

NTP (Network Time Protocol)—allows devices to automatically set their clock to match a time server on the network. First set up your timezone.

```
R5(config)# clock timezone PST -8
R5(config)# clock summer-time PDT recurring
```

Then, get the clock close to the correct time. NTP is optimized for fine-tuning a clock within fractions of a second. Cisco devices seem to cope with clocks that are badly wrong—it just takes longer—but some computer operating systems will give up if the clock is years off.

```
R5# clock set 10:12:00 NOVEMBER 1 2016
R5# show clock
10:12:19.183 PDT Tue Nov 1 2016
```

Now you can set up your device to synchronize its clock to an NTP server.

```
R5(config)# ntp server 17.253.38.253 prefer
R5(config)# ntp server 4.53.160.75
```

*Multiple sources add redundancy, but only one is used at a time. The "optional prefer" keyword allows you to influence which is used and isn't part of CCENT.*

```
R5# show ntp associations
address      ref clock      st  when  poll reach  delay  offset  disp
+~67.227.252.196  50.4.23.100    2   454   1024  377 88.720  1.592 18.676
+-4.53.160.75     142.66.101.13  2   611   1024  377 74.369  -5.203 18.651
*~17.253.38.253  71.80.83.115   1   816   1024  377 193.21  1.106 18.694
* sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
```

```
R5# show ntp status
Clock is synchronized, stratum 2, reference is 17.253.38.253
nominal freq is 250.0000 Hz, actual freq is 250.0180 Hz, precision is 2**24
reference time is DBC35076.5B94C917 (10:33:42.357 PDT Tue Nov 1 2016)
clock offset is 0.1893 msec, root delay is 189.39 msec
root dispersion is 25.30 msec, peer dispersion is 14.82 msec
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is -0.000071940 s/s
system poll interval is 1024, last update was 604 sec ago.
```

You can also ask one of your routers to act as an NTP server, passing the time on to others. In a large enterprise, it can make sense for an edge router to act as both a client, using NTP to set its clock accurately, and a server to internal clients, keeping their NTP traffic off the internet. In a lab environment, you can just set the clock manually on a router and make it a master.

```
R5(config)# ntp master 2
```

*2 is the stratum number (how many hops from a radio clock). A radio clock is 1. Just add 1 to whatever is in the "st" column of "show ntp associations" or use the stratum from "show ntp status," where the math has already been done for you.*

To make your NTP server more reliable, clients can use the address of a loopback interface instead of a real interface. Since loopback interfaces are imaginary, they don't break. So, as long as the router can be reached by any route, the loopback will be reachable. (Ignoring admin. down.)

```
R5(config)# interface loopback 0
R5(config-if)# ip address 10.0.0.1 255.255.255.0
R5(config)# ntp source lo0
```

*Outgoing NTP Packets will bear the source IP address of the loopback interface.*