

NTP

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RouterOS v6 implements the SNTP protocol defined in RFC4330, multicast mode is not supported. SNTP client is included in the *system* package. To use an NTP server, *ntp* package must be [installed and enabled](#).

RouterOS v7 main package includes NTP client and server functionality, which is based on RFC5905.

The client configuration is located in the `/system ntp client` console path, and the **"System > SNTP Client"** (RouterOS version 6), **"System > NTP Client"** (RouterOS version 7) WinBox window. This configuration is shared by the SNTP client implementation in the *system* package and the NTP client implementation in the *ntp* package. When *ntp* package is installed and enabled, the SNTP client is disabled automatically.

RouterOS version 6

SNTP Client properties:

Property	Description
enabled (<i>yes, no</i> <i>default: no</i>)	Enable SNTP client for time synchronization
mode (<i>broadcast, unicast, filed is read-only</i>)	Mode that the SNTP client will operate in. If no NTP servers are configured <i>broadcast</i> mode will be used. If there is a dynamic or static NTP server IP address or FQDN used it will automatically switch to unicast mode.
primary-ntp (<i>IP address default: 0.0.0.0</i>)	IP address of the NTP server that has to be used for time synchronization. If both values are non-zero, then the SNTP client will alternate between the two server addresses, switching to the other when the request to the current server times out or when the "KoD" packet is received, indicating that the server is not willing to respond to requests from this client. The following formats are accepted: - <i>ipv4</i> - <i>ipv6</i>
secondary-ntp (<i>IP address default: 0.0.0.0</i>)	see primary-ntp
server-dns-names (<i>Comma separated domain name list default:)</i>	To set the NTP server using its domain name. The domain name will be resolved each time an NTP request is sent. Router has to have <i>/ip dns</i> configured.

Status

- **active-server** (IP address; read-only property) : Currently selected NTP server address. This value is equal to **primary-ntp** or **secondary-ntp**.
- **poll-interval** (Time interval; read-only property) : Current interval between requests sent to the active server. The initial value is 16 seconds, and it is increased by doubling to 15 minutes.

Last received packet information

Values of the following properties are reset when the SNTP client is stopped or restarted, either because of a configuration change, or because of a network error.

- **last-update-from** (IP address; read-only property) : Source IP address of the last received NTP server packet that was successfully processed.

- **last-update-before** (Time interval; read-only property) : Time since the last successfully received server message.
- **last-adjustment** (Time interval; read-only property) : Amount of clock adjustment that was calculated from the last successfully received NTP server message.
- **last-bad-packet-from** (IP address; read-only property) : Source IP address of last received SNTP packet that was not successfully processed. Reason of the failure and time since this packet was received is available in the next two properties.
- **last-bad-packet-before** (Time interval; read-only property) : Time since the last receive failure.
- **last-bad-packet-reason** (Text; read-only property) : Text that describes the reason of the last receive failure. Possible values are:
 - *bad-packet-length* - Packet length is not in the acceptable range.
 - *server-not-synchronized* - Leap Indicator field is set to "alarm condition" value, which means that clock on the server has not been synchronized yet.
 - *zero-transmit-timestamp* - Transmit Timestamp field value is 0.
 - *bad-mode* - Value of the Mode field is neither 'server' nor 'broadcast'.
 - *kod-ABCD* - Received "KoD" (Kiss-o'-Death) response. *ABCD* is the short "kiss code" text from the Reference Identifier field.
 - *broadcast* - Received broadcast message, but **mode=unicast**.
 - *non-broadcast* - Received packet was server reply, but **mode=broadcast**.
 - *server-ip-mismatch* - Received response from address that is not **active-server**.
 - *originate-timestamp-mismatch* - Originate Timestamp field in the server response message is not the same as the one included in the last request.
 - *roundtrip-too-long* - request/response roundtrip exceeded 1 second.

Client settings example:

To check the status of the NTP client in CLI, use the "print" command

```
[admin@ntp-example_v6] > /system ntp client print
enabled: no
primary-ntp: 0.0.0.0
secondary-ntp: 0.0.0.0
server-dns-names:
mode: unicast
```

To enable the NTP client and set IP addresses or FQDN of the NTP servers:

```
[admin@ntp-example_v6] > /system ntp client set enabled=yes
[admin@ntp-example_v6] > /system ntp client print
enabled: yes
primary-ntp: 0.0.0.0
secondary-ntp: 0.0.0.0
server-dns-names:
mode: unicast
dynamic-servers: x.x.x.x, x.x.x.x
poll-interval: 15s
active-server: x.x.x.x
last-update-from: x.x.x.x
last-update-before: 6s570ms
last-adjustment: -1ms786us
[admin@ntp-example_v6] > /system ntp client set primary-ntp=162.159.200.123
[admin@ntp-example_v6] > /system ntp client print
enabled: yes
primary-ntp: 162.159.200.123
secondary-ntp: 0.0.0.0
server-dns-names:
mode: unicast
dynamic-servers: x.x.x.x, x.x.x.x
poll-interval: 16s
active-server: x.x.x.x
```

NTP Server settings:

Server configuration is located in **/system ntp server**

Property	Description
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enabled (yes or no; default value: no)	Enable NTP server
broadcast (yes or no; default value: no)	Enable certain NTP server mode, for this mode to work you have to set up broadcast-addresses field
multicast (yes or no; default value: no)	Enable certain NTP server mode
manycast (yes or no; default value: no)	Enable certain NTP server mode
broadcast-addresses (IP address; default value:)	Set broadcast address to use for NTP server broadcast mode

Example:

Set up an NTP server for the local network that is 192.168.88.0/24

```
/system ntp server set broadcast=yes broadcast-addresses=192.168.88.255 enabled=yes manycast=no
```

RouterOS version 7

NTP Client properties:

Property	Description
enabled (yes, no default: no)	Enable NTP client for time synchronization
mode (broadcast, manycast, multicast, unicast)	Mode that the NTP client will operate in
NTP servers	<p>The list of NTP servers. It is possible to add static entries.</p> <p>The following formats are accepted:</p> <ul style="list-style-type: none"> - FQDN ("Resolved Address" will appear in the "Servers"- window in an appropriate column if the address is resolved) or IP address can be used. If DHCP-Client property use-peer-ntp=yes - the dynamic entries advertised by DHCP - ipv4 - ipv4@vrf - ipv6 - ipv6@vrf - ipv6-linklocal%interface
vrf (default: main)	Virtual Routing and Forwarding
Servers (Button/Section)	<p>A detailed table of dynamically and statically added NTP servers (Address, Resolved address, Min Poll, Max Poll, iBurst, Auth. Key)</p> <p>To set the NTP server using its FQDN. The domain name will be resolved each time an NTP request is sent. Router has to have /ip/dns configured.</p>
Peers	<p>Current parameter values</p> <pre>[admin@ntp-example_v7] > /system/ntp/monitor-peers type="ucast-client" address=x.x.x.x refid="y.y.y.y" stratum=3 hpoll=10 ppoll=10 root- delay=28.869 ms root-disp=50.994 ms offset=-0.973 ms delay=0.522 ms disp=15.032 ms jitter=0.521 ms -- [Q quit D dump C-z pause]</pre>
Keys	NTP symmetric keys, used for authentication between the NTP client and server. Key Identifier (Key ID) - an integer identifying the cryptographic key used to generate the message-authentication code.

Status

- **synchronized, stopped, waiting, using-local-clock** - Current status of the NTP client
- **Frequency drift** - The fractional frequency drift per unit time.
- **synced-server** - The IP address of the NTP Server.
- **synced-stratum** - The accuracy of each server is defined by a number called the stratum, with the topmost level (primary servers) assigned as one and each level downwards (secondary servers) in the hierarchy assigned as one greater than the preceding level.
- **system-offset** - This is a signed, fixed-point number indicating the offset of the NTP server's clock relative to the local clock, in seconds.

NTP Server settings:

Server configuration is located in **/system ntp server**

Property	Description
enabled (<i>yes or no</i> ; default value: <i>no</i>)	Enable NTP server
broadcast (<i>yes or no</i> ; default value: <i>no</i>)	Enable certain NTP server mode, for this mode to work you have to set up broadcast-addresses field
multicast (<i>yes or no</i> ; default value: <i>no</i>)	Enable certain NTP server mode
manycast (<i>yes or no</i> ; default value: <i>no</i>)	Enable certain NTP server mode
broadcast-addresses (<i>IP address</i> ; default value: <i>)</i>	Set broadcast address to use for NTP server broadcast mode
vrf (<i>default: main</i>)	Virtual Routing and Forwarding
use-local-clock (<i>yes or no</i> ; default value: <i>no</i>)	The server will supply its local system time as valid if others are not available.
local-clock-stratum	Manually set stratum if use-local-clock=yes
auth-key (default value: <i>none</i>)	NTP symmetric key, used for authentication between the NTP client and server. Key Identifier (Key ID) - an integer identifying the cryptographic key used to generate the message-authentication code.

Log messages

SNTP client can produce the following log messages. See the article "[log](#)" on how to set up logging and how to inspect logs.

- **ntp.debug** gradually adjust by *OFFS*
- **ntp.debug** instantly adjust by *OFFS*
- **ntp.debug** Wait for *N* seconds before sending the next message
- **ntp.debug** Wait for *N* seconds before restarting
- **ntp.debug.packet** packet receive an error, restarting
- **ntp.debug.packet** received *PKT*
- **ntp.debug.packet** ignoring received *PKT*
- **ntp.debug.packet** error sending to *IP*, restarting
- **ntp.debug.packet** sending to *IP PKT*

Explanation of log message fields

- *OFFS* - difference of two NTP timestamp values, in hexadecimal.
- *PKT* - dump of NTP packet. If the packet is shorter than the minimum 48 bytes, it is dumped as a hexadecimal string. Otherwise, the packet is dumped as a list of field names and values, one per log line. Names of fields follow RFC4330.
- *IP* - remote IP address.

NOTE: the above logging rules work only with the built-in SNTP client, the separate NTP package doesn't have any logging facilities.

