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Junos® OS

Time Management Administration Guide for Routing Devices

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Junos® OS Time Management Administration Guide for Routing Devices
14.1

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- M Series
- MX Series
- T Series
- J Series
- EX Series
- PTX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   system {
     scripts {
       commit {
         file ex-script.xsl;
       }
     }
   }
   interfaces {
     fxp0 {
       disable;
       unit 0 {
         family inet {
           address 10.0.0.1/24;
         }
       }
     }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   commit {
     file ex-script-snippet.xsl; }
   ```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

   ```
   [edit]
   user@host# edit system scripts
   [edit system scripts]
   ```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

   ```
   [edit system scripts]
   user@host# load merge relative /var/tmp/ex-script-snippet.conf
   load complete
   ```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page x defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page x defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric *metric*>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
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- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: http://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://tools.juniper.net/SerialNumberEntitlementSearch/

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see http://www.juniper.net/support/requesting-support.html.

CHAPTER 1

Configuring Date and Time on Devices

Setting the Date and Time Locally

You can set the date and time on a device running Junos OS by using the **set date** operational mode command:

To set the date and time on a device running Junos OS, you can either enter it manually or instruct the device to retrieve it from a Network Time Protocol (NTP) server. If you do not have access to an NTP server, you can configure Junos OS to keep its own local time using an onboard clock.

To enter the date and time locally:

1. From operational mode, manually set the date and time.

   Because this is an operational-mode command, there is no need to perform a commit operation.

   ```
   user@host> set date YYYYMMDDhhmm.ss
   ```

   For example:

   ```
   user@host> set date 201307251632
   Thu Jul 25 16:32:00 PDT 2013
   ```

2. Verify the time.

The **show system uptime** command provides the following information: current time, last boot time, protocols start time, last configuration commit time.

```
user@host> show system uptime
Current time: 2013-07-25 16:33:38 PDT
System booted: 2013-07-11 17:14:25 PDT (1w6d 23:19 ago)
Protocols started: 2013-07-11 17:16:35 PDT (1w6d 23:17 ago)
Last configured: 2013-07-23 12:32:42 PDT (2d 04:00 ago) by user
 4:33PM  up 13 days, 23:19, 1 user, load averages: 0.00, 0.01, 0.00
```

To instruct the device to retrieve the date and time from an NTP server:

- From operational mode, issue the **set date** command and specify **ntp** to retrieve the date and time from a configured NTP server, or specify **ntp** ***ntp-server*** to retrieve the date and time from the given NTP server.

  ```
  user@host> set date ntp ntp-server
  ```

  For example:

  ```
  user@host> set date ntp
   25 Jun 16:38:28 ntpdate[2314]: step time server 192.0.2.1 offset -0.004182 sec
  ```

Related Documentation

- *Time Management Administration Guide for Routing Devices*
- set date on page 54

NTP Overview

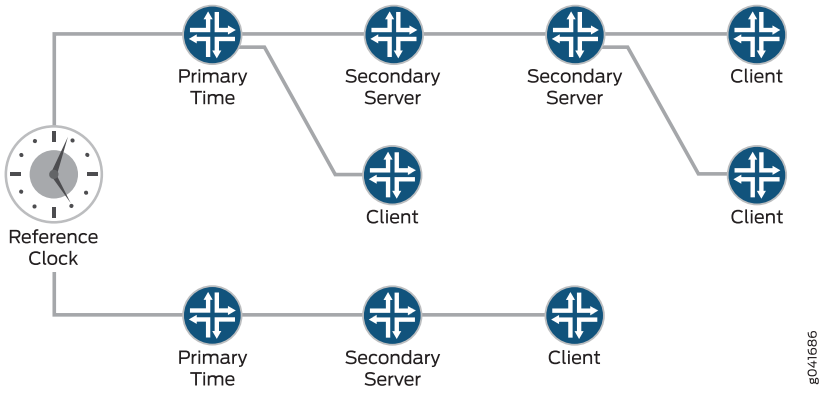
Network Time Protocol (NTP) is a widely used protocol used to synchronize the clocks of routers and other hardware devices on the Internet. Primary NTP servers are synchronized to a reference clock directly traceable to Coordinated Universal Time (UTC). Reference clocks include GPS receivers and telephone modem services, NTP accuracy expectations depend on the environment application requirements, however, NTP can generally maintain time to within tens of milliseconds over the public internet.

NTP is defined in the RFC 5905: Network Time Protocol Version 4: Protocol and Algorithms Specification

Devices running Junos OS can be configured to act as an NTP client, a secondary NTP server, or a primary NTP server. These variations are as follows:

- Primary NTP Server—Primary NTP servers are synchronized to a reference clock that is directly traceable to UTC. These servers then re-distribute this time data downstream to other Secondary NTP servers or NTP clients.
- Secondary NTP Server—Secondary NTP servers are synchronized to a primary or secondary NTP server. These servers then re-distribute this data downstream to other Secondary NTP servers or NTP clients.

- NTP Client—NTP clients are synchronized to a primary or secondary NTP server. Clients do not re-distribute this time data to other devices.



NOTE: The NTP subnet includes a number of widely accessible public primary time servers that can be used as a network's primary NTP server. Juniper Networks strongly recommends that you authenticate any primary servers you use.

Each device on your network can be configured to run in one or more of the following NTP modes:

- Broadcast Mode—One or more devices is set up to transmit time information to a specified broadcast or multicast address. Other devices listen for time sync packets on these addresses. This mode is less accurate than the client/server mode.
- Client/Server Mode—Devices are organized hierarchically across the network in client/server relationships.

NOTE: QFX devices cannot act as NTP servers, only clients.

- Symmetric Active (peer) Mode—Two or more devices are configured as NTP server peers to provide redundancy.

By default, if an NTP client time drifts so that the difference in time from the NTP server exceeds 128 milliseconds, the NTP client is automatically stepped back into synchronization. The NTP client will still synchronize with the server even if the offset between the NTP client and server exceeds the 1000-second threshold. You can manually request that a device synchronize with an NTP server by using the **set date ntp** operational command on the router. On devices running Junos OS that have dual Routing Engines, the backup Routing Engine synchronizes directly with the master Routing Engine.

For more details about the Network Time Protocol, go to the Network Time Foundation website at http://www.ntp.org.

NOTE: NTP is required for Common Criteria compliance. For more information on the Common Criteria certification, see Public Sector Certifications.

In Junos operating system (Junos OS) Release 11.2 or later, NTP supports IPv4 VPN routing and forwarding (VRF) requests. This enables an NTP server running on a provider edge (PE) router to respond to NTP requests from a customer edge (CE) router. As a result, a PE router can process any NTP request packet coming from different routing instances. In Junos OS Release 11.4 and later, NTP also supports IPv6 VRF requests.

Related Documentation

- Synchronizing and Coordinating Time Distribution Using NTP on page 19
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Understanding NTP Time Servers

The IETF defined the Network Time Protocol (NTP) to synchronize the clocks of computer systems connected to each other over a network. Most large networks have an NTP server that ensures that time on all devices is synchronized, regardless of the device location. If you use one or more NTP servers on your network, ensure you include the NTS server addresses in your Junos OS configuration.

When configuring the NTP, you can specify which system on the network is the authoritative time source, or time server, and how time is synchronized between systems on the network. To do this, you configure the router, switch, or security device to operate in one of the following modes:

- Client mode—In this mode, the local router or switch can be synchronized with the remote system, but the remote system can never be synchronized with the local router or switch.
- Symmetric active mode—In this mode, the local router or switch and the remote system can synchronize with each other. You use this mode in a network in which either the local router or switch or the remote system might be a better source of time.

  NOTE: Symmetric active mode can be initiated by either the local or the remote system. Only one system needs to be configured to do so. This means that the local system can synchronize with any system that offers symmetric active mode without any configuration whatsoever. However, we strongly encourage you to configure authentication to ensure that the local system synchronizes only with known time servers.

- Broadcast mode—In this mode, the local router or switch sends periodic broadcast messages to a client population at the specified broadcast or multicast address. Normally, you include this statement only when the local router or switch is operating as a transmitter.
- Server mode—In this mode, the local router or switch operates as an NTP server.

NOTE: In NTP server mode, the Junos OS supports authentication as follows:

- If the NTP request from the client comes with an authentication key (such as a key ID and message digest sent with the packet), the request is processed and answered based on the authentication key match.
- If the NTP request from the client comes without any authentication key, the request is processed and answered without authentication.

Related Documentation

- *Configuring the NTP Time Server and Time Services*
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Synchronizing and Coordinating Time Distribution Using NTP

Using NTP to synchronize and coordinate time distribution in a large network involves these tasks:

1. Configuring NTP on page 19
2. Configuring the NTP Boot Server on page 19
3. Specifying a Source Address for an NTP Server on page 20

Configuring NTP

To configure NTP on the router or switch, include the **ntp** statement at the **[edit system]** hierarchy level:

```
[edit system]
ntp {
  authentication-key number type type value password;
  boot-server (address | hostname);
  broadcast <address> <key key-number> <routing-instance-name routing-instance-name>
    <ttl value> <version value> ;
  broadcast-client;
  multicast-client <address>;
  peer address <key key-number> <version value> <prefer>;
  server address <key key-number> <version value> <prefer>;
  source-address <source-address> <routing-instance routing-instance-name>;
  trusted-key [ key-numbers ];
}
```

Configuring the NTP Boot Server

When you boot the router or switch, it issues an **ntpdate** request, which polls a network server to determine the local date and time. You need to configure a server that the router or switch uses to determine the time when the router or switch boots. If you configure an NTP boot server, then when the router or switch boots, it immediately synchronizes

with the boot server even if the NTP process is explicitly disabled or if the time difference between the client and the boot server exceeds the threshold value of 1000 seconds.

To configure the NTP boot server, include the **boot-server** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
boot-server (address | hostname);
```

Specify the address of the network server. You must specify an IP address or a hostname.

Specifying a Source Address for an NTP Server

For IP version 4 (IPv4), you can specify that if the NTP server configured at the **[edit system ntp]** hierarchy level is contacted on one of the loopback interface addresses, the reply always uses a specific source address. This is useful for controlling which source address NTP will use to access your network when it is either responding to an NTP client request from your network or when it itself is sending NTP requests to your network.

To configure the specific source address that the reply will always use, and the source address that requests initiated by NTP server will use, include the **source-address** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
source-address source-address;
```

source-address is a valid IP address configured on one of the router or switch interfaces.

You can also configure the source address using the **routing-instance** statement at the **[edit system ntp source-address *source-address*]** hierarchy level:

```
[edit system ntp source-address source-address]
user@host# set routing-instance routing-instance-name
```

For example, the following statement is configured:

```
[edit system ntp source-address source-address]
user@host# set system ntp source-address 12.12.12.12 routing-instance ntp-source-test
```

As a result, while sending NTP message through any interface in the *ntp-source-test* routing instance, the source address 12.12.12.12 is used.

NOTE: The routing-instance statement is optional and if not configured, the primary address of the interface will be used.

NOTE: If a firewall filter is applied on the loopback interface, ensure that the **source-address** specified for the NTP server at the **[edit system ntp]** hierarchy level is explicitly included as one of the match criteria in the firewall filter. This enables the Junos OS to accept traffic on the loopback interface from the specified source address.

The following example shows a firewall filter with the source address **10.0.10.100** specified in the **from** statement included at the **[edit firewall filter *firewall-filter-name*]** hierarchy:

```
[edit firewall filter Loopback-Interface-Firewall-Filter]
term Allow-NTP {
   from {
      source-address {
         172.17.27.46/32; // IP address of the NTP server
         10.0.10.100/32; // Source address specified for the NTP server
         }
      then accept;
   }
}
```

If no **source-address** is configured for the NTP server, include the primary address of the loopback interface in the firewall filter.

Related Documentation

- NTP Overview on page 16
- Understanding NTP Time Servers on page 18
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Configuring NTP

The Network Time Protocol (NTP) provides the mechanisms to synchronize time and coordinate time distribution in a large, diverse network. Debugging and troubleshooting are much easier when the timestamps in the log files of all the routers or switches are synchronized, because events that span the network can be correlated with synchronous entries in multiple logs. We recommend using the Network Time Protocol (NTP) to synchronize the system clocks of routers, switches, and other network equipment.

To configure NTP:

1. Configure Junos OS to retrieve the time when it first boots up.

   Use the **boot-server** statement with the IP address of your NTP server. If DNS is configured, you can use a domain name instead of an IP address.

   ```
   [edit system ntp]
   user@host# set boot-server (name | ip-address)
   ```

   For example, set an IP address of 172.16.1.1 for your NTP server.

```
[edit system ntp]
user@host# set boot-server 172.16.1.1
```

For example, set a domain name. In this example, the domain name is provided by pool.ntp.org.

```
[edit system ntp]
user@host# set boot-server 0.north-america.pool.ntp.org
```

2. (Optional) Configure one or more reference NTP servers to keep the device synchronized with periodic updates.

   It is a good practice to do this, as the Junos OS device can remain up for a long time, and therefore the clock can drift.

   ```
   [edit system ntp]
   user@host# set server (name | ip-address)
   ```

   For example, set an IP address of 172.16.1.1 for your NTP server.

   ```
   [edit system ntp]
   user@host# set server 172.16.1.1
   ```

   For example, set a domain name provided by pool.ntp.org.

   ```
   [edit system ntp]
   user@host# set server 0.north-america.pool.ntp.org
   ```

3. (Optional) Set the local time zone to match the device's location.

   Universal Coordinated Time (UTC) is the default. Many administrators prefer to keep all their devices configured to use the UTC time zone. This approach has the benefit of allowing you to easily compare the time stamps of logs and other events across a network of devices in many different time zones.

   On the other hand, setting the time zone allows Junos OS to present the time in the correct local format.

   ```
   [edit system ntp]
   user@host# set time-zone time-zone
   ```

   For example:

   ```
   [edit system ntp]
   user@host# set time-zone America/Los_Angeles
   ```

4. Verify the configuration.

   Check the system uptime. This command provides the current time, when the device was last booted, when the protocols started, and when the device was last configured.

   ```
   user@host> show system uptime
   Current time: 2013-07-25 16:33:38 PDT
   System booted: 2013-07-11 17:14:25 PDT (1w6d 23:19 ago)
   Protocols started: 2013-07-11 17:16:35 PDT (1w6d 23:17 ago)
   Last configured: 2013-07-23 12:32:42 PDT (2d 04:00 ago) by user
    4:33PM  up 13 days, 23:19, 1 user, load averages: 0.00, 0.01, 0.00
   ```

   Check the NTP server status and associations of the clocking sources used by your device.

   ```
   user@host> show ntp associations
   ```

```
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================

 tux.brhelwig.co .INIT.          16 -    -  512    0    0.000    0.000 4000.00
```

```
user@host > show ntp status
status=c011 sync_alarm, sync_unspec, 1 event, event_restart,
version="ntpd 4.2.0-a Thu May 30 19:14:15 UTC 2013 (1)",
processor="i386", system="JUNOS13.2-20130530_ib_13_3_psd.1", leap=11,
stratum=16, precision=-18, rootdelay=0.000, rootdispersion=5.130,
peer=0, refid=INIT,
reftime=00000000.00000000  Wed, Feb  6 2036 22:28:16.000, poll=4,
clock=d59d4f2e.1793bce9  Fri, Jul 26 2013 12:40:30.092, state=1,
offset=0.000, frequency=62.303, jitter=0.004, stability=0.000
```

Related Documentation

- Understanding NTP Time Servers on page 18
- *Time Management Administration Guide for Routing Devices*

Configuring the NTP Time Server and Time Services

When you use NTP, configure the router or switch to operate in one of the following modes:

- Client mode
- Symmetric active mode
- Broadcast mode
- Server mode

The following topics describe how to configure these modes of operation:

1. Configuring the Router or Switch to Operate in Client Mode on page 23
2. Configuring the Router or Switch to Operate in Symmetric Active Mode on page 24
3. Configuring the Router or Switch to Operate in Broadcast Mode on page 24
4. Configuring the Router or Switch to Operate in Server Mode on page 25

Configuring the Router or Switch to Operate in Client Mode

To configure the local router or switch to operate in client mode, include the **server** statement and other optional statements at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
server address <key key-number> <version value> <prefer>;
authentication-key key-number type type value password;
boot-server address;
trusted-key [ key-numbers ];
```

Specify the address of the system acting as the time server. You must specify an address, not a hostname.

To include an authentication key in all messages sent to the time server, include the **key** option. The key corresponds to the key number you specify in the **authentication-key** statement, as described in "Configuring NTP Authentication Keys" on page 27.

By default, the router or switch sends NTP version 4 packets to the time server. To set the NTP version level to 1, 2, or 3, include the **version** option.

If you configure more than one time server, you can mark one server preferred by including the **prefer** option.

For information about how to configure trusted keys, see "Configuring NTP Authentication Keys" on page 27. For information about how to configure an NTP boot server, see "Configuring the NTP Boot Server" on page 19. For information about how to configure the router or switch to operate in server mode, see "Configuring the Router or Switch to Operate in Server Mode" on page 25.

The following example shows how to configure the router or switch to operate in client mode:

```
[edit system ntp]
authentication-key 1 type md5 value "$9$EgfcrvX7VY4ZEcwgoHjkP5Q3CuREyv87";
boot-server 10.1.1.1;
server 10.1.1.1 key 1 prefer;
trusted-key 1;
```

Configuring the Router or Switch to Operate in Symmetric Active Mode

To configure the local router or switch to operate in symmetric active mode, include the **peer** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
peer address <key key-number> <version value> <prefer>;
```

Specify the address of the remote system. You must specify an address, not a hostname.

To include an authentication key in all messages sent to the remote system, include the **key** option. The key corresponds to the key number you specify in the **authentication-key** statement, as described in "Configuring NTP Authentication Keys" on page 27.

By default, the router or switch sends NTP version 4 packets to the remote system. To set the NTP version level to 1, 2 or 3, include the **version** option.

If you configure more than one remote system, you can mark one system preferred by including the **prefer** option:

```
peer address <key key-number> <version value> prefer;
```

Configuring the Router or Switch to Operate in Broadcast Mode

To configure the local router or switch to operate in broadcast mode, include the **broadcast** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
broadcast address <key key-number> <version value> <ttl value>;
```

Specify the broadcast address on one of the local networks or a multicast address assigned to NTP. You must specify an address, not a hostname. If the multicast address is used, it must be **224.0.1.1**.

To include an authentication key in all messages sent to the remote system, include the **key** option. The key corresponds to the key number you specify in the **authentication-key** statement, as described in "Configuring NTP Authentication Keys" on page 27.

By default, the router or switch sends NTP version 4 packets to the remote system. To set the NTP version level to 1, 2, or 3, include the **version** option.

Configuring the Router or Switch to Operate in Server Mode

In server mode, the router or switch acts as an NTP server for clients when the clients are configured appropriately. The only prerequisite for "server mode" is that the router or switch must be receiving time from another NTP peer or server. No other configuration is necessary on the router or switch.

To configure the local router or switch to operate as an NTP server, include the following statements at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
authentication-key key-number type type value password;
server address <key key-number> <version value> <prefer>;
trusted-key [ key-numbers ];
```

Specify the address of the system acting as the time server. You must specify an address, not a hostname.

To include an authentication key in all messages sent to the time server, include the **key** option. The key corresponds to the key number you specify in the **authentication-key** statement, as described in "Configuring NTP Authentication Keys" on page 27.

By default, the router or switch sends NTP version 4 packets to the time server. To set the NTP version level to 1, 2, or 3, include the **version** option.

If you configure more than one time server, you can mark one server preferred by including the **prefer** option.

For information about how to configure trusted keys, see "Configuring NTP Authentication Keys" on page 27. For information about how to configure the router or switch to operate in client mode, see "Configuring the Router or Switch to Operate in Client Mode" on page 23.

The following example shows how to configure the router or switch to operate in server mode:

```
[edit system ntp]
authentication-key 1 type md5 value "$9$txERuBEreWx-wtuLNdboaUjH.T3AtOESe";
server 172.17.27.46 prefer;
trusted-key 1;
```

NOTE: When a host is added as an NTP server, it resolves to an IP address prior to being adding to the configuration. When using a public NTP server, the host might resolve to different IP addresses.

If the resolved IP address becomes unreachable for any reason, the switch cannot access the NTP server. In order to leverage public NTP pool entities, this functionality has been modified so that a host is accepted as a string without DNS resolution.

Related Documentation

- Understanding NTP Time Servers on page 18
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization

Debugging and troubleshooting are much easier when the timestamps in the log files of all the routers or switches are synchronized, because events that span the network can be correlated with synchronous entries in multiple logs. We strongly recommend using the Network Time Protocol (NTP) to synchronize the system clocks of routers, switches, and other network equipment.

By default, NTP operates in an entirely unauthenticated manner. If a malicious attempt to influence the accuracy of a router or switch's clock succeeds, it could have negative effects on system logging, make troubleshooting and intrusion detection more difficult, and impede other management functions.

The following sample configuration synchronizes all the routers or switches in the network to a single time source. We recommend using authentication to make sure that the NTP peer is trusted. The **boot-server** statement identifies the server from which the initial time of day and date is obtained when the router boots. The **server** statement identifies the NTP server used for periodic time synchronization. The **authentication-key** statement specifies that an HMAC-Message Digest 5 (MD5) scheme should be used to hash the key value for authentication, which prevents the router or switch from synchronizing with an attacker's host posing as the time server.

```
[edit]
system {
   ntp {
      authentication-key 2 type md5 value "$9$aH1j8gqQ1gjyjgjhgjgiiii"; # SECRET-DATA
      boot-server 10.1.4.1;
      server 10.1.4.2;
   }
}
```

Related Documentation

- NTP Overview on page 16
- Understanding NTP Time Servers on page 18

- *authentication-key*
- *boot-server*
- *server*
- show ntp associations on page 55
- show ntp status on page 57

Configuring NTP Authentication Keys

Time synchronization can be authenticated to ensure that the local router or switch obtains its time services only from known sources. By default, network time synchronization is unauthenticated. The system will synchronize to whatever system appears to have the most accurate time. We strongly encourage you to configure authentication of network time services.

To authenticate other time servers, include the **trusted-key** statement at the **[edit system ntp]** hierarchy level. Only time servers transmitting network time packets that contain one of the specified key numbers and whose key matches the value configured for that key number are eligible to be synchronized to. Other systems can synchronize to the local router without being authenticated.

```
[edit system ntp]
trusted-key [ key-numbers ];
```

Each key can be any 32-bit unsigned integer except 0. Include the **key** option in the **peer**, **server**, or **broadcast** statements to transmit the specified authentication key when transmitting packets. The key is necessary if the remote system has authentication enabled so that it can synchronize to the local system.

To define the authentication keys, include the **authentication-key** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
authentication-key key-number type type value password;
```

number is the key number, ***type*** is the authentication type (only Message Digest 5 [MD5] is supported), and ***password*** is the password for this key. The key number, type, and password must match on all systems using that particular key for authentication.

Related Documentation

- Understanding NTP Time Servers on page 18
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Configuring the Router or Switch to Listen for Broadcast Messages Using NTP

When you are using NTP, you can configure the local router or switch to listen for broadcast messages on the local network to discover other servers on the same subnet by including the **broadcast-client** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
broadcast-client;
```

When the router or switch detects a broadcast message for the first time, it measures the nominal network delay using a brief client-server exchange with the remote server. It then enters *broadcast client* mode, in which it listens for, and synchronizes to, succeeding broadcast messages.

To avoid accidental or malicious disruption in this mode, both the local and remote systems must use authentication and the same trusted key and key identifier.

Related Documentation

- Configuring the Router or Switch to Listen for Multicast Messages Using NTP on page 28
- Configuring the NTP Time Server and Time Services on page 23
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

Configuring the Router or Switch to Listen for Multicast Messages Using NTP

When you are using NTP, you can configure the local router or switch to listen for multicast messages on the local network to discover other servers on the same subnet by including the **multicast-client** statement at the **[edit system ntp]** hierarchy level:

```
[edit system ntp]
multicast-client <address>;
```

When the router or switch receives a multicast message for the first time, it measures the nominal network delay using a brief client-server exchange with the remote server. It then enters *multicast client* mode, in which it listens for, and synchronizes to, succeeding multicast messages.

You can specify one or more IP addresses. (You must specify an address, not a hostname.) If you do, the router or switch joins those multicast groups. If you do not specify any addresses, the software uses **224.0.1.1**.

To avoid accidental or malicious disruption in this mode, both the local and remote systems must use authentication and the same trusted key and key identifier.

Related Documentation

- Configuring the Router or Switch to Listen for Broadcast Messages Using NTP on page 27
- Configuring the NTP Time Server and Time Services on page 23
- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26

CHAPTER 2

Configuring Time Zones on Devices

Modifying the Default Time Zone for a Router or Switch Running Junos OS

The default local time zone on the router is UTC (Coordinated Universal Time, formerly known as Greenwich Mean Time, or GMT). To modify the local time zone, include the **time-zone** statement at the **[edit system]** hierarchy level:

```
[edit system]
time-zone (GMThour-offset | time-zone);
```

You can use the **GMT *hour-offset*** option to set the time zone relative to UTC (GMT) time. By default, ***hour-offset*** is 0. You can configure this to be a value in the range from –14 to +12.

You can also specify ***time-zone*** as a string such as PDT (Pacific Daylight Time) or WET (Western European Time), or specify the continent and major city.

NOTE: Junos OS complies with the POSIX time-zone standard, which is counter-intuitive to the way time zones are generally indicated relative to UTC. A time zone ahead of UTC (east of the Greenwich meridian) is commonly indicated as GMT +*n*; for example, the Central European Time (CET) zone is indicated as GMT +1. However, this is not true for POSIX time zone designations. POSIX indicates CET as GMT-1. If you include the **set system time-zone GMT+1** statement for a router in the CET zone, your router time will be set to one hour behind GMT, or two hours behind the actual CET time. For this reason, you might find it easier to use the POSIX time-zone strings, which you can list by entering **set system time-zone ?**.

For the time zone change to take effect for all processes running on the router or switch, you must reboot the router or switch.

The following example shows how to change the current time zone to **America/New_York**:

```
[edit]
user@host# set system time-zone America/New_York
```

```
[edit]
user@host# show
system {
  time-zone America/New_York;
}
```

Related Documentation

- NTP Overview on page 16
- Updating the IANA Time Zone Database on Junos Devices on page 30

Updating the IANA Time Zone Database on Junos Devices

Junos devices use the tz database, also known as the IANA Time Zone Database to manage time zones. This database is periodically updated by IANA to reflect political and time changes. As such, you may need from time to time to update this file to ensure the Junos devices continue to accurately reflect worldwide time zones and daylight savings time intervals.

To update the IANA Time Zone Database, perform the following steps:

1. Importing and Installing Time Zone Files on page 30
2. Configuring a Custom Time Zone on page 31

Importing and Installing Time Zone Files

The IANA Time Zone Database is maintained by the Internet Assigned Numbers Authority (IANA), which is a department of the Internet Corporation for Assigned Names and Numbers (ICANN). You can download the latest IANA Time Zone Database file from the following URL: http://www.iana.org/time-zones.

The following steps will guide you through one method of installing the file to your device. However, depending on your network access and other preferences, you may need to modify these steps.

1. Log into the Junos device.
2. If you are in the CLI interface, open the shell interface.

   ```
   device@user# start shell
   ```

3. Create a **tz** directory in the **/var/tmp** and navigate to that directory.

   ```
   # mkdir /var/tmp/tz
   # cd /var/tmp/tz
   ```

4. Using FTP, download the time zone files archive.

   NOTE: FTP must be enabled on your device before you can use FTP. FTP is enabled by adding the **ftp** statement into the **[edit system services]** hierarchy.

   ```
   # ftp ftp.iana.org/tz
   # bin
   ```

```
# get tzdata-latest.tar.gz
```

NOTE: If needed, you can edit the above untarred files to create or modify the time zones.

5. Select the names of time zone files to compile and feed them to the following script. For example, to generate **northamerica** and **asia** tz files:

   ```
   # /usr/libexec/ui/compile-tz northamerica asia
   ```

6. Enable the use of the generated tz files using the CLI:

   ```
   [edit]
   # set system use-imported-time-zones
   [edit]
   # set system time-zone ?
   ```

   This should show the newly generated tz files in **/var/db/zoneinfo/**.

7. Set the time zone and commit the configuration:

   ```
   [edit]
   # set system time-zone <your-time-zone>
   # commit
   ```

8. Verify that the time zone change has taken effect:

   ```
   [edit]
   # run show system uptime
   ```

Configuring a Custom Time Zone

To use a custom time zone, follow these steps:

1. Download a time zones archive (from a known or designated source) to the router or switch. Compile the time zone archive using the *zic* time zone compiler, which generates *tz* files.
2. Using the CLI, configure the router or switch to enable the use of the generated tz files as follows:

   ```
   [edit]
   user@host# set system use-imported-time-zones
   ```

3. Display the imported time zones (saved in the directory **/var/db/zoneinfo/**):

   ```
   [edit]
   user@host# set system time-zone ?
   ```

   If you do not configure the router to use imported time zones, the Junos OS default time zones are shown (saved in the directory **/usr/share/zoneinfo/**).

Related Documentation

- Modifying the Default Time Zone for a Router or Switch Running Junos OS on page 29
- NTP Overview on page 16
- Understanding NTP Time Servers on page 18

- Example: Configuring NTP as a Single Time Source for Router and Switch Clock Synchronization on page 26
- use-imported-time-zones on page 51

CHAPTER 3

Configuration Statements

System Management Configuration Statements

This topic lists all the configuration statements that you can include at the **[edit system]** hierarchy level to configure system management features:

```
system {
    accounting {
        destination {
            radius {
                server {
                    server-address {
                        accounting-port port-number;
                        retry number;
                        secret password;
                        source-address address;
                        timeout seconds;
                    }
                }
            }
            tacplus {
                server {
```

```
            server-address {
                port port-number;
                secret password;
                single-connection;
                timeout seconds;
            }
        }
    }
  }
  enhanced-avs-max;
  events [ login change-log interactive-commands ];
}
archival {
  configuration {
    archive-sites {
      ftp://<username>:<password>@<host>:<port>/<url-path>;
      ftp://<username>:<password>@<host>:<port>/<url-path>;
    }
    transfer-interval interval;
    transfer-on-commit;
  }
}
allow-v4mapped-packets;
arp {
  aging-timer minutes;
  gratuitous-arp-delay;
  gratuitous-arp-on-ifup;
  interfaces;
  passive-learning;
  purging;
}
authentication-order [ authentication-methods ];
backup-router address <destination destination-address>;
commit {
  fast-synchronize;
  persist-groups-inheritance ;
  server;
  synchronize
}
synchronize;
(compress-configuration-files | no-compress-configuration-files);
default-address-selection;
dump-device (compact-flash | remove-compact | usb);
diag-port-authentication (encrypted-password "password" | plain-text-password);
dynamic-profile-options {
  versioning;
}
domain-name domain-name;
domain-search [ domain-list ];
host-name hostname;
inet6-backup-router address <destination destination-address>;
internet-options {
  tcp-mss mss-value;
  (gre-path-mtu-discovery | no-gre-path-mtu-discovery);
  icmpv4-rate-limit bucket-size bucket-size packet-rate packet-rate;
  icmpv6-rate-limit bucket-size bucket-size packet-rate packet-rate;
```

```
    (ipip-path-mtu-discovery | no-ipip-path-mtu-discovery);
    (ipv6-path-mtu-discovery | no-ipv6-path-mtu-discovery);
    ipv6-path-mtu-discovery-timeout;
    no-tcp-rfc1323-paws;
    no-tcp-rfc1323;
    (path-mtu-discovery | no-path-mtu-discovery);
    source-port upper-limit <upper-limit>;
    (source-quench | no-source-quench);
    tcp-drop-synfin-set;
}
location {
    altitude feet;
    building name;
    country-code code;
    floor number;
    hcoord horizontal-coordinate;
    lata service-area;
    latitude degrees;
    longitude degrees;
    npa-nxx number;
    postal-code postal-code;
    rack number;
    vcoord vertical-coordinate;
}
login {
    announcement text;
    class class-name {
        access-end;
        access-start;
        allow-commands "regular-expression";
        ( allow-configuration | allow-configuration-regexps) "regular expression 1" "regular
            expression 2";
        allowed-days;
        deny-commands "regular-expression";
        ( deny-configuration | deny-configuration-regexps )  "regular expression 1" "regular
            expression 2 ";
        idle-timeout minutes;
        login-script
        login-tip;
        permissions [ permissions ];
    }
    message text;
    password {
        change-type (set-transitions | character-set);
        format (md5 | sha1 | des);
        maximum-length length;
        minimum-changes number;
        minimum-length length;
    }
    retry-options {
        backoff-threshold number;
        backoff-factor seconds;
        minimum-time seconds;
        tries-before-disconnect number;
    }
    user username {
```

```
        full-name complete-name;
        uid uid-value;
        class class-name;
        authentication {
          (encrypted-password "password" | plain-text-password);
          ssh-rsa "public-key";
          ssh-dsa "public-key";
        }
      }
    }
    login-tip number;
    mirror-flash-on-disk;
    name-server {
      address;
    }
    no-multicast-echo;
    no-redirects;
    no-ping-record-route;
    no-ping-time-stamp;
    ntp {
      authentication-key key-number type type value password;
      boot-server address;
      broadcast <address> <key key-number> <version value> <ttl value>;
      broadcast-client;
      multicast-client <address>;
      peer address <key key-number> <version value> <prefer>;
      source-address source-address;
      server address <key key-number> <version value> <prefer>;
      trusted-key [ key-numbers ];
    }
    ports {
      auxiliary {
        type terminal-type;
      }
      pic-console-authentication {
        encrypted-password encrypted-password;
        plain-text-password;
        console {
          insecure;
          log-out-on-disconnect;
          type terminal-type;
          disable;
        }
      }
      processes {
        process--name (enable | disable) failover (alternate-media | other-routing-engine);
        timeout seconds;
      }
    }
    radius-server server-address {
      accounting-port port-number;
      port port-number;
      retry number;
      secret password;
      source-address source-address;
      timeout seconds;
```

```
}
radius-options {
  attributes {
    nas-ip-address ip-address;
  }
  enhanced-accounting;
  password-protocol mschap-v2;
}
root-authentication {
  (encrypted-password “password” | plain-text-password);
  ssh-rsa “public-key”;
  ssh-dsa “public-key”;
}
(saved-core-context | no-saved-core-context);
saved-core-files saved-core-files;
scripts {
  commit {
    allow-transients;
    file filename {
      optional;
      refresh;
      refresh-from url;
      source url;
    }
    traceoptions {
      file <filename> <files number> <size size> <world-readable | no-world-readable>;
      flag flag;
      no-remote-trace;
  }
  op {
    file filename {
      arguments {
        argument-name {
          description descriptive-text;
        }
      }
      command filename-alias;
      description descriptive-text;
      refresh;
      refresh-from url;
      source url;
    }
    refresh;
    refresh-from url;
    traceoptions {
      file <filename> <files number> <size size> <world-readable | no-world-readable>;
      flag flag;
      no-remote-trace;
    }
  }
}
services {
  finger {
    connection-limit limit;
    rate-limit limit;
  }
```

```
    flow-tap-dtcp {
      ssh {
        connection-limit limit;
        rate-limit limit;
      }
    }
    ftp {
      connection-limit limit;
      rate-limit limit;
    }
    service-deployment {
      servers server-address {
        port port-number;
      }
      source-address source-address;
    }
    ssh {
      root-login (allow | deny | deny-password);
      protocol-version [v1 v2];
      connection-limit limit;
      rate-limit limit;
    }
    telnet {
      connection-limit limit;
      rate-limit limit;
    }
    web-management {
      http {
        interfaces [ interface-names ];
        port port;
      }
      https {
        interfaces [ interface-names ];
        local-certificate name;
        port port;
      }
      session {
        idle-timeout [ minutes ];
        session-limit [ session-limit ];
      }
    }
    xnm-clear-text {
      connection-limit limit;
      rate-limit limit;
    }
    xnm-ssl {
      connection-limit limit;
      local-certificate name;
      rate-limit limit;
    }
  }
  static-host-mapping {
    hostname {
      alias [ alias ];
      inet [ address ];
      sysid system-identifier;
```

```
    }
  }
  syslog {
    archive <files number> <size size> <world-readable | no-world-readable>;
    console {
      facility severity;
    }
    file filename {
      facility severity;
      archive <archive-sites {ftp-url <password password>}> <files number> <size size>
        <start-time "YYYY-MM-DD.hh:mm"> <transfer-interval minutes> <world-readable |
        no-world-readable>;
      explicit-priority;
      match "regular-expression";
      structured-data {
        brief;
      }
    }
    host (hostname | other-routing-engine | scc-master) {
      facility severity;
      explicit-priority;
      facility-override facility;
      log-prefix string;
      match "regular-expression";
      source-address source-address;
      structured-data {
        brief;
      }
    }
    source-address source-address;
    time-format (year | millisecond | year millisecond);
    user (username | *) {
      facility severity;
      match "regular-expression";
    }
  }
  tacplus-options {
    enhanced-accounting;
    service-name service-name;
    (no-cmd-attribute-value | exclude-cmd-attribute);
  }
  tacplus-server server-address {
    secret password;
    single-connection;
    source-address source-address;
    timeout seconds;
  }
  time-zone (GMThour-offset | time-zone);
  }
  tracing {
    destination-override {
    syslog host;
    }
  }
  use-imported-time-zones;
}
```

authentication-key

Syntax authentication-key *key-number* type *type* value *password*;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure Network Time Protocol (NTP) authentication keys so that the router or switch can send authenticated packets. If you configure the router or switch to operate in authenticated mode, you must configure a key.

Both the keys and the authentication scheme (MD5) must be identical between a set of peers sharing the same key number.

Options ***key-number***—Positive integer that identifies the key.

type *type*—Authentication type. It can only be **md5**.

value *password*—The key itself, which can be from 1 through 8 ASCII characters. If the key contains spaces, enclose it in quotation marks.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring NTP Authentication Keys on page 27
- broadcast on page 42
- peer on page 45
- server on page 46
- *trusted-key*

boot-server (NTP)

Syntax boot-server (*address* | *hostname*);

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure the server that NTP queries when the router or switch boots to determine the local date and time.

When you boot the router or switch, it issues an **ntpdate** request, which polls a network server to determine the local date and time. You need to configure a server that the router or switch uses to determine the time when the router or switch boots. You can either configure an IP address or a hostname for the boot server. If you configure a hostname instead of an IP address, the **ntpdate** request resolves the hostname to an IP address when the router or switch boots up.

If you configure an NTP boot server, then when the router or switch boots, it immediately synchronizes with the boot server even if the NTP process is explicitly disabled or if the time difference between the client and the boot server exceeds the threshold value of 1000 seconds.

Options

- ***address***—The IP address of an NTP boot server.
- ***hostname***—The hostname of an NTP boot server.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring the NTP Boot Server on page 19

broadcast

Syntax broadcast *address* <key *key-number*> <routing-instance-name *routing-instance-name*> <ttl *value*> <version *value*>;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
routing-instance-name option added in Junos OS Release 14.1

Description Configure the local router or switch to operate in broadcast mode with the remote system at the specified ***address***. In this mode, the local router or switch sends periodic broadcast messages to a client population at the specified broadcast or multicast ***address***. Normally, you include this statement only when the local router or switch is operating as a transmitter.

Options ***address***—The broadcast address on one of the local networks or a multicast address assigned to NTP. You must specify an address, not a hostname. If the multicast address is used, it must be **224.0.1.1**.

key ***key-number***—(Optional) All packets sent to the address include authentication fields that are encrypted using the specified key number.

Range: Any unsigned 32-bit integer

routing-instance-name ***routing-instance-name***—(Optional) The routing instance name in which the interface has address in the broadcast subnet.

Default: The default routing instance is used to broadcast packets.

ttl ***value***—(Optional) Time-to-live (TTL) value to use.

Range: 1 through 255

Default: 1

version ***value***—(Optional) Specify the version number to be used in outgoing NTP packets.

Range: 1 through 4

Default: 4

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring the NTP Time Server and Time Services on page 23

broadcast-client

Syntax broadcast-client;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure the local router or switch to listen for broadcast messages on the local network to discover other servers on the same subnet.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation
- Configuring the Router or Switch to Listen for Broadcast Messages Using NTP on page 27

multicast-client

Syntax multicast-client <*address*>;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description For NTP, configure the local router or switch to listen for multicast messages on the local network to discover other servers on the same subnet.

Options ***address***—(Optional) One or more IP addresses. If you specify addresses, the router or switch joins those multicast groups.

Default: 224.0.1.1.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation
- Configuring the Router or Switch to Listen for Multicast Messages Using NTP on page 28

ntp

Syntax

```
ntp {
  authentication-key number type type value password;
  boot-server address;
  broadcast <address> <key key-number> <routing-instance-name routing-instance-name>
    <version value> <ttl value>;
  broadcast-client;
  multicast-client <address>;
  peer address <key key-number> <version value> <prefer>;
  server address <key key-number> <version value> <prefer>;
  source-address source-address <routing-instance routing-instance-name>;
  trusted-key [ key-numbers ];
}
```

Hierarchy Level [edit system]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure NTP on the router or switch.

The remaining statements are explained separately.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Synchronizing and Coordinating Time Distribution Using NTP on page 19

peer (NTP)

Syntax peer *address* <key *key-number*> <version *value*> <prefer>;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description For NTP, configure the local router or switch to operate in symmetric active mode with the remote system at the specified address. In this mode, the local router or switch and the remote system can synchronize with each other. This configuration is useful in a network in which either the local router or switch or the remote system might be a better source of time.

Options ***address***—Address of the remote system. You must specify an address, not a hostname.

key ***key-number***—(Optional) All packets sent to the address include authentication fields that are encrypted using the specified key number.

Range: Any unsigned 32-bit integer

prefer—(Optional) Mark the remote system as the preferred host, which means that if all other factors are equal, this remote system is chosen for synchronization among a set of correctly operating systems.

version *value*—(Optional) Specify the NTP version number to be used in outgoing NTP packets.

Range: 1 through 4

Default: 4

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring the NTP Time Server and Time Services on page 23

server (NTP)

Syntax server *address* <key *key-number*> <version *value*> <prefer>;

Hierarchy Level [edit system ntp]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description For NTP, configure the local router or switch to operate in client mode with the remote system at the specified ***address***. In this mode, the local router or switch can be synchronized with the remote system, but the remote system can never be synchronized with the local router or switch.

If the NTP client time drifts so that the difference in time from the NTP server exceeds 128 milliseconds, the client is automatically stepped back into synchronization. If the offset between the NTP client and server exceeds the 1000-second threshold, the client still synchronizes with the server, but it also generates a system log message noting that the threshold was exceeded.

Options ***address***—Address of the remote system. You must specify an address, not a hostname.

key ***key-number***—(Optional) Use the specified key number to encrypt authentication fields in all packets sent to the specified address.

Range: Any unsigned 32-bit integer

prefer—(Optional) Mark the remote system as preferred host, which means that if all other things are equal, this remote system is chosen for synchronization among a set of correctly operating systems.

version *value*—(Optional) Specify the version number to be used in outgoing NTP packets.

Range: 1 through 4

Default: 4

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring the NTP Time Server and Time Services on page 23

source-address (NTP, RADIUS, System Logging, or TACACS+)

Syntax source-address *source-address* <routing-instance *routing-instance-name*>;

Hierarchy Level [edit system accounting destination radius server *server-address*],
[edit system accounting destination tacplus server *server-address*],
[edit system ntp],
[edit system radius-server *server-address*],
[edit system syslog],
[edit system tacplus-server *server-address*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
routing-instance option added in Junos OS Release 14.1

Description Specify a source address for each configured IPv4 or IPv6 TACACS+ server, RADIUS server, NTP server, or the source address to record in system log messages that are directed to a remote machine.

Options ***source-address***—A valid IP address configured on one of the router or switch interfaces. For system logging, the address is recorded as the message source in messages sent to the remote machines specified in all **host *hostname*** statements at the **[edit system syslog]** hierarchy level, but not for messages directed to the other Routing Engine or to the TX Matrix router or TX Matrix Plus router in a routing matrix based on a TX Matrix router or TX Matrix Plus router.

routing-instance *routing-instance-name*—(Optional) The routing instance name in which the source address is defined.

Default: The primary address of the interface

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- *Configuring RADIUS Authentication*
- Specifying a Source Address for an NTP Server on page 20
- *Specifying an Alternative Source Address for System Log Messages*

system

Syntax system { ... }

Hierarchy Level [edit]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure system management properties. Set values in the **edit system** hierarchy of the configuration.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation
- System Management Configuration Statements on page 33

time-zone

Syntax time-zone (GMT *hour-offset* | *time-zone*);

Hierarchy Level [edit system]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
GMT *hour-offset* option added in Junos OS Release 7.4.

Description Set the local time zone. To have the time zone change take effect for all processes running on the router or switch, you must reboot the router or switch.

Default UTC

Options **GMT *hour-offset***—Set the time zone relative to UTC time.

Range: –14 through +12

Default: 0

time-zone—Specify the time zone as **UTC**, which is the default time zone, or as a string such as PDT (Pacific Daylight Time), or use one of the following continents and major cities:

Africa/Abidjan, Africa/Accra, Africa/Addis_Ababa, Africa/Algiers, Africa/Asmera, Africa/Bamako, Africa/Bangui, Africa/Banjul, Africa/Bissau, Africa/Blantyre, Africa/Brazzaville, Africa/Bujumbura, Africa/Cairo, Africa/Casablanca, Africa/Ceuta, Africa/Conakry, Africa/Dakar, Africa/Dar_es_Salaam, Africa/Djibouti, Africa/Douala, Africa/El_Aaiun, Africa/Freetown, Africa/Gaborone, Africa/Harare, Africa/Johannesburg, Africa/Kampala, Africa/Khartoum, Africa/Kigali, Africa/Kinshasa, Africa/Lagos, Africa/Libreville, Africa/Lome, Africa/Luanda, Africa/Lubumbashi, Africa/Lusaka, Africa/Malabo, Africa/Maputo, Africa/Maseru, Africa/Mbabane, Africa/Mogadishu, Africa/Monrovia, Africa/Nairobi, Africa/Ndjamena, Africa/Niamey, Africa/Nouakchott, Africa/Ouagadougou, Africa/Porto-Novo, Africa/Sao_Tome, Africa/Timbuktu, Africa/Tripoli, Africa/Tunis, Africa/Windhoek

America/Adak, America/Anchorage, America/Anguilla, America/Antigua, America/Aruba, America/Asuncion, America/Barbados, America/Belize, America/Bogota, America/Boise, America/Buenos_Aires, America/Caracas, America/Catamarca, America/Cayenne, America/Cayman, America/Chicago, America/Cordoba, America/Costa_Rica, America/Cuiaba, America/Curacao, America/Dawson, America/Dawson_Creek, America/Denver, America/Detroit, America/Dominica, America/Edmonton, America/El_Salvador, America/Ensenada, America/Fortaleza, America/Glace_Bay, America/Godthab, America/Goose_Bay, America/Grand_Turk, America/Grenada, America/Guadeloupe, America/Guatemala, America/Guayaquil, America/Guyana, America/Halifax, America/Havana, America/Indiana/Knox, America/Indiana/Marengo, America/Indiana/Vevay, America/Indianapolis, America/Inuvik, America/Iqaluit, America/Jamaica, America/Jujuy, America/Juneau, America/La_Paz, America/Lima, America/Los_Angeles, America/Louisville, America/Maceio, America/Managua, America/Manaus, America/Martinique, America/Mazatlan, America/Mendoza, America/Menominee, America/Mexico_City, America/Miquelon, America/Montevideo, America/Montreal, America/Montserrat, America/Nassau, America/New_York, America/Nipigon, America/Nome, America/Noronha, America/Panama, America/Pangnirtung, America/Paramaribo, America/Phoenix, America/Port-au-Prince,

America/Port_of_Spain, America/Porto_Acre, America/Puerto_Rico, America/Rainy_River, America/Rankin_Inlet, America/Regina, America/Rosario, America/Santiago, America/Santo_Domingo, America/Sao_Paulo, America/Scoresbysund, America/Shiprock, America/St_Johns, America/St_Kitts, America/St_Lucia, America/St_Thomas, America/St_Vincent, America/Swift_Current, America/Tegucigalpa, America/Thule, America/Thunder_Bay, America/Tijuana, America/Tortola, America/Vancouver, America/Whitehorse, America/Winnipeg, America/Yakutat, America/Yellowknife

Antarctica/Casey, Antarctica/DumontDUrville, Antarctica/Mawson, Antarctica/McMurdo, Antarctica/Palmer, Antarctica/South_Pole

Arctic/Longyearbyen

Asia/Aden, Asia/Alma-Ata, Asia/Amman, Asia/Anadyr, Asia/Aqtau, Asia/Aqtobe, Asia/Ashkhabad, Asia/Baghdad, Asia/Bahrain, Asia/Baku, Asia/Bangkok, Asia/Beirut, Asia/Bishkek, Asia/Brunei, Asia/Calcutta, Asia/Chungking, Asia/Colombo, Asia/Dacca, Asia/Damascus, Asia/Dubai, Asia/Dushanbe, Asia/Gaza, Asia/Harbin, Asia/Hong_Kong, Asia/Irkutsk, Asia/Ishigaki, Asia/Jakarta, Asia/Jayapura, Asia/Jerusalem, Asia/Kabul, Asia/Kamchatka, Asia/Karachi, Asia/Kashgar, Asia/Katmandu, Asia/Krasnoyarsk, Asia/Kuala_Lumpur, Asia/Kuching, Asia/Kuwait, Asia/Macao, Asia/Magadan, Asia/Manila, Asia/Muscat, Asia/Nicosia, Asia/Novosibirsk, Asia/Omsk, Asia/Phnom_Penh, Asia/Pyongyang, Asia/Qatar, Asia/Rangoon, Asia/Riyadh, Asia/Saigon, Asia/Seoul, Asia/Shanghai, Asia/Singapore, Asia/Taipei, Asia/Tashkent, Asia/Tbilisi, Asia/Tehran, Asia/Thimbu, Asia/Tokyo, Asia/Ujung_Pandang, Asia/Ulan_Bator, Asia/Urumqi, Asia/Vientiane, Asia/Vladivostok, Asia/Yakutsk, Asia/Yekaterinburg, Asia/Yerevan

Atlantic/Azores, Atlantic/Bermuda, Atlantic/Canary, Atlantic/Cape_Verde, Atlantic/Faeroe, Atlantic/Jan_Mayen, Atlantic/Madeira, Atlantic/Reykjavik, Atlantic/South_Georgia, Atlantic/St_Helena, Atlantic/Stanley

Australia/Adelaide, Australia/Brisbane, Australia/Broken_Hill, Australia/Darwin, Australia/Hobart, Australia/Lindeman, Australia/Lord_Howe, Australia/Melbourne, Australia/Perth, Australia/Sydney

Europe/Amsterdam, Europe/Andorra, Europe/Athens, Europe/Belfast, Europe/Belgrade, Europe/Berlin, Europe/Bratislava, Europe/Brussels, Europe/Bucharest, Europe/Budapest, Europe/Chisinau, Europe/Copenhagen, Europe/Dublin, Europe/Gibraltar, Europe/Helsinki, Europe/Istanbul, Europe/Kaliningrad, Europe/Kiev, Europe/Lisbon, Europe/Ljubljana, Europe/London, Europe/Luxembourg, Europe/Madrid, Europe/Malta, Europe/Minsk, Europe/Monaco, Europe/Moscow, Europe/Oslo, Europe/Paris, Europe/Prague, Europe/Riga, Europe/Rome, Europe/Samara, Europe/San_Marino, Europe/Sarajevo, Europe/Simferopol, Europe/Skopje, Europe/Sofia, Europe/Stockholm, Europe/Tallinn, Europe/Tirane, Europe/Vaduz, Europe/Vatican, Europe/Vienna, Europe/Vilnius, Europe/Warsaw, Europe/Zagreb, Europe/Zurich

Indian/Antananarivo, Indian/Chagos, Indian/Christmas, Indian/Cocos, Indian/Comoro, Indian/Kerguelen, Indian/Mahe, Indian/Maldives, Indian/Mauritius, Indian/Mayotte, Indian/Reunion

Pacific/Apia, Pacific/Auckland, Pacific/Chatham, Pacific/Easter, Pacific/Efate, Pacific/Enderbury, Pacific/Fakaofo, Pacific/Fiji, Pacific/Funafuti, Pacific/Galapagos, Pacific/Gambier, Pacific/Guadalcanal, Pacific/Guam, Pacific/Honolulu, Pacific/Johnston, Pacific/Kiritimati, Pacific/Kosrae, Pacific/Kwajalein, Pacific/Majuro, Pacific/Marquesas, Pacific/Midway, Pacific/Nauru, Pacific/Niue, Pacific/Norfolk, Pacific/Noumea, Pacific/Pago_Pago, Pacific/Palau, Pacific/Pitcairn, Pacific/Ponape, Pacific/Port_Moresby, Pacific/Rarotonga, Pacific/Saipan, Pacific/Tahiti, Pacific/Tarawa, Pacific/Tongatapu, Pacific/Truk, Pacific/Wake, Pacific/Wallis, Pacific/Yap

Required Privilege Level
system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Modifying the Default Time Zone for a Router or Switch Running Junos OS on page 29
- System Management Configuration Statements on page 33

use-imported-time-zones

Syntax use-imported-time-zones;

Hierarchy Level [edit system]

Release Information Statement introduced in Junos OS Release 9.0.

Description Configure a custom time zone from a locally generated time-zone database.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- Updating the IANA Time Zone Database on Junos Devices on page 30

CHAPTER 4

Operational Commands

set date

Syntax set date (***date-time*** | ntp <***ntp-server***> <source-address ***source-address***>)

Release Information Command introduced before Junos OS Release 7.4.

Description Set the date and time.

```
user@host> set date ntp
21 Apr 17:22:02 ntpdate[3867]: step time server 172.17.27.46 offset 8.759252 sec
```

Options

- ***date-time***—Specify date and time in one of the following formats:
  - ***YYYYMMDDHHMM.SS***
  - **"*month DD*, *YYYY HH:MM*(am | pm)"**
- **ntp**—Configure the router to synchronize the current date and time setting with a Network Time Protocol (NTP) server.
- ***ntp-server*—(**Optional) Specify the IP address of one or more NTP servers.
- **source-address *source-address***—(Optional) Specify the source address that is used by the router to contact the remote NTP server.

Required Privilege Level view

Related Documentation

- Setting the Date and Time Locally on page 15

show ntp associations

Syntax show ntp associations
<no-resolve>

Release Information Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description Display Network Time Protocol (NTP) peers and their state.

Options **none**—Display NTP peers and their state.

no-resolve—(Optional) Suppress symbolic addressing.

Required Privilege Level view

Related Documentation
- show ntp status on page 57

List of Sample Output show ntp associations on page 56

Output Fields Table 3 on page 55 describes the output fields for the **show ntp associations** command. Output fields are listed in the approximate order in which they appear.

Table 3: show ntp associations Output Fields

Field Name	Field Description
remote	Address or name of the remote NTP peer.
refid	Reference identifier of the remote peer. If the reference identifier is not known, this field shows a value of **0.0.0.0**.
st	Stratum of the remote peer.
t	Type of peer: **b** (broadcast), **l** (local), **m** (multicast), or **u** (unicast).
when	When the last packet from the peer was received.
poll	Polling interval, in seconds.
reach	Reachability register, in octal.
delay	Current estimated delay of the peer, in milliseconds.
offset	Current estimated offset of the peer, in milliseconds.
disp	Current estimated dispersion of the peer, in milliseconds.

Table 3: show ntp associations Output Fields *(continued)*

Field Name	Field Description
peer-name	Peer name and status of the peer in the clock selection process: • space—Discarded because of a high stratum value or failed sanity checks. • **x**—Designated "falseticker" by the intersection algorithm. • **.**—Culled from the end of the candidate list. • **-** —Discarded by the clustering algorithm. • **+**—Included in the final selection set. • **#**—Selected for synchronization, but the distance exceeds the maximum. • ***—Selected for synchronization. • **o**—Selected for synchronization, but the packets-per-second (pps) signal is in use.

Sample Output

show ntp associations

```
user@host> show ntp associations
     remote           refid      st t when poll reach   delay   offset    disp
==============================================================================
*wolfe-gw.junipe tick.ucla.edu    2 u   43   64  377     1.86    0.319    0.08
```

show ntp status

Syntax
show ntp status
<no-resolve>

Release Information
Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description
Display the values of internal variables returned by Network Time Protocol (NTP) peers.

Options
none—Display the values of internal variables returned by NTP peers.

no-resolve—(Optional) Suppress symbolic addressing.

Required Privilege Level
view

Related Documentation
- show ntp associations on page 55

List of Sample Output
show ntp status on page 58

Output Fields
Table 4 on page 57 describes the output fields for the **show ntp status** command. Output fields are listed in the approximate order in which they appear.

Table 4: show ntp status Output Fields

Field Name	Field Description
status	System status word, a code representing the status items listed.
leap_none	Indicates a normal synchronized state with no leap seconds imminent. Other options could be **leap_add_sec**, **leap_del_sec**, or **leap_alarm**, indicating a leap second will be added, deleted, or a leap second requirement is upcoming.
sync_ntp	Indicates the current synchronization source, in this case, an NTP server. Other options include **sync_alarm** and **sync_unspec**, both indicating that the router has not been synched.
x events	Indicates the number of events that have occurred since that last code change. An event is often the receipt of an NTP polling message.
event_peer/strat_chg	Describes the most recent event, in this case, the stratum of the peer server changed.
version	A detailed description of the version of NTP being used.
processor	Indicates the current hardware platform and version of the processor.
system	Detailed description of the name and version of the operating system in use.
leap	The number of leap seconds in use.

Table 4: show ntp status Output Fields *(continued)*

Field Name	Field Description
stratum	The stratum of the peer server. Anything greater than 1 is a secondary reference source, and the number roughly represents the number of hops away from the stratum 1 server.. Stratum 1 is a primary reference, such as an atomic clock.
precision	The precision of the peer clock, how precisely the frequency and time can be maintained with this particular timekeeping system.
rootdelay	The total roundtrip delay to the primary reference source, in seconds.
rootdispersion	The maximum error relative to the primary reference source, in seconds.
peer	An identification number of the peer in use.
refid	Reference identifier of the remote peer. If the reference identifier is not known, this field shows a value of **0.0.0.0**.
reftime	The local time, in timestamp format, when the local clock was last updated. If the local clock has never been synchronized, the value is zero.
poll	The NTP broadcast message polling interval, in seconds.
clock	The current time on the local router clock.
state	The current mode of NTP operation, where 1 is symmetric active, 2 is symmetric passive, 3 is client, 4 is server, and 5 is broadcast.
offset	Current estimated offset of the peer, in milliseconds. Indicates the time difference between the reference clock and the local clock.
frequency	The frequency of the clock.
jitter	Indicates the magnitude of jitter, in milliseconds, between several time queries.
stability	A measure of how well this clock can maintain a constant frequency.

Sample Output

show ntp status

```
user@host> show ntp status
assID=0 status=0544 leap_none, sync_local_proto, 4 events, event_peer/strat_chg,
version="ntpd 4.2.2p1@1.1570-o Tue May 19 13:57:55 UTC 2009 (1)",
processor="x86_64", system="Linux/2.6.18-164.el5", leap=00, stratum=4,
precision=-10, rootdelay=0.000, rootdispersion=11.974, peer=59475,
refid=LOCAL(0),
reftime=d495c32c.0e71eaf2  Mon, Jan  7 2013 13:57:00.056, poll=10,
clock=d495c32c.cebd43bd  Mon, Jan  7 2013 13:57:00.807, state=4,
offset=0.000, frequency=0.000, jitter=0.977, noise=0.977,
stability=0.000, tai=0
```

CHAPTER 5

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