

UC20-SL2000-OLAC-EC

Quick Start Guide for using the NTP protocol with OLAC

Abstract:

The document shows how to set up a NTP server on a windows system and on a u-control SL2000. It shows further, how to set up a u-control SL2000 and a u-view HMI to connect to a NTP server. NTP(Network Time Protocol) is used to synchronize clocks of different devices through an IP based network. Therefore, it uses the port 123 of the UDP protocol.

Hardware reference

No.	Component name	Article No.	Hardware / Firmware version
1	UC20-SL2000-OLAC-EC	2638920000	HW 01.xx.xx

Software reference

No.	Software name	Article No.	Software version
1	WinSCP	-	5.19.x
2	PuTTY	-	0.75
3	u-create studio	2660130000	1.18a

File reference

No.	Name	Description	Version
1	-	-	-

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1 Warning and Disclaimer

Warning

Controls may fail in unsafe operating conditions, causing uncontrolled operation of the controlled devices. Such hazardous events can result in death and / or serious injury and / or property damage. Therefore, there must be safety equipment provided / electrical safety design or other redundant safety features that are independent from the automation system.

Disclaimer

This Application Note / Quick Start Guide / Example Program does not relieve you of the obligation to handle it safely during use, installation, operation and maintenance. Each user is responsible for the correct operation of his control system. By using this Application Note / Quick Start Guide / Example Program prepared by Weidmüller, you accept that Weidmüller cannot be held liable for any damage to property and / or personal injury that may occur because of the use.

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Security notes

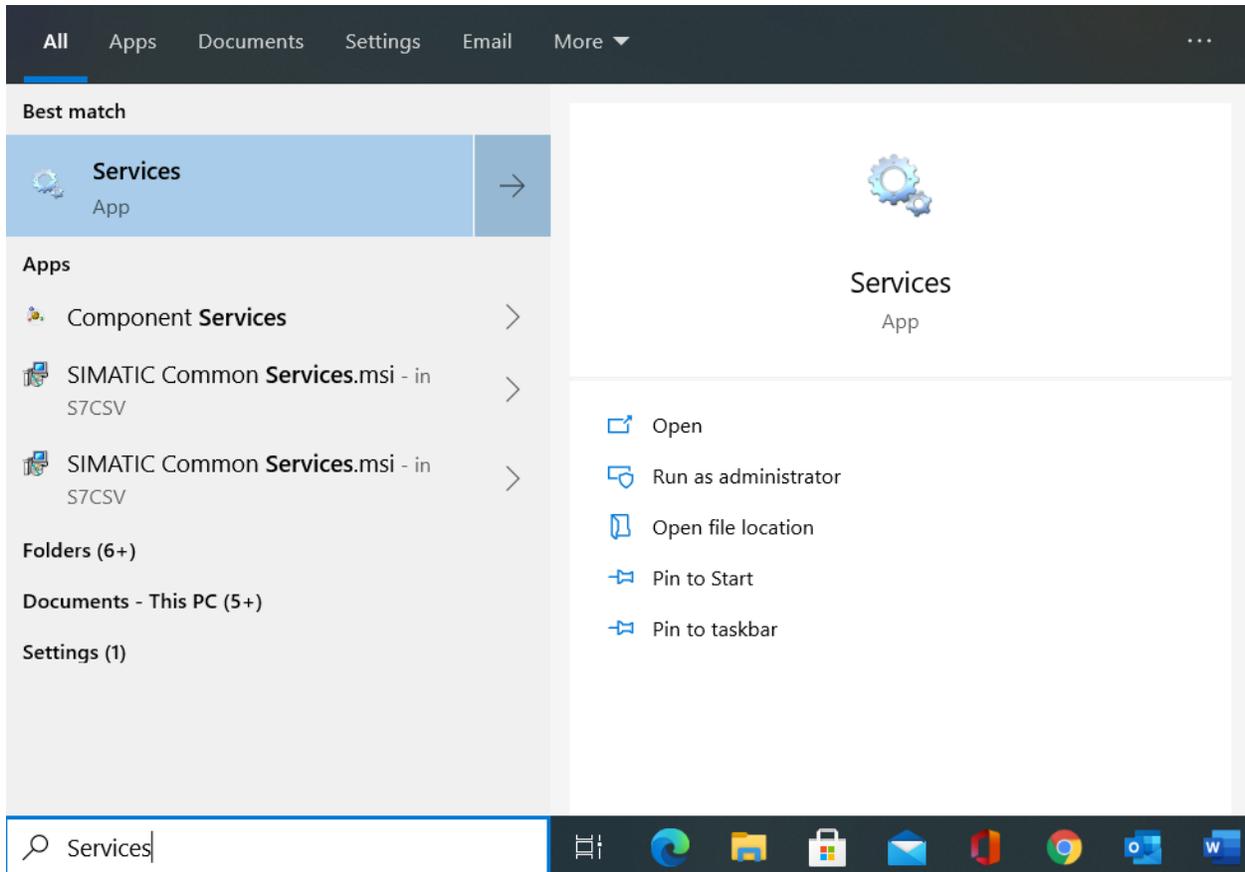
In order to protect equipment, systems, machines and networks against cyber threats, it is necessary to implement (and maintain) a complete state-of-the-art industrial security concept. The customer is responsible for preventing unauthorized access to his equipment, systems, machines and networks. Systems, machines and components should only be connected to the corporate network or the Internet if necessary and appropriate safeguards (such as firewalls and network segmentation) have been taken.

2 Using a Windows computer as NTP server

One use case is to setup a Windows PC to act as NTP server and connect the controller and other devices to this server.

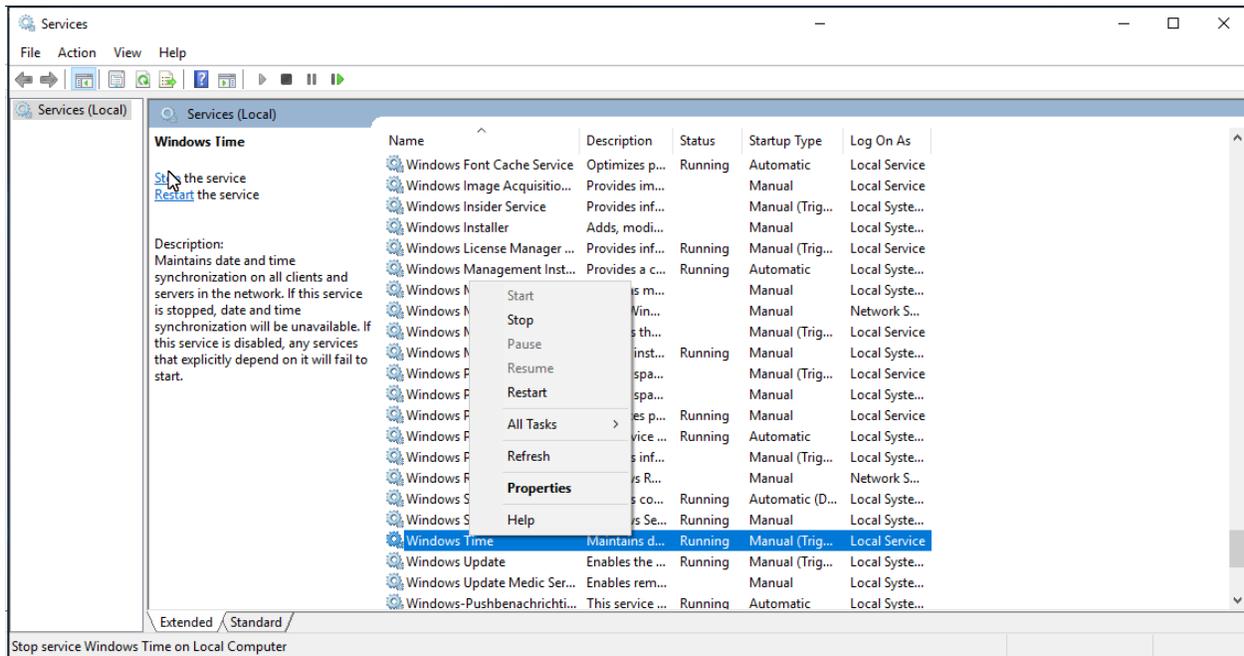
2.1 Setting up the Windows system

- 1.) Stop the service “Windows Time”. It is opened by typing “Services” in the search bar. This may differ if you use another Operating System.

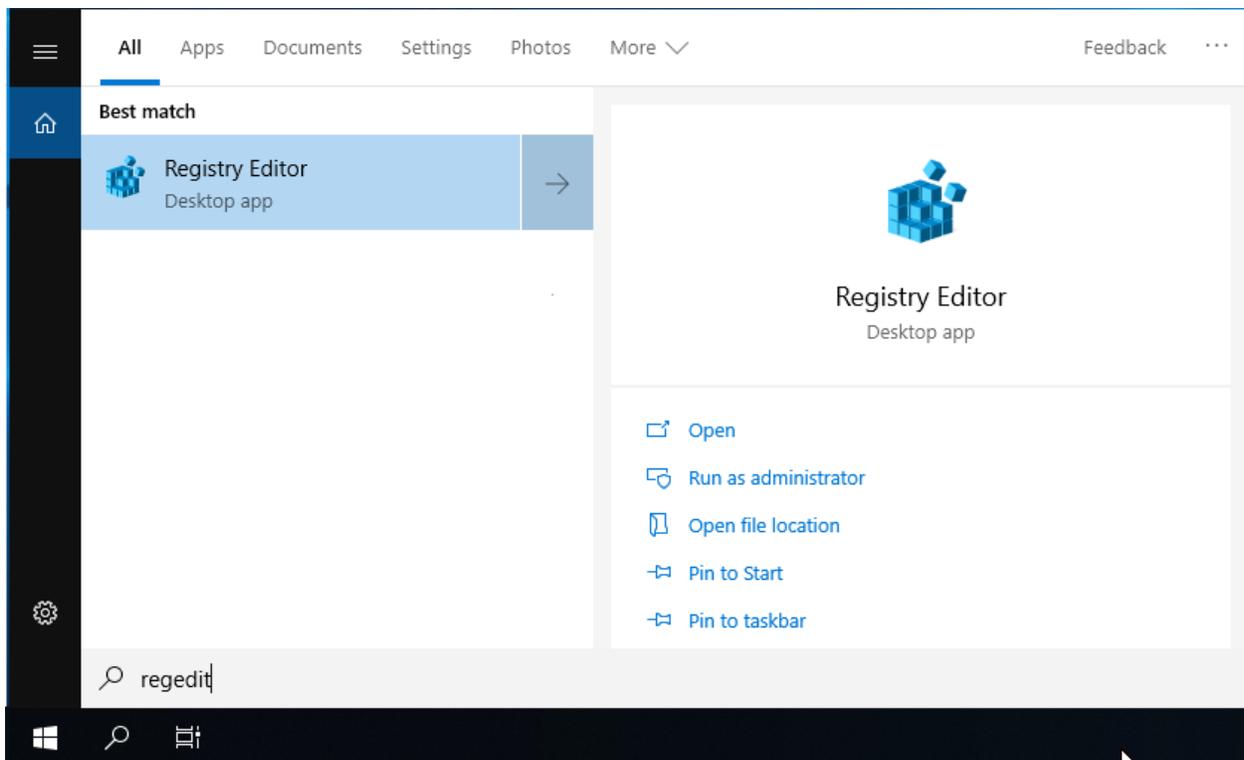


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2.) Right click on the service and select Stop to stop the Service.



3.) Once the setup has been stopped, there are some registry keys that needs to be changed. The registry editor is opened by typing regedit in the search bar.



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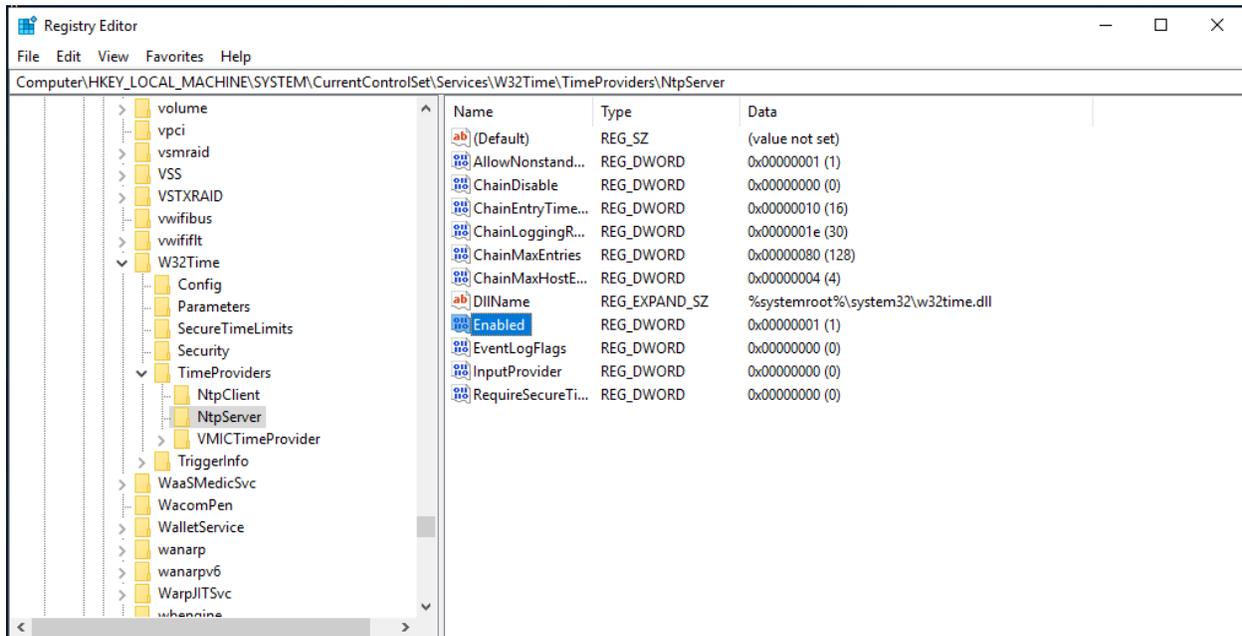


Warning: The registry editor is a very powerful tool and cause serious damage to the system. It must be used very carefully.

4.) To activate the NTP server two keys needs to be changed.

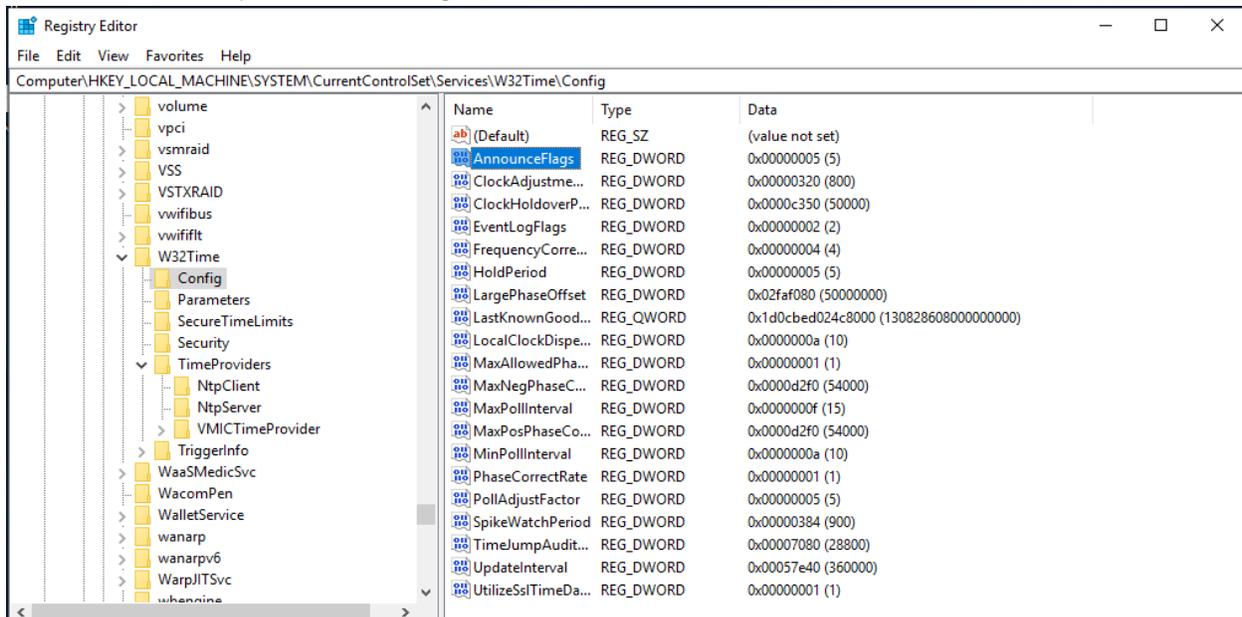
- Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpServer

The key Enabled needs to be set from 0 to 1.

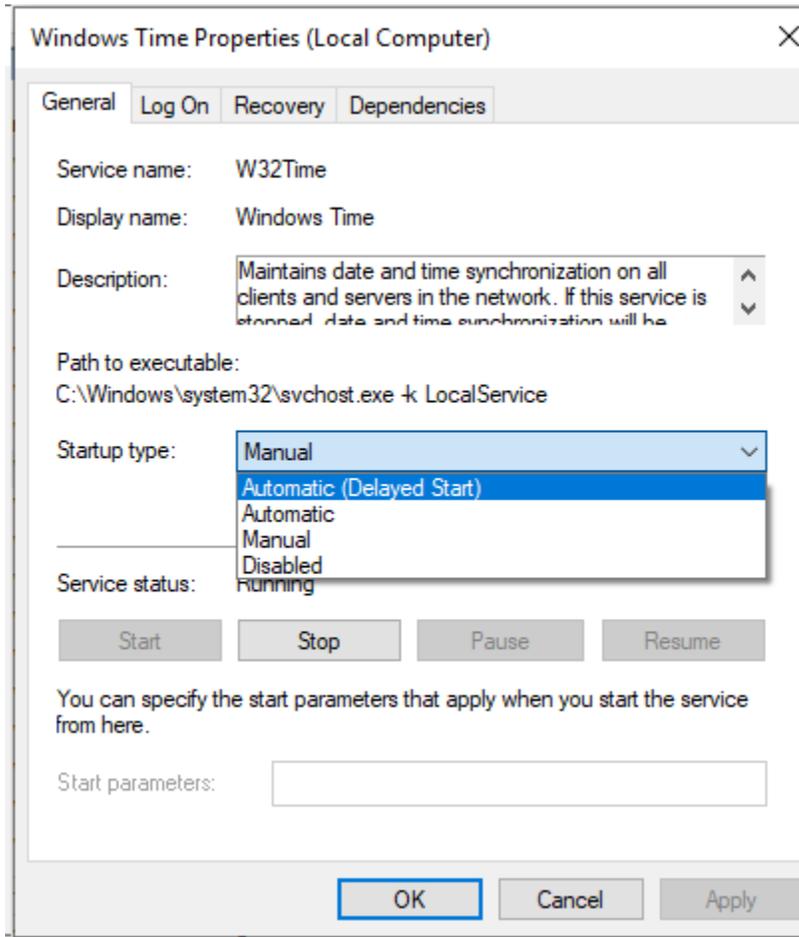


- Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config

The key AnnounceFlags needs to be set from 10 to 5.



- 5.) Once the keys are modified, the service “Windows Time” needs to be reactivated and set to auto start. This is done in the services menu by a double click to the service.



- 6.) Select the Startup type Automatic (Delayed Start).
- 7.) The last step is to open the Port UDP 123 on the PCs firewall.



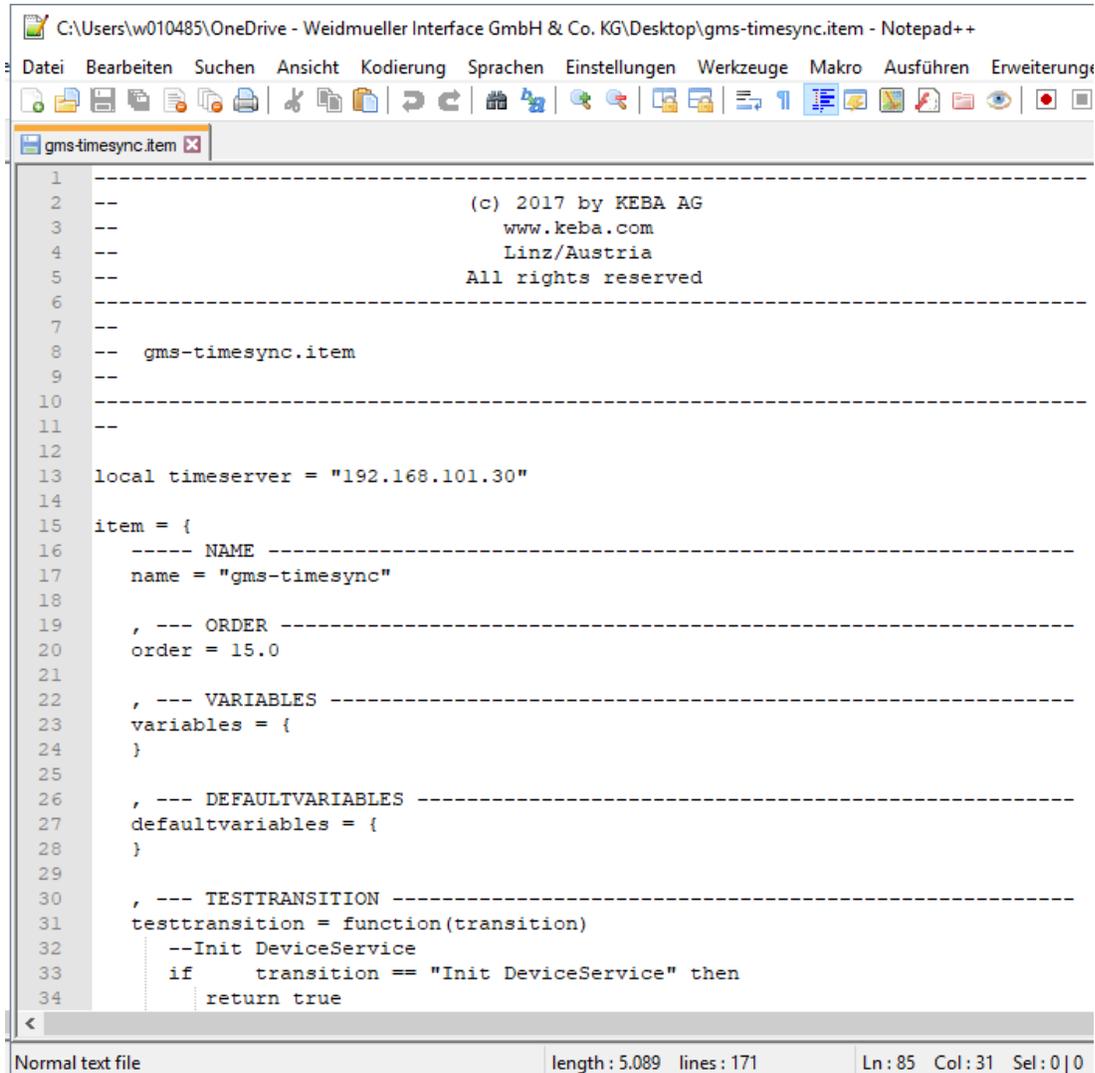
There are different firewalls available on the market, this Quick Start Guide does not go into details on this topic.

2.2 Connecting the PLC to the NTP Server

The PLC can now act as an NTP client, to synchronize its local clock with the clock of the NTP server, in this scenario the Windows PC. This is done via the item file “**gms-timesync.item**”. The file requires a modification.

- 1.) The IP Address of the NTP server needs to be entered.

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```
C:\Users\w010485\OneDrive - Weidmueller Interface GmbH & Co. KG\Desktop\gms-timesync.item - Notepad++
Datei Bearbeiten Suchen Ansicht Kodierung Sprachen Einstellungen Werkzeuge Makro Ausfuehren Erweiterungen
gms-timesync.item x
1 -----
2 (c) 2017 by KEBA AG
3 www.keba.com
4 Linz/Austria
5 All rights reserved
6 -----
7
8 gms-timesync.item
9
10 -----
11
12
13 local timeserver = "192.168.101.30"
14
15 item = {
16 ----- NAME -----
17 name = "gms-timesync"
18
19 , --- ORDER -----
20 order = 15.0
21
22 , --- VARIABLES -----
23 variables = {
24 }
25
26 , --- DEFAULTVARIABLES -----
27 defaultvariables = {
28 }
29
30 , --- TESTTRANSITION -----
31 testtransition = function(transition)
32 --Init DeviceService
33 if transition == "Init DeviceService" then
34 return true

```

Normal text file length: 5.089 lines: 171 Ln: 85 Col: 31 Sel: 0|0

- 2.) Once the IP-Address of the NTP servers has been entered, the file needs to be copied to the controller, under the path: /opt/deviceservice/items.d.

The .item relies on **ntpd**. This program reads the time from an NTP server and sets the system clock.

- 3.) First the additional package “**libopts25**” and then “**ntpd**” needs to be installed as a **Debian** package.

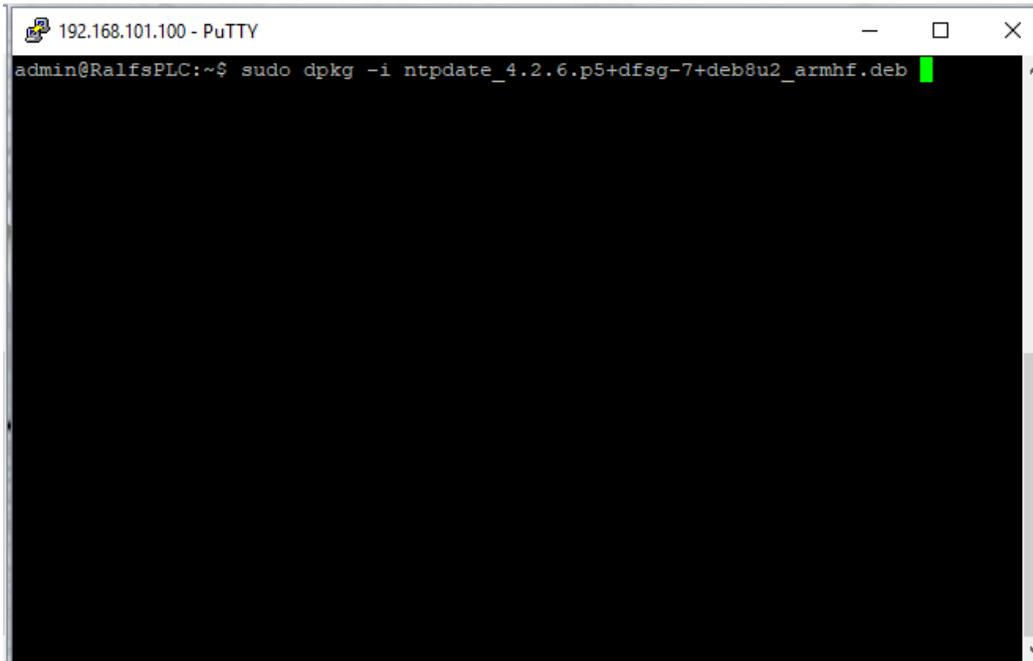
The packages can be downloaded here:

<https://packages.debian.org/de/jessie/armhf/ntpd/download> and
<https://packages.debian.org/de/jessie/armhf/libopts25/download>

To install the package, the downloaded .deb file needs to be moved to the PLC’s filesystem (WinSCP can be used). The following command executes the Installation:

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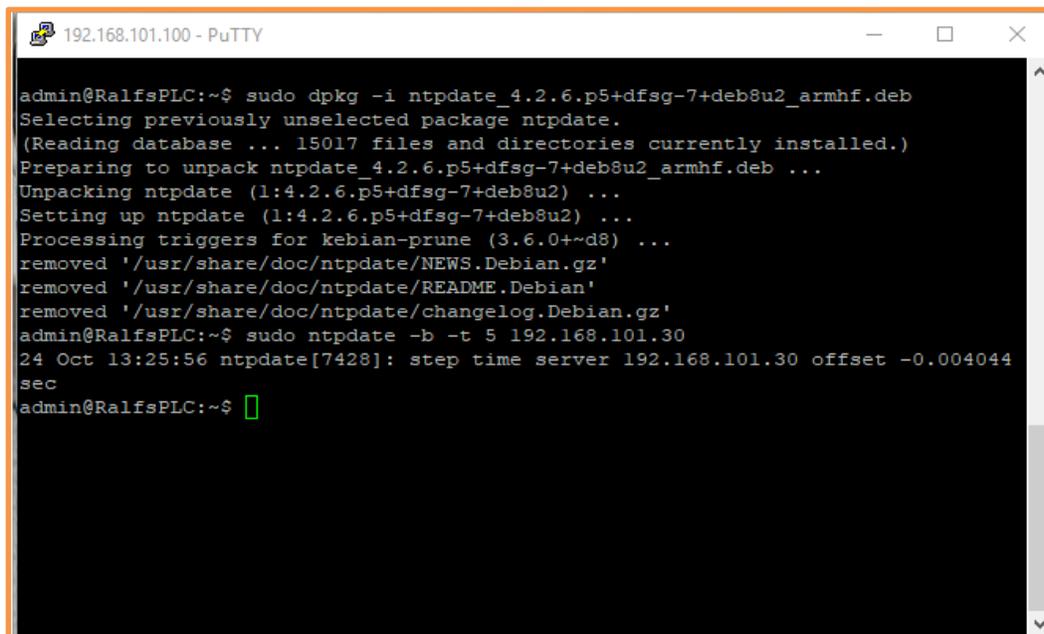
```
sudo  
> sudo dpkg -i [path of the package]
```



```
192.168.101.100 - PuTTY  
admin@RalfsPLC:~$ sudo dpkg -i ntpdate_4.2.6.p5+dfsg-7+deb8u2_armhf.deb
```

4.) After successful Installation, the package can be tested by the command:

```
> sudo ntpdate -b -t 5 [ip address of the server]
```

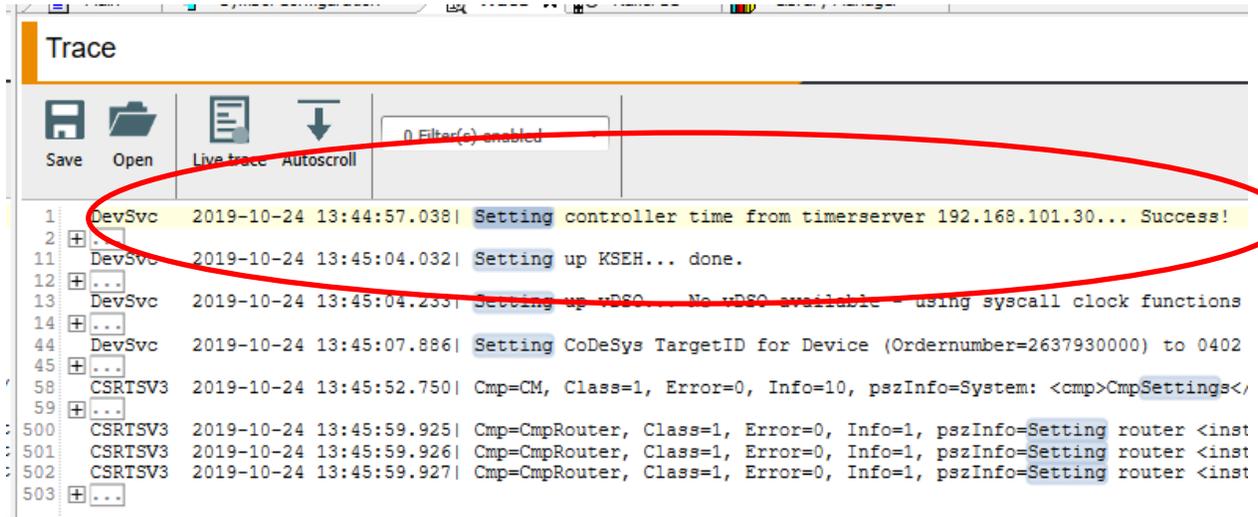


```
192.168.101.100 - PuTTY  
admin@RalfsPLC:~$ sudo dpkg -i ntpdate_4.2.6.p5+dfsg-7+deb8u2_armhf.deb  
Selecting previously unselected package ntpdate.  
(Reading database ... 15017 files and directories currently installed.)  
Preparing to unpack ntpdate_4.2.6.p5+dfsg-7+deb8u2_armhf.deb ...  
Unpacking ntpdate (1:4.2.6.p5+dfsg-7+deb8u2) ...  
Setting up ntpdate (1:4.2.6.p5+dfsg-7+deb8u2) ...  
Processing triggers for kebian-prune (3.6.0+~d8) ...  
removed '/usr/share/doc/ntpdate/NEWS.Debian.gz'  
removed '/usr/share/doc/ntpdate/README.Debian'  
removed '/usr/share/doc/ntpdate/changelog.Debian.gz'  
admin@RalfsPLC:~$ sudo ntpdate -b -t 5 192.168.101.30  
24 Oct 13:25:56 ntpdate[7428]: step time server 192.168.101.30 offset -0.004044  
sec  
admin@RalfsPLC:~$
```

After the package has been installed, the PLC can be rebooted and the time from the NTP server is set as system time of the PLC during startup.

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- 5.) A successful read of the time from a NTP server is also displayed in the Trace of u-create studio.



The screenshot shows the Trace window in u-create studio. The window title is "Trace". Below the title bar is a toolbar with icons for Save, Open, Live trace, and Autoscroll. A search filter box contains "0 Filter(s) enabled". The main area displays a list of trace events. The first event is highlighted in yellow and circled in red. It is a DevSvc event from 2019-10-24 at 13:44:57.038, with the message "Setting controller time from timerserver 192.168.101.30... Success!". Other events include setting up KSEH, setting up vDSO, setting CoDeSys TargetID, and CSRTSV3 events related to Cmp=CmpRouter.

```
1 DevSvc 2019-10-24 13:44:57.038| Setting controller time from timerserver 192.168.101.30... Success!
2 + ...
11 DevSvc 2019-10-24 13:45:04.032| Setting up KSEH... done.
12 + ...
13 DevSvc 2019-10-24 13:45:04.293| Setting up vDSO... No vDSO available - using syscall clock functions
14 + ...
44 DevSvc 2019-10-24 13:45:07.886| Setting CoDeSys TargetID for Device (Ordernumber=2637930000) to 0402
45 + ...
58 CSRTSV3 2019-10-24 13:45:52.750| Cmp=CM, Class=1, Error=0, Info=10, pszInfo=System: <cmp>CmpSettings</
59 + ...
500 CSRTSV3 2019-10-24 13:45:59.925| Cmp=CmpRouter, Class=1, Error=0, Info=1, pszInfo=Setting router <inst
501 CSRTSV3 2019-10-24 13:45:59.926| Cmp=CmpRouter, Class=1, Error=0, Info=1, pszInfo=Setting router <inst
502 CSRTSV3 2019-10-24 13:45:59.927| Cmp=CmpRouter, Class=1, Error=0, Info=1, pszInfo=Setting router <inst
503 + ...
```

3 Using the PLC as NTP Server

Another use case for the NTP protocol is to setup a NTP server on the PLC, to synchronize the clocks of other devices with the PLC's clock.



There is a possibility, that the NTP package causes real time issues on the PLC. Just use it in case if there is no other possibility to implement a NTP server in the setup.

The NTP server is included in the package “**chrony_1.30-2+deb8u2_armhf.deb**”, which can be found here:

<https://packages.debian.org/jessie/armhf/chrony/download>

To install the package, the downloaded **.deb file** needs to be moved to the PLC's filesystem (WinSCP can be used). The following command executes the Installation:

```
> sudo dpkg -i [path of the package]
```

After the package has been installed, the PLC can be used as NTP server. The configuration file for the server can be found here:

[/etc/chrony/chrony.conf](#)

The configuration below shows the default configuration.

```
# This the default chrony.conf file for the Debian chrony package. After
# editing this file use the command 'invoke-rc.d chrony restart' to make
# your changes take effect. John Hasler <jhasler@debian.org> 1998-2008

# See www.pool.ntp.org for an explanation of these servers. Please
# consider joining the project if possible. If you can't or don't want to
# use these servers I suggest that you try your ISP's nameservers. We mark
# the servers 'offline' so that chronyd won't try to connect when the link
# is down. Scripts in /etc/ppp/ip-up.d and /etc/ppp/ip-down.d use chronyc
# commands to switch it on when a dialup link comes up and off when it goes
# down. Code in /etc/init.d/chrony attempts to determine whether or not
# the link is up at boot time and set the online status accordingly. If
# you have an always-on connection such as cable omit the 'offline'
# directive and chronyd will default to online.
#
# Note that if Chrony tries to go "online" and dns lookup of the servers
# fails they will be discarded. Thus under some circumstances it is
# better to use IP numbers than host names.

server 0.debian.pool.ntp.org offline minpoll 8
server 1.debian.pool.ntp.org offline minpoll 8
server 2.debian.pool.ntp.org offline minpoll 8
server 3.debian.pool.ntp.org offline minpoll 8

# Look here for the admin password needed for chronyc. The initial
# password is generated by a random process at install time. You may
# change it if you wish.

keyfile /etc/chrony/chrony.keys

# Set runtime command key. Note that if you change the key (not the
# password) to anything other than 1 you will need to edit
# /etc/ppp/ip-up.d/chrony, /etc/ppp/ip-down.d/chrony, /etc/init.d/chrony
# and /etc/cron.weekly/chrony as these scripts use it to get the password.

commandkey 1

# I moved the driftfile to /var/lib/chrony to comply with the Debian
# filesystem standard.

driftfile /var/lib/chrony/chrony.drift

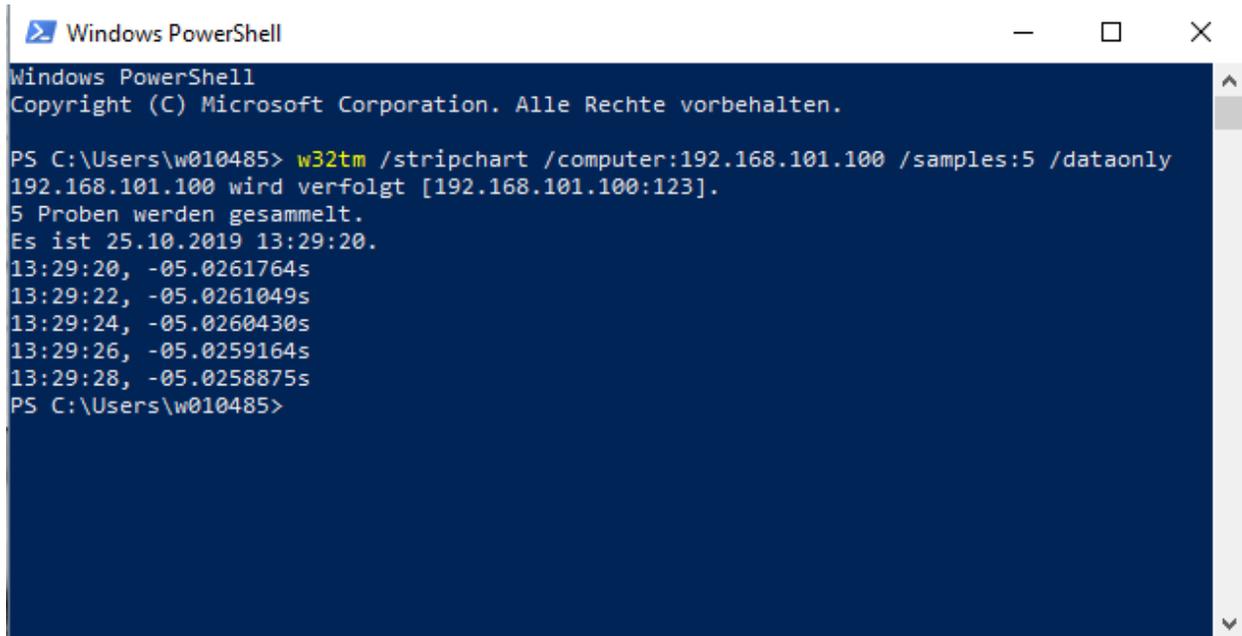
# Comment this line out to turn off logging.
```

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To test the NTP server from a Windows system, the following command can be used from the Windows PowerShell:

```
w32tm /stripchart /computer:192.168.101.100 /samples:5 /dataonly
```

The result should look like this.



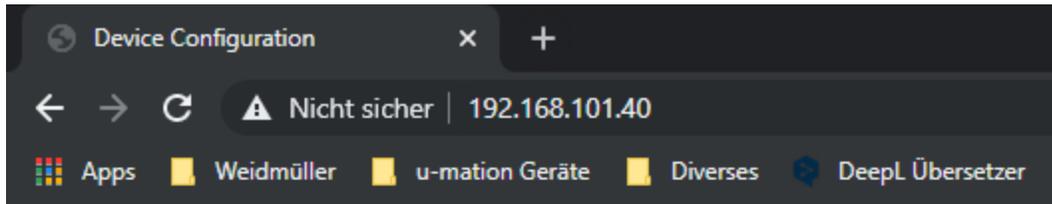
```
Windows PowerShell
Copyright (C) Microsoft Corporation. Alle Rechte vorbehalten.

PS C:\Users\w010485> w32tm /stripchart /computer:192.168.101.100 /samples:5 /dataonly
192.168.101.100 wird verfolgt [192.168.101.100:123].
5 Proben werden gesammelt.
Es ist 25.10.2019 13:29:20.
13:29:20, -05.0261764s
13:29:22, -05.0261049s
13:29:24, -05.0260430s
13:29:26, -05.0259164s
13:29:28, -05.0258875s
PS C:\Users\w010485>
```

4 Connecting a u-view HMI to an NTP Server

The Weidmüller u-view HMI's offer the possibility to connect to a NTP server out of the box.

This setting can be done on the Device configuration website. This website can be accessed by entering the HMI's IP-address into a web browser.



Device configuration

General options

Hostname	<input type="text" value="Panel"/>
Internet connectivity	<input type="text" value="WAN"/>
Keyboard layout	<input type="text" value="DE"/>

Date and time

Mode	<input type="text" value="Auto (NTP server)"/>
NTP server	<input type="text" value="192.168.101.100"/>
Date	<input type="text" value="2019"/> <input type="text" value="10"/> <input type="text" value="25"/>
Time	<input type="text" value="02"/> <input type="text" value="33"/>
Time zone	<input type="text" value="(UTC+01:00) Amsterdam, Berlin"/>

Once the Device configuration has been opened, the Mode dropdown menu in the section “Date and Time” needs to be set to “Auto (NTP server)” and the NTP servers IP-address needs to be inserted into the field “NTP server”.