Timing and Synchronization Command Reference for Cisco 8000 Series Routers

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Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

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Preface

Preface

This guide consists of information about the system management commands in Cisco IOS XR Software.

The *Timing and Synchronization Command Reference for Cisco 8000 Series Routers* preface contains these sections:

Changes to This Document

This table lists the changes made to this document since it was first printed.

Date	Change Summary
November 2025	Initial release of this document

Clock Commands

clock set

To change the software clock settings, use the **clock set** command in XR EXEC mode.

clock set *hh*:*mm*:*ss* {*day month* | *month day*} *year*

Syntax Description

hh:*mm*:*ss*	Current time in hours (24-hour format), minutes, and seconds. Colons are required between values.
day	Current day (by date) in the month.
month	Current month (by name).
year	Current year (no abbreviation). Enter a valid four-digit year.

Command Default

Clock is not set.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Generally, if the system is synchronized by a valid outside timing mechanism, such as a Network Time Protocol (NTP) clock source, or if you have a networking device with calendar capability, you need not set the software clock. Use the **clock set** command if no other time sources are available. The time specified in this command is relative to the configured time zone.

Setting the Software Clock

This example shows how to set the software clock using the **clock set** command with the *day month* arguments first.

```
RP/0/RP0/CPU0:router# clock set 14:12:00 10 feb 2005

14:12:00.114 JST Fri Feb 10 2009
```

This example shows how to set the software clock using the **clock set** command with the *month day* arguments first.

```
RP/0/RP0/CPU0:router# clock set 14:38:00 feb 10 2005

14:38:00.069 PST Tue Feb 10 2009
```

Displaying the Clock Settings

This example shows how to display the settings of the software clock:

```
RP/0/RP0/CPU0:router# show clock

14:38:11.292 PST Tue Feb 10 2009
```

clock timezone

To set the time zone for display, use the **clock timezone** command in System Admin Config mode or XR Config mode. To remove the time zone setting, use the **no** form of this command.

clock timezone *zone region*

Syntax Description

zone	Name of the time zone to be displayed when standard time is in effect.
region	Sets the offset according to the region specified.

Command Default

UTC

Command Modes

System Admin Config mode

XR Config mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

This table lists common time zone acronyms used for the *zone* argument.

Table 1: Common Time Zone Acronyms

Acronym	Time Zone Name and UTC Offset
Europe	
GMT	Greenwich Mean Time, as UTC.
BST	British Summer Time, as UTC plus 1 hour.
IST	Irish Summer Time, as UTC plus 1 hour.
WET	Western Europe Time, as UTC.
WEST	Western Europe Summer Time, as UTC plus 1 hour.
CET	Central Europe Time, as UTC plus 1 hour.
CEST	Central Europe Summer Time, as UTC plus 2 hours.
EET	Eastern Europe Time, as UTC plus 2 hours.
EEST	Eastern Europe Summer Time, as UTC plus 3 hours.
MSK	Moscow Time, as UTC plus 3 hours.

Acronym	Time Zone Name and UTC Offset
MSD	Moscow Summer Time, as UTC plus 4 hours.
United States and Canada	
AST	Atlantic Standard Time, as UTC minus 4 hours.
ADT	Atlantic Daylight Time, as UTC minus 3 hours.
ET	Eastern Time, either as EST or EDT, depending on place and time of year.
EST	Eastern Standard Time, as UTC minus 5 hours.
EDT	Eastern Daylight Saving Time, as UTC minus 4 hours.
CT	Central Time, either as CST or CDT, depending on place and time of year.
CST	Central Standard Time, as UTC minus 6 hours.
CDT	Central Daylight Saving Time, as UTC minus 5 hours.
MT	Mountain Time, either as MST or MDT, depending on place and time of year.
MST	Mountain Standard Time, as UTC minus 7 hours.
MDT	Mountain Daylight Saving Time, as UTC minus 6 hours.
PT	Pacific Time, either as PST or PDT, depending on place and time of year.
PST	Pacific Standard Time, as UTC minus 8 hours.
PDT	Pacific Daylight Saving Time, as UTC minus 7 hours.
AKST	Alaska Standard Time, as UTC minus 9 hours.
AKDT	Alaska Standard Daylight Saving Time, as UTC minus 8 hours.
HST	Hawaiian Standard Time, as UTC minus 10 hours.
Australia	
WST	Western Standard Time, as UTC plus 8 hours.
CST	Central Standard Time, as UTC plus 9.5 hours.
EST	Eastern Standard/Summer Time, as UTC plus 10 hours (plus 11 hours during summer time).

This table lists an alternative method for referring to time zones, in which single letters are used to refer to the time zone difference from UTC. Using this method, the letter Z is used to indicate the zero meridian,

equivalent to UTC, and the letter J (Juliet) is used to refer to the local time zone. Using this method, the International Date Line is between time zones M and Y.

Table 2: Single-Letter Time Zone Designators

Letter Designator	Word Designator	Difference from UTC
Y	Yankee	UTC minus 12 hours.
X	Xray	UTC minus 11 hours.
W	Whiskey	UTC minus 10 hours.
V	Victor	UTC minus 9 hours.
U	Uniform	UTC minus 8 hours.
T	Tango	UTC minus 7 hours.
S	Sierra	UTC minus 6 hours.
R	Romeo	UTC minus 5 hours.
Q	Quebec	UTC minus 4 hours.
P	Papa	UTC minus 3 hours.
O	Oscar	UTC minus 2 hours.
N	November	UTC minus 1 hour.
Z	Zulu	Same as UTC.
A	Alpha	UTC plus 1 hour.
B	Bravo	UTC plus 2 hours.
C	Charlie	UTC plus 3 hours.
D	Delta	UTC plus 4 hours.
E	Echo	UTC plus 5 hours.
F	Foxtrot	UTC plus 6 hours.
G	Golf	UTC plus 7 hours.
H	Hotel	UTC plus 8 hours.
I	India	UTC plus 9 hours.
K	Kilo	UTC plus 10 hours.
L	Lima	UTC plus 11 hours.
M	Mike	UTC plus 12 hours.

This example shows how to set the time zone to IST Asia/Calcutta:

```
Router# config
Router(config)# clock timezone IST Asia/Calcutta
```

locale country

To set the default country of use, use the **locale country** command in mode. To remove the country setting, use the **no** form of this command.

locale country *country*

Syntax Description

country	Country, where *country* is a two-character country code. Case is not important.

Command Default

No default behavior or values

Command Modes

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

To display a complete listing of the available country codes, use the online help (**?**) function:

```
RP/0/RP0/CPU0:router(config)# locale country ?

    AD    Andorra
    AE    United Arab Emirates
    AF    Afghanistan
    AG    Antigua and Barbuda
    AI    Anguilla
    AL    Albania
    AM    Armenia
    AN    Netherlands Antilles
    AO    Angola
    AQ    Antarctica
    AR    Argentina
    AS    American Samoa
    AT    Austria
    AU    Australia
    AW    Aruba
    AZ    Azerbaijan
    BA    Bosnia and Herzegovina
    BB    Barbados
    BD    Bangladesh
    BE    Belgium
  --More--
```

The following example shows how to set the country of use to Australia:

```
RP/0/RP0/CPU0:router(config)# locale country au
```

locale language

To set the default language of use, use the **locale language** command in mode. To remove the language setting, use the **no** form of this command.

locale language *language*

Syntax Description

language	Two-character code that specifies the language. Case is not important.

Command Default

No default behavior or values

Command Modes

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

To display a complete listing of the available language codes, use the online help (?) function:

```
RP/0/RP0/CPU0:router(config)# locale language ?

aa    Afar
ab    Abkhazian
af    Afrikaans
am    Amharic
ar    Arabic
as    Assamese
ay    Aymara
  --More--
```

The following example shows how to set the language of use to English:

```
RP/0/RP0/CPU0:router(config)# locale language en
```

show clock

To display the system clock, use the **show clock** command in XR EXEC mode.

show clock [**detail**]

Syntax Description

detail	(Optional) Indicates the time zone, time source, and current summer time setting (if any).

Command Default

No default behavior or values.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The system clock keeps an "authoritative" flag that indicates whether the time is authoritative (believed to be accurate). If the system clock has been set by a timing source, such as system calendar or Network Time Protocol (NTP), the flag is set. If the time is not authoritative, it is used only for display. Until the clock is authoritative and the "authoritative" flag is set, the flag prevents peers from synchronizing to the clock when the peers have invalid times.

The leading symbols that precede the **show clock** command display are shown in this table

Table 3: show clock Display Leading Symbol Descriptions

Symbol	Description
*	Time is not authoritative.
(blank)	Time is authoritative.
.	Time is authoritative, but NTP is not synchronized.

The following sample output shows the current clock settings:

```
RP/0/RP0/CPU0:router# show clock

16:18:28.927 PST Tue Feb 10 2009
```

The following sample output shows the current clock detail, including the time zone and time source:

```
RP/0/RP0/CPU0:router# show clock detail

16:18:07.164 PST Tue Feb 10 2009
Timezone: PST8PST Timesource: User configured
```

Frequency Synchronization Commands

clock-id mac-address mac-address-id

To configure the MAC address of the device clock that can transmit the enhanced QL TLV in the network, use the **clock-id mac-address** *mac-address-id* command. To disable the device clock as the one that can transmit the enhanced QL TLV in the network, use the **no** form of this command.

clock-identity **mac-address** *mac-address-identity* *region*

Command Default

When the **clock-id mac-address** *mac-address-id* command is not configured, the router MAC address is used to send clock-id in enhanced QL-TLV of ESMC packet.

Command Modes

XR Config mode

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Task ID

Task ID	Operations
ethernet-services	read, write

This example shows how to configure the MAC address of the device clock that can transmit the enhanced QL TLV in the network:

```
Router# config
Router(config)# frequency synchronization
Router(config-freqsync)# clock-id mac-address 0000.0001.0003
Router(config-freqsync)# commit
```

synchronous-ethernet prefer-interface ptp-receiver

To choose PTP receiver interface as the SyncE source among equally qualified sources, use the **synchronous-ethernet prefer-interface ptp-receiver** command in XR Config mode mode.

synchronous-ethernet prefer-interface ptp-receiver

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

XR Config mode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

This example shows how to select the PTP receiver interface as the SyncE source among equally qualified sources using the **synchronous-ethernet prefer-interface ptp-receiver** command:

```
Router#configure terminal
Router(config)#frequency synchronization
Router(config-freqsync)#synchronous-ethernet prefer-interface ptp-receiver
Router(config-freqsync)#commit
```

Network Time Protocol Commands

access-group (NTP)

To control access to Network Time Protocol (NTP) services for an IPv4 or IPv6 access list, use the **access-group** command in one of the NTP configuration modes. To remove the **access-group** command from the configuration file and restore the system to its default condition with respect to this command, use the **no** form of this command.

access-group [**vrf** *vrf-name*] [**ipv4** | **ipv6**] {**peer** | **query-only** | **serve** | **serve-only**} *access-list-name*
no access-group [**vrf** *vrf-name*] [**ipv4** | **ipv6**] {**peer** | **query-only** | **serve** | **serve-only**}

Syntax Description

vrf *vrf-name*	(Optional) Applies the access control configuration to a specified nondefault VRF. If not specified, the configuration is applied to the default VRF.
ipv4	(Optional) Specifies an IPv4 access list (default).
ipv6	(Optional) Specifies an IPv6 access list.
peer	Allows time requests and NTP control queries and allows a networking device to synchronize to the remote system.
query-only	Allows only NTP control queries. Cisco IOS XR software uses NTP Version 4, but the RFC for Version 3 (RFC 1305: *Network Time Protocol (Version 3)—Specification, Implementation and Analysis*) still applies.
serve	Allows time requests and NTP control queries, but does not allow the networking device to synchronize to the remote system.
serve-only	Allows only time requests.
access-list-name	Name of an IPv4 or IPv6 access list.

Command Default

No NTP access control is configured.

Command Modes

NTP configuration

VRF-specific NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The access group options are scanned in the following order from least restrictive to most restrictive:

1. **peer**—Allows time requests and NTP control queries and allows the router to synchronize itself to a system whose address passes the access list criteria.
2. **serve**—Allows time requests and NTP control queries, but does not allow the router to synchronize itself to a system whose address passes the access list criteria.
3. **serve-only**—Allows only time requests from a system whose address passes the access list criteria.
4. **query-only**—Allows only NTP control queries from a system whose address passes the access list criteria.

Access is granted for the first match that is found. If no access groups are specified, all access is granted to all sources. If any access groups are specified, only the specified access is granted. This facility provides minimal security for the time services of the system. However, it can be circumvented by a determined programmer. If tighter security is desired, use the NTP authentication facility.

If you use the **access-group** command in a VRF-specific NTP configuration mode, the command is applied to the specific VRF. If you are not in a VRF-specific NTP configuration mode, the command is applied to the default VRF unless you use the **vrf** *vrf-name* keyword and argument to specify a VRF.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the router to allow itself to be synchronized by a peer from an IPv4 access list named access1 and to restrict access to allow only time requests from an IPv4 access list named access2:

```
RP/0/RP0/CPU0:router(config-ntp)# access-group peer access1
RP/0/RP0/CPU0:router(config-ntp)# access-group serve-only access2
```

The following example shows how to configure the router to allow itself to be synchronized by peers from the IPv6 access list named access20 that route through the vrf10 VRF:

```
RP/0/RP0/CPU0:router(config-ntp)# access-group vrf vrf10 ipv6 peer access20
```

Related Commands

Command	Description
ipv4 access-list	Defines an IPv4 access list by name.
ipv6 access-list	Defines an IPv6 access list by name.
vrf	Configures a VRF instance for a routing protocol.

authenticate (NTP)

To enable Network Time Protocol (NTP) authentication, use the **authenticate** command in NTP configuration mode. To restore the system to its default condition, use the **no** form of this command.

authenticate

Syntax Description

This command has no keywords or arguments.

Command Default

NTP authentication is enabled by default.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

This feature is enabled by default to prevent an exploitable condition when **passive**, **broadcast client** or **multicast client** is configured.

If the system has been configured with the **broadcast client** or **multicast client** command in NTP configuration mode, and when the system receives an incoming symmetric active NTP packet, or if the system receives a broadcast or multicast mode NTP packet, it can set up an ephemeral peer association in order to synchronize with the sender. The system will then synchronize to the peer when a symmetric active, broadcast, or multicast NTP packet is received and the packet carries one of the authentication keys specified in the **trusted-key** command.

Even though NTP authentication is enabled by default, it does not force the authentication of peer associations that are created using the **server** and **peer** commands in NTP configuration mode. It only enforces authentication when remote systems attempt to create new ephemeral associations.

Use the **no authenticate** command to allow synchronizing with unauthenticated and unconfigured network peers.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the system to synchronize only to a system that provides an authentication key 42 in its NTP packets:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# authenticate
RP/0/RP0/CPU0:router(config-ntp)# authentication-key 42 md5 clear key1
RP/0/RP0/CPU0:router(config-ntp)# trusted-key 42
```

authentication-key (NTP)

To define an authentication key for a trusted Network Time Protocol (NTP) time source, use the **authentication-key** command in NTP configuration mode. To restore the system to its default condition, use the **no** form of this command.

authentication-key *key-number* **md5** [**clear** | **encrypted**] *key-name*
no authentication-key *key-number*

Syntax Description

key-number	Authentication key. A number in the range from 1 to 65535.
md5	Provides message authentication support using the Message Digest 5 (MD5) algorithm.
clear	(Optional) Specifies that the key value entered after this keyword is unencrypted.
encrypted	(Optional) Specifies that the key value entered after this keyword is encrypted.
key-name	Key value. The maximum length is 32 characters.

Command Default

No authentication key is defined for NTP.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **authentication-key** command to define authentication keys for use with trusted NTP time sources.

Note When this command is written to NVRAM, the key is encrypted so that it is not displayed when the configuration is displayed.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the system to synchronize only to systems providing authentication key 42 in their NTP packets:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# authenticate
RP/0/RP0/CPU0:router(config-ntp)# authentication-key 42 md5 clear key1
RP/0/RP0/CPU0:router(config-ntp)# trusted-key 42
```

broadcast

To create a Network Time Protocol (NTP) broadcast server on a specified NTP interface, use the **broadcast** command in NTP interface configuration mode. To remove the command from the configuration file and restore the system to its default condition, use the **no** form of this command.

broadcast [**destination** *ip-address*] [**key** *key-id*] [**version** *number*]
no broadcast [**destination** *ip-address*] [**key** *key-id*] [**version** *number*]

Syntax Description

destination *ip-address*	(Optional) Specifies the host IPv4 address.
key *key-id*	(Optional) Defines the authentication key, where *key-id* is the authentication key to use when sending packets to this peer. The key identified by the *key-id* value is also used for packets received from the peer.
version *number*	(Optional) Specifies a number from 1 to 4, indicating the NTP version.

Command Default

No NTP broadcast servers are configured.

Command Modes

NTP interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **broadcast** command to create an NTP broadcast server on an NTP interface to send NTP broadcast packets.

Use the **broadcast client** command to set a specific interface to receive NTP broadcast packets.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure interface 0/0/0/1 to send NTP packets to destination host IP address 10.0.0.0:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# interface tengige 0/0/0/1
RP/0/RP0/CPU0:router(config-ntp-int)# broadcast destination 10.0.0.0
```

broadcast client

To allow a networking device to receive Network Time Protocol (NTP) broadcast packets on an interface, use the **broadcast client** command in NTP interface configuration mode. To remove the configuration and restore the system to its default condition, use the **no** form of this command.

broadcast client
no broadcast client

Syntax Description

This command has no keywords or arguments.

Command Default

No NTP broadcast clients are configured.

Command Modes

NTP interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **broadcast client** command to configure and create an NTP broadcast client and to associate the client with an interface to receive and handle NTP broadcast packets. If no NTP client has been created for an interface, the received NTP broadcast packets are dropped. Use this command to allow the system to listen to broadcast packets on an interface-by-interface basis.

To prevent synchronization with unauthorized systems, whenever this command is specified, authentication must be enabled using the **authenticate (NTP)** command or access must be restricted to authorized systems using the **access-group (NTP)** command. See the documentation of the respective commands for more information.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure interface 0/0/0/1 to send NTP packets:

```
RP/0/RP0/CPU0:router(config)# ntp interface tengige 0/0/0/1
RP/0/RP0/CPU0:router(config-ntp-int)# broadcast client
```

broadcastdelay

To set the estimated round-trip delay between a Network Time Protocol (NTP) client and an NTP broadcast server, use the **broadcastdelay** command in NTP configuration mode. To restore the system to its default condition, use the **no** form of this command.

broadcastdelay *microseconds*
no broadcastdelay *microseconds*

Syntax Description

microseconds	Estimated round-trip time for NTP broadcasts, in microseconds. The range is from 1 to 999999. The default is 3000.

Command Default

microseconds: 3000

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **broadcastdelay** command to change the default round-trip delay time on a networking device that is configured as a broadcast client.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to set the estimated round-trip delay between a networking device and the broadcast client to 5000 microseconds:

```
RP/0/RP0/CPU0:router(config-ntp)# broadcastdelay 5000
```

interface (NTP)

To enter a Network Time Protocol (NTP) interface mode and run NTP interface configuration commands, use the **interface** command in one of the NTP configuration modes. To remove an NTP interface configuration, use the **no** form of this command.

interface *type interface-path-id* [**vrf** *vrf-name*] [**disable**]
no interface *type interface-path-id* [**disable**]

Syntax Description

type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
vrf *vrf-name*	(Optional) Applies the interface configuration to a specific nondefault VRF.
disable	(Optional) Disables NTP on the specified interface.

Command Default

No NTP interfaces are configured.

Command Modes

NTP configuration mode

VRF-specific NTP configuration mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **interface** command to place the router in NTP interface configuration mode, from which NTP broadcast and multicast servers and clients can be configured. By default, after the NTP process is started, NTP features become available for all interfaces. To exit NTP interface configuration mode, use the **exit** command.

If you use the **interface** command in a VRF-specific NTP configuration mode, the command is applied to the specific VRF. If you are not in a VRF-specific NTP configuration mode, the command is applied to the default VRF unless you use the **vrf** *vrf-name* keyword and argument to specify a VRF.

By default, NTP is enabled on every interface. To disable NTP on a specific interface, use the **interface** command with the **disable** keyword. To reenable NTP on an interface, use the **no** form of the **interface** command with the **disable** keyword.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to enter NTP configuration mode, specify an NTP interface to be configured, and enter NTP interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# interface POS 0/1/0/0
RP/0/RP0/CPU0:router(config-ntp-int)#
```

The following example shows how to enter a VRF-specific NTP interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# interface TenGiGE 0/1/1/0 vrf vrf_10
RP/0/RP0/CPU0:router(config-ntp-int)#
```

The following example shows a different way to enter a VRF-specific NTP interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# ntp vrf vrf_10
RP/0/RP0/CPU0:router(config-ntp-vrf)# interface TenGigE 0/1/1/0
RP/0/RP0/CPU0:router(config-ntp-int)#
```

master

To configure the router to use its own Network Time Protocol (NTP) master clock to synchronize with peers when an external NTP source becomes unavailable, use the **master** command in NTP configuration mode. To restore the system to its default condition, use the **no** form of this command.

master [*stratum*]
no master [*stratum*]

Syntax Description

stratum	(Optional) NTP stratum number that the system claims. Range is from 1 to 15. The default is 8.

Command Default

By default, the master clock function is disabled. When the function is enabled, the default stratum is 8.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

NTP uses the concept of a "stratum" to describe how many NTP "hops" away a machine is from an authoritative time source. A stratum 1 time server has a radio or atomic clock attached directly. A stratum 2 time server receives its time through NTP from a stratum 1 time server, a stratum 3 from a stratum 2, and so on.

Caution Use the **master** command with extreme caution. It is easy to override other valid time sources using this command, especially if a low-stratum number is configured. Configuring multiple machines in the same network with the **master** command can lead to instability in time-keeping if the machines do not agree on the time.

The networking device is normally synchronized, directly or indirectly, with an external system that has a clock. Cisco IOS XR software does not support directly attached radio or atomic clocks. The **master** command should be used only when there is a temporary disruption in a reliable time service. It should not be employed as an alternative source by itself in the absence of a real-time service.

If the system has the **master** command configured and it cannot reach any clock that has a lower stratum number, the system claims to be synchronized at the configured stratum number. Other systems synchronize with it through NTP.

Note The system clock must have been manually set from some source before the **master** command has an effect. This precaution protects against the distribution of erroneous time after the system is restarted.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure a networking device as an NTP master clock to which peers may synchronize:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# master 9
```

master primary-reference-clock

To configure the router to use PTP and external timing sources, such as such as PTP grandmaster, Data over Cable Service Interface Specification (DOCSIS) Timing Interface [DTI] or global positioning system (GPS) clock, as the time-of-day source for NTP and operating system time, use the **master primary-reference-clock** command in NTP configuration mode. To remove the PTP configuration, use the **no** form of this command.

master primary-reference-clock
no master primary-reference-clock

Syntax Description

This command has no keywords or arguments.

Command Default

PTP is not used as the time-of-day source for NTP.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

PTP must be enabled on the router before this command can be used. If PTP is not enabled, you receive an error message similar to the following when you try to commit the configuration:

```
RP/0/RP0/CPU0:router(config)# ntp master primary-reference-clock
RP/0/RP0/CPU0:router(config)# commit

% Failed to commit one or more configuration items. Please issue
'show configuration failed' from this session to view the errors

RP/0/RP0/CPU0:router(config)# show configuration failed
[:::]
ntp
 master primary-reference-clock
!!% 'ip-ntp' detected the 'fatal' condition 'PTP is not supported on this platform'
!
end
```

To verify that PTP is used as the reference clock, use the **show ntp association** command.

```
RP/0/RP0/CPU0:router# show ntp association

  address           ref clock        st   when  poll reach  delay  offset  disp
*~127.127.45.1     .PTP.            0    54    64   377    0.00   6.533   1.905

* sys_peer, # selected, + candidate, - outlayer, x falseticker, ~ configured
```

Task ID

Task ID	Operation
ip-services	read, write

This example shows how to configure PTP as the reference clock for NTP:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# master primary-reference-clock
```

max-associations

To set the maximum number of Network Time Protocol (NTP) associations, use the **max-associations** command in NTP configuration mode. To restore the default setting, use the **no** form of this command.

max-associations *number*
no max-associations *number*

Syntax Description

number	Maximum number of NTP associations. Range is from 0 to 4294967295. The default is 100.

Command Default

The default setting for the maximum number of NTP associations is 100.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **max-associations** command to specify the maximum number of associations for an NTP server.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to set the maximum number of associations to 200:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# max-associations 200
```

multicast client

To configure an NTP interface as an NTP multicast client, use the **multicast client** command in NTP interface configuration mode. To remove the NTP multicast client configuration from an interface, use the **no** form of this command.

multicast client [*ip-address*]
no multicast client [*ip-address*]

Syntax Description

ip-address	IPv4 or IPv6 IP address of the multicast group to join. The default is the IPv4 address 224.0.1.1.

Command Default

The interface is not configured as an NTP multicast client.

Command Modes

NTP interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **multicast client** command to configure an NTP interface to receive multicast packets that are sent to an IPv4 or IPv6 multicast group IP address. If you do not specify an IP address, the interface is configured to receive multicast packets sent to the IPv4 multicast group address 224.0.1.1. You can configure multiple multicast groups on the same interface.

To prevent synchronization with unauthorized systems, whenever this command is specified, authentication must be enabled using the **authenticate (NTP)** command or access must be restricted to authorized systems using the **access-group (NTP)** command. See the documentation of the respective commands for more information.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the router to receive NTP multicast packets to the multicast group address of 224.0.1.1:

```
RP/0/RP0/CPU0:router(config)# ntp interface TenGigE 0/1/1/0
RP/0/RP0/CPU0:router(config-ntp-int)# multicast client
```

multicast destination

To configure an NTP interface as an NTP multicast server, use the **multicast destination** command in NTP interface configuration mode. To remove the NTP multicast server configuration from an interface, use the **no** form of this command.

multicast destination *ip-address* [**key** *key-id*] [**ttl** *ttl*] [**version** *number*]
no multicast destination *ip-address* [**key** *key-id*] [**ttl** *ttl*] [**version** *number*]

Syntax Description

ip-address	The IPv4 or IPv6 multicast group IP address to which to send NTP multicast packets.
key *key-id*	(Optional) Specifies an authentication key, where the value of the *key-id* argument is the authentication key to use when sending multicast packets to the specified multicast group.
ttl *ttl*	(Optional) Specifies the time to live (TTL) of a multicast packet.
version *number*	(Optional) Specifies the NTP version number.

Command Default

The interface is not configured as an NTP multicast server.

Command Modes

NTP interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the router to send NTP multicast packets to the multicast group address of 224.0.1.1:

```
RP/0/RP0/CPU0:router(config)# ntp interface TenGigE 0/1/1/0
RP/0/RP0/CPU0:router(config-ntp-int)# multicast destination 224.0.1.1
```

ntp

To enter Network Time Protocol (NTP) configuration mode and run NTP configuration commands, use the **ntp** command in

global

configuration mode.

ntp [**vrf** *vrf-name*]

Syntax Description

vrf *vrf-name*	(Optional) Enters a VRF-specific NTP configuration mode.

Command Default

No defaults behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

NTP configuration commands can also be run from global configuration mode by preceding the command string with the **ntp** keyword. From NTP configuration mode, the following NTP configuration commands are available:

```
RP/0/RP0/CPU0:router(config-ntp)# ?

    access-group        Control NTP access
    authenticate        Authenticate time sources
    authentication-key  Authentication key for trusted time sources
    broadcastdelay      Estimated round-trip delay
    commit              Commit the configuration changes to running
    default             Set a command to its defaults
    describe            Describe a command without taking real actions
    do                  Run an exec command
    exit                Exit from this submode
    interface           Configure NTP on an interface
    master              Act as NTP master clock
    max-associations    Set maximum number of associations
    no                  Negate a command or set its defaults
    peer                Configure NTP peer
    port                Enable NTP port
    server              Configure NTP server
    show                Show contents of configuration
    source              Configure interface for source address
    trusted-key         Key numbers for trusted time sources
    update-calendar     Periodically update calendar with NTP time
```

Use the **ntp** command with the **vrf** *vrf-name* keyword and argument to enter an NTP configuration mode specific to the specified VRF.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to enter NTP configuration mode:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)#
```

The following example shows how to enter an NTP configuration mode for a VRF called VRF1:

```
RP/0/RP0/CPU0:router(config)# ntp vrf vrf1
RP/0/RP0/CPU0:router(config-ntp-vrf)#
```

ntp clear

To clear all Network Time Protocol (NTP) peers or a specific NTP peer, use the **ntp clear** command in EXEC

mode.

ntp clear {*peer* | **all** | **vrf** *vrf-name* *ip-address*}

Syntax Description

peer	IPv4 address or hostname of the NTP peer to be cleared.
all	Clears all NTP peers.
vrf *vrf-name*	Clears a peer on the specified nondefault VRF.
ip-address	IPv4 or IPv6 IP address of the peer.

Command Default

No defaults behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to clear all NTP peers:

```
RP/0/RP0/CPU0:router# ntp clear all
```

ntp reset drift

To reset the NTP drift and loopfilter state, use the **ntp reset drift** command in

EXEC

mode.

ntp reset drift

Syntax Description

This command has no keywords or arguments.

Command Default

No defaults behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **ntp reset drift** command to set the loopfilter state to NSET (never set) and reset the drift. Resetting the loopfilter state and drift enables the router to relearn the frequency of the NTP server clock. This is necessary if there is a synchronization error caused by a large frequency error. This can arise, for example, if the router switches from synchronizing with one NTP server to synchronizing with another NTP server with a different frequency.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to reset the NTP drift and loopfilter state:

```
RP/0/RP0/CPU0:router# ntp reset drift

Thu Nov 13 11:21:04.381 JST
```

The following example shows NTP status before and after resetting NTP drift and loopfilter state:

```
RP/0/RP0/CPU0:router# show ntp status

Thu Nov 13 11:20:53.122 JST

Clock is synchronized, stratum 3, reference is 192.168.128.5
nominal freq is 1000.0000 Hz, actual freq is 1000.2787 Hz, precision is 2**24
reference time is CCC60CBE.9F836478 (11:17:34.623 JST Thu Nov 13 2008)
clock offset is -3.172 msec, root delay is 189.289 msec
root dispersion is 70.03 msec, peer dispersion is 0.11 msec
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is -0.0002785891 s/s
system poll interval is 128, last update was 199 sec ago
```

```
RP/0/RP0/CPU0:router# ntp reset drift
Thu Nov 13 11:21:04.381 JST

RP/0/RP0/CPU0:router# show ntp status
Thu Nov 13 11:21:10.595 JST

Clock is unsynchronized, stratum 16, no reference clock
nominal freq is 1000.0000 Hz, actual freq is 1000.0000 Hz, precision is 2**24
reference time is CCC60CBE.9F836478 (11:17:34.623 JST Thu Nov 13 2008)
clock offset is -3.172 msec, root delay is 0.000 msec
root dispersion is 0.09 msec, peer dispersion is 0.00 msec
loopfilter state is 'NSET' (Never set), drift is 0.0000000000 s/s
system poll interval is 64, last update was 216 sec ago
```

peer (NTP)

To configure the system clock to synchronize a peer or to be synchronized by a peer, use the **peer** command in one of the NTP configuration modes. To remove the **peer** command from the configuration file and restore the system to its default condition with respect to the command, use the **no** form of this command.

peer [**vrf** *vrf-name*] [**ipv4** | **ipv6**] *ip-address* [**version** *number*] [**key** *key-id*] [**minpoll** *interval*] [**maxpoll** *interval*] [**source** *type interface-path-id*] [**prefer**] [**burst**] [**iburst**]
no peer [**vrf** *vrf-name*] [**ipv4** | **ipv6**] *ip-address*

Syntax Description

vrf *vrf-name*	(Optional) Applies the peer configuration to the specified nondefault VRF.
ipv4	(Optional) Specifies an IPv4 IP address.
ipv6	(Optional) Specifies an IPv6 IP address.
ip-address	IPv4 or IPv6 address of the peer providing or being provided with the clock synchronization.
version *number*	(Optional) Defines the Network Time Protocol (NTP) version number, where the *number* argument is a value from 1 to 4. The default is 4.
key *key-id*	(Optional) Defines the authentication key, where the *key-id* argument is the authentication key to use when packets are sent to this peer. The authentication key is also used for packets received from the peer. By default, no authentication key is used.
minpoll *interval*	(Optional) Defines the shortest polling interval, where the *interval* argument is specified in powers of two seconds. Range is from 4 to 17. The default value is 6.
maxpoll *interval*	(Optional) Defines the longest polling interval, where the *interval* argument is specified in powers of two seconds. Range is from 4 to 17. The default value is 10.
source	(Optional) IP source address. The default is the outgoing interface.
type	(Optional) Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
prefer	(Optional) Makes this peer the preferred peer that provides synchronization.
burst	(Optional) Sends a series of packets instead of a single packet within each synchronization interval to achieve faster synchronization.
iburst	(Optional) Sends a series of packets instead of a single packet within the initial synchronization interval to achieve faster initial synchronization.

Command Default

No peers are configured by default.

Command Modes

NTP configuration

VRF-specific NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **peer** command to allow this machine to synchronize with the peer, or conversely.

Caution Although using the **prefer** keyword can help reduce the switching among peers, you should avoid using the keyword because it interferes with the source selection mechanism of NTP and can result in a degradation in performance.

The value for the **minpoll** keyword must be less than or equal to the value for the **maxpoll** keyword. If this is not the case, the system issues an error message.

To provide peer-level service (as opposed to client/server-level service), it may be necessary to explicitly specify the NTP version for the peer if it is not version 4.

If you use the **peer** command in a VRF-specific NTP configuration mode, the command is applied to the specific VRF. If you are not in a VRF-specific NTP configuration mode, the command is applied to the default VRF unless you use the **vrf** *vrf-name* keyword and argument to specify a VRF.

Note To change the configuration of a specific IP address from peer to server or from server to peer, use the **no** form of the **peer** or **server** command to remove the current configuration before you perform the new configuration. If you do not remove the old configuration before performing the new configuration, the new configuration does not overwrite the old configuration.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure a networking device to allow its system clock to be synchronized with the clock of the peer (or conversely) at IP address 10.0.0.0 using NTP. The source IP address is the address of interface 0/0/0/1.

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# peer 10.0.0.0 minpoll 8 maxpoll 12 source tengige 0/0/0/1
```

server (NTP)

To allow the system clock to be synchronized by a time server, use the **server** command in one of the NTP configuration modes. To remove the **server** command from the configuration file and restore the system to its default condition with respect to this command, use the **no** form of this command.

server [**vrf** *vrf-name*][**ipv4** | **ipv6**] *ip-address* [**version** *number*] [**key** *key-id*] [**minpoll** *interval*] [**maxpoll** *interval*] [**source** *type interface-path-id*][**prefer**] [**burst**] [**iburst**]
no server [**vrf** *vrf-name*] [**ipv4** | **ipv6**] *ip-address*

Syntax Description

vrf *vrf-name*	(Optional) Applies the server configuration to the specified nondefault VRF.
ipv4	(Optional) Specifies an IPv4 IP address.
ipv6	(Optional) Specifies an IPv6 IP address.
ip-address	IPv4 or IPv6 address of the time server providing the clock synchronization.
version *number*	(Optional) Defines the Network Time Protocol (NTP) version number, where the *number* argument is a value from 1 to 4. The default is 4.
key *key-id*	(Optional) Defines the authentication key, where the *key-id* argument is the authentication key to use when packets are sent to this peer. By default, no authentication key is used.
minpoll *interval*	(Optional) Defines the shortest polling interval, where the *interval* argument is specified in powers of two seconds. Range is from 4 to 17. The default value is 6.
maxpoll *interval*	(Optional) Defines the longest polling interval, where the *interval* argument is specified in powers of two seconds. Range is from 4 to 17. The default value is 10.
source	(Optional) Specifies the IP source address. The default is the outgoing interface.
type	(Optional) Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
prefer	(Optional) Makes this peer the preferred server that provides synchronization.
burst	(Optional) Sends a series of packets instead of a single packet within each synchronization interval to achieve faster synchronization.
iburst	(Optional) Sends a series of packets instead of a single packet within the initial synchronization interval to achieve faster initial synchronization.

Command Default

No servers are configured by default.

Command Modes

NTP configuration

VRF-specific NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The value for the **minpoll** keyword must be less than or equal to the value for the **maxpoll** keyword. If this is not the case, the system issues an error message.

Using the **prefer** keyword reduces switching back and forth among servers.

If you use the **server** command in a VRF-specific NTP configuration mode, the command is applied to the specific VRF. If you are not in a VRF-specific NTP configuration mode, the command is applied to the default VRF unless you use the **vrf** *vrf-name* keyword and argument to specify a VRF.

Note To change the configuration of a specific IP address from peer to server or from server to peer, use the **no** form of the **peer** or **server** command to remove the current configuration before you perform the new configuration. If you do not remove the old configuration before performing the new configuration, the new configuration does not overwrite the old configuration.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure a router to allow its system clock to be synchronized with the clock of the peer at IP address 209.165.201.1 using NTP:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# server 209.165.201.1 minpoll 8 maxpoll 12
```

show calendar

To display the system time and date, use the **show calendar** command in the EXEC mode.

show calendar

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The time format of the **show calendar** output depends on the time format set using the **clock timezone** command.

Task ID

Task ID	Operations
basic-services	read

The following example shows sample output from the **show calendar** command:

```
RP/0/RP0/CPU0:router# show calendar

01:29:28 UTC Thu Apr 01 2004
```

show ntp associations

To display the status of Network Time Protocol (NTP) associations, use the **show ntp associations** command in privileged EXEC mode.

show ntp associations [**detail**] [**location** *node-id*]

Syntax Description

detail	(Optional) Displays detailed information about each NTP association.
location *node-id*	(Optional) Displays the status of NTP associations from the designated node. The *node-id* argument is entered in the *rack/slot* notation.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Output for the **show ntp associations** command is displayed only if NTP is configured on the router.

Task ID

Task ID	Operations
ip-services	read

This example shows sample output from the **show ntp associations** command:

```
RP/0/RP0/CPU0:router# show ntp associations

Wed Jul 30 04:03:13.471 PST DST

     address         ref clock     st  when  poll reach  delay  offset    disp
~172.19.69.1      172.24.114.33     3    25    64    3    2.89  57550122  39377
~2001:db8::feed   .INIT.           16     -    64    0    0.00   0.000   15937
~2001:db8::beef vrf vrf_1
                  .INIT.           16     -    64    0    0.00   0.000   16000
* sys_peer, # selected, + candidate, - outlayer, x falseticker, ~ configured
```

Table 4: show ntp associations Field Descriptions

Field	Description
*	Peer has been declared the system peer and lends its variables to the system variables.
#	Peer is a survivor, but not among the first six peers sorted by synchronization distance. If the association is ephemeral, it may be demobilized to conserve resources.
+	Peer is a survivor and a candidate for the combining algorithm.

Field	Description
-	Peer is discarded by the clustering algorithm as an outlier.
x	Peer is discarded by the intersection algorithm as a falseticker.
~	Indicates peer is statically configured.
address	IPv4 or IPv6 address of the peer. If a nondefault VRF is configured for the peer, the VRF follows the address.
ref clock	Reference clock type or address for the peer.
st	Stratum setting for the peer.
when	Time since last NTP packet was received from peer, in milliseconds.
poll	Polling interval, in seconds.
reach	Peer reachability (bit string, in octal).
delay	Round-trip delay to peer, in milliseconds.
offset	Relative time difference between a peer clock and a local clock, in milliseconds.
disp	Dispersion.

This example shows sample output from the **show ntp associations** command with the **detail** keyword:

```
RP/0/RP0/CPU0:router# show ntp associations detail

172.19.69.1 configured, our_master, sane, valid, stratum 2
ref ID 171.68.10.150, time C4143AAE.00FCF396 (18:27:58.003 UTC Tue Mar 30 2004)
our mode client, peer mode server, our poll intvl 64, peer poll intvl 64
root delay 5.23 msec, root disp 4.07, reach 3, sync dist 0.0077
delay 1.9829 msec, offset -3.7899 msec, dispersion 0.0358
precision 2**18, version 4
org time C4143B8D.7EBD5FEF (18:31:41.495 UTC Tue Mar 30 2004)
rcv time C4143B8D.801DFA44 (18:31:41.500 UTC Tue Mar 30 2004)
xmt time C4143B8D.7F595E44 (18:31:41.497 UTC Tue Mar 30 2004)
filtdelay =     2.99    1.98    1.98    1.99    1.99    1.99    2.98    1.98
filtoffset =   -3.89   -3.74   -3.78   -3.81   -3.76   -3.73   -4.08   -3.64
filterror =     0.00    0.02    0.03    0.05    0.06    0.08    0.09    0.32

2001:0DB8::FEED vrf xxx configured, candidate, sane, valid, stratum 2
ref ID 64.103.34.14, time CB0C8C66.38285D84 (14:00:22.219 JST Fri Dec 14 2007)
our mode client, peer mode server, our poll intvl 64, peer poll intvl 64
root delay 181.17 msec, root disp 3.19, reach 377, sync dist 0.1463
delay 104.9158 msec, offset -15.4552 msec, dispersion 0.0439
precision 2**16, version 4
org time CB0C8D0A.70282853 (14:03:06.438 JST Fri Dec 14 2007)
rcv time CB0C8D0A.81CA0E2B (14:03:06.506 JST Fri Dec 14 2007)
xmt time CB0C8D0A.66AAB677 (14:03:06.401 JST Fri Dec 14 2007)
filtdelay =   105.90  104.92  104.91  104.91  105.90  105.85  105.90  104.91
filtoffset =  -15.92  -15.67  -15.54  -15.59  -15.58  -15.54  -15.41  -14.36
filterror =     0.02    0.03    0.05    0.06    0.08    0.09    0.11    1.05

2001:0DB8::BEEF vrf yyy configured, our_master, sane, valid, stratum 2
```

```
ref ID 64.104.193.12, time CB0C8CC1.2C14CED1 (14:01:53.172 JST Fri Dec 14 2007)
our mode client, peer mode server, our poll intvl 64, peer poll intvl 64
root delay 160.83 msec, root disp 4.35, reach 377, sync dist 0.1372
delay 104.9302 msec, offset -14.6327 msec, dispersion 0.0183
precision 2**18, version 4
org time CB0C8CCB.684619D8 (14:02:03.407 JST Fri Dec 14 2007)
rcv time CB0C8CCB.79782B09 (14:02:03.474 JST Fri Dec 14 2007)
xmt time CB0C8CCB.5E9A5429 (14:02:03.369 JST Fri Dec 14 2007)
filtdelay =   104.93  104.93  104.93  104.93  104.93  104.93  104.93  104.93
filtoffset =  -14.71  -14.53  -14.78  -14.73  -14.70  -14.52  -14.59  -14.50
filterror =     0.00    0.02    0.03    0.05    0.06    0.08    0.09    0.11
```

Table 5: show ntp associations detail Field Descriptions

Field	Descriptions
vrf	Nondefault VRF, if specified for this peer.
configured	Statically configured peer.
dynamic	Dynamically discovered peer.
our_master	Synchronization of the local machine to this peer.
sane	Passing of basic sanity checks by this peer.
ref ID	Address of machine to which the peer is synchronized.
time	Last time stamp that the peer received from its master.
our mode	`Mode relative to peer (active/passive/client/server/bdcast/bdcast client).`
peer mode	Mode of peer relative.
our poll intvl	Poll interval to peer.
peer poll intvl	Poll interval of interval.
root delay	Delay along path to root (ultimate stratum 1 time source).
root disp	Dispersion of path to root.
reach	Peer reachability (bit string in octal).
sync dist	Peer synchronization distance.
delay	Round-trip delay to peer.
offset	Offset of peer clock relative to this clock.
dispersion	Dispersion of peer clock.
precision	Precision of peer clock in (Hertz) Hz.
version	NTP version number that peer is using.

Field	Descriptions
org time	Originate time stamp.
rcv time	Receive time stamp.
xmt time	Transmit time stamp.
filtdelay	Round-trip delay of each sample, in milliseconds.
filtoffset	Clock offset of each sample, in milliseconds.
filterror	Approximate error of each sample.

show ntp status

To display the status of Network Time Protocol (NTP), use the **show ntp status** command in XR EXEC mode.

show ntp status [**location** *node-id*]

Syntax Description

location *node-id*	(Optional) Displays the status of NTP from the designated node. The *node-id* argument is entered in the *rack/slot* notation.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ip-services	read

This example shows sample output from the **show ntp status** command:

```
Router# show ntp status

Clock is synchronized, stratum 3, reference is 192.168.128.5
nominal freq is 1000.0000 Hz, actual freq is 1000.0021 Hz, precision is 2**24
reference time is CC38EC6A.8FCCA1C4 (10:10:02.561 JST Tue Jul 29 2008)
clock offset is -124.051 msec, root delay is 174.060 msec
root dispersion is 172.37 msec, peer dispersion is 0.10 msec
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is -0.0000021106 s/s
system poll interval is 32, last update was 19 sec ago
```

Table 6: show ntp status Field Descriptions

Field	Description
synchronized	Synchronized system to an NTP peer.
stratum	NTP stratum of this system.
reference	IPv4 address or first 32 bits of the MD5 hash of the IPv6 address of the peer to which clock is synchronized.
nominal freq	Nominal frequency in Hertz (Hz) of the system hardware clock.

Field	Description
actual freq	Measured frequency in Hz of the system hardware clock.
precision	Precision of the clock of this system in Hz.
reference time	Reference time stamp.
clock offset	Offset of clock to synchronized peer, in milliseconds.
root delay	Total delay along path to root clock, in milliseconds.
root dispersion	Dispersion of root path.
peer dispersion	Dispersion of synchronized peer.
loopfilter state	The state of the clock state machine transition function.
drift	Drift of the hardware clock.
system poll interval	Poll interval of the peer.
last update	Time the router last updated its NTP information.

source (NTP)

To use a particular source address in Network Time Protocol (NTP) packets, use the **source** command in one of the NTP configuration modes. To remove the **source** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

source [**vrf** *vrf-name*] *type interface-path-id*
no source

Syntax Description

vrf *vrf-name*	(Optional) Applies the source address configuration to the specified nondefault VRF.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.

Command Default

The source address is determined by the outgoing interface.

Command Modes

NTP configuration

VRF-specific NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **source** command to use a particular source IP address for all NTP packets. The address is taken from the named interface. This command is useful if the address on an interface cannot be used as the destination for reply packets. If the **source** keyword has been configured with the **server** (NTP) or **peer** (NTP) command, that value overrides the global value.

Use the **source** command in a VRF-specific NTP configuration mode or use the **vrf** *vrf-name* keyword and argument to configure the source address for a specific nondefault VRF. Otherwise, the configuration is applied to the default VRF.

Task ID

Task ID	Operations
ip-services	read, write

This example shows how to configure the router to use the IP address of interface 0/0/0/1 as the source address of all outgoing NTP packets:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# source tengige 0/0/0/1
```

trusted-key

To designate a Network Time Protocol (NTP) trusted key, use the **trusted-key** command in NTP configuration mode. To remove the **trusted-key** command from the configuration file and restore the system to its default condition with respect to this command, use the **no** form of this command.

trusted-key *key-number*
no trusted-key *key-number*

Syntax Description

key-number	Authentication key number to be trusted. Range is from 1 to 65535.

Command Default

No NTP trusted key is designated.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

If authentication is enabled, use the **trusted-key** command to define one or more key numbers (corresponding to the keys defined with the **authentication-key** [NTP] command) that a NTP system must provide in its NTP packets for this system to synchronize to it. Because the other system must know the correct authentication key, this precaution provides protection against accidentally synchronizing the system to a system that is not trusted.

Task ID

Task ID	Operations
ip-services	read, write

The following example shows how to configure the system to synchronize only to systems providing authentication key 42 in its NTP packets:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# authenticate
RP/0/RP0/CPU0:router(config-ntp)# authentication-key 42 md5 clear key1
RP/0/RP0/CPU0:router(config-ntp)# trusted-key 42
```

update-calendar

To update the calendar periodically from Network Time Protocol (NTP), use the **update-calendar** command in NTP configuration mode. To remove the **update-calendar** command from the configuration file and restore the system to its default condition with respect to the command, use the **no** form of this command.

update-calendar
no update-calendar

Syntax Description

This command has no keywords or arguments.

Command Default

This command is disabled.

Command Modes

NTP configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Your router has a calendar that is separate from the software clock. This calendar runs continuously, even if the router is powered off or rebooted.

If a router is synchronized to an outside time source through NTP, it is a good idea to update the router's calendar with the time learned from NTP. Otherwise, the calendar may gradually lose or gain time.

After you configure the **update-calendar** command, NTP updates the calendar with the software clock every hour.

Task ID

Task ID	Operations
ip-services	read, write

This example shows how to configure the router to update the calendar periodically from the software clock:

```
RP/0/RP0/CPU0:router(config)# ntp
RP/0/RP0/CPU0:router(config-ntp)# update-calendar
```

PTP Commands

synchronous-ethernet prefer-interface ptp-receiver

To prefer selection of the SyncE source on the same interface where the PTP receiver is selected by the router, use the **synchronous-ethernet prefer-interface ptp-receiver** command in the global frequency synchronization mode.

The desired SyncE source on PTP receiver interface gets selected if it has the highest or equal QL and user configured priority among the other available SyncE sources.

If the selected PTP source goes down or if the PTP source's quality degrades, the system may switch to another PTP source. In such case, use this command so that the SyncE source selection would also switch to the new PTP receiver interface. Here, the preferred switching of SyncE source to the new PTP receiver interface shall happen only if the new interface uses the same SyncE QL and the user configured priority as the previously selected interface.

synchronous-ethernet prefer-interface ptp-receiver

Syntax Description

prefer-interface	Selects the frequency source among equal sources.
ptp-receiver	Selects the PTP receiver interface.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operation
ethernet-services	read, write

Example

This example shows how to configure the **synchronous-ethernet prefer-interface ptp-receiver** command.

```
RP/0/RP0/CPU0:router(config)# frequency synchronization synchronous-ethernet prefer-interface
 ptp-receiver
RP/0/RP0/CPU0:router(config)# commit
```

This example verifies the **synchronous-ethernet prefer-interface ptp-receiver** configuration.

```
RP/0/RP0/CPU0:router(config)# show running-config frequency synchronization
Thu Aug 8 04:50:13.638 UTC
frequency-synchronization
 synchronous-ethernet prefer-interface ptp-receiver
!
```

performance-monitoring

To enable the collection of performance-monitoring statistics, use the **performance-monitoring** command in PTP configuration mode.

performance-monitoring

Syntax Description

This command has no keywords or arguments.

Command Default

By default performance-monitoring is not enabled.

Command Modes

Global PTP configuration

Command History

Release	Modification
Release 25.3.1	This command was introduced.

Usage Guidelines

None.

Task ID

Task ID	Operation
performance-monitoring	read, write

The following example shows how to enable the collection of performance-monitoring statistics.

```
Router(config)# ptp
Router(config-ptp)# performance-monitoring
Router(config-ptp)# commit
```

show ptp dataset performance

To display the performance monitoring dataset for the local clock and any PTP port for the current 15-minute window, use the **show ptp dataset performance** { **clock** | **port** { **all** | **interface***name* } } command in EXEC mode.

show ptp dataset performance { **clock** | **port** { **all** | **interface** *name* } } }

Syntax Description

clock	Displays the performance monitoring dataset of the local clock for the current 15-minute window.
port	Displays the performance monitoring dataset of the port for the current 15-minute window for *all* or specified **interface***name*.

Syntax Description This command has no keywords or arguments.

Command Default None

Command Modes EXEC

Command History

Release	Modification
Release 25.3.1	This command was introduced.

Usage Guidelines None.

Task ID

Task ID	Operation
performance	read

Example

The following show command displays the performance monitoring dataset of the local clock for the current 15-minute window.

```
Router#show ptp dataset performance clock

performanceMonitoringDS for the current 15-minute window:
Clock ID ccccfffecccc00, steps removed 1, receiving port 2:
    Start of time window: Thursday, 14:18:59
    Measurement is valid
    Period is complete
    Measurement has been taken with reference to system clock
    Master slave delay:
        Average: 50ns
        Min: 50ns
        Max: 70ns
        Std: 1ns
    Slave master delay:
        Average: 51ns
        Min: 51ns
        Max: 71ns
```

```
        Std: 2ns
    Mean path delay:
        Average: 52ns
        Min: 52ns
        Max: 72ns
        Std: 3ns
    Offset from master:
        Average: 53ns
        Min: 53ns
        Max: 73ns
        Std: 4ns

Clock ID aaaabbbecccc00, steps removed 1, receiving port 2:
    Start of time window: Thursday, 14:18:59
    Measurement is not valid
    Period is not complete
    Measurement has been taken with reference to system clock
    Master slave delay:
        Average: 50ns
        Min: 50ns
        Max: 70ns
        Std: 1ns
    Slave master delay:
        Average: 51ns
        Min: 51ns
        Max: 71ns
        Std: 2ns
    Mean path delay:
        Average: 52ns
        Min: 52ns
        Max: 72ns
        Std: 3ns
    Offset from master:
        Average: 53ns
        Min: 53ns
        Max: 73ns
        Std: 4ns
```

Example

The following show command displays the performance monitoring dataset of the port for the current 15-minute window.

```
Router#show ptp dataset performance port GigabitEthernet 0/0/0/1
performanceMonitoringPortDS for the current 15-minute window:
Interface GigabitEthernet 0/0/0/1
    Start of time window: Thursday, 14:18:59
    Measurement is valid
    Period is not complete
    Measurement has been taken with reference to system clock
    Packets                    Sent        Received         Dropped
    ----------------------------------------------------------------
    Announce                      3              83              11
    Sync                          0              32               5
    Follow-Up                     0              31               0
    Delay-Req                    22               0               0
    Delay-Resp                    0              21               7
    Pdelay-Req                    0               7               0
    Pdelay-Resp                   0               0               0
```

```
Pdelay-Resp-Follow-Up          0               0               0
Signaling                      2               1               0
Management                     0               0               0
Other                          0               3              12
                           -----           -----           -----
TOTAL                         27             178              35
```

show ptp platform performance-counters

To display counters details for platform performance sent by Precision Time Protocol (PTP), use the **show ptp platform performance-counters** in command in EXEC mode.

show ptp platform performance-counters { **detail** | **brief** }

Syntax Description

detail	Displays all 123 counter record details for platform performance sent by PTP.
brief	Displays only the current counter record in 15 minutes, 24 hours, 3minutes, and 1hour windows.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 25.3.1	This command was introduced.

Usage Guidelines

None.

Task ID

Task ID	Operation
platform performance-counters	read

Example

In this example, the **detail** mode of the command displays all 123 records.

```
Router#sh ptp platform performance-counters detail

PTP Current record index 15 min: 96
PTP Current record index 3 min: 119

PTP performance monitoring statistics:
================================================================================
15 min stats
[0]     07:08:59 UTC 15 min statistics
--------------------------------------------------------------------------------

                Stat    Min(sec.nsec)        Max(sec.nsec)       Mean(sec.nsec)     Std
deviation           Samples
--------------------------------------------------------------------------------

  Master-slave-delay -000000000.15937      000000000.333       -000000000.1780
000000000.71191      154
  Slave-master-delay  000000000.319        000000000.16593      000000000.2437
000000000.74103      154
     mean-path-delay  000000000.322        000000000.334        000000000.327
000000000.4057       154
  offset-from-master -000000000.16263      000000000.6         -000000000.2108
```

```
000000000.72546      154

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

            Complete      Valid      PmRef      ServoAtStart     ServoAtEnd
LastServoFlapTime
-------------------------------------------------------------------------------------------------------------------

               FALSE      FALSE       TRUE        PHASE_LOCKED   HOLDOVER
07:09:09 UTC

==============

….
```

Example

In this example, the **brief** mode displays only the current counter record in 15 minutes, 24 hours, 3minutes, and 1hour windows.

```
Router#sh ptp platform performance-counters brief

==============
PTP Current record index 15 min: 96
PTP Current record index 3 min: 116

PTP performance monitoring statistics:
===================================================================================================================
15 min stats
[0]     11:46:07 UTC 15 min statistics
-------------------------------------------------------------------------------------------------------------------

                Stat    Min(sec.nsec)        Max(sec.nsec)       Mean(sec.nsec)     Std
deviation           Samples
-------------------------------------------------------------------------------------------------------------------

  Master-slave-delay  000000000.271        000000000.336        000000000.325
000000000.38386      13922
  Slave-master-delay  000000000.314        000000000.377        000000000.326
000000000.38526      13922
     mean-path-delay  000000000.318        000000000.334        000000000.325
000000000.38425      13922
  offset-from-master -000000000.53         000000000.9         -000000000.0
000000000.369        13922

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

            Complete      Valid      PmRef      ServoAtStart     ServoAtEnd
LastServoFlapTime
-------------------------------------------------------------------------------------------------------------------

               FALSE      FALSE       TRUE         FREQ_LOCKED   HOLDOVER
12:00:33 UTC

==============
```

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