match clauses:
    tag 3 4
Set clauses:
    metric 6
Policy routing matches: 0packets; 0 bytes
```

The following example shows MPLS-related route map information:

```
Router# show route-map

route-map OUT, permit, sequence 10
Match clauses:
  ip address (access-lists): 1
Set clauses:
  mpls label
Policy routing matches: 0 packets, 0 bytes

route-map IN, permit, sequence 10
Match clauses:
  ip address (access-lists): 2
  mpls label
Set clauses:
Policy routing matches: 0 packets, 0 bytes
```

Table 83 describes the significant fields shown in the display.

Table 85 show route-map Field Descriptions

Field	Description
route-map	Name of the route map.
permit	Indicates that the route is redistributed as controlled by the set actions.
sequence	Number that indicates the position a new route map is to have in the list of route maps already configured with the same name.
Match clauses tag	Match criteria—conditions under which redistribution is allowed for the current route map.
Set clauses metric	Set actions—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met.
Policy routing matches:	Displays the number of packets and bytes that have been filtered by policy routing.

Related Commands

Command	Description
redistribute (IP)	Redistributes routes from one routing domain into another routing domain.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

spf-interval

To customize IS-IS throttling of shortest path first (SPF) calculations, use the **spf-interval** command in router configuration mode. To restore default values, use the **no** form of this command.

spf-interval [**level-1** | **level-2**] *spf-max-wait* [*spf-initial-wait spf-second-wait*]

no spf-interval

Syntax Description

level-1	(Optional) Apply intervals to Level-1 areas only.
level-2	(Optional) Apply intervals to Level-2 areas only.
spf-max-wait	Indicates the maximum interval (in seconds) between two consecutive SPF calculations. The range is 1 to 120 seconds. The default is 10 seconds.
spf-initial-wait	(Optional) Indicates the initial SPF calculation delay (in milliseconds) after a topology change. The range is 1 to 120000 milliseconds. The default is 5500 milliseconds (5.5 seconds).
spf-second-wait	(Optional) Indicates the hold time between the first and second SPF calculation (in milliseconds). The range is 1 to 120000 milliseconds. The default is 5500 milliseconds (5.5 seconds).

Defaults

spf-max-wait: 10 seconds
spf-initial-wait: 5500 milliseconds
spf-second-wait: 5500 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.1	This command was introduced.

Usage Guidelines

The following description will help you determine whether to change the default values of this command:

- The *spf-initial-wait* argument indicates the initial wait time (in milliseconds) before the first SPF calculation.
- The *spf-second-wait* argument indicates the amount of time to wait (in milliseconds) between the first and second SPF calculation.
- Each subsequent wait interval is twice as long as the previous one until the wait interval reaches the *spf-max-wait* interval specified, so this value causes the throttling or slowing down of the SPF calculations after the initial and second intervals. Once this interval is reached, the wait interval continues at this interval until the network calms down.
- After the network calms down and there are no triggers for 2 times the *spf-max-wait* interval, fast behavior is restored (the initial wait time).

SPF throttling is not a dampening mechanism; that is, SPF throttling does not prevent SPF calculations or mark any route, interface, or router as down. SPF throttling simply increases the intervals between SPF calculations.

Examples

The following example configures intervals for SPF calculations, PRC, and LSP generation:

```
router isis
 spf-interval 5 10 20
 prc-interval 5 10 20
 lsp-gen-interval 2 50 100
```

summary-address (IS-IS)

To create aggregate addresses for IS-IS or Open Shortest Path First (OSPF), use the **summary-address** command in router configuration mode. To restore the default, use the **no** form of this command.

summary-address *address mask* {**level-1** | **level-1-2** | **level-2**}

no summary-address *address mask* {**level-1** | **level-1-2** | **level-2**}

Syntax Description

address	Summary address designated for a range of addresses.
mask	IP subnet mask used for the summary route.
level-1	Only routes redistributed into Level 1 are summarized with the configured address and mask value.
level-1-2	Summary routes are applied when redistributing routes into Level 1 and Level 2 IS-IS, and when Level 2 IS-IS advertises Level 1 routes as reachable in its area.
level-2	Routes learned by Level 1 routing are summarized into the Level 2 backbone with the configured address and mask value. Redistributed routes into Level 2 IS-IS will be summarized also.

Defaults

All redistributed routes are advertised individually.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Multiple groups of addresses can be summarized for a given level. Routes learned from other routing protocols can also be summarized. The metric used to advertise the summary is the smallest metric of all the more specific routes. This command helps reduce the size of the routing table.

This command also reduces the size of the link-state packets (LSPs) and thus the link-state database (LSDB). It also helps stability because a summary advertisement is depending on many more specific routes. A single route flap does not cause the summary advertisement to flap in most cases.

The drawback of summary addresses is that other routes might have less information to calculate the most optimal routing table for all individual destinations.

Examples

The following example redistributes Routing Information Protocol (RIP) routes into IS-IS. In a RIP network, there are IP routes for 10.1.1, 10.1.2, 10.1.3, 10.1.4, and so on. This example advertises only 10.1.0.0 into the IS-IS Level 1 link-state PDU.

```
router isis
net 01.0000.0000.0001.00
redistribute rip level-1 metric 40
summary-address 10.1.0.0 255.255.0.0 level-1
```

summary-address (OSPF)

To create aggregate addresses for OSPF, use the **summary-address** command in router configuration mode. To restore the default, use the **no** form of this command.

summary-address {{*ip-address mask*} | {*prefix mask*}} [**not-advertise**] [**tag** *tag*]

no summary-address {{*ip-address mask* } | {*prefix mask*}} [**not-advertise**] [**tag** *tag*]

Syntax Description

ip-address	Summary address designated for a range of addresses.
mask	IP subnet mask used for the summary route.
prefix	IP route prefix for the destination.
mask	IP subnet mask used for the summary route.
not-advertise	(Optional) Suppress routes that match the specified prefix/mask pair. This keyword applies to OSPF only.
tag *tag*	(Optional) Tag value that can be used as a "match" value for controlling redistribution via route maps. This keyword applies to OSPF only.

Defaults

This command is disabled by default.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Routes learned from other routing protocols can be summarized. The metric used to advertise the summary is the smallest metric of all the more specific routes. This command helps reduce the size of the routing table.

Using this command for OSPF causes an OSPF Autonomous System Boundary Router (ASBR) to advertise one external route as an aggregate for all redistributed routes that are covered by the address. For OSPF, this command summarizes only routes from other routing protocols that are being redistributed into OSPF. Use the **area range** command for route summarization between OSPF areas.

OSPF does not support the **summary-address 0.0.0.0 0.0.0.0** command.

Examples

In the following example, the summary address 10.1.0.0 includes address 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. Only the address 10.1.0.0 is advertised in an external link-state advertisement.

```
summary-address 10.1.0.0 255.255.0.0
```

Related Commands

Command	Description
area range	Consolidates and summarizes routes at an area boundary.
ip ospf authentication-key	Assigns a password to be used by neighboring routers that are using the simple password authentication of OSPF.
ip ospf message-digest-key	Enables OSPF MD5 authentication.

synchronization

To enable the synchronization between BGP and your Interior Gateway Protocol (IGP) system, use the **synchronization** command in address family or router configuration mode. To enable the Cisco IOS software to advertise a network route without waiting for the IGP, use the **no** form of this command.

synchronization

no synchronization

Syntax Description

This command has no arguments or keywords.

Defaults

The behavior of this command is disabled by default.

Command Modes

Address family configuration

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(7)T	Address family configuration mode was added.
12.2(8)T	Command default behavior changed to disabled.

Usage Guidelines

Usually, a BGP speaker does not advertise a route to an external neighbor unless that route is local or exists in the IGP. By default, synchronization between BGP and the IGP is turned off to allow the Cisco IOS software to advertise a network route without waiting for route validation from the IGP. This feature allows routers and access servers within an autonomous system to have the route before BGP makes it available to other autonomous systems.

Use the **synchronization** command if routers in the autonomous system do not speak BGP.

Examples

The following example shows how to enable synchronization in router configuration mode. The router validates the network route in its IGP before advertising the route externally.

```
router bgp 65120
 synchronization
```

The following example shows how to enable synchronization in address family configuration mode. The router validates the network route in its IGP before advertising the route externally.

```
router bgp 65120
address-family ipv4 unicast
 synchronization
```

Related Commands

Command	Description
address-family ipv4 (BGP)	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard IP Version 4 address prefixes.
address-family vpnv4	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard VPN Version 4 address prefixes.

table-map

To modify metric and tag values when the IP routing table is updated with BGP learned routes, use the **table-map** command in address family or router configuration mode. To disable this function, use the **no** form of the command.

table-map *map-name*

no table-map *map-name*

Syntax Description

map-name	Route map name, from the **route-map** command.

Defaults

This command is disabled by default.

Command Modes

Address family configuration

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(7)T	Address family configuration mode was added.

Usage Guidelines

This command adds the route map name defined by the **route-map** command to the IP routing table. This command is used to set the tag name and the route metric to implement redistribution.

You can use **match** clauses of route maps in the **table-map** command. IP access list, autonomous system paths, and next hop match clauses are supported.

Examples

In the following router configuration mode example, the Cisco IOS software is configured to automatically compute the tag value for the BGP learned routes and to update the IP routing table:

```
route-map tag
 match as path 10
 set automatic-tag
!
router bgp 100
 table-map tag
```

In the following address family configuration mode example, the Cisco IOS software is configured to automatically compute the tag value for the BGP learned routes and to update the IP routing table:

```
route-map tag
 match as path 10
 set automatic-tag
!
router bgp 100
address-family ipv4 unicast
 table-map tag
```

Related Commands

Command	Description
address-family ipv4 (BGP)	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard IP Version 4 address prefixes.
address-family vpnv4	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard VPN Version 4 address prefixes.
match as-path	Matches a BGP autonomous system path access list.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

timers active-time

To adjust routing wait time, use the **timers active-time** command in router configuration mode. To disable this function, use the **no** form of the command.

timers active-time [*time-limit* | **disabled**]

no timers active-time

Syntax Description

time-limit	Enhanced Interior Gateway Routing Protocol (EIGRP) active-time limit (in minutes). The time range is from 1to 4294967295 minutes.
disabled	Disables the timers and permits the routing wait time to remain active indefinitely.

Defaults

This command is disabled by default.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

In EIGRP, there are timers that control the time the router waits (after sending a query) before declaring the route to be in the stuck in active (SIA) state.

Examples

In the following example, the routing wait time is 200 minutes on the specified route:

```
router eigrp 5
 timers active-time 200
```

In the following example, the routing wait time is indefinite on the specified route:

```
router eigrp 5
 timers active-time disabled
```

Related Commands

Command	Description
show ip eigrp topology	Displays the EIGRP topology table.

timers basic (ODR)

To adjust On-Demand Routing (ODR) network timers, use the **timers basic** command in router configuration mode. To restore default ODR timer values, use the **no** form of this command.

timers basic *update invalid holddown flush* [*sleeptime*]

no timers basic

Syntax Description

update	Rate (in seconds) at which updates are sent. This is the fundamental timing parameter of the ODR routing protocol.
invalid	Interval of time (in seconds) after which a route is declared invalid; it should be at least three times the value of the *update* argument. A route becomes invalid when there is an absence of updates that refresh the route. The route then enters holddown. The route is marked inaccessible and advertised as unreachable. However, the route is still used for forwarding packets.
holddown	Interval (in seconds) during which routing information regarding better paths is suppressed. It should be at least three times the value of the *update* argument. A route enters into a *holddown* state when an update packet is received that indicates the route is unreachable. The route is marked inaccessible and advertised as unreachable. However, the route is still used for forwarding packets. When *holddown* expires, routes advertised by other sources are accepted and the route is no longer inaccessible.
flush	Amount of time (in seconds) that must pass before the route is removed from the routing table; the interval specified must be at least the sum of the *invalid* and *holddown* arguments. If it is less than this sum, the proper holddown interval cannot elapse, which results in a new route being accepted before the holddown interval expires.
sleeptime	(Optional) Interval (in milliseconds) for postponing routing updates in the event of a flash update. The *sleeptime* value should be less than the *update* time. If the *sleeptime* is greater than the *update* time, routing tables will become unsynchronized.

Defaults

ODR uses the following default values if this command is not configured or if the no form of this command is entered:

update: 90 seconds
invalid: 270 seconds
holddown: 280 seconds
flush: 630 seconds
sleeptime: 0 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The basic timing parameters for ODR are adjustable. Because this routing protocol is executing a distributed, asynchronous routing algorithm, it is important that these timers be the same for all routers and access servers in the network.

Note The current and default timer values are displayed in the output of the **show ip protocols** EXEC command. The relationships of the various timers should be preserved as described in the syntax description table.

Examples

In the following example, updates are configured to be broadcast every 5 seconds. If a reply is not received from a peer within 15 seconds, the route is declared unusable. Further information the dead peer is suppressed for an additional 15 seconds. At the end of the suppression period, the route is flushed from the routing table.

```
Router(config)# router odr
Router(config-router)# timers basic 5  15  15  30
Router(config-router)# end
```

Note When configuring a short update period, you run the risk of congesting slow-speed serial lines; however, this is less of a concern on high-speed links, such as Fast Ethernet, Gigabit Ethernet, and T1-rate serial links. Also, if you have many routes in your updates, you can cause the routers to spend an excessive amount of time processing updates.

Related Commands

Command	Description
cdp timer	Specifies how often the Cisco IOS software sends CDP updates,
router odr	Configures an ODR process on a Cisco router.

timers basic (RIP)

To adjust Routing Information Protocol (RIP) network timers, use the **timers basic** command in router configuration mode. To restore the default timers, use the **no** form of this command.

timers basic *update invalid holddown flush*

no timers basic

Syntax Description

update	Rate (in seconds) at which updates are sent. This is the fundamental timing parameter of the routing protocol. The default is 30 seconds.
invalid	Interval of time (in seconds) after which a route is declared invalid; it should be at least three times the value of the *update* argument. A route becomes invalid when there is an absence of updates that refresh the route. The route then enters into a *holddown* state. The route is marked inaccessible and advertised as unreachable. However, the route is still used for forwarding packets. The default is 180 seconds.
holddown	Interval (in seconds) during which routing information regarding better paths is suppressed. It should be at least three times the value of the *update* argument. A route enters into a *holddown* state when an update packet is received that indicates the route is unreachable. The route is marked inaccessible and advertised as unreachable. However, the route is still used for forwarding packets. When holddown expires, routes advertised by other sources are accepted and the route is no longer inaccessible. The default is 180 seconds.
flush	Amount of time (in seconds) that must pass before the route is removed from the routing table; the interval specified should be greater than the value of the *invalid* argument. If it is less than this sum, the proper *holddown* interval cannot elapse, which results in a new route being accepted before the *holddown* interval expires. The default is 240 seconds.

Defaults

update: 30 seconds
invalid: 180 seconds
holddown: 180 seconds
flush: 240 seconds

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The basic timing parameters for RIP are adjustable. Because RIP is executing a distributed, asynchronous routing algorithm, these timers must be the same for all routers and access servers in the network.

Note The current and default timer values can be seen by inspecting the output of the **show ip protocols** EXEC command. The relationships of the various timers should be preserved as described previously.

Examples

The following example sets updates to be broadcast every 5 seconds. If a router is not heard from in 15 seconds, the route is declared unusable. Further information is suppressed for an additional 15 seconds. At the end of the suppression period, the route is flushed from the routing table.

```
router rip
 timers basic 5  15  15  30
```

Note By setting a short update period, you run the risk of congesting slow-speed serial lines. A short update period can be a concern on faster-speed Ethernets and T1-rate serial lines. Also, if you have many routes in your updates, you can cause the routers to spend an excessive amount of time processing updates.

timers bgp

To adjust BGP network timers, use the **timers bgp** command in router configuration mode. To reset the BGP timing defaults, use the **no** form of this command.

timers bgp *keepalive holdtime*

no timers bgp

Syntax Description

keepalive	Frequency (in seconds) with which the Cisco IOS software sends *keepalive* messages to its peer. The default is 60 seconds. The range is from 0 to 65535.
holdtime	Interval (in seconds) after not receiving a *keepalive* message that the software declares a peer dead. The default is 180 seconds. The range is from 0 to 65535.

Defaults

keepalive: 60 seconds

holdtime: 180 seconds

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following example changes the keepalive timer to 70 seconds and the hold-time timer to 210 seconds:

```
timers bgp 70 210
```

Related Commands

Command	Description
clear ip bgp peer-group	Removes all the members of a BGP peer group.
router bgp	Configures the BGP routing process.
show ip bgp	Displays entries in the BGP routing table.

timers nsf route-hold

To set the route-hold timer to determine how long an NSF-aware router that is running Enhanced Interior Gateway Routing Protocol (EIGRP) will hold routes for an inactive peer, use the **timers nsf route-hold** command in router configuration mode. To return the route-hold timer to the default value, use the **no** form of this command.

timers nsf route-hold *seconds*

no timers nsf route-hold

Syntax Description

seconds	The time, in seconds, that EIGRP will hold routes for an inactive peer. The configurable time range is from 20 to 300 seconds.

Defaults

EIGRP NSF awareness is enabled by default. The default value for the route-hold timer is 240 seconds.

Command Modes

Router configuration

Command History

Release	Modification
12.2(15)T	This command was introduced.

Usage Guidelines

The route-hold timer sets the maximum period of time that the NSF-aware router will hold known routes for an NSF-capable neighbor during a switchover operation or a well-known failure condition. The route-hold timer is configurable so that you can tune network performance and avoid undesired effects, such as “black holing” routes if the switchover operation takes too much time. When this timer expires, the NSF-aware router scans the topology table and discards any stale routes, allowing EIGRP peers to find alternate routes instead of waiting during a long switchover operation.

Examples

The following configuration example sets the route-hold timer value for an NSF-aware router. In the example, the route-hold timer is set to 2 minutes:

```
Router(config-router)# timers nsf route-hold 120
```

Related Commands

Command	Description
debug eigrp nsf	Displays EIGRP NSF-specific events in the console of a router.
debug ip eigrp notifications	Displays EIGRP events and notifications in the console of the router.

Command	Description
show ip eigrp neighbors	Displays the neighbors discovered by EIGRP.
show ip protocols	Displays the parameters and current state of the active routing protocol process.

timers pacing flood

To configure link-state advertisement (LSA) flood packet pacing, use the **timers pacing flood** command in router configuration mode. To restore the default flood packet pacing value, use the **no** form of this command.

timers pacing flood *milliseconds*

no timers pacing flood

Syntax Description

milliseconds	Time (in milliseconds) at which LSAs in the flooding queue are paced in between updates. The configurable range is from 5 milliseconds to 100 milliseconds. The default value is 33 milliseconds.

Defaults

33 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.2(4)T	This command was introduced.

Usage Guidelines

Configuring Open Shortest Path First (OSPF) flood pacing timers allows you to control interpacket spacing between consecutive link-state update packets in the OSPF transmission queue. This command allows you to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced.

The default settings for OSPF packet pacing timers are suitable for the majority of OSPF deployments. Do not change the packet pacing timers unless all other options to meet OSPF packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flood timers. Furthermore, there are no guidelines for changing timer values; each OSPF deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default flood timer values.

Examples

The following example configures LSA flood packet-pacing updates to occur in 55-millisecond intervals for OSPF routing process 1:

```
Router(config)# router ospf 1
Router(config-router)# timers pacing flood 55
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.
timers pacing lsa-group	Changes the interval at which OSPF LSAs are collected into a group and refreshed, checksummed, or aged.
timers pacing retransmission	Configures LSA retransmission packet pacing.

timers pacing lsa-group

To change the interval at which Open Shortest Path First (OSPF) link-state advertisements (LSAs) are collected into a group and refreshed, checksummed, or aged, use the **timers pacing lsa-group command** in router configuration mode. To restore the default value, use the **no** form of this command.

timers pacing lsa-group *seconds*

no timers pacing lsa-group

Syntax Description

seconds	Number of seconds in the interval at which LSAs are grouped and refreshed, checksummed, or aged. The range is from 10 to 1800 seconds. The default value is 240 seconds.

Defaults

The default interval for this command is 240 seconds. OSPF LSA group pacing is enabled by default.

Command Modes

Router configuration

Command History

Release	Modification
11.3 AA	This command was introduced.
12.2(4)T	The syntax of this command was changed from **timers lsa-group-pacing** to **timers pacing lsa-group**.

Usage Guidelines

This command allows you to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced. The default settings for OSPF packet pacing timers are suitable for the majority of OSPF deployments. Do not change the packet pacing timers unless all other options to meet OSPF packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flooding timers. Furthermore, there are no guidelines for changing timer values; each OSPF deployment is unique and should be considered on a case-by-case basis. The network operator assumes the risks associated with changing the default timer values.

Cisco IOS software groups the periodic refresh of LSAs to improve the LSA packing density for the refreshes in large topologies. The group timer controls the interval used for group refreshment of LSAs; however, this timer does not change the frequency that individual LSAs are refreshed (the default refresh rate is every 30 minutes).

The duration of the LSA group pacing is inversely proportional to the number of LSAs the router is handling. For example, if you have about 10,000 LSAs, decreasing the pacing interval would benefit you. If you have a very small database (40 to 100 LSAs), increasing the pacing interval to 10 to 20 minutes might benefit you slightly.

Examples

The following example configures OSPF group packet-pacing updates between LSA groups to occur in 60-second intervals for OSPF routing process 1:

```
Router(config)# router ospf 1
Router(config-router)# timers pacing lsa-group 60
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.
timers pacing flood	Configures LSA flood packet pacing.
timers pacing retransmission	Configures LSA retransmission packet pacing.

timers pacing retransmission

To configure link-state advertisement (LSA) retransmission packet pacing, use the **timers pacing retransmission** command in router configuration mode. To restore the default retransmission packet pacing value, use the **no** form of this command.

timers pacing retransmission *milliseconds*

no timers pacing retransmission

Syntax Description

milliseconds	The time (in milliseconds) at which LSAs in the retransmission queue are paced. The configurable range is from 5 milliseconds to 200 milliseconds. The default value is 66 milliseconds.

Defaults

66 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.2(4)T	This command was introduced.

Usage Guidelines

Configuring OSPF retransmission pacing timers allow you to control interpacket spacing between consecutive link-state update packets in the OSPF retransmission queue. This command allows you to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced. The default settings for OSPF packet retransmission pacing timers are suitable for the majority of OSPF deployments. Do not change the packet retransmission pacing timers unless all other options to meet OSPF packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flooding timers. Furthermore, there are no guidelines for changing timer values; each OSPF deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default packet retransmission pacing timer values.

Examples

The following example configures LSA flood pacing updates to occur in 55-millisecond intervals for OSPF routing process 1:

```
Router(config)# router ospf 1
Router(config-router)# timers pacing retransmission 55
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.

Command	Description
timers pacing flood	Configures LSA flood packet pacing.
timers pacing lsa-group	Changes the interval at which OSPF LSAs are collected into a group and refreshed, checksummed, or aged.

timers spf

The **timers spf** command is replaced by the **timers throttle spf** command. Refer to the **timers throttle spf** command reference page for instructions on using the new command.

timers throttle spf

To turn on OSPF shortest path first (SPF) throttling, use the **timers throttle spf** command in router address family configuration or router configuration mode. To turn off OSPF SPF throttling, use the **no** form of this command.

timers throttle spf *spf-start spf-hold spf-max-wait*

no timers throttle spf *spf-start spf-hold spf-max-wait*

Syntax Description

spf-start	Initial delay to schedule an SFP calculation after a change, in milliseconds. Range is from 1 to 600000.
spf-hold	Minimum hold time between two consecutive SPF calculations, in milliseconds. Range is from 1 to 600000.
spf-max-wait	Maximum wait time between two consecutive SPF calculations, in milliseconds. Range is 1 to 600000.

Command Default

SPF throttling is not set.

Command Modes

Router address family configuration
Router configuration

Command History

Release	Modification
12.2(14)S	This command was introduced.This command replaces the **timers spf-interval** command.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family configuration mode.

Usage Guidelines

The first wait interval between SPF calculations is the amount of time in milliseconds specified by the *spf-start* argument. Each consecutive wait interval is two times the current hold level in milliseconds until the wait time reaches the maximum time in milliseconds as specified by the *spf-max-wait* argument. Subsequent wait times remain at the maximum until the values are reset or a link-state advertisement (LSA) is received between SPF calculations.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **timers throttle spf** command in router address family configuration mode in order to make this OSPF router configuration command become topology-aware.

Examples

The following example shows how to configure a router with the delay, hold, and maximum interval values for the **timers throttle spf** command set at 5, 1000, and 90,000 milliseconds, respectively.

```
router ospf 1
 router-id 10.10.10.2
 log-adjacency-changes
 timers throttle spf 5 1000 90000
 redistribute static subnets
 network 10.21.21.0 0.0.0.255 area 0
 network 10.22.22.0 0.0.0.255 area 00
```

traffic-share balanced

To control how traffic is distributed among routes when there are multiple routes for the same destination network that have different costs, use the **traffic-share balanced** command in router configuration mode. To disable this function, use the **no** form of the command.

traffic-share balanced

no traffic-share balanced

Syntax Description

This command has no arguments or keywords.

Defaults

Traffic is distributed proportionately to the ratios of the metrics.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command applies to only the Enhanced Interior Gateway Routing Protocol (EIGRP). With the default setting, routes that have higher metrics represent less-preferable routes and get less traffic.

Examples

In the following example, traffic is balanced across multiple routes:

```
router eigrp 5
 traffic-share balanced
 variance 1
```

Related Commands

Command	Description
variance (EIGRP)	Controls load balancing in an EIGRP and IGRP internetwork.

traffic-share min

To configure traffic to use minimum cost routes, when there are multiple routes that have different cost routes to the same destination network, use the **traffic-share min across-interfaces** command in router configuration mode. To disable this function, use the **no** form of this command.

traffic-share min {**across-interfaces**}

no traffic-share min {**across-interfaces**}

Syntax Description

This command has no arguments or keywords.

Defaults

Traffic is configured to use minimum cost paths.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
11.0(3)	This command became protocol independent when the **across-interfaces** keyword was added.

Usage Guidelines

The **traffic-share min** command causes the Cisco IOS software to divide traffic only among the routes with the best metric. Other routes will remain in the routing table, but will receive no traffic. Configuring this command with the **across-interfaces** keyword allows you to configure multi-interface load splitting on different interfaces with equal cost paths.

Examples

In the following example, multi-interface load splitting is configured on different interfaces with equal cost paths:

```
router ospf 5
 traffic-share min across-interfaces
```

validate-update-source

To have the Cisco IOS software validate the source IP address of incoming routing updates for Routing Information Protocol (RIP) and Interior Gateway Routing Protocol (IGRP), use the **validate-update-source** command in router configuration mode. To disable this function, use the **no** form of this command.

validate-update-source

no validate-update-source

Syntax Description

This command has no arguments or keywords.

Defaults

The behavior of this command is enabled by default.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command is applicable only to RIP and IGRP. The software ensures that the source IP address of incoming routing updates is on the same IP network as one of the addresses defined for the receiving interface.

Disabling split horizon on the incoming interface will also cause the system to perform this validation check.

For unnumbered IP interfaces (interfaces configured as IP unnumbered), no checking is performed.

Examples

The following example configures a router not to perform validation checks on the source IP address of incoming RIP updates:

```
router rip
 network 10.105.0.0
 no validate-update-source
```

variance (EIGRP)

To control load balancing in an Enhanced Interior Gateway Routing Protocol (EIGRP)-based network, use the **variance** command in router configuration mode. To reset the variance to the default value, use the **no** form of this command.

variance *multiplier*

no variance

Syntax Description

multiplier	Metric value used for load balancing. It can be a value from 1 to 128. The default is 1, which means equal-cost load balancing.

Defaults

1 (equal-cost load balancing)

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Setting a variance value lets the Cisco IOS software determine the feasibility of a potential route. A route is feasible if the next router in the path is closer to the destination than the current router and if the metric for the entire path is within the variance. Only paths that are feasible can be used for load balancing and included in the routing table.

If the following two conditions are met, the route is deemed feasible and can be added to the routing table:

- The local best metric must be greater than the metric learned from the next router.
- The multiplier times the local best metric for the destination must be greater than or equal to the metric through the next router.

Examples

The following example sets a variance value of 4:

```
router eigrp 109
 variance 4
```

version

To specify a Routing Information Protocol (RIP) version used globally by the router, use the **version** command in router configuration mode. To restore the default value, use the **no** form of this command.

version {**1** | **2**}

no version

Syntax Description

1	Specifies RIP Version 1.
2	Specifies RIP Version 2.

Defaults

The software receives RIP Version 1 and Version 2 packets, but sends only Version 1 packets.

Command Modes

Router configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

To specify RIP versions used on an interface basis, use the **ip rip receive version** and **ip rip send version** commands.

Examples

The following example enables the software to send and receive RIP Version 2 packets:

```
version 2
```

Related Commands

Command	Description
ip rip receive version	Specifies a RIP version to receive on an interface basis.
ip rip send version	Specifies a RIP version to send on an interface basis.
show ip protocols	Displays the parameters and current state of the active routing protocol process.