



# Intel® Edison Tutorial: Network Time Protocol (NTP)

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1.0	10/28/2015	Initial release



## Introduction

This guide is only intended for projects where your Intel Edison's are configured in **Access Point** mode and do not have access to the internet. Without internet access, the Intel Edison's native **NTP** daemon cannot find the reference clock. The below guide will help you install a custom service that will help synchronize your Intel Edison nodes.

From the Wikipedia page about NTP:

“Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks. NTP is intended to synchronize all participating computers to within a few milliseconds of Coordinated Universal Time (UTC). It is designed to mitigate the effects of variable network latency. NTP can usually maintain time to within tens of milliseconds over the public Internet, and can achieve better than one millisecond accuracy in local area networks under ideal conditions. Asymmetric routes and network congestion can cause errors of 100ms or more.”

Or put simply, NTP is a very reliable and robust method of synchronizing clocks for a network of computers. The error in synchronization of the clocks is as tabulated below

Local area connection (access point mode)	0 – 1ms
Internet connection	0 – 10ms
Asymmetric routes/network congestion	100ms+

In this tutorial you will

1. Install NTP from source
2. Use NTP to synchronize clocks of client Intel Edison node(s) to a server Intel Edison node

## Things Needed

1. 2x Intel® Edison (at least)
2. A PC or a Mac
3. 2x Micro USB cables per Intel Edison
4. An internet connection



## Setup and Usage

1. Designate one Intel Edison to be a server, and the rest to be clients
2. Use the Intel Edison designated as the server to perform the below steps
3. Connect your Intel Edison to the internet
4. SSH into your Intel Edison
5. Navigate to the folder `/etc/` **Make sure to use the / in front of /etc/ or this will not work**

```
$ cd /etc/
```

Download the NTP library using the following command

```
$ wget http://www.eecis.udel.edu/~ntp/ntp_spool/ntp4/ntp-4.2/ntp-4.2.8p7.tar.gz
```

6. Extract the contents of the downloaded file using the below command

```
$ tar -zxvf ntp-4.2.8p7.tar.gz
```

7. Navigate to the folder containing the extracted files

```
$ cd ntp-4.2.8p7/
```

8. Run the configure command as below

```
$ ./configure
```

*This command takes about 10 minutes to run*

9. Run the make install command as below

```
$ make install
```

*This command takes about 10 minutes to run*

10. Navigate to the `/etc/` folder

```
$ cd /etc/
```

11. Write a `ntp.conf` file

```
$ vi ntp.conf
```

Write a `ntp.conf` file

```
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```

For the server Intel Edison type the following lines in:



```
server 127.127.1.0 prefer
fudge 127.127.1.0 stratum 10
driftfile /etc/ntp/drif
broadcastdelay 0.008
restrict 127.0.0.1
restrict 192.1.1.0 mask 255.255.255.0 nomodify notrap
```

For the client Intel Edison(s) type the following lines:

```
tinker panic 0
server 192.168.42.1
server 0.pool.ntp.org
server 1.pool.ntp.org
server 2.pool.ntp.org
server 3.pool.ntp.org
restrict default ignore
restrict 127.0.0.1
restrict 192.168.42.1 mask 255.255.255.255 nomodify notrap noquery
driftfile /var/lib/ntp/drift
```

*Make sure to replace the 192.168.42.1 in the client Intel Edisons with the IP address of the Intel Edison you wish to synchronize with*

*You may omit the **server X.pool.ntp.org** if you do not plan to connect your Intel Edison to the internet*

*Make sure your Intel Edison's can communicate with each other by running the ping command*

```
$ ping <IP_ADDR_OF_EDISON>
```

12. Save and exit the file
13. Navigate back to the home directory

```
$ cd
```

14. Disable the native NTP daemon

```
$ timedatectl set-ntp false
```

15. Access point mode

Connect to your Intel Edison using the **serial interface**

If you are using the **server Intel Edison**, re-enable access point mode



**\$ configure\_edison --enableOneTimeSetup --persist**

If you are using a client Intel Edison, connect it to the server Intel Edison

**\$ configure\_edison --wifi**

16. Run the NTP daemon. A daemon is a background process that runs continuously on a computer.

**\$ ntpd**

17. Verify that the NTP daemon is running

**\$ ntpq -p**

```
root@ucla_iot:~# ntpq -p
      remote           refid      st t when poll reach   delay   offset  jitter
=====
192.68.42.1          .XFAC.           16 u    -   128    0    0.000    0.000    0.000
LOCAL(0)            .LOCL.           10 l   567    64    0    0.000    0.000    0.004
*clock.xmission.     .GPS.            1 u    34    64   377   43.451   19.310   21.595
+108.61.194.85 (     200.23.51.102   2 u    29    64   377   46.086   13.798   23.232
+104.131.53.252      209.51.161.238   2 u    24    64   377  124.787   21.106   23.126
+blue.1e400.net      173.66.221.127   2 u    29    64   377  114.628   16.508   19.314
root@ucla_iot:~#
```

Figure 1: example output command "ntpq -p" given successful install and configuration

```
root@ucla_iot:~# ntpq -p
ntpq: read: Connection refused
root@ucla_iot:~#
```

Figure 2: example output of command "ntpq -p" given successful install, but no live daemon

18. Repeat steps 3 -> 17 for each Intel Edison client node



## Auto-run NTP on Boot

Unfortunately, the configuration above merely installs the NTP daemon (ntpd). However, if we want this to start automatically each time we boot the Intel Edison, please follow the below directions.

While these instructions will run the NTP daemon, they can be easily modified to run any program you wish to use by changing the contents of the file **boot\_script.sh**.

1. Create a folder named **init.d** in the folder **/etc/**

```
$ mkdir /etc/init.d
```

2. Navigate to the **/etc/init.d** folder

```
$ cd /etc/init.d
```

3. Create a file named “boot\_script.sh”

```
$ vi boot_script.sh
```

4. Write the following into the boot\_script.sh file:

```
#!/bin/sh  
ntpd
```

5. Save and exit the file
6. Make the script executable

```
$ chmod +x boot_script.sh
```

7. Add the file to the sequence at boot

```
$ update-rc.d boot_script.sh defaults
```

8. Reboot the board

```
$ reboot
```

9. Log into your board
10. Check if the NTP daemon is running

```
$ ntpq -p
```