Network Time Protocol (NTP)

Topology

Initial Configuration Commands

R1:

```
enable
conf t
host R1
no banner motd
no banner login
no banner exec
no banner incoming
line vty 0 15
password cisco
login
line con 0
logging synchronous
exit
no ip domain-lookup
int gig 0/1
ip address 192.0.2.100 255.255.255.0
no shut
router ospf 1
```

```
network 0.0.0.0 0.0.0.0 area 0
end
copy run star
```

INTERNET:

```
enable
conf t
host INTERNET
no banner motd
no banner login
no banner exec
no banner incoming
line vty 0 15
password cisco
login
line con 0
logging synchronous
exit
no ip-domain lookup
int gig 0/1
ip address 192.0.2.1 255.255.255.0
no shut
router ospf 1
network 0.0.0.0 0.0.0.0 area 0
int lo0
ip address 1.1.1.1 255.255.255.255
ip http server
end
copy run star
```

Lab Tasks

1. On our INTERNET router, let's set our time to 12pm, our date to June 28, 2024, and our time zone to UTC with an offset of zero.
2. Let's set up our INTERNET router as the "ntp master" with a stratum value of 3.
3. Let's set up R1 as an "ntp server" and point it towards the 1.1.1.1 loopback interface of our INTERNET router. We are going to set up this router as if it is in the EST timezone, which would be "EST -5".
4. Let's set our R1 router to a recurring daylight savings time by using the "clock summer-time EDT recurring" command.
5. Let's verify if R1's time is synchronized with its timesource, which is our INTERNET router, by using the "show clock" command and the "show ntp status" command.
6. On R1, after the 15 minutes of waiting for R1 to fully converge with the INTERNET router, let's check our clock and NTP status and see what our time and stratum value is now.
7. On R1, let's use the "show ntp associations" command to verify that we are associated with our INTERNET router as our timesource.

Solution

Step 1: On our INTERNET router, let's set our time to 12pm, our date to June 28, 2024, and our time zone to UTC with an offset of zero.

```
INTERNET>en
INTERNET#clock set 12:00:00 ?
  <1-31>  Day of the month
  MONTH   Month of the year

INTERNET#clock set 12:00:00 June 28 2024
INTERNET#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
INTERNET(config)#clock timezone UTC ?
  <-23 - 23>  Hours offset from UTC

INTERNET(config)#clock timezone UTC 0
```

Step 2: Let's set up our INTERNET router as the "ntp master" with a stratum value of 3.

```
INTERNET(config)#ntp master ?
  <1-15>  Stratum number
  <cr>    <cr>

INTERNET(config)#ntp master 3
INTERNET(config)#end
```

Step 3: Let's set up R1 as an "ntp server" and point it towards the 1.1.1.1 loopback interface of our INTERNET router. We are going to set up this router as if it is in the EST timezone, which would be "EST -5".

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ntp server 1.1.1.1
R1(config)#clock timezone EST -5
```

Step 4: Let's set our R1 router to a recurring daylight savings time by using the "clock summer-time EDT recurring" command.

```
R1(config)#clock summer-time EDT recurring
R1(config)#end
```

Step 5: Let's verify if R1's time is synchronized with its timesource, which is our INTERNET router, by using the "show clock" command and the "show ntp status" command.

```
R1#show clock
*09:37:46.355 EDT Sat Jun 29 2024
R1#show ntp status
Clock is unsynchronized, stratum 16, no reference clock
nominal freq is 1000.0003 Hz, actual freq is 1000.0003 Hz, precision is 2**13
ntp uptime is 5000 (1/100 of seconds), resolution is 1000
reference time is 00000000.00000000 (19:00:00.000 EST Thu Dec 31 1899)
clock offset is 0.0000 msec, root delay is 0.00 msec
root dispersion is 0.76 msec, peer dispersion is 0.00 msec
loopfilter state is 'NSET' (Never set), drift is 0.000000000 s/s
system poll interval is 8, never updated.
```

(##Notice how our date and time is not yet synchronized with the date and time that we set up on our INTERNET router.)
(##Whenever an NTP status shows a stratum of 16, it means that the route has not learned time from a trusted source. Since R1 doesn't make an assumption that a time update is completely accurate, it can take up to 15 minutes for our time to synchronize with our NTP master.)

Step 6: On R1, after the 15 minutes of waiting for R1 to fully converge with the INTERNET router, let's check our clock and NTP status and see what our time and stratum value is now.

```
R1#show clock
*08:20:14.035 EDT Fri Jun 28 2024
R1#show ntp status
```

```
Clock is unsynchronized, stratum 4, reference is 1.1.1.1
nominal freq is 1000.0003 Hz, actual freq is 1000.0003 Hz, precision is 2**13
ntp uptime is 90700 (1/100 of seconds), resolution is 1000
reference time is EA2928DA.A5BF6998 (08:19:38.647 EDT Fri Jun 28 2024)
clock offset is 1.4861 msec, root delay is 9.31 msec
root dispersion is 4.90 msec, peer dispersion is 0.97 msec
loopfilter state is 'FREQ' (Drift being measured), drift is 0.000000000 s/s
system poll interval is 64, last update was 43 sec ago.
```

(##Notice how our time now reflects 5 hours behind the time we set on our INTERNET router, as well as how our date reflects the date that we set on our INTERNET router.)
(##Notice how we now have a stratum value of 4 on R1.)

Step 7: On R1, let's use the "show ntp associations" command to verify that we are associated with our INTERNET router as our timesource.

```
R1#show ntp ?
  associations  NTP associations
  config        NTP server/peer configs
  information   NTP Information
  packets       NTP Packet statistics
  status        NTP status

R1#show ntp associations

  address         ref clock       st   when   poll reach  delay  offset
disp
*~1.1.1.1         127.127.1.1      3     44     64     3  7.737  43.130
62.774
 * sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
```

(##We can see here that R1 is associated with an NTP server of 1.1.1.1.)