# NTP Timing Based on GPS Clock

This chapter contains the following sections:

## Configuring NTP using GPS Time

You can configure the GPS time as the reference clock for NTP using the command **ntp refclock gps**.

**Note**    This feature is available with IOS XE release 17.6.1. Further information can be found in NTP Clock Sync with GPS in the Cellular Pluggable Interface Module Configuration Guide.

The GPS time acts as a stratum 0 source, and the Cisco IOS NTP server acts as a stratum 1 device, which in turn provides clock information to its NTP clients (stratum 2 and 3).

**Procedure**

**Step 1**    Enter global configuration mode:

**Example:**

```
Router# configure terminal
```

**Step 2**    Configure the NTP reference clock as GPS:

**Example:**
```
Router(config)#ntp refclock gps
```

**Step 3**    To verify the configuration, use the **show** commands in the following example:

**Example:**
```
Router#
Sep 24 19:58:43.046 GMT: %PKI-6-AUTHORITATIVE_CLOCK: The system clock has been set.
Router#show ntp status
Clock is synchronized, stratum 1, reference is .GPS.
nominal freq is 250.0000 Hz, actual freq is 249.9970 Hz, precision is 2**10
ntp uptime is 94000 (1/100 of seconds), resolution is 4016
```

```
reference time is E31778F3.0B851ED8 (19:58:43.045 GMT Thu Sep 24 2020)
clock offset is 11.0000 msec, root delay is 0.00 msec
root dispersion is 3950.55 msec, peer dispersion is 3938.47 msec
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is 0.000011995 s/s
system poll interval is 64, last update was 7 sec ago.
Router#
Router#
Router#show ntp associations

address ref clock st when poll reach delay offset disp
*~127.127.5.1 .GPS. 0 38 64 7 0.000 11.000 1938.8
* sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
Router#
Router#show clock
20:00:43.660 GMT Thu Sep 24 2020
Router#
```

**Step 4**    Use the **debug ntp refclock** command to troubleshoot the configuration:

**Example:**

```
Router#debug ntp ?
adjust NTP clock adjustments
all NTP all debugging on
core NTP core messages
events NTP events
packet NTP packet debugging
refclock NTP refclock messages

Router#debug ntp refclock
*Sep 24 19:58:43.045 GMT: GPS: Poll Requested
*Sep 24 19:58:43.045 GMT: GPS (19:58:43.056 GMT Thu Sep 24 2020)
*Sep 24 19:58:43.045 GMT: Valid time rcvd from GPS: 2020/09/24 19:58:43.056 (frac =
0x0E560440)
*Sep 24 19:58:43.045 GMT: RTS poll timestamp (local clock) was 0xE31778F3.0B851ED8
*Sep 24 19:58:43.045 GMT: GPS timestamp is 0xE31778F3.0E560440
*Sep 24 19:58:43.045 GMT: NTP Core(NOTICE): ntpd PPM
*Sep 24 19:58:43.046 GMT: NTP Core(NOTICE): trans state : 5
*Sep 24 19:58:43.046 GMT: NTP Core(NOTICE): Clock is synchronized.
```