Configuring SNTP Client

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Simple Network Time Protocol Client

Switch system time can be achieved in two ways - the SNTP client where the SNTP server automatically synchronizes time; and the administrator's configuration.

The Simple Network Time Protocol (SNTP) is used for time synchronization between network devices. Normally, an SNTP server exists in the network and provides reference time for multiple SNTP clients. This way, time synchronization is achieved among all network devices.

SNTP can work in four modes: unicast, broadcast, multicast, and anycast.

- In the unicast mode, the client initiates a request to the server. After receiving the request, the server constructs a response message based on the local time and sends the response message back to the client.
- In the broadcast and multicast mode, the server periodically sends broadcast or multicast messages to the client, and the client receives the messages from the server.
- In the anycast mode, the client initiates a local broadcast address or a multicast address to send a request. In this case, the server in the network responds to the client. The client selects the server that receives the response message as the server, and discards the messages sent by the other server. After electing out of the server, the work pattern is same as unicast.

In all modes, the client receives a response message to parse the message to obtain the current standard time, and calculates the network transmission delay and local time compensation through a certain algorithm. The data is used to calibrate the current time.

How to Configure SNTP Client

Enabling SNTP Client

To enable or disable the SNTP client, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client**
4. **show sntp client**
5. **show clock**

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 client** **Example:** `Device(config)# sntp client`	Enables the SNTP client. To disable the SNTP client, use the **no** form of this command. By default, the SNTP client is disabled.
Step 4	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.
Step 5	**show clock** **Example:** `Device(config)# show clock`	(Optional) Displays the system time.

Configuring the SNTP Client Mode

To configure the mode in which the SNTP client should function, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client mode** { **anycast** [**key** *key-id*] | **broadcast** | **multicast** | **unicast** }
4. **show sntp client**

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 client mode** { **anycast** [**key** *key-id*] | **broadcast** | **multicast** | **unicast** } **Example:** `Device(config)# sntp client mode unicast`	Configures the work-mode of the SNTP client. By default, the SNTP client is set to broadcast mode.
Step 4	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring the SNTP Server Address

When an SNTP client works in the unicast mode, you must configure the specified SNTP server.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp server** *ip-address*
4. **sntp server backup** *ip-address*
5. **show sntp client**

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** *ip-address* **Example:**	Configures the SNTP server address. Use the **no** form of the command to disable the SNTP server.

	Command or Action	Purpose
	`Device(config)# sntp server 122.2.2.1`	
Step 4	**sntp server backup** *ip-address* **Example:** `Device(config)# sntp server backup 112.1.1.1`	(Optional) Configures the SNTP backup server address. Use the **no** form of the command to disable the SNTP backup server.
Step 5	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring the Broadcast Transmission Delay

When the SNTP client works in the broadcast or multicast mode, it is necessary to use the broadcast transmission delay parameter. In the broadcast mode, the local system time of the SNTP client is equal to the time taken from the server plus the transmission delay. You can modify the broadcast transmission delay based on the actual bandwidth of the network. To configure the broadcast transmission delay, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client broadcastdelay** *time*
4. **show sntp client**

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 client broadcastdelay** *time* **Example:** `Device(config)# sntp client broadcastdelay 5`	Configures the broadcast propagation delay to the specified time in milliseconds. Use the **no** form of the command to disable broadcast propogation delay. By default, the broadcast propagation delay is 3 milliseconds.
Step 4	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring the Polling Interval

When the SNTP client works in the unicast or anycast mode, you need to configure the polling interval. The SNTP client initiates a request to the server every other polling interval to calibrate the local system time. To configure the polling interval, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client poll-interval** *time*
4. **show sntp client**

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 client poll-interval** *time* **Example:** `Device(config)# sntp client poll-interval 800`	Configures the polling interval to the specified time in seconds. Use the **no** form of the command to disable polling interval. By default, the polling interval is 1000 seconds.
Step 4	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring Timeout Retransmission

When the SNTP request message is sent, there is no guarantee that the request message will reach the destination since it is a UDP message. In such cases, the timeout retransmission mechanism is adopted. When the client sends a request, if it does not receive a response within a certain period of time, it resends the request until the number of retransmissions exceeds the set value.

Note The configured timeout retransmission mechanism takes effect only when the SNTP client works in the unicast or anycast mode.

To configure the timeout retransmission attempts and the time interval, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client retransmit-interval** *time*
4. **sntp client retransmit** *number*
5. **show sntp client**

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 client retransmit-interval** *time* **Example:** `Device(config)# sntp client retransmit-interval 20`	Configures the timeout retransmission interval. Use the **no** form of the command to disable retransmission interval. By default, the timeout retransmission interval is 5 seconds.
Step 4	**sntp client retransmit** *number* **Example:** `Device(config)# sntp client retransmit 8`	Sets the number of timeout retransmission attempts. By default, the number of timeout retransmission is set to 0.
Step 5	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring Legacy Server List

When an SNTP client works in broadcast or multicast mode, it trusts and receives protocol messages from any SNTP server. If there is a malicious attack on the network server and it provides the wrong time, the local time cannot be synchronized to standard time.

When a list of valid servers is configured on the SNTP client, the client can only receive messages whose source addresses are in the legal server list.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client valid-server** *ip-address wildcard*
4. **no sntp client valid-server** {**all** | *ip-address wildcard* }

5. **show sntp client**

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 client valid-server** *ip-address wildcard* **Example:** `Device(config)# sntp client valid-server 10.23.23.1 23.1.1.4`	Configures the legal server list.
Step 4	**no sntp client valid-server** {**all** | *ip-address wildcard* } **Example:** `Device(config)# sntp client valid-server all`	Deletes a legal server list.
Step 5	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring Authentication

To further improve security, you can enable MD5 authentication between the SNTP server and the client. The SNTP client receives only authenticated messages.

To configure authentication, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sntp client authenticate**
4. **sntp client authentication-key** *key-number* **md5** *auth-key*
5. **sntp trusted-key** *key-number*
6. **sntp server key** *key-number*
7. **sntp client mode anycast key** *key-number*
8. **show sntp client**

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 client authenticate** **Example:** `Device(config)# sntp client authenticate`	Authenticates time sources. Use the **no** form of the command to disable authentication. By default, authentication is disabled.
Step 4	**sntp client authentication-key** *key-number* **md5** *auth-key* **Example:** `Device(config)# sntp client authentication-key 3 md5 5`	Configures the password for authentication for trusted time sources. Use the **no** form of the command to disable the authentication password.
Step 5	**sntp trusted-key** *key-number* **Example:** `Device(config)# sntp trusted-key 234586`	Configures a trusted password for multicast and broadcast modes. Use the **no** form of the command to disable the password.
Step 6	**sntp server key** *key-number* **Example:** `Device(config)# sntp server key 5`	Configures the password used by the server. This must be equal to the authentication-key Use the **no** form of the command to disable the password of the server.
Step 7	**sntp client mode anycast key** *key-number* **Example:** `Device(config)# sntp client mode anycast key 5`	Configures the password for anycast mode. This must be equal to the authentication-key.
Step 8	**show sntp client** **Example:** `Device(config)# show sntp client`	(Optional) Displays the SNTP client configuration.

Configuring System Clock Manually

The SNTP client can either automatically synchronize time from the SNTP server, or the administrator can perform manual calibration of the system clock.

Note If the switch has a built-in lithium battery, when the switch power is off, the system clock runs normally. If there is no built-in lithium battery and the switch power is off, the system clock stops running.

To manually calibrate the system clock, perform the following steps:

SUMMARY STEPS

1. **enable**
2. **clock set** *HH:MM:SS YYYY/MM/DD*
3. **configure terminal**
4. **clock timezone** *time-zone-name hours-offset minutes-offset*
5. Use any of the following commands depending on the requirement:
   - **clock summer-time dayly** *start-time*
   - **clock summer-time weekly** *start-time*
6. **show clock**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**clock set** *HH:MM:SS YYYY/MM/DD* **Example:** `Device# clock set 22:22:13 2020/03/06`	
Step 3	**configure terminal** **Example:** `Device#configure terminal`	Enters global configuration mode.
Step 4	**clock timezone** *time-zone-name hours-offset minutes-offset* **Example:** `Device(config)# clock timezone ch 3 43`	Configures the system time zone. Use the **no** form of the command to disable system time zone.
Step 5	Use any of the following commands depending on the requirement: • **clock summer-time dayly** *start-time* • **clock summer-time weekly** *start-time* **Example:** `Device(config)# clock summer-time dayly 00:00:00 2021/03/12 00:00:00 2021/11/05`	Configures daylight savings time. Use the **no** form of the command to disable daylight savings time.
Step 6	**show clock** **Example:** `Device(config)# show clock`	(Optional) Displays the system time.

Configuration Examples for SNTP Client

The following example shows how to configure the SNTP client in broadcast mode:

```
Device> enable
Device# configure terminal
Device(config)# sntp client mode broadcast
Device(config)# sntp client valid-server 192.168.1.99 0.0.0.0
Device(config)# sntp client authentication-key 1 md5 test
Device(config)# sntp trusted-key 1
Device(config)# sntp client authenticate
```

The following example shows how to configure the SNTP client in multicast mode:

```
Device> enable
Device# configure terminal
Device(config)# sntp client mode multicast
Device(config)# sntp client valid-server 192.168.1.99 0.0.0.0
Device(config)# sntp client authentication-key 1 md5 test
Device(config)# sntp trusted-key 1
Device(config)# sntp client authenticate
```

The following example shows how to configure the SNTP client in unicast mode:

```
Device> enable
Device# configure terminal
Device(config)# sntp client
Device(config)# sntp client mode unicast
Device(config)# sntp server 192.168.1.99
Device(config)# sntp client authentication-key 1 md5 test
Device(config)# sntp server key 1
Device(config)# sntp client authenticate
```

The following example shows how to configure the SNTP client in anycast mode:

```
Device> enable
Device# configure terminal
Device(config)# sntp client mode anycast
Device(config)# sntp server 192.168.1.99
Device(config)# sntp client
Device(config)# sntp client authentication-key 1 md5 test
Device(config)# sntp client mode anycast key 1
Device(config)# sntp client authenticate
```

The following sample output displays time synchronization results:

```
Device(config)# show sntp client
Clock state  : synchronized    Current mode    : anycast
Use server   : 192.168.1.99    State           : idle
Server state : synchronized    Server stratum  : 1
Retrans-times: 3               Retrans-interval: 30s
Authenticate : enable          Authentication-key: 1
Poll interval   : 1000s
Last synchronized time: THU NOV 26 09:22:25 2015
Last received packet's originateTime: THU NOV 26 17:22:24 2015
Summer-time is not set.
```