How to install and configure NTP Server (ntpd) to synchronize Linux server clock over the Internet on CentOS, RHEL, Fedora

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Every now and then I have to work on servers running **CentOS or Fedora Linux**. Very typical problem that I observe on many servers which I have to inherit is the previous administrator did not know about the existence of **NTP** (Network Time Protocol) or forgot to install the ntpd server. As a consequence the many installed server services did not have a correct clock and at some specific cases this caused issues for web applications running on the server or any CMS installed etc.

The *NTP Daemon* is existing in GNU / linux since the early days of Linux and it served quite well so far. The *NTP* protocol has been used since the early days of the internet and for centuries is a standard protocol for BSD UNIX.

ntp is available in I believe all Linux distributions directly as a precompiled binary and can be installed on Fedora, CentOS with:

```
[root@centos ~]# yum install ntp
```

ntpd synchronizes the server clock with one of the **/etc/ntp.conf** defined RedHat NTP list

```
server 0.rhel.pool.ntp.org
server 1.rhel.pool.ntp.org
server 2.rhel.pool.ntp.org
```

To Synchronize manually the server system clock the **ntp** CentOS rpm package contains a tool called **ntpdate** :
Hence its a good practice to use **ntpdate** to synchronize the local server time with a internet server, the way I prefer to do this is via a government owned ntp server **time.nist.gov**, e.g.

```
[root@centos ~]# ntpdate time.nist.gov
8 Feb 14:21:03 ntpdate[9855]: adjust time server 192.43.244.18 offset -0.003770 sec
```

Alternatively if you prefer to use one of the *redhat* servers use:

```
[root@centos ~]# ntpdate 0.rhel.pool.ntp.org
8 Feb 14:20:41 ntpdate[9841]: adjust time server 72.26.198.240 offset 0.005671 sec
```

Now as the system time is set to a correct time via the ntp server, the ntp server is to be launched:

```
[root@centos ~]# /etc/init.d/ntpd start
```

...

To permanently enable the **ntpd** service to start up in boot time issue also:

[root@centos ~]# chkconfig ntpd on

Using *chkconfig* and */etc/init.d/ntpd* cmds, makes the **ntp** server to run permanently via the ntpd daemon:

[root@centos ~]# ps ax |grep -i ntp
29861 ? SLs 0:00 ntpd -u ntp:ntp -p /var/run/ntpd.pid -g

If you prefer to synchronize periodically the system clock instead of running permanently a network server listening (for increased security), you should omit the above *chkconfig ntpd on* and */etc/init.d/ntpd start* commands and instead set in root crontab the time to get synchronize lets say every 30 minutes, like so:

[root@centos ~]# echo '30 * * * * root /sbin/ntpd -q -u ntp:ntp' > /etc/cron.d/ntpd

The time synchronization via crontab can be also done using the *ntpdate* cmd. For example if you want to synchronize the server system clock with a network server every 5 minutes:

[root@centos ~]# crontab -u root -e

And paste inside:

*/5 * * * * /sbin/ntpdate time.nist.gov 2>1 > /dev/null

ntp package is equipped with **ntpq** - *Standard NTP Query Program*. To get very basic stats for the running ntpd daemon use:

[root@centos ~]# ntpq -p
remote refid st t when poll reach delay offset jitter
==
B1-66ER.matrix. 192.43.244.18 2 u 47 64 17 149.280 41.455 11.297
*ponderosa.piney 209.51.161.238 2 u 27 64 37 126.933 32.149 8.382
www2.bitvector. 132.163.4.103 2 u 1 64 37 202.433 12.994 13.999
LOCAL(0) .LOCL. 10 l 24 64 37 0.000 0.000 0.001

The *remote* field shows the servers to which currently the **ntpd** service is connected. This IPs are the servers which ntp uses to synchronize the local system server clock. *when* field shows when last the system was synchronized by the remote time server and the rest is statistical info about connection quality etc.

If the ntp server is to be run in daemon mode (ntpd to be running in the background). Its a good idea to *allow ntp connections from the local network* and *filter incoming connections to port num 123* in **/etc/sysconfig/iptables** :

```
-A INPUT -s 192.168.1.0/24 -m state --state NEW -p udp --dport 123 -j ACCEPT
-A INPUT -s 127.0.0.1 -m state --state NEW -p udp --dport 123 -j ACCEPT
-A INPUT -s 0.0.0.0 -m state --state NEW -p udp --dport 123 -j DROP
```

Restrictions on which IPs can be connected to the ntp server can also be implied on a ntpd level through */etc/ntp.conf*. For example if you would like to add the local network IPs range *192.168.0.1/24* to access *ntpd*, in ntpd.conf should be added policy:

```
# Hosts on local network are less restricted.
restrict 192.168.0.1 mask 255.255.255.0 nomodify notrap
```

To deny all access to any machine to the *ntpd server* add in **/etc/ntp.conf**:

```
restrict default ignore
```

After making any changes to *ntp.conf* , a server restart is required to load the new config settings, e.g.:

```
[root@centos ~]# /sbin/service ntpd restart
```

In most cases I think it is better to imply restrictions on a iptables (firewall) level instead of bothering change the default *ntp.conf*

Once *ntpd* is running as daemon, the server listens for UDP connections on udp port 123, to see it use:

```
[root@centos ~]# netstat -tulpn|grep -i ntp
udp 0 0 10.10.10.123:123 0.0.0.0:* 29861/ntpd
udp 0 0 80.95.28.179:123 0.0.0.0:* 29861/ntpd
udp 0 0 127.0.0.1:123 0.0.0.0:* 29861/ntpd
udp 0 0 0.0.0.0:123 0.0.0.0:* 29861/ntpd
```