Cisco IOS Interface and Hardware Component Command Reference

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Cisco IOS ISO Connectionless Network Service Commands

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

Use the commands in this book to configure and monitor ISO CLNS networks. For ISO CLNS protocol configuration information and examples, see the *Cisco IOS Apollo Domain, Banyan VINES, DECnet, ISO CLNS, and XNS Configuration Guide,* Release 12.2.

clear clns cache

To clear and reinitialize the CLNS routing cache, use the **clear clns cache** command in EXEC mode.

clear clns cache

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example clears the CLNS routing cache:

```
clear clns cache
```

Related Commands

Command	Description
show clns cache	Displays the CLNS routing cache.

clear clns es-neighbors

To remove end system (ES) neighbor information from the adjacency database, use the **clear clns es-neighbors** command in EXEC mode.

clear clns [*tag*] **es-neighbors**

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.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The *tag* argument was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When you enter the **clear clns es-neighbors** command to clear dynamically discovered neighbors that are learned through ES-IS or IS-IS protocols, keep in mind that these adjacencies may have reappeared by the time you enter the **show clns neighbors** command. These dynamic adjacencies can be quickly reformed if the neighbors exchange hello messages.

Examples

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

```
clear clns es-neighbors
```

Related Commands

Command	Description
clear clns is-neighbors	Removes the IS neighbors that this router knows.
clear clns neighbors	Removes CLNS neighbor information from the adjacency database.
show clns es-neighbors	Lists the ES neighbors that this router knows.

clear clns is-neighbors

To remove intermediate system (IS) neighbor information from the adjacency database, use the **clear clns is-neighbors** command in EXEC mode.

clear clns [*tag*] **is-neighbors**

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.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The *tag* argument was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When you enter the **clear clns is-neighbors** command to clear dynamically discovered neighbors that are learned through ES-IS or IS-IS protocols, keep in mind that these adjacencies may have reappeared by the time you enter the **show clns neighbors** command. These dynamic adjacencies can be quickly reformed if the neighbors exchange hello messages.

Examples

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

```
clear clns is-neighbors
```

Related Commands

Command	Description
clear clns es-neighbors	Removes ES neighbor information from the adjacency database.
clear clns neighbors	Removes CLNS neighbor information from the adjacency database.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.

clear clns neighbors

To remove CLNS neighbor information from the adjacency database, use the **clear clns neighbors** command in EXEC mode.

clear clns [*tag*] **neighbors**

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.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The *tag* argument was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When you enter the **clear clns neighbors** command to clear dynamically discovered neighbors that are learned through ES-IS or IS-IS protocols, keep in mind that these adjacencies may have reappeared by the time you enter the **show clns neighbors** command. These dynamic adjacencies can be quickly reformed if the neighbors exchange hello messages.

Examples

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

```
clear clns neighbors
```

Related Commands

Command	Description
clear clns es-neighbors	Removes ES neighbor information from the adjacency database.
clear clns is-neighbors	Removes IS neighbor information from the adjacency database.
show clns neighbors	Displays both ES and IS neighbors.

clear clns route

To remove all of the dynamically derived CLNS routing information, use the **clear clns route** command in EXEC mode.

clear clns route

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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

```
clear clns route
```

Related Commands

Command	Description
show clns route	Displays all of the destinations to which this router knows how to route packets.

clear clns traffic

To clear all ISO CLNS statistics that are displayed when you use the **show clns traffic** command, use the **clear clns traffic** command in EXEC mode.

clear clns [*tag*] **traffic**

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.

Command Modes

EXEC

Command History

Release	Modification
12.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example removes the ISO CLNS statistics:

```
clear clns traffic
```

Related Commands

Command	Description
show clns traffic	Lists the CLNS packets that this router has seen.

clear tarp counters

To clear all Target Identifier Address Resolution Protocol (TARP) counters that are shown with the **show tarp traffic** command, use the **clear tarp counters** command in EXEC mode.

clear tarp counters

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Clearing the counters can assist you with troubleshooting. For example, you may want to clear the counter and then check to see how many PDUs the router is originating.

Examples

The following example clears the TARP counters:

```
clear tarp counters
```

Related Commands

Command	Description
show tarp traffic	Displays statistics about TARP PDUs since the last time the counters were cleared.

clear tarp ldb-table

To clear the system ID-to-sequence number mapping entries stored in the TARP loop-detection buffer table, use the **clear tarp ldb-table** command in EXEC mode.

clear tarp ldb-table

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The loop-detection buffer table prevents TARP packets from looping.

Clearing the mapping entries assists you with troubleshooting. For example, clear the loop-detection buffer table and assign a new sequence number (using the **tarp sequence-number** command) to ensure that other hosts update their entries.

Examples

The following example clears the TARP loop-detection buffer table:

```
clear tarp ldb-table
```

Related Commands

Command	Description
show tarp ldb	Displays the contents of the loop-detection buffer table.
tarp ldb-timer	Specifies the length of time that a system ID-to-sequence number mapping entry remains in the loop-detection buffer table.

clear tarp tid-table

To clear the dynamically created TARP target identifier (TID)-to-NSAP address mapping entries stored in TID cache, use the **clear tarp tid-table** command in EXEC mode.

clear tarp tid-table

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Clearing the TID cache is one method to remove old entries. Another method is to set the length of time a dynamically created TARP entry remains in the TID cache using the **tarp cache-timer** command.

The **clear tarp tid-table** command does not delete the cache entry for its own TID or the cache entries explicitly configured with the **tarp map** command**.**

Examples

The following example clears the TARP TID table:

```
clear tarp tid-table
```

Related Commands

Command	Description
show tarp map	Lists all static entries in the TID cache that were configured with the tarp map command.
show tarp tid-cache	Displays information about the entries in the TID cache.
tarp allow-caching	Reenables the storage of TID-to-NSAP address mapping in the TID cache.
tarp cache-timer	Specifies the length of time that a dynamically created TARP entry remains in the TID cache.
tarp map	Enters a TID-to-NSAP static map entry in the TID cache.

clns access-group

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

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	(Optional) 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.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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

For descriptions of filter sets and expressions, refer to the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Examples

The following example enables 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

Command	Description
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.

clns adjacency-filter

To filter the establishment of ES-IS adjacencies, use the **clns adjacency-filter** command in interface configuration mode. To disable this filtering, use the **no** form of this command.

clns adjacency-filter {**es** | **is**} *name*

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

Syntax Description

es	ES adjacencies are to be filtered.
is	IS adjacencies are to be filtered.
name	Name of the filter set or expression to apply.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Note When you enter the **clns adjacency-filter** command, only the adjacencies that were formed using ES-IS will be filtered out. In order to remove adjacencies that were formed using IS-IS and ISO-IGRP, use the **isis adjacency-filter** and **iso-igrp adjacency-filter** commands, respectively.

For descriptions of filter sets and expressions, refer to the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Examples

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

Command	Description
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.
isis adjacency-filter	Filters the establishment of IS-IS adjacencies.
iso-igrp adjacency-filter	Filters the establishment of ISO IGRP adjacencies.

clns cache-invalidate-delay

To control the invalidation rate of the CLNS route cache, use the **clns cache-invalidate-delay** command in global configuration mode. To allow the CLNS route cache to be immediately invalidated, use the **no** form of this command.

clns cache-invalidate-delay [*minimum maximum quiet threshold*]

no clns cache-invalidate-delay

Syntax Description

minimum	(Optional) Minimum time (in seconds) between invalidation request and actual invalidation. The default is 2 seconds.
maximum	(Optional) Maximum time (in seconds) between invalidation request and actual invalidation. The default is 5 seconds.
quiet	(Optional) Length of time (in seconds) before invalidation.
threshold	(Optional) Maximum number of invalidations considered to be quiet.

Defaults

minimum: 2 seconds

maximum: 5 seconds

quiet: 3 seconds

threshold: 0 invalidations

Command Modes

Global configuration

Command History

Release	Modification
10.3	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

All cache invalidation requests are honored immediately.

This command should typically not be used except under the guidance of technical support personnel. Incorrect settings can seriously degrade network performance.

In an environment with heavy traffic, the CLNS cache can get invalidated (purged) too frequently. Frequent cache invalidations will cause the CPU to spend too much time purging and repopulating the cache.

The **clns cache-invalidate-delay** command controls how the CLNS route cache is purged. The intent is to delay invalidation of the cache until after routing has settled down. Because the routing table changes tend to be clustered in a short period of time, and the cache may be purged repeatedly, a high CPU load might be placed on the router.

When this feature is enabled, and the system requests that the route cache be purged, the request is held for at least the *minimum* seconds. Then the system determines whether the cache has been "quiet" (that is, less than *threshold* invalidation requests in the last *quiet* seconds). If the cache has been quiet, the cache is then purged. If the cache does not become quiet within *maximum* seconds after the first request, it is purged unconditionally.

Manipulation of these parameters trades off CPU utilization versus route convergence time. The timing of routing protocols is not affected, but the removal of stale cache entries is affected.

Examples

The following example sets a minimum delay of 5 seconds, a maximum delay of 30 seconds, and a quiet threshold of no more than 5 invalidation requests in the previous 10 seconds:

```
clns cache-invalidate-delay 5 30 10 5
```

Related Commands

Command	Description
clns route-cache	Allows fast switching through the cache.
show clns cache	Displays the CLNS route cache.

clns checksum

To enable checksum generation when ISO CLNS routing software sources a CLNS packet, use the **clns checksum** command in interface configuration mode. To disable checksum generation, use the **no** form of this command.

clns checksum

no clns checksum

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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

Examples

The following example enables checksum generation:

```
interface ethernet 0
 clns checksum
```

clns cluster-alias

To allow multiple end systems to advertise the same NSAP address but with different system IDs in ES hello messages, use the **clns cluster-alias** command in interface configuration mode. To disable cluster aliasing, use the **no** form of this command.

clns cluster-alias

no clns cluster-alias

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This feature caches multiple ES adjacencies with the same NSAP, but with different subnetwork point of attachment (SNPA) addresses. When a packet is destined to the common NSAP address, Cisco IOS software 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, ES 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.

Examples

The following example enables cluster aliasing 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

To specify the rate at which ES hellos and IS hellos are sent, use the **clns configuration-time** command in global configuration mode. To restore the default value, use the **no** form of this command.

clns configuration-time *seconds*

no clns configuration-time

Syntax Description

seconds	Rate, in seconds, at which ES and IS hello packets are sent.

Defaults

60 seconds

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **clns configuration-time** command controls how frequently a router will send hello messages to its adjacent routers. A hello message sent by the router contains the clns-holding time that tells the receiver for how long it should consider the hello message valid. By default, the clns configuration-time is 60 seconds and the clns holding-time is 300 seconds.

Caution Do not set the **clns configuration-time** and the **clns holding-time** so that the **clns configuration-time** is more than half of the **clns holding-time**. Doing so can lead to adjacencies being reformed. When adjacencies are being reformed, the routers at either end of the adjacency will flood their new link-state packet (LSP) routing packets throughout the network, forcing all routers to recompute the network topology. If this situation occurs repeatedly, it can have a detrimental effect on network performance.

Examples

The following example specifies that ES hellos and IS hellos are to be sent every 100 seconds:

```
clns configuration-time 100
```

Related Commands

Command	Description
clns esct-time	Supplies an ES configuration timer option in a sent IS hello packet that tells the ES how often it should send ES hello packet PDUs.
clns holding-time	Allows the sender of an ES hello or IS hello packet to specify the length of time you consider the information in the hello packets to be valid.

clns congestion-threshold

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

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.

Defaults

4 packets

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 (ERPDU) is sent to the sending router and the packet is dropped if the number of packets exceeds the threshold.

Examples

The following example sets the congestion threshold to 10:

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

clns dec-compatible

To allow IS hellos sent and received to ignore the N-selector byte, use the **clns dec-compatible** command in interface configuration mode. To disable this feature, use the **no** form of this command.

clns dec-compatible

no clns dec-compatible

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example enables DEC-compatible mode:

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

clns enable

If you do not intend to perform any dynamic routing on an interface, but intend to pass ISO CLNS packet traffic to end systems, use the **clns enable** command in interface configuration mode. To disable ISO CLNS on a particular interface, use the **no** form of this command.

clns enable

no clns enable

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example enables ISO CLNS on Ethernet interface 0:

```
interface ethernet 0
 clns enable
```

clns erpdu-interval

To determine the minimum interval time, in milliseconds, between error ERPDUs, use the **clns erpdu-interval** command in interface configuration mode. To turn off the interval rate and effectively set no limit between ERPDUs, use the **no** form of this command or a *milliseconds* value of zero.

clns erpdu-interval *milliseconds*

no clns erpdu-interval *milliseconds*

Syntax Description

milliseconds	Minimum interval time (in milliseconds) between ERPDUs.

Defaults

10 ms

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command prevents the router from sending ERPDUs more frequently than 1 per interface per 10 ms. It is wise not to send an ERPDU frequently if bandwidth is precious (such as over slow serial lines).

Examples

The following example sets the ERPDU interval to 30 ms:

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

Related Commands

Command	Description
clns send-erpdu	Allows CLNS to send an error PDU when the routing software detects an error in a data PDU.

clns esct-time

To supply an ES configuration timer option in a transmitted IS hello packet that tells the ES how often it should transmit ES hello packet PDUs, use the **clns esct-time** command in interface configuration mode. To restore the default value and disable this function, use the **no** form of this command.

clns esct-time *seconds*

no clns esct-time *seconds*

Syntax Description

seconds	Time, in seconds, between ES hello PDUs. Range is from 0 to 65,535.

Defaults

0 seconds (disabled)

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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

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

Related Commands

Command	Description
clns configuration-time	Specifies the rate at which ES hello messages and IS hello messages are sent.
clns holding-time	Allows the sender of an ES hello or IS hello packet to specify the length of time you consider the information in the hello packets to be valid.

clns es-neighbor

To manually define adjacencies for end systems that do not support the ES-IS routing protocol, use the **clns es-neighbor** command in interface configuration mode. To delete the ES neighbor, use the **no** form of this command.

clns es-neighbor *nsap snpa*

no clns es-neighbor *nsap*

Syntax Description

nsap	Specific NSAP to map to a specific data link address.
snpa	Data link address.

Defaults

No end systems are listed.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When you do use the **clns es-neighbor** command, you will have to manually specify the NSAP-to-SNPA mapping for the adjacencies. The subnetwork point of attachment (SNPA) of the end system will depend upon what type of interface is being used to provide connectively. On LANs, the SNPA will be a MAC address.

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 Cisco IOS software will continue to discover dynamically those end systems that *do* support ES-IS.

Examples

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

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

In this case, the end system with the following NSAP, or network entity title (NET), is configured with an Ethernet MAC address of 0000.0C00.A45B:

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

Related Commands

Command	Description
clns host	Defines a name-to-NSAP mapping that can then be used with commands requiring NSAPs.
clns is-neighbor	Defines all intermediate systems that will be used when you manually specify the NSAP-to-SNPA mapping.
show clns es-neighbors	Lists the ES neighbors that this router knows.

clns filter-expr

To combine CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions, use one or more **clns filter-expr** commands in global configuration mode. To delete the expression, use the **no** form of this command.

clns filter-expr *ename* [*term* | **not** *term* | *term* {**and** | **or** | **xor**} *term*]

no clns filter-expr *ename*

Syntax Description

ename	Alphanumeric name to apply to this filter expression.
not	(Optional) Defines a filter expression that is pattern matched only if the pattern given by *term* is not matched.
and	(Optional) Defines a filter expression that is pattern matched only if both of the patterns given by the two terms are matched.
or	(Optional) Defines a filter expression that is pattern matched if either of the patterns given by the two terms is matched.
xor	(Optional) Defines a filter expression that is pattern matched only if one of the patterns, but not both, given by the two terms are matched.
term	(Optional) 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.

Defaults

No filter expression is defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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

If none of the optional keywords is used, then the command defines a simple filter expression that is pattern matched only if the pattern given by *term* is matched.

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.

Examples

The following example defines 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

Command	Description
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.
show clns filter-expr	Displays one or all currently defined CLNS filter expressions.

clns filter-set

To build a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions, use the **clns filter-set** command in global configuration mode. CLNS filter expressions are used in the creation and use of CLNS access lists. To delete the entire filter set, use the **no** form of this command.

clns filter-set *name* [**permit | deny**] *template*

no clns filter-set *name*

Syntax Description

name	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.

Defaults

No address templates are defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 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

Command	Description
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.
show clns filter-set	Displays one or all currently defined CLNS filter sets.

clns holding-time

To allow the sender of an ES hello or IS hello to specify the length of time for which you consider the information in the hello packets to be valid, use the **clns holding-time** command in global configuration mode. To restore the default value (300 seconds, or 5 minutes), use the **no** form of this 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 is considered valid.

Defaults

300 seconds (5 minutes)

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 Cisco IOS software sends updates.

Examples

The following example sets the holding time at 150 seconds:

```
clns holding-time 150
```

Related Commands

Command	Description
clns configuration-time	Specifies the rate at which ES hello messages and IS hello messages are sent.
clns esct-time	Supplies an ES configuration timer option in a sent IS hello packet that tells the ES how often it should send ES hello packet PDUs.

clns host

To define a name-to-NSAP mapping that can then be used with commands that require NSAPs, use the **clns host** command in global configuration mode.

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 to which that the name maps.

Defaults

No mapping is defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 network entity titles (NETs) and NSAPs, however. Although using names as proxies for addresses is allowed with CLNS commands, they are never written out to nonvolatile random-access memory (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)

Examples

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

Command	Description
clns es-neighbor	Defines all end systems that will be used when you manually specify the NSAP-to-SNPA mapping.
clns is-neighbor	Defines all intermediate systems that will be used when you manually specify the NSAP-to-SNPA mapping.
net	Configures a NET for a CLNS routing process.

clns is-neighbor

To manually define adjacencies for intermediate systems, use the **clns is-neighbor** command in interface configuration mode. To delete the specified IS neighbor, use the **no** form of this command.

clns is-neighbor *nsap snpa*

no clns is-neighbor *nsap*

Syntax Description

nsap	NSAP of a specific intermediate system to enter as neighbor to a specific data link address.
snpa	Data link address.

Defaults

No intermediate systems are listed.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When you do use the **clns is-neighbor** command, you will have to manually specify the NSAP-to-SNPA mapping for the adjacencies. The subnetwork point of attachments (SNPAs) are the MAC addresses. The SNPA of the end system will depend upon what type of interface is being used to provide connectively. On LANs, the SNPA will be a MAC address.

It is sometimes preferable 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.

Examples

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

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

Related Commands

Command	Description
clns es-neighbor	Defines all end systems that will be used when you manually specify the NSAP-to-SNPA mapping.
clns host	Defines a name-to-NSAP mapping that can then be used with commands requiring NSAPs.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.

clns mtu

To set the maximum transmission unit (MTU) packet size for the interface, use the **clns mtu** command in interface configuration mode. To restore the default and maximum packet size, use the **no** form of this command.

clns mtu *bytes*

no clns mtu

Syntax Description

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

Defaults

Depends on interface type

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

All interfaces have a default maximum packet size. You can set the MTU size of the packets sent on the interface with the **mtu** interface configuration command.

All routers 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 MTUs to be the same on all routers on the network with 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, 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.

Examples

The following example sets the MTU packet size to 1000 bytes:

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

Related Commands

Command	Description
mtu	Adjusts the maximum packet size or MTU size.

clns net (global)

To assign a static address for a router, use the **clns net** command in global configuration mode. If the Cisco IOS software 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. To remove any previously configured NET or NSAP address, use the **no** form of this command.

clns net {*net-address* | *name*}

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

Syntax Description

net-address	NET address. Refer to the "Usage Guidelines" section.
name	CLNS host name to be associated with this interface.

Defaults

No static address is assigned.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

A CLNS packet sent to any of the defined NSAPs or NETs will be received by the router. The Cisco IOS software 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.

Examples

The following example assigns a static address:

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

clns packet-lifetime

To specify the initial lifetime for locally generated packets, use the **clns packet-lifetime** command in global configuration mode. To remove the parameter's settings, use the **no** form of this command.

clns packet-lifetime *seconds*

no clns packet-lifetime

Syntax Description

seconds	Packet lifetime in seconds.

Defaults

32 seconds

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example sets a packet lifetime of 120 seconds:

```
clns packet-lifetime 120
```

Related Commands

Command	Description
clns want-erpdu	Specifies whether to request ERPDUs on packets sourced by the router.

clns rdpdu-interval

To determine the minimum interval time between redirect PDUs (RDPDUs), use the **clns rdpdu-interval** command in interface configuration mode. To turn off the interval rate and effectively set no limit between RDPDUs, use the **no** form of this command or a *milliseconds* value of zero.

clns rdpdu-interval *milliseconds*

no clns rdpdu-interval *milliseconds*

Syntax Description

milliseconds	Minimum interval time in milliseconds between RDPDUs.

Defaults

100 ms

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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

Examples

The following example sets an interval of 50 ms:

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

Related Commands

Command	Description
clns send-rdpdu	Allows CLNS to send RPDUs when a better route for a given host is known.

clns route (create)

To create an interface static route, use this form of the **clns route** command in global configuration mode. To remove this route, use the **no** form of this command.

clns route *nsap-prefix type number* [*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.
type	Interface type.
number	Interface number.
snpa-address	(Optional) Specific subnetwork point of attachment (SNPA) address. Optional for serial links; required for multiaccess networks.

Defaults

No interface static routes are created.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

CLNS static routes will not be used to route traffic to a destination for which there is a dynamic route, if that destination is within the domain (ISO-IGRP) or area (IS-IS) of the router.

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

Examples

The following example creates a static route for an Ethernet interface:

```
clns route 39.0002 ethernet 3 aa00.0400.1111
```

The following example creates a static route for a serial interface:

```
clns route 39.0002 serial 0
```

Related Commands

Command	Description
clns route (enter)	Enters a specific static route.
clns route default	Configures a default zero-length prefix rather than typing an NSAP prefix.
clns route discard	Explicitly tells a router to discard packets with NSAP addresses that match the specified nsap-prefix.

clns route (enter)

To enter a specific static route, use this form of the **clns route** command in global configuration mode. NSAPs that start with *nsap-prefix* are forwarded to *next-hop-net* or the *name* of the next hop. To remove this route, use the **no** form of this command.

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 NET. 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.

Defaults

No static route is entered.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

CLNS static routes will not be used to route traffic to a destination for which there is a dynamic route, if that destination is within the domain (ISO-IGRP) or area (IS-IS) of the router.

Examples

The following example forwards all packets toward the specified route:

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

Related Commands

Command	Description
clns route (create)	Creates an interface static route.
clns route default	Configures a default zero-length prefix rather than typing an NSAP prefix.
clns route discard	Explicitly tells a router to discard packets with NSAP addresses that match the specified nsap-prefix.

clns route default discard

To assign a default discard route and automatically discard packets with NSAP addresses that do not match any existing routes, use the **clns route default discard** command in global configuration mode. To remove the default discard route, use the **no** form of this command.

clns route default discard

no clns route default discard

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
11.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The only time you would use this command is if you are using static routing and ES-IS and you wish disable ES-IS and therefore reduce the router to using purely static routing. Using this command will reduce the functionality of the router by forcing ISO CLNS to ignore all nodes that were learned through ES-IS.

Note This command will have little or no affect if you are using a dynamic routing process such as IS-IS or ISO-IGRP, as the router will discard any packets for which it does not have a route, even if this command has not been entered.

Examples

The following example assigns a default discard route:

```
clns route default discard
```

When you enter the enter the **show clns route** command, you will see the following default discard route information:

```
Router# show clns route

Codes: C - connected, S - static, d - DecnetIV
I - ISO-IGRP, i - IS-IS, e - ES-IS
S Default Prefix [10/0], Discard Entry
```

Related Commands

Command	Description
clns route discard	Explicitly tells a router to discard packets with NSAP addresses that match the specified nsap-prefix.
show clns route	Displays all of the destinations to which this router knows how to route packets.

clns route default

To configure a default zero-length prefix rather than type an NSAP prefix, use the **clns route default** command in global configuration mode. To remove this route, use the **no** form of this command.

clns route default *type number*

no clns route default

Syntax Description

type	Interface type. Specify the interface type immediately followed by the interface number; there is no space between the two.
number	Interface number.

Defaults

No default prefix is configured.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example configures a default zero-length prefix:

```
clns route default ethernet0
```

Related Commands

Command	Description
clns route (interface static route)	Creates an interface static route.
clns route (enter)	Enters a specific static route.
clns route discard	Explicitly tells a router to discard packets with NSAP addresses that match the specified nsap-prefix.

clns route discard

To explicitly tell a router to discard packets with NSAP addresses that match the specified *nsap-prefix*, use the **clns route discard** command in global configuration mode. To remove this route, use the **no** form of this command.

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	The router discards packets with NSAPs that match the specified value for the *nsap-prefix* argument.

Defaults

No NSAP addresses are identified.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **decnet advertise** command and the **clns route discard** command work together when DECnet Phase IV/V conversion is enabled. Any packet with the specified CLNS NSAP prefix causes CLNS to behave as if no route were found. Because DECnet Phase IV/V conversion is enabled, the route is then looked up in the Phase IV routing table. The router that is advertising the DECnet Phase IV route converts the packet to OSI and sends it to the router that is advertising the CLNS discard static route. Once it gets there, the packet is converted back to Phase IV.

CLNS discard routes cannot be used to discard packets that are addressed to a destination for which there is a dynamic route, if that destination is within the domain (ISO IGRP) or area (IS-IS) of the router.

Examples

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

```
clns route 47.0005 discard
```

Related Commands

Command	Description
clns route (enter)	Enters a specific static route.
clns route (interface static route)	Creates an interface static route.
clns route default	Configures a default zero-length prefix rather than typing an NSAP prefix.
decnet advertise	Configures border routers to propagate Phase IV areas through an OSI backbone.

clns route-cache

To allow fast switching through the cache, use the **clns route-cache** command in interface configuration mode. 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.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

The following example allows fast switching through the cache:

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

clns router isis

To configure an Intermediate System-to-Intermediate System (IS-IS) routing process for ISO Connectionless Network Service Protocol (CLNS) on a specified interface and to attach an area designator to the routing process, use the **clns router isis** command in interface configuration mode. To disable IS-IS for ISO CLNS, use the **no** form of the command.

clns router isis *area-tag*

no clns router isis *area-tag*

Syntax Description

area-tag	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Defines a meaningful name for an area routing process. If not specified, a null tag is assumed. It must be unique among all CLNS router processes for a given router. The *area-tag* argument is used later as a reference to this area routing process. Each area in a multiarea configuration should have a non-null area tag to facilitate identification of the area.

Defaults

No routing processes are specified.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	Multiarea functionality for ISO CLNS was added, changing the way the *tag* argument (now *area-tag*) is used.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Before the IS-IS router process is useful, a network entity title (NET) must be assigned with the **net** command and some interfaces must be enabled with IS-IS.

If you have IS-IS running and at least one ISO-IGRP process, the IS-IS process and the ISO-IGRP process cannot both be configured without an area tag. The null tag can be used by only one process. If you run ISO-IGRP and IS-IS, a null tag can be used for IS-IS, but not for ISO-Interior Gateway Routing Protocol (IGRP) at the same time. However, each area in an IS-IS multiarea configuration should have a non-null area tag to facilitate identification of the area.

Note The IS-IS multiarea feature is not supported for IP.

You can configure only one process to perform Level 2 (interarea) routing. If Level 2 routing is configured on any process, all additional processes are automatically configured as Level 1. You can configure this process to perform intra-area (Level 1) routing at the same time. You can configure up to 29 additional processes as Level 1-only processes. Use the **is-type** command to remove Level 2 routing from a router instance. You can then use the **is-type** command to enable Level 2 routing on some other IS-IS router instance.

Note The CPU memory required to run 29 Level 1 ISIS processes will probably not be present in low-end platforms unless the routing information and area topology are limited.

An interface cannot be part of more than one area, except in the case where the associated routing process is performing both Level 1 and Level 2 routing. On media (such as WAN media, for example) where subinterfaces are supported, different subinterfaces could be configured for different areas.

Examples

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

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

The following example shows an IS-IS configuration with two Level 1 areas and one Level 1-2 area:

```
clns routing

...

interface Tunnel529
 clns router isis BB

interface Ethernet1
 clns router isis A3253-01
!
interface Ethernet2
 clns router isis A3253-02

...

router isis BB                          ! Defaults to "is-type level-1-2"
 net 49.2222.0000.0000.0005.00
!
router isis A3253-01
 net 49.0553.0001.0000.0000.0005.00
 is-type level-1
!
router isis A3253-02
 net 49.0553.0002.0000.0000.0005.00
 is-type level-1
```

Related Commands

Command	Description
router isis	Enables the IS-IS routing protocol and specifies an IS-IS process for IP.

clns router iso-igrp

To specify ISO IGRP routing on a specified interface, use the **clns router iso-igrp** command in interface configuration mode. To disable ISO IGRP routing for the system, use the **no** form of the global configuration command with the appropriate tag.

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.

Defaults

ISO IGRP routing is not specified on any interface.

Command Modes

Interface configuration

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 Cisco IOS software 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.

Examples

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

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

Related Commands

Command	Description
router iso-igrp	Identifies the area the router will work in and informs it that it will route dynamically using the ISO IGRP protocol.

clns routing

To enable routing of CLNS packets, use the **clns routing** command in global configuration mode. To disable CLNS routing, use the **no** form of this command.

clns routing

no clns routing

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example enables routing of CLNS packets:

```
clns routing
```

Related Commands

Command	Description
clns security pass-through	Allows Cisco IOS software to pass packets that have security options set.

clns security pass-through

To allow Cisco IOS software to pass packets that have security options set, use the **clns security pass-through** command in global configuration mode. To disable this function, 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.

Defaults

The software discards any packets it sees as set with security options.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example allows Cisco IOS software to pass packets that have security options set:

```
clns routing
router iso-igrp
 net 47.0004.004d.0001.0000.0c11.1111.00
clns security pass-through
```

Related Commands

Command	Description
clns routing	Enables routing of CLNS packets.

clns send-erpdu

To allow CLNS to send an error PDU when the routing software detects an error in a data PDU, use the **clns send-erpdu** command in interface configuration mode. 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.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 ERPDU can be sent to the original source/sender of the packet that was discarded.

Examples

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

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

Related Commands

Command	Description
clns erpdu-interval	Determines the minimum interval time, in milliseconds, between error ERPDUs.

clns send-rdpdu

To allow CLNS to redirect PDUs (RDPDUs) when a better route for a given host is known, use the **clns send-rdpdu** command in interface configuration mode. 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.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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

Examples

The following example allows CLNS to send RDPDUs:

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

Related Commands

Command	Description
clns erpdu-interval	Determines the minimum interval time (in milliseconds) between RDPDUs.

clns split-horizon

To implement split horizon for ISO IGRP updates, use the **clns split-horizon** command in interface configuration mode. To disable this function, use the **no** form of this command.

clns split-horizon

no clns split-horizon

Syntax Description

This command has no arguments or keywords.

Defaults

For all LAN interfaces—enabled

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

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

The following example disables split horizon on a serial link connected to an X.25 network:

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

clns template-alias

To build a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets, use one or more **clns template-alias** commands in global configuration mode. To delete the alias, use the **no** form of this command.

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 the "Usage Guidelines" section.

Defaults

No alias list is defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

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

Command	Description
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.

clns want-erpdu

To specify whether to request ERPDUs on packets sourced by the router, use the **clns want-erpdu** command in global configuration mode. To remove the parameter's settings, use the **no** form of this command.

clns want-erpdu

no clns want-erpdu

Syntax Description

This command has no arguments or keywords.

Defaults

To request ERPDUs

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

The following example requests ERPDUs on packets sourced by the router:

```
clns want-erpdu
```

Related Commands

Command	Description
clns packet-lifetime	Specifies the initial lifetime for locally generated packets.

ctunnel destination

To configure the destination parameter for an IP over CLNS tunnel (CTunnel), use the **ctunnel destination** command in interface configuration mode. To remove the destination parameter, use the **no** form of this command.

ctunnel destination *nsap-address*

no ctunnel destination *nsap-address*

Syntax Description

nsap-address	NSAP address for the CTunnel destination.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When creating an IP over CLNS tunnel, you must first create the virtual interface by using the **interface ctunnel** command. Once you have created the virtual interface, the order in which you configure the destination parameter by using the **ctunnel destination** command and set the IP address for that destination parameter by using the **ip address** command does not matter.

Addresses in the ISO network architecture are referred to as network service access point (NSAP) addresses and network entity titles (NETs). Each node in an OSI network has one or more NETs. In addition, each node has many NSAP addresses. Each NSAP address differs from one of the NETs for that node in only the last byte. This byte is called the *N-selector*. Its function is similar to the port number in other protocol suites.

When a CTunnel interface is being configured, the N-selector of the destination NSAP address is set automatically by the router. Regardless of the value you enter for the N-selector byte, the router will select the appropriate value. You will see the value that was chosen by the router when you enter the **show interfaces ctunnel** command.

Examples

The following example configures a CTunnel from one router to another and shows the CTunnel destination set to 49.0001.1111.1111.1111.00.

```
interface ctunnel 301
 ip address 10.0.0.3 255.255.255.0
 ctunnel destination 49.0001.1111.1111.1111.00
```

Related Commands

Command	Description
clns routing	Enables routing of CLNS packets.
debug ctunnel	Displays debug messages for the IP over a CLNS Tunnel feature.
interface ctunnel	Creates a virtual interface to transport IP over a CLNS tunnel.
ip address	Sets a primary or secondary IP address for an interface.
ip routing	Enables IP routing.

ctunnel mode

To transport IPv4 and IPv6 packets over Connectionless Network Service (CLNS) tunnel (CTunnel), use the **ctunnel mode** command in interface configuration mode. To return the ctunnel to the default **cisco** mode, use the **no** form of this command.

ctunnel mode [**gre** | **cisco**]

no ctunnel mode

Syntax Description

gre	(Optional) Sets the ctunnel mode to Generic Routing Encapsulation (GRE) for transporting IPv6 packets over the CLNS network.
cisco	(Optional) Returns the ctunnel mode to the default cisco.

Command Default

Cisco encapsulation

Command Modes

Interface configuration

Command History

Release	Modification
12.3(7)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

GRE tunneling of IPv4 and IPv6 packets through CLNS-only networks enables Cisco ctunnels to interoperate with networking equipment from other vendors. This feature provides compliance with RFC 3147, *Generic Routing Encapsulation over CLNS Networks*, which should allow interoperation between Cisco equipment and that of other vendors. in which the same standard is implemented.

RFC 3147 specifies the use of GRE when tunneling packets. The implementation of this feature does not include support for GRE header fields such as those used to specify checksums, keys, or sequencing. Any packets received which specify the use of these features will be dropped.

The default ctunnel mode continues to use the standard Cisco encapsulation. Both ends of the tunnel must be configured with the same mode for it to work. If you want to tunnel ipv6 packets you must use the new gre mode.

Examples

The following example configures a CTunnel from one router to another and shows the CTunnel destination set to 49.0001.1111.1111.1111.00. The ctunnel mode is set to gre to transport IPv6 packets.

```
interface ctunnel 301
 ipv6 address 2001:0DB8:1111:2222::2/64
 ctunnel destination 49.0001.1111.1111.1111.00
 ctunnel mode gre
```

Related Commands

Command	Description
clns routing	Enables routing of CLNS packets.
ctunnel destination	Specifies the destination for the CTunnel.
debug ctunnel	Displays debug messages for the IP over a CLNS Tunnel feature.
interface ctunnel	Creates a virtual interface to transport IP over a CLNS tunnel.
ip address	Sets a primary or secondary IP address for an interface.

distance (ISO CLNS)

To configure the administrative distance for CLNS routes learned, use the **distance** command in router configuration mode. To restore the administrative distance to the default, use the **no** form of this command.

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.
clns	(Optional) CLNS-derived routes for IS-IS.

Defaults

Static routes—10

ISO IGRP routes—100

IS-IS routes—110

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

If the router is forwarding packets, dynamic routes will always take priority over static routes, unless the router is routing to a destination outside of its domain and area. The router first will look for an ISO IGRP route within its own area, then for an ISO IGRP route within its own domain, and finally for an IS-IS route within its own area, until it finds a matching route. If a matching route still has not been found, the router will check its prefix table, which contains static routes and routes to destinations outside the area (ISO IGRP), domain (ISO IGRP), and area (IS-IS) routes for that router. When the router is using its prefix table, it will choose the route that has the lowest administrative distance.

Note The administrative distance for CLNS routes that you have configured by entering the **distance** command will take effect only when routes are entered into the routing prefix table.
If you want an ISO IGRP prefix route to override a static route, you must set the administrative distance for the routing process to be lower than 10 (assigned administrative distance for static routes). You cannot change the assigned administrative distance for static routes.

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

Examples

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
```

ignore-lsp-errors

To allow the router to ignore Intermediate System-to-Intermediate System (IS-IS) link-state packets that are received with internal checksum errors rather than purging the link-state packets, use the **ignore-lsp-errors** command in router configuration mode. To disable this function, use the **no** form of this command.

ignore-lsp-errors

no ignore-lsp-errors

Syntax Description

This command has no arguments or keywords.

Defaults

This command is enabled by default; that is, corrupted LSPs are dropped instead of purged for network stability.

Command Modes

Router configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0	This command is now enabled by default.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The IS-IS protocol definition requires that a received link-state packet with an incorrect data-link checksum be purged by the receiver, which causes the initiator of the packet to regenerate it. However, if a network has a link that causes data corruption while still delivering link-state packets with correct data link checksums, a continuous cycle of purging and regenerating large numbers of packets can occur. Because this could render the network nonfunctional, use the **ignore-lsp-errors command** to ignore these link-state packets rather than purge the packets.

Link-state packets are used by the receiving routers to maintain their routing tables.

If you want to explicitly purge the corrupted LSPs, issue the **no ignore-lsp-errors** command.

Examples

The following example instructs the router to ignore link-state packets that have internal checksum errors:

```
router isis
 ignore-lsp-errors
```

interface ctunnel

To create a virtual interface to transport IP over a CLNS tunnel (CTunnel), use the **interface ctunnel** command in global configuration mode. To remove the virtual interface, use the **no** form of this command.

interface ctunnel *interface-number*

no interface ctunnel *interface-number*

Syntax Description

interface-number	CTunnel interface number (a number from 0 through 2,147,483,647).

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When configuring an IP over CLNS tunnel, you must first create a virtual interface. In the following example, the **interface ctunnel** command is used to create the virtual interface.

Examples

The following example configures a CTunnel from one router to another and shows the CTunnel destination set to 49.0001.1111.1111.1111.00:

```
interface ctunnel 301
 ip address 10.0.0.3 255.255.255.0
 ctunnel destination 49.0001.1111.1111.1111.00
```

Related Commands

Command	Description
clns routing	Enables routing of CLNS packets.
ctunnel destination	Configures the destination parameter for a CLNS tunnel.
debug ctunnel	Displays debug messages for the IP over a CLNS Tunnel feature.
ip address	Sets a primary or secondary IP address for an interface.
ip routing	Enables IP routing.

ip domain-lookup nsap

To allow Domain Name System (DNS) queries for CLNS addresses, use the **ip domain-lookup nsap** command in global configuration mode. To disable this function, use the **no** form of this command.

ip domain-lookup nsap

no ip domain-lookup nsap

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 given a host name. This feature is useful for the ISO CLNS **ping** EXEC command and when making CLNS Telnet connections.

Examples

The following example disables DNS queries of CLNS addresses:

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

Related Commands

Command	Description
ip domain-lookup	Enables the IP DNS-based host name-to-address translation.
ping (privileged)	Diagnoses basic network connectivity on AppleTalk, CLNS, DECnet, IP, or Novell IPX networks.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.

isis adjacency-filter

To filter the establishment of Intermediate System-to-Intermediate System (IS-IS) adjacencies, use the **isis adjacency-filter** command in interface configuration mode. To disable filtering of the establishment of IS-IS adjacencies, use the **no** form of this command.

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.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 the **match-all** keyword 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.

Examples

The following example builds a filter that 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

Command	Description
clns adjacency-filter	Filters the establishment of CLNS ES and IS adjacencies.
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.
iso-igrp adjacency-filter	Filters the establishment of ISO IGRP adjacencies.

iso-igrp adjacency-filter

To filter the establishment of ISO IGRP adjacencies, use the **iso-igrp adjacency-filter** command in interface configuration mode. To disable filtering of the establishment of ISO IGRP adjacencies, use the **no** form of this command.

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 Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

For descriptions of filter sets and expressions, refer to the **clns filter-expr**, **clns filter-set**, and **clns template-alias** global configuration commands.

Examples

The following example builds a filter that 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

Command	Description
clns adjacency-filter	Filters the establishment of CLNS ES and IS adjacencies.
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.
clns template-alias	Builds a list of alphanumeric aliases of CLNS address templates for use in the definition of CLNS filter sets.
isis adjacency-filter	Filters the establishment of IS-IS adjacencies.

lsp-mtu (ISO CLNS)

To set the maximum transmission unit (MTU) size of Intermediate System-to-Intermediate System (IS-IS) link-state packets (LSPs), use the **lsp-mtu** command in router configuration mode. To disable this function, use the **no** form of this command.

lsp-mtu *size*

no lsp-mtu

Syntax Description

size	Maximum packet size in bytes. The size must be less than or equal to the smallest MTU of any link in the network. The default size is 1497 bytes.

Defaults

1497 bytes

Command Modes

Router configuration

Command History

Release	Modification
10.3	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Under normal conditions, the default MTU size should be sufficient. However, if the MTU of a link is below 1500 bytes, the link-state packet MTU must be lowered accordingly on each router in the network. If this is not done, routing becomes unpredictable.

Note This rule applies for all routers in a network. If any link in the network has a reduced MTU, all routers must be changed, not just the routers directly connected to the link.

Caution The CLNS MTU of a link (which is the applicable value for IS-IS, even if it is being used to route IP) may differ from the IP MTU. To be certain about a link MTU as it pertains to IS-IS, use the **show clns interface** command to display the value.

Examples

The following example sets the MTU size to 1300 bytes:

```
router isis
 lsp-mtu 1300
```

Related Commands

Command	Description
clns mtu	Sets the MTU packet size for the interface.
mtu	Adjusts the maximum packet size or MTU size.

match clns address

To define the match criterion, use the **match clns address** command in route-map configuration mode. Routes that have a network address matching one or more of the names—and that satisfy all other defined match criteria—will be redistributed. To remove the match criterion, use the **no** form of this command.

match clns address *name* [*name...name*]

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

Syntax Description

name	Name of a standard access list, filter set, or expression.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and *all* defined **match** criteria must be satisfied 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.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the CLNS address matching criterion:

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

```
match clns address ourprefix
clns filter-set ourprefix permit 49.0001.0002...
```

Related Commands

Command	Description
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Defines the route-type match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

match clns next-hop

To define the next-hop match criterion, use the **match clns next-hop** command in route-map configuration mode. Routes that have a next-hop router address matching one of the names—and that satisfy all other defined match criteria—will be redistributed. To remove the match criterion, use the **no** form of this command.

match clns next-hop *name* [*name...name*]

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

Syntax Description

name	Name of an access list, filter set, or expression.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and *all* defined **match** criteria must be satisfied 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.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the CLNS next-hop matching criterion:

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

```
match clns next-hop ourprefix
clns filter-set ourprefix permit 49.0001.0002...
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Defines the route-type match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

match clns route-source

To define the route-source match criterion, use the **match clns route-source** command in route-map configuration mode. Routes that have been advertised by routers at the address specified by the name—and that satisfy all other defined match criteria—will be redistributed. To remove the specified match criterion, use the **no** form of this command.

match clns route-source *name* [*name...name*]

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

Syntax Description

name	Name of access list, filter set, or expression.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and *all* defined **match** criteria must be satisfied 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.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the CLNS route-source matching criterion:

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

```
match clns route-source ourprefix
clns filter-set ourprefix permit 49.0001.0002...
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Defines the route-type match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

match interface (ISO CLNS)

To define the interface match criterion, use the **match interface** command in route-map configuration mode. Routes that have the next hop out one of the interfaces specified—and that satisfy all other defined match criteria—will be redistributed. To remove the specified match criterion, use the **no** form of this command.

match interface *type number* [*type number...type number*]

no match interface *type number* [*type number...type number*]

Syntax Description

type	Interface type.
number	Interface number.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and *all* defined **match** criteria must be satisfied 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.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the interface (ISO CLNS) matching criterion:

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

```
route-map ourmap permit
 match interface ethernet2
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the route-source match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Defines the route-type match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

match metric (ISO CLNS)

To define the metric match criterion, use the **match metric** command in route-map configuration mode. Routes that have the specified metric—and satisfy all other defined match criteria—will be redistributed. To remove the specified match criterion, use the **no** form of this command.

match metric *metric-value*

no match metric *metric-value*

Syntax Description

metric-value	Route metric. This can be an Interior Gateway Routing Protocol (IGRP) five-part metric.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and *all* defined **match** criteria must be satisfied 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.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the metric (ISO CLNS) matching criterion:

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

```
route-map ourmap permit
 match metric 26795
```
clns filter-set ourprefix permit 49.0001.0002...

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the route-source match criterion.
match route-type (ISO CLNS)	Defines the route-type match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

match route-type (ISO CLNS)

To define the route-type match criterion, use the **match route-type** command in route-map configuration mode. Routes that have the specified route type—and satisfy all other defined match criteria—will be redistributed. To remove the specified match criterion, use the **no** form of this command.

match route-type {**level-1** | **level-2**}

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

Syntax Description

level-1	IS-IS Level 1 routes.
level-2	IS-IS Level 2 routes.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. 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.

The **match** route-map configuration command has multiple formats. The **match** commands may be given in any order, and all defined **match** criteria must be satisfied to cause the route to be redistributed according to the *set actions* argument given with the **set** commands. The **no** forms of the **match** commands remove the specified match criteria.

Examples

In the following configuration, an ISO IGRP-learned route with a prefix 49.0001.0002 will be redistributed if it satisfies the route-type (ISO CLNS) matching criterion:

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

```
route-map ourmap permit
 match route-type level-2
```
clns filter-set ourprefix permit 49.0001.0002...

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the route-source match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

metric weights (ISO CLNS)

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

metric weights *qos k1 k2 k3 k4 k5*

no metric weights

Syntax Description

qos	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 to 127; higher numbers mean a greater multiplier effect.

Defaults

qos: **0**
k1: **1**
k2: **0**
k3: **1**
k4: **0**
k5: **0**

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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 also changes 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 9600 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 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, the following additional operation is done:

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

The default version of IGRP has both k1 and k3 equal to 1, and k2, k4, and k5 equal to 0.

Delay is in units of 10 microseconds. This gives a range of 10 microseconds to 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 10^e10. The range is 1200 bps to 10 Gbps.

Table 8 lists the default values used for several common media.

Table 8 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.

Examples

The following example sets all five metric constants:

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

Related Commands

Command	Description
bandwidth (interface)	Sets a bandwidth value for an interface.
delay	Sets a delay value for an interface.

redistribute (ISO CLNS)

To redistribute routes from one routing domain into another routing domain, use the **redistribute** command in router configuration mode. To disable redistribution, or to disable any of the specified keywords, use the **no** form of this command.

redistribute *protocol* [*tag*] [**route-map** *map-tag*]

no redistribute *protocol* [*tag*] [**route-map** *map-tag*] **static** [**clns** | **ip**]

Syntax Description

protocol	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**.
tag	(Optional) Meaningful name for a routing process.
route-map *map-tag*	(Optional) 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.
static	Keyword **static** is used to redistribute static routes. When used without the optional keywords, Cisco IOS software injects any OSI static routes into an OSI domain.
clns	(Optional) Keyword **clns** is used when redistributing OSI static routes into an IS-IS domain.
ip	(Optional) Keyword **ip** is used when redistributing IP into an IS-IS domain.

Defaults

Disabled, except for static routes, which by default are redistributed into IS-IS routing domains but are not redistributed into ISO IGRP domains. The keyword **clns** is the default with the keyword **static**.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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** command is performed. Redistribution only occurs for Level 2 routing.

You can specify more than one IS-IS process per router. Cisco IOS Release 12.1 provides multi-area support where each IS-IS process can handle a separate level-1 area. To create more than one level-1 IS-IS routing process, use the **clns router isis** command in interface configuration mode. You must use the *area tag* argument for multiarea IS-IS configuration, in order to define a meaningful name for each routing process. See the **clns router isis** command for more information.

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 Commands

Command	Description
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.

route-map (ISO CLNS)

To define the conditions for redistributing routes from one routing protocol into another, use the **route-map** command in global configuration mode. To delete the route map, use the **no** form of this command.

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 this command, it specifies the position of the route map that should be deleted.

Defaults

The **permit** keyword is the default.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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 command. 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.

The **match** route-map configuration command has multiple formats. 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 route maps when you want detailed control over how routes are redistributed between routing processes. The destination routing protocol is the one you specify with the **router** global configuration command. The source routing protocol is the one you specify with the **redistribute** router configuration command. See the "Examples" section for an illustration of how route maps are configured.

When you are passing routes through a route map, a route map can have several parts. Any route that does not match at least one **match** clause relating to a **route-map** command will be ignored; that is, the route will not be advertised for outbound route maps and will not be accepted for inbound route maps. If you want to modify only some data, you must configure a second route map section with an explicit match specified.

Examples

The following example redistributes Routing Information Protocol (RIP) routes with a hop count equal to 1 into Open Shortest Path First (OSPF). These routes will be redistributed into OSPF as external link-state advertisements (LSAs) with a metric of 5, metric type of Type 1, and a tag equal to 1.

```
router ospf 109
 redistribute rip route-map rip-to-ospf

route-map rip-to-ospf permit
 match metric 1
 set metric 5
 set metric-type type1
 set tag 1
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

router iso-igrp

To identify the area that the router will work in and let it know that it will be routing dynamically using the ISO IGRP protocol, use the **router iso-igrp** command in global configuration mode. To disable ISO IGRP routing for the system, use the **no** form of this command with the appropriate tag.

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.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

The following example specifies a router in *Manufacturing*. The command must be typed on one line.

```
router iso-igrp Manufacturing
```

Related Commands

Command	Description
clns router iso-igrp	Specifies ISO IGRP routing on a specified interface.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.

set level (ISO CLNS)

To specify the routing level of routes to be advertised into a specified area of the routing domain, use the **set level** command in route-map configuration mode. To disable advertising the specified routing level into a specified area, use the **no** form of this command.

set level {**level-1** | **level-2** | **level-1-2**}

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

Syntax Description

level-1	Inserted in IS-IS Level 1 link-state PDUs.
level-2	Inserted in IS-IS Level 2 link-state PDUs. For IS-IS destinations, **level-2** is the default.
level-1-2	Inserted into both Level 1 and Level 2 IS-IS link-state PDUs.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. The **set** commands specify the redistribution *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. When all match criteria are met, all set actions are performed. The **no route-map** command deletes the route map.

Examples

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 link-state PDU 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 Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Sets the metric type to give redistributed routes.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

set metric (ISO CLNS)

To change the metric value used to redistribute routes, use the **set metric** command in route-map configuration mode. To reinstate the original metric values, use the **no** form of this command.

set metric *metric-value*

no set metric *metric-value*

Syntax Description

metric-value	Route metric. This can be an IGRP five-part metric.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. The **set** commands specify the redistribution *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. When all match criteria are met, all set actions are performed. The **no route-map** command deletes the route map.

Examples

Given the following configuration, a RIP-learned route for network 172.16.0.0 and an ISO IGRP-learned route with prefix 49.0001.0002 will be redistributed into an IS-IS Level 2 link-state PDU 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 172.16.0.0 0.0.255.255
 clns filter-set ourprefix permit 49.0001.0002...
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Sets the metric type to give redistributed routes.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

set metric-type (ISO CLNS)

To set the metric type for redistributed routes, use the **set metric-type** command in route-map configuration mode. To reinstate the original metric type, use the **no** form of this command.

set metric-type {**internal** | **external**}

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

Syntax Description

internal	IS-IS internal metric.
external	IS-IS external metric.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. The **set** commands specify the redistribution *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. When all match criteria are met, all set actions are performed. The **no route-map** command deletes the route map.

Examples

The following example sets the metric type of the destination protocol to IS-IS internal metric:

```
route-map map-type
 set metric-type internal
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
match metric (ISO CLNS)	Defines the metric match criterion.
match route-type (ISO CLNS)	Sets the metric type to give redistributed routes.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set tag (ISO CLNS)	Sets a tag value to associate with the redistributed routes.

set tag (ISO CLNS)

To set a tag value to associate with the redistributed routes, use the **set tag** command in route-map configuration mode. To revert to redistributing routes without associating a specific tag with them, use the **no** form of this command.

set tag *tag-value*

no set tag *tag-value*

Syntax Description

tag-value	Name for the tag. The 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.

Defaults

Disabled

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

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** command. The **set** commands specify the redistribution *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. When all match criteria are met, all set actions are performed. The **no route-map** command deletes the route map.

Examples

The following example sets the tag value of the destination routing protocol to 5:

```
route-map tag
 set tag 5
```

Related Commands

Command	Description
match clns address	Defines the match criterion.
match clns next-hop	Defines the next-hop match criterion.
match clns route-source	Defines the route-source match criterion.
match interface (ISO CLNS)	Defines the interface match criterion.
redistribute (ISO CLNS)	Redistributes routing information from one domain into another routing domain.
route-map (ISO CLNS)	Defines the conditions for redistributing routes from one routing protocol into another.
set level (ISO CLNS)	Specifies the routing level of routes to be advertised into a specified area of the routing domain.
set metric (ISO CLNS)	Sets the metric value to give the redistributed routes.
set metric-type (ISO CLNS)	Sets the metric type to give redistributed routes.

show clns cache

To display the CLNS route cache, use the **show clns cache** command in EXEC mode. The cache contains an entry for each destination that recently has been fast-switched. 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 itself.

show clns cache [**delay-parameters** | **invalidations**]

Syntax Description

delay-parameters	(Optional) Current settings for delays when entries are invalidated in the CLNS route cache.
invalidations	(Optional) When specified, shows the last time each function purged the CLNS route cache.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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 => Rewrite / Length
[42] *39.0004.0040.0000.0C00.2D55.00 ISOLATOR
-> 0000.0C00.2D55 @ Ethernet0/1: 0000.0c00.6fa5
```

Table 9 describes significant fields shown in the display.

Table 9 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.
SNPA Address	Address of the subnetwork point of attachment (SNPA) of the next hop for this destination NSAP.
Rewrite / Length	Interface encapsulation data and length of the cache entry that the cache must overwrite onto the outgoing frame prior to sending it. If the rewrite length of the cache entry is zero, this field will not be displayed.
[42]	Cache location for this entry.
*39.0004.0040.0000.0C00.2D55.00[1]	Destination NSAP address.
ISOLATOR	Destination host name.
0000.0C00.2D55	System ID of the next-hop router.
Ethernet0/1	Interface through which the router transmitted the packet.
000.0c00.6fa5	SNPA for the next-hop router through the output interface.

1. A leading asterisk (*) indicates that the entry is an allowable value.

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

```
Router# show clns cache delay-parameters

Minimum invalidation interval 2 seconds,
Maximum invalidation interval 5 seconds,
Quiet interval 3 seconds,
Threshold 0 requests
Invalidation rate 3 in last second, 3 in last 3 seconds
```

Table 10 describes significant fields shown in the display.

Table 10 show clns cache delay-parameters Field Descriptions

Field	Description
Minimum invalidation interval	Minimum time (in seconds) between invalidation request and actual invalidation.
Maximum Invalidation interval	Maximum time (in seconds) between invalidation request and actual invalidation.
Quiet interval	Length of time (in seconds) before invalidation.
Threshold	Maximum number of invalidations considered to be quiet.
Invalidation rate	Number of invalidations (route cache purges) per second.

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

```
Router# show clns cache invalidations

Caller              Count       Last Invalidation
clns_fastsetup      3           20:55:56
clns_route_update   23          20:56:44
clns_route_adjust   2           20:55:52
isis_compute_spt    2017        00:10:13
delete_adjacency    9           1d19h
clns_ager           11          1d19h
```

Table 11 describes significant fields shown in the display.

Table 11 show clns cache invalidations Field Descriptions

Field	Description
Caller	Lists the names of the functions that have purged the CLNS route cache.
Count	Number of times the function has invalidated the CLNS route cache.
Last invalidation	The last time the function invalidated the CLNS route cache.

Related Commands

Command	Description
clear clns cache	Clears and reinitializes the CLNS routing cache.

show clns es-neighbors

To list the ES neighbors that this router knows about, use the **show clns es-neighbors** command in EXEC mode.

show clns *area-tag* **es-neighbors** [*type number*] [**detail**]

Syntax Description

area-tag	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Meaningful name for a routing process. This name must be unique among all IP or Connectionless Network Service (CLNS) router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area.
type	(Optional) Interface type.
number	(Optional) Interface number.
detail	(Optional) When specified, the areas associated with the end systems are displayed. Otherwise, a summary display is provided.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The *area-tag* argument was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show clns es-neighbors** command when Ethernet interface 0 is specified:

```
Router# show clns es-neighbors ethernet0

System Id       Interface   State  Type  Format
0800.2B14.060E  Ethernet0   Up     ES    Phase V
0800.2B14.0528  Ethernet0   Up     ES    Phase V
```

Table 12 describes the significant fields shown in the display.

Table 12 show clns es-neighbors Field Descriptions

Field	Descriptions
System Id	Identification value of the system.
Interface	Interface on which the router was discovered.

Table 12 show clns es-neighbors Field Descriptions (continued)

Field	Descriptions
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.
Format	Indicates if the neighbor is either a Phase V (OSI) adjacency or Phase IV (DECnet) adjacency.

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.

Related Commands

Command	Description
clear clns es-neighbors	Removes ES neighbor information from the adjacency database.
clns es-neighbor	Defines all end systems that will be used when you manually specify the NSAP-to-SNPA mapping.

show clns filter-expr

To display one or all currently defined CLNS filter expressions, use the **show clns filter-expr** command in EXEC mode.

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 Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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 ADULTS MEN or WOMEN
```

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

```
Router# show clns filter-expr

MEN = FRED or BARNEY
WOMEN = WILMA or BETTY
ADULTS = MEN or WOMEN
```

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

```
Router# show clns filter-expr detail

MEN = FRED or BARNEY
WOMEN = WILMA or BETTY
ADULTS = (FRED or BARNEY) or (WILMA or BETTY)
```

Related Commands

Command	Description
clns filter-expr	Combines CLNS filter sets and CLNS address templates to create complex logical NSAP pattern-matching expressions.

show clns filter-set

To display one or all currently defined CLNS filter sets, use the **show clns filter-set** command in EXEC mode.

show clns filter-set [*name*]

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following display 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 following is a sample output from the **show clns filter-set** command:

```
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 Commands

Command	Description
clns filter-set	Builds a list of CLNS address templates with associated permit and deny conditions for use in CLNS filter expressions.

show clns interface

To list the CLNS-specific information about each interface, use the **show clns interface** command in privileged EXEC mode.

show clns interface [*type number*]

Syntax Description

type	(Optional) Interface type.
number	(Optional) Interface number.

Command Modes

Privileged EXEC

Command History

Mainline Release	Modification
10.0	This command was introduced.
OS Release	
12.0(31)S	Support for the BFD feature was added.
S Release	
12.2(18)SXE	Support for the Bidirectional Forwarding Detection (BFD) feature was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
T Release	
12.4(4)T	Support for the BFD feature was added.

Examples

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
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>
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
     CLNS cluster alias enabled on 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
```

Cisco IOS Release 12.2(18)SXE, 12.0(31)S, and 12.4(4)T

The following is sample output from the **show clns interface** command that verifies that the BFD feature has been enabled on Ethernet interface 3/0. The relevant command output is shown in bold in the output.

```
Router# show clns interface ethernet 3/0

Ethernet3/0 is up, line protocol is up
  Checksums enabled, MTU 1497, Encapsulation SAP
  ERPDUs enabled, min. interval 10 msec.
  CLNS fast switching enabled
  CLNS SSE switching disabled
  DEC compatibility mode OFF for this interface
  Next ESH/ISH in 42 seconds
  Routing Protocol: IS-IS
    Circuit Type: level-1-2
    Interface number 0x1, local circuit ID 0x2
    Level-1 Metric: 10, Priority: 64, Circuit ID: RouterA.02
    DR ID: 0000.0000.0000.00
    Level-1 IPv6 Metric: 10
    Number of active level-1 adjacencies: 0
    Level-2 Metric: 10, Priority: 64, Circuit ID: RouterA.02
    DR ID: 0000.0000.0000.00
    Level-2 IPv6 Metric: 10
    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 5 seconds
    BFD enabled
```

Table 13 describes the significant fields shown in the display.

Table 13 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	(Second interface). Shown to be up, and the line protocol is up.
Serial 2 is up, line protocol is up	(Third interface). Shown to be up, and the line protocol is up.
Checksums enabled	Can be enabled or disabled.
MTU	The number following maximum transmission unit (MTU) is the maximum transmission size for a packet on this interface.
Encapsulation	Describes the encapsulation used by CLNP packets on this interface.

Table 13 show clns interface Field Descriptions (continued)

Field	Description
ERPDUs	Displays information about the generation of error protocol data units (ERPDUs). They can be either enabled or disabled. If they are enabled, they are sent out no more frequently than the specified interval.
RDPDUs	Provides information about the generation of redirect protocol data units (RDPDUs). They can be either enabled or disabled. If they are enabled, they are sent out no more frequently than the specified interval. If the address mask is enabled, redirects are 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 fast switching is supported for CLNS on this interface.
DEC compatibility mode	Indicates whether Digital Equipment Corporation (DEC) compatibility has been enabled.
CLNS cluster alias enabled on this interface	Indicates that CLNS cluster aliasing has been enabled on this interface.
Next ESH/ISH	Displays when the next end system (ES) hello or intermediate system (IS) hello 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).
Interface number, local circuit ID Level-1 Metric DR ID Level-1 IPv6 Metric Number of active level-1 adjacencies Level-2 Metric DR ID Level-2 IPv6 Metric Number of active level-2 adjacencies Next IS-IS LAN Level-1 Next IS-IS LAN Level-2	Last series of fields displays information pertaining to the International Organization for Standardization (ISO) CLNS routing protocols enabled on the interface. For ISO Interior Gateway Routing Protocol (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.
BFD enabled	BFD has been enabled on the interface.

show clns is-neighbors

To display Intermediate System-to-Intermediate System (IS-IS) related information for IS-IS router adjacencies, use the **show clns is-neighbors** command in EXEC mode. Neighbor entries are sorted according to the area in which they are located.

show clns *area-tag* **is-neighbors** [*type number*] [**detail**]

Syntax Description

area-tag	Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. Meaningful name for a routing process. This name must be unique among all IP or CLNS router processes for a given router. If an area tag is not specified, a null tag is assumed and the process is referenced with a null tag. If an area tag is specified, output is limited to the specified area.
type	(Optional) Interface type.
number	(Optional) Interface number.
detail	(Optional) When specified, the areas associated with the intermediate systems are displayed. Otherwise, a summary display is provided.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show clns is-neighbors** 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 14 describes significant fields shown in the display.

Table 14 show clns is-neighbors Field Descriptions

Field	Descriptions
System Id	Identification value of the system.
Interface	Interface on which the router was discovered.

Table 14 show clns is-neighbors Field Descriptions (continued)

Field	Descriptions
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.

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

```
Router# show clns is-neighbors detail

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
  Uptime: 0:03:35
0800.2B16.24EA  Ethernet0   Up     L1L2  64/64     0800.2B16.24EA.01  Phase V
  Area Address(es): 47.0004.004D.0001
  Uptime: 0:03:35
0000.0C00.3E51  Serial1     Up     L2    0         04                 Phase V
  Area Address(es): 39.0004
  Uptime: 0:03:35
000.0C00.62E6  Ethernet1    Up     L1    64        0000.0C00.62E6.03  Phase V
  Area Address(es): 47.0004.004D.0001
  Uptime: 0:03:35
```

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) and how long (uptime) the adjacency has existed.

Related Commands

Command	Description
clear clns is-neighbors	Removes IS neighbor information from the adjacency database.
clns is-neighbor	Defines all intermediate systems that will be used when you manually specify the NSAP-to-SNPA mapping.

show clns neighbor areas

To display information about Intermediate System-to-Intermediate System (IS-IS) neighbors and the areas to which they belong, use the **show clns neighbor areas** command in EXEC mode.

show clns *area-tag* **neighbor areas**

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use the **show clns neighbor areas** command to verify that all expected adjacencies are up with all neighbors. If they are not, recheck the area addresses specified in both routers. If the router is running in dual CLNS-IP mode in an area, verify that a valid IP address is configured on each interface in the area. Consider using the **debug isis adjacency** command to gather additional information.

Examples

The following example shows output when two Level 1 and one Level 2 IS-IS areas are configured.

```
Router# show clns neighbor areas

System Id      Interface   Area Name           State  Holdtime  Type Protocol
0000.0000.0009 Tu529       L2BB                Up     26        L1L2 IS-IS
0000.0000.0053 Et1         A3253-01            Up     21        L1   IS-IS
0000.0000.0003 Et1         A3253-01            Up     28        L1   IS-IS
0000.0000.0002 Et2         A3253-02            Up     22        L1   IS-IS
0000.0000.0053 Et2         A3253-02            Up     23        L1   IS-IS
```

Table 15 describes the significant fields shown in the display.

Table 15 show clns neighbor areas Field Descriptions

Field	Descriptions
System Id	Identification value of the system.
Interface	Interface on which the router was discovered.
Area Name	Name of the area in which the system is configured.
State	Adjacency state. Up and Init are the states. See the **show clns neighbors** description.
Init	System is waiting for an IS-IS hello message.
Up	Believes the system is reachable.
Holdtime	Number of seconds before this adjacency entry times out.
Type	L1, L2, and L1L2 type adjacencies.
ES	End-system adjacency either discovered by the ES-IS protocol or statically configured.
IS	Router adjacency either discovered by the ES-IS protocol or statically configured.
L1	Router adjacency for Level 1 routing only.
L1L2	Router adjacency for Level 1 and 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, International Standards Organization Interior Gateway Routing Protocol (ISO IGRP), static, and DECnet.

Related Commands

Command	Description
show clns es-neighbors	Lists the ES neighbors that this router knows.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.
show clns neighbors	Displays both ES and IS neighbors.

show clns neighbors

To display end system (ES), intermediate system (IS), and multitopology Integrated Intermediate System-to-Intermediate System (M-ISIS) neighbors, use the **show clns neighbors** command in user EXEC or privileged EXEC mode.

show clns neighbors [*process-tag*] [*interface-type interface-number*] [**area**] [**detail**]

Syntax Description

process-tag	(Optional) A unique name among all International Organization for Standardization (ISO) router processes including IP and Connectionless Network Service (CLNS) router processes for a given router. If a process tag is specified, output is limited to the specified routing process. When **null** is specified for the process tag, output is displayed only for the router process that has no tag specified. If a process tag is not specified, output is displayed for all processes.
interface-type	(Optional) Interface type.
interface-number	(Optional) Interface number.
area	(Optional) Displays the CLNS multiarea adjacencies.
detail	(Optional) Displays the area addresses advertised by the neighbor in the hello messages. Otherwise, a summary display is provided. In IPv6, this keyword displays the address family of the adjacency.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The **area** and **detail** keywords were added.
12.2(15)T	Support was added for IPv6.
12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S.
12.0(29)S	The *process-tag* argument was added.
12.2(15)T	Support was added for IPv6.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(25)SG	This command was integrated into Cisco IOS Release 12.2(25)SG.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **show clns neighbors** command displays the adjacency that is learned through multitopology IS-IS for IPv6.

Examples

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

```
Router# show clns neighbors

System Id          Interface    SNPA            State  Holdtime  Type Protocol
0000.0000.0007     Et3/3        aa00.0400.6408  UP     26        L1   IS-IS
0000.0C00.0C35     Et3/2        0000.0c00.0c36  Up     91        L1   IS-IS
0800.2B16.24EA     Et3/3        aa00.0400.2d05  Up     27        L1   M-ISIS
0800.2B14.060E     Et3/2        aa00.0400.9205  Up     8         L1   IS-IS
```

The following is sample output from the **show clns neighbors** command using the *process-tag* argument to display information about the VRF-aware IS-IS instance tagRED:

```
Router# show clns tagRED neighbors

Tag tagRED:
System Id          Interface    SNPA            State  Holdtime  Type Protocol
igp-03             Fa0/         200d0.2b7f.9502 Up     9         L2   IS-IS
igp-03             PO2/2.1      DLCI 211        Up     27        L2   IS-IS
igp-02             PO2/0.1      DLCI 131        Up     29        L2   IS-IS
igp-11             Fa0/4        000e.d79d.7920  Up     7         L2   IS-IS
igp-11             Fa0/5        000e.d79d.7921  Up     8         L2   IS-IS
igp-11             PO3/2.1      DLCI 451        Up     24        L2   IS-IS
```

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

```
Router# show clns neighbors detail

System Id          Interface    SNPA            State  Holdtime  Type Protocol
0000.0000.0007     Et3/3        aa00.0400.6408  UP     26        L1   IS-IS

Area Address(es): 20
IP Address(es): 172.16.0.42*
Uptime: 00:21:49
0000.0C00.0C35     Et3/2        0000.0c00.0c36  Up     91        L1   IS-IS

Area Address(es): 20
IP Address(es): 192.168.0.42*
Uptime: 00:21:52
0800.2B16.24EA     Et3/3        aa00.0400.2d05  Up     27        L1   M-ISIS

Area Address(es): 20
IP Address(es): 192.168.0.42*
IPv6 Address(es): FE80::2B0:8EFF:FE31:EC57
Uptime: 00:00:27
Topology: IPv6
0800.2B14.060E     Et3/2        aa00.0400.9205  Up     8         L1   IS-IS

Area Address(es): 20
IP Address(es): 192.168.0.30*
Uptime: 00:21:52
```

The following is sample output from the **show clns neighbors** command using the *process-tag* argument to display information about the VRF-aware IS-IS instance tagSecond:

```
Router# show clns tagSecond neighbors
```

```
Tag tagSecond:

System Id      Interface   SNPA            State  Holdtime  Type Protocol
igp-03         Fa0/2       00d0.2b7f.9502  Up     9         L2   IS-IS
igp-03         PO2/2.1     DLCI 211        Up     27        L2   IS-IS
igp-02         PO2/0.1     DLCI 131        Up     29        L2   IS-IS
igp-11         Fa0/4       000e.d79d.7920  Up     7         L2   IS-IS
igp-11         Fa0/5       000e.d79d.7921  Up     8         L2   IS-IS
igp-11         PO3/2.1     DLCI 451        Up     24        L2   IS-IS
```

Table 16 describes the significant fields shown in the display.

Table 16 show clns neighbors Field Descriptions

Field	Description
Tag tagSecond	Tag name that identifies an IS-IS instance.
System Id	Six-byte value that identifies a system in an area.
Interface	Interface from which the system was learned.
SNPA	Subnetwork Point of Attachment. This is the data-link address.
State	State of the ES, IS, or M-ISIS.
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 as follows: • ES—End-system adjacency either discovered via the ES-IS protocol or statically configured. • IS—Router adjacency either discovered via the ES-IS protocol or statically configured. • M-ISIS—Router adjacency discovered via the multitopology IS-IS protocol. • L1—Router adjacency for Level 1 routing only. • L1L2—Router adjacency for Level 1 and 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, DECnet, and M-ISIS.

Notice that the information displayed in the **show clns neighbors detail** command output includes everything shown in **show clns neighbors** command output in addition to the area address associated with the IS neighbor and its uptime. When IP routing is enabled, Integrated-ISIS adds information to the output of the **show clns** commands. The **show clns neighbors detail** command output shows the IP addresses that are defined for the directly connected interface and an asterisk (*) to indicate which IP address is the next hop.

show clns protocol

To list the protocol-specific information for each ISO Interior Gateway Routing Protocol (IGRP) or Intermediate System-to-Intermediate System (IS-IS) routing process in the router, use the **show clns protocol** command in privileged EXEC mode.

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

Syntax Description

domain	(Optional) Particular ISO IGRP routing domain.
process-tag	(Optional) Required for multiarea IS-IS configuration. Optional for conventional IS-IS configuration. A unique name among all ISO router processes including IP and Connectionless Network Service (CLNS) router processes for a given router. If a process tag is specified, output is limited to the specified routing process. When **null** is specified for the process tag, output is displayed only for the router process that has no tag specified. If a process tag is not specified, output is displayed for all processes.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(29)S	The *process-tag* argument was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

There will always be at least two routing processes, a Level 1 and a Level 2, and there can be more.

Examples

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
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
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
```

The following is sample output from the **show clns protocol** command using the *process-tag* argument to display information about the VPN routing/forwarding instance (VRF)-aware IS-IS instance tagFirst:

```
Router# show clns tagBLUE protocol

IS-IS Router: tagFirst
  System Id: 0000.0001.0002.00  IS-Type: level-2-only
  Manual area address(es):
        49.000b
  Routing for area address(es):
        49.000b
  Interfaces supported by IS-IS:
        FastEthernet4/1 - IP
        FastEthernet4/0 - IP
        Ethernet0/2 - IP
        FastEthernet4/3 - IP
  Redistributing:
    static
  Distance: 110
  RRR level: none
  Generate narrow metrics: level-1-2
  Accept narrow metrics:   level-1-2
  Generate wide metrics:   none
  Accept wide metrics:     none
```

Table 17 describes the significant fields shown in the display.

Table 17 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 using the **router iso-igrp** global configuration command.

Table 17 show clns protocol Field Descriptions (continued)

Field	Description
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 are sent.
Next due in 11 seconds	Indicates when the next update is sent.
Invalid after 135 seconds	Indicates how long routing updates are to be regarded as accurate.
Hold down for 145 seconds	Indicates how long a route is held down before new information is to be regarded as accurate.
Sending Router Hellos every 17 seconds. Next due in 9 seconds	Indicates how often Cisco IOS software sends hello packets to each other and when the next is due.
Invalid after 51 seconds	Indicates how long a neighbor entry is remembered.
IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0	Displays the weights applied to the various components of the metric. These fields are followed by the list of interfaces in this area.
Interfaces in domain/area	List of interface names for which the router process is configured.

Table 18 describes significant fields shown in the IS-IS portion of the display.

Table 18 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 addresses that have been configured.
Routing for area address(es): 39.0004.0030	List of manually configured and learned area addresses.
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.
Redistributing:	Configuration of route redistribution.
Distance:	Configured distance.

show clns route

To display one or all of the destinations to which this router knows how to route CLNS packets, use the **show clns route** command in EXEC mode.

show clns route *nsap*

Syntax Description

nsap	CLNS network service access point (NSAP) address.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	Fields for displaying information about prefix routes were added or changed.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **show clns route** command shows the Intermediate System-to-Intermediate System (IS-IS) Level 2 routing table and static and Intermediate System-to-Intermediate System Interior Gateway Routing Protocol (ISO-IGRP) learned prefix routes. This table stores IS-IS area addresses and prefix routes.

Examples

The following is sample output from the **show clns route** command when the *nsap* argument is not used:

```
Router# show clns route

ISO-IGRP Routing Table for Domain 49.0002, Area 0007
System Id       Next-Hop        SNPA                Interface   Metric   State
milles          milles          *HDLC*              Se1         8476     Up
0000.0000.0007  milles          *HDLC*              Se1         10476    Up
rips            0000.0000.0000  --                  --          0        Up

ISO-IGRP Routing Table for Domain 49.0002
Area Id         Next-Hop        SNPA                Interface   Metric   State
0002            0000.0000.0000  --                  --          0        Up

Codes: C - connected, S - static, d - DecnetIV
I - ISO-IGRP,  i - IS-IS,  e - ES-IS

C  49.0002 [2/0], Local ISO-IGRP Domain
C  49.0001.0000.0000.0005.00 [1/0], Local IS-IS NET
C  49.0002.0007.0000.0000.0005.00 [1/0], Local ISO-IGRP NET
C  49.0001 [2/0], Local IS-IS Area

i  33.3333.3333 [110/10]
via bakel, Ethernet0
S  50.1234 [10/0], Discard Entry
```

```
I  55.5555.5555 [100/8476]
via milles, Serial1
S  77.7777.7777.7777 [10/0]
via Serial0
d  88.8888.8888.0007 [120/0], DecnetIV Entry
i  33.4567.8901 [110/10]
via bakel, Ethernet0
```

Table 19 describes the significant fields shown in the display.

Table 19 show clns route Field Descriptions

Field	Description
Domain 49.0002	The ISO-IGRP routing domain for which we are displaying the routes.
Area 0007	The ISO-IGRP area in which the displayed the Level 1 host routes are.
System Id	Identification value of the system listed in the Level 1 forwarding table.
Area Id	The identification value of the area listed in the area forwarding table.
Next-Hop	System ID of the best cost next-hop to listed address.
SNPA	MAC address of the next-hop system.
Interface	Interface through which next-hop system is known.
Metric	ISO-IGRP cost to reach the destination.
State	Up (active) or Down (nonoperational).

Table 20 describes the codes as they appear in the previous display.

Table 20 prefix routes Field Descriptions

Field	Description
C (connected)	The domain, area, or NET was learned via local configuration.
S (static)	The destination was learned via a locally configured static route.
d (DECnet IV)	The destination is a converted DECnet phase IV area address.
I (ISO-IGRP)	The destination is a prefix learned via Level 2 ISO-IGRP.
i (IS-IS)	The destination is a prefix learned via Level 2 IS-IS.
e (ES-IS)	The destination is learned via end system-intermediate system (ES-IS) redirects.
33.3333.3333	Destination prefix.
[110/10]	Administrative distance/metric.
via bakel	Next-hop system via which this destination is reachable. Shown as a 6-byte system ID, or as symbolic name (if available).
Ethernet0	Outgoing interface via which this destination is reachable.

Table 20 prefix routes Field Descriptions (continued)

Local IS-IS NET	Prefix is the full NET configured under an IS-IS process.
Local ISO-IGRP NET	Prefix is the full NET configured under an ISO-IGRP process.
Local ISO-IGRP Domain	Prefix is the domain part of a locally configured ISO-IGRP NET. This prefix is installed for redistribution purposes.
Local IS-IS Area	Prefix is the area address of a locally configured IS-IS NET. This prefix is installed for redistribution purposes.
Discard Entry	Prefix is learned via a locally configured static discard entry.
DecnetIV Entry	Prefix is a combination of the locally configured DECnet conversion prefix and a dynamically learned DECnet IV route. This prefix is installed for redistribution purposes.

The following is sample output showing a single CLNS route using the **show clns route** command with the *nsap* argument:

```
Router# show clns route 33.3333.3333

Routing entry for 33.3333.3333
Known via "isis", distance 110, metric 10, Dynamic Entry
Routing Descriptor Blocks:
via bakel, Ethernet0
isis, route metric is 10, route version is 4
```

Table 21 describes the significant fields shown in the display.

Table 21 show clns route Field Descriptions

Field	Description
Routing entry for 33.3333.3333	The prefix route being examined.
Known via "isis", distance 110, metric 10, Dynamic Entry	This route was learned from an IS-IS routing process. The administrative distance is 110. The cost to reach the destination is 10.
Routing Descriptor Blocks	Each destination in the CLNS routing table can be reached by one or more paths. Each path is stored in a Routing Descriptor Block. The maximum number of paths in CLNS is 6.
via bakel, Ethernet0	Next-hop is neighbor “bakel.” Outgoing interface is Ethernet0.
Redistributing via	Protocols other than originating protocol that advertise this prefix.
isis, route metric is 10, route version is 4	Originating protocol, cost for this path, route version in case this is an IS-IS route.

Related Commands

Command	Description
show clns es-neighbors	Lists the ES neighbors that this router knows.
show clns is-neighbors	Displays IS-IS related information for IS-IS router adjacencies.
show clns neighbor areas	Displays information about IS-IS neighbors and the areas to which they belong.
show clns neighbors	Displays both ES and IS neighbors.
show isis topology	Displays a list of all connected routers in all areas.

show clns traffic

To list the CLNS packets that this router has seen, use the **show clns traffic** command in user EXEC or privileged EXEC mode.

show clns *area-tag* **traffic**

Syntax Description

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

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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 22 describes significant fields shown in the display.

Table 22 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.
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 ISO Interior Gateway Routing Protocol (IGRP) queries and updates sent and received.
Router Hellos	Lists the number of ISO 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.

Table 22 show clns traffic Field Descriptions (continued)

Field	Description
IS-IS: Level-1 CSNPs (sent/rcvd)	Lists the number of Level 1 CSNPs sent and received.
IS-IS: Level-2 CSNPs (sent/rcvd)	Lists the number of Level 2 CSNPs sent and received.
IS-IS: Level-1 PSNPs (sent/rcvd)	Lists the number of Level 1 PSNPs sent and received.
IS-IS: Level-2 PSNPs (sent/rcvd)	Lists the number of Level 2 PSNPs 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 (SPF) tree was computed.
IS-IS: Level-2 SPF Calculations	Lists the number of times Level 2 SPF tree was computed.

show clns

To display information about the CLNS network, use the **show clns** command in EXEC mode.

show clns

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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 23 describes significant fields shown in the display.

Table 23 show clns Field Descriptions

Field	Description
2 Interfaces Enabled for CLNS	Indicates how many interfaces have the CLNS protocol enabled.
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 sends out IS hello packets.

Table 23 show clns Field Descriptions (continued)

Field	Description
Default Holding Timer: 300	Length of time (in seconds) hello packets are remembered.
Packet Lifetime 64	Default value used in packets sourced by this router.
ERPDUs requested on locally generated packets	Indicates whether ERPDUs are requested for packets sourced by the router.
Intermediate system operation enabled (forwarding allowed)	Indicates whether this router is configured to be an ES or an IS.
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.
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 isis routes

To display the Intermediate System-to-Intermediate System (IS-IS) Level 1 forwarding table for IS-IS learned routes, use the **show isis routes** command in EXEC mode.

show isis *area-tag* **routes**

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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 24 describes significant fields shown in the display.

Table 24 show isis routes 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 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.
Metric	IS-IS metric for the route.
State	Up (active) or Down (nonoperational).

show tarp blacklisted-adjacencies

To list all adjacencies that have been blacklisted (that is, adjacencies that this router will not propagate TARP PDUs to) by the **tarp blacklist-adjacency** command, use the **show tarp blacklisted-adjacencies** command in EXEC mode.

show tarp blacklisted-adjacencies

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp blacklisted-adjacencies** command:

```
Router# show tarp blacklisted-adjacencies

Adjacencies that we won't propagate TARP PDU's to:

        49.0001.5555.5555.5555.00
```

Table 25 describes the field shown in the display.

Table 25 show tarp blacklisted adjacencies Field Descriptions

Field	Description
49.0001.5555.5555.5555.00	NSAP address of the blacklisted router.

Related Commands

Command	Description
tarp blacklist-adjacency	Blacklists the specified router so that the router does not receive TARP PDUs propagated by this router.

show tarp host

To display information about a specific TID Address Resolution Protocol (TARP) router stored in the local TID cache, use the **show tarp host** command in EXEC mode.

show tarp host *tid*

Syntax Description

tid	Target identifier of the router from which you want information. Alphanumeric string up to 255 characters.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp host** command:

```
router# show tarp host artemis

TID of entry: artemis
NET of entry: 49.0001.1111.1111.1111.00
Entry type: DYNAMIC
Expiration time: 280 seconds
```

Table 26 describes the fields shown in the display.

Table 26 show tarp host Field Descriptions

Field	Description
TID	Target identifier of the router.
NET	NSAP address of the router.
Entry type	Type of entry in the TID cache. Values are local, dynamic, or static. A static entry is created with the **tarp map** command.
Expiration time	Amount of time that a dynamically created entry will remain in the TID cache. The cache timer is set by the **tarp cache-timer** command.

Related Commands

Command	Description
tarp tid	Assigns a TID to the router.

show tarp interface

To list all interfaces that have TID Address Resolution Protocol (TARP) enabled, use the **show tarp interface** command in EXEC mode.

show tarp interface [*type number*]

Syntax Description

type	(Optional) Interface type.
number	(Optional) Interface number.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp interface** command:

```
Router# show tarp interface

Ethernet0 is up, line protocol is up, encapsulation is ARPA
TARP propagation is enabled on this interface
```

Table 27 describes the fields shown in the display.

Table 27 show tarp interface Field Descriptions

Field	Description
Ethernet...is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) or if it has been taken down by an administrator.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol think the line is usable (that is, whether keepalives are successful).
Encapsulation	Indicates the encapsulation method assigned to the interface.
TARP propagation	Indicates whether this interface can propagate TARP PDUs. The propagation is set by the **tarp propagate** command.

Related Commands

Command	Description
tarp enable	Enables the TARP on an interface.
tarp propagate	Reenables propagation of TARP PDUs on an interface.

show tarp ldb

To display the contents of the loop-detection buffer table, use the **show tarp ldb** command in EXEC mode.

show tarp ldb

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp ldb** command:

```
Router# show tarp ldb

   System ID          Sequence Number      Expiration (sec)
  1111.1111.1111             4            240
```

Table 28 describes the fields shown in the display.

Table 28 show tarp ldb Field Descriptions

Field	Description
System ID	System ID of the router.
Sequence Number	Sequence number of the last packet originated by the router specified by the system ID.
Expiration (sec)	Time, in seconds, left before this entry in the loop-detection buffer table is cleared. The time is set by the **tarp ldb-timer** command.

Related Commands

Command	Description
clear tarp ldb-table	Clears the system ID-to-sequence number mapping entries stored in the TARP loop-detection buffer table.
tarp sequence-number	Specifies the sequence number to be used in the next outgoing TARP PDU.

show tarp map

To list all static entries in the TID cache that were configured with the **tarp map** command, use the **show tarp map** command in EXEC mode.

show tarp map

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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

```
Router# show tarp map

        Static MAP entries:

shashi                          49.0001.6666.6666.6666.00
sonali                          49.0001.7777.7777.7777.00
```

Table 29 describes the fields shown in the display.

Table 29 show tarp map Field Descriptions

Field	Description
shashi	TID of the static entry.
49.0001.6666.6666.6666.00	NSAP address of the static entry.

Related Commands

Command	Description
clear tarp tid-table	Clears the dynamically created TARP TID-to-NSAP address mapping entries stored in TID cache.
tarp map	Enters a TID-to-NSAP static map entry in the TID cache.

show tarp static-adjacencies

To list all static TID Address Resolution Protocol (TARP) adjacencies that are configured with the **tarp route-static** command, use the **show tarp static-adjacencies** command in EXEC mode.

show tarp static-adjacencies

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp static-adjacencies** command:

```
Router# show tarp static-adjacencies

        Manual (static) TARP adjacencies:

        55.0001.0001.1111.1111.1111.1111.1111.1111.1111.00
```

Table 30 describes the field shown in the display.

Table 30 show tarp static-adjacencies Field Descriptions

Field	Description
55.0001.0001.1111.1111.1111.1111.1111.1111.1111.0	NSAP address of the TARP adjacency.

Related Commands

Command	Description
tarp route-static	Configures a static TARP adjacency.

show tarp tid-cache

To display information about the entries in the TID cache, use the **show tarp tid-cache** command in EXEC mode. Entries are created dynamically, statically, or as a result of assigning a TID to the device by using the **tarp tid** command.

show tarp tid-cache [**detail**]

Syntax Description

detail	(Optional) List additional information in the TID/NET cache (such as the expiration time for dynamic entries).

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show tarp tid-cache** command:

```
Router# show tarp tid-cache

TID ('*' : static; & : local)              NSAP
* shashi                       49.0001.6666.6666.6666.00
& router                       49.0001.3333.3333.3333.00
* sonali                       49.0001.7777.7777.7777.00
  artemis                      49.0001.1111.1111.1111.00
```

The following is sample output from the **show tarp tid-cache detail** command:

```
Router# show tarp tid-cache detail

TID ('*': static; &: local)              NSAP
& router                       49.0001.3333.3333.3333.00
 Expiration time: NONE
```

Table 31 describes the fields shown in the displays.

Table 31 show tarp tid-cache Field Descriptions

Field	Description
TID	Target identifier assigned to the TID cache entry. Static entries are flagged with an asterisk (*). The local entry is flagged with an ampersand (&).
NSAP	NSAP address of the TID cache entry.
*	An asterisk (*) indicates that the entry in the TID cache is static (that is, you have created an entry in the TID cache with the **tarp map** command.
&	An ampersand (&) indicates that the entry in the TID cache is the local entry (that is, the router to which you are connected).
Expiration time	Amount of time the entry remains in the TID cache. When this time expires, the entry is removed from the TID cache. Only dynamic entries have an expiration time. The local entry indicated by an ampersand (&) and static entries indicated by an asterisk (*) are not removed from the TID cache.

Related Commands

Command	Description
clear tarp tid-table	Clears the dynamically created TARP TID-to-NSAP address mapping entries stored in TID cache.
tarp cache-timer	Specifies the length of time that a dynamically created TARP entry remains in the TID cache.
tarp map	Enters a TID-to-NSAP static map entry in the TID cache.
tarp tid	Assigns a TID to the router.

show tarp traffic

To display statistics about TID Address Resolution Protocol (TARP) PDUs since the last time the counters were cleared, use the **show tarp traffic** command in EXEC mode.

show tarp traffic

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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

```
Router# show tarp traffic

TARP counters:
        Packets output: 11, Input: 5
        Hdr syntax: 0
        No memory: 0, Invalid packet: 0
        Lifetime exceeded: 0
```

Table 32 describes the fields shown in the display.

Table 32 show tarp traffic Field Descriptions

Field	Description
Packets output	Indicates the number of PDUs that this router has originated.
Input	Indicates the number of PDUs that this router has received.
Hdr syntax	Number of PDUs with bad header information.
No memory	Number of times a request for memory failed (because of insufficient memory).
Invalid packets	Number of received PDUs that contained invalid information.
Lifetime exceeded	Number of received PDUs with zero lifetime.

Related Commands

Command	Description
clear tarp counters	Clears all TARP counters that are displayed with the show tarp traffic command.

show tarp

To display all global TID Address Resolution Protocol (TARP) parameters, use the **show tarp** command in EXEC mode.

show tarp

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

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

```
Router# show tarp

Global TARP information:
  TID of this station is "cerd"
  Timer T1 (timer for response to TARP Type 1 PDU) is 15 seconds
  Timer T2 (timer for response to TARP Type 2 PDU) is 25 seconds
  Timer T3 (timer for response to ARP request) is 40 seconds
  Timer T4 (timer that starts when T2 expires) is 15 seconds
  Loop Detection Buffer entry timeout: 300 seconds
  TID cache entry timeout: 300 seconds
  This station will propagate TARP PDUs
  This station will originate TARP PDUs
  TID<->NET cache is enabled
  Sequence number that next packet originated by this station will have: 9
  Update remote cache (URC) bit is 0
  Packet lifetime: 100 hops
  Protocol type used in outgoing packets: "FE"
  N-Selector used in TARP PDU's: "AF"
```

Table 33 describes the fields shown in the display.

Table 33 show tarp Field Descriptions

Field	Description
TID	Target identifier assigned to this router by the **tarp tid** command.
Timer T1	Number of seconds that the router will wait to receive a response from a Type 1 PDU. The T1 timer is set by the **tarp t1-response-timer** command.
Timer T2	Number of seconds that the router will wait to receive a response from a Type 2 PDU. The T2 timer is set by the **tarp t2-response-timer** command.
Timer T3	Number of seconds that the router will wait for a response from a Type 5 PDU. The T3 timer is set by the **tarp arp-request-timer** command.
Timer T4	Number of seconds that the router will wait for a response from a Type 2 PDU after the T2 timer has expired. The T4 timer is set by the **tarp post-t2-response-timer** command.
Loop Detection Buffer entry timeout	Number of seconds that a System ID-to-sequence number mapping entry remains in the loop-detection buffer table. The loop-detection buffer timeout is set by the **tarp ldb-timer** command.
TID cache entry timeout	Number of seconds that a dynamically created TARP entry remains in the TID cache. The cache timeout is set by the **tarp cache-timer** command.
Propagate TARP PDUs	Indicates whether the router can propagate TARP PDUs to its TARP neighbors. This field is set by the **tarp global-propagate** command.
Originate TARP PDUs	Indicates whether the router can originate TARP PDUs. This field is set by the **tarp originate** command.
TID<->NET cache	Indicates whether the router will store TID-to-network (NSAP) address mapping in cache. This field is set by the **tarp allow-caching** command.
Sequence number	Number used by the next packet to indicate if the packet is newer than the last information received. This number can be changed by the **tarp sequence-number** command.
Update remote cache	Indicates the setting of the URC bit in outgoing PDUs. When the bit is zero, the receiver of the PDU will update its cache entry. When the bit is one, the receiver of the PDU will not update its cache entry. This URC bit is set by the **tarp urc** command.
Packet lifetime	Number of hosts that a PDU can traverse before the PDU is discarded. The packet lifetime is set by the **tarp lifetime** command.

Table 33 show tarp Field Descriptions (continued)

Field	Description
Protocol type	Hexadecimal representation of the protocol used in outgoing PDUs. The protocol type is set by the **tarp protocol-type** command. Only CLNP (indicated by FE) is supported.
N-selector	Hexadecimal representation of the N-selector used to indicate that the packet is a TARP PDU. The N-selector is set by the **tarp nselector-type** command. The default is AF.

tarp allow-caching

To reenable the storage of TID-to-NSAP address mapping in the TID cache, use the **tarp allow-caching** command in global configuration mode. To disable this function and clear the TID cache, use the **no** form of this command.

tarp allow-caching

no tarp allow-caching

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

By default, storing TID-to-network (NSAP) address mapping in the cache is enabled unless you specifically disable the capability with the **no tarp allow-caching** command. If you disable this capability, you must use the **tarp allow-caching** command to reenable storage of TID-to-network address mapping in cache. After re-enabling this capability, any previously cleared local entry and all static entries are restored.

Examples

The following example disables storage of TID-to-NSAP address mapping in cache on the router:

```
no tarp allow-caching
```

Related Commands

Command	Description
clear tarp tid-table	Clears the dynamically created TARP TID-to-NSAP address mapping entries stored in TID cache.
show tarp map	Lists all static entries in the TID cache that were configured with the tarp map command.
show tarp tid-cache	Displays information about the entries in the TID cache.

Command	Description
tarp cache-timer	Specifies the length of time that a dynamically created TARP entry remains in the TID cache.
tarp map	Enters a TID-to-NSAP static map entry in the TID cache.

tarp arp-request-timer

To set the timeout for TID Address Resolution Protocol (TARP) Type 5 PDUs, use the **tarp arp-request-timer** command in global configuration mode. To set the timeout to the default value, use the **no** form of this command.

tarp arp-request-timer *seconds*

no tarp arp-request-timer

Syntax Description

seconds	Number of seconds for which the router will wait for a response from a TARP Type 5 PDU. The range is from 0 to 3600 seconds.

Defaults

40 seconds

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You may want to increase the time if your network has a slow link or there are long delay times on the link.

TARP Type 5 PDUs are sent by the **tarp query** command to determine a TID that corresponds to a particular NSAP.

Examples

The following example sets the timeout for TARP Type 5 PDUs to 60 seconds (one minute):

```
tarp arp-request-timer 60
```

Related Commands

Command	Description
tarp lifetime	Specifies the lifetime for locally generated TARP PDUs based on the number of hops.
tarp query	Determines a TID corresponding to a specific NSAP address.

tarp blacklist-adjacency

To blacklist the specified router so that the router does not receive TID Address Resolution Protocol (TARP) PDUs propagated by this router, use the **tarp blacklist-adjacency** command in global configuration mode. To remove the specified router from the blacklist so that the router can once again receive propagated TARP PDUs, use the **no** form of this command.

tarp blacklist-adjacency *nsap*

no tarp blacklist-adjacency *nsap*

Syntax Description

nsap	NSAP address that cannot receive TARP PDUs. Use the full NSAP address.

Defaults

All hosts receive propagated TARP PDUs.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

A TARP router propagates PDUs to all its TARP adjacencies (both dynamic and static). Use the **tarp blacklist-adjacency** command to bypass hosts that may not have TARP running or to bypass hosts to which you do not want to propagate TARP PDUs.

Examples

The following example specifies that the router 49.0001.0000.0c00.1111.1234.00 will not receive propagated TARP PDUs:

```
tarp blacklist-adjacency 49.0001.0000.0c00.1111.1234.00
```

Related Commands

Command	Description
show tarp blacklisted-adjacencies	Lists all blacklisted adjacencies (to which this router will not propagate TARP PDUs) by the tarp blacklist-adjacency command.

tarp cache-timer

To specify the length of time for which a dynamically created TID Address Resolution Protocol (TARP) entry remains in the TID cache, use the **tarp cache-timer** command in global configuration mode. To set the timer to the default value, use the **no** form of this command.

tarp cache-timer *seconds*

no tarp cache-timer

Syntax Description

seconds	Number of seconds for which an entry remains in the TID cache. The range is 30 to 86,400 seconds.

Defaults

3,600 seconds (one hour)

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Static entries (those created with the **tarp map** command) remain in the TID cache unless cleared by the **no tarp map** command.

If entries frequently change, you may want to use a shorter time period. If entries are stable, you may want to use a longer time period.

Examples

The following example limits the time for which an entry remains in the TID cache to 1,800 seconds (30 minutes):

```
tarp cache-timer 1800
```

Related Commands

Command	Description
clear tarp tid-table	Clears the dynamically created TARP TID-to-NSAP address mapping entries stored in TID cache.
show tarp tid-cache	Displays information about the entries in the TID cache.

tarp enable

To enable TID Address Resolution Protocol (TARP) on an interface, use the **tarp enable** command in interface configuration mode. To disable TARP on a particular interface, use the **no** form of this command.

tarp enable

no tarp enable

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Enabling TARP allows the interface to request and respond to TARP PDUs. TARP PDUs are identified by a unique N-selector in the NSAP address. You must also have the TARP process running on the router by using the **tarp run** command.

Examples

The following example enables TARP on Ethernet interface 0:

```
interface ethernet 0
 tarp enable
```

Related Commands

Command	Description
show tarp interface	Lists all interfaces that have TARP enabled.
tarp nselector-type	Specifies the N-selector to be used in CLNP PDUs to indicate that the packet is a TARP PDU.
tarp propagate	Reenables propagation of TARP PDUs on an interface.
tarp run	Starts the TARP process on the router.

tarp global-propagate

To reenable the capability to propagate TID Address Resolution Protocol (TARP) PDUs globally, use the **tarp global-propagate** command in global configuration mode. To disable global propagation of TARP PDUs, use the **no** form of this command.

tarp global-propagate

no tarp global-propagate

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

TARP PDUs are globally propagated to all TARP neighbors by default unless you specifically disable the capability with the **no tarp global-propagate** command. If you disable this capability, you must use the **tarp global-propagate** command to reenable global purgation of TARP PDUs.

TARP PDUs are propagated on all interfaces by default unless you specifically disable the capability on a specific interface with the **no tarp propagate** command.

Note The **no tarp global-propagate** command disables propagation of TARP PDUs on the router (and thus on all interfaces).

Examples

The following example disables global propagation of TARP PDUs on this router:

```
no tarp global-propagate
```

Related Commands

Command	Description
tarp propagate	Reenables propagation of TARP PDUs on an interface.

tarp ldb-timer

To specify the length of time for which a system ID-to-sequence number mapping entry remains in the loop-detection buffer table, use the **tarp ldb-timer** command in global configuration mode. To set the timer to the default value, use the **no** form of this command.

tarp ldb-timer *seconds*

no tarp ldb-timer

Syntax Description

seconds	Number of seconds for which a system ID-to-sequence number mapping entry remains in the loop-detection buffer table. The range is 0 to 86,400 seconds. The default is 300 seconds.

Defaults

300 seconds

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The loop-detection buffer table prevents TARP PDUs from looping.

Examples

The following example limits the time for which an entry remains in the loop-detection buffer table to 600 seconds (10 minutes):

```
tarp ldb-timer 600
```

Related Commands

Command	Description
clear tarp ldb-table	Clears the system ID-to-sequence number mapping entries stored in the TARP loop-detection buffer table.
show tarp ldb	Displays the contents of the loop-detection buffer table.
tarp lifetime	Specifies the lifetime for locally generated TARP PDUs based on the number of hops.

tarp lifetime

To specify the lifetime for locally generated TID Address Resolution Protocol (TARP) PDUs based on the number of hops, use the **tarp lifetime** command in global configuration mode. To set the PDU lifetime to the default value, use the **no** form of this command.

tarp lifetime *hops*

no tarp lifetime

Syntax Description

hops	Number of hosts that a PDU can traverse before it is discarded. Each router represents one hop. The range is 0 to 65,535 hops. The default is 100 hops.

Defaults

100 hops

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The number of hops specified is decremented after every hop. A PDU with a lifetime of zero is discarded.

Examples

The following example specifies that the TARP PDU can traverse 150 hosts before it is discarded:

```
tarp lifetime 150
```

Related Commands

Command	Description
tarp arp-request-timer	Sets the timeout for waiting for a response to a TARP Type 5 PDU.
tarp ldb-timer	Specifies the length of time that a system ID-to-sequence number mapping entry remains in the loop-detection buffer table.

tarp map

To enter a TID-to-NSAP static map entry in the TID cache, use the **tarp map** command in global configuration mode. To remove a static map entry from the TID cache, use the **no** form of this command.

tarp map *tid nsap*

no tarp map *tid nsap*

Syntax Description

tid	Target identifier to be mapped to the specified NSAP. Alphanumeric string up to 255 characters.
nsap	NSAP address to map to the specified TID. Use the full NSAP address.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use the **tarp map** command to map multiple NSAP addresses on a router. For example, using the **tarp resolve** to get the NSAP for a known TID will always return the first NSAP address. If the router has multiple NSAP addresses, you can use the **tarp map** command to map the TID to multiple NSAP addresses. If a router has NSAP addresses 1, 2, 3, the **tarp resolve** command will always return NSAP address 1. Use the **tarp map** command to map the router to NSAP addresses 2 and 3 so the **tarp query** command will return the TID corresponding to the other NSAP addresses.

Examples

The following example maps the NSAP address 49.0001.000.1111.1111.1234.00 to TID SJ1:

```
tarp map sj1 49.0001.0000.1111.1111.1234.00
```

Related Commands

Command	Description
clear tarp tid-table	Clears the dynamically created TARP TID-to-NSAP address mapping entries stored in TID cache.
show tarp map	Lists all static entries in the TID cache that were configured with the tarp map command.
tarp query	Determines a TID corresponding to a specific NSAP address.
tarp resolve	Determines an NSAP address corresponding to a specified TID.

tarp nselector-type

To specify the N-selector to be used in Connectionless Network Protocol (CLNP) PDUs to indicate that the packet is a TID Address Resolution Protocol (TARP) PDU, use the **tarp nselector-type** command in global configuration mode. To set the N-selector to the default value, use the **no** form of this command.

tarp nselector-type *hex-digit*

no tarp nselector-type

Syntax Description

hex-digit	Two digits in hexadecimal format to be used to identify TARP PDUs.

Defaults

AF

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This feature provides flexibility in using the N-selector field to indicate TARP PDUs. The N-selector must be the same on all hosts running the TARP process.

Examples

The following example changes the N-selector used in CLNP PDUs to BC:

```
tarp nselector-type BC
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.

tarp originate

To reenable the router to originate TID Address Resolution Protocol (TARP) PDUs, use the **tarp originate** command in global configuration mode. To disable the capability to originate TARP PDUs, use the **no** form of this command.

tarp originate

no tarp originate

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Origination of TARP PDUs is enabled by default unless you specifically disable the capability with the **no tarp originate** command. If you disable this capability, you must use the **tarp originate** command to reenable origination of TARP PDUs.

Examples

The following example disables the origination of TARP PDUs on this router:

```
no tarp originate
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.

tarp post-t2-response-timer

To specify the length of time for which a router waits for a response to a Type 2 PDU after the default timer expires, use the **tarp post-t2-response-timer** command in global configuration mode. To set the timer to the default value, use the **no** form of this command.

tarp post-t2-response-timer *seconds*

no tarp post-t2-response-timer

Syntax Description

seconds	Number of seconds for which the router will wait for a response for a Type 2 PDU after the default timer has expired. The range is 0 to 3600 seconds.

Defaults

15 seconds

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

A Type 1 PDU is sent to all Level 1 (IS-IS and ES-IS) neighbors when a router has a TID for which it has no matching NSAP information. If no response is received within the specified timeout period, a Type 2 PDU is sent to all Level 1 and Level 2 neighbors. If no response is received within the specified timeout period, additional time is allocated based on the number specified in the **tarp post-t2-response-timer** command.

Examples

The following example sets the additional time to wait for a response from a Type 2 PDU to 60 seconds:

```
tarp post-t2-response-timer 60
```

Related Commands

Command	Description
tarp t2-response-timer	Specifies the length of time for which the router will wait for a response from a Type 2 PDU.

tarp propagate

To reenable propagation of TID Address Resolution Protocol (TARP) PDUs on an interface, use the **tarp propagate** command in interface configuration mode. To disable propagation of TARP PDUs on one or more interfaces, use the **no** form of this command.

tarp propagate [**all** | **message-type** *type-number* [*type-number*] [*type-number*]]

no tarp propagate [**all** | **message-type** *type-number* [*type-number*] [*type-number*]]

Syntax Description

all	(Optional) Specifies all TARP PDUs.
message-type *type-number*	(Optional) Specifies only type-number broadcast PDUs. Valid values are 1, 2, and 4. You may enter more than one value for the *type-number* argument.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(5)T	The following keywords and arguments were added: • **all** • **message-type** *type-number*
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Pressing Return or Enter after **tarp propagate** is the same as typing the keyword **all**.

TARP PDUs are propagated on all interfaces by default unless you specifically disable the capability on a specific interface with the **no tarp propagate** command. If you disable this capability, you must use the **tarp propagate** command to reenable propagation of TARP PDUs. Enabling propagation of TARP PDUs allows the interface to propagate PDUs to all neighbors on this interface. TARP PDUs are identified by a unique N-selector in the NSAP.

Note The **no tarp global-propagate** command disables propagation of TARP PDUs on the router (and, thus, on all interfaces).

Examples

The following example starts the TARP process on the router and enables TARP propagation on Ethernet interface 0:

```
interface ethernet 0
 tarp propagate
```

Related Commands

Command	Description
show tarp interface	Lists all interfaces that have TARP enabled.
tarp enable	Enables the TARP on an interface.
tarp global-propagate	Reenables the capability to propagate TARP PDUs globally.
tarp nselector-type	Specifies the N-selector to be used in CLNP PDUs to indicate that the packet is a TARP PDU.
tarp run	Starts the TARP process on the router.

tarp protocol-type

To specify the network protocol type to be used in outgoing TID Address Resolution Protocol (TARP) PDUs, use the **tarp protocol-type** command in global configuration mode. To set the protocol type to the default value, use the **no** form of this command.

tarp protocol-type *hex-digit*

no tarp protocol-type

Syntax Description

hex-digit	Two digits in hexadecimal format to be used to identify the protocol used in outgoing TARP PDUs. The default is FE (for CLNP).

Defaults

FE

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Only FE is supported.

Examples

The following example shows the TARP network protocol type changed from the default of FE to AO:

```
tarp protocol-type ao
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.

tarp query

To determine a corresponding TID entry for a specific NSAP address, use the **tarp query** command in EXEC mode.

tarp query *nsap*

Syntax Description

nsap	NSAP address that you want the TID for. Use the full NSAP address.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

If there is a TID entry in the local TID cache, the requested information is displayed.

If there is no TID entry in the local TID cache, a TARP Type 5 PDU is sent to the specified NSAP address. Because the NSAP address is specified, the PDU is unicast to the particular NSAP address. If a response is received (in the form of a Type 3 PDU), the local TID cache is updated and the requested information is displayed.

The length of time that the router will wait for a response to a Type 5 PDU is controlled by the **tarp arp-request-timer** command.

Examples

The following is sample output from the **tarp query** command:

```
Router# tarp query 49.0001.3333.3333.3333.00

Type escape sequence to abort.
Sending TARP type 5 PDU, timeout 40 seconds...

 TID corresponding to NET 49.0001.3333.3333.3333.00 is cerd
```

Table 34 describes the fields shown in the display.

Table 34 tarp query Field Descriptions

Field	Description
Sending TARP type 5 PDU	PDU requesting the TID of the specified NSAP.
Timeout...	Number of seconds the router will wait for a response from the Type 5 PDU. The timeout is set by the **tarp arp-request-timer** command.
TID corresponding to... is...	Indicates the TID for the specified NSAP address.

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.
tarp arp-request-timer	Sets the timeout for TARP Type 5 PDUs.

tarp resolve

To determine an NSAP address corresponding to a specified TID, use the **tarp resolve** command in EXEC mode.

tarp resolve *tid* [**1** | **2**]

Syntax Description

tid	Target identifier to be mapped to the specified NSAP. Alphanumeric string up to 255 characters.
1	(Optional) Send a Type 1 PDU. The default is a Type 1 PDU. If a response is not received before the timeout period, a Type 2 PDU is sent.
2	(Optional) Send only Type 2 PDU.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

If there is an NSAP entry in the local TID cache, the requested information is displayed.

If there is no NSAP entry in the local TID cache, a TARP Type 1 or Type 2 PDU is sent out. By default a Type 1 PDU is sent. A Type 1 PDU is sent to all Level 1 (IS-IS and ES-IS) neighbors. If a response is received (in the form of a Type 3 PDU), the local TID cache is updated and the requested information is displayed.

If a response from the Type 1 PDU is not received within the timeout period, a Type 2 PDU is sent to all Level 1 and Level 2 neighbors. If a response is received (in the form of a Type 3 PDU), the local TID cache is updated and the requested information is displayed.

The length of time that the router will wait for a response to a Type 1 PDU is controlled by the **tarp t1-response-timer** command. The length of time that the router waits for a response to a Type 2 PDU is controlled by the **tarp t2-response-timer** command and the **tarp-post-t2-response-timer** command.

Examples

The following is sample output from the **tarp resolve** command:

```
Router# tarp resolve artemis

Type escape sequence to abort.
Sending TARP type 1 PDU, timeout 15 seconds...

 NET corresponding to TID artemis is 49.0001.1111.1111.1111.00
```

Table 35 describes the fields shown in the display.

Table 35 tarp resolve Field Descriptions

Field	Description
Sending TARP type 1 PDU	PDU requesting the NSAP of the specified TID.
timeout...	Number of seconds the router will wait for a response from the Type 1 PDU. The timeout is set by the **tarp t1-response-timer** command.
NET corresponding to... is...	Indicates the NSAP address (in this case, 49.0001.1111.1111.1111.00) for the specified TID.

Related Commands

Command	Description
tarp map	Enters a TID-to-NSAP static map entry in the TID cache.
tarp post-t2-response-timer	Specifies the length of time that a router waits for a response to a Type 2 PDU after the default timer expires.
tarp t1-response-timer	Specifies the length of time for which the router will wait for a response from a Type 1 PDU.
tarp t2-response-timer	Specifies the length of time for which the router will wait for a response from a Type 2 PDU.

tarp route-static

To configure a static TID Address Resolution Protocol (TARP) adjacency, use the **tarp route-static** command in global configuration mode. To remove a static TARP adjacency from the TARP queue, use the **no** form of this command.

tarp route-static *nsap* [**all** | **message-type** *type-number* [*type-number*] [*type-number*]]

no tarp route-static *nsap* [**all** | **message-type** *type-number* [*type-number*] [*type-number*]]

Syntax Description

nsap	NSAP address to create a static TARP adjacency. Use the full NSAP address.
all	(Optional) Specifies all TARP PDUs.
message-type *type-number*	(Optional) Specifies only type-number broadcast PDUs.Valid values are 1, 2, and 4. You may enter more than one value for the *type-number* argument.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0	The following keywords and arguments were added: • **all** • **message-type** *type-number*
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Pressing Return or Enter after **tarp route-static** is the same as typing the keyword **all**.

A TARP router propagates PDUs to all its adjacencies and static TARP adjacencies.

If a router is not running TARP, the router discards TARP PDUs rather than propagating the PDUs to all its adjacencies. To allow propagation of the PDU to hosts that are "beyond" a non-TARP router, you must use the **tarp route-static** command to ensure that the hosts receive PDUs. The **tarp route-static** command allows TARP PDUs to "tunnel" through hosts that are not running TARP.

The specified router, as identified by the NSAP address, is stored in a TARP static adjacencies queue.

Use the **tarp blacklist-adjacency** command to prevent sending TARP PDUs directly to hosts that are not running TARP.

Examples

The following example adds 49.0001.0000.0c00.1111.1234.00 as a static TARP adjacency to the TARP queue:

```
tarp route-static 49.0001.0000.0c00.1111.1234.00
```

Related Commands

Command	Description
show tarp static-adjacencies	Lists all static TARP adjacencies that are configured with the tarp route-static command.
tarp blacklist-adjacency	Blacklists the specified router so that the router does not receive TARP PDUs propagated by this router.

tarp run

To start the TID Address Resolution Protocol (TARP) process on the router, use the **tarp run** command in global configuration mode. To stop the TARP process, use the **no** form of this command.

tarp run

no tarp run

Syntax Description

This command has no arguments or keywords.

Defaults

No TARP process (unless configured to start in NVRAM).

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You must also enable TARP on the individual interfaces by using the **tarp enable** command.

Examples

The following example starts the TARP process on the router:

```
tarp run
```

Related Commands

Command	Description
tarp enable	Enables the TARP on an interface.
tarp propagate	Reenables propagation of TARP PDUs on an interface.

tarp sequence-number

To specify the sequence number to be used in the next originated TID Address Resolution Protocol (TARP) PDU, use the **tarp sequence-number** command in global configuration mode. To return to the default value, use the **no** form of this command.

tarp sequence-number *number*

no tarp sequence-number *number*

Syntax Description

number	Number from 0 to 65,535 that will be used as the sequence number in the next originated PDU.

Defaults

Zero

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The sequence number lets the router determine if information received in the PDU is newer than the last information received. You may want to increase the sequence number to ensure that other hosts update their entries in TID cache.

Examples

The following example causes a sequence number of 10 to be assigned to the next TARP PDU:

```
tarp sequence-number 10
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.
show tarp ldb	Displays the contents of the loop-detection buffer table.

tarp t1-response-timer

To specify the length of time for which the router will wait for a response from a Type 1 PDU, use the **tarp t1-response-timer** command in global configuration mode. To set the timer to the default value, use the **no** form of this command.

tarp t1-response-timer *seconds*

no tarp t1-response-timer

Syntax Description

seconds	Number of seconds for which the router will wait to receive a response from a Type 1 PDU. The range is 0 to 3600 seconds.

Defaults

15 seconds

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

A Type 1 PDU is sent to all Level 1 (IS-IS and ES-IS) neighbors when a router has a TID for which it has no matching NSAP information. If no response is received within the timeout period (specified by the **tarp t1-response-timer** command), a Type 2 PDU is sent to all Level 2 neighbors.

Examples

The following example sets the timeout period for a Type 1 PDU to 60 seconds:

```
tarp t1-response-timer 60
```

Related Commands

Command	Description
tarp t2-response-timer	Specifies the length of time for which the router will wait for a response from a Type 2 PDU.

tarp t2-response-timer

To specify the length of time for which the router will wait for a response from a Type 2 PDU, use the **tarp t2-response-timer** command in global configuration mode. To set the timer to the default value, use the **no** form of this command.

tarp t2-response-timer *seconds*

no tarp t2-response-timer

Syntax Description

seconds	Number of seconds for which the router will wait to receive a response from a Type 2 PDU. The range is 0 to 3600 seconds.

Defaults

25 seconds

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

A Type 1 PDU is sent to all Level 1 (IS-IS and ES-IS) neighbors when a router has a TID for which it has no matching NSAP information. If no response is received within the timeout period (specified by the **tarp t1-response-timer** command), a Type 2 PDU is sent to all Level 2 neighbors. If no response is received within the timeout period (specified by the **tarp t2-response-timer** command), additional time can be allocated by using the **tarp post-t2-response-timer** command.

Examples

The following example sets the timeout period for a Type 2 PDU to 60 seconds:

```
tarp t2-response-timer 60
```

Related Commands

Command	Description
tarp post-t2-response-timer	Specifies the length of time for which a router waits for a response to a Type 2 PDU after the default timer expires.
tarp t1-response-timer	Specifies the length of time for which the router will wait for a response from a Type 1 PDU.

tarp tid

To assign a TID to the router, use the **tarp tid** command in global configuration mode. To remove the TID from the router, use the **no** form of this command.

tarp tid *tid*

no tarp tid *tid*

Syntax Description

tid	Target identifier to be used by this router. Alphanumeric string up to 255 characters.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

All hosts using TID Address Resolution Protocol (TARP) must have a unique TID assigned.

Examples

The following example assigns the TID SJ3 to the router:

```
tarp tid sj3
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.
show tarp host	Displays information about a specific TARP router stored in the local TID cache.
show tarp tid-cache	Displays information about the entries in the TID cache.

tarp urc

To set the update remote cache bit in all subsequent outgoing PDUs, use the **tarp urc** command in global configuration mode. To set the update remote cache bit to the default value, use the **no** form of this command.

tarp urc {**0** | **1**}

no tarp urc

Syntax Description

0	Sets the update remote cache bit to 0, which is the default value. When the bit is zero, the receiver's PDU will update its TID cache entry.
1	Sets the update remote cache bit to 1. When the bit is 1, the receiver's TID cache is not updated.

Defaults

The default value is 0.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

If you do not specify either 0 or 1, the default value 0 is used.

Examples

The following example sets the update remote cache bit in the outgoing PDU to 1, so the cache at the receiver's end is not updated:

```
tarp urc 1
```

Related Commands

Command	Description
show tarp	Displays all global TARP parameters.

timers basic (ISO CLNS)

To configure ISO IGRP timers, use the **timers basic** command in router configuration mode. To restore the default values, use the **no** form of this command.

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.
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.
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.

Defaults

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

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

Examples

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
```

which-route

To determine which next-hop router will be used or to troubleshoot your configuration if you have multiple processes running, use the **which-route** command in EXEC mode. 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 Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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.

```
Router# 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.

```
Router# 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.

```
Router# 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 36 describes the display fields in the adjacency entry used to reach system green.

Table 36 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 ES-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 36 describes the display fields in the adjacency entry used to reach NSAP address 49.0001.1111.1111.1111.00.

```
Router# 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:

```
Router# 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.

```
Router# 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 Commands

Command	Description
clns host	Defines a name-to-NSAP mapping that can then be used with commands requiring NSAPs.