Project planning of the NTP time synchronization of a Process Historian and Information Server

SIMATIC PCS 7, SIMATIC Information Server 2014

https://support.industry.siemens.com/cs/ww/en/view/66579062

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Table of contents

1 Introduction

NTP time synchronization

The Network Time Protocol (NTP) is a standard for synchronizing clocks in computer networks. The UDP port 123 is reserved for NTP. This example uses the NTP functionality of the operating system.

Operator Station PC Station

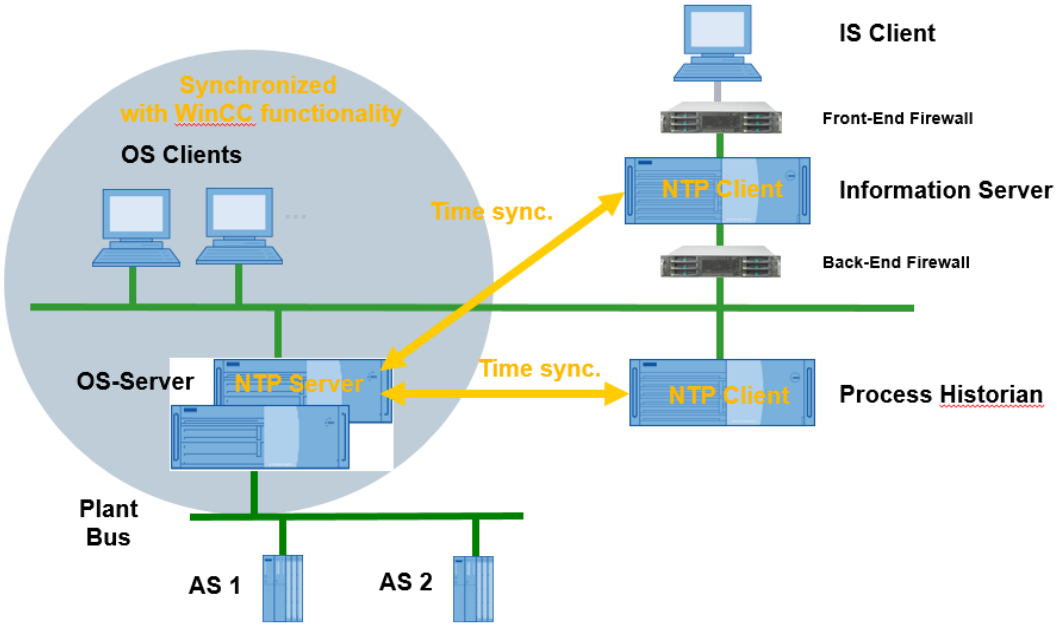
In PCS 7, an Operator Station with the "WinCC Time Synchronization" application has an integrated option of time synchronization. For clock synchronization of the PC station, you must configure the "WinCC Timesynchronization" application.

Process Historian and Information Server

The Process Historian and Information Server do not have internal functionality for time synchronization. This description assumes that the time synchronization in the PCS 7 system, including the OS systems, is configured and functioning correctly. With the help of Microsoft Windows, the time of the PH and IS is synchronized with the OS Server.

Overview

The overview below shows the PH and IS computers in the PCS 7 environment that are to be synchronized. The network is operated in a workgroup.



In this example, we will use the following computer names:

Process Historian = PH01 = Windows Server 2012 R2

Information Server = IS80 = Windows 10

OS Server1 = SV80A = Windows Server 2016 = IP 172.80.0.2

OS Server1 = SV80B = Windows Server 2016 = IP 172.80.0.3

In this document you will find instructions for clock synchronization in small PCS 7 systems without an external DCF77 time master and without a domain controller (DC).

Note:

An IS client can also be time-synchronized using the NTP procedure. The procedure is comparable to PH / IS time synchronization.

2 Time synchronization via the NTP method

All PC stations of a PCS 7 system can be synchronized via the NTP process. With the NTP procedure, the network components retrieve the time cyclically and actively from an NTP server. In devices without central system clock it is recommended to use a redundant OS server pair. An NTP server is configured using the Group Policy Objects (GPOs) settings at the appropriate PC station. This procedure is described step by step in the following sections. If the NTP server, which is configured on a non-redundant computer, fails, a project-specific solution must be worked out (e.g. synchronization via the Internet or another NTP server).

2.1 Requirements

- The service "Windows Time" (service name "W32Time") must be started on all computers to be synchronized.

The "Startup type" of the service must be "Automatic (Delayed Start)".

- In the Windows Firewall, create an incoming rule that

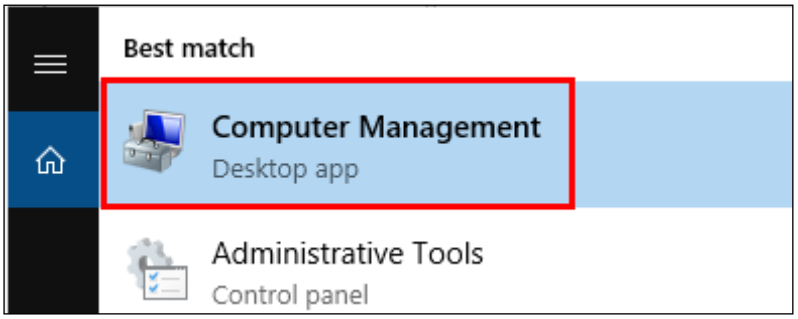
allows connections for the UDP port "123".

3 Start the Windows time service

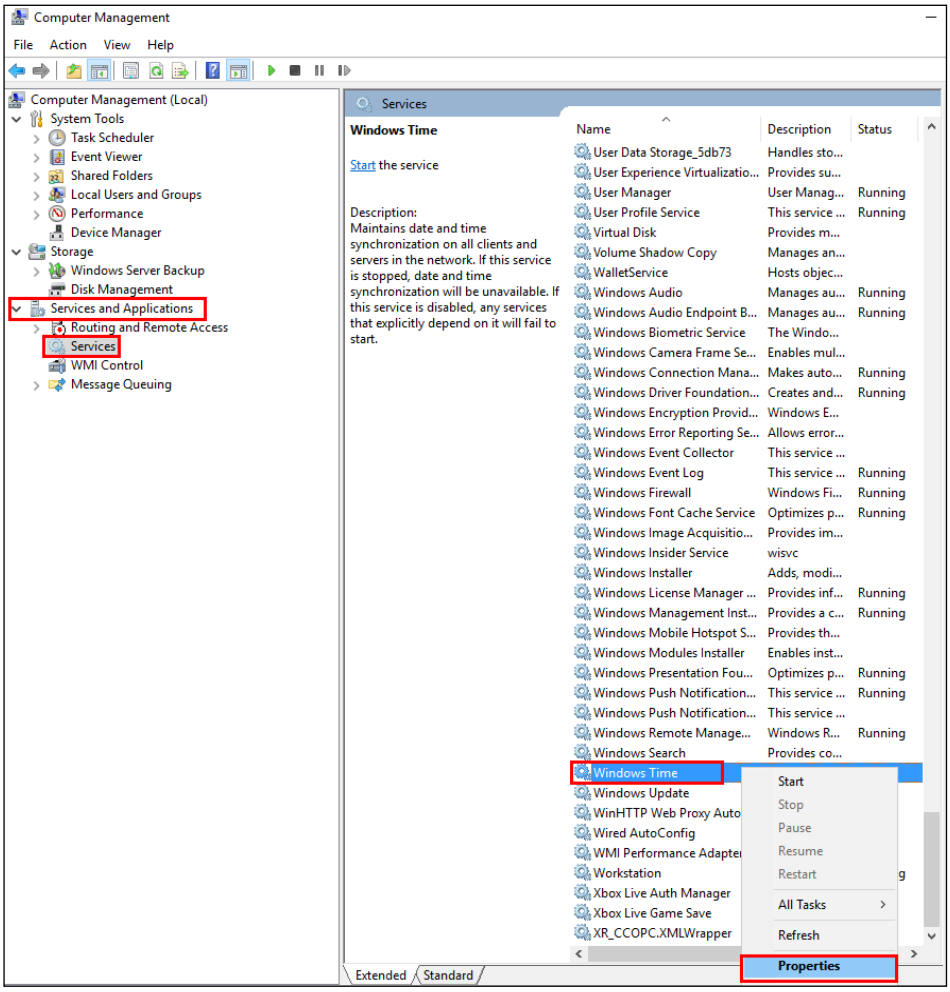
1. Click the "Find" icon in the taskbar.

2. Enter "Computer Management".

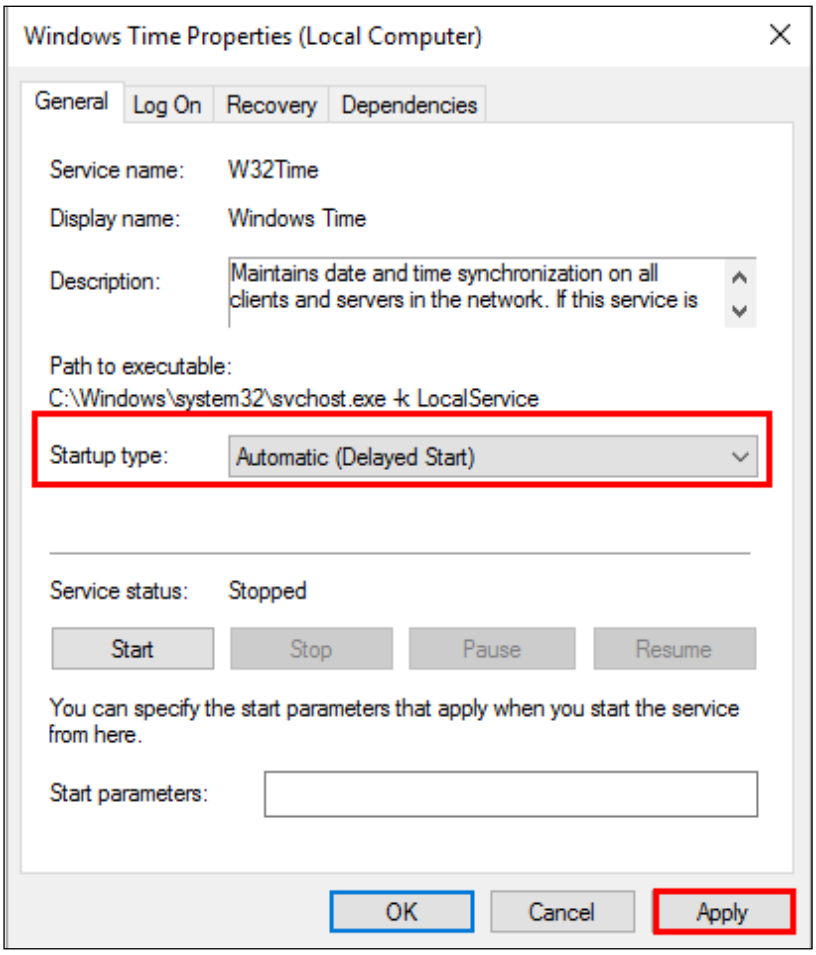
3. Start "Computer Management".



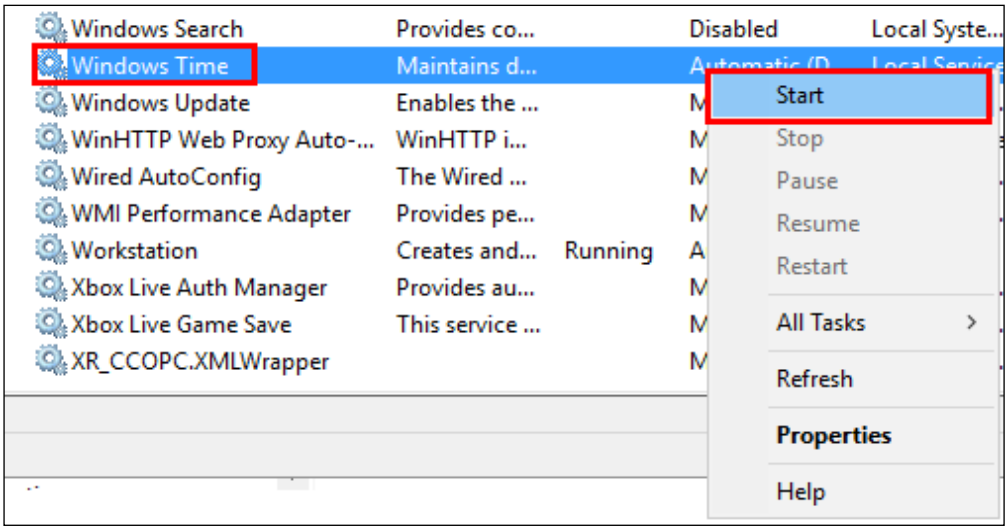
4. Navigate to the "Services and Applications > Services" folder.
5. Open the Properties object of the "Windows Time" service with a right mouse click.



6. Configure the "Startup type" "Automatic (Delayed Start)" and click on the "Apply" button and then on the "OK" button.

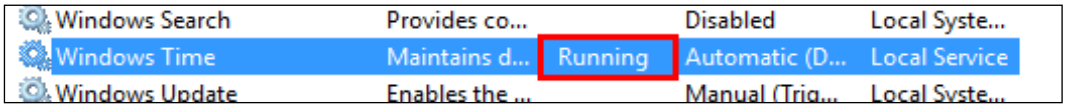


7. Open the context menu of the service "Windows Time" with a right mouse click and click on "Start" to start the service.



Result:

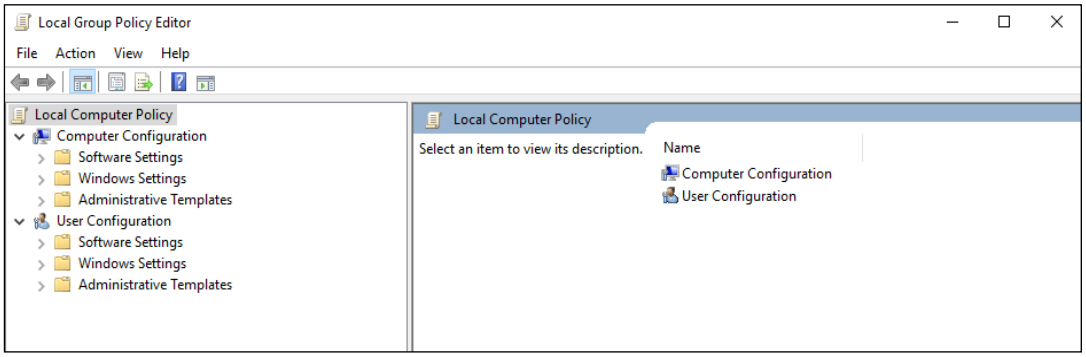
The Windows Time service is started.



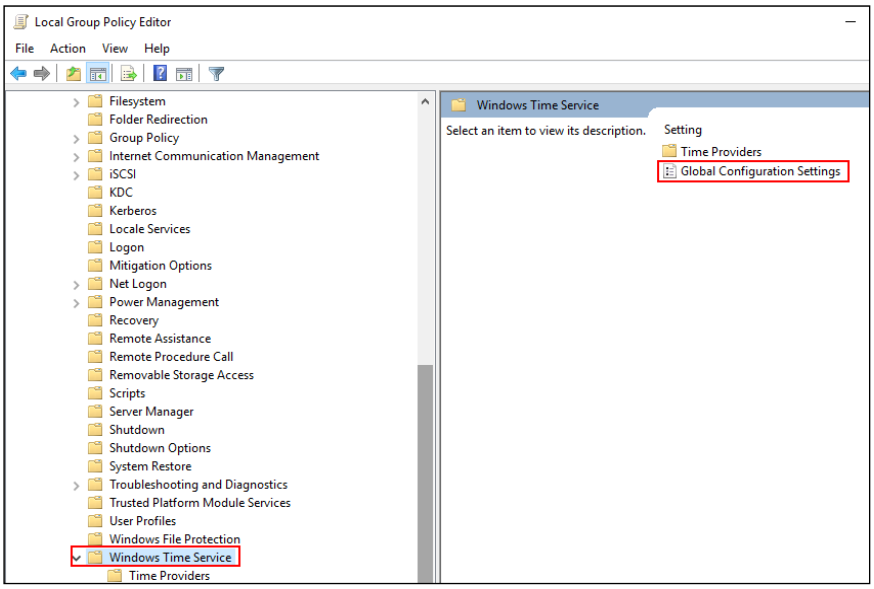
4 Configuring the NTP Master on the OS Server SV80A (OS Master)

To configure a PC station (SV80A computer) as an NTP server and thus to synchronize other PC stations with it, proceed as follows:

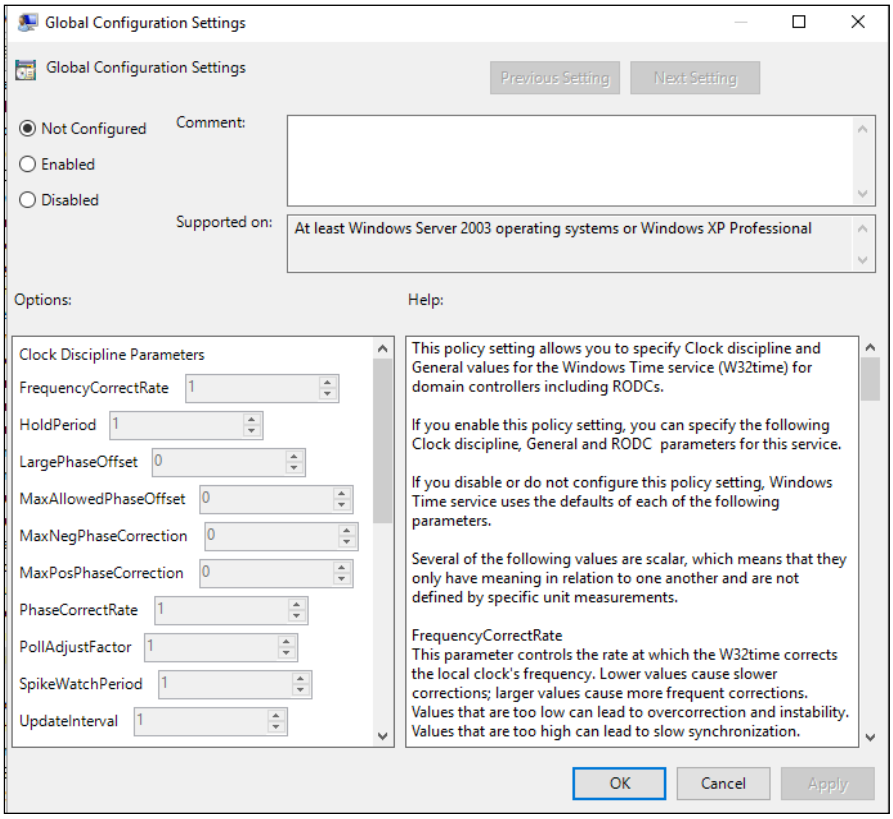
1. Log in with a user with administrative rights.
2. Open the Windows command line by pressing the key combination "Windows key + R".
3. Enter the command "gpedit.msc" in the input field "Open". This opens the "Local Group Policy Editor" dialog.



4. In the tree view, select the folder "Local Computer Policy > Computer Configuration > Administrative Templates > System > Windows Time Service".
5. Double-click on the "Global Configuration Setting" object in the details window.



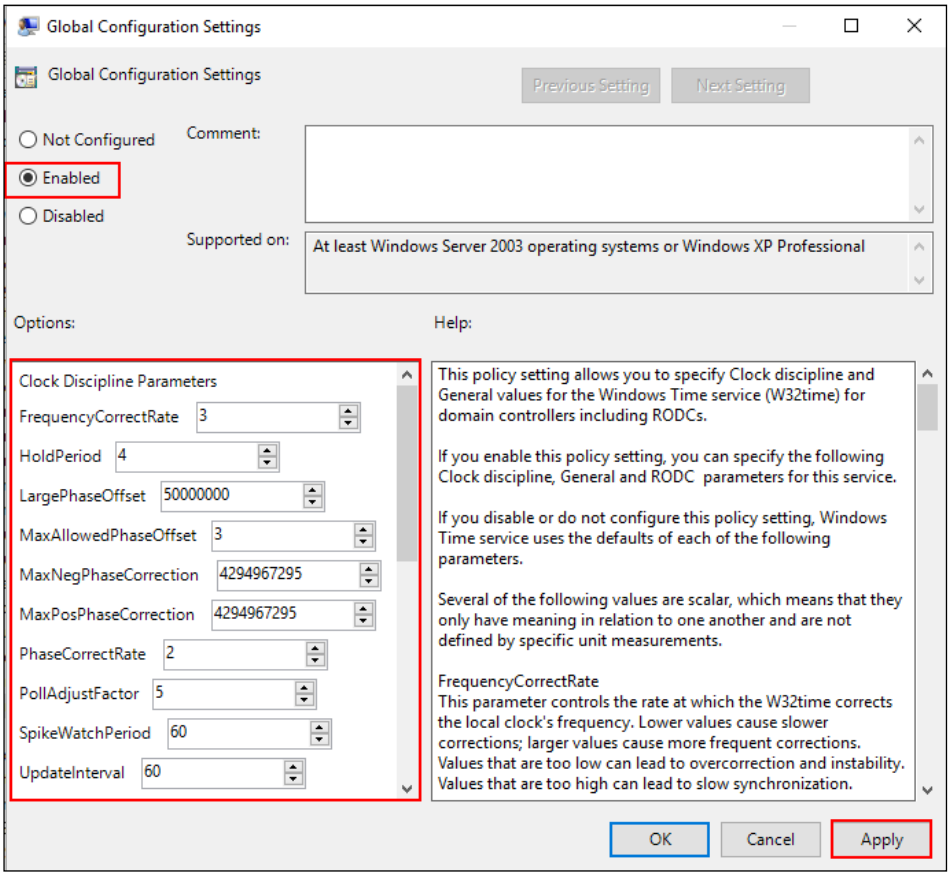
The "Global Configuration Setting" dialog opens.



6. Activate the option "Enabled".
7. Make the following settings:

Field	Value
FrequencyCorrectRate	3
HoldPeriod	4
LargePhaseOffset	50000000
MaxAllowedPhaseOffset	3
MaxNegPhaseCorrection	4294967295 (max. value)
MaxPosPhaseCorrection	4294967295 (max. value)
PhaseCorrectRate	2
PollAdjustFactor	5
SpikeWatchPeriod	60
UpdateInterval	60
AnnounceFlags	5
EventLogFlags	2
LocalClockDispersion	10
MaxPollInterval	10
MinPollInterval	10

8. Leave all other values at the default setting.
9. Click the "Apply" button.



10. Click on the "OK" button.
11. In the tree view of the editor " Local Group Policy Editor " select the folder "Local Computer Policy > Computer Configuration > Administrative Templates > System > Windows Time Service > Time Provider". The corresponding objects are displayed in the detail window.
12. Make the following settings:

Object	Setting
Activate Windows NTP Client	Double-click the object and activate the option "Disabled".
Configuring the Windows NTP Client	Double-click the object and activate the option "Disabled".
Activate Windows NTP Server	Double-click the object and activate the option "Enabled".

13. Close the "Local Group Policy Editor" dialog.

12. start the Windows command prompt as administrator.

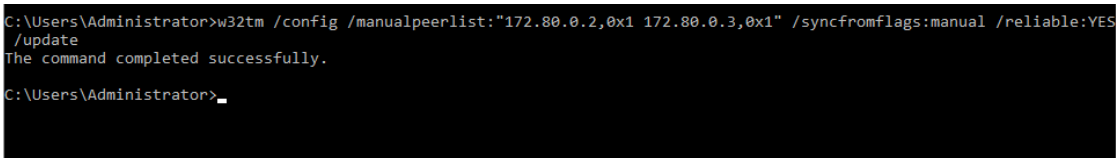
To do this, click the "Find" icon in the taskbar and type "cmd". The search result now shows the "Command Prompt" program. Start the program with a right click as "Run as administrator".

13. At the Windows command prompt, type the following commands (replace "IP address Server1" and "IP address Server2" with the IP addresses of the two servers and note the space before the second IP address):

w32tm /config /manualpeerlist:"<IP-Adresse Server1>,0x1 <IP-Adresse Server2>,0x1"/syncfromflags:manual /reliable:YES /update

Example:

w32tm /config /manualpeerlist:"172.80.0.2,0x1 172.80.0.3,0x1“
/syncfromflags:manual /reliable:YES /update



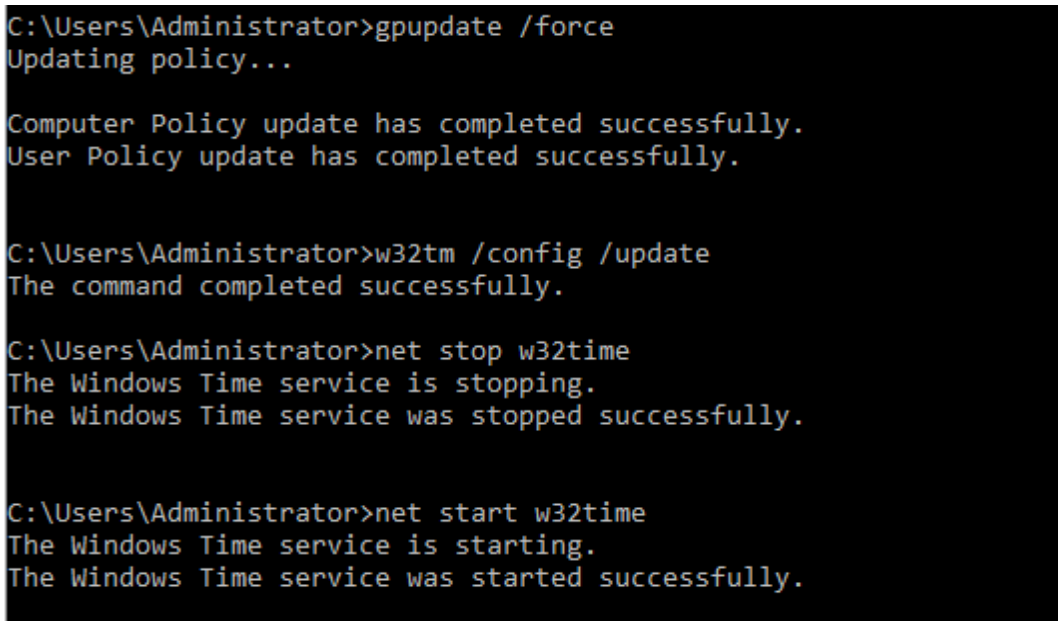
14. after changes to the NTP service (W32time is the service, W32tm the Application to Service) it must be restarted. You achieve this via a computer restart.

Alternatively, you can run the following commands at the command prompt:

1. gpupdate /force
2. w32tm /config /update

Starting and stopping the service:

3. net stop w32time
4. net start w32time



5 Configuring NTP Master on OS Server SV80B (OS Standby)

To configure a PC station (computer SV80B) as a redundant NTP server,

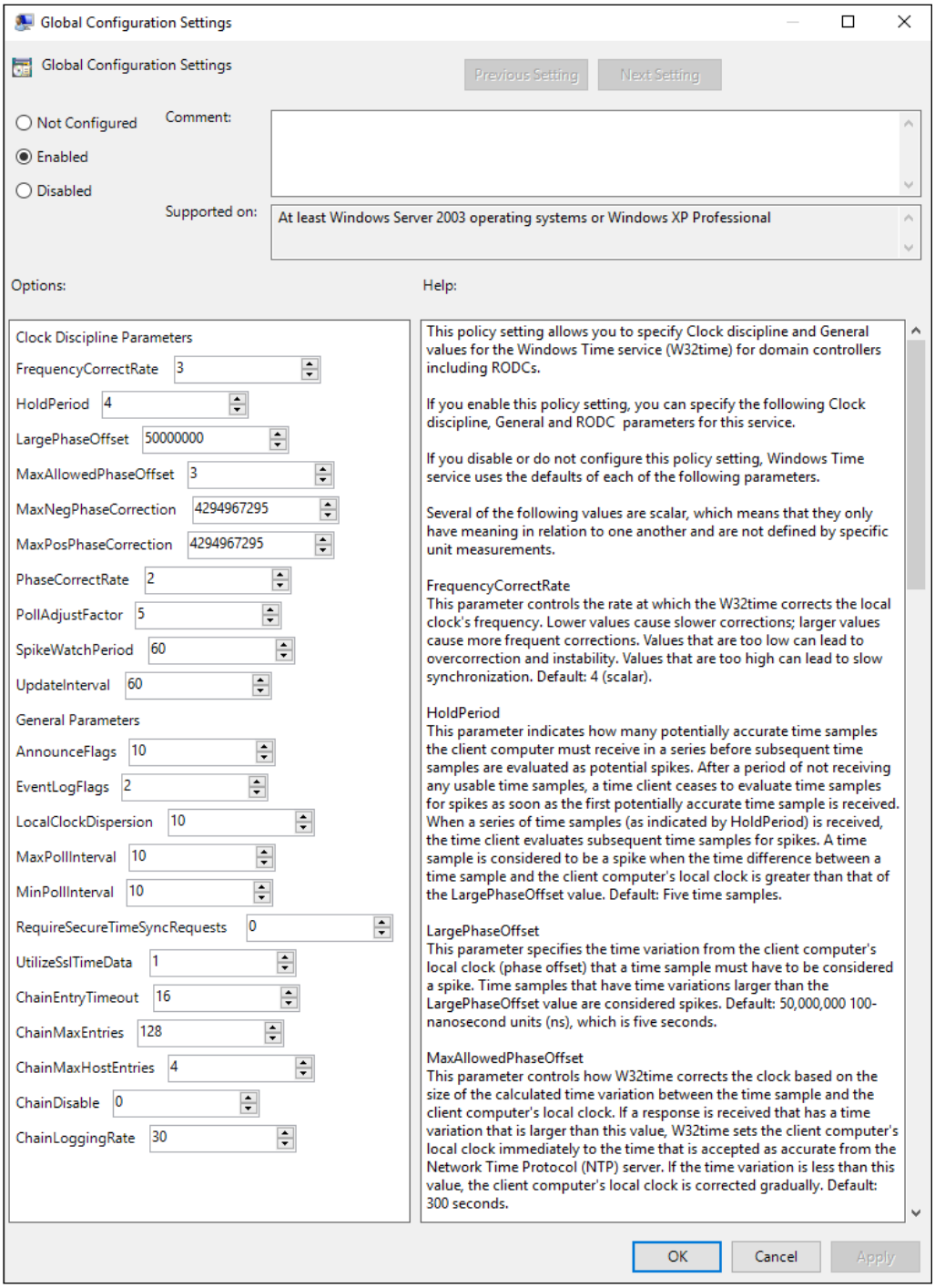
proceed as follows:

1. Perform steps 1 to 6 described in section 1.4 "Configuring the NTP Master on the OS Server SV80A (OS Master)".

2. Make the following settings in the "Global Configuration Settings" dialog:

Field	Value
FrequencyCorrectRate	3
HoldPeriod	4
LargePhaseOffset	50000000
MaxAllowedPhaseOffset	3
MaxNegPhaseCorrection	4294967295 (max. value)
MaxPosPhaseCorrection	4294967295 (max. value)
PhaseCorrectRate	2
PollAdjustFactor	5
SpikeWatchPeriod	60
UpdateInterval	60
AnnounceFlags	**10**
EventLogFlags	2
LocalClockDispersion	10
MaxPollInterval	10
MinPollInterval	10

5. Leave all other values at the default setting.



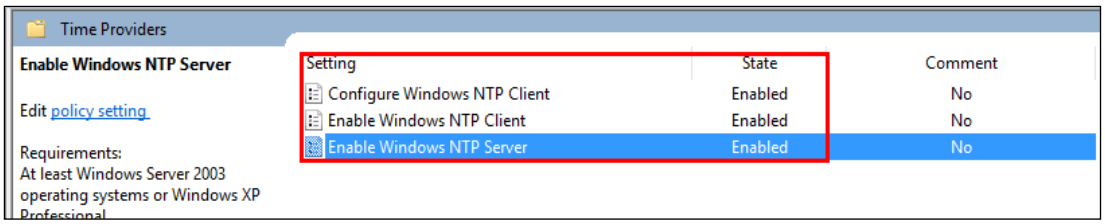
4. click on the "OK" button.

6. In the tree view of the editor " Local Group Policy Editor " select the folder "Local Computer Policy > Computer Configuration > Administrative Templates > System > Windows Time Service > Time Provider". The corresponding objects are displayed in the detail window.

7. Make the following settings:

Object	Setting
Activate Windows NTP Client	Double-click the object and activate the option "Enabled".
Configuring the Windows NTP Client	Double-click the object and activate the option "Enabled".

Object	Setting
Activate Windows NTP Server	Double-click the object and activate the option "Enabled".



7. Start the Windows command prompt as administrator (section 1.4, Step 12).

8. At the Windows command prompt, type the following commands (replace "IP-Address Server1" and "IP-Address Server2" with the IP Addresses of both servers):

w32tm /config /manualpeerlist:"<IP-Adresse Server1>,0x1 <IP-Adresse Server2>,0x1"/syncfromflags:manual /reliable:YES /update

Example:

w32tm /config /manualpeerlist:"172.80.0.2,0x1 172.80.0.3,0x1" /syncfromflags:manual /reliable:YES /update

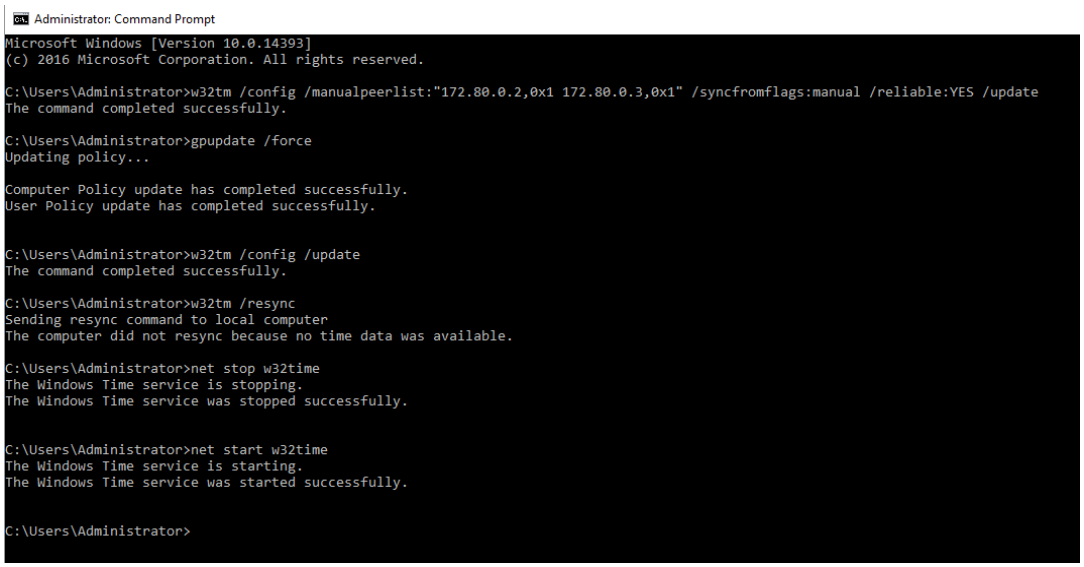
9. after changes to the NTP service (W32time is the service, W32tm the Application to Service) it must be restarted. You achieve this via a computer restart.

Alternatively, you can run the following commands at the command prompt:

1. gpupdate /force
2. w32tm /config /update
3. w32tm /resync

Starting and stopping the service:

4. net stop w32time
5. net start w32time



6 Configuring the NTP Client

6.1 NTP Client on the PH configuration

1. Log in with a user with administrative rights.
2. Enter the command "gpedit.msc" into the Windows command line.
3. In the tree view of the editor " Local Group Policy Editor " select the folder "Local Computer Policy > Computer Configuration > Administrative Templates > System > Windows Time Service > Time Provider".
4. Double-click on the "Enable Windows NTP Client" object in the detail window of the editor.

5. Activate the "Enable" option.

6. Click on the "Apply" button and then on the "OK" button.

7. Double-click on the "Configure Windows NTP Client" object in the details window.

8. Activate the "Enable" option.

9. Select the following settings:

- Enter the IP address of the NTP server in the "NtpServer" input field.

as follows: "<IP-Adresse Server1>,0x9" (e.g.

172.80.0.2,0x9).

- For redundant servers, also enter the IP address of the

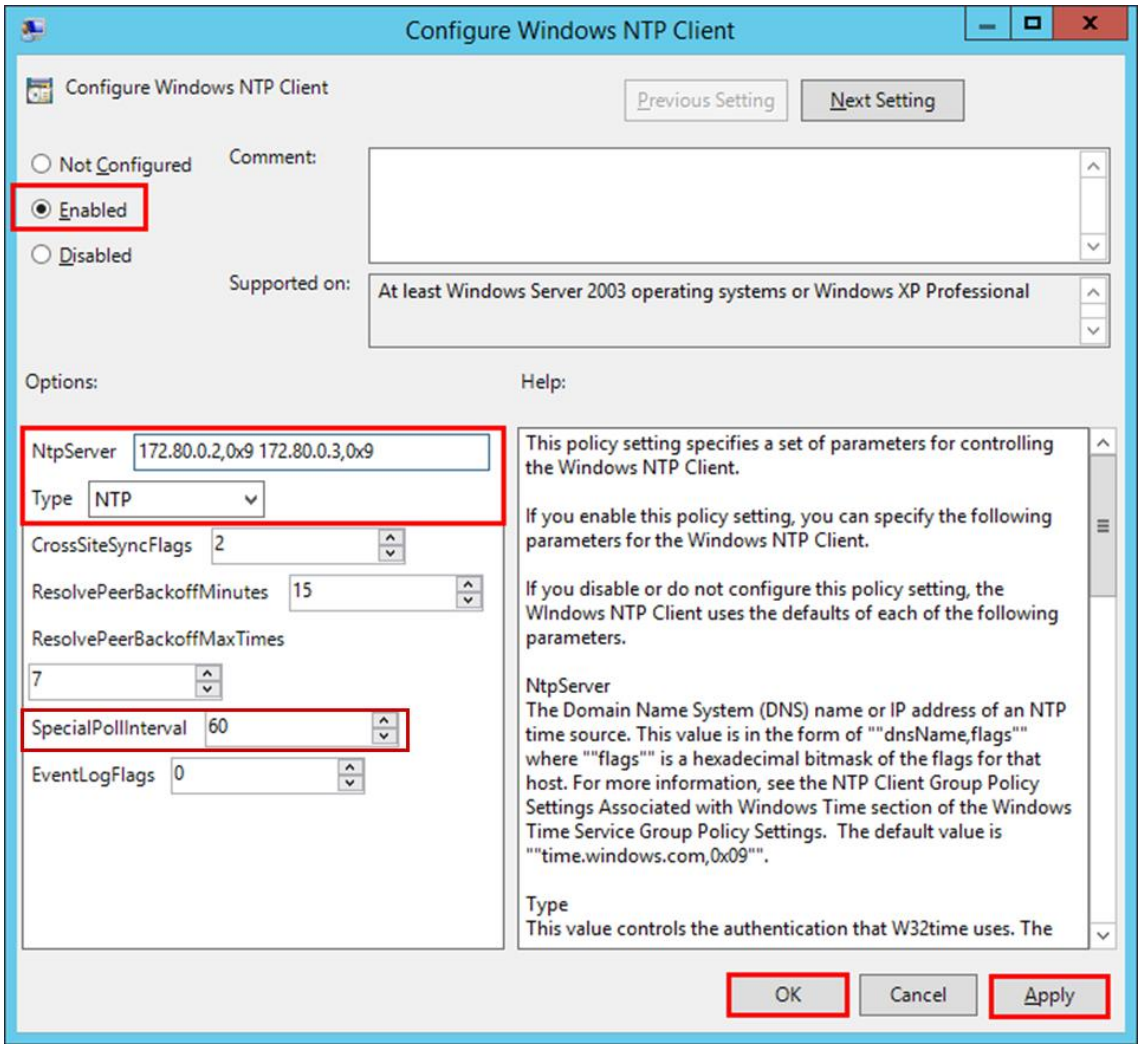
second NTP server, separated by spaces:

"<IP-Adresse Server1>,0x9 <IP-Adresse Server2>,0x9"

(e.g.*172.80.0.2,0x9 172.80.0.3,0x9*).

- Select the entry "NTP" from the dropdown list "Type".
- Enter the value "60" in the input field "SpecialPollInterval".
- For all other settings take the default values.

10. Click on the "Apply" button and then on the "OK" button.



11. Start the Windows command prompt as administrator (section 1.4, Step 12).

At the Windows command prompt, type the following commands (replace "IP-Address Server1" and "IP-Address Server2" with the IP Addresses of both servers):

w32tm /config /manualpeerlist:"<IP-Adresse Server1>,0x1 <IP-Adresse Server2>,0x1“ /syncfromflags:manual /update

Example:

w32tm /config /manualpeerlist:" 172.80.0.2,0x1 172.80.0.3,0x1“ /syncfromflags:manual /reliable:YES /update

12. after changes to the NTP service (W32time is the service, W32tm the Application to Service) it must be restarted. You achieve this via a computer restart.

Alternatively, you can run the following commands at the command prompt:

1. gpupdate /force
2. w32tm /config /update
3. w32tm /resync

Starting and stopping the service:

4. net stop w32time
5. net start w32time

Note

If you want to configure the NTP client functionality on several computers, then it makes sense to use the commands in a batch file.

6.2 NTP Client on the IS configuration

You can perform the NTP client configuration on the IS analogously to the configuration in section 1.6.1.

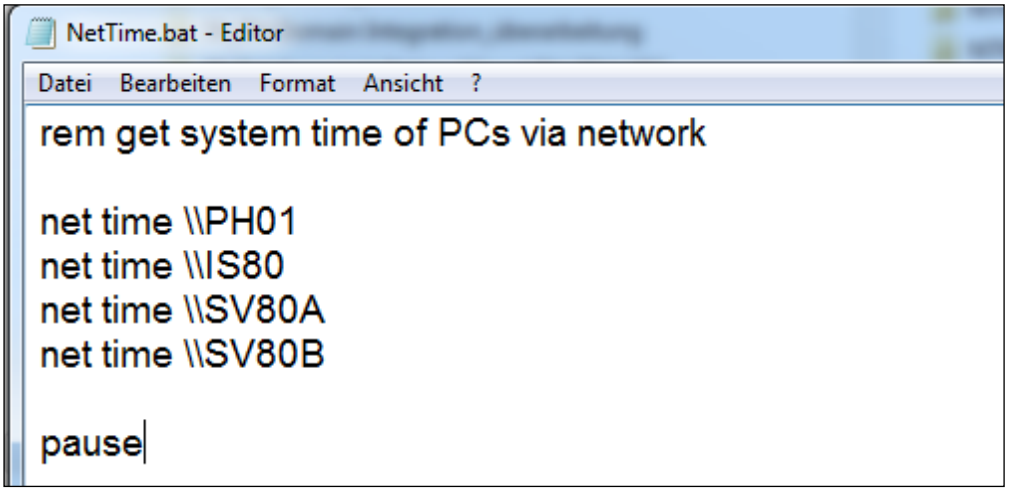
7 To check the time synchronization

7.1 Read out the computer time with the command "net time"

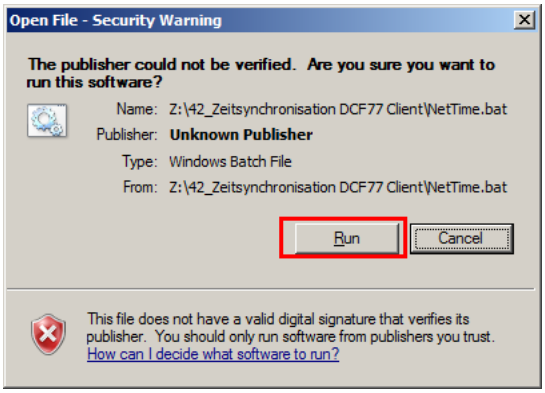
You can determine the time of different computers in the network with the command "net time ***Error! Link reference invalid.>“*** .

Procedure:

1. Create a text file and name the file "NetTime.bat".
   Copy the following code into the batch file:
   rem get system time of PCs via network
   net time \\PH01
   net time \\IS80
   net time \\SV80A
   net time \\SV80B
   pause

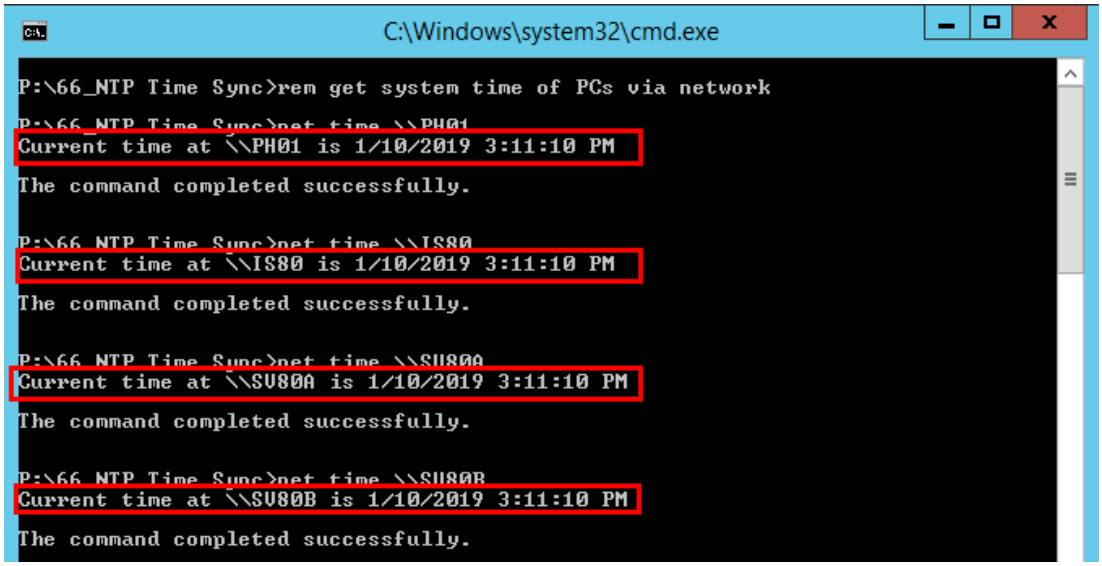


2. Adapt the host names to your installation.
3. Double-click on "NetTime.bat".
4. Click on the "Run" button.



Result:

This allows you to judge whether the systems are working "to the second" synchronously.



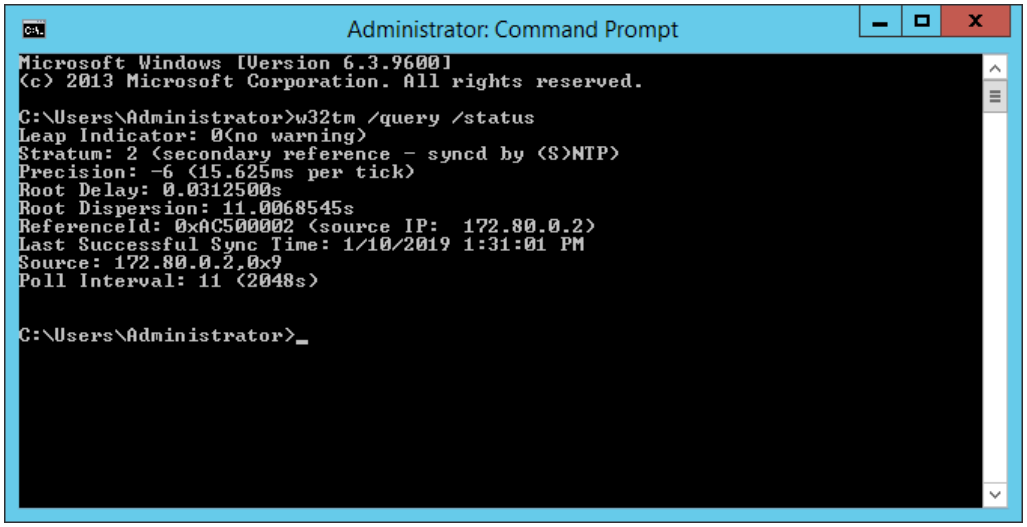
7.2 Querying a local computer with the command "w32tm /query /status"

If you want to check a higher accuracy than one second, you can use the command *"w32tm /query /status"*.

Procedure:

1. Open the application "cmd" on the computer you want to check.
2. Type the command *"w32tm /query /status"*.
3. Press the "Enter" button.

Result:



7.3 Query the NTP server with the command "w32tm /stripchart"

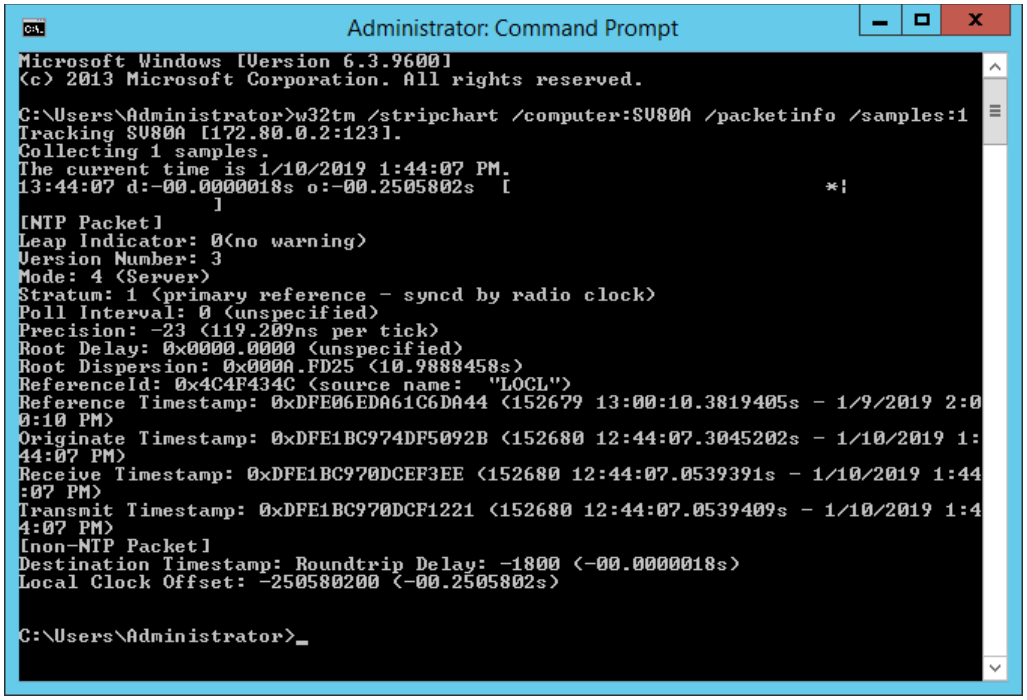
Procedure:

1. Open the application "cmd" on a computer in the network.
2. Give the command "*w32tm /stripchart /computer:<computername> /packetinfo /samples:1*".

   Example:

   w32tm /stripchart /computer:SV80A /packetinfo /samples:1
3. Press the "Enter" button.

Result:



8 Appendix

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8.2 Links and literature

Table 8-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com.
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/66579062
\3\	

8.3 Change documentation

Table 8-2

Version	Date	Modifications
V1.0	01/2019	First version