CHAPTER 17

ISO CLNS Commands

The International Organization for Standardization (ISO) Connectionless Network Service (CLNS) protocol is a standard for the network layer of the Open System Interconnection (OSI) model.

Use the commands in this chapter to configure and monitor ISO CLNS networks. For ISO CLNS protocol configuration information and examples, refer to the "Configuring ISO CLNS" chapter of the *Router Products Configuration Guide*.

area-password

Use the **area-password** router configuration command to configure the area authentication password. The **no area-password** command disables the password.

area-password *password*
no area-password [*password*]

Syntax Description

password	Password you assign.

Default

None

Command Mode

Router configuration

Usage Guidelines

This password is inserted in Level 1 (station router level) LSPs, CSNPs, and Partial Sequence Number PDUs (PSNP).

Example

The following example assigns an area authentication password:

```
router isis
area-password angel
```

Related Command

domain-password

clear clns cache

Use the **clear clns cache** EXEC command to clear and reinitialize the CLNS routing cache.

clear clns cache

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example clears the CLNS routing cache:

```
clear clns cache
```

Related Command

show clns cache

clear clns es-neighbors

Use the **clear clns es-neighbors** EXEC command to remove ES neighbor information from the adjacency database.

clear clns es-neighbors

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example removes the ES neighbor information from the adjacency database:

```
clear clns es-neighbors
```

Related Commands

clear clns neighbors
show clns es-neighbors

clear clns is-neighbors

Use the **clear clns is-neighbors** EXEC command to remove IS neighbor information from the adjacency database.

clear clns is-neighbors

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example removes the IS neighbor information from the adjacency database:

```
clear clns is-neighbors
```

Related Commands

clear clns neighbors
show clns is-neighbors

clear clns neighbors

Use the **clear clns neighbors** EXEC command to remove CLNS neighbor information from the adjacency database.

clear clns neighbors

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example removes the CLNS neighbor information from the adjacency database:

```
clear clns neighbors
```

Related Commands

clear clns es-neighbors
clear clns is-neighbors
show clns neighbors

clear clns route

Use the **clear clns route** EXEC command to remove all of the dynamically derived CLNS routing information.

clear clns route

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example removes all of the dynamically derived CLNS routing information:

```
clear clns route
```

Related Command

show clns route

clns access-group

Use the **clns access-group** interface configuration command to filter transit CLNS traffic going either into or out of the router or both on a per-interface basis. Use the **no** form of this command to disable filtering of transit CLNS packets.

clns access-group *name* {**in** | [**out**]}
no clns access-group *name* {**in** | [**out**]}

Syntax Description

name	Name of the filter set or expression to apply.
in	Filter should be applied to CLNS packets entering the router.
out	(Optional.) Filter should be applied to CLNS packets leaving the router. If you do not specify an **in** or **out** keyword, **out** is assumed.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command has no effect on any CLNS packets sourced by the router. It applies only to packets forwarded by the router. Fast switching is still supported with access groups in place, but its performance will be impacted based on the complexity of the filters.

Filter sets and expressions are described in this manual in the descriptions for the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Example

The following example shows how to enable forwarding of frames received on Ethernet 0 that had a source address of anything other than 38.840F, and a destination address that started with 47.0005 or 47.0023, but nothing else:

```
clns filter-set US-OR-NORDUNET permit 47.0005...
clns filter-set US-OR-NORDUNET permit 47.0023...
clns filter-set NO-ANSI deny 38.840F...
clns filter-set NO-ANSI permit default
clns filter-expr STRANGE source NO-ANSI and destination US-OR-NORDUNET

interface ethernet 0
clns access-group STRANGE in
```

Related Commands

clns filter-expr
clns filter-set
clns template-alias

clns adjacency-filter

Use the **clns adjacency-filter** interface configuration command to filter the establishment of CLNS end system (ES) and intermediate system (IS) adjacencies. Use the **no** form of this command to disable this filtering.

clns adjacency-filter {**es** | **is**} *name*
no clns adjacency-filter {**es** | **is**} *name*

Syntax Description

es	End system adjacencies are to be filtered.
is	Intermediate system adjacencies are to be filtered.
name	Name of the filter set or expression to apply.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

Filtering is performed on full NSAP addresses. If filtering should only be performed on system IDs or any other substring of the full NSAP address, the wildcard-matching capabilities of filter sets should be used to ignore the insignificant portions of the NSAP addresses.

Filter sets and expressions are described in this manual in the descriptions for the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Example

The following example builds a filter that accepts end system adjacencies with only two systems, based only on their system IDs:

```
clns filter-set ourfriends ...0000.0c00.1234.**
clns filter-set ourfriends ...0000.0c00.125a.**

interface ethernet 0
clns adjacency-filter es ourfriends
```

Related Commands

clns filter-expr
clns filter-set
clns template-alias

clns checksum

Use the **clns checksum** interface configuration command to enable checksum generation when ISO CLNS routing software sources a CLNS packet. Use the **no** form of this command to disable checksum generation.

clns checksum
no clns checksum

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

This command has no effect on routing packets (ES-IS, ISO-IGRP, and IS-IS) sourced by the system. It applies to pings and trace route packets.

Example

The following example shows how to enable checksum generation:

```
interface ethernet 0
clns checksum
```

clns cluster-alias

Use the **clns cluster-alias** interface configuration command to allow multiple systems to advertise the same system ID as other systems in end-system Hello messages. The **no** form of this command disables cluster aliasing.

clns cluster-alias
no clns cluster-alias

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This feature caches multiple ES adjacencies with the same network service access point (NSAP) but different subnetwork point of attachment (SNPA) addresses. When a packet is destined to the common NSAP address, the router load-splits the packets among the different SNPA addresses. A router that supports this capability forwards traffic to each system.

If DECnet Phase V cluster aliases are disabled on an interface, End-System Hello packet information is used to replace any existing adjacency information for the NSAP. Otherwise, an additional adjacency (with a different SNPA) is created for the same NSAP.

Example

The following example shows how cluster aliasing is enabled on specified interfaces:

```
clns nsap 47.0004.004d.0001.0000.0c00.1111.00
clns routing

interface Ethernet 0
clns cluster-alias

interface Ethernet 1
clns cluster-alias
```

clns configuration-time

Use the **clns configuration-time** global configuration command to specify the rate at which ES Hellos (ESHs) and IS Hello (ISHs) are sent. You can restore the default value by specifying the **no clns configuration-time** command.

clns configuration-time *seconds*
no clns configuration-time

Syntax Description

seconds	Rate in seconds at which ESH and ISH packets are sent.

Default

60 seconds

Command Mode

Global configuration

Example

The following example specifies that ESHs and ISHs are to be sent every 100 seconds:

```
clns configuration-time 100
```

Related Commands

clns esct-time
clns holding-time

clns congestion-threshold

Use the **clns congestion-threshold** interface configuration command to set the congestion experienced bit if the output queue has more than the specified number of packets in it. A *number* value of zero or the **no** form of the command prevents this bit from being set. Use the **no clns congestion-threshold** command to remove the parameter setting and set it to 0.

clns congestion-threshold *number*
no clns congestion-threshold

Syntax Description

number	Number of packets that are allowed in the output queue before the system sets the congestion-experienced bit. The value zero (0) prevents this bit from being set.

Default

4

Command Mode

Interface configuration

Usage Guidelines

If a router configured for CLNS experiences congestion, it sets the congestion experienced bit. The congestion threshold is a per-interface parameter set by this interface configuration command. An error PDU is sent to the sending router and the packet is dropped if the number of packets exceeds the threshold.

Example

The following example sets the congestion threshold to 10:

```
interface ethernet 0
clns congestion-threshold 10
```

clns dec-compatible

Use the **clns dec-compatible** interface configuration command to allow ISHs sent and received to ignore the N-selector byte. Use the **no clns-compatible** command to disable this feature.

clns dec-compatible
no clns dec-compatible

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example enables DEC-compatible mode:

```
interface ethernet 0
clns dec-compatible
```

clns enable

Use the **clns enable** interface configuration command if you do not intend to perform any static or dynamic routing on an interface, but intend to pass ISO CLNS packet traffic to end systems. Use the **no clns enable** command to disable ISO CLNS on a particular interface.

clns enable
no clns enable

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example enables ISO CLNS on interface Ethernet 0:

```
interface Ethernet 0
clns enable
```

clns erpdu-interval

Use the **clns erpdu-interval** interface configuration command to determine the minimum interval time, in milliseconds, between error PDUs (ERPDUs). A *milliseconds* value of zero or the **no** form of this command turns off the interval rate and effectively sets no limit to the ERPDU rate.

clns erpdu-interval *milliseconds*
no clns erpdu-interval *milliseconds*

Syntax Description

milliseconds	Minimum interval time in milliseconds between ERPDUs.

Default

Once every 10 milliseconds

Command Mode

Interface configuration

Usage Guidelines

This command does not send ERPDUs more frequently than one per interface per 10 milliseconds. It is wise not to send an ERPDU frequently if bandwidth is precious, such as over slow serial lines.

Example

The following example sets the ERPDU interval to 30 milliseconds:

```
interface Ethernet 0
clns erpdu-interval 30
```

Related Command

clns send-erpdu

clns esct-time

Use the **clns esct-time** interface configuration command to supply an ES Configuration Timer (ESCT) option in a transmitted IS Hello packet that tells the end system how often it should transmit ES Hello packet protocol data units (PDUs). Use the **no clns esct-time** command to restore the default value and disable this feature.

clns esct-time *seconds*
no clns esct-time *seconds*

Syntax Description

seconds	Rate in seconds that ESH PDUs are transmitted. Range is from 0 through 65535.

Default

0

Command Mode

Interface configuration

Example

The following example sets the ES configuration time to 10 seconds:

```
interface Ethernet 0
clns esct-time 10
```

Related Commands

clns configuration-time
clns holding-time

clns es-neighbor

Use the **clns es-neighbor** interface configuration command to list all end systems that will be used when you manually specify the NSAP-to-SNPA mapping. The SNPAs are the MAC addresses. Use the **no** form of this command to delete the ES neighbor.

clns es-neighbor *nsap snpa*
no clns es-neighbor *nsap*

Syntax Description

nsap	CLNS address.
snpa	Data link address.

Default

None

Command Mode

Interface configuration

Usage Guidelines

If you have configured either the **clns router iso-igrp** or **clns router isis** interface configuration commands for a particular interface, the ES-IS routing software automatically turns ES-IS on for that interface.

It is only necessary to use static mapping for those end systems that do *not* support ES-IS. The router will continue to dynamically discover those end systems that *do* support ES-IS.

Example

The following example defines an ES neighbor on interface ethernet 0:

```
interface ethernet 0
clns es-neighbor 47.0004.004D.0055.0000.0C00.A45B.00 0000.0C00.A45B
```

In this case, the end systems with the following NSAP (or NET) are configured with an Ethernet MAC address of 0000.0C00.A45B:

```
47.0004.004D.0055.0000.0C00.A45B.00
```

Related Commands

clns is-neighbor
clns host

clns filter-expr

Use one or more **clns filter-expr** global configuration commands to combine CLNS filter sets and CLNS address templates into complex logical NSAP pattern-matching expressions. The **no** form of this command deletes the expression. There are many forms of this command.

clns filter-expr *ename term*
clns filter-expr *ename* **not** *term*
clns filter-expr *ename term* **or** *term*
clns filter-expr *ename term* **and** *term*
clns filter-expr *ename term* **xor** *term*
no clns filter-expr *ename*

Syntax Description

ename	Alphanumeric name to apply to this filter expression.
term	Filter expression term. A term can be any of the following: *ename*—Another, previously defined, filter expression. *sname* (or **destination** *sname*)—A previously defined filter set name, with the filter set applied to the destination NSAP address. **source** *sname*—A previously defined filter set name, with the filter set applied to the source NSAP address.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

Filter expressions can reference previously defined filter expressions, so you can build arbitrarily complex expressions.

The first form listed defines a simple filter expression that is pattern matched only if the pattern given by *term* is matched.

The second form defines a filter expression that is pattern matched only if the pattern given by *term* is *not* matched.

The third form defines a filter expression that is pattern matched if *either* of the patterns given by the two terms are matched.

The fourth form defines a filter expression that is pattern matched only if *both* of the patterns given by the two terms are matched.

The fifth form defines a filter expression that is pattern matched only if *one* of the patterns, but *not both*, given by the two terms are matched.

The sixth and final form of the command deletes the definition of an existing filter expression.

Use this command to define complex filter expressions. See the description of the **clns filter-set** global configuration command to learn how to define filter sets.

Example

The following example shows how to define a filter expression that matches addresses with a source address of anything besides 39.840F, and a destination address that started with 47.0005 or 47.0023, but nothing else:

```
clns filter-set US-OR-NORDUNET permit 47.0005...
clns filter-set US-OR-NORDUNET permit 47.0023
clns filter-set NO-ANSI deny 38.840F...
clns filter-set NO-ANSI permit default

clns filter-expr STRANGE source NO-ANSI and destination US-OR-NORDUNET
```

Related Commands

clns filter-set
clns template-alias
show clns filter-expr

clns filter-set

Use one or more **clns filter-set** global configuration commands to build a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions. CLNS filter expressions are used in the creation and use of CLNS access lists. The **no clns filter-set** command deletes the entire filter set.

clns filter-set *sname* {[**permit**] | **deny**} *template*
no clns filter-set *sname*

Syntax Description

sname	Alphanumeric name to apply to this filter set.
permit | **deny**	(Optional.) Addresses matching the pattern specified by *template* are to be permitted or denied. If neither **permit** nor **deny** is specified, **permit** is assumed.
template	Address template, template alias name, or the keyword **default**. Address templates and alias names are described under the description of the **clns template-alias** global configuration command. The **default** keyword denotes a zero-length prefix and matches any address.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

Use this command to define a list of pattern matches and permit/deny conditions for use in CLNS filter expressions. Filter expressions are used in the creation and use of CLNS access lists. See the description of the **clns filter-expr** global configuration command to learn how to define filter expressions and the **clns template-alias** global configuration command to learn how to define address templates and address template aliases.

Each address that must be matched against a filter set is first compared against all of the entries in the filter set, in order, for an exact match with the address. If the exact match search fails to find a match, then the entries in the filter set containing wildcard matches are scanned for a match, again, in order. The first template that matches is used. If an address does not match any of the filter set entries, an implicit “deny” is returned as the permit/deny action of the filter set.

Examples

The following example returns a permit action if an address starts with either 47.0005 or 47.0023. It returns an implicit deny action on any other address.

```
clns filter-set US-OR-NORDUNET permit 47.0005...
clns filter-set US-OR-NORDUNET permit 47.0023...
```

The following example returns a deny action if an address starts with 39.840F, but returns a permit action for any other address:

```
clns filter-set NO-ANSI deny 38.840F...
clns filter-set NO-ANSI permit default
```

Related Commands

clns filter-expr
clns template-alias
show clns filter-set

clns holding-time

Use the **clns holding-time** global configuration command to allow the sender of an ESH or ISH to specify the length of time you consider the information in the Hello packets to be valid. You can restore the default value (300 seconds or 5 minutes) by using the **no clns holding-time** command.

clns holding-time *seconds*
no clns holding-time

Syntax Description

seconds	Length of time in seconds during which the information in the Hello packets will be believed.

Default

300 seconds (5 minutes)

Command Mode

Global configuration

Usage Guidelines

Setting this value too high puts extra traffic on a line and adds time to process Hellos. However, you want to avoid setting it too low if your topology changes more often than the router sends updates.

Example

The following example sets the holding time at 150 seconds:

```
clns holding-time 150
```

Related Commands

clns configuration-time
clns esct-time

clns host

Use the **clns host** global configuration command to define a name-to-NSAP mapping that can then be used with commands requiring NSAPs.

clns host *name nsap*

Syntax Description

name	Desired name for the NSAP. The first character can be either a letter or a number, but if you use a number, the operations you can perform are limited.
nsap	NSAP that the name maps to.

Default

None

Command Mode

Global configuration

Usage Guidelines

The assigned NSAP name is displayed, where applicable, in **show** and **debug** EXEC commands. There are some effects and requirements associated with using names to represent NETs and NSAPs, however. Although using names as proxies for addresses is allowed with CLNS commands, they are never written out to NVRAM.

The first character can be either a letter or a number, but if you use a number, the operations you can perform (such as ping) are limited.

The **clns host** command is generated after all other CLNS commands when the configuration file is parsed. As a result, the NVRAM version of the configuration cannot be edited to specifically change the address defined in the original **clns host** command. You must specifically change any commands that refer to the original address. This affects all commands that accept names.

The commands that are affected by these requirements include the following:

- **net** (router configuration command)
- **clns is-neighbor** (interface configuration command)
- **clns es-neighbor** (interface configuration command)
- **clns route** (global configuration command)

Example

The following example defines names to NSAPs:

```
clns host cisco1 39.0001.0000.0c00.1111.00
clns host cisco2 39.0002.0000.0c00.1111.00
router iso-igrp
net cisco1
!
interface ethernet 0
clns net cisco2
```

Related Commands

clns is-neighbor
clns es-neighbor

clns is-neighbor

Use the **clns is-neighbor** interface configuration command to list all intermediate systems that will be used when you manually specify the NSAP-to-SNPA mapping. The SNPAs are the MAC addresses. Use the **no clns is-neighbor** command to delete the specified IS neighbor.

clns is-neighbor *nsap snpa*
no clns is-neighbor *nsap*

Syntax Description

nsap	NSAP address.
snpa	Data link address.

Default

None

Command Mode

Interface configuration

Usage Guidelines

It is sometimes desirable for a router to have a neighbor entry statically configured rather than learned through ES-IS, ISO-IGRP, or IS-IS. This interface configuration command enters an IS neighbor.

Example

The following example defines an IS neighbor on interface ethernet 0:

```
interface ethernet 0
clns is-neighbor 47.0004.004D.0055.0000.0C00.A45B.00  0000.0C00.A45B
```

Related Commands

clns es-neighbor
clns host

clns mtu

Use the **clns mtu** interface configuration command to set the MTU packet size for the interface. The **no** form of this command restores the default and maximum packet size.

clns mtu *size*
no clns mtu

Syntax Description

size	Maximum packet size in bytes. The minimum value is 512; the default and maximum packet size depends on the interface type.

Default

Depends on interface type

Command Mode

Interface configuration

Usage Guidelines

All interfaces have a default maximum packet size. You can set the maximum transmission unit (MTU) size of the packets sent on the interface using this interface configuration command.

All devices on a physical medium must have the same protocol MTU in order to operate.

The CTR card does not support the switching of frames larger than 4472 bytes. Interoperability problems can occur if CTR cards are intermixed with other Token Ring cards on the same network. These problems can be minimized by lowering the CLNS maximum packet sizes (MTUs) to be the same on all devices on the network, using the **clns mtu** command.

Note Changing the MTU value with the **mtu** interface configuration command can affect the CLNS MTU value. If the CLNS MTU is at its maximum given the interface MTU, then the CLNS MTU will change with the interface MTU. However, the reverse is not true: changing the CLNS MTU value has no effect on the value for the **mtu** interface configuration command.

Example

The following example shows how to set the MTU packet size:

```
interface ethernet 0
clns mtu 1000
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

mtu †

clns net (global configuration command)

Use the **clns net** global configuration command to assign a static address for a router. If a router is configured to support ISO CLNS but is not configured to dynamically route CLNS packets using ISO-IGRP or IS-IS, use this command to assign an address to the router. The **no clns net** command removes any previously configured NET or NSAP address.

clns net {*net-address* | *name*}
no clns net {*net-address* | *name*}

Syntax Description

net-address	Network Entity Title (NET). See algorithm under "Usage Guidelines" on this page.
name	CLNS host name to be associated with this interface.

Default

None

Command Mode

Global configuration

Usage Guidelines

A CLNP packet sent to any of the defined NSAPs or NETs will be received by the router. The router chooses the NET to use when it sends a packet with the following algorithm:

- If no dynamic routing protocol is running, use the NET defined for the outgoing interface if it exists; otherwise, use the NET defined for the router.
- If ISO-IGRP is running, use the NET of the routing process that is running on this interface.
- If IS-IS is running, use the NET of the IS-IS routing process that is running on this interface.

Example

The following example assigns a static address:

```
clns net 49.0001.aa00.0400.9105.00
```

clns net (interface configuration command)

Use this form of the **clns net** command as an interface configuration command to assign an NSAP address or name to a router interface. If a router is configured to support ISO CLNS, but is not configured to dynamically route CLNS packets using a ISO-IGRP or IS-IS, use this command to assign an address to the router. The **no clns net** command removes any previously configured NSAP address.

clns net {*nsap-address* | *name*}
no clns net {*nsap-address* | *name*}

Syntax Description

nsap-address	NSAP address.
name	Name to be associated with this interface.

Default

None

Command Mode

Interface configuration

Usage Guidelines

This command is useful if you are doing static routing and need to control the source NET used by the router on each interface.

Examples

The following example assigns an NSAP address to a router interface:

```
interface Ethernet 0
clns net 49.0001.0000.0c00.1111.00
```

The following example assigns a name to a router interface:

```
interface Ethernet 0
clns net cisco
```

clns packet-lifetime

Use the **clns packet-lifetime** global configuration command to specify the initial lifetime for locally generated packets. The **no** form of the command removes the parameter's settings.

clns packet-lifetime *time-to-live*
no clns packet-lifetime

Syntax Description

time-to-live	Packet lifetime in seconds.

Default

32 seconds

Command Mode

Global configuration

Example

The following example sets a packet lifetime of 120 seconds:

```
clns packet-lifetime 120
```

Related Command

clns want-erpdu

clns rdpdu-interval

Use the **clns rdpdu-interval** interface configuration command to determine the minimum interval time, in milliseconds, between redirect PDUs (RDPDUs). A *milliseconds* value of zero or the **no** form of the command turns off the interval rate and effectively sets no limit to the RDPDU rate.

clns rdpdu-interval *milliseconds*
no clns rdpdu-interval *milliseconds*

Syntax Description

milliseconds	Minimum interval time in milliseconds between RDPDUs.

Default

Once every 100 milliseconds

Command Mode

Interface configuration

Usage Guidelines

An RDPDU is rate-limited and is not sent more frequently than one per interface per 100 milliseconds. There is no need to change the default. This setting will work fine for most networks.

Example

The following example sets an interval of 50 milliseconds:

```
interface Ethernet 0
clns rdpdu-interval 50
```

Related Command

clns send-rdpdu

clns route (to discard packets)

Use this form of the **clns route** global configuration command with the **discard** keyword to explicitly tell a router to discard packets with NSAP addresses that match the specified *nsap-prefix*. The **no** form of the command removes this route.

clns route *nsap-prefix* **discard**
no clns route *nsap-prefix*

Syntax Description

nsap-prefix	Network service access point prefix. This value is entered into a static routing table and used to match the beginning of a destination NSAP. The longest NSAP-prefix entry that matches is used.
discard	Explicitly tell a router to discard packets with NSAPs that match the specified *nsap-prefix*.

Default

None

Command Mode

Global configuration

Example

The following example discards packets with a destination NSAP address that matches the prefix 47.0005:

```
clns route 47.0005 discard
```

Related Commands

clns route (interface static route)
clns route (to enter a static route)
clns route default

clns route (interface static route)

Use this form of the **clns route** global configuration command to create an interface static route. The **no** form of the command removes this route.

clns route *nsap-prefix interface-type* [*snpa-address*]
no clns route *nsap-prefix*

Syntax Description

nsap-prefix	Network service access point prefix. This value is entered into a static routing table and used to match the beginning of a destination NSAP. The longest NSAP-prefix entry that matches is used.
interface-type	Type of interface, such as Ethernet or Serial, plus the interface unit. Specify the interface type immediately followed by the unit number; there is no space between the two. For example, ethernet3. Numbering begins with 0 and is incremented by 1 for each of the installed interfaces of a particular type. Use the **show interfaces** EXEC command for the interfaces installed on your router.
snpa-address	(Optional.) Optional for serial links; required for multiaccess networks.

Default

None

Command Mode

Global configuration

Usage Guidelines

If you do not specify an SNPA address when you have a multiaccess network, you will received an error message indicating a bad SNPA.

Examples

The following example shows how to create a static route for an Ethernet interface:

```
clns route 39.0002 ethernet3 aa00.0400.1111
```

The following example shows how to create a static route for a serial interface:

```
clns route 39.0002 serial0
```

Related Commands

clns route (to discard packets)
clns route (to enter a static route)
clns route default

clns route (to enter a static route)

Use this form of the **clns route** global configuration command to enter a specific static route. NSAPs that start with *nsap-prefix* are forwarded to *next-hop-net* or the *name* of the next hop. The **no** form of the command removes this route.

clns route *nsap-prefix* {*next-hop-net* | *name*}
no clns route *nsap-prefix*

Syntax Description

nsap-prefix	Network service access point prefix. This value is entered into a static routing table and used to match the beginning of a destination NSAP. The longest NSAP-prefix entry that matches is used.
next-hop-net	Next-hop Network Entity Title. This value is used to establish the next hop of the route for forwarding packets.
name	Name of the next hop node. This value can be used instead of the next-hop NET to establish the next hop of the route for forwarding packets.

Default

None

Command Mode

Global configuration

Example

The following example forwards all packets toward the specified route:

```
clns route 39.840F 47.0005.80FF.FF00.0123.4567.89AB.00
```

Related Commands

clns route (to discard packets)
clns route (interface static route)
clns route default

clns route default

Use this form of the **clns route** global configuration command to configure a default zero-length prefix rather than type an NSAP prefix. The **no** form of the command removes this route.

clns route default *nsap-prefix interface-type*
no clns route default

Syntax Description

nsap-prefix	Network service access point prefix that is a default zero-length prefix.
interface-type	Type of interface, such as Ethernet or Serial, plus the interface unit. Specify the interface type immediately followed by the unit number; there is no space between the two. For example, ethernet3. Numbering begins with 0 and is incremented by 1 for each of the installed interfaces of a particular type. Use the **show interfaces** EXEC command for the interfaces installed on your router.

Default

None

Command Mode

Global configuration

Example

The following example configures a default zero-length prefix:

```
clns route default 39.840F
```

Related Commands

clns route (to discard packets)
clns route (interface static route)
clns route (to enter a static route)

clns route-cache

Use the **clns route-cache** interface configuration command to allow fast switching through the cache. To disable fast switching, use the **no** form of this command.

clns route-cache
no clns route-cache

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

The cache still exists and is used after the **no clns route-cache** command is used; the software just does not do fast switching through the cache.

Example

The following example shows how to allow fast switching through the cache:

```
interface ethernet 0
clns route-cache
```

clns router isis

Use the **clns router isis** interface configuration command to enable IS-IS routing for OSI on a specified interface. The **no clns router isis** command with the appropriate area tag disables IS-IS on the interface. Use the **no router isis** command with the appropriate area tag to disable IS-IS routing for the system.

clns router isis [*tag*]
no clns router isis [*tag*]

Syntax Description

tag	(Optional.) Meaningful name for a routing process. If not specified, a null tag is assumed. It must be unique among all CLNS router processes for a given router. Use the same text for the argument *tag* as specified in the **router isis** global configuration command.

Default

None

Command Mode

Interface configuration

Usage Guidelines

Creating a name for a routing process means that you use names when configuring routing. You can specify *only one* IS-IS process per router.

Example

The following example enables IS-IS routing for OSI on interface Ethernet 0:

```
router isis cisco
net 39.0001.0000.0c00.1111.00
interface ethernet 0
clns router isis cisco
```

Related Command

router isis

clns router iso-igrp

Use the **clns router iso-igrp** interface configuration command to specify ISO-IGRP routing on a specified interface. The **no clns router iso-igrp** command with the appropriate area tag disables ISO-IGRP on the interface. Use the **no router iso-igrp** global configuration command with the appropriate tag to disable ISO-IGRP routing for the system.

clns router iso-igrp *tag* [**level 2**]
no clns router iso-igrp *tag*

Syntax Description

tag	Meaningful name for routing process. It must be unique among all CLNS router processes for a given router. This tag should be the same as defined for the routing process in the **router iso-igrp** global configuration command.
level 2	(Optional.) Allows the interface to advertise Level 2 information.

Default

None

Command Mode

Interface configuration

Usage Guidelines

If you want this interface to advertise Level 2 information only, use the **level 2** keyword. This option reduces the amount of router-to-router traffic by telling the router to send out only Level 2 routing updates on certain interfaces. Level 1 information is not passed on the interfaces for which the Level 2 option is set.

Example

In the following example, the interface advertises Level 2 information only on interface serial 0:

```
router iso-igrp marketing
net 49.0001.0000.0c00.1111.00
interface serial 0
clns router iso-igrp marketing level 2
```

Related Command

router iso-igrp

clns routing

Use the **clns routing** global configuration command to enable routing of CLNS packets. Use the **no clns routing** command to disable CLNS routing.

clns routing
no clns routing

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Global configuration

Example

The following example enables routing of CLNS packets:

```
clns routing
```

Related Command

clns security pass-through

clns security pass-through

Use the **clns security pass-through** global configuration command to allow the router to pass packets that have security options set. To revert to the default, use the **no** form of this command.

clns security pass-through
no clns security pass-through

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

By default, the router discards any packets it sees as set with security options.

Example

The following example allows the router to pass packets that have security options set:

```
clns routing
router iso-igrp
net ...
clns security pass-through
```

Related Command

clns routing

clns send-erpdu

Use the **clns send-erpdu** interface configuration command to allow CLNS to send an error PDU when the routing software detects an error in a data PDU. To disable this function, use the **no** form of this command.

clns send-erpdu
no clns send-erpdu

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

When a CLNS packet comes in, the routing software looks in the routing table for the next hop. If it does not find the next hop, the packet is discarded and an error protocol Data Unit (ERPDU) can be sent.

Example

The following example shows how to allow CLNS to send an error PDU when it detects an error in a data PDU:

```
interface ethernet 0
clns send-erpdu
```

Related Command

clns erpdu-interval

clns send-rdpdu

Use the **clns send-rdpdu** interface configuration command to allow CLNS to send redirect PDUs (RDPDUs) when a better route for a given host is known. To disable this function, use the **no** form of this command.

clns send-rdpdu
no clns send-rdpdu

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

If a packet is sent out the same interface it came in on, an RDPDU also can be sent to the sender of the packet.

Example

The following example shows how to allow CLNS to send redirect PDUs:

```
interface ethernet 0
clns send-rdpdu
```

Related Command

clns rdpdu-interval

clns split-horizon

Use the **clns split-horizon** interface configuration command to implement split horizon for ISO-IGRP updates. The **no clns split-horizon** command disables this feature.

clns split-horizon
no clns split-horizon

Syntax Description

This command has no arguments or keywords.

Default

For all LAN interfaces—enabled
For WAN interfaces on X.25, Frame Relay, or SMDS networks—disabled

Command Mode

Interface configuration

Usage Guidelines

Normally, routers that are connected to broadcast-type OSI networks and that use distance vector routing protocols employ the split-horizon mechanism to prevent routing loops. Split horizon blocks information about routes from being advertised by a router out any interface from which that information originated. This behavior usually optimizes communications among multiple routers, particularly when links are broken. However, with nonbroadcast networks, such as Frame Relay and SMDS, situations can arise for which this behavior is less than ideal. For all interfaces except those for which either Frame Relay or SMDS encapsulation is enabled, the default condition for this command is for split horizon to be enabled.

If your configuration includes either the **encapsulation frame-relay** or **encapsulation smds** interface configuration commands, the default is for split horizon to be disabled. Split horizon is not disabled by default for interfaces using any of the X.25 encapsulations.

For networks that include links over X.25 PSNs, the **neighbor** interface configuration command can be used to defeat the split horizon feature. You can as an alternative explicitly specify the **no clns split-horizon** command in your configuration. However, if you do so, you must similarly disable split horizon for all routers in any relevant multicast groups on that network.

Split horizon for ISO-IGRP defaults to off for X.25, SMDS, and Frame Relay. Thereby, destinations are advertised out the interface for which the router has a destination.

In general, changing the state of the default for this interface configuration command is not recommended, unless you are certain that your application requires making a change in order to properly advertise routes. Remember that if split horizon is disabled on a serial interface (and that interface is attached to a packet-switched network), you must disable split horizon for all routers in any relevant multicast groups on that network.

Example

In the following example, split horizon is disabled on a serial link connected to an X.25 network:

```
interface serial 0
encapsulation x25
no clns split-horizon
```

clns template-alias

Use one or more **clns template-alias** global configuration commands to build a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets. The **no clns template-alias** command deletes the alias.

clns template-alias *name template*
no clns template-alias *name*

Syntax Description

name	Alphanumeric name to apply as an alias for the template.
template	Address template, as defined in "Usage Guidelines."

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

Address templates are "pattern forms" that match one or more CLNS addresses. They can be simple single CLNS addresses, which match just themselves, or contain *wildcards*, *prefixes*, and *suffixes*, allowing a single template to match many addresses.

The simplest address template matches just a single address, as shown in this example:

```
47.0005.1234.5678.9abc.def0.00
```

Wildcard digits, which can match any value, are indicated with asterisks (*****). The following template matches the above address and any other 12-byte long address that starts with 47.0005.1234.5678:

```
47.0005.1234.5678.****.****.**
```

Because OSI addresses are variable in length, it is often useful to build templates that match addresses that share a common prefix. The following template matches any address of any length that begins with the prefix 47.0005.1234.5678:

```
47.0005.1234.5678...
```

In other instances, matching a suffix of the address is also important, such as when matching system IDs. The following template matches any address that ends with the suffix 0000.0c01.2345.00:

```
...0000.0c01.2345.00
```

In other cases, you might want to match addresses on a single-bit granularity, rather than half-byte (four-bit, or *nibble*) granularity. This pattern matching is supported by allowing the hex digits that represent four bits to be replaced by groups of four binary bits, represented by 0s and 1s. These four binary digits are enclosed within parentheses. The following template matches any address that starts with 47.0005 followed by the binary bits 10. The final two binary bits in the nibble can be either 0 or 1, and are represented with asterisks.

```
47.0005.(10**)...
```

Use this command to define aliases for commonly referenced address templates. The use of these aliases reduces the chances for typographical error in the creation of CLNS filter sets.

Example

The following command defines a filter set called COMPLEX-PREFIX for the last example given in the “Usage Guidelines” section:

```
clns template-alias COMPLEX-PREFIX 47.0005.(10**)...
```

Related Commands

clns filter-expr
clns filter-set

clns want-erpdu

Use the **clns want-erpdu** global configuration command to specify whether to request error PDUs on packets sourced by the router. The **no** form of this command removes the parameter's settings.

clns want-erpdu
no clns want-erpdu

Syntax Description

This command has no arguments or keywords.

Default

To request error PDUs

Command Mode

Global configuration

Usage Guidelines

This command has no effect on routing packets (ES-IS, ISO-IGRP, and IS-IS) sourced by the system. It applies to pings and trace route packets.

Example

The following example shows how to request error PDUs on packets sourced by the router:

```
clns want-erpdu
```

Related Command

clns packet-lifetime

distance

Use the **distance** router configuration command to configure the administrative distance for CLNS routes learned. The **no distance** router configuration command restores the administrative distance to the default.

distance *value* [**clns**]
no distance *value* [**clns**]

Syntax Description

value	Administrative distance, indicating the trustworthiness of a routing information source. This argument has a numerical value between 0 and 255. A higher relative value indicates a lower trustworthiness rating. Preference is given to routes with smaller values. The default, if unspecified, is 110.
clns	(Optional.) CLNS-derived routes for IS-IS.

Default

- Static routes—10
- ISO-IGRP routes—100
- IS-IS routes—110

Command Mode

Router configuration

Usage Guidelines

When multiple routing processes are running in the same router for CLNS, it is possible for the same route to be advertised by more than one routing process. The router always picks the route whose routing protocol has the lowest administrative distance.

The **show clns protocols** EXEC command displays the default administrative distance for a specified routing process.

Example

In the following example, the distance value for CLNS routes learned is 90. Preference is given to these CLNS routes rather than routes with the default administrative distance value of 110.

```
router isis
distance 90 clns
```

domain-password

Use the **domain-password** router configuration command to configure the routing domain authentication password. The **no domain-password** command disables the password.

domain-password *password*
no domain-password [*password*]

Syntax Description

password	Password you assign.

Default

None set

Command Mode

Router configuration

Usage Guidelines

This password is inserted in Level 2 (area router level) LSPs, CSNPs, and Partial Sequence Number PDUs (PSNP).

Example

The following example assigns an authentication password to the routing domain:

```
router isis
domain-password flower
```

Related Command

area-password

ip domain-lookup nsap

Use the **ip domain-lookup nsap** global configuration command to allow Domain Name System (DNS) queries for CLNS addresses. To disable this feature, specify the **no ip domain-lookup nsap** command.

ip domain-lookup nsap
no ip domain-lookup nsap

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Global configuration

Usage Guidelines

With both IP and ISO CLNS enabled on a router, this feature allows you to discover a CLNS address without having to specify a full CLNS address. This feature is useful for the ISO CLNS **ping** EXEC command and when making Telnet connections.

Example

The following example disables DNS queries of CLNS addresses:

```
no ip domain-lookup nsap
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

ip domain-lookup †
ping

is-type

Use the **is-type** router configuration command to configure the IS-IS level at which the router is to operate. The **no is-type** command resets the parameter to the default.

is-type {**level-1** | **level-1-2** | **level-2-only**}
no is-type {**level-1** | **level-1-2** | **level-2-only**}

Syntax Description

level-1	Causes the router to act as a station router.
level-1-2	Causes the router to act as both a station router and an area router.
level-2-only	Causes the router to act as an area router only.

Default

level-1-2

Command Mode

Router configuration

Usage Guidelines

It is normally not necessary to configure this feature because the IS-IS protocol will automatically determine area boundaries and keep Level 1 and Level 2 routing separate. Indiscriminate use of this feature may cause incorrect operation, such as routing loops brought on by an accidental partitioning of a Level 1 area.

Example

The following example specifies a router as capable of being used as an area router only:

```
clns routing
router isis area1
net 47.0004.004d.0001.0000.0c11.1111.00
is-type level-2-only
```

isis adjacency-filter

Use the **isis adjacency-filter** interface configuration command to filter the establishment of IS-IS adjacencies. Use the **no** form of this command to disable filtering of the establishment of IS-IS adjacencies.

isis adjacency-filter *name* [**match-all**]
no isis adjacency-filter *name* [**match-all**]

Syntax Description

name	Name of the filter set or expression to apply.
match-all	(Optional.) All NSAP addresses must match the filter in order to accept the adjacency. If not specified (the default), only one address need match the filter in order for the adjacency to be accepted.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

Filtering is performed by building NSAP addresses out of incoming IS-IS Hello packets by combining each area address in the Hello with the system ID. Each of these NSAP addresses is then passed through the filter. If any one NSAP matches, the filter is considered "passed," unless **match-all** was specified, in which case all addresses must pass. The functionality of the **match-all** keyword is useful in performing "negative tests," such as accepting an adjacency only if a particular address is *not* present.

Filtering is performed on full NSAP addresses. If filtering should only be performed on system IDs, or any other substring of the full NSAP address, the wildcard matching capabilities of filter sets should be used to ignore the insignificant portions of the NSAP addresses.

Filter sets and expressions are described in this manual in the descriptions for the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Example

The following example builds a filter which accepts adjacencies with only two systems, based only on their system IDs:

```
clns filter-set ourfriends ...0000.0c00.1234.**
clns filter-set ourfriends ...0000.0c00.125a.**

interface ethernet 0
isis adjacency-filter ourfriends
```

Related Commands

clns filter-expr
clns filter-set
clns template-alias

isis circuit-type

Use the **isis circuit-type** interface configuration command to configure the type of adjacency desired for the specified interface. The **no isis circuit-type** command resets the circuit type to Level l and Level 2.

isis circuit-type {**level-1** | **level-1-2** | **level-2-only**}
no isis circuit-type

Syntax Description

level-1	Level 1 adjacency can be established if there is at least one area address in common between this system and its neighbors.
level-1-2	Level 1 and 2 adjacency is established if the neighbor is also configured as **level-1-2** and there is at least one area in common. If there is no area in common, a Level 2 adjacency is established. This is the default.
level-2-only	Level 2 adjacency is established on the circuit. If the neighboring router is a Level 1 only router, no adjacency will be established.

Default

level-1-2

Command Mode

Interface configuration

Usage Guidelines

It is normally not necessary to configure this feature because the IS-IS protocol will automatically determine area boundaries and keep Level 1 and Level 2 routing separate. Indiscriminate use of this feature may cause incorrect operation, such as routing loops brought on by an accidental partitioning of a Level 1 area.

Example

In the following example, a router is configured to allow only a Level 1 adjacency. If there are no area addresses in common between this system and its neighbors, no adjacency will be formed:

```
clns router isis
interface serial 0
isis circuit type level-1
```

isis csnp-interval

Use the **isis csnp-interval** interface configuration command to configure the IS-IS Complete Sequence Number PDUs (CSNP) interval for the specified interface. The **no isis csnp-interval** command restores the default value.

isis csnp-interval *seconds* {**level-1** | **level-2**}
no isis csnp-interval *seconds* {**level-1** | **level-2**}

Syntax Description

seconds	Interval of time in seconds between transmission of CSNPs on multiaccess networks. (Only applies for the designated router.) The default is 10 seconds.
level-1	Interval of time between transmission of CSNPs for Level 1 independently.
level-2	Interval of time between transmission of CSNPs for Level 2 independently.

Default

10 seconds

Command Mode

Interface configuration

Usage Guidelines

This command only applies for the designated router (DR) for a specified interface. Only DRs send CSNP packets in order to maintain database synchronization. The CSNP interval can be configured independently for Level 1 and Level 2. This feature does not apply to serial point-to-point interfaces. It does apply to WAN connections if the WAN is viewed as a multiaccess meshed network.

Example

In the following example, interface serial 0 is configured for transmitting CSN PDUs every 5 seconds. The router is configured to act as a station router.

```
interface serial 0
isis csnp-interval 5 level-1
```

isis hello-interval

Use the **isis hello-interval** interface configuration command to specify the length of time in seconds between Hello packets that the router sends on the specified interface. The **no isis hello-interval** command restores the default value.

isis hello-interval *seconds* {**level-1** | **level-2**}
no isis hello-interval *seconds* {**level-1** | **level-2**}

Syntax Description

seconds	Unsigned integer value. A value three times the Hello interval *seconds* is advertised as the *holdtime* in the Hello packets transmitted. It must be the same for all routers attached to a common network. With smaller Hello intervals, topological changes are detected faster, but there is more routing traffic. The default is 10 seconds.
level-1	Configure the Hello interval for Level 1 independently. Use this on X.25, SMDS, and Frame Relay multiaccess networks.
level-2	Configure the Hello interval for Level 2 independently. Use with X.25, SMDS, and Frame Relay multiaccess networks.

Default

10 seconds

Command Mode

Interface configuration

Usage Guidelines

The Hello interval can be configured independently for Level 1 and Level 2, except on serial point-to-point interfaces. (Because there is only a single type of Hello packet sent on serial links, it is independent of Level 1 or Level 2.) The **level-1** and **level-2** keywords are used on X.25, SMDS, and Frame Relay multiaccess networks.

Example

In the following example, interface serial 0 is configured to advertise Hello packets every 5 seconds. The router is configured to act as a station router. This causes more traffic than configuring a longer interval, but topological changes will be detected faster.

```
interface serial 0
isis hello-interval 5 level-1
```

isis metric

Use the **isis metric** interface configuration command to configure the metric (or cost) for the specified interface. The **no isis metric** command restores the default metric value.

isis metric *default-metric delay-metric expense-metric error-metric* {**level-1** | **level-2**}
no isis metric {**level-1** | **level-2**}

Syntax Description

default-metric	Metric used for the redistributed route. The range is from 0 through 63. The default value is 10.
delay-metric	Not supported.
expense-metric	Not supported.
error-metric	Not supported.
level-1	The router acts as a station router (Level 1) only.
level-2	The router acts as an area router (Level 2) only.

Default

default-metric = 10

Command Mode

Interface configuration

Usage Guidelines

The *default-metric* is used as a value for the IS-IS metric. This is the value assigned when there is no QOS routing performed. Only this metric is supported by Cisco routers. You can configure this metric for Level 1 and/or Level 2 routing.

Specifying the **level-1** or **level-2** keywords resets the metric only for Level 1 or Level 2 routing, respectively.

Example

In the following example, interface serial 0 is configured for a default link-state metric cost of 15 for Level 1:

```
interface serial 0
isis metric 15 level-1
```

isis password

Use the **isis password** interface configuration command to configure the authentication password for a specified interface. The **no isis password** command disables authentication for IS-IS.

isis password *password* {**level-1** | **level-2**}
no isis password {**level-1** | **level-2**}

Syntax Description

password	Authentication password you assign for an interface.
level-1	Configure the authentication password for Level 1 independently. For Level 1 routing, the router acts as a station router only.
level-2	Configure the authentication password for Level 2 independently. For Level 2 routing, the router acts as an area router only.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

Different passwords can be assigned for different routing levels using the **level-1** and **level-2** keywords.

Specifying the **level-1** or **level-2** keywords disables the password only for Level 1 or Level 2 routing, respectively. If no keyword is specified, the default is **level-1**.

Example

The following example configures a password for interface serial 0 at Level 1:

```
interface serial 0
isis password frank level-1
```

isis priority

Use the **isis priority** interface configuration command to configure the priority of this system for designated router election. The **no isis priority** command resets priority to 64.

isis priority *value* {**level-1** | **level-2**}
no isis priority {**level-1** | **level-2**}

Syntax Description

value	Priority of a router; a number from 0 through 127. The default *value* is 64.
level-1	Set priority of a router for Level 1 independently.
level-2	Set priority of a router for Level 2 independently.

Default

64

Command Mode

Interface configuration

Usage Guidelines

Priorities can be configured for Level 1 and Level 2 independently. Specifying the **level-1** or **level-2** keywords resets priority only for Level 1 or Level 2 routing, respectively.

Example

The following example shows the Level 1 priority level being set to 50:

```
interface serial 0
isis priority 50 level-1
```

isis retransmit-interval

Use the **isis retransmit-interval** interface configuration command to configure the number of seconds between retransmission of IS-IS link-state PDU (LSP) retransmission for point-to-point links. The **no isis retransmit-interval** command restores the default value.

isis retransmit-interval *seconds*
no isis retransmit-interval *seconds*

Syntax Description

seconds	Integer that should be greater than the expected round-trip delay between any two routers on the attached network. The setting of this parameter should be conservative, or needless retransmission will result. The value should be larger for serial lines and virtual links. The default value is 5 seconds.

Default

5 seconds

Command Mode

Interface configuration

Example

The following example configures interface serial 0 for retransmission of IS-IS LSP every 10 seconds for a large serial line:

```
interface serial 0
isis retransmit-interval 10
```

iso-igrp adjacency-filter

Use the **iso-igrp adjacency-filter** interface configuration command to filter the establishment of ISO-IGRP adjacencies. Use the **no** form of this command to disable filtering of the establishment of ISO-IGRP adjacencies.

iso-igrp adjacency-filter *name*
no iso-igrp adjacency-filter *name*

Syntax Description

name	Name of the filter set or expression to apply.

Defaults

Disabled

Command Mode

Interface configuration

Usage Guidelines

Filtering is performed on full NSAP addresses. If filtering should only be performed on system IDs, or any other substring of the full NSAP address, the wildcard matching capabilities of filter sets should be used to ignore the insignificant portions of the NSAP addresses.

Filter sets and expressions are described in this manual in the descriptions for the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Example

The following example builds a filter which accepts adjacencies with only two systems, based only on their system IDs:

```
clns filter-set ourfriends ...0000.0c00.1234.**
clns filter-set ourfriends ...0000.0c00.125a.**

interface ethernet 0
iso-igrp adjacency-filter ourfriends
```

Related Commands

clns filter-expr
clns filter-set
clns template-alias

match

See the **route-map** global configuration command in this chapter.

metric weights

Use the **metric weights** router configuration command to specify different metrics for the ISO-IGRP routing protocol on CLNS. This command allows you to configure the metric constants used in the ISO-IGRP composite metric calculation of reliability and load. Use the **no metric weights** command to return the five *k* constants to their default values.

metric weights *qos k1 k2 k3 k4 k5*
no metric weights

Syntax Description

qos	Quality of Service. QOS defines transmission quality and availability of service. The argument must be 0, the *default metric*.
k1, k2, k3, k4, k5	Values that apply to ISO-IGRP for the default metric QOS. The *k* values are metric constants used in the ISO-IGRP equation that converts an IGRP metric vector into a scalar quantity. They are numbers from 0 through 127; higher numbers mean a greater multiplier effect.

Default

qos = 0
k1 = 1
k2 = 0
k3 = 1
k4 = 0
k5 = 0

Command Mode

Router configuration

Usage Guidelines

Two additional ISO-IGRP metrics can be configured. These are the bandwidth and delay associated with an interface.

Note Using the **bandwidth** and **delay** interface configuration commands to change the values of the ISO-IGRP metrics will also change the values of IP IGRP metrics.

By default, the IGRP composite metric is a 24-bit quantity that is a sum of the segment delays and the lowest segment bandwidth (scaled and inverted) for a given route. For a network of homogeneous media, this metric reduces to a hop count. For a network of mixed media (FDDI, Ethernet, and serial lines running from 9,600 bps to T1 rates), the route with the lowest metric reflects the most desirable path to a destination.

Use this command to alter the default behavior of IGRP routing and metric computation and allow the tuning of the IGRP metric calculation for a Quality of Service (QOS).

If k5 equals 0, the composite IGRP metric is computed according to the following formula:

```
metric = [K1 * bandwidth + (K2 * bandwidth) / (256 - load) + K3 * delay]
```

If k5 does not equal zero, an additional operation is done:

```
metric = metric * [K5 / (reliability + K4)]
```

The default version of IGRP has k1 = k3 = 1, k2 = k4 = k5 = 0.

Delay is in units of 10 microseconds. This gives a range of 10 microseconds through 168 seconds. A delay of all ones indicates that the network is unreachable.

Bandwidth is inverse minimum bandwidth of the path in bits per second scaled by a factor of 10e10. The range is from a 1200 bps line to 10 Gbps.

Table 1-1 lists the default values used for several common media.

Table 1-1 Bandwidth Values By Media Type

Media Type	Delay	Bandwidth
Satellite	200,000 (2 sec)	20 (500 Mbit)
Ethernet	100 (1 ms)	1,000
1.544 Mbps	2000 (20 ms)	6,476
64 kbps	2000	156,250
56 kbps	2000	178,571
10 kbps	2000	1,000,000
1 kbps	2000	10,000,000

Reliability is given as a fraction of 255. That is, 255 is 100 percent reliability or a perfectly stable link. Load is given as a fraction of 255. A load of 255 indicates a completely saturated link.

Example

In the following example, all five metric constants are set:

```
router iso-igrp
metric weights 0 2 0 1 0 0
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

bandwidth †
delay †

net

Use the **net** router configuration command to configure a Network Entity Title (NET) for the specified routing process. The **no net** command removes a specific NET; you must specify the NET.

net *network-entity-title*
no net *network-entity-title*

Syntax Description

network-entity-title	Area addresses for the ISO-IGRP or IS-IS area.

Default

None

Command Mode

Router configuration

Usage Guidelines

For IS-IS, multiple NETs per router are allowed, with a maximum of three. There is no default value for this command.

Although IS-IS allows you to configure multiple NETs, ISO-IGRP allows only one NET per routing process.

The **net** router configuration command allows you to specify a name for an NET, as well as an address.

Examples

The following example illustrates specifying an NET for ISO-IGRP:

```
router iso-igrp Finance
net 47.0004.004d.0001.0000.0c11.1111.00
```

The following example illustrates specifying a single NET for IS-IS:

```
router isis Pieinthesky
net 47.0004.004d.0001.0000.0c11.1111.00
```

ping (privileged)

Use the ISO CLNS **ping** privileged EXEC command to send ISO CLNS echo packets to test the reachability of a remote host over a connectionless OSI network. The ping command sends an echo request packet to an address, then awaits a reply. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.

ping clns {*host* | *address*}

Syntax Description

clns	CLNS protocol.
host	Host name of system to ping.
address	Address of system to ping.

Command Mode

Privileged EXEC

Usage Guidelines

The OSI Connectionless Network Protocol (ISO 8473) does not specify a network-level echo protocol. The Internet Engineering Task Force (IETF) has specified and proposed such a protocol in RFC 1139. Cisco has implemented this specification using the proposed new PDU types Echo Request (1E) and Echo Reply (1F). Non-Cisco routers may or may not forward these packets, depending on whether they are specific about the packet types they will forward. End Systems may not recognize these packets, but will typically generate an error packet (ERPDU) as a response. This ERPDU is useful, as it confirms the reachability of the end system.

To abort a ping session, type the escape sequence (by default, Ctrl-^ X, which is done by simultaneously pressing the Ctrl, Shift, and 6 keys, letting go, then pressing the X key).

Table 1-2 describes the test characters that the ping facility sends.

Table 1-2 Ping Test Characters

Character	Description
!	Each exclamation point indicates receipt of a reply.
.	Each period indicates the network server timed out while waiting for a reply.
U	A destination unreachable error PDU was received.
C	A congestion experienced packet was received.
I	User interrupted test.
?	Unknown packet type.
&	Packet lifetime exceeded.

Sample ISO CLNS Display Using a Named Source

The following display shows a sample ISO CLNS ping session that uses a name to specify the source:

```
Router# ping
Protocol [ip]: clns
Target CLNS address: thoth
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Source CLNS address [39.000f.aa00.0400.013c.00]:
Type escape sequence to abort.
Sending 5, 100-byte CLNS Echos to
55.0006.0100.0000.0000.0001.8888.1112.1314.151
6.00, timeout is 2 seconds:
!!!!!
Success rate is 100 percent, round-trip min/avg/max = 112/113/116 ms
```

Sample ISO CLNS Display Using a NET Address

The following display shows a sample ISO CLNS **ping** session that uses a NET address to specify the source:

```
Router# ping
Protocol [ip]: clns
Target CLNS address: 47.0004.0050.0002.0000.0c00.243b.00
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Source CLNS address [39.000f.aa00.0400.013c.00]:
Type escape sequence to abort.
Sending 5, 100-byte CLNS Echos to 47.0004.0050.0002.0000.0C00.243B.00,
timeout is 2 seconds:
!!!!!
Success rate is 100 percent, round-trip min/avg/max = 1/4/8 ms
```

Table 1-3 describes the fields shown in the display.

Table 1-3 Ping Field Descriptions

Field	Description
Protocol [ip]:	Default is IP. Enter **clns**.
Target CLNS address:	Prompts for the CLNS address or host name of the destination node you plan to ping.
Repeat count [5]:	Number of ping packets that will be sent to the destination address. Default: 5.
Datagram size [100]:	Size of the ping packet (in bytes). Default: 100 bytes.
Timeout in seconds [2]:	Timeout interval. Default: 2 (seconds).
Source address:	Address that appears in the ping packet as the source address.

Sample ISO CLNS Display Using the IP Domain Name System (DNS)

If you have both ISO CLNS and IP enabled, you can use the Domain Name System (DNS) to query ISO CLNS addresses through use of the "NSAP" type.

For example, suppose your DNS entries look something like the following:

```
    foo.cisco.comIN          A             1.2.3.4
    bar.cisco.comIN          NSAP
47.0005.80.FEFF00.0000.0001.0001.1b2a.0000.0c1a.1bff.00
    baz.cisco.comIN          A             1.2.3.5
                                           IN              NSAP
47.0005.80.FEFF00.0000.0001.0001.1b2a.0000.0c1a.1b2c.00
```

Based on the above entries, the following examples will produce the results as indicated:

```
Router# ping foo.cisco.com
! this will do an IP style ping

Router# ping bar.cisco.com
! this will do a CLNS style ping (since only a NSAP entry appears)

Router# ping baz.cisco.com
! this will do an IP style ping (prefers IP if it can get it)

Router# ping
Protocol [ip]: clns
Target CLNS address: baz.cisco.com
! this will do a CLNS ping the NSAP for baz.cisco.com
```

Related Command

ping (user)

ping (user)

Use the ISO CLNS **ping** user EXEC command to send ISO CLNS echo packets to test the reachability of a remote host over a connectionless OSI network.

ping clns {*host* | *address*}

Syntax Description

clns	CLNS protocol.
host	Host name of system to ping.
address	Address of system to ping.

Command Mode

EXEC

Usage Guidelines

The OSI Connectionless Network Protocol (ISO 8473) does not specify a network-level echo protocol. The Internet Engineering Task Force (IETF) has specified and proposed such a protocol in RFC 1139. Cisco has implemented this specification using the proposed new PDU types Echo Request (1E) and Echo Reply (1F). Non-Cisco routers may or may not forward these packets, depending on whether they are specific about the packet types they will forward. End Systems may not recognize these packets, but will typically generate an error packet (ERPDU) as a response. This ERPDU is useful, as it confirms the reachability of the end system.

The user ping feature provides a basic ping facility for CLNS users who do not have system privileges. This feature allows the router to perform the simple default ping functionality for the CLNS protocol. Only the nonverbose form of the **ping** command is supported for user pings.

If the system cannot map an address for a host name, it will return an "%Unrecognized host or address" error message.

To abort a ping session, type the escape sequence (by default, Ctrl-^ X, which is done by simultaneously pressing the Ctrl, Shift, and 6 keys, letting go, then pressing the X key).

Table 1-4 describes the test characters that the ping facility sends.

Table 1-4 Ping Test Characters

Character	Description
!	Each exclamation point indicates receipt of a reply.
.	Each period indicates the network server timed out while waiting for a reply.
U	A destination unreachable error PDU was received.
C	A congestion experienced packet was received.
I	User interrupted test.
?	Unknown packet type.
&	Packet lifetime exceeded.

Sample ISO CLNS Display Using a NET Address

The following display shows sample ping output when you ping the CLNS address 47.0004.0050.0002.0000.0c00.243b.00:

```
router> ping clns 47.0004.0050.0002.0000.0c00.243b.00
Sending 5, 100-byte CLNS Echos to 47.0004.0050.0002.0000.0C00.243B.00,
timeout is 2 seconds:
!!!!!
Success rate is 100 percent, round-trip min/avg/max = 1/4/8 ms
```

Related Command

ping (privileged)

redistribute

Use the **redistribute** router configuration command to redistribute routes from one routing domain into another routing domain. The **no redistribute** command disables redistribution, or disables any of the specified keywords.

redistribute *router-name* [*tag*] [**route-map** *map-tag*]
no redistribute *router-name* [*tag*] [**route-map** *map-tag*]

Syntax Description

router-name	Type of other routing protocol that is to be redistributed as a source of routes into the current routing protocol being configured. The keywords supported are **iso-igrp**, **isis**, and **static** [**clns**]. The keyword **static** [**clns**] is used to redistribute CLNS prefix static routes. This causes the router to inject any static CLNS routes into the domain. The optional **clns** keyword is used when redistributing into IS-IS.
tag	(Optional.) Meaningful name for a routing process.
route-map *map-tag*	(Optional.) A route map should be interrogated to filter the importation of routes from this source routing protocol to the current routing protocol. If not specified, all routes are redistributed. If this keyword is specified, but no route map tags are listed, no routes will be imported. The argument *map-tag* is the identifier of a configured route map.

Default

Disabled, except for static routes, which by default are redistributed into ISO-IGRP and IS-IS routing domains.

Command Mode

Router configuration

Usage Guidelines

When used with IS-IS, the **redistribute** command causes the routes learned by the routing process tag to be advertised in the IS-IS routing process. Static routes are always redistributed into IS-IS unless a **no redistribute static** is performed. Redistribution only occurs for Level 2 routing.

You can specify only one IS-IS process per router. Creating a name for a routing process means that you use names when configuring routing. If the *tag* argument is not specified, a null tag is assumed. It must be unique among all CLNS router processes for a given router.

When used with ISO-IGRP, if you have a router that is in two routing domains, you might want to redistribute routing information between the two domains. The **redistribute** router configuration command configures which routes are redistributed into the ISO-IGRP domain. It is not necessary to use redistribution between areas.

The *tag* argument must be unique among all CLNS router processes for a given router. This tag should be the same as defined for the routing process in the **router iso-igrp** global configuration command.

Static routes are only redistributed into ISO-IGRP when a **redistribute static** command is entered. The default is to not redistribute static routes into ISO-IGRP. Only the router that injects the static route needs to have a **redistribute static** command defined. This command is needed only when you run ISO-IGRP.

Examples

The following example illustrates redistribution of ISO-IGRP routes of Michigan and ISO-IGRP routes of Ohio into the IS-IS area tagged USA:

```
router isis USA
redistribute iso-igrp Michigan
redistribute iso-igrp Ohio
```

The following example illustrates redistribution of IS-IS routes of France and ISO-IGRP routes of Germany into the ISO-IGRP area tagged Backbone:

```
router iso-igrp Backbone
redistribute isis France
redistribute iso-igrp Germany
```

In the following example, the router advertises any static routes it knows about in the Chicago domain:

```
router iso-igrp Chicago
redistribute static
```

Related Command

route-map

route-map (including match and set route-map configuration commands)

Use the **route-map** global configuration command, and the route-map configuration commands **match** and **set**, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map**. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

route-map *map-tag* {**permit** | **deny**} *sequence-number*
no route-map *map-tag* {**permit** | **deny**} *sequence-number*

Syntax Description

map-tag	Meaningful name for the route map. The **redistribute** command uses this name to reference this route map. Multiple route-maps can share the same map tag name. Can either be an expression or a filter set.
permit	If the match criteria are met for this route map, and **permit** is specified, the route is redistributed as controlled by the set actions. If the match criteria are not met, and **permit** is specified, the next route map with the same map-tag is tested. If a route passes none of the match criteria for the set of route maps sharing the same name, it is not redistributed by that set.
deny	If the match criteria are met for the route map, and **deny** is specified, the route is not redistributed, and no further route maps sharing the same map tag name will be examined.
sequence-number	Number that indicates the position a new route map is to have in the list of route maps already configured with the same name. If given with the **no** form of the command, it specifies the position of the route map that should be deleted.

match route-map configuration commands

The **match** route-map configuration command has multiple formats. Each format is shown below, described as separate commands. The **match** commands can be given in any order, and all **match** commands must "pass" to cause the route to be redistributed according to the *set actions* given with the **set** commands. The **no** forms of the **match** commands remove the specified match criteria.

Use this form of the **match** command for any routes with address specified by a standard access list:

match clns address *name* [*name...name*]
no match clns address *name* [*name...name*]

Syntax Description

clns address	Any routes with the network address passed by one or more of the standard access lists specified will be redistributed.
name	Name of filter set or expression.

Use this form of the **match** command for any routes which have their next hop out one of the interfaces specified:

match interface *name unit* [*name unit...name unit*]
no match interface *name unit* [*name unit...name unit*]

Syntax Description

interface	Any routes that have their next hop out one of the interfaces specified will be redistributed.
name unit	Names of interfaces, such as “Ethernet 0” or “Serial 2”.

Use this form of the **match** command for any routes with the metric specified:

match metric *metric-value*
no match metric *metric-value*

Syntax Description

metric	Any routes with the metric specified will be redistributed.
metric-value	Route metric. This can be an IGRP five-part metric.

Use this form of the **match** command for any routes that have a next-hop router address passed by one of the access lists specified:

match clns next-hop *name* [*name...name*]
no match clns next-hop *name* [*name...name*]

Syntax Description

clns next-hop	Any routes that have a next-hop router address passed by one of the access lists specified will be redistributed.
name	Name of filter set or expression.

Use this form of the **match** command for any routes which have been advertised by routers at the address specified by the access lists:

match clns route-source *name* [*name..name*]
no match clns route-source *name* [*name..name*]

Syntax Description

clns route-source	Any routes which have been advertised by routers at the address specified by the access lists will be redistributed. There are situations in which a route's next hop and source router address may not be the same.
name	Name of filter set or expression.

Use this form of the **match** command for any routes which are of the specified type:

match route-type {**level-1** | **level-2**}
no match route-type {**level-1** | **level-2**}

Syntax Description

route-type	Any routes that are of the specified type will be redistributed.
level-1	IS-IS Level 1 routes.
level-2	IS-IS Level 2 routes.

set route-map configuration commands

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all of a route map's match criteria are met. When all match criteria are met, all set actions are performed.

Use this form of the **set** command to provide a mechanism to perform conditional route aggregation as well as conditional default route advertisements. Using this command is allowed in the route-map although no protocols support conditional aggregation at this time.

set clns destination *prefix*
no set clns destination *prefix*

Syntax Description

destination	NSAP of a "route" to advertise instead of the one under consideration. This provides a mechanism to perform conditional route aggregation as well as conditional default route advertisements. There is no default value.
prefix	NSAP prefix to advertise.

Use this form of the **set** command for routes that are advertised into this specified area of the routing domain:

set level {**level-1** | **level-2** | **level-1-2**}
no set level {**level-1** | **level-2** | **level-1-2**}

Syntax Description

level	Redistributed routes are advertised into this specified area of the routing domain. For IS-IS destinations, the default value is **level-2**.
level-1	Inserted in IS-IS Level 1 LSPs.
level-2	Inserted in IS-IS Level 2 LSPs.
level-1-2	Inserted into both Level 1 and Level 2 IS-IS LSPs.

Use this form of the **set** command to set the metric value to give the redistributed routes:

set metric *metric-value*
no set metric *metric-value*

Syntax Description

metric	Metric value to give the redistributed routes. There is no default value.
metric-value	Route metric. This can be an IGRP five-part metric.

Use this form of the **set** command to set the metric type to give redistributed routes:

set metric-type {**internal** | **external**}
no set metric-type {**internal** | **external**}

Syntax Description

metric-type	Metric type to give redistributed routes. There is no default value.
internal	IS-IS internal metric.
external	IS-IS external metric.

Use this form of the **set** command to set a tag value to associate with the redistributed routes:

set tag *tag-value*
no set tag *tag-value*

Syntax Description

tag	Tag value to associate with the redistributed route. If not specified, the default action is to *forward* the tag in the source routing protocol onto the new destination protocol.
tag-value	Name for the tag.

Default

Disabled

Command Mode

route-map: global configuration
match and **set**: route-map configuration

Usage Guidelines

Use route maps when you wish to have detailed control over how routes are redistributed between routing processes.

Example

Given the following configuration, a RIP learned route for network 160.89.0.0 and an ISO-IGRP learned route with prefix 49.0001.0002 will be redistributed into an IS-IS Level 2 LSP with metric 5:

```
router isis
redistribute rip route-map ourmap
redistribute iso-igrp remote route-map ourmap

route-map ourmap permit
match ip address 1
match clns address ourprefix
set metric 5
set level level-2

access-list 1 permit 160.89.0.0 0.0.255.255
clns filter-set ourprefix permit 49.0001.0002...
```

Related Command

redistribute

router isis

Use the **router isis** global configuration command to enable the IS-IS routing protocol on your router and to configure the IS-IS routing process. This command identifies the area the router will work in and lets the router know that it will be routing dynamically rather than statically. The **no router isis** command with the appropriate tag disables IS-IS routing for the system.

router isis [*tag*]
no router isis [*tag*]

Syntax Description

tag	(Optional.) Meaningful name for a routing process. If it is not specified, a null tag is assumed. The argument *tag* must be unique among all CLNS router processes for a given router. The *tag* argument is used later as a reference to this process.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

Creating a name for a routing process means that you use names when configuring routing. You can specify only one IS-IS process per router.

Only one IS-IS process is allowed whether you run it in integrated mode, ISO CLNS only, or IP only.

Example

The following example illustrates starting IS-IS routing with the optional *tag* argument:

```
router isis Pieinthesky
```

Related Commands

net
clns router isis

router iso-igrp

Use the **router iso-igrp** global configuration command to identify the area the router will work in and let it know that it will be routing dynamically using the ISO-IGRP protocol. The **no router iso-igrp** command with the appropriate tag disables ISO-IGRP routing for the system.

router iso-igrp [*tag*]
no router iso-igrp [*tag*]

Syntax Description

tag	(Optional.) Meaningful name for a routing process. For example, you could define a routing process named *Finance* for the Finance department, and another routing process named *Marketing* for the Marketing department. If not specified, a null tag is assumed. The *tag* argument must be unique among all CLNS router processes for a given router.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

Creating a name for a routing process means that you use names when configuring routing. You can specify up to ten ISO-IGRP processes.

Example

In the following example, a router is specified in *Manufacturing*. The command must be typed on one line.

```
router iso-igrp Manufacturing
```

Related Commands

net
clns router iso-igrp

set

See the **route-map** global configuration command in this chapter.

show clns

Use the **show clns** EXEC command to display information about the CLNS network.

show clns

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns** command:

```
Router#  show clns

Global CLNS Information:
  2 Interfaces Enabled for CLNS
  NET: 39.0004.0030.0000.0C00.224D.00
  NET: 39.0003.0020.0000.0C00.224D.00
  Configuration Timer: 60, Default Holding Timer: 300, Packet Lifetime 64
  ERPDU's requested on locally generated packets
  Intermediate system operation enabled (forwarding allowed)
  ISO-IGRP level-1 Router: remote
     Routing for Domain: 39.0003, Area: 0020
  ISO-IGRP level-2 Router: DOMAIN_remote
     Routing for Domain: 39.0003
  IS-IS level-1-2 Router:
     Routing for Area: 39.0004.0030
```

Table 1-5 describes significant fields shown in the display.

Table 1-5 Show CLNS Field Descriptions

Field	Description
2 Interfaces Enabled for CLNS	Indicates how many interfaces have the CLNS routing protocol turned on.
NET: 39.0004.0030.0000.0C00.224D.00	First of two NETs for this router.
Configuration Timer: 60	Displays the interval (in seconds) after which the router will send out IS Hello packets.
Default Holding Timer: 300	Length of time (in seconds) the router's Hello packets will be remembered.
Packet Lifetime 64	Default value used in packets sourced by this router.
ERPDU's requested on locally generated packets	Indicates whether error PDUs (ERPDUs) will be requested for packets sourced by the router.
Intermediate system operation enabled (forwarding allowed)	Indicates whether or not this router is configured to be an End System or an Intermediate System. Because the purpose of a router is to route messages, it is not generally useful to configure a router to be an End System.
ISO-IGRP level-1 Router: remote	Specifies what CLNS routing type (ISO-IGRP or IS-IS) and what routing level (Level 1, Level 2, or both) is enabled on the router.

Field	Description
Routing for Domain: 39.0003, Area: 0020	Specifies the domain (39.0003) and area (0020) for which this CLNS routing type and routing level is enabled.
IS-IS level-1-2 Router:	Specifies that IS-IS is running in this router. Its tag is null. It is running Level 1 and Level 2.
Routing for Area: 39.0004.0030	Specifies the IS-IS area this router is in.

show clns cache

Use the **show clns cache** EXEC command to display the CLNS routing cache. The cache contains an entry for each destination that has packet switching enabled. The output of this command includes entries showing each destination for which the router has switched a packet in the recent past. This includes the router.

show clns cache

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns cache** command:

```
Router# show clns cache

CLNS routing cache version 433
Destination -> Next hop @ Interface : SNPA Address
[42] *39.0004.0040.0000.0C00.2D55.00 ISOLATOR
-> 0000.0C00.2D55 @ Serial2 : 0000.0c00.6fa5
```

Table 1-6 describes significant fields shown in the display.

Table 1-6 Show CLNS Cache Field Descriptions

Field	Description
CLNS routing cache version 433	Number identifying this particular CLNS routing cache.
Destination ->	Destination NSAP for the packet.
Next hop	Next hop system ID used to reach the destination.
@ Interface :	Interface through which the router transmitted the packet.
[42]	Cache location for this entry.
39.0004.0040.0000.0C00.2D55.00	NSAP address.
ISOLATOR	NSAP host name.

Note A leading asterisk (*) indicates that the entry is valid.

Related Command

clear clns cache

show clns es-neighbors

Use the **show clns es-neighbors** EXEC command to list the ES neighbors (end-system adjacencies) that this router knows about.

show clns es-neighbors [*interface-type unit*] [**detail**]

Syntax Description

interface-type unit	(Optional.) Specifies that information for a particular interface is to be displayed. For example, e0 specifies the first Ethernet interface; e1 specifies the second Ethernet interface. You must specify both the *interface-type* and *unit* number.
detail	(Optional.) When specified, the areas associated with the End Systems are displayed. Otherwise, a summary display is provided.

Command Mode

EXEC

Sample Display Using Specific Interface

The following is sample output from the **show clns es-neighbors** command when the Ethernet0 interface is specified:

```
Router# show clns es-neighbors
System Id       Interface   State  Type  Format
0800.2B14.060E  Ethernet0   Up     ES    Phase V
0800.2B14.0528  Ethernet0   Up     ES    Phase V
```

Table 1-7 describes the significant fields shown in the display.

Table 1-7 Show CLNS ES-Neighbors Field Descriptions

Field	Descriptions
System Id	Identification value of the system.
Interface	Interface on which the router was discovered.
State	Adjacency state. Up and Init are the states. See the **show clns neighbors** description.
Type	Type of neighbor. Only valid value for the **show clns es-neighbors** EXEC command is ES (end-system).
Format	Indicates if the neighbor is either a Phase V (OSI) adjacency or Phase IV (DECnet) adjacency.

Sample Display Using the Detail Option

The following is sample output from the **show clns es-neighbors detail** command:

```
Router# show clns es-neighbors detail
System Id       Interface   State  Type  Format
0800.2B14.060E  Ethernet0   Up     ES    Phase V
Area Address(es): 49.0040
0800.2B14.0528  Ethernet0   Up     ES    Phase V
Area Address(es): 49.0040
```

Notice that the information displayed in **show clns es-neighbors detail** output includes everything shown in **show clns es-neighbors** output, but it also includes the area addresses associated with the ES neighbors (end-system adjacencies).

Related Command

clear clns es-neighbors

show clns filter-expr

Use the **show clns filter-expr** EXEC command to display one or all currently defined CLNS filter expressions.

show clns filter-expr [*name*] [**detail**]

Syntax Description

name	(Optional.) Name of the filter expression to display. If none is specified, all are displayed.
detail	(Optional.) When specified, expressions are evaluated down to their most primitive filter set terms before being displayed.

Command Mode

EXEC

Sample Displays

The following displays assume filter expressions have been defined with the following commands. FRED, BARNEY, WILMA and BETTY are all filter sets.

```
clns filter-expr MEN FRED or BARNEY
clns filter-expr WOMEN WILMA or BETTY
clns filter-expr COUPLE MEN and WOMEN
```

The command **show clns filter-expr** would yield the following output:

```
Router# show clns filter-expr
MEN = FRED or BARNEY
WOMEN = WILMA or BETTY
COUPLE = MEN and WOMEN
```

The command **show clns filter-expr detail** would yield the following output:

```
Router# show clns filter-expr detail
MEN = FRED or BARNEY
WOMEN = WILMA or BETTY
COUPLE = (FRED or BARNEY) and (WILMA or BETTY)
```

Related Command

clns filter-expr

show clns filter-set

Use the **show clns filter-set** EXEC command to display one or all currently defined CLNS filter sets.

show clns filter-set [*name*]

Syntax Description

name	(Optional.) Name of the filter set to display. If none is specified, all are displayed.

Command Mode

EXEC

Sample Display

The following displays assumes filter sets have been defined with the following commands:

```
clns filter-set US-OR-NORDUNET 47.0005...
clns filter-set US-OR-NORDUNET 47.0023...
clns filter-set LOCAL 49.0003...
```

The command **show clns filter-set** would yield the following output:

```
Router# show clns filter-set
CLNS filter set US-OR-NORDUNET
permit 47.0005...
permit 47.0023...
CLNS filter set LOCAL
permit 49.0003...
```

Related Command

clns filter-set

show clns interface

Use the **show clns interface** EXEC command to list the CLNS-specific information about each interface.

show clns interface [*interface-type unit*]

Syntax Description

interface-type unit	(Optional.) A particular interface's information is to be displayed. For example, e0 specifies the first Ethernet interface; e1 specifies the second Ethernet interface. You must specify both the interface type and unit number.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns interface** command that includes information for Token Ring and Serial interfaces:

```
Router#  show clns interface
TokenRing 0 is administratively down, line protocol is down
  CLNS protocol processing disabled
  --More--
TokenRing 1 is up, line protocol is up
  Checksums enabled, MTU 4461, Encapsulation SNAP
  ERPDUs enabled, min. interval 10 msec.
  RDPDUs enabled, min. interval 100 msec., Addr Mask enabled
  Congestion Experienced bit set at 4 packets
  CLNS fast switching disabled
  DEC compatibility mode OFF for this interface
  Next ESH/ISH in 18 seconds
  Routing Protocol: ISO-IGRP
      Routing Domain/Area: <39.0003> <0020>
  --More--
  Serial 2 is up, line protocol is up
      Checksums enabled, MTU 1497, Encapsulation HDLC
ERPDUs enabled, min. interval 10 msec.
     RDPDUs enabled, min. interval 100 msec., Addr Mask enabled
     Congestion Experienced bit set at 4 packets
     CLNS fast switching enabled
     DEC compatibility mode OFF for this interface
     Next ESH/ISH in 48 seconds
  Routing Protocol: IS-IS
       Circuit Type: level-1-2
       Level-1 Metric: 10, Priority: 64, Circuit ID: 0000.0C00.2D55.0A
       Number of active level-1 adjacencies: 0
       Level-2 Metric: 10, Priority: 64, Circuit ID: 0000.0000.0000.00
       Number of active level-2 adjacencies: 0
       Next IS-IS LAN Level-1 Hello in 3 seconds
       Next IS-IS LAN Level-2 Hello in 3 seconds
```

Table 1-8 describes significant fields shown in the display.

Table 1-8 Show CLNS Interface Field Descriptions

Field	Description
TokenRing 0 is administratively down, line protocol is down	(First interface). Shown to be administratively down with CLNS disabled.
TokenRing 1 is up, line protocol is up/ Serial 2 is up, line protocol is up	(Second, third interfaces). Shown to be up, and CLNS is up.
Checksums enabled	Can be enabled or disabled.
MTU	The number following `MTU` is the maximum transmission size for a packet on this interface.
Encapsulation	Describes the encapsulation used by CLNP packets on this interface.
ERPDUs	Displays information about the generation of error PDUs (ERPDUs). They can be either enabled or disabled. If they are enabled, they will be sent out no more frequently than the specified interval.
RDPDUs	Provides information about the generation of redirect PDUs (RDPDUs). They can be either enabled or disabled. If they are enabled, they will be sent out no more frequently than the specified interval. If the address mask is enabled, redirects will be sent out with an address mask.
Congestion Experienced	Tells when CLNS will turn on the congestion experienced bit. The default is to turn this bit on when there are more than four packets in a queue.
CLNS fast switching	Displays whether or not fast switching is supported for CLNS on this interface.
DEC compatibility mode	Indicates whether DEC compatibility has been enabled.
Next ESH/ISH	Displays when the next ESH or ISH will be sent on this interface.
Routing Protocol	Lists the areas that this interface is in. In most cases, an interface will be in only one area.
Circuit type	Indicates whether the interface has been configured for local routing (Level 1), area routing (Level 2), or local and area routing (Level 1-2).
Remaining fields	Last series of fields displays information pertaining to the ISO CLNS routing protocols enabled on the interface. For ISO-IGRP, the routing domain and area addresses are specified. For IS-IS, the Level 1 and Level 2 metrics, priorities, Circuit IDs, and number of active Level 1 and Level 2 adjacencies are specified.

show clns is-neighbors

Use the **show clns is-neighbors** EXEC command to display IS-IS related information for IS-IS router adjacencies. Neighbor entries are sorted according to the area in which they are located.

show clns is-neighbors [*interface-type unit*] [**detail**]

Syntax Description

interface-type unit	(Optional.) Specifies that information for a particular interface is to be displayed. For example, e0 specifies the first Ethernet interface; e1 specifies the second Ethernet interface. You must specify both the *interface-type* and *unit* number.
detail	(Optional.) When specified, the areas associated with the Intermediate Systems are displayed. Otherwise, a summary display is provided.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns is-neighbor** command:

```
Router# show clns is-neighbors
System Id       Interface   State  Type  Priority  Circuit Id         Format
0000.0C00.0C35  Ethernet1   Up     L1    64        0000.0C00.62E6.03  Phase V
0800.2B16.24EA  Ethernet0   Up     L1L2  64/64     0800.2B16.24EA.01  Phase V
0000.0C00.3E51  Serial1     Up     L2    0         04                 Phase V
0000.0C00.62E6  Ethernet1   Up     L1    64        0000.0C00.62E6.03  Phase V
```

Table 1-9 describes significant fields shown in the display.

Table 1-9 Show CLNS IS-Neighbors Field Descriptions

Field	Descriptions
System Id	Identification value of the system.
Interface	Interface on which the router was discovered.
State	Adjacency state. Up and Init are the states. See the **show clns neighbors** description.
Type	L1, L2, and L1L2 type adjacencies. See the **show clns neighbors** description.
Priority	IS-IS priority that the respective neighbor is advertising. The highest priority neighbor is elected the designated IS-IS router for the interface.
Circuit Id	Neighbor's idea of what the designated IS-IS router is for the interface.
Format	Indicates if the neighbor is either a Phase V (OSI) adjacency or Phase IV (DECnet) adjacency.

Sample Display Using the Detail Option

The following is sample output from the **show clns is-neighbors detail** command:

```
Router# show clns is-neighbors
System Id       Interface   State  Type  Priority  Circuit Id         Format
0000.0C00.0C35  Ethernet1   Up     L1    64        0000.0C00.62E6.03  Phase V
  Area Address(es): 47.0004.004D.0001 39.0001
0800.2B16.24EA  Ethernet0   Up     L1L2  64/64     0800.2B16.24EA.01  Phase V
  Area Address(es): 47.0004.004D.0001
0000.0C00.3E51  Serial1     Up     L2    0         04                 Phase V
  Area Address(es): 39.0004
000.0C00.62E6  Ethernet1    Up     L1    64        0000.0C00.62E6.03  Phase V
  Area Address(es): 47.0004.004D.0001
```

Notice that the information displayed in **show clns is-neighbors detail** output includes everything shown in **show clns is-neighbors** output, but it also includes the area addresses associated with the IS neighbors (intermediate-system adjacencies).

Related Command

clear clns is-neighbors

show clns neighbors

The **show clns neighbors** EXEC command displays both ES and IS neighbors.

show clns neighbors [*interface-type unit*] [**detail**]

Syntax Description

interface-type unit	(Optional.) Specifies that information for a particular interface is to be displayed. For example, e0 specifies the first Ethernet interface; e1 specifies the second Ethernet interface. You must specify both the *interface-type* and *unit* number.
detail	(Optional.) When specified, the area addresses advertised by the neighbor in the Hello messages is displayed. Otherwise, a summary display is provided.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns neighbors** command. This display is a composite of the **show clns es-neighbor** and **show clns is-neighbor** commands.

```
Router# show clns neighbors
System Id          SNPA            Interface    State  Holdtime  Type Protocol
0000.0000.0007     aa00.0400.6408  Ethernet0    Init   277       IS   ES-IS
0000.0C00.0C35     0000.0c00.0c36  Ethernet1    Up     91        L1   IS-IS
0800.2B16.24EA     aa00.0400.2d05  Ethernet0    Up     29        L1L2 IS-IS
0800.2B14.060E     aa00.0400.9205  Ethernet0    Up     1698      ES   ES-IS
0000.0C00.3E51     *HDLC*          Serial1      Up     28        L2   IS-IS
0000.0C00.62E6     0000.0c00.62e7  Ethernet1    Up     22        L1   IS-IS
0A00.0400.2D05     aa00.0400.2d05  Ethernet0    Init   24        IS   ES-IS
```

Table 1-10 describes the fields shown in the display.

Table 1-10 Show CLNS Neighbors Field Descriptions

Field	Description
System Id	Six-byte value that identifies a system in an area.
SNPA	Subnetwork Point of Attachment. This is the data link address.
Interface	Interface in which the system was learned from.
State	State of the ES or IS.
Init	System is an IS and is waiting for an IS-IS Hello message. IS-IS regards the neighbor as not adjacent.
Up	Believes the ES or IS is reachable.
Holdtime	Number of seconds before this adjacency entry times out.
Type	The adjacency type. Possible values are:
ES	End-system adjacency either discovered via the ES-IS protocol or statically configured.

Field	Description
IS	Router adjacency either discovered via the ES-IS protocol or statically configured.
L1	Router adjacency for Level 1 routing only.
L1L2	Router adjacency for Level 2 routing.
L2	Router adjacency for Level 2 only.
Protocol	Protocol through which the adjacency was learned. Valid protocol sources are ES-IS, IS-IS, ISO-IGRP, Static, and DECnet.

Sample Display Using the Detail Option

The following is sample output from the **show clns neighbors detail** command:

```
Router# show clns neighbors detail
System Id       SNPA            Interface   State  Holdtime  Type  Protocol
000.0000.0007  aa00.0400.6408   Ethernet0   Init   291       IS    ES-IS
  Area Address(es): 47.0005.80FF.F500.0000.0003.0020
0000.0C00.0C35  0000.0c00.0c36   Ethernet1   Up     94        L1    IS-IS
  Area Address(es): 47.0004.004D.0001 39.0001
0800.2B16.24EA  aa00.0400.2d05   Ethernet0   Up     9         L1L2  IS-IS
  Area Address(es): 47.0004.004D.0001
0800.2B14.060E  aa00.0400.9205   Ethernet0   Up     1651      ES    ES-IS
  Area Address(es): 49.0040
0000.0C00.3E51  *HDLC*           Serial1     Up     27        L2    IS-IS
  Area Address(es): 39.0004
0000.0C00.62E6  0000.0c00.62e7   Ethernet1   Up     26        L1    IS-IS
  Area Address(es): 47.0004.004D.0001
oA00.0400.2D05  aa00.0400.2d05   Ethernet0   Init   29        IS    ES-IS
      Area Address(es): 47.0004.004D.0001
```

Notice that the information displayed in **show clns neighbors detail** output includes everything shown in **show clns neighbors** output, but it also includes the area addresses associated with the ES and IS neighbors (intermediate-system and end-system adjacencies).

Related Command

clear clns neighbors

show clns protocol

Use the **show clns protocol** EXEC command to list the protocol-specific information for each ISO-IGRP routing process in the router. There will always be at least two routing processes, a Level 1 and a Level 2, and there can be more.

show clns protocol [*domain* | *area-tag*]

Syntax Description

domain	(Optional.) A particular ISO-IGRP routing domain.
area-tag	(Optional.) A particular IS-IS area.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns protocol** command:

```
Router#  show clns protocol
ISO-IGRP Level 1 Router: remote
   Routing for domain: 39.0003 area: 0020
   Sending Updates every 45 seconds. Next due in 11 seconds
   Invalid after 135 seconds,
   Hold down for 145 seconds
   Sending Router Hellos every 17 seconds. Next due in 9 seconds
   Invalid after 51 seconds,
   IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
   Interfaces in domain/area:
        TokenRing1
 --More--
ISO-IGRP Level 2 Router: DOMAIN_remote
   Routing for domain: 39.0003
   Redistribute:
      isis (Null Tag)
   Sending Updates every 45 seconds. Next due in 2 seconds
   Invalid after 135 seconds,
   Hold down for 145 seconds
   Sending Router Hellos every 17 seconds. Next due in 0 seconds
   Invalid after 51 seconds,
   ISO-IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
   Interfaces in domain/area:
        TokenRing1
 --More--
IS-IS Router: <Null Tag>
   System Id: 0000.0C00.224D.00  IS-Type: level-1-2
   Manual area address(es):
        39.0004.0030
   Routing for area address(es):
        39.0004.0030
   Interfaces supported by IS-IS:
        Serial2
   Next global update in 530 seconds
   Redistributing:
      static
      iso-igrp (remote)
   Distance: 110
```

Table 1-11 describes significant fields shown in the display.

Table 1-11 Show CLNS Protocol Field Descriptions

Field	Description
ISO-IGRP Level 1 Router:	Indicates what CLNS routing type is enabled on the router. (Always ISO-IGRP when the fields in this section are displayed.) Also indicates what routing level (Level 1, Level 2 or both) is enabled on the router.
remote	Process tag that has been configured for the router using the **router iso-igrp** global configuration command.
Routing for domain: 39.0003 area: 0020	Domain address and area number for Level 1 routing processes. For Level 2 routing processes, this command lists the domain address.
Sending Updates every 45 seconds.	Displays when the next routing updates will be sent.
Next due in 11 seconds	Indicates when the next update will be sent.
Invalid after 135 seconds	Indicates how long routing updates are to be believed.
Hold down for 145 seconds	Indicates how long a route will be held down before new information is to be believed.
Sending Router Hellos every 17 seconds. Next due in 9 seconds	Indicates how often the routers will send Hello packets to each other and when the next is due.
Invalid after 51 seconds	Indicates how long a neighbor entry will be remembered.
IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0	Displays lists the weights applied to the various components of the metric. These fields are followed by the list of interfaces that are in this area
Interfaces in domain/area:	List of interface names for which the router process is configured.

Table 1-12 describes significant fields shown in the IS-IS portion of the display.

Table 1-12 Show CLNS Protocol with IS-IS Field Descriptions

Field	Description
IS_IS Router: <Null Tag>	Indicates what CLNS routing type is enabled on the router. (Always IS-IS when the fields in this section are displayed.)
System Id: 0000.0C00.224D.00	Identification value of the system.
IS-Type: level-1-2	Indicates what routing level (Level 1, Level 2 or both) is enabled on the router.
Manual area address(es): 39.0004.0030	Area address(es) that have been configured for the router.
Routing for area address(es): 39.0004.0030	List of manually configured and learned area addresses for the router.
Interfaces supported by IS-IS:	List of interfaces on the router supporting IS-IS.
Next global update in 530 seconds	Next expected IS-IS update (in seconds).
Redistributing:	Configuration of route redistribution.
Distance:	Configured distance.

show clns route

Use the **show clns route** EXEC command to display all of the destinations to which this router knows how to route packets.

The **show clns route** command shows the IS-IS Level 2 routing table as well as static and ISO-IGRP learned prefix routes. This table stores IS-IS area addresses and prefix routes. Destinations are sorted by category.

show clns route [*nsap*]

Syntax Description

nsap	(Optional.) CLNS address.

Command Mode

EXEC

Sample Display

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

```
Router#  show clns route
ISO-IGRP Routing Table for Domain 39.0003, Area 0020
System Id       Next-Hop        SNPA            Interface   Metric  State
0000.0C00.224D  0000.0000.0000  --              --          0       Up

ISO-IGRP Routing Table for Domain 39.0003
Area Id         Next-Hop        SNPA            Interface   Metric  State
0020            0000.0000.0000  --              --          0       Up

CLNS Prefix Routing Table
39.0003 [100/0]
  via 39.0004.0030.0000.0C00.224D.00, ISO-IGRP, Up
39.0004.0040 [110/10]
  via 0000.0C00.2D55, IS-IS, Up, Serial2
39.0004.0030 [110/0]
  via 0000.0C00.224D, IS-IS, Up
39.0004.0030.0000.0C00.224D.00, Local NET Entry
39.0003.0020.0000.0C00.224D.00, Local NET Entry
```

As the display shows, neighbors are not included in the **show clns route** output.

Table 1-13 describes significant fields shown in the display.

Table 1-13 Show CLNS Route Field Descriptions

Field	Descriptions
The following are for dynamically learned routes:	
Domain 39.0003	The routing domain for which we are displaying the routes.
Area 0020	The area this portion of the routing table describes.
System Id	Identification value of the system listed in Level 1 forwarding table.
Area Id	The identification value of the area listed in the area forwarding table.
Next-Hop	System ID of best cost next-hop to listed address.
SNPA	SNPA of next hop system.

Field	Descriptions
Interface	Interface through which next-hop system is known by router.
Metric	ISO-IGRP metric for the route.
State	Up (active) or Down (nonoperational).
The following are for prefix routes:	
39.0003	Destination prefix.
[100/0]	Administrative distance/metric.
Next-hop address	Either an NET (if a static route) or System ID, if route obtained via IS-IS or ISO-IGRP.
ISO-IGRP	Indicates whether the route was learned using ISO-IGRP or IS-IS.
Up	Link status—Up (active) or Down (nonoperational).
Serial 2 Local NET Entry	Interface type—Only appears if the specific interface through which the destination is reachable is unambiguously known to router; Local NET Entry indicates destination is on a directly connected network.

Output for the **show clns route** *nsap* command is the same as that for **show clns route**, but only lists a single entry.

Related Command

clear clns route

show clns traffic

Use the **show clns traffic** EXEC command to list the CLNS packets this router has seen.

show clns traffic

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Sample Display

The following is sample output from the **show clns traffic** command:

```
Router#  show clns traffic
CLNS & ESIS Output: 139885, Input: 90406
CLNS Local: 0, Forward: 0
CLNS Discards:
  Hdr Syntax: 150, Checksum: 0, Lifetime: 0, Output cngstn: 0
  No Route: 0, Dst Unreachable 0, Encaps. Failed: 0
  NLP Unknown: 0, Not an IS: 0
CLNS Options: Packets 19, total 19, bad 0, GQOS 0, cngstn exprncd 0
CLNS Segments:  Segmented: 0, Failed: 0
CLNS Broadcasts: sent: 0, rcvd: 0
Echos: Rcvd 0 requests, 69679 replies
  Sent 69701 requests, 0 replies
ESIS(sent/rcvd): ESHs: 0/34, ISHs: 483/1839, RDs: 0/0, QCF: 0/0
ISO-IGRP: Querys (sent/rcvd): 0/0 Updates (sent/rcvd): 1279/1402
ISO-IGRP: Router Hellos: (sent/rcvd): 1673/1848
ISO-IGRP Syntax Errors: 0
IS-IS:Level-1 Hellos(sent/rcvd):0/0
IS-IS:Level-2 Hellos(sent/rcvd):0/0
IS-IS:PTP Hellos(sent/rcvd):0/0
IS-IS:Level-1 LSPs(sent/rcvd):0/0
IS-IS:Level-2 LSPs(sent/rcvd):0/0
IS-IS:Level-1 CSNPs(sent/rcvd):0/0
IS-IS:Level-2 CSNPs(sent/rcvd):0/0
IS-IS:Level-1 PSNPs(sent/rcvd):0/0
IS-IS:Level-2 PSNPs(sent/rcvd):0/0
IS-IS:Level-1 DR Elections:0
IS-IS:Level-2 DR Elections:0
IS-IS:Level-1 SPF Calculations:0
IS-IS:Level-2 SPF Calculations:0
```

Table 1-14 describes significant fields shown in the display.

Table 1-14 Show CLNS Traffic Field Descriptions

Field	Description
CLNS & ESIS Output	Total number of packets that this router has sent.
Input	Total number of packets that this router has received.
CLNS Local	Lists the number of packets that were generated by this router.
Forward	Lists the number of packets that this router has forwarded.
CLNS Discards	Lists the packets that CLNS has discarded, along with the reason for the discard.

Field	Description
CLNS Options	Lists the options that have been seen in CLNS packets.
CLNS Segments	Lists the number of packets that have been segmented and the number of failures that occurred because a packet could not be segmented.
CLNS Broadcasts	Lists the number of CLNS broadcasts that have been sent and received.
Echos	Lists the number of echo request packets and echo reply packets that have been received. The line following this field lists the number of echo request packets and echo reply packets that have been sent.
ESIS (sent/rcvd)	Lists the number of ESH, ISH, and Redirects sent and received.
ISO-IGRP	Lists the number of IGRP queries and updates sent and received.
Router Hellos	Lists the number of IGRP router Hello packets that have been sent and received.
IS-IS: Level-1 Hellos (sent/rcvd)	Lists the number of Level 1 IS-IS Hello packets sent and received.
IS-IS: Level-2 Hellos (sent/rcvd)	Lists the number of Level 2 IS-IS Hello packets sent and received.
IS-IS: PTP Hellos (sent/rcvd)	Lists the number of point-to-point IS-IS Hello packets sent and received over serial links.
IS-IS: Level-1 LSPs (sent/rcvd)	Lists the number of Level 1 link state PDUs sent and received.
IS-IS: Level-2 LSPs (sent/rcvd)	Lists the number of Level 2 link state PDUs sent and received.
IS-IS: Level-1 CSNPs (sent/rcvd)	Lists the number of Level 1 complete sequence number PDUs sent and received.
IS-IS: Level-2 CSNPs (sent/rcvd)	Lists the number of Level 2 complete sequence number PDUs sent and received.
IS-IS: Level-1 PSNPs (sent/rcvd)	Lists the number of Level 1 partial sequence number PDUs sent and received.
IS-IS: Level-2 PSNPs (sent/rcvd)	Lists the number of Level 2 partial sequence number PDUs sent and received.
IS-IS: Level-1 DR Elections	Lists the number of times Level 1 designated router election occurred.
IS-IS: Level-2 DR Elections	Lists the number of times Level 2 designated router election occurred.
IS-IS: Level-1 SPF Calculations	Lists the number of times Level 1 shortest-path-first tree was computed.
IS-IS: Level-2 SPF Calculations	Lists the number of times Level 2 shortest path first tree was computed.

show isis database

Use the **show isis database** EXEC command to display the IS-IS link state database. A summary display is provided if no options are specified.

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

Syntax Description

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 option **level-1**.
l2	(Optional.) Abbreviation for the option **level-2**.
detail	(Optional.) When specified, the contents of each LSP is displayed. Otherwise, a summary display is provided.
lspid	(Optional.) Link-state protocol ID (LSPID). Displays the contents of the specified link state packet. The LSPID must be of the form xxxx.xxxx.xxxx.yy-zz or name.yy-zz. For a description of these values, see the table in the "Usage Guidelines" section on this page.

Command Mode

EXEC

Usage Guidelines

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

The values for the argument *lspid* are described in Table 1-15:

Table 1-15 LSPID Values

Value	Description
xxxx.xxxx.xxxx.yy-zz	xxxx.xxxx.xxxx—System ID. yy—Pseudo ID. zz—LSP number.
name.yy-zz	name—CLNS host name. yy—Pseudo ID. zz—LSP number.

Sample Display

The following is sample output from the **show isis database** command when specified with no options or as **show isis data l1 l2**:

```
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 1-16 describes significant fields shown in the display.

Table 1-16 Show IS-IS Database Field Descriptions

Field	Description
LSPID	The link state PDU ID. The first six octets form the System ID. The next octet is the pseudo ID. When this value is zero, the LSP describes links from the system. When it is nonzero, the LSP is a pseudo-node LSP. The designated router for an interface is the only system that originates pseudonode LSPs. The last octet is the LSP number. If there is more data than can fit in a single LSP, additional LSPs are sent with increasing LSP numbers. An asterisk (*) indicates that the LSP was originated by the local system.
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.
ATT	The attach bit. This indicates that the router is also a Level 2 router, and it can reach other areas.
P	The P bit. Detects if the IS is area partition repair capable.
OL	The Overload bit. Determines if the IS is congested.

Sample Display Using the Detail Option

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

Table 1-17 describes significant fields shown in the display.

Table 1-17 Show IS-IS Database Detail Field Descriptions

Field	Description
LSPID	The link state PDU ID. The first six octets form the System ID. The next octet is the pseudo ID. When this value is zero, the LSP describes links from the system. When it is nonzero, the LSP is a pseudo-node LSP. The designated router for an interface is the only system that originates pseudonode LSPs. The last octet is the LSP number. If there is more data than can fit in a single LSP, additional LSPs are sent with increasing LSP numbers. An asterisk (*) indicates that the LSP was originated by the local system.
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.
ATT	The attach bit. This indicates that the router is also a Level 2 router, and it can reach other areas.
P	The P bit. Detects if the IS is area partition repair capable.
OL	The Overload bit. Determines if the IS is congested.
Area Address:	Reachable area addresses from the router.
Metric:	IS-IS metric for the route.

show isis routes

Use the **show isis route**s EXEC command to display the IS-IS Level 1 forwarding table for IS-IS learned routes.

show isis routes

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Sample Display

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

```
Router# show isis routes

IS-IS Level-1 Routing Table - Version 34
System Id       Next-Hop        SNPA            Interface    Metric    State
0000.0C00.0C35  0000.0C00.0C35  0000.0c00.0c36  Ethernet1    20        Up
0800.2B16.24EA  0800.2B16.24EA  aa00.0400.2d05  Ethernet0    10        Up
0800.2B14.060E  0800.2B14.060E  aa00.0400.9205  Ethernet0    10        Up
0800.2B14.0528  0800.2B14.0528  aa00.0400.9105  Ethernet0    10        Up
0000.0C00.40AF  0000.0000.0000  --              --           0         Up
0000.0C00.62E6  0000.0C00.62E6  0000.0c00.62e7  Ethernet1    10        Up
AA00.0400.2D05  0800.2B16.24EA  aa00.0400.2d05  Ethernet0    10        Up
```

Table 1-18 describes significant fields shown in the display.

Table 1-18 Show ISIS Route Field Descriptions

Field	Description
Version 34	Indicates version number of the Level 1 routing table. All Level 1 routes with a version number that does not match this number are flushed from the routing table. The router's version number increments when the router configuration changes from Level 1 or Level 1-2 to Level 2 only.
System Id	Identification value of the system listed in Level 1 forwarding table.
Next-Hop	System ID of best cost next-hop to listed address.
SNPA	SNPA of next-hop system.
Interface	Interface through which next-hop system is known by router.
Metric	IS-IS metric for the route.
State	Up (active) or Down (non-operational).

show route-map

Use the **show route-map** EXEC command to display all route-maps configured or only the one specified.

show route-map [*map-name*]

Syntax Description

map-name	(Optional.) Name of a specific route-map.

Command Mode

EXEC

Sample Display

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

```
Router# show route-map
route-map foo, permit, sequence 10
  Match clauses:
    tag 1 2
  Set clauses:
    metric 5
route-map foo, permit, sequence 20
  Match clauses:
    tag 3 4
  Set clauses:
    metric 6
```

Table 1-19 describes the fields shown in the display:

Table 1-19 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.

Related Commands

redistribute
route-map

timers basic

Use the **timers basic** router configuration command to configure ISO-IGRP timers. The **no timers basic** command restores the default values.

timers basic *update-interval holddown-interval invalid-interval*
no timers basic *update-interval holddown-interval invalid-interval*

Syntax Description

update-interval	Time, in seconds, between the sending of routing updates. The default value is 90 seconds.
holddown-interval	Time, in seconds, a system or area router is kept in holddown state, during which routing information regarding better paths is suppressed. (A router 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 the holddown interval expires, routes advertised by other sources are accepted and the route is no longer inaccessible. The default value is 145 seconds.
invalid-interval	Time, in seconds, that a route remains in the routing table after it has been determined that it is not reachable. After that length of time, the route is removed from the routing table. The default value is 135 seconds.

Default

update-interval = 90 seconds
holddown-interval = 145 seconds
invalid-interval = 135 seconds

Command Mode

Router configuration

Usage Guidelines

Because the ISO-IGRP routing protocol executes a distributed, asynchronous routing algorithm, it is important that these timers be the same for all routers in the network.

Example

In the following example, updates are broadcast every 60 seconds. When an update packet is received that indicates the router is unreachable, the router will be in holddown state for 100 seconds before once more becoming accessible. If a router is not heard from in 130 seconds, the route is removed from the routing table.

```
router iso-igrp
timers basic 60 100 130
```

trace (privileged)

You can use the **trace** privileged EXEC command to trace routes on a router configured with the ISO CLNS protocol.

trace

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Usage Guidelines

The **trace** command terminates when the destination responds, when the maximum TTL was exceeded, or when the user interrupts the trace with the escape sequence. The information is encoded as follows:

hop-count name(nsap) *result-of-probe*

Sample Display

The following display shows an example of ISO CLNS **trace** output:

```
Protocol [ip]: clns
Target CLNS address: thoth
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Type escape sequence to abort.
Tracing the route to THOTH (55.0006.0100.0000.0000.0001.8888.1112.1314.1516)
 1 HORUS(55.0006.0100.0000.0000.0001.6666.3132.3334.3536) 32 msec ! 28 msec
28 msec !
 2 ISIS(55.0006.0100.0000.0000.0001.7777.2122.2324.2526) 56 msec ! 80 msec
56 msec !
 3 THOTH(55.0006.0100.0000.0000.0001.8888.1112.1314.1516) 80 msec ! 80 msec ! 8
```

Table 1-20 describes the parameters that can be specified when using the **trace** dialog for CLNS.

Table 1-20 ISO CLNS Trace Field Descriptions

Field	Description
Protocol [ip]	The default protocol for **trace** is IP. You must specify CLNS to begin tracing a router on a CLNS router.
Target CLNS address	You can specify either an NSAP or host name.
Timeout in seconds	You can specify the length of time to wait after sending each probe before giving up on getting a response.

Field	Description
Probe count	You can specify the number of probes to be sent at each TTL level. The default is 3.
Minimum Time to Live [1]	You can set the TTL value for the first probes. The default is 1. Set to a higher value to suppress the display of known hops.
Maximum Time to Live [30]	You can set the largest TTL value that can be used. The default is 30. The **trace** command terminates when the destination is reached or when this value is reached.

Table 1-21 describes characters that can appear in ISO CLNS output.

Table 1-21 ISO CLNS Trace Characters

Character	Description
&	A time-to-live-exceeded error PDU was received.
U	A destination unreachable error PDU was received.
I	The user interrupted the test.
*	The probe timed out.
C	A congestion experienced packet was received.

Related Command

trace (user)

trace (user)

Use the **trace** user EXEC command to discover the CLNS routes the router's packets will actually take when traveling to their destination.

trace clns *destination*

Syntax Description

destination	Destination address or host name on the command line. The default parameters for the appropriate protocol are assumed and the tracing action begins.

Command Mode

EXEC

Usage Guidelines

The **trace** command works by taking advantage of the error messages generated by routers when a datagram exceeds its time-to-live (TTL) value.

The **trace** command starts by sending probe datagrams with a TTL value of one. This causes the first router to discard the probe datagram and send back an error message. The **trace** command sends several probes at each TTL level and displays the round-trip time for each.

The **trace** command sends out one probe at a time. Each outgoing packet can result in one or two error messages. A *time exceeded* error message indicates that an intermediate router has seen and discarded the probe. A *destination unreachable* error message indicates that the destination node has received the probe and discarded it because it could not deliver the packet. If the timer goes off before a response comes in, **trace** prints an asterisk (*).

The **trace** command terminates when the destination responds, when the maximum TTL is exceeded, or when the user interrupts the trace with the escape sequence. By default, to invoke the escape sequence, press Ctrl-^, X—which is done by simultaneously pressing the Ctrl, Shift, and 6 keys, letting go, then pressing the X key.

Sample Display Showing Trace CLNS Routes

The following display shows sample CLNS **trace** output when a destination host name has been specified:

```
Router# trace clns ABA.NYC.mil
Type escape sequence to abort.
Tracing the route to ABA.NYC.mil (26.0.0.73)
  1 DEBRIS.CISCO.COM (131.108.1.6) 1000 msec 8 msec 4 msec
  2 BARRNET-GW.CISCO.COM (131.108.16.2) 8 msec 8 msec 8 msec
  3 EXTERNAL-A-GATEWAY.STANFORD.EDU (192.42.110.225) 8 msec 4 msec 4 msec
  4 BB2.SU.BARRNET.NET (131.119.254.6) 8 msec 8 msec 8 msec
  5 SU.ARC.BARRNET.NET (131.119.3.8) 12 msec 12 msec 8 msec
  6 MOFFETT-FLD-MB.in.MIL (192.52.195.1) 216 msec 120 msec 132 msec
  7 ABA.NYC.mil (26.0.0.73) 412 msec 628 msec 664 msec
```

Table 1-22 describes the fields shown in the display.

Table 1-22 ISO CLNS Trace Field Descriptions

Field	Description
1	Indicates the sequence number of the router in the path to the host.
DEBRIS.CISCO.COM	Host name of this router.
131.108.1.6	Internet address of this router.
1000 msec 8 msec 4 msec	Round-trip time for each of the three probes that are sent.

Table 1-23 describes the characters that can appear in **trace** output.

Table 1-23 ISO CLNS Trace Text Characters

Character	Description
nn msec	For each node, the round-trip time in milliseconds for the specified number of probes.
*	The probe timed out.
?	Unknown packet type.
Q	Source quench.
P	Protocol unreachable.
N	Network unreachable.
U	Port unreachable.
H	Host unreachable.

Related Command

trace (privileged)

which-route

Use the **which-route** EXEC command if you want to know which next-hop router will be used or if you have multiple processes running and want to troubleshoot your configuration. This command displays the routing table in which the specified CLNS destination is found.

which-route {*nsap-address* | *clns-name*}

Syntax Description

nsap-address	CLNS destination network address.
clns-name	Destination host name.

Command Mode

EXEC

Usage Guidelines

Route information can reside in the following tables:

- IS-IS level-1 routing table
- ISO-IGRP system-id or area routing table
- Prefix routing table (IS-IS level-2 routes, ISO-IGRP domain routes, and static routes)
- Adjacency database

Examples

The following example shows that destination information for router “gray” is found in the IS-IS level-1 routing table. The destination is on the local system.

```
gray# which-route gray
Route look-up for destination 39.0001.0000.0c00.bda8.00, GRAY
  Found route in IS-IS level-1 routing table - destination is local
```

The following example shows that destination information for NSAP address 49.0001.0000.0c00.bda8.00 is found in the ISO-IGRP level-1 routing table. The destination is on the local system.

```
gray# which-route 49.0001.0000.0c00.bda8.00
Route look-up for destination 49.0001.0000.0c00.bda8.00
  Found route in ISO-IGRP routing table - destination is local
```

The following example shows that destination information for router “green” is found in the IS-IS level-1 routing table. The destination is not on the local system. Table 1-24 describes the display fields in the adjacency entry used to reach system “green.”

```
gray# which-route green
Route look-up for destination 39.0001.0000.0c00.7f06.00, GREEN
  Found route in IS-IS level-1 routing table

Adjacency entry used:
System Id       SNPA            Interface   State  Holdtime  Type  Protocol
GREEN           0000.0c00.2d55  Ethernet0   Up     91        L1L2  IS-IS
  Area Address(es): 39.0001
```

Table 1-24 Which-Route Field Descriptions

Field	Description
System ID	Six-byte value that identifies a system in an area. A name is displayed in this field if one has been assigned with the **clns host** global configuration command.
SNPA	SNPA data link address.
Interface	Interface from which system information was learned.
State	State of the ES or IS. Possible values are as follows: Init—The system is an IS and is waiting for an IS-IS Hello message. The neighbor to the IS-IS is not adjacent. Up—The ES or IS is reachable.
Holdtime	Number of seconds for which the information is valid.
Type	Adjacency type. Possible values are as follows: ES—An end-system adjacency that is either discovered by the ES-IS protocol or statically configured. IS—A router adjacency that is either discovered by the IS-IS protocol or is statically configured. L1—A router adjacency for Level 1 routing only. L1L2—A router adjacency for Level 1 and Level 2 routing. L2—A router adjacency for Level 2 only.
Protocol	Protocol through which the adjacency was learned. Valid protocol sources are ES-IS, IS-IS, ISO-IGRP, and Static.

The following example shows that destination information for NSAP address 49.0001.1111.1111.1111.00 is found in the ISO-IGRP routing table. Table 1-24 describes the display fields in the adjacency entry used to reach NSAP address 49.0001.1111.1111.1111.00.

```
gray# which-route 49.0001.1111.1111.1111.00
Route look-up for destination 49.0001.1111.1111.1111.00
  Found route in ISO-IGRP routing table

Adjacency entry used:
System Id       SNPA            Interface   State  Holdtime  Type  Protocol
1111.1111.1111  0000.0c01.151d   Ethernet1   Up     38        L1L2  ISO-IGRP
  Area Address(es): 49.0001
```

The following example indicates that the specified address is not found in a routing table:

```
gray# which-route 47.0003.0000.0000.0000.00
Route look-up for destination 47.0003.0000.0000.0000.00
  Route not found
```

The following example indicates that the specified NSAP address was found in the CLNS prefix routing table. This information is followed by the route entry used to reach NSAP address 49.0003.0000.0000.0000.00.

```
gray# which-route 49.0003.0000.0000.0000.00
Route look-up for destination 49.0003.0000.0000.0000.00
  Found route in CLNS prefix routing table

Route entry used:
49 [10/0]
  via 1111.1111.1111, Ethernet1, Static
```

Related Command

clns host