Simple Network Time Protocol

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Simple Network Time Protocol (SNTP) is a simplified version of Network Time Protocol(NTP). This module describes how to configure Simple Network Time Protocol on Cisco devices.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About Network Time Protocol

Time and Calendar Services

The primary source for time data on your system is the software clock. This clock runs from the moment the system starts up and keeps track of the current date and time. The software clock can be set from a

number of sources and in turn can be used to distribute the current time through various mechanisms to other systems. When a device with a hardware clock is initialized or rebooted, the software clock is initially set based on the time in the hardware clock. The software clock can then be updated from the following sources:

- Manual configuration (using the hardware clock)
- Network Time Protocol (NTP)
- Simple Network Time Protocol (SNTP)
- Virtual Integrated Network Service (VINES) Time Service

Because the software clock can be dynamically updated, it has the potential to be more accurate than the hardware clock.

The software clock can provide time to the following services:

- Access lists
- Logging and debugging messages
- NTP
- The hardware clock
- User **show** commands
- VINES Time Service

Note The software clock cannot provide time to the NTP or VINES Time Service if the clock was set using SNTP.

The software clock keeps track of time internally based on the Coordinated Universal Time (UTC), also known as Greenwich Mean Time (GMT). You can configure information about the local time zone and summer time (daylight saving time) so that time is displayed correctly relative to the local time zone.

The software clock keeps track of whether the time is authoritative (that is, whether it has been set by a time source considered to be authoritative). If it is not authoritative, the time will be available only for display purposes and will not be redistributed.

Network Time Protocol

Network Time Protocol (NTP) is a protocol designed to time-synchronize a network of machines. NTP runs on User Datagram Protocol (UDP), which in turn runs on IP. NTP Version 3 is documented in RFC 1305.

An NTP network usually gets its time from an authoritative time source such as a radio clock or an atomic clock attached to a time server. NTP then distributes this time across the network. NTP is extremely efficient; no more than one packet per minute is necessary to synchronize two machines to the accuracy of within a millisecond of one another.

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 typically has an authoritative time source (such as a radio or atomic clock, or a Global Positioning System (GPS) time source) directly attached, a stratum 2 time server receives its time via NTP from a stratum 1 time server, and so on.

NTP has two ways to avoid synchronizing to a machine whose time may not be accurate. NTP will never synchronize to a machine that is not in turn synchronized. NTP will compare the time reported by several machines, and will not synchronize to a machine whose time is significantly different from others, even if its stratum is lower. This strategy effectively builds a self-organizing tree of NTP servers.

The Cisco implementation of NTP does not support stratum 1 service; that is, you cannot connect to a radio or atomic clock (for some specific platforms, however, you can connect to a GPS time-source device). Cisco recommends that the time service for your network be derived from the public NTP servers available in the IP Internet.

If the network is isolated from the Internet, the Cisco implementation of NTP allows a machine to be configured so that it acts as though it is synchronized via NTP, when in fact it has determined the time using other means. Other machines can then synchronize to that machine via NTP.

A number of manufacturers include NTP software for their host systems and a publicly available version for systems running UNIX. This software also allows UNIX-derivative servers to acquire the time directly from an atomic clock, which would subsequently propagate time information along to Cisco routers.

The communications between machines running NTP (known as associations) are usually statically configured; each machine is given the IP address of all machines with which it should form associations. Accurate timekeeping is made possible through exchange of NTP messages between each pair of machines with an association.

However, in a LAN environment, NTP can be configured to use IP broadcast messages instead. This alternative reduces configuration complexity because each machine can be configured to send or receive broadcast messages. However, the accuracy of timekeeping is marginally reduced because the information flow is one-way only.

The time kept on a machine is a critical resource, so Cisco strongly recommends that you use the security features of NTP to avoid the accidental or malicious setting of incorrect time. Two mechanisms are available: an access list-based restriction scheme and an encrypted authentication mechanism.

When multiple sources of time (Virtual Integrated Network System (VINES), hardware clock, manual configuration) are available, NTP is always considered to be more authoritative. NTP time overrides the time set by any other method.

NTP services are disabled on all interfaces by default.

For more information about NTP, see the following sections:

Poll-Based NTP Associations

Networking devices running NTP can be configured to operate in variety of association modes when synchronizing time with reference time sources. A networking device can obtain time information on a network in two ways—by polling host servers and by listening to NTP broadcasts. This section focuses on the poll-based association modes. Broadcast-based NTP associations are discussed in the *Broadcast-Based NTP Associations* section.

The following are the two most commonly used poll-based association modes:

- Client mode
- Symmetric active mode

The client and the symmetric active modes should be used when NTP is required to provide a high level of time accuracy and reliability.

When a networking device is operating in the client mode, it polls its assigned time-serving hosts for the current time. The networking device will then pick a host from among all the polled time servers to synchronize with. Because the relationship that is established in this case is a client-host relationship, the host will not capture or use any time information sent by the local client device. This mode is most suited for file-server and workstation clients that are not required to provide any form of time synchronization to other local clients. Use the **ntp server** command to individually specify the time server that you want your networking device to consider synchronizing with and to set your networking device to operate in the client mode.

When a networking device is operating in the symmetric active mode, it polls its assigned time-serving hosts for the current time and it responds to polls by its hosts. Because this is a peer-to-peer relationship, the host will also retain time-related information of the local networking device that it is communicating with. This mode should be used when a number of mutually redundant servers are interconnected via diverse network paths. Most stratum 1 and stratum 2 servers on the Internet adopt this form of network setup. Use the **ntp peer** command to individually specify the time serving hosts that you want your networking device to consider synchronizing with and to set your networking device to operate in the symmetric active mode.

The specific mode that you should set for each of your networking devices depends primarily on the role that you want them to assume as a timekeeping device (server or client) and the device's proximity to a stratum 1 timekeeping server.

A networking device engages in polling when it is operating as a client or a host in the client mode or when it is acting as a peer in the symmetric active mode. Although polling does not usually place a burden on memory and CPU resources such as bandwidth, an exceedingly large number of ongoing and simultaneous polls on a system can seriously impact the performance of a system or slow the performance of a given network. To avoid having an excessive number of ongoing polls on a network, you should limit the number of direct, peer-to-peer or client-to-server associations. Instead, you should consider using NTP broadcasts to propagate time information within a localized network.

Broadcast-Based NTP Associations

Broadcast-based NTP associations should be used when time accuracy and reliability requirements are modest and if your network is localized and has more than 20 clients. Broadcast-based NTP associations are also recommended for use on networks that have limited bandwidth, system memory, or CPU resources.

A networking device operating in the broadcast client mode does not engage in any polling. Instead, it listens for NTP broadcast packets that are transmitted by broadcast time servers. Consequently, time accuracy can be marginally reduced because time information flows only one way.

Use the **ntp broadcast client** command to set your networking device to listen for NTP broadcast packets propagated through a network. For broadcast client mode to work, the broadcast server and its clients must be located on the same subnet. You must enable the time server that transmits NTP broadcast packets on the interface of the given device by using the **ntp broadcast** command.

NTP Access Group

The access list-based restriction scheme allows you to grant or deny certain access privileges to an entire network, a subnet within a network, or a host within a subnet. To define an NTP access group, use the **ntp access-group** command in global configuration mode.

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

1. **ipv4**—Configures IPv4 access lists.
2. **ipv6**—Configures IPv6 access lists.

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

If the source IP address matches the access lists for more than one access type, the first type is granted access. If no access groups are specified, all access types are granted access to all systems. If any access groups are specified, only the specified access types will be granted access.

For details on NTP control queries, see RFC 1305 (NTP Version 3).

The encrypted NTP authentication scheme should be used when a reliable form of access control is required. Unlike the access list-based restriction scheme that is based on IP addresses, the encrypted authentication scheme uses authentication keys and an authentication process to determine if NTP synchronization packets sent by designated peers or servers on a local network are deemed as trusted before the time information that they carry along with them is accepted.

The authentication process begins from the moment an NTP packet is created. Cryptographic checksum keys are generated using the message digest algorithm 5 (MD5) and are embedded into the NTP synchronization packet that is sent to a receiving client. Once a packet is received by a client, its cryptographic checksum key is decrypted and checked against a list of trusted keys. If the packet contains a matching authentication key, the time-stamp information that is contained within the packet is accepted by the receiving client. NTP synchronization packets that do not contain a matching authenticator key are ignored.

Note In large networks, where many trusted keys must be configured, the Range of Trusted Key Configuration feature enables configuring multiple keys simultaneously.

It is important to note that the encryption and decryption processes used in NTP authentication can be very CPU-intensive and can seriously degrade the accuracy of the time that is propagated within a network. If your network setup permits a more comprehensive model of access control, you should consider the use of the access list-based form of control.

After NTP authentication is properly configured, your networking device will synchronize with and provide synchronization only to trusted time sources.

NTP Services on a Specific Interface

Network Time Protocol (NTP) services are disabled on all interfaces by default. NTP is enabled globally when any NTP commands are entered. You can selectively prevent NTP packets from being received through a specific interface by using the **ntp disable** command in interface configuration mode.

Source IP Address for NTP Packets

When the system sends an NTP packet, the source IP address is normally set to the address of the interface through which the NTP packet is sent. Use the **ntp source** *interface* command in global configuration mode to configure a specific interface from which the IP source address will be taken.

This interface will be used for the source address for all packets sent to all destinations. If a source address is to be used for a specific association, use the **source** keyword in the **ntp peer** or **ntp server** command.

System as an Authoritative NTP Server

Use the **ntp master** command in global configuration mode if you want the system to be an authoritative NTP server, even if the system is not synchronized to an outside time source.

Note Use the **ntp master** command with caution. It is very easy to override valid time sources using this command, especially if a low stratum number is configured. Configuring multiple machines in the same network with the **ntp master** command can cause instability in timekeeping if the machines do not agree on the time.

Orphan Mode

The NTP subnet is sometimes isolated from local reference clocks or Internet clock servers. During this period of isolation, the subnet servers and clients are synchronized to a common time scale. The local clock driver simulates a UTC source to provide a common time scale. A server connected to the driver directly or indirectly synchronizes the other hosts in the subnet.

Using a local clock driver may sometimes result in irrecoverable failures of the subnet, and maintaining redundancy using multiple servers is not feasible. The Orphan Mode feature, which does not have any such disadvantages, eliminates the need for a local clock driver. The Orphan Mode feature provides a single simulated UTC source with multiple servers and a seamless switching mechanism as servers recover from a failure.

In private networks, one or multiple core servers operating at the lowest stratum is normally included. You must configure each of these servers as backups for other servers using symmetric or broadcast modes. Even if one core server reaches a UTC source, the entire subnet synchronizes to the simulating server. If none of the servers reach a UTC source, one of the servers, which is known as the orphan parent, can simulate a UTC source, and serve as the simulated UTC source for all the other hosts, known as orphan children, in the subnet.

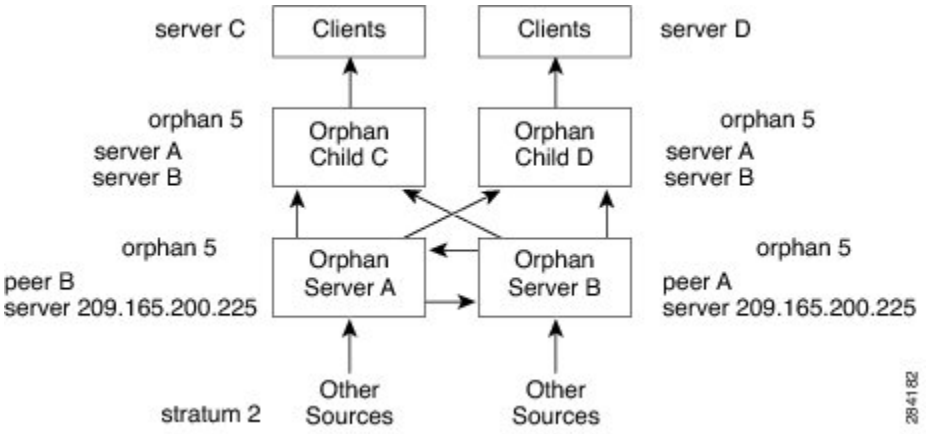
Use the **ntp orphan** *stratum* command to enable a host for orphan mode, where *stratum* is a stratum value less than 16 and greater than any stratum value that occurs in the configured Internet time servers. However, you must provide sufficient stratums so that every subnet host dependent on the orphan children has a stratum value less than 16. If no associations for other servers or reference clocks are configured, you must set the orphan stratum value to 1.

An orphan parent operating at stratum 1 with no sources displays the reference ID LOOP. An orphan parent not operating at stratum 1 displays the UNIX loopback address 127.0.0.1. Ordinary NTP clients use a selection metric based on delay and dispersion, whereas orphan children use a metric computed from the IP address of each core server in the subnet. Each orphan child selects the orphan parent with the smallest metric as the root server.

A server that loses all sources, continuously synchronizes the local clock driver with other servers, thus backing up the server. Enable orphan mode only in core servers and orphan children.

The following figure illustrates how orphan mode is set up, and a peer network configuration, where two primary or secondary (stratum 2) servers are configured with reference clocks or public Internet primary servers, with each using symmetric modes.

Figure 1 Orphan Mode Setup



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Prerequisites for Orphan Mode

To ensure smooth function of orphan mode, you must configure each core server with available sources to operate at the same stratum. Configure the same **ntp orphan** *stratum* command in all the core servers and the orphan children. Configure each orphan child with all the root servers.

Simple Network Time Protocol

Simple Network Time Protocol (SNTP) is a simplified, client-only version of NTP. SNTP can receive only the time from NTP servers; it cannot be used to provide time services to other systems.

SNTP typically provides time within 100 milliseconds of the accurate time, but it does not provide the complex filtering and statistical mechanisms of NTP. In addition, SNTP does not authenticate traffic, although you can configure extended access lists to provide some protection. An SNTP client is more vulnerable to servers that have unexpected behavior than an NTP client, and should be used only in situations where strong authentication is not required.

You can configure SNTP to request and accept packets from configured servers or to accept NTP broadcast packets from any source. When multiple sources are sending NTP packets, the server with the best stratum is selected. (See the *Network Time Protocol* section on page 3 for a description of strata.) If multiple servers are at the same stratum, a configured server is preferred over a broadcast server. If multiple servers pass both tests, the first one to send a time packet is selected. SNTP will choose a new server only if it stops receiving packets from the currently selected server, or if a better server (according to the criteria described) is discovered.

VINES Time Service

Time service is available when Banyan VINES is configured. This protocol is a standard part of VINES. The Cisco implementation allows the VINES time service to be used in two ways. First, if the system has learned the time from some other source, it can act as a VINES time server and provide time to other

machines running VINES. Second, it can use the VINES time service to set the software clock if no other form of time service is available.

Note Support for Banyan VINES and Xerox Network Systems (XNS) is not available in all releases.

Hardware Clock

Some devices contain a battery-powered hardware clock that tracks the date and time across system restarts and power outages. The hardware clock is always used to initialize the software clock when the system is restarted.

Note Within the CLI command syntax, the hardware clock is referred to as the system calendar.

If no other source is available, the hardware clock can be considered as an authoritative source of time and be redistributed via NTP. If NTP is running, the hardware clock can be updated periodically from NTP, compensating for the inherent drift, which is the consistent gain or loss of time at a certain rate if the hardware clock is left to run.

You can configure a hardware clock (system calendar) on any device to be periodically updated from the software clock. We recommend that you use this configuration for any device using NTP, because the time and date on the software clock (set using NTP) will be more accurate than the hardware clock, because the time setting on the hardware clock has the potential to drift slightly over time.

Use the **ntp update-calendar** command in global configuration mode if a routing device is synchronized to an outside time source via NTP and you want the hardware clock to be synchronized to NTP time.

How to Configure Network Time Protocol

Configuring Simple Network Time Protocol

Simple Network Time Protocol (SNTP) is a simplified version of Network Time Protocol (SNTP). This module describes how to configure SNTP on Cisco devices.

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Restrictions for Simple Network Time Protocol

- Simple Network Time Protocol(SNTP) and Network Time Protocol(NTP) cannot coexist on the same machine as they use the same port. This means that these two services cannot be configured on the system at the same time.
- Support for IPv6 addresses is available only if the image supports IPv6 addressing.

Configuring Poll-Based NTP Associations

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ntp peer** *ip-address* [**normal-sync**] [**version** *number*] [**key** *key-id*] [**prefer**]
4. **ntp server** *ip-address* [**version** *number*] [**key** *key-id*] [**prefer**]
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ntp peer** *ip-address* [**normal-sync**] [**version** *number*] [**key** *key-id*] [**prefer**] **Example:** `Device(config)# ntp peer 192.168.10.1 normal-sync version 2 prefer`	Forms a peer association with another system.

	Command or Action	Purpose
Step 4	**ntp server** *ip-address* [**version** *number*] [**key** *key-id*] [**prefer**] **Example:** `Device(config)# ntp server 192.168.10.1 version 2 prefer`	Forms a server association with another system.
Step 5	**end** **Example:** `Device(config)# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuring Broadcast-Based NTP Associations

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ntp broadcast version** *number*
5. **ntp broadcast client**
6. **ntp broadcastdelay** *microseconds*
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**interface** *type number* **Example:** `Device(config)# interface ethernet 0/0`	Configures an interface and enters interface configuration mode.
Step 4	**ntp broadcast version** *number* **Example:** `Device(config-if)# ntp broadcast version 2`	Configures the specified interface to send NTP broadcast packets.
Step 5	**ntp broadcast client** **Example:** `Device(config-if)# ntp broadcast client`	Configures the specified interface to receive NTP broadcast packets.
Step 6	**ntp broadcastdelay** *microseconds* **Example:** `Device(config-if)# ntp broadcastdelay 100`	Adjusts the estimated round-trip delay for NTP broadcasts.
Step 7	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring Simple Network Time Protocol(SNTP) Authentication

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. s**ntp authenticate**
4. s**ntp authentication-key** *number* **md5** *key*
5. **sntp authentication-key** *number* **md5** *key*
6. **sntp authentication-key** *number* **md5** *key*
7. **sntp trusted-key** *key-number* [**-** *end-key*]
8. **sntp server** *ip-address* **key** *key-id*
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**sntp authenticate** **Example:** `Device(config)# sntp authenticate`	Enables the SNTP Authentication feature.
Step 4	**sntp authentication-key** *number* **md5** *key* **Example:** `Device(config)# sntp authentication-key 1 md5 key1`	Defines authentication keys. • Each key has a key number, a type, and a value.
Step 5	**sntp authentication-key** *number* **md5** *key* **Example:** `Device(config)# sntp authentication-key 2 md5 key2`	Defines authentication keys.
Step 6	**sntp authentication-key** *number* **md5** *key* **Example:** `Device(config)# sntp authentication-key 3 md5 key3`	Defines authentication keys.
Step 7	**sntp trusted-key** *key-number* [**-** *end-key*] **Example:** `Device(config)# sntp trusted-key 1 - 3`	Defines trusted authentication keys. • If a key is trusted, this device will be ready to synchronize to a system that uses this key in its SNTP packets.

	Command or Action	Purpose
Step 8	**sntp server** *ip-address* **key** *key-id* **Example:** `Device(config)# sntp server 172.16.22.44 key 2`	Allows the software clock to be synchronized by an SNTP time server.
Step 9	**end** **Example:** `Device(config)# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuring an External Reference Clock

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **line aux** *line-number*
4. **ntp refclock trimble pps none stratum** *number*
5. **end**
6. **show ntp associations**
7. **show ntp status**
8. **debug ntp refclock**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**line aux** *line-number* **Example:** `Device(config)# line aux 0`	Enters line configuration mode for the auxiliary port 0.
Step 4	**ntp refclock trimble pps none stratum** *number* **Example:** `Device(config-line)# ntp refclock trimble pps none stratum 1`	Configures an external reference clock. • To configure a Trimble Palisade GPS product connected to the auxiliary port of a Cisco 7200 series device as the NTP reference clock, use the **ntp refclock trimble pps none stratum** form of the command. Use this command to enable the driver that allows the Trimble Palisade NTP Synchronization Kit to be used as the NTP reference clock source (Cisco 7200 series device only). • To configure a pulse per second signal (PPS) as the source for NTP synchronization, use the **ntp refclock trimble pps** command.
Step 5	**end** **Example:** `Device(config-line)# end`	Exits line configuration mode and returns to privileged EXEC mode.
Step 6	**show ntp associations** **Example:** `Device# show ntp associations`	Displays the status of NTP associations, including the status of the GPS reference clock.
Step 7	**show ntp status** **Example:** `Device# show ntp status`	Displays the status of NTP.
Step 8	**debug ntp refclock** **Example:** `Device# debug ntp refclock`	Allows advanced monitoring of reference clock activities for the purposes of debugging.

Configuring Orphan Mode

To configure orphan mode, you would require at least two clients. The following task shows how to configure orphan mode on one client. Repeat the steps in the other client.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ntp server** *ip-address*
4. **ntp peer** *ip-address*
5. **ntp orphan** *stratum*
6. Repeat steps 1 to 5 on the other client.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ntp server** *ip-address* **Example:** `Router(config)# ntp server 10.1.1.1`	Forms a server association with another system.
Step 4	**ntp peer** *ip-address* **Example:** `Router(config)# ntp peer 172.16.0.1`	Forms a peer association with another system. **Note** Use an IP address that is different from the one you just configured, such as 172.16.0.2, while configuring the peer in the other client.
Step 5	**ntp orphan** *stratum* **Example:** `Router(config)# ntp orphan 4`	Enables orphan mode in the host.
Step 6	Repeat steps 1 to 5 on the other client.	

Configuring Simple Network Time Protocol

Simple Network Time Protocol(SNTP) is generally supported on those platforms that do not provide support for Network Time Protocol(NTP). SNTP is disabled by default.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp server** {*ipv4 address* | *ipv6 address*|*hostname*} [**version 1-4** *number*]
4. **sntp broadcast client**
5. **exit**
6. **show sntp**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**sntp server** {*ipv4 address* | *ipv6 address*| *hostname*} [**version 1-4** *number*] **Example:** `Device(config)# sntp server 192.168.2.1 version 2`	Configures SNTP to request NTP packets from an NTP server. • Enter the **sntp server** command once for each NTP server. The NTP servers must be configured to respond to the SNTP messages from the device.
Step 4	**sntp broadcast client** **Example:** `Device(config)# sntp broadcast client`	Configures SNTP to accept NTP packets from any NTP broadcast server. **Note** If you enter both the **sntp server** command and the **sntp broadcast client** command, the device will accept time from a broadcast server but will prefer time from a configured server, assuming that the strata are equal.
Step 5	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

	Command or Action	Purpose
Step 6	**show sntp** **Example:** `Device# show sntp`	Displays information about SNTP.

Configuring VINES Time Service

Time service is available when Banyan VINES is configured. This protocol is a standard part of VINES. Perform the following task to configure VINES Time Service.

Note Depending on your release, the Banyan VINES and XNS is available in the Cisco software. The **vines time set-system** and **vines time use-system** commands are not available in some releases.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vines time use-system**
4. **vines time set-system**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**vines time use-system** **Example:** `Device(config)# vines time use-system`	Distributes the system software clock time to other VINES systems.

	Command or Action	Purpose
Step 4	**vines time set-system** **Example:** `Device(config)# vines time set-system`	Sets the software clock system time and date as derived from VINES time services.
Step 5	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Configuring the Time and Date

If no other source of time is available, you can manually configure the current time and date after the system is restarted. The time will remain accurate until the next system restart. We recommend that you use manual configuration only as a last resort.

If you have an outside source to which the device can synchronize, you need not manually set the software clock. Perform the following task to configure the time and date manually.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **clock timezone** *zone hours-offset* [*minutes-offset*]
4. **clock summer-time** *zone* **recurring** [*week day month hh*:*mm week day month hh*:*mm* [*offset*]]
5. **clock summer-time** *zone* **date** *date month year hh*:*mm date month year hh*:*mm* [*offset*]
6. **exit**
7. **clock set** *hh*:*mm*:*ss date month year*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**clock timezone** *zone hours-offset* [*minutes-offset*] **Example:** `Device(config)# clock timezone PST 2 30`	Configures the time zone used by the Cisco software. **Note** The *minutes-offset* argument of the **clock timezone** command is available for those cases where a local time zone is a percentage of an hour different from UTC/GMT. For example, the time zone for some sections of Atlantic Canada (AST) is UTC –3.5. In this case, the necessary command would be **clock timezone AST –3 30**.
Step 4	**clock summer-time** *zone* **recurring** [*week day month hh*:*mm week day month hh*:*mm* [*offset*]] **Example:** `Device(config)# clock summer-time PST recurring 1 monday january 12:12 4 Tuesday december 12:12 120`	Configures summer time (daylight saving time) in areas where it starts and ends on a particular day of the week each year.
Step 5	**clock summer-time** *zone* **date** *date month year hh*:*mm date month year hh*:*mm* [*offset*] **Example:** `Device(config)# clock summer-time PST date 1 january 1999 12:12 4 december 2001 12:12 120`	Configures a specific summer time start and end date. • The *offset* argument is used to indicate the number of minutes to add to the clock during summer time.
Step 6	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.
Step 7	**clock set** *hh*:*mm*:*ss date month year* **Example:** `Device# clock set 12:12:12 1 january 2011`	Sets the software clock. • Use this command if no other time sources are available. The time specified in this command is relative to the configured time zone. **Note** Generally, if the system is synchronized by a valid outside timing mechanism, such as an NTP or VINES clock source, or if you have a device with a hardware clock, you need not set the software clock.

Setting the Hardware Clock

Most Cisco devices have a separate hardware-based clock in addition to the software-based clock. The hardware clock is a chip with a rechargeable backup battery that can retain the time and date information across reboots of the device.

To maintain the most accurate time update from an authoritative time source on the network, the software clock should receive time updates from an authoritative time on the network. The hardware clock should in turn be updated at regular intervals from the software clock while the system is running.

The hardware clock (system calendar) maintains time separately from the software clock. The hardware clock continues to run when the system is restarted or when the power is turned off. Typically, the hardware clock needs to be manually set only once, when the system is installed.

You should avoid setting the hardware clock if you have access to a reliable external time source. Time synchronization should instead be established using NTP.

Perform the following task to set the hardware clock.

Note Depending on your release, NTP runs within IOS daemon (IOSd), which updates the time on the Linux kernel. As the Linux kernel updates the hardware clock every 11 minutes, NTP does not interact with the hardware clock directly. So, the calendar-related commands are not required.

SUMMARY STEPS

1. **enable**
2. **calendar set** *hh*:*mm*:*ss day month year*
3. **configure terminal**
4. **clock calendar-valid**
5. **exit**
6. **clock read-calendar**
7. **clock update-calendar**
8. **show calendar**
9. **show clock** [**detail**]
10. **show ntp associations** [**detail**]
11. **show ntp status**
12. **show sntp**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**calendar set** *hh*:*mm*:*ss day month year* **Example:** `Device# calendar set 10:12:15 monday june 1999`	Sets the hardware clock. **Note** Use this command when you have no access to an external time source.
Step 3	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 4	**clock calendar-valid** **Example:** `Device(config)# clock calendar-valid`	Enables the device to act as a valid time source to which network peers can synchronize. • By default, the time maintained on the software clock is not considered to be reliable and will not be synchronized with NTP or VINES time service. To set the hardware clock as a valid time source, use this command.
Step 5	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.
Step 6	**clock read-calendar** **Example:** `Device# clock read-calendar`	Sets the software clock to the new hardware clock setting.
Step 7	**clock update-calendar** **Example:** `Device# clock update-calendar`	Updates the hardware clock with a new software clock setting.
Step 8	**show calendar** **Example:** `Device# show calendar`	Displays the current hardware clock time.

	Command or Action	Purpose
Step 9	**show clock** [**detail**] **Example:** `Device# show clock detail`	Displays the current software clock time.
Step 10	**show ntp associations** [**detail**] **Example:** `Device# show ntp associations detail`	Displays the status of NTP associations.
Step 11	**show ntp status** **Example:** `Device# show ntp status`	Displays the status of NTP.
Step 12	**show sntp** **Example:** `Device# show sntp`	Displays information about SNTP.

Configuring Time Ranges

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **time-range** *time-range-name*
4. Enter one of the following:
   - **absolute** [**start** *hh*:*mm date month year*] [**end** *hh*:*mm date month year*]
   - **periodic** *day-of-the-week hh*:*mm* **to** [*day-of-the-week*] *hh*:*mm*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**time-range** *time-range-name* **Example:** `Device(config)# time-range range1`	Assigns a name to the time range to be configured and enters time range configuration mode.

Step 4	Enter one of the following:
	• **absolute** [**start** *hh***:***mm date month year*] [**end** *hh***:***mm date month year*]
	• **periodic** *day-of-the-week hh***:***mm* **to** [*day-of-the-week*] *hh***:***mm*
	
	Example:
	`Device(config-time-range)# absolute start 12:12 30 January 1999 end 12:12 30 December 2000`
	
	`Device(config-time-range)# periodic monday 12:12 to friday 12:12`
		Specifies when the time range will be in effect.
		• Use a combination of these commands; multiple **periodic** commands are allowed; only one **absolute** command is allowed.

Step 5	**end** **Example:** `Device(config-time-range)# end`	Exits time range configuration mode and returns to privileged EXEC mode.

Verifying Simple Network Time Protocol

To verify information about the Simple Network Time Protocol, perform the following command.

SUMMARY STEPS

1. **show sntp**

DETAILED STEPS

show sntp

Example:

```
Device# show sntp

SNTP server     Stratum   Version    Last Receive
172.168.10.1      16        1        never
Broadcast client mode is enabled.
Multicast client 224.0.1.1 is enabled.
```

This command displays information about SNTP available in Cisco devices.

Configuration Examples for Network Time Protocol

Example: Configuring Simple Network Time Protocol

```
clock timezone PST -8
clock summer-time PDT recurring
sntp update-calendar
sntp server 192.168.13.57
sntp server 192.168.11.58
interface Ethernet 0/0
 sntp broadcast
```

Additional References for Simple Network Time Protocol

Related Documents

Related Topic	Document Title
Cisco IOS commands	*Cisco IOS Master Commands List, All Releases*
Basic System Management commands	*Basic System Management Command Reference*
NTP4 in IPv6	*Cisco IOS Basic System Management Guide*
IP extended access lists	*Cisco IOS IP Addressing Configuration Guide*
IPX extended access lists	*Novell IPX Configuration Guide*

Related Topic	Document Title
NTP package vulnerability	*Network Time Protocol Package Remote Message Loop Denial of Service Vulnerability*
Cisco IOS and NX-OS software releases	*'White Paper: Cisco IOS and NX-OS Software Reference Guide*

Standards and RFCs

Standard/RFCs	Title
RFC 1305	*Network Time Protocol (Version 3) Specification, Implementation and Analysis*

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Simple Network Time Protocol

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1 Feature Information for Simple Network Time Protocol

Feature Name	Releases	Feature Information
Simple Network Time Protocol	Cisco IOS 15.3(2)T Cisco IOS 15.3(2)S Cisco IOS XE 3.9.0 S	Simple Network Time Protocol (SNTP) is a simplified, client-only version of Network Time Protocol(SNTP) The following commands were introduced or modified: **sntp server**,**sntp authenticate**, **sntp authentication-key**, **sntp multicast**,**sntp trusted-key**.