

SIEMENS

SIMATIC

Process Historian 2014 SP1 Process Historian - Administration

System Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.

⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Basics

1.1 Overview

Introduction

SIMATIC Process Historian is a central archiving system for storing process data, such as process values and alarms.

The Process Historian uses Microsoft SQL Server 2008 R2 SP1 64 Bit. The Process Historian archives historical data originating from an PCS 7 operator station (OS) or a WinCC OS or from SIMATIC BATCH. The data can belong to different PCS 7 or WinCC projects. Access to the historical data is transparent for the OS clients.

Services

Process Historian employs four services for processing, storing and backing up data:

- **SIMATIC Process Historian Server**
This service implements all functions the server needs to process and store data.
- **Process Historian Maintenance Service**
This service implements all functions that are necessary to maintain the Process Historian database. The Maintenance Service handles tasks such as starting mirroring, mirror monitoring, restore functions, maintenance of the transaction log and suchlike.
- **Process Historian Redundancy Service**
This service implements functions that are necessary for data exchange between two redundant server systems.
- **Process Historian Discovery Service**
This service supports the search for connected Process Historian systems. The Discovery Service is essential for the functionality of the Process Historian.

Operating states










You can give the Process Historian the following commands by using the shortcut menu of the icon in the system tray (information area):



- Start
- Shut down
- Start recovery

<p>NOTICE</p> <p>Disabling the Process Historian server before shutting down</p> <p>You must disable the Process Historian server before shutting down the computer on which the Process Historian server is running. There are two options available to you:</p> <ul style="list-style-type: none"> - In the start screen of the Process Historian Management Console, select the status "Shut down". - In the shortcut menu of the system tray of the Process Historian, select the "Shut down" command. <p>The "Inactive" status is displayed.</p>

Overview of operating states

The following table provides an overview of the operating states and the color coding of the associated icons in the system tray:

Symbol	Process Historian operating state	Description
	Active	In the "Active" operating state, the Process Historian archives data. You can query data from the OS Server or the Information Server.
	ActiveRecovery	In the "ActiveRecovery" operating state, the Process Historian requests data from an OS Server for a recognized period of inactivity. The preceding and the subsequent operating state is "Active".
	Starting restore	This operating state starts "ActiveRecovery".
	ActiveRecoveryStopping	This operating state terminates "ActiveRecovery" and is the intermediate state between "ActiveRecovery" and "Active".
	Deactivated	The Process Historian changes to the "Disabled" operating state in the case of maintenance tasks where access to the database is limited. The maintenance tasks can include the creation or the backing up/restoring of segments. The system is offline in this operating state. Access via the network is not possible.
	Locked	The Process Historian server is in the "Locked" state. In this state, the Process Historian server can no longer be switched to "Enabled". No more values are archived. Read access to stored values is possible.
	Deactivate	"Deactivate" is the intermediate state between "Active" and "Deactivated".
	Error	The "Error" operating state occurs when an error has been recognized or when no connection to the SIMATIC Process Historian service exists.
	Inactive	No data are archived in the "Inactive" operating state. In this operating state, you can carry out updates, maintenance work to the Process Historian PC or a restart of the PC.

Symbol	Process Historian operating state	Description
	Shut down	The intermediate state between "Active" and "Inactive".
	Starting	The intermediate state between "Inactive" and "Active".

"Locked" state of the Process Historian server

If insufficient disk space is available on a monitored drive, the maintenance service sets the Process Historian server to the "locked" state.

In this state, the Process Historian server can no longer be set to "Enabled". The maintenance service can set the Process Historian server to "Enabled" again only when free space has been increased.

NOTICE
<p>Avoiding the "Locked" state</p> <p>To ensure enough free space is available for the operation of the Process Historian, regularly check the currently available space in the "I/O systems" dashboard.</p> <p>Determine which automatic mechanisms for reducing the used space can be activated in the dashboards.</p>

Checking the current space

You can find an overview of your hard disks space in the "I/O systems" dashboard.

Click in "I/O systems" dashboard in the "Available I/O subsystems" window on the desired drive.

The used space is displayed as relative and absolute in a pie chart in the table.

Space monitoring

On the OS, PH-Ready monitors the disk space on the system drive where the cache is located.

On the Process Historian server the maintenance service monitors the disk space on the following drives:

- System drive
- Drive where the transaction log is located
- All data drives on which the Process Historian database or database segments are located

A warning is sent to WinCC if the following occurs:

- The free space falls below the limit of 100 GB and is less than 20 % of the drive capacity.

The Process Historian server switches to the "Locked" state when the following occurs:

- The free space falls below the limit of 50 GB and is less than 10 % of the drive capacity.
 - Hard drive up to 500 GB: Free space < 10 %
 - Hard drive larger than 500 GB: Free space < 50 GB

Increasing free space

To put the server back into the "Enabled" state, you must make sufficient free space available.

Options available:

- Put segments offline. This required creating backups of the segments.
- Freeing up space on the drive:
Log files, temporary files and other unnecessary files can be deleted.
Redundancy: Check the size of the transaction log and maybe reduce it (see section "Redundant system (Page 53)").
- Reduce the number of runtime segments or future segments.
This measure is only effective after segmentation.

See also

Redundant system (Page 53)

1.2 Data structures

Value sequences

The Process Historian stores each value sequence to be archived and its individual values at certain points in time with a unique identifier (GUID). The physical location of the individual values is determined with this identifier. This provides the user with easy access to the values.

To improve performance when archiving a large number of process values and alarms, the value sequences in the Process Historian can be divided into data groups.

Each data group is assigned a storage location on a shared cluster of physical sources.

- Data group 1 on drive partition 1
- Data group 2 on drive partition 2
- etc.

Note

You can distribute the data groups among the available hard disks in order to influence the performance and the scaling of the system used. Distribution is carried out using the Wizard when creating the database.

Partition

The amount of runtime data of a single value sequence to be archived, such as an archive tag, for example, is not limited and constantly increases.

The entire amount of data that is assigned to an individual value sequence must therefore be divided into several "partitions" using the time axis.

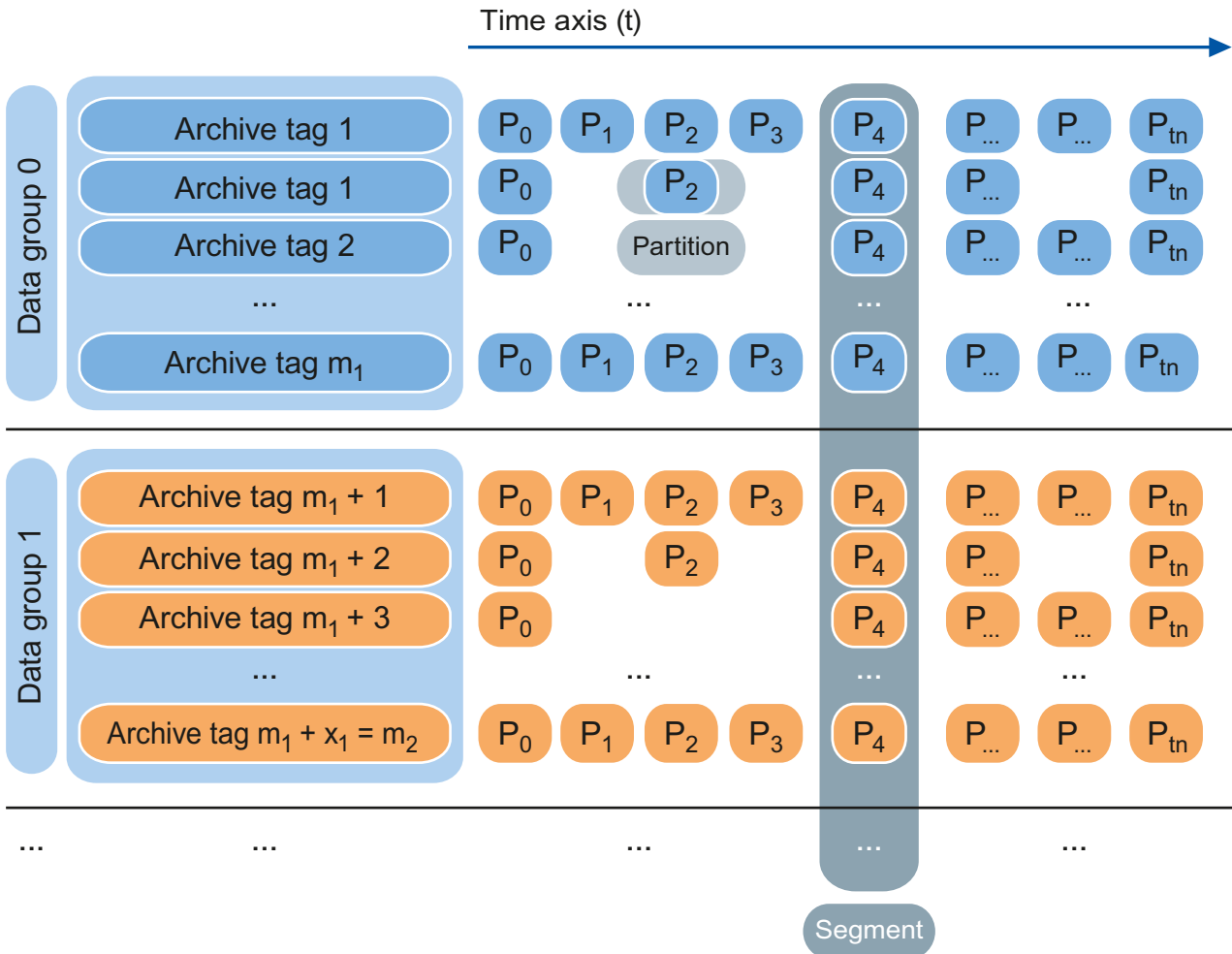
Data groups are divided into partitions using the time axis.

The following conditions apply to partitions:

- Each partition has a high and low limit for the time period.
- but the high time limit must always be higher than the low one.
- The partitions of a data group should not overlap.

Segment of a runtime database

A segment is a summary of all archive data incurred during a period of time.



A database segment consists of the sum of partitions of all data groups that share the same high and low time limits. These groups correspond to the limits of the segment.

The difference between the high and low time limit is referred to as "time period" of the database segment.

Each segment has a unique segment number.

- The start segment, the first segment created in a system, has the number 100,000.
- The segment whose low limit is equal to the high limit of segment n is referred to as segment "n+1".
- The segment whose high limit is equal to the low limit of segment n is referred to as segment "n-1".

1.3 Segmentation

Introduction

A Process Historian database can process and manage very large volumes of data. The saved data are split up into segments so that performance is not impaired.

Segments are defined by a time period with a high and low time limit. A segment contains the amount of data that was recorded during the defined time period.

By default, segments are created with a segment size of one week when the Process Historian database is created. You can change this setting. You can find information on changing segment configurations under 'Segmentation dashboard (Page 35)'.

The configuration of segments that contain data cannot be changed later.

Note

You can already specify all segmentation settings during installation of the database in advanced mode. The selection of the segment unit affects the required hard disk space.

The segment size is extrapolated proportionally to the estimated load of the data values according to the user-defined settings.

Segmentation configuration

You can change the properties of segmentation on the "Segmentation" dashboard as Process Historian administrator.

You can make the following settings:

- Anchor point of segmentation
- Time period of a segment
- Number of prepared segments
- Total number of runtime segments

The following table provides an overview of the basic segmentation parameters:

Parameter	Value	Description
Anchor point of segmentation	Date, time	Start time of the segment
Time period of the segment	Day, week, month	Segment size
Multiplier	Integer	Multiplier for the configured period of segmentation
Number of segments	Prepared segments	Total number of prepared segments
	Total number of runtime segments	Number of active segments in runtime that are available for storing process values and alarms. These segments are not archived.

The Process Historian continuously creates segments with the defined time period. To ensure that the entire period of possible times is covered, there is a high and a low "Catch-all" segment.

1.3 Segmentation

These special segments collect all incoming data that lies outside the **current** runtime segment. These segments are called "Catch-all-upper" (CAU) and "Catch-all-lower" (CAL). The CAL and CAU segments are permanently available and cannot be deleted, removed or set offline.

Anchor point

When you change the anchor point, it should refer to a time at or after the last time stamp of all segments.

The anchor point of the segmentation does not have to be changed if the number of prepared segments or the total number of runtime segments is to be changed. Any existing segments are not deleted when the settings are changed (e.g. reducing the prepared segments).

This means the new settings are not reached when you reduce the prepared signals until the surplus and prepared segments have been used.

If the number of prepared signals is increased, a segmentation with the new settings is initiated immediately.

Note

If the last segment of the existing segmentation configuration ends before the anchor point of the new segmentation, an intermediate segment must be created. This intermediate segment starts with the end time of the last segment of the existing segmentation configuration and ends with the start time of the new segmentation configuration. A suitable anchor point is suggested to avoid the need for an intermediate segment. If you reject this suggestion, an intermediate segment is created automatically.

Segments: Types

In the Process Historian, there is a difference between segments of the "**Runtime**" and "**Archive**" types.

Runtime segments are displayed on the "Segmentation" dashboard. They have the following properties:

Action	Runtime segment	Archive segment
Change	Yes	No
Compression	No	Yes
Back up	No	Yes
Delete	No	Yes

Archive segments are displayed on the "Backup/Restore" dashboard. These are compressed or uncompressed, depending on the setting.

The status of a segment is classified as "Online" or "Offline".

- Segments of the "Runtime" type always have the status "Online".
- Segments of the "Archive" type can have the status "Online" or the status "Offline".

You can only read the contents of segments that are online. In order to read the contents of segments that are offline, you have to restore these segments.

Note

Information about restoring a segment is available under 'Restoring a segment (Page 32)'.

Segments: Status

The properties of segments are structured as follows:

Type	Status	Reading	Writing	Archiving	Deleting
Runtime	Online	Yes	Yes	No	No
Archive	Online	Yes	Indirect ¹⁾	Yes	No
Archive (archived)	Online	Yes	Indirect ¹⁾	Yes	Yes ²⁾
Archive (deleted)	Offline	No	Indirect ¹⁾	No	No

¹⁾ Pending changes in the CAL segment are transferred to the archive segment during the backup.

²⁾ Can only be deleted if no changes to the data were carried out after the last archiving.

Hardware configuration

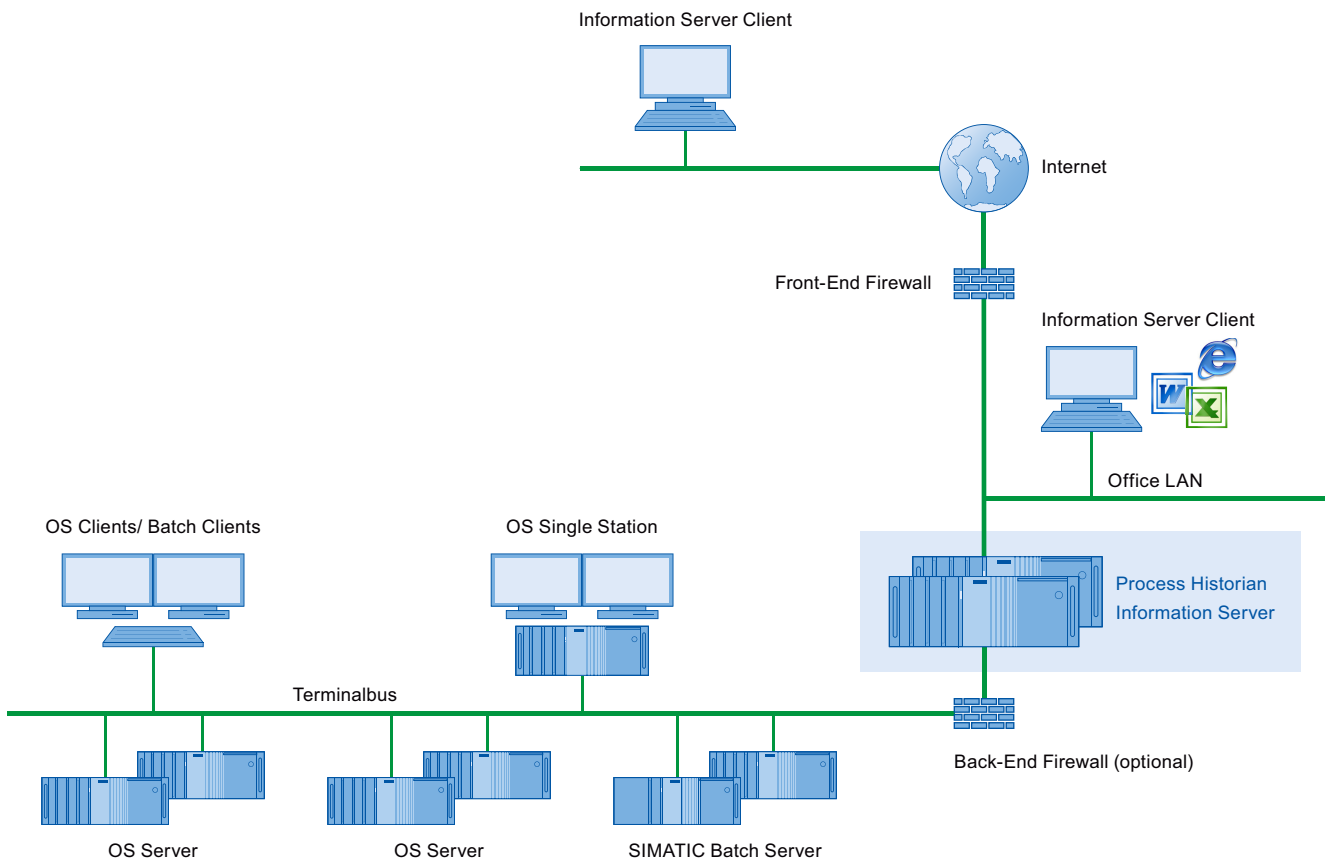
The following section describes the hardware requirements for Process Historian.

Overview of the configuration

The hardware configuration shown here refers to the SIMATIC Process Historian and the Information Server. The simple configuration of Process Historian provides a clear overview of the topology.

The figure below illustrates a simple configuration.

A sufficiently powerful PC system is capable of handling all tasks involved. This configuration is suitable for small-scale installations with corresponding quantity frameworks.



Hardware example for small quantity frameworks

You can handle a data volume of up to two servers and a maximum archiving load of 1500 values per second and server, for example, by using a SIMATIC IPC of the 847 series.

Hardware equipment

CPU	Intel Xeon E3-1268L V3; 2.3 GHz	
RAM	16 GB DDR3; SDRAM	
Hard disks	240 GB SSD SATA	Operating system and software
	RAID 5 (3 x 1 TB, HDD SAS)	Process Historian Database and transaction log
RAID controller	Hardware RAID controller PCIe X8 in PCIe X16 slots incl. battery backup unit (BBU)	

The described RAID 5 system is approx. 1.8 TB.

All SAS HDDs are connected to the hardware RAID controller.

Process Historian and Information Server on the same system

Process Historian and Information Server can be installed and operated on the same system.

In this case the two server applications share the available hardware resources. Depending on the frequency of data queries from the WinCC client systems and Information Server clients, we recommend using higher-grade equipment. You need at least 16 GB of RAM.

Hardware example for medium quantity frameworks

Use a comparable system based on the hardware listed in the following table to handle the data volume of up to 12 servers at an archiving load of up to 12,000 values per second.

Configuration of a PRIMERGY RX300 S8

CPU	Intel Xeon E5-2650 V2; 2.6 GHz	
RAM	32 GB DDR3	
Hard disks	RAID 1; 2 x HD SAS 6G 300 GB 10K HOT PL 2.5"	Operating system and software
	RAID 1; 2 x HD SAS 6G 300 GB 10K HOT PL 2.5"	Transaction log
	RAID 10; 4 x HD SAS 6G 900 GB 10K HOT PLUG 2.5"	Process Historian database
RAID controller	SAS 6G 5/ 6 512 MB (D2616); BBU expansion RAID 5/ 6 V16	

This configuration allows you to expand RAM, as well as the number of processors and HDDs.

The hardware configuration described is based on the use of internal hard disks for:

- Operating system, SQL server
- Process Historian database
- Transaction log

You can expand the scale in regard to database size and performance by using a Storage Area Network (SAN).

You can also increase the performance by creating and distributing the database to several symmetrical database groups on separate hardware RAID systems.

Hardware example for large quantity frameworks

Use a comparable system based on the hardware listed in the following table to handle the data volume from several projects at an archiving load of more than 12,000 values per second.

Configuration of a PRIMERGY RX300 S8

CPU	2 x Intel Xeon E5-2690 V2; 2.9 GHz	
RAM	64 GB DDR3	
Hard disks (internal)	4 x 300 GB 2 x RAID 1	Operating system and software
Storage Area Network (SAN)	4 x RAID 1 (each with 2 x HD SATA 2 TB)	Process Historian database: 4 tag data groups from 0 to 3
	6 TB (3 x RAID 1, each with 2 x HD SATA 2 TB)	Process Historian database: Alarms, BATCH data, configuration data tags and alarms
	3 TB (3 x RAID 1, each with 2 x HD SATA 1 TB)	Process Historian database: Transaction log, general data groups
RAID controller	SAN Infotrend DS S24F-G2840-4 (14 x 2 TB, 6 x 1 TB)	

Redundant Process Historian servers

A redundant Process Historian system consists of symmetrically configured servers for master (principal) and standby (mirror) operation (e.g. PRIMERGY RX300 S8).

We recommend a dedicated redundancy connection with a minimum bandwidth of 1 gigabit between the redundant Process Historian servers.

The Witness Server component is designed for scenarios with automatic redundancy failover. It is also installed on an additional computer of the system, depending on availability an Information Server or WinCC Server.

Administration

3.1 Administration - overview

The Management Console is used for diagnostics and configuration of the Process Historian system. It is installed with the installation of the Process Historian and started automatically during logon. For a manual start, open the Management Console by selecting "Start > Programs > Siemens Automation > SIMATIC > Process Historian > Process Historian Management Console".

Note

Certificate verification by Internet Explorer

In Internet Explorer under "Internet Options > Advanced > Security", deactivate the option "Check for publisher's certificate revocation".

If this option is activated, it can slow down opening of the Process Historian and cause error messages.

Dashboards - Overview

The following table shows the dashboards of the Management Console and their tasks:

Dashboard	Description
Process Historian Management	<ul style="list-style-type: none"> • Display of fundamental hardware indicators and performance indicators for the PC and operating system • Display of basic indicators for the status and current activity of the Process Historian server • Display of the license status • Redundancy status • Changing the operating state
Plant structure	<ul style="list-style-type: none"> • Display of incorporated projects • Display of the OS server systems • Display of the PC name
I/O Systems	<ul style="list-style-type: none"> • Display of the available input and output devices • Display of the memory space used • Detailed information about the load
Diagnostics	<ul style="list-style-type: none"> • Diagnostic messages of the Process Historian • Messages from the event display of the operating system
Backup/Restore	<ul style="list-style-type: none"> • Display of the segments of the "Runtime" type • Display of the segments of the "Archive" type • Creating segment backups • Restoring backed-up segments

Dashboard	Description
Compression	<ul style="list-style-type: none">• Display of the compression state• Configuration of the number of uncompressed archive segments
Segmentation	<ul style="list-style-type: none">• Display of the current segmentation setting• Changing the segmentation settings
Database backup	<ul style="list-style-type: none">• Manual creation of full database backups• Automatic (cyclic) creation of full database backups
Redundancy	<ul style="list-style-type: none">• Display of the redundancy status• Switchover / disconnection of principal (master) and mirror (standby)• Redundancy configuration
Licensing	<ul style="list-style-type: none">• Display of the current license status of server and project
SIMATIC Batch Backup/Restore	<ul style="list-style-type: none">• Display of the selected batch data• Create backups of batch data• Restoring backed-up batch data

3.2 Process Historian Management dashboard

Overview

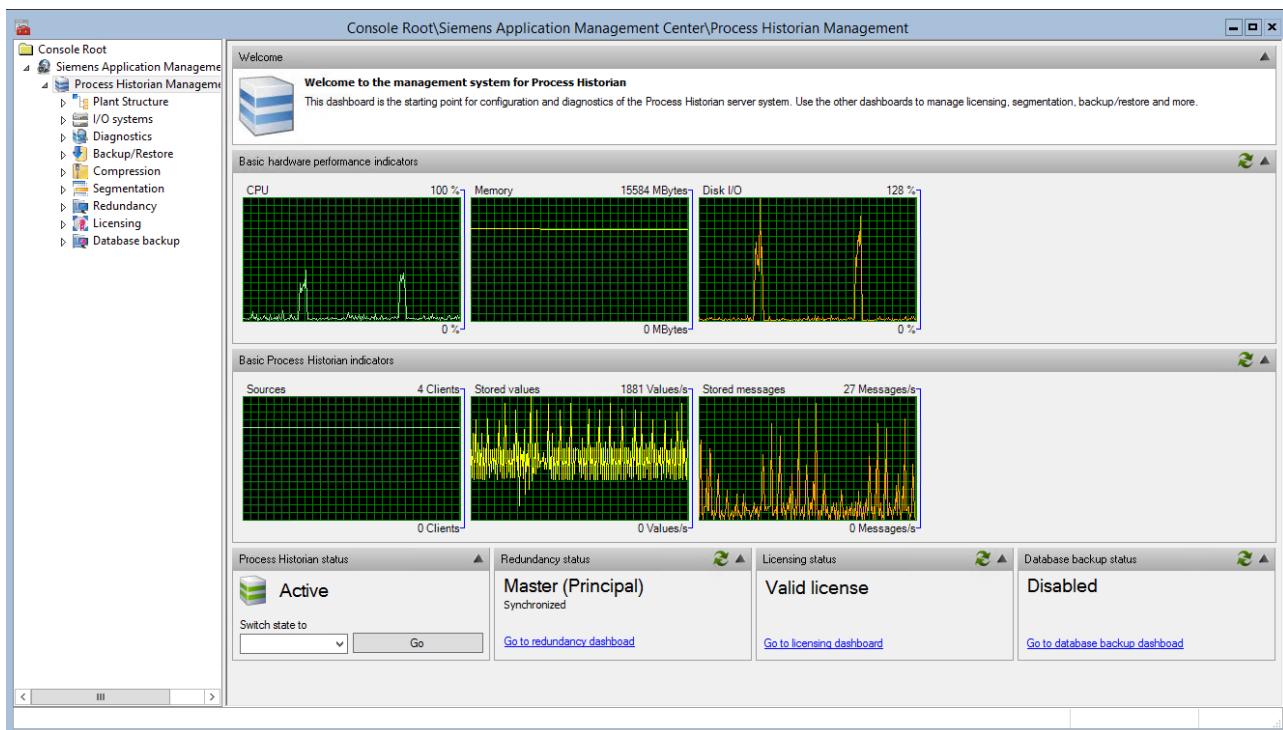
The "Process Historian Management" dashboard includes information about:

- Basic indicators for monitoring the PC:
 - Processor load (CPU)
 - Available RAM
 - Hard disk load (Disk I/O)
- Basic indicators on Process Historian:
 - Number of connected data sources
 - Stored tags per second
 - Stored messages per second
- Operating state of the Process Historian server
- Redundancy status of the Process Historian
- Licensing status of the Process Historian
- Automatic backup Process Historian

Note

Display in percent

Percentage values displayed can exceed 100 % for a short time. These values are determined by a statistical extrapolation from mean values. They do not correspond to the real values.



Status control

Process Historian status: Changing the operating mode

You can change the operating state of the Process Historian on the "Process Historian Management" dashboard.

The following operating modes are available:

- Start
- Shut down
- Start recovery

For this purpose, select the respective entry from the drop-down list in the "Process Historian status" area.

Redundancy and licensing status

The status respectively displayed can be updated in the redundancy and licensing status fields.

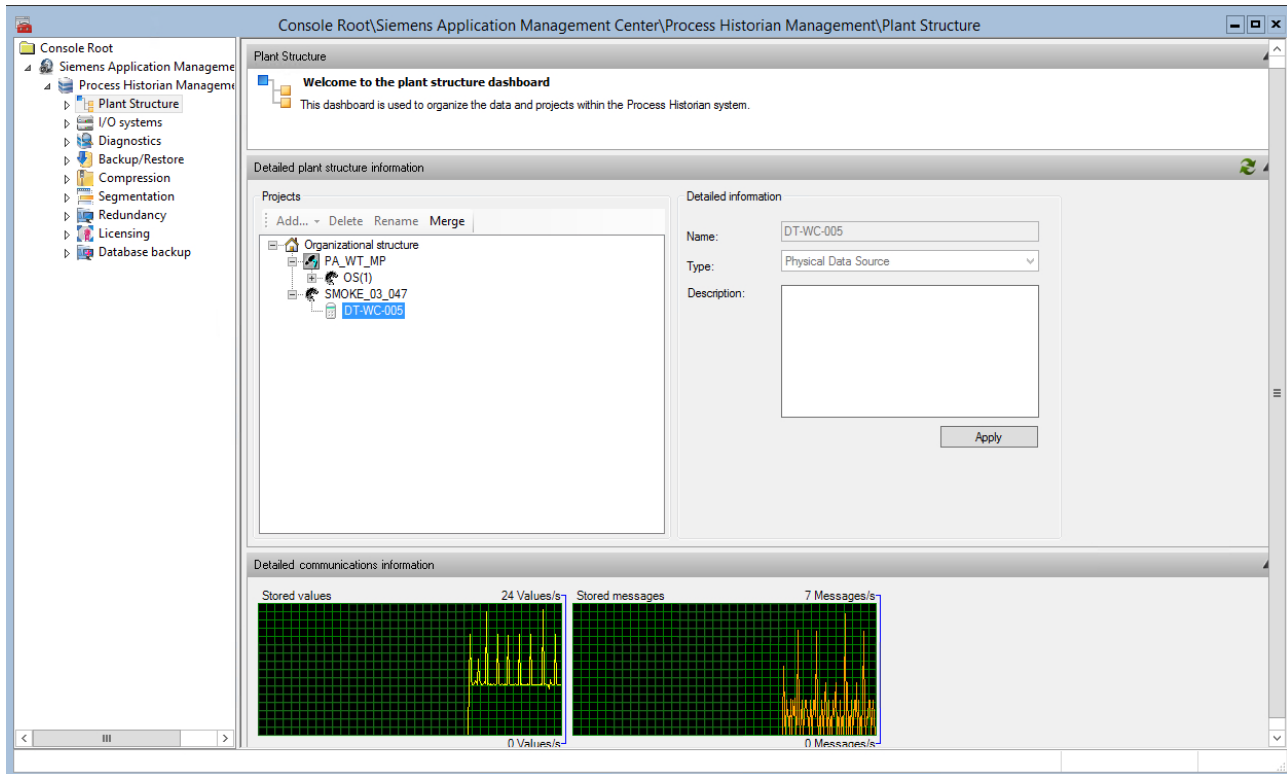
3.3 Plant structure dashboard

The "Plant structure" dashboard displays all projects in the project tree that are currently integrated in the system.

The basic area of the structure is automatically detected and displayed. You can manually add the expanded external structure.

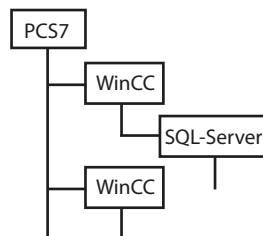
You add, rename or remove structure parts at a later time.

To do so, use the Add..., Delete and Rename buttons.



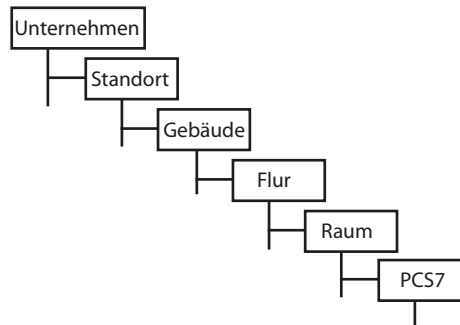
Plant structure detection

- PCS 7 projects
 - WinCC projects
 - PC



You can manually add, edit or remove the following expanded structure:

- Company
- Location
- Building
- Corridor
- Room
- PCS 7



The nesting depth of the structure can be expanded as necessary.

Detailed project information

The following detailed information on the project is displayed when you select a project:

- Name
- Type
- Description

You can change and confirm the description and type of the project.

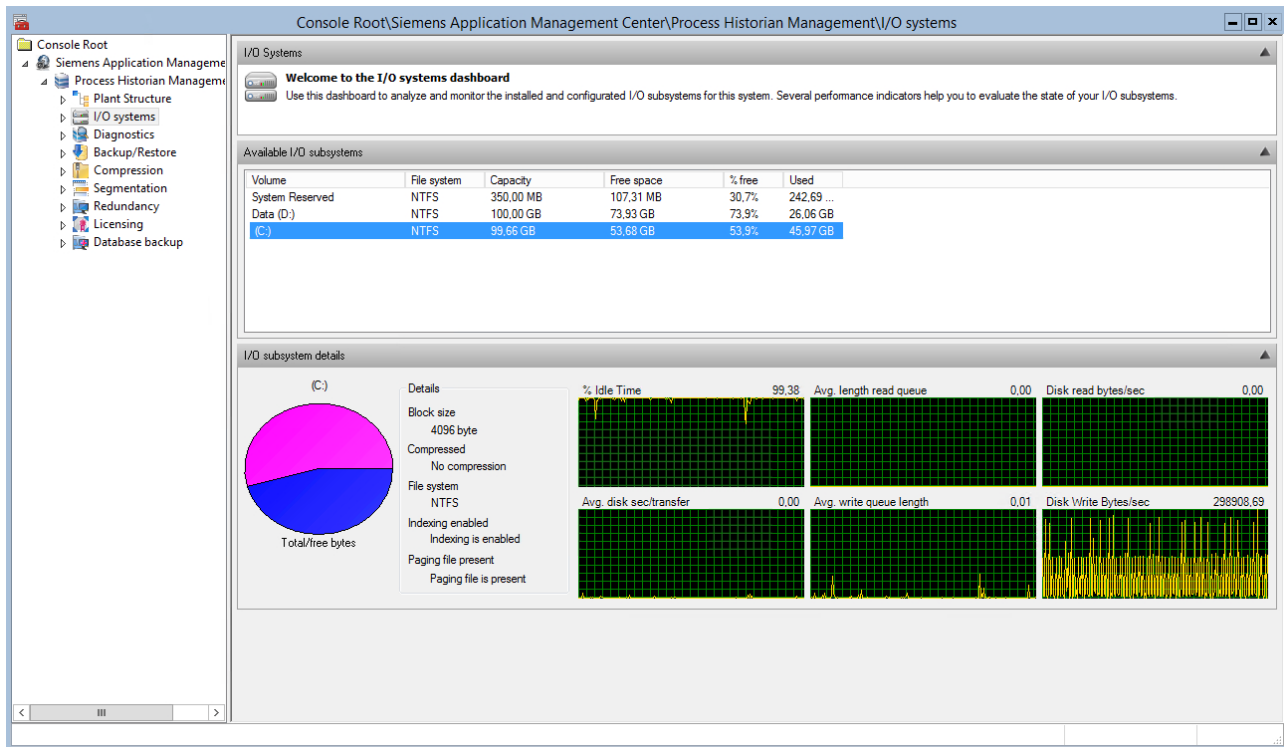
Merge

You use this functionality in case there are duplicate project entries in the structure tree. Duplicate entries can be caused, for example, when an image of the OS server was installed again after a hardware fault.

You use the 'Merge' function to combine the duplicate entries so that they form a single entry again in the plant structure.

3.4 I/O Systems dashboard

The "I/O Systems" dashboard displays the entire memory system to which there is read and write access and in which data is archived. The dashboard displays all hard drives integrated in the system. This includes hard drives that do not contain archive data.



The "I/O Systems" dashboard displays the following information on the storage system:

- Name and drive letter of the hard drives
- File system
- Total storage space: Capacity
- Absolute available storage space
- Free storage space in percent
- Absolute storage space used

The states of the input and output devices are graphically monitored by the system. If you select a drive, you receive the following detailed information on the selected drive:

- Idle time of the hard drive: Idle time
- Average duration per transfer
- Average length of queue for read access
- Byte per second with read access to data medium
- Average length of queue for write access

3.4 I/O Systems dashboard

- Reading speed in Byte per second
- Writing speed in Byteper second

3.5 Diagnostics dashboard

The upper area of the "Diagnostics" dashboard displays the last 1000 diagnostic messages from the Process Historian event log.

The screenshot displays the Siemens Application Management Center Diagnostics dashboard. The main window shows the 'Process Historian event log (4749 results)' table. The table has the following columns: LogID, Severity, TimeStamp, AppDomainName, ProcessID, and Message. The messages listed include:

LogID	Severity	TimeStamp	AppDomainName	ProcessID	Message
4749	Error	06.06.2014 08:59:00.607	MaintenanceService.exe	3392	Cyclic truncate transaction log failed
4748	Information	06.06.2014 08:55:13.140	MaintenanceService.exe	3392	Log backup to null device
4747	Information	06.06.2014 07:19:55.637	MaintenanceService.exe	3392	Log backup to null device
4746	Information	06.06.2014 05:44:50.887	MaintenanceService.exe	3392	Log backup to null device
4745	Information	06.06.2014 05:16:54.740	MaintenanceService.exe	3392	ProcessHistorian state changed.
4744	Information	06.06.2014 05:16:54.740	ProcessHistorianUI.exe	4356	State change from [ActiveRecovery/Stopping] to [Active] at [06.06.2014 05:16:54]
4743	Information	06.06.2014 05:16:54.740	ProcessHistorianUI.exe	4356	ProcessHistorian state changed.
4742	Information	06.06.2014 05:16:54.737	ProcessHistorian.exe	2920	DatabaseWriterController state changed.
4741	Information	06.06.2014 05:16:54.740	Siemens.ApplicationManagementCenter.MMC	1192	ProcessHistorian state changed.

Below the event log table, the 'Messages (shows the last 100 messages)' section displays a list of messages with columns: Date/Time, Message, Category, and Source. The messages include:

Date/Time	Message	Category	Source
06.06.2014 09:14:18	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:13:56	The Desktop Window Manager has exited with code (0xd00002fe)	(0)	Desktop Window Manager
06.06.2014 09:12:23	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:10:29	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:08:56	The Desktop Window Manager has exited with code (0xd00002fe)	(0)	Desktop Window Manager
06.06.2014 09:08:35	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:06:39	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:04:45	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN
06.06.2014 09:02:50	Log was backed up. Database: HistorianStorage, creation date(time): ...	Backup	MSSQLSHISTORIAN

The event log of the Process Historian contains the following information:

- Log entry ID
- Severity of the message
- Time stamp
- Name of application domain
- Process ID
- Message

The lower section of the dashboard includes the last 100 entries from the event log for Windows applications. The following information is displayed:

- Time stamp
- Message
- Category
- Source

3.6 Backup/Restore dashboard

3.6.1 Introduction

Backup types

The Process Historian saves process values and alarms in segments. The data and messages are saved with a time stamp in the segments. The data and messages of the same time period are saved in the same segment.

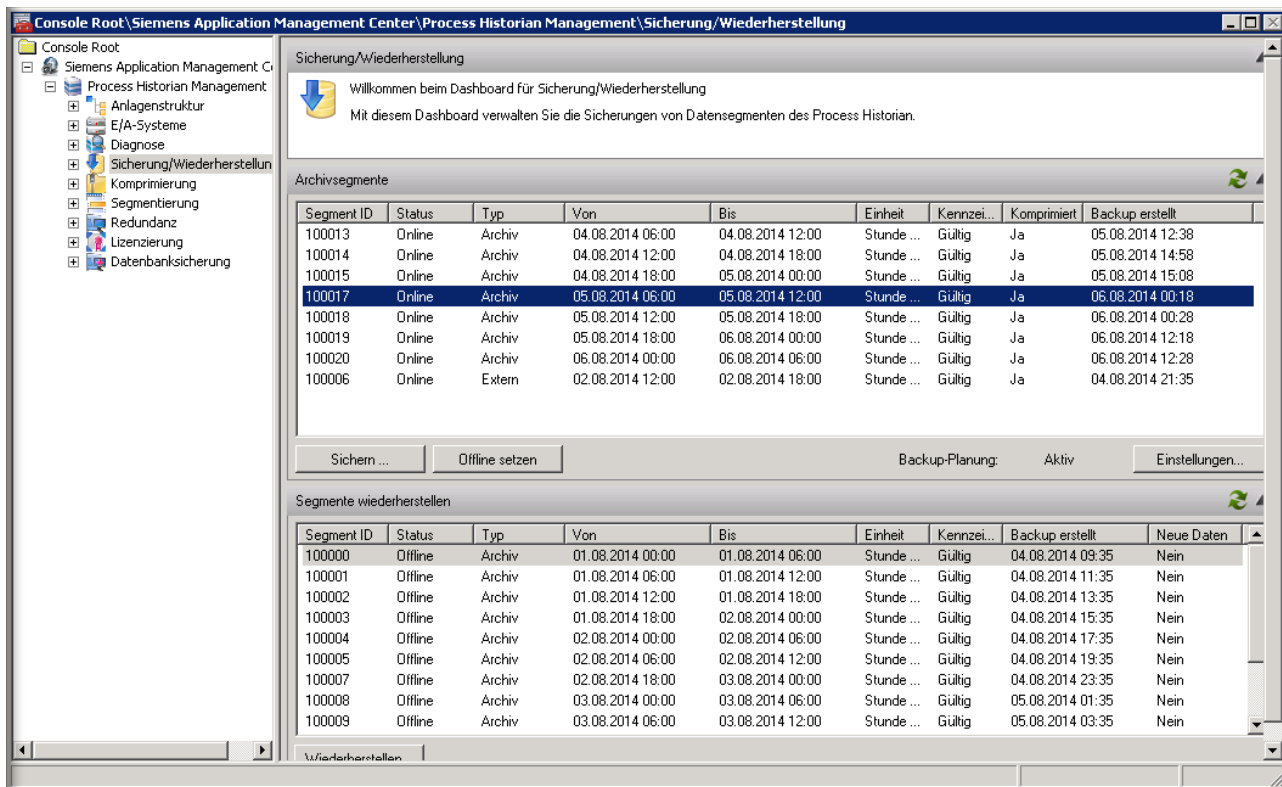
Whenever the configured duration has expired for a segment, a new prepared segment is created. The oldest prepared segment becomes a runtime segment. When the configured number of runtime segments has been reached, the oldest runtime segment is converted to an archive segment. You can only create a backup for archive segments.

When an archive segment is backed up, the runtime data are stored in the backup file. The stored data includes:

- Process values
- Messages
- Configuration data

You can plan the automated backup of segments using the "Settings ..." button in the 'Archive segments' area of the 'Backup/Restore' dashboard.

You can make selected archive segments available as runtime data once again by using the "Restore ..." button in the 'Restore segments' area.



3.6.2 Creating segment backups

Requirement

The segment to be backed up has the "Archive" status.

Backup planning

The storage space of the Process Historian is continuously filled with data. If the free space falls below a threshold, the Process Historian is set to the "locked" state. Archiving is then paused.

To put the Process Historian back into the "Enabled" state, you must make sufficient free space available.

You have the following options for avoiding the "Locked" state:

- Backup segments manually and set them offline.
- Backup segments automatically and set them offline.

Current storage space

In order to keep free enough free space available, you need to delete the archived segments in backups in a timely manner.

Only offline archive segments can be deleted. You can copy the offline archive segments to an external drive before deleting them.

Note

Operating state during the segment backup

While the following functions are being performed, the Process Historian briefly changes to the "Disabled" operating state for a short time:

- During the preparation of a segment
- During the backup of a segment
- During the restoration of a segment
- When the segment is set offline

You have no access to the database in this operating state.

Segment backup

Manual backup

1. Select the "Backup/Restore" dashboard in the navigation of the Management Console.
2. Select segment to be backed up in the "Archive segments" area.
3. Click the "Backup" button to launch backup.
4. Select the path for the backup file in the "Backup segment" dialog box that opens. You can specify further identifiers and descriptions for the backup such as the name or number of the data medium. To set segments automatically offline after they are saved, select "Set offline".



5. Click "Backup".

Automated backup

In the "Backup/Restore" dashboard you can restore the backup and have the archive segments set offline automatically. Automatic backup only creates a backup for archive segments. When compression is switched on, this archive segment must be completely compressed before backup.

To do this, select the option "Set segment offline after backup" via the "Settings" button in the "Archive segments" area.

You can enable automatic backup by setting the "Planner is activated" option .

Delayed segments

Delayed segments are archive segments that are set offline with a delay when the option "Set segment offline after backup" is set. The delayed segments remain available online longer, and existing data and messages can still be read.

In the counter, set the number of delayed segments to remain available online.

Note

Process Historian does not archive data

If the Process Historian does not archive data, check the Microsoft Message Queuing (MSMQ) and the databases.

Setting segments offline manually

In order to provide enough free space, you need to regularly delete data segments already archived in backups.

1. Open the "Backup/Restore" dashboard.
2. Select the desired segment in the "Archive segments" area.
3. Click the "Set offline" button.
 - The entry for the selected segment is moved to the "Restore segments" view.
 - The data cached on the WinCC server is transferred (recovery).
 - The storage space for this segment is released.

The segments can only be moved individually.

You can check the amount of space gained in the "I/O systems" dashboard.

Note

Checking the storage space

To ensure enough free space for the Process Historian in operation, repeat these steps regularly.

Result

A backup is created and the date of the backup entered.

The segment remains in the "Online" status and is not moved.

3.6.3 Restoring a segment

If you want to access data that is stored in an archived and already deleted segment, you must restore the respective segments. When restoring a segment, you must select the backup file corresponding to the segment.

Requirement

- The corresponding backup file for the segment to be restored is available.
- The Process Historian is in the "Active" operating state.

Procedure

1. Select the "Backup/Restore" dashboard in the navigation of the Management Console.
2. Select the required segment in the "Restore segments" area.
3. Click on the "Restore" button.
4. In the "Backup segment" dialog, select the corresponding backup file for the segment that is to be restored.
5. Click "Restore".

Result

You can access the data of the restored segment from the OS Server, OS Client or the Information Server.

3.6.4 Deleting a segment

There are two types of segments in Process Historian, runtime segments and archive segments. Runtime segments are always online and cannot be deleted.

As soon as the runtime segment becomes an archive segment, you can perform a backup for it. The archive segment can be deleted (set offline) after successful backup.

After setting the segment offline, only the information for restoring the backed up segment is stored in the system. You can configure the automatic setting to offline together with the automatic backup.

Requirement

You can only use the "Set offline" button if a backup of the selected segment has already been created and this segment is marked as "valid". A segment is, for example, marked as "invalid" if additional runtime data for the segment has accumulated after the creation of a backup. In this case, create a backup of the relevant segment again.

Segments can only be deleted individually.

Procedure

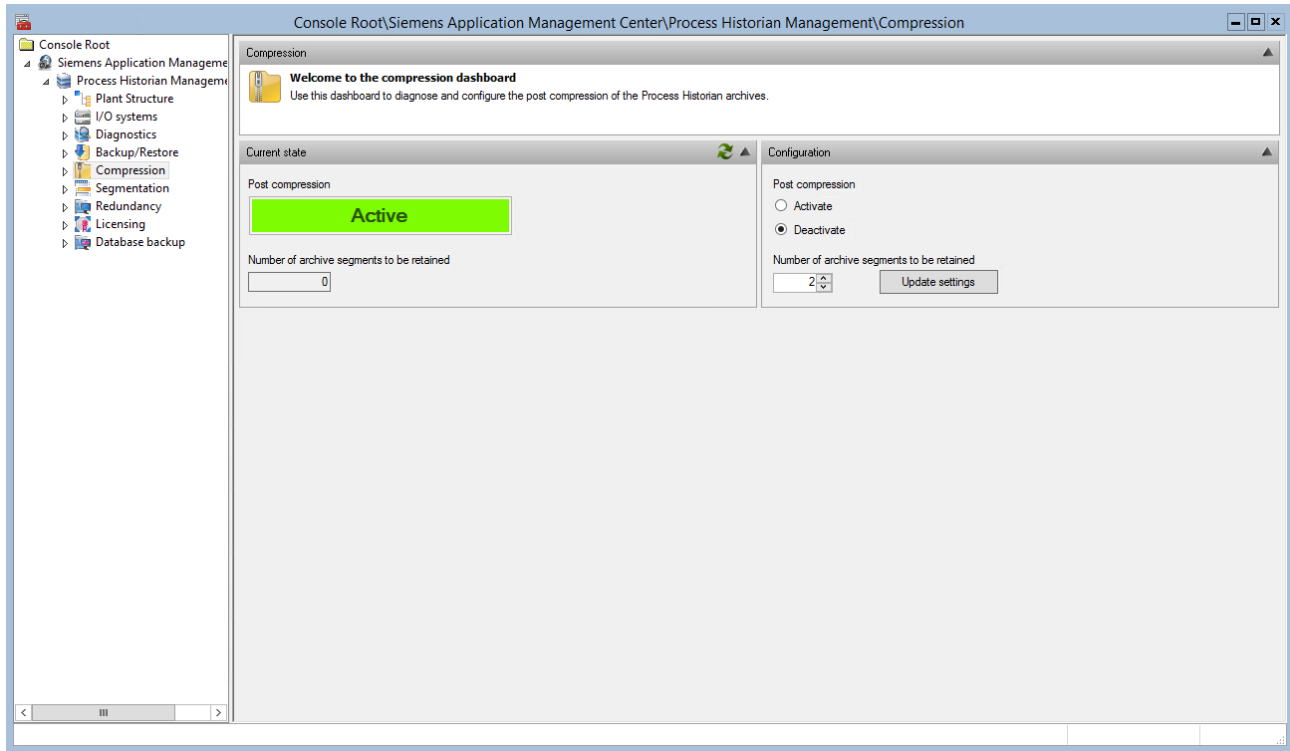
1. Select the "Backup/Restore" dashboard in the navigation of the Management Console.
2. Select the segment you want to delete in the "Archive segments" area.
3. Click the "Set offline" button.

Result

The segment is deleted from the database.

3.7 Compression dashboard

On the "Compression" dashboard, you can see the current compression state as well as the current default number of uncompressed segments. The uncompressed segments are counted starting from the first archive segment. The compression starts with the third segment.



Note

The archive segments are compressed automatically in the background.

Procedure

1. Select the "Compression" dashboard in the navigation of the management console.
2. Select the "Activate" option in the 'Configuration' area for 'Post compression'.
3. Specify the number of uncompressed segments you want to keep in the "Configuration" area.
4. Click "Apply".
5. The "Current status" area indicates whether compression is enabled and, if so, as of which segment.

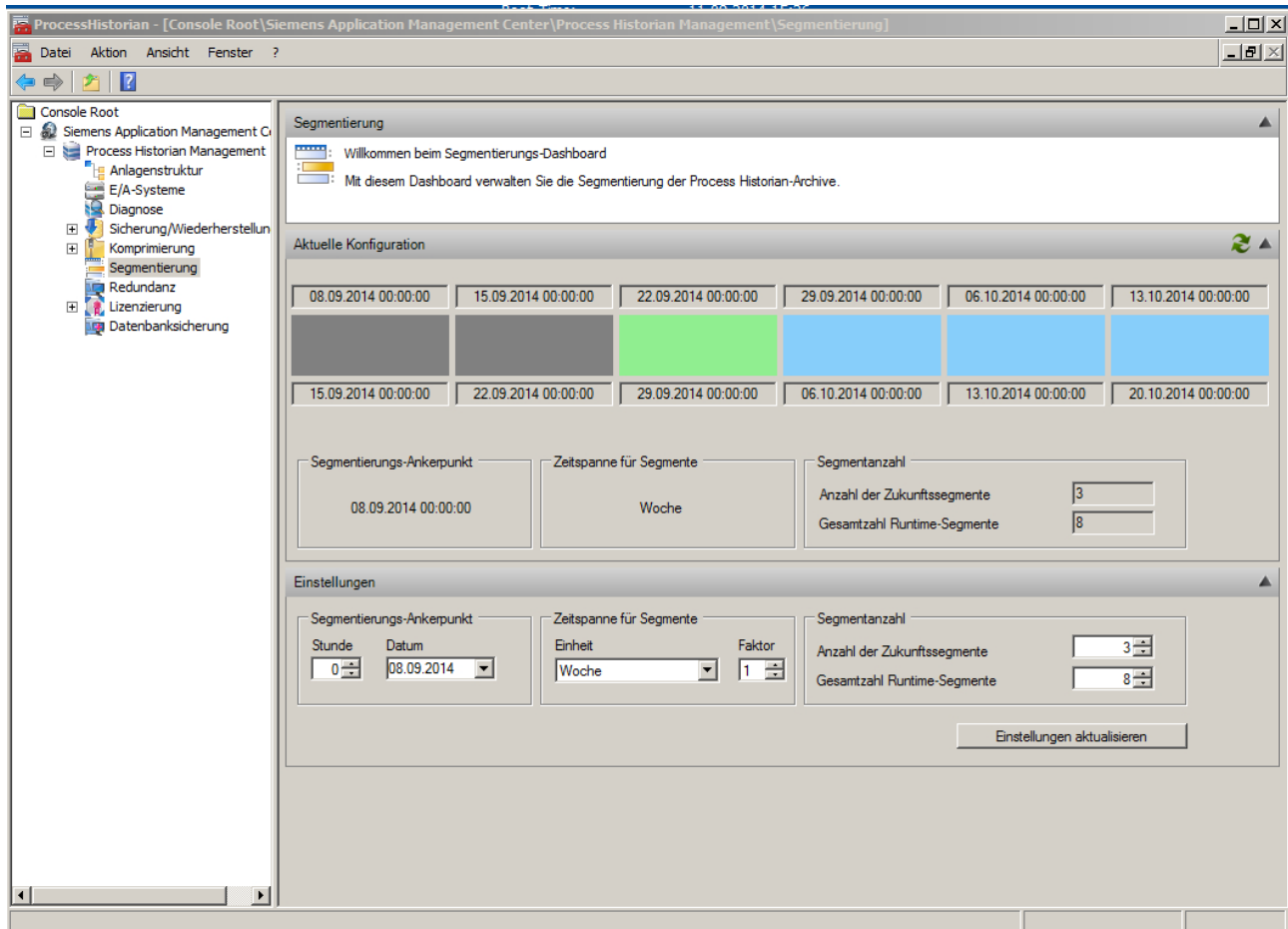
Result

The settings for the compression of archive segments have been reconfigured.

3.8 Segmentation dashboard

The "Segmentation" dashboard provides an overview of the current segmentation configuration.

You configure the segmentation of the Process Historian archives in the "Settings" area.



The segment states are color coded:

Segment status	Color
Completed runtime segment	Gray
Current segment	Green
Prepared segment	Blue

3.8 Segmentation dashboard

You specify the following parameters for configuration of the segmentation in the "Settings" area:

1. Segmentation anchor point:
 - Hour
 - Date
2. Time period for segments:
 - Unit (period)
 - Factor
3. Number of segments:
 - Number of future segments
 - Total number of runtime segments

The "Database Installation Wizard" supports you in the installation of the Process Historian database in advanced mode. By default, the following presets are made for the segmentation during installation:

Segment size	One week
Total number of segments in runtime	Eight
Number of prepared segments	Three

Only existing segments are displayed. In the example above, the oldest archive segments starts on 08.09.2014 at 0:00 hours. Because the segment interval is one week, two segments have been completed as archive segments by 22.09.2014. Another archive segment is created each week until the display consists of 8 segments. When a new segment is added, the oldest archive segments is stored and set offline.

Note

Process Historian Installation Notes

Additional information on defaults of the Process Historian database is available in the Installation Notes.

Depending on the quantity structure, the amount of data per segment can be very large. This applies to all segments in runtime. When the segments are created, the estimated required memory space is calculated based on the size of the previous segments and reserved for future segments.

If segments in the past are created, minimal space is allocated.

The optimum settings for the segmentation are a compromise between the memory space used and the number of uncompressed data segments to be reserved.

The following settings are recommended:

- A time period of 1 week for the prepared segments.
- A time period of 4 weeks for the runtime segments.

The time period that is available as read-only depends on the number of runtime segments plus the number of archive segments that are not deleted (set offline).

Note

The Process Historian database is switched automatically to the "Deactivated" state to allow changes to the segmentation to be carried out. After the settings have been accepted, the database changes back to the "Active" state automatically.

Procedure

1. Select the "Segmentation" dashboard in the navigation of the Management Console.
2. In the "Number of segments" area, select the required number of segments to be prepared continuously.
3. In the "Number of segments" area, select the required total number of runtime segments.
4. Click "Apply".

Result

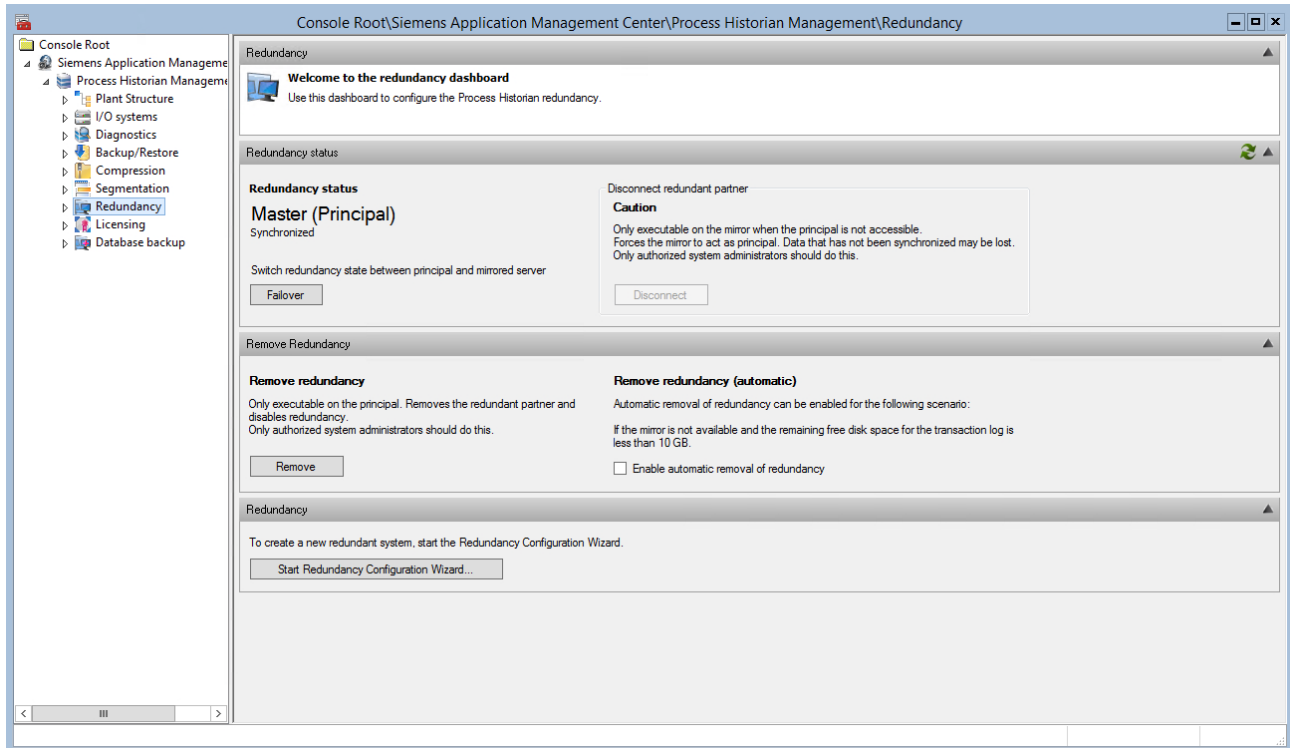
The segmentation of the Process Historian database is configured.

3.9 Dashboard redundancy

You configure the redundancy of the Process Historian in the 'Redundancy' dashboard.

You specify the configuration for a redundant system in the following areas:

- Redundancy status
- Remove redundancy
- Redundancy



To create a new redundant system, click the "Start redundancy configuration..." button in the 'Redundancy' area.

Follow the instructions of the installation wizard to configure a new redundant system.

Note

Process Historian Redundancy Wizard

You will find detailed information on redundancy configuration in the Process Historian **Installation Notes**.

Redundant Process Historian servers

A redundant Process Historian system consists of symmetrically configured servers for master (principal) and standby (mirror) operation (e.g. PRIMERGY TX300 S6). We recommend a dedicated redundancy connection with a minimum bandwidth of 1 gigabit between the redundant Process Historian servers. The Witness server component for scenarios with automatic redundancy failover is also installed on an additional server of the system, depending on availability of an Information Server or WinCC server.

Note

Redundancy

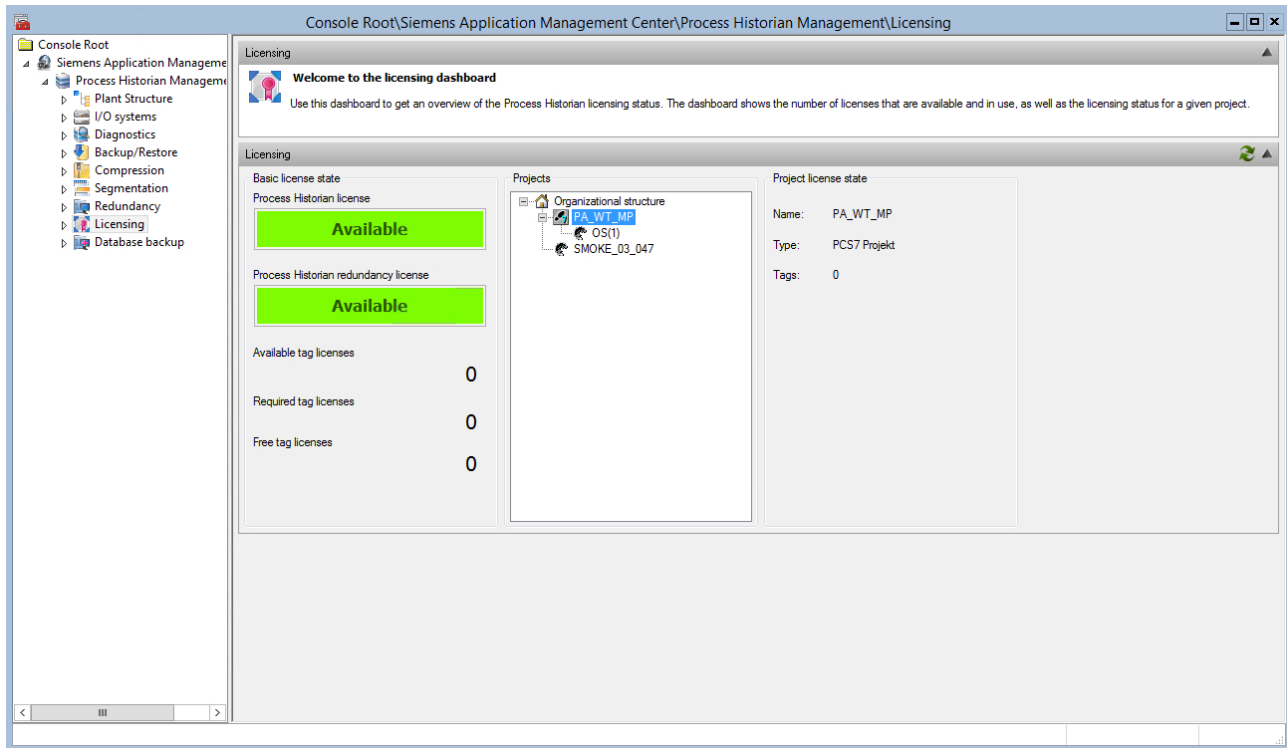
More information on redundant systems can be found in the section 'Redundant system (Page 53)'.

3.10 Licensing dashboard

Dashboard

The "Licensing" dashboard gives you an overview of the licenses used and available in the system.

The availability of the Process Historian licenses is displayed.



You also obtain detailed information about the states of the tag licenses:

- Available
- Required
- Free

The Process Historian does not require any archive tag licenses for the PCS 7/ WinCC sources.

When you select a project, you receive information on the project-specific license status with the following information:

- Project name
- Project type
- Number of tags

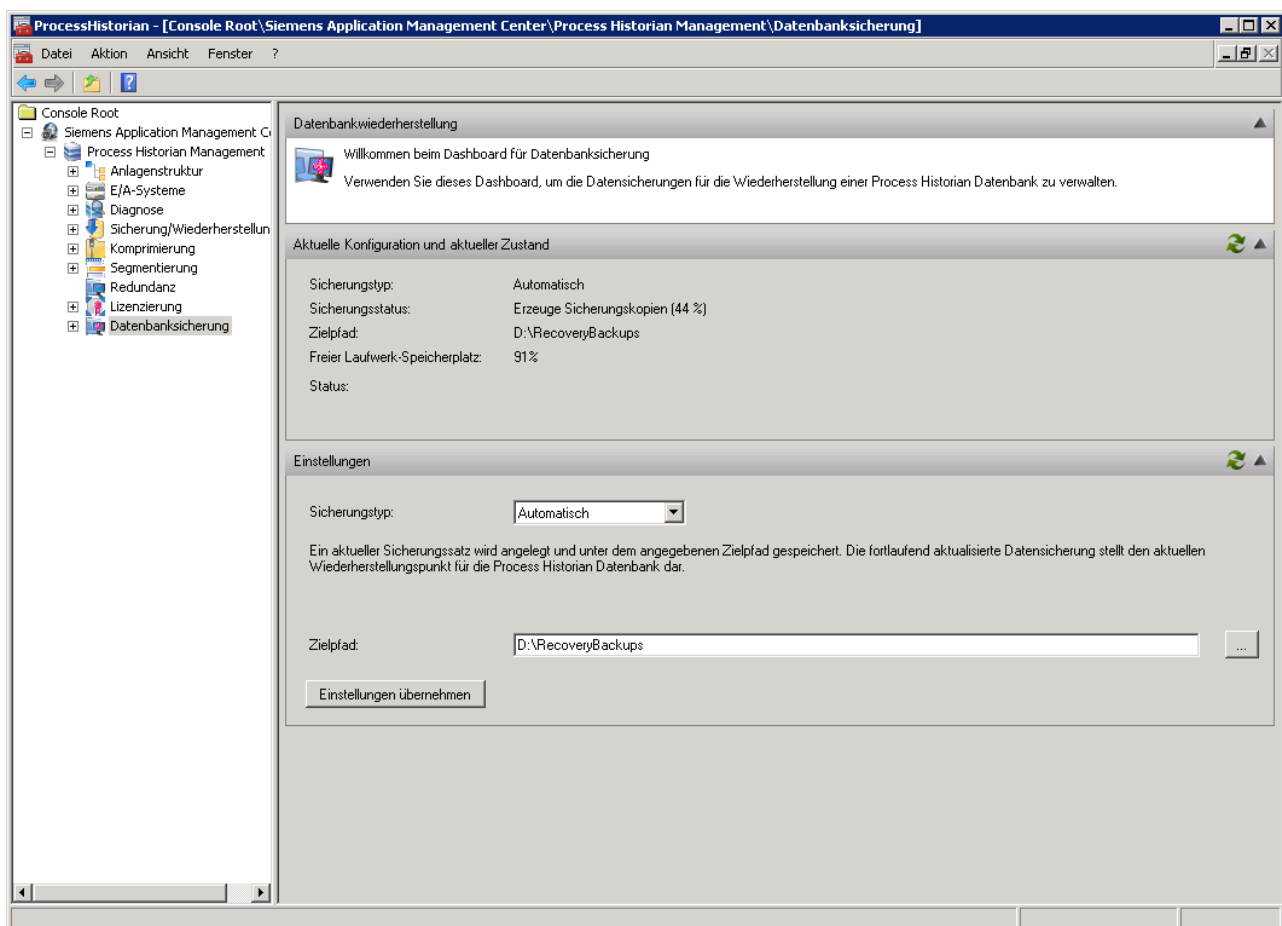
3.11 Database backup dashboard

You can use the features of this dashboard to create a full backup of your database at the time of creation.

Database backup

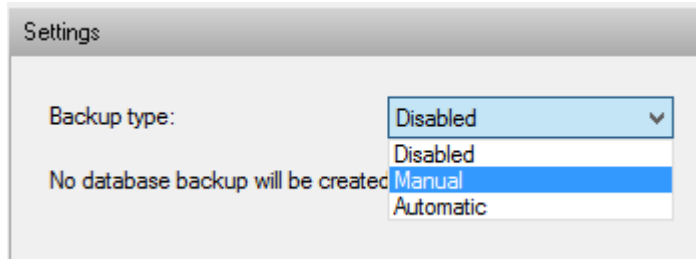
The "Current configuration and current status" displays the following information:

1. Configured backup type
2. Backup status: Progress of the backup copy:
3. Path to backup copies
4. Free disk space
5. Status



Settings

Three settings are available in the "Settings" area:



- The "Database backup" function is deactivated when set to "Disable".
- A full backup of the database is defined only once with the "Manual" setting.
- A full backup of the database is defined periodically with the "Automatic" setting.

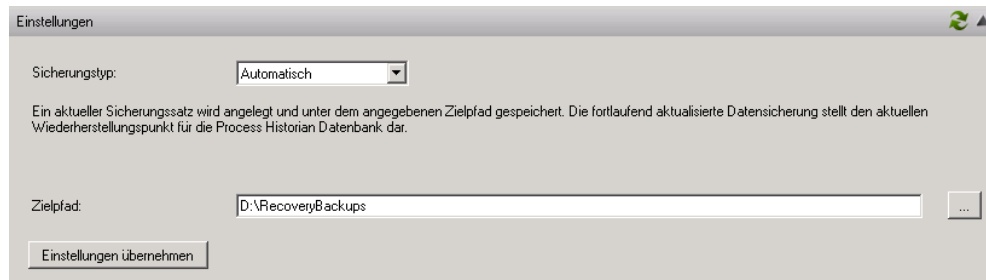
Storage types

Only one backup is defined with the "Manual" setting. Once the backup is complete (status = 100%), the operation is terminated. A recovery from this backup restores the database with data from the backup timestamp.

A full backup with the current timestamp is created with the "Automatic" setting. In addition, the backup is repeated cyclically. The timestamp is updated with each backup. The backups no longer needed are deleted. A backup always represents the current state of the database. A recovery from this backup restores the database with the latest data from the backup timestamp. The process is continued.

Storage path

The destination path for the backup is specified in the "Settings" window. The destination path can be changed manually.



Changing the destination path

1. In the "Destination path" field, enter the desired drive and folder with the database name as a path.
Example: D:\DatabaseBackup
2. Click "Apply Settings".
In an overview window you will find the steps to be performed after confirmation.

3. Check this information.
4. Confirm with "OK" of all the entries are correct.
Then, the full backup is performed based on the above specifications.

Storage structure

The structure of the storage depends on whether the backup type is set to "Automatic" or "Manual".

Setting for automatic

The backup is stored in the specified destination path.

Example:

The Process Historian database has the name "HistorianStorage". As the destination path, you specified: D:\DatabaseBackup.

The backup is stored in the following destination path:

- D:\DatabaseBackup\HistorianStorage

The following periodic backups are stored in the same destination path.

If you terminate the automatic backup and restart it, all previous backups are deleted in the specified destination path. The new backups are saved. To prevent the loss of previous backups, you need to enter a new destination path for restarting the automatic backup.

Setting for manual

The backup is stored in the specified destination path. The current date and time when the backup is created are part of the name.

Example:

The Process Historian database has the name "HistorianStorage". The backup started on 5/31/2014 at 18:00. The following path and name of the backup is thus formed:

- D:\DatabaseBackup\20140531_1800_HistorianStorage

Manual backups created later can be stored in the same destination path, whereby the data is not changed or deleted.

Storage device

We recommend you store the database backup on a separate drive.

The following external drives can be used as a storage medium for database backups:

- USB hard disk
- Network drive via iSCSI. You can find information about iSCSI from Microsoft at:
 - [http://technet.microsoft.com/de-de/library/ee338476\(v=ws.10\).aspx](http://technet.microsoft.com/de-de/library/ee338476(v=ws.10).aspx) ([http://technet.microsoft.com/de-de/library/ee338476\(v=ws.10\).aspx](http://technet.microsoft.com/de-de/library/ee338476(v=ws.10).aspx))

Sufficient free space must be available on the selected storage medium in order to perform a full backup.

Note

Required space

If less than 20 GB are free on the drive, a warning is displayed on the control system.

If less than 10 GB are free on the drive, a process control message is generated and the creation of the backup is stopped.

Incomplete backups

If the backup type is changed during the creation of the backup, incomplete backups cannot be resumed. Incomplete backups are unsuitable for recovery.

Redundant system

The "Database backup" function are used to save the entire database in the form of a backup. In a redundant system, the mirror takes over this task.

The "Database backup" function is not possible in a redundant system.

Recovery

Recovery restores the state of the Process Historian that existed at the time the last backup was started.

You import the recovery with Database Installation Wizard. Select the desired backup and start the recovery.

Before the recovery process is started, the backup will be checked for completeness. The recovery is only started when the backup is complete, i.e. the backup status is 100 %.

You can learn about the detailed steps for recovery in the section "Database Installation Wizard (Page 124)".

See also

[http://technet.microsoft.com/de-de/library/ee338476\(v=ws.10\).aspx](http://technet.microsoft.com/de-de/library/ee338476(v=ws.10).aspx) ([http://technet.microsoft.com/de-de/library/ee338476\(v=ws.10\).aspx](http://technet.microsoft.com/de-de/library/ee338476(v=ws.10).aspx))

3.12 SIMATIC Batch Backup/Restore dashboard

Overview

You can use the dashboard to backup and restore the batch data archived by the SIMATIC Batch server with the Process Historian. The data include the batch information provided by the SIMATIC Batch server and the runtime information during batch creation.

You can swap out the batch data manually or automatically to backup files. After successful backup, you can delete the backed-up batch data from the Process Historian. If you need the swapped out batch data in the Process Historian again, use "Restore" to make the selected batch data once again available to OS servers, OS clients or the Information Server.

The archive tags and alarms supplied by the OS computers from the batches are archived in separate segments in the Process Historian. You backup and remove these segments with the "Backup/Restore" dashboard.

Requirement

- There are SIMATIC Batch files in the Process Historian.
- The tree view of the plant structure corresponds to the respective batch project.

Selecting batch data for backup

1. In the "SIMATIC Batch data" navigation pane, select the data you wish to back up from all archived batch data.

The data are displayed in the following hierarchy:

- SIMATIC Batch system
- Order category
- Order
- Batch

You can expand/collapse and select/deselect individual elements of the hierarchy. The selection of a parent node also selects all elements below.

2. The table displays the selected batch data with the properties. When you click on the header of one of the displayed property columns, the entries in the table are sorted according to this property. The "Backup created" column shows if the respective batches have been backed up and their status.

The screenshot shows the SIMATIC Batch Backup/Restore dashboard. On the left, a tree view displays the 'Simatic batch data repository' hierarchy, including 'Process Historian Archive', 'SB8_2101-612343-33 (V8_0)', 'Temp', and 'Dauertest 2014->2015'. The main area contains a table with the following data:

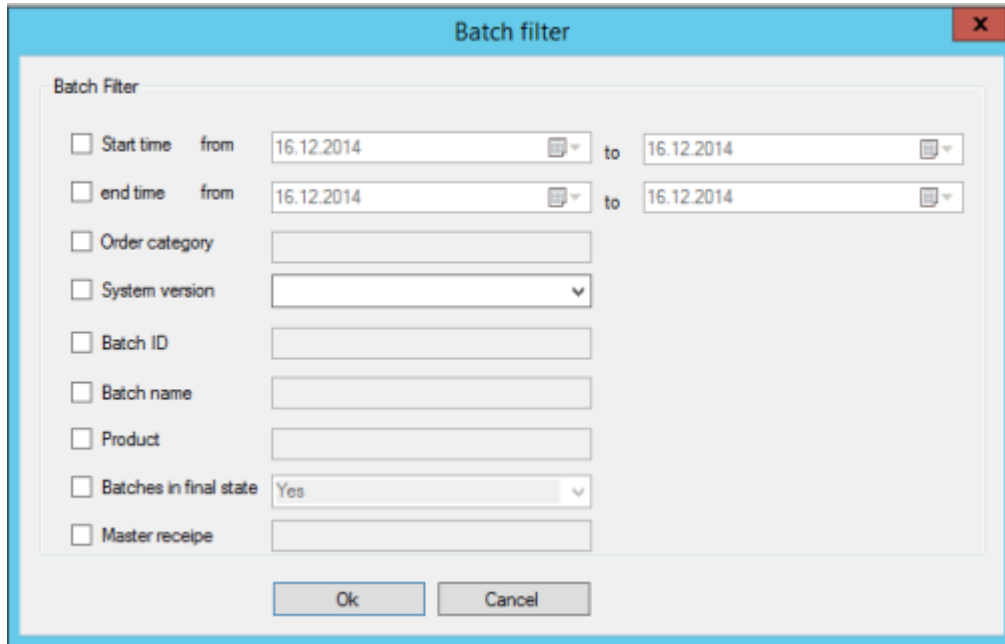
System	System version	Order category	Order	Batch name	Batch ID	Product	Master recipe
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch	89	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 1	90	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 2	91	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 3	92	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 4	93	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 5	94	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 6	95	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 7	96	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 8	97	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Temp	temp1	Batch 9	98	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	2. Woche	Batch 6	51	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	2. Woche	Batch 7	52	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	2. Woche	Batch 8	53	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	2. Woche	Batch 9	54	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	3. Woche	Batch 10	55	Paint	PH2014+SP1
SB8_2101-61234...	V8_01_01	Dauertest 2014->...	3. Woche	Batch 11	56	Paint	PH2014+SP1

Below the table are buttons for 'Add', 'Remove', and 'Remove all'. At the bottom, there are 'Tasks' buttons for 'Backup', 'Delete', and 'Restore', along with a 'Configure' button and a 'Task status: Disabled' indicator.

3. Click "Add" to display more data for the displayed batch data which meet specific criteria. For example, display batches with a specific start time.

3.12 SIMATIC Batch Backup/Restore dashboard

4. Select the check boxes of the criteria by which you wish to filter the batch data. Enter the specific criteria or select the criterion from the drop-down list. You can use the wildcards "*" and "?" in text fields. You do not have to set the wildcards at the beginning or end of an entered text. An "*" is automatically added here. You cannot use wildcards in number fields and selection boxes.



5. Click "OK". The batch data which meet the criteria are displayed in the table.
6. If you want to remove individual rows in the table, click "Remove". Or click "Remove all" to remove all entries from the table. You can now select batch data once again that you want to display and back up.

Backing up batch data manually

You can manually back up the batch data displayed in the table. Each batch is stored in its own, compressed backup file.

1. In the table, select the rows of the batches with the data you want to back up. Use "Ctrl A" to select all batch data of the table.
2. In the "Tasks" area, click on the "Backup" button.
3. Enter the path for the backup files in the dialog box. You can select a local directory or a network drive as backup location.
4. Click "OK". You cannot execute any other task in the dashboard during backup.

Result

The batch data are saved to the specified path. The file name of the backed-up batches has the following components:

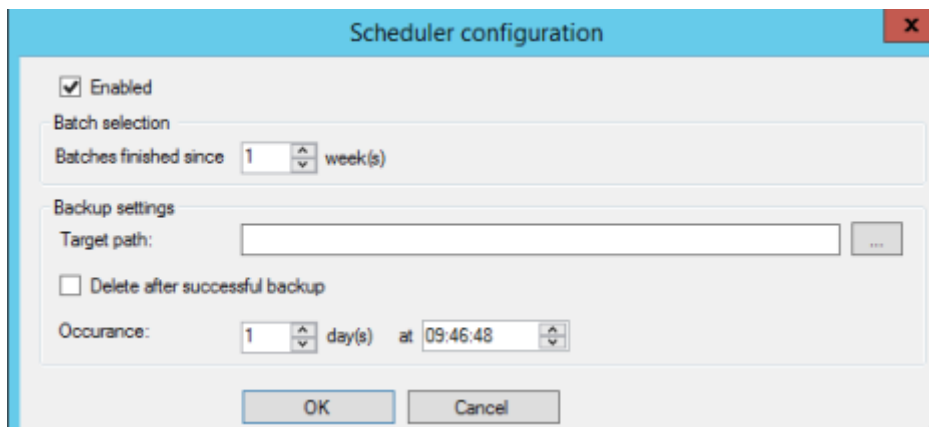
- Name of the Batch process cell
- Batch name
- Start time

The number of backed-up batches is updated in the "Number of batches" area of the dashboard. The "Backup created" column in the table indicates the state in which the batches were backed up.

Backing up batch data automatically

You can use a scheduler to automatically back up all batch data archived in the Process Historian when the archived data have reached the final state in the Process Historian. The scheduler checks if there are batches to be backed up in the configurable time period. Each batch is stored in its own, compressed backup file.

1. In the "Tasks" area, click on the "Configure" button. The "Scheduler Configuration" dialog opens. The configuration refers to all batch data that have reached the final state.



2. Select the "Active" check box so that the scheduler can back up the batches automatically. If you no longer wish to use the scheduler for an automatic backup, clear the "Active" check box.
3. In the "Batch selection" area, select the interval as of which the batches archived in the final state are to be backed up by the scheduler. For example, select all batches for backup that have reached the final state of archiving one week before the start of the automatic backup. The backup of the archived batches should be coordinated with the backup of the segments with the archive tags and alarms of the batches.
4. Enter the path for the backup file. All backup files of the batches are stored in the folder.
5. If you have selected the "Delete after successful backup" check box, the batch data are removed from the Process Historian after the successful backup.

3.12 SIMATIC Batch Backup/Restore dashboard

6. For "Run", select after how many days and at what time the scheduler is to check if the criterion for an automatic backup has been met. The archived data which meet the criterion are then backed up.
7. Click "OK" to save the scheduler configuration.

Result

When the scheduler is active, the batch data are backed up automatically. The status of the scheduler is displayed as "Active" in the "Tasks" area of the dashboard.

When the scheduler is deactivated, the batch data are not backed up automatically. The status of the scheduler is displayed as "Inactive" in the "Tasks" area of the dashboard.

You can change the configuration of the scheduler at any time without affecting the ongoing backup process. The updated scheduler is not used until the next time you run the backup.

Manually deleting backed-up batch data from the Process Historian

Requirement

- The archiving of the batch data has reached the final state in the Process Historian.
- The batch data have been backed up successfully.

Procedure

1. Click "Delete".

The batch data selected in the table are removed from the Process Historian. You cannot execute any other task in the dashboard during deletion. The batches are removed from the table and the total number of batches is updated in the "Number of batches" area.

Restoring backed-up batch data

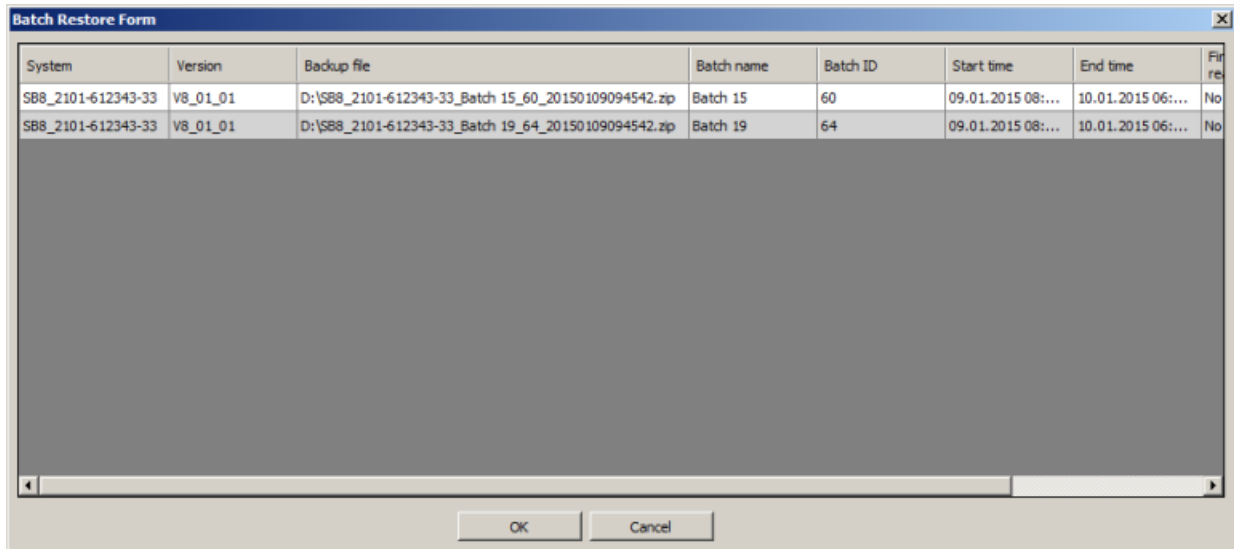
Requirement

- There are backup files with the batch data to be restored.
- The backed-up batch data are no longer available in the Process Historian.

Procedure

1. In the "Tasks" area, click on the "Restore" button.
2. In the dialog box, select the backup file(s) of the batch data you want to restore.

- Click "Open". A window opens to check the properties of the batch data and the path of the backup file.



- Select the batches to be restored.
- Click "OK". You are notified that the segments with the corresponding process values and messages for the time period will also be restored.

Result

The batch data from the backup file is transferred back to the Process Historian. The restored data are shown in the table. The "Backup created" column shows the time when the backed-up batches were restored.

You can now access the restored batch data from the OS server, OS client or the Information Server.

Redundant system

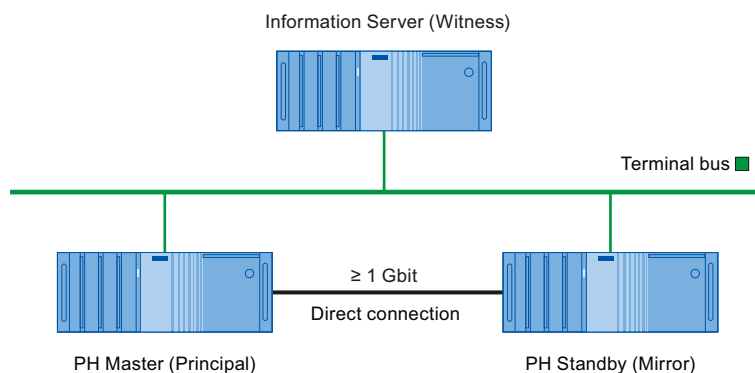
4.1 Redundant system

Redundancy

The redundant systems are based on Microsoft SQL Server mirroring.

Process Historian requires a third system to monitor the availability of redundancy: the Witness.

You can assign the Information Server the role of the 'Witness'.



Setting up redundancy

You start the Redundancy Wizard using the "Redundancy" dashboard of the Process Historian Management Console.

You can find additional information in the section 'Dashboard redundancy (Page 38)' as well as in the Installation Notes for the Process Historian describing how to set up redundancy.

Write rights in the redundant system

Within a redundant system, only the Principal is allowed to write to the Process Historian.

Microsoft SQL Server continuously synchronized the database of the Principal with the Mirror.

Transaction log when a redundant partner fails

If the redundant Mirror fails, all data is stored in the transaction log of the Principal.

The data on the transaction log is synchronized as soon as the partner server is back online.

Size of the transaction log

Depending on the amount of incoming data and the downtime of redundant PC, the transaction log can grow quickly and become very large.

4.1 Redundant system

Following synchronization, the transaction log is reduced to its previous size.

If, for example, the Mirror goes down for an extended period of time, the lack of space can cause the Principal to switch to the "Locked" status. The Process Historian server is then locked and can no longer be set to "Enabled". The archive data of the OS are buffered in the cache. The period of caching depends on the space available and the volume of incurred data.

The redundancy synchronization (mirroring) must be switched off to prevent an overflow of the transaction log and locking of the Principal:

- Manual: You disable the redundancy synchronization in the "Redundancy" dashboard of the Process Historian Management Console.
- Automatic: The automatic shutdown function is activated in the "Redundancy" dashboard of the Management Console.

The transaction log is automatically reduced.

You can find additional information about the "Locked" state in the section "Overview (Page 5)".

Note

Providing sufficient disk space

To avoid data loss due to a lack of space, ensure sufficient disk space:

- Regularly check the current disk space in the "I/O systems" dashboard.
 - Determine which automatic mechanisms for reducing the used space can be activated in the dashboards.
-

See also

Dashboard redundancy (Page 38)

Overview (Page 5)

4.2 Redundancy scenarios

Standard behavior of the redundant system

This section describes typical scenarios for a redundant Process Historian system.

Conflict resolution options via the Process Historian Management Console are also described.

Short designations

The following designations are used for better legibility:

- **Principal:** Process Historian Master
- **Mirror:** Process Historian Standby
- **Witness:** Information Server or WinCC Server with Witness components

Conflict management with the Process Historian Management Console

1. Failover (switchover)

- In case of a switchover, the Principal and the Mirror swap roles.
- This switchover is only possible if the systems are synchronized.

2. Disconnect (Disconnect)

- In case of a disconnect, the current Mirror is declared as 'Principal' even if the systems are not synchronized at this time.
- A disconnect results in the loss of data that is not synchronized.
- This procedure is only available on the Mirror.
- You should only use this function if the Principal is in an undefined state or if the automatic failover fails.

3. Remove (Remove)

- Mirroring ends when the redundancy is removed.
- This procedure is only available on the Principal.
- You should only use this function if the Mirror does not respond or is not/will not be available for a long time.
- This action terminates the growth of the transaction log.

Note

Redundancy switchover

With a redundancy switchover, a time period of a few seconds is missing in the data management of the Process Historian due to the switchover. This time period is transferred to the Process Historian after the switch to "Active (Restore)" operating state.

If there is no prompt to restart the systems, the restart cannot be performed manually because this would cause a loss of data.

Scenario 1

The Mirror is temporarily inactive:

1. The Principal and the Mirror are active and synchronized.
2. The Mirror is separated from the network, for example, for maintenance work.
3. There is no data synchronization between the Principal and the Mirror in this case.
4. The transaction log on the Principal is growing.
5. The Mirror is reactivated after a certain time period.
6. The Principal and the Mirror are in the resynchronization status.
7. Once the data is synchronized, the two server systems are once again synchronized and redundant.

Scenario 2

The Principal fails:

- The Principal and the Mirror are active and synchronized.
- The Principal server system fails.
- The Mirror queries the Witness to determine if the Witness has an active connection to the Principal.
- If the Witness does not have a connection to the Principal, the Mirror automatically switches to 'Principal' mode.
- If the Witness has an active connection to the Principal, switchover is not performed automatically.
- The pending data from the transaction log is processed before the Mirror switches to Principal mode.
The operation can take some time.
- The connection to the Principal is re-established.
- The original Principal now takes on the role of the 'Mirror'.
- The Principal and the Mirror are in the resynchronization status.
- Once the data is synchronized, the two server systems are once again synchronized and redundant.

Scenario 3

The Witness fails:

1. The Principal and the Mirror are active and synchronized.
2. The Witness fails.
3. A switchover is not necessary, because none of the archiving systems are affected.
4. An automatic switchover is not possible in this case.

5. The Witness is active once again.
6. Automatic switchover is possible once again.

Scenario 4

The Mirror is decommissioned and too little memory space is available for the transaction log. The Principal changes to the "Locked" state:

1. The Principal and the Mirror are active and synchronized.
2. The Mirror is separated from the network, for example, for maintenance work.
3. Data synchronization between the Principal and the Mirror does not take place.
4. The transaction log on the Principal is growing.
5. The low limit for free memory space for the transaction log is violated:
Less than 10% is free on hard disks with maximum 500 GB, or less than 50 GB is free on hard disks with more than 500 GB.
6. The Principal changes to the "Locked" state.
The archive data of the OS are buffered in the cache. The cached time period depends on the available memory space and the accumulating volume of data.
7. The Mirror becomes active once again.
8. The Principal is unlocked and changes to "Active" state.
9. The Principal and the Mirror are in the resynchronization status.
10. The transaction log is automatically reduced after completion of the synchronization.
11. The archive data buffered on the OS in the cache is transferred to the Principal.

Scenario 5

The Mirror is decommissioned and too little memory space is available for the transaction log. The redundancy synchronization is deactivated to ensure operation of the Principal:

1. The Principal and the Mirror are active and synchronized.
2. The Mirror is separated from the network, for example, for maintenance work.
3. Data synchronization between the Principal and the Mirror does not take place.
4. The transaction log on the Principal is growing.
5. Redundancy synchronization (Mirroring) is deactivated to prevent an overflow of the transaction log and a locking of the Principal.
 - Manual: You disable the redundancy synchronization in the "Redundancy" dashboard of the Process Historian Management Console.
 - Automatic: The automatic shutdown function is activated in the "Redundancy" dashboard of the Management Console.
6. The transaction log is automatically reduced.
7. The Principal is still available.

8. The Mirror becomes active once again.
9. No synchronization of the data takes place. The Mirroring needs to be set up again.

Scenario 6

The Mirror and the Principal are switched off and on in succession:

1. Both servers, Principal and Mirror, are synchronized.
2. The data is redundant and identical on both servers.
3. The Mirror is switched off.
4. The data is still saved on the Principal.
The data is no longer synchronized because the Mirror is switched off.
This means the database on both servers is not identical.
The transaction log of the Principal is growing.
5. The Principal is switched off.
6. No data can be saved.
7. The previous Mirror is switched on.
8. The Mirror works. However, the data of the Mirror cannot be synchronized with the Principal.
To prevent the risk of data loss, there is no automatic switchover from the Mirror for the Principal in this case.
If you force a manual switchover, the previous Mirror takes over the role of the switched off Principal.
If the original Principal is switched on once again, it takes over the role of 'Mirror'.
The previously saved data would be deleted in case of a synchronization with the new 'Principal' that is actually missing these databases.
These technical conflicts can be resolved in different ways with the Process Historian Management Console.

4.3 Configuring Process Historian Redundancy Service

This chapter describes how to set up the Process Historian redundancy.

Configuring the Process Historian Redundancy Service

The service installation wizard opens when the Process Historian database installation is completed and the PC has rebooted. In the wizard, enter a user that has been granted access rights for the Process Historian database of the redundant PC.

1. Follow the wizard instructions and click "Next".
2. In the 'Service configuration' dialog, enter a 'User' and a 'Password' in the "New security setting" area of the service configuration. Click "Next".
3. The 'Overview' dialog displays a summary of the configuration. Verify your entries and complete the process with "Finish".

Note

Process Historian status and licensing status

Before the restart, the status is shown as "Undefined" in the 'Process Historian status' area of the Management Console.

The license is declared as "Invalid license" in the 'Licensing status' area.

After the restart, the status is synchronized again with the update.

For additional information, see the Installation Notes on the installation DVD and in the Siemens portal.

4.4 Setting up Process Historian redundancy

This chapter describes how to set up the Process Historian redundancy.

Setting up redundancy

1. To open the Management Console on the principal (master), select "Start > Programs > Siemens Automation > SIMATIC > Process Historian > Process Historian Management Console".
2. Select the 'Redundancy' dashboard in the Explorer.
3. Click "Start redundancy configuration ..." in the 'Redundancy' area to launch the configuration wizard.

4. In the 'Host configuration' dialog, configure the Process Historian server principal (master) and mirror (standby), as well as the witness server.

The configuration includes the network adapters that are used by the principal (master) to run the mirroring.

Configure the SQL server instance for each computer in the following format:

- <Computer name>\<SQLServer instance name>

Assign the following objects from the drop-down menus:

- SQL Server instance
- Network Adapter

Alternatively, you can enter the <Computer name>\<SQLServer instance name> manually. Confirm your settings with "Next".

Configuration

Take the following configuration details into account when selecting the required settings.

Principal (master)

The wizard is launched on the Principal, so this is the default entry. This setting cannot be changed.

- SQL Server instance:
<Computer name>\<SQLServer instance name>
The SQL Server instance for PH server is "HISTORIAN".
- Network adapter:
Selection of a dedicated redundancy link.

Mirror (standby)

- SQL Server instance:
Selection from the drop-down menu. If necessary, you can reload the list using the "Refresh" button.
- Network adapter:
Selection similar to the dedicated redundancy link of the principal.

Witness server

- SQL Server instance:
Selection from the drop-down menu. If necessary, you can reload the list using the "Refresh" button.
The instance depends on the base of the witness server, Information Server or WinCC.
The instance is named "INFSERVER" or "WINCC" respectively.
 - Network adapter:
Selecting the terminal bus link.
5. Specify the ports and required firewall settings in the "TCP port settings" dialog. Accept the Process Historian defaults. The firewall settings specified in the setup are now taken into account.

Note

The default settings are edited if the proposed resources are already in use by a different application.

You can find more detailed information on the firewall settings in the section Firewall settings (Page 134).

4.4 Setting up Process Historian redundancy

6. A plausibility check of your configuration is performed in the 'Validation' dialog. This dialog is also used to validate the connectivity of the configured servers and paths. The action currently performed is indicated via a log in the "Validation" area.
Click "Rerun" to restart a possibly interrupted validation process.
Confirm the successful validation with "Next".
7. The "Overview" dialog displays a summary of the completed settings. Verify these settings.
Start the configuration process with "Next".
Click "Previous" to correct any incorrect entries.
8. The prepared configuration of redundancy on the principal, mirror, and witness servers is executed in the "Execution" dialog.
The new configuration is set up in a step-by-step process. The log of actions is displayed in the "Setup actions" area.
Certain setup actions may take a longer time depending on the size of the Process Historian database.
We distinguish between the following processes:
 - "Fast data backup and restore":
This process generates a complete backup copy of the principal database and simultaneously restores it on the mirror.
 - "Fast transmission of the transaction log":
This process generates and synchronously restores a backup of the transaction log.Click "Rerun" to restart a possibly interrupted configuration process.

See also

Firewall settings (Page 134)

Migration

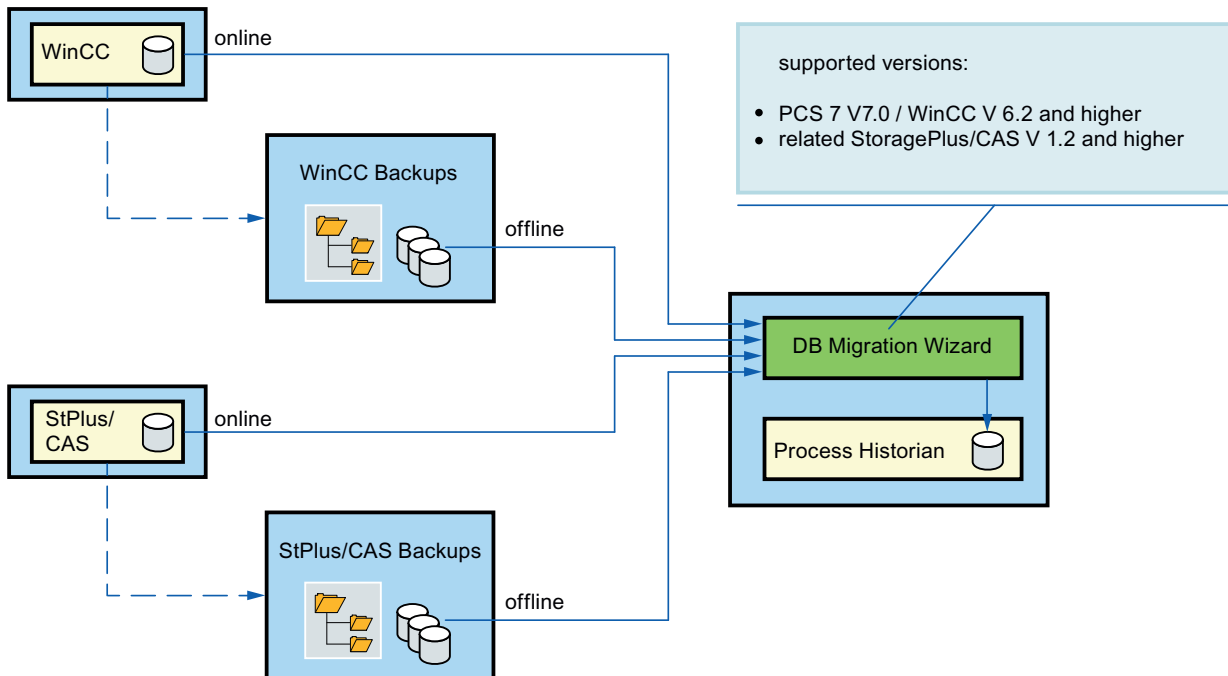
5.1 Overview

Introduction

This section describes the migration of the following projects to the current Process Historian:

- WinCC V7
- Central Archive Server (CAS)
- StoragePlus
- Process Historian

You can find a compilation of migratable data sources in the following graphic.



You can migrate process data from the following sources:

1. CAS project online (Page 65)
2. CAS project backup (Page 70)
3. WinCC project online (Page 74)
4. WinCC project backup (Page 78)
5. Process Historian project online (Page 83)

The data from the CAS and WinCC sources can be migrated online and offline. The data from the Process Historian source can only be migrated online.

System requirements

The computer with which you perform the migration must meet the following conditions:

- The hardware requirements from the installation instructions must be met.
- The software requirements from the installation instructions must be met.
- The Process Historian must be enabled.
- The free space on the drive must be large enough to accommodate the new data.
- The latest version of the Process Historian must be installed.
- The required licenses must be available.
- Online segments can only be migrated if the corresponding output system is active.
- Backup segments can only be migrated if the backup files are available in the destination path.

Process Data Migrator

To migrate data, open the Process Data Migrator service. The Process Data Migrator is installed together with the Process Historian on the same computer.

The Process Historian must be started in order to start the Process Data Migrator.

The migration procedure is very similar in the five scenarios, but differs somewhat in detail:

1. First, select the data source and the segment type.
2. Select the path and the data segments. The data segments consists of tag values and alarm data.
3. Select the desired data and start the migration process.
4. Before starting the actual migration process, a summary screen is displayed, which you should check.
5. If all the data are correct, start the migration process.
6. An overview with green check mark indicates the current progress of the migration.
7. If all entries are checked green, the migration is complete and the migrated data are available to you.

Note

Migration time

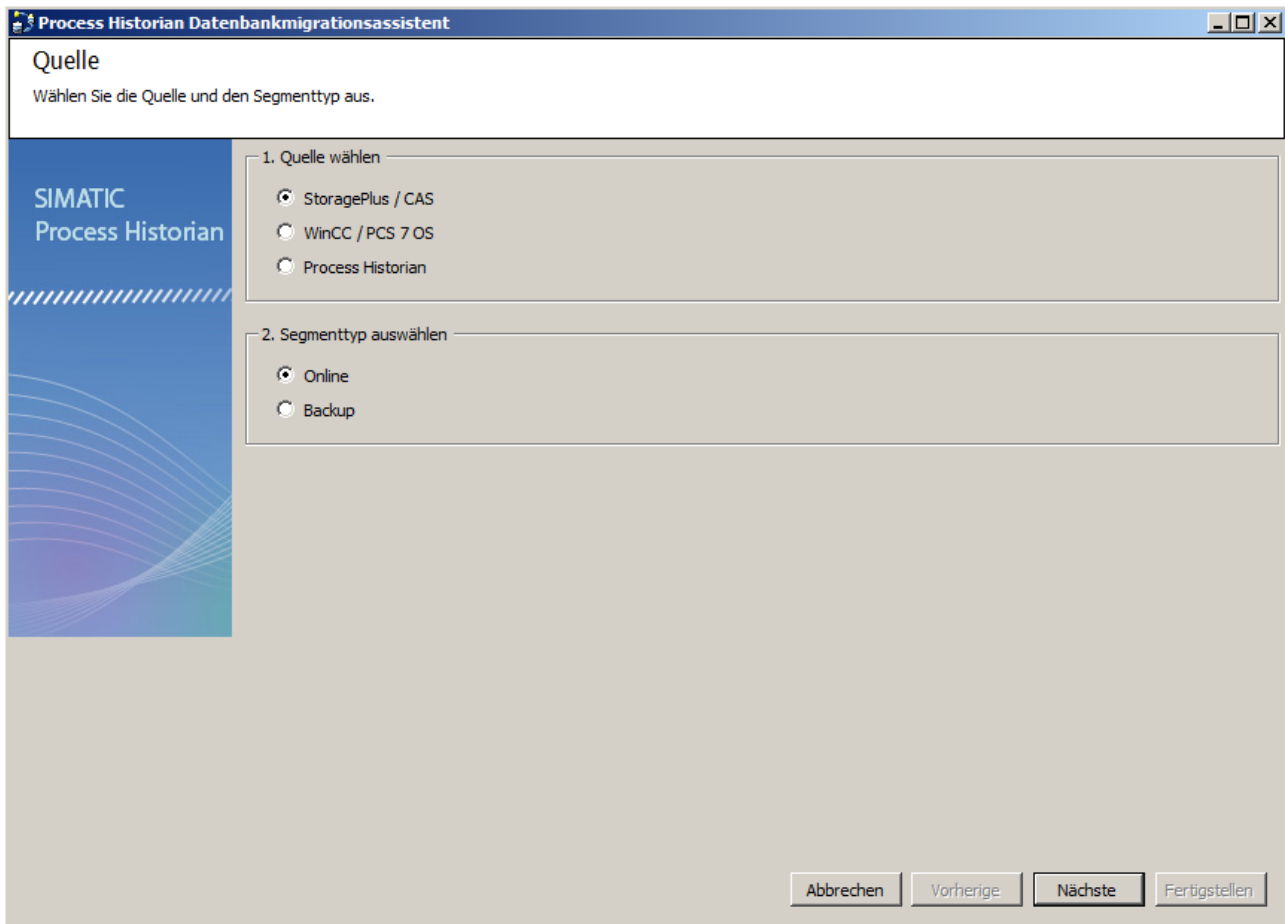
Depending on the data volume, the time needed for the migration may take from a few minutes to several days.

5.2 Migrating

5.2.1 CAS project online

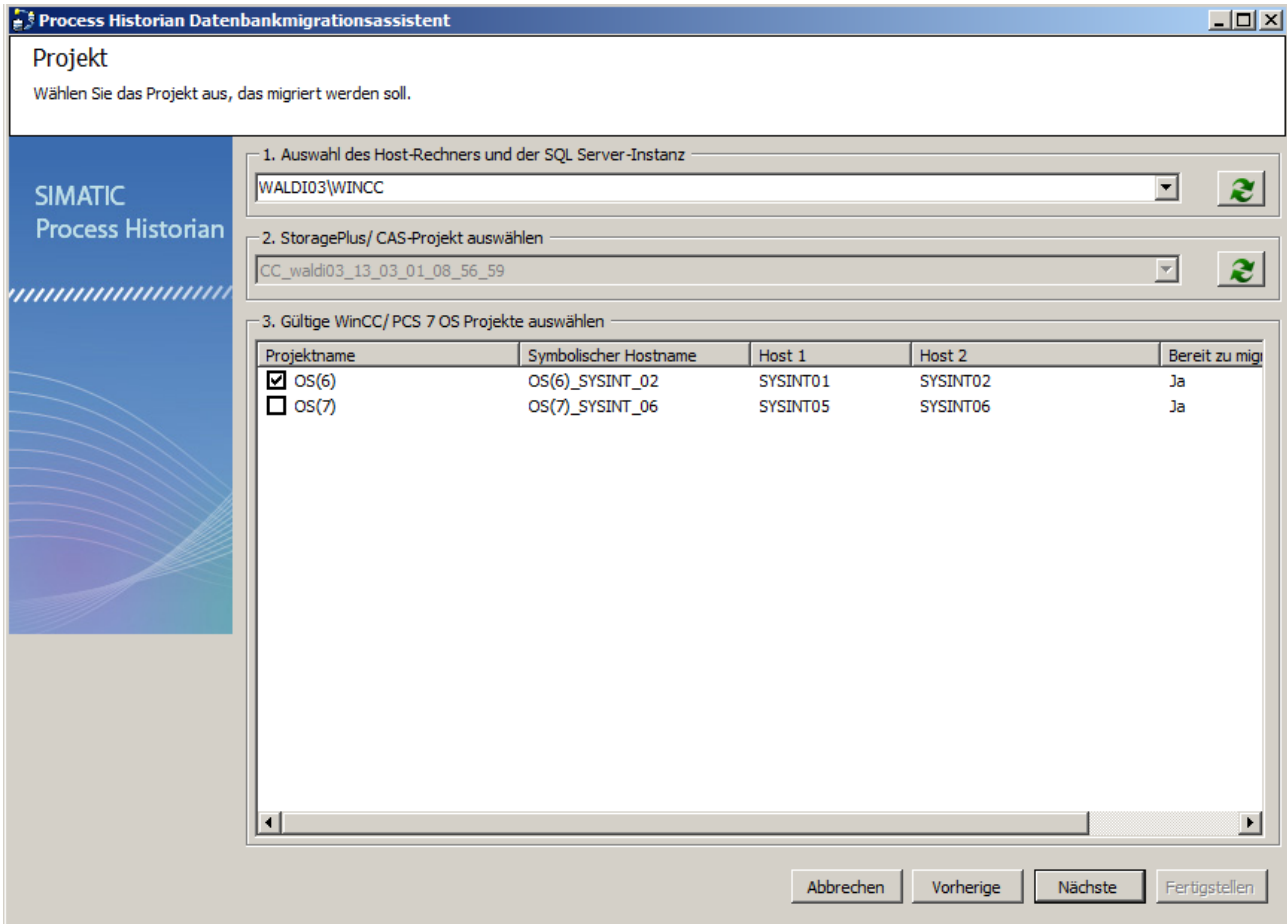
Migrating CAS project online

1. Start the Process Data Migrator.
2. Select the source and the segment type.
In this example, online segments of a StoragePlus project or CAS project are migrated.

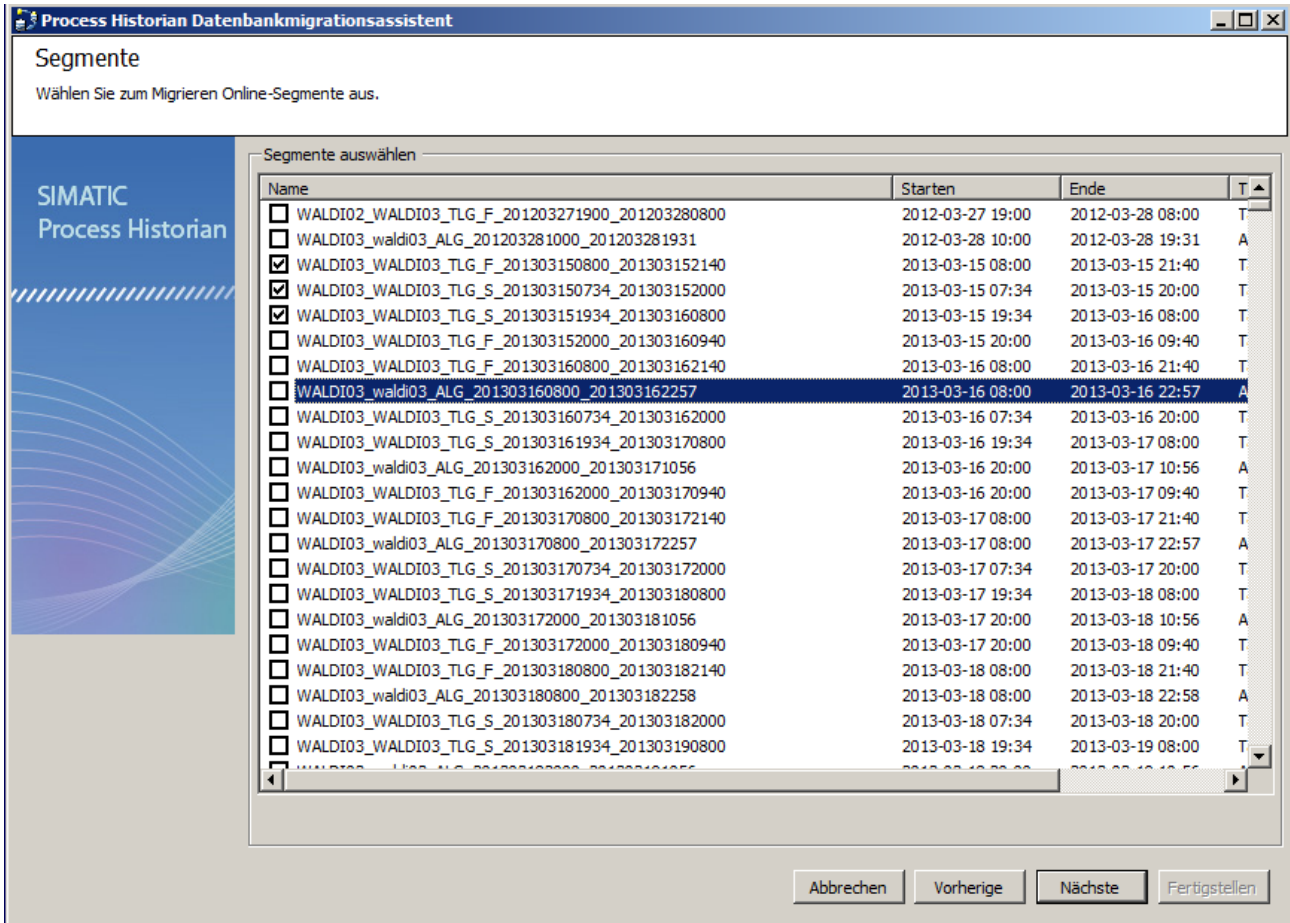


3. The dialog for the source path shows the available SQL instances in the network. Select the required computer in the selection list. The available projects are displayed. Two OS, OS(6) and OS(7), are in use in this example. The data from the OS(6) are to be migrated.

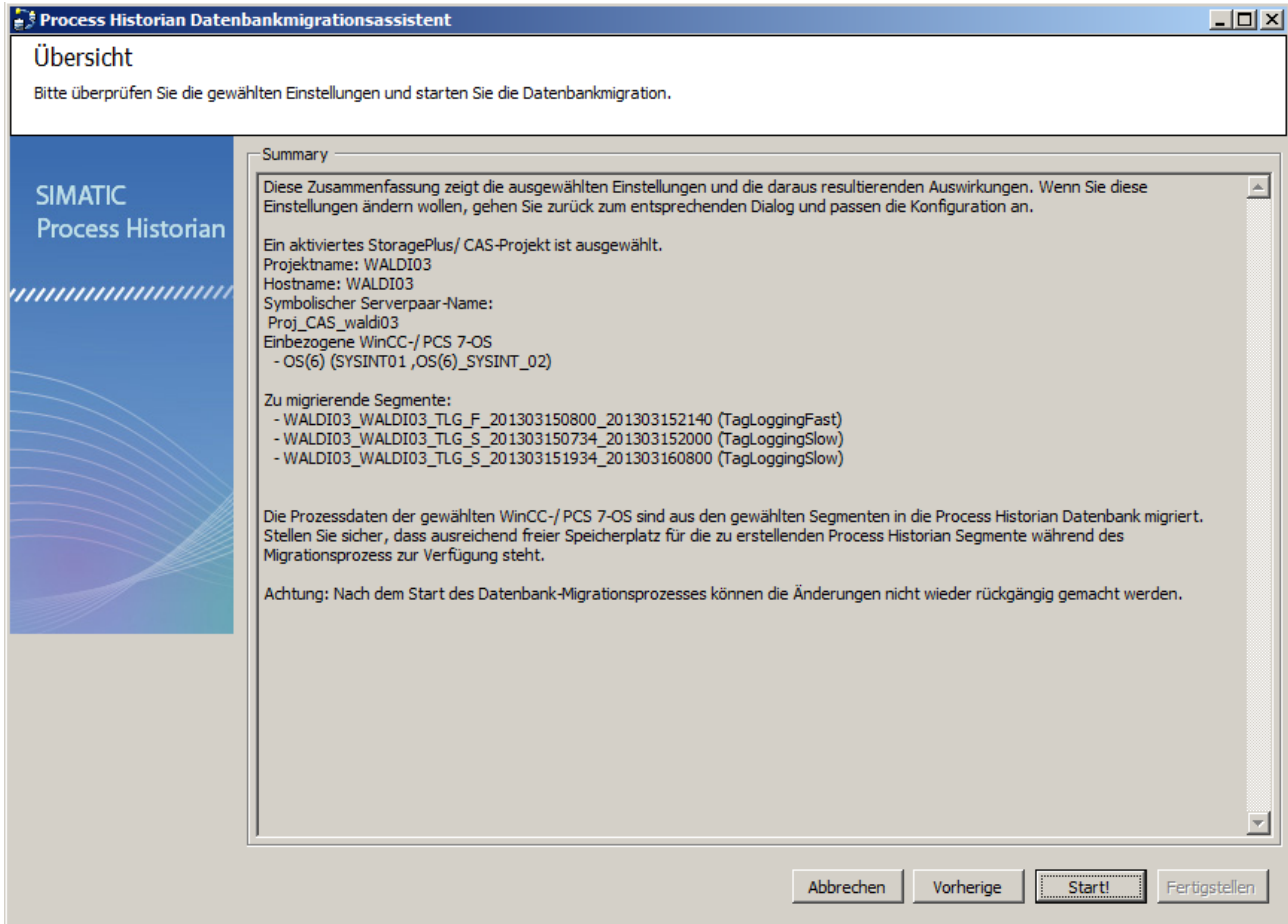
4. Select the required project.



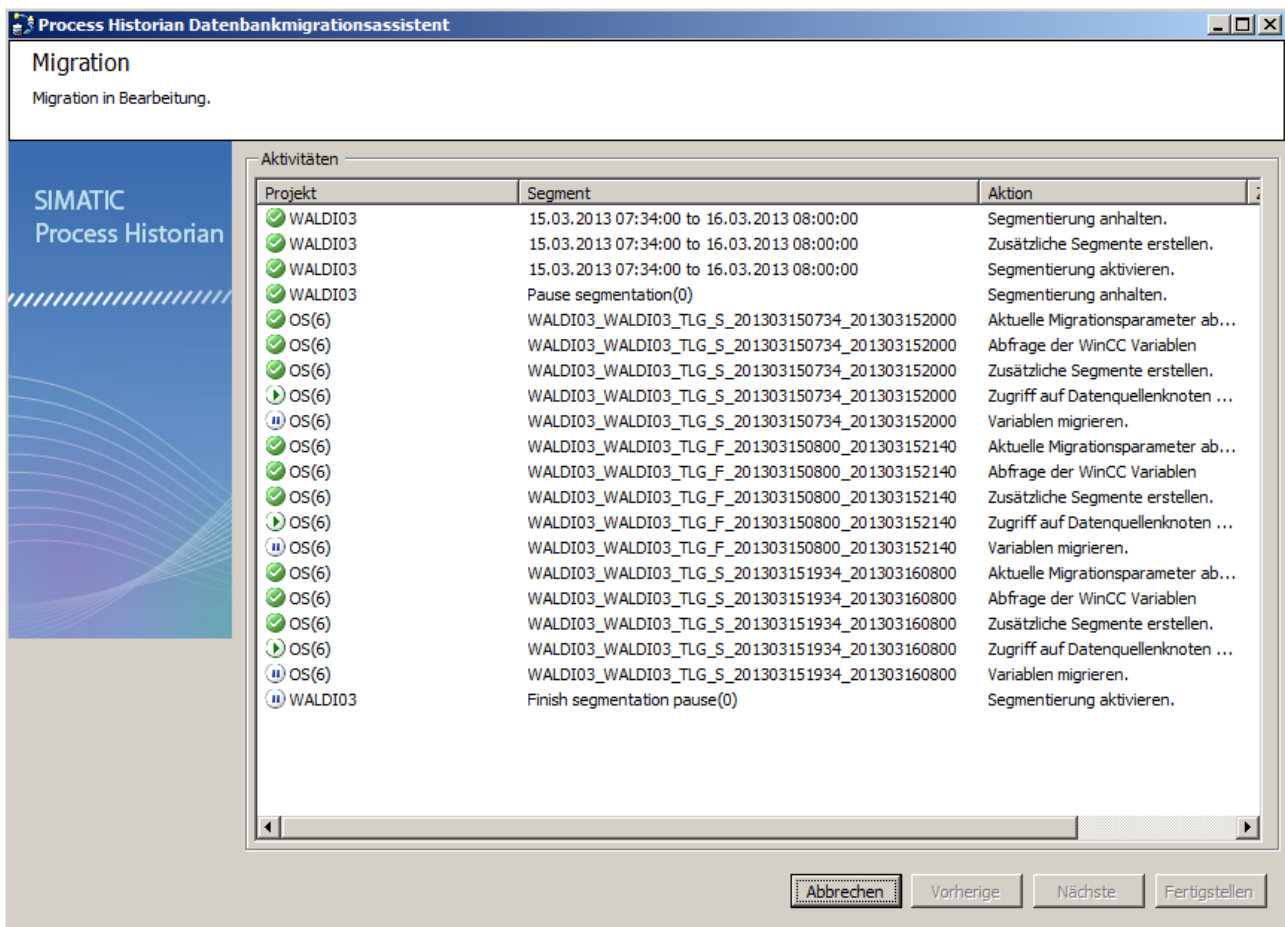
5. Select the segments you want to migrate.
Disable all other segments.
Three data segments of the Tag Logging type were selected in this example.



6. Check the displayed summary of the migration.
If the summary is correct, start the migration.



7. The migration progress is displayed.
When the migration has been completed, exit the Process Data Migrator with "Finish".



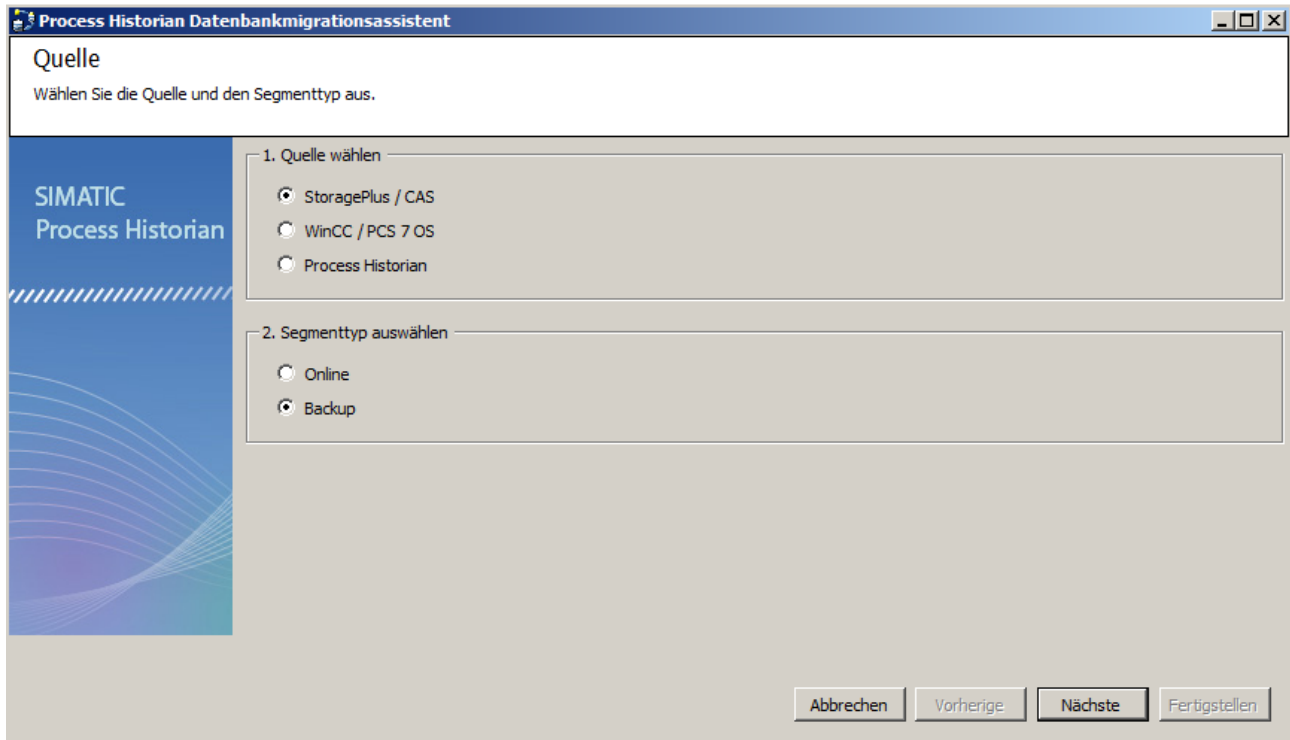
Result

The selected data has been migrated to the current Process Historian database.

5.2.2 CAS project backup

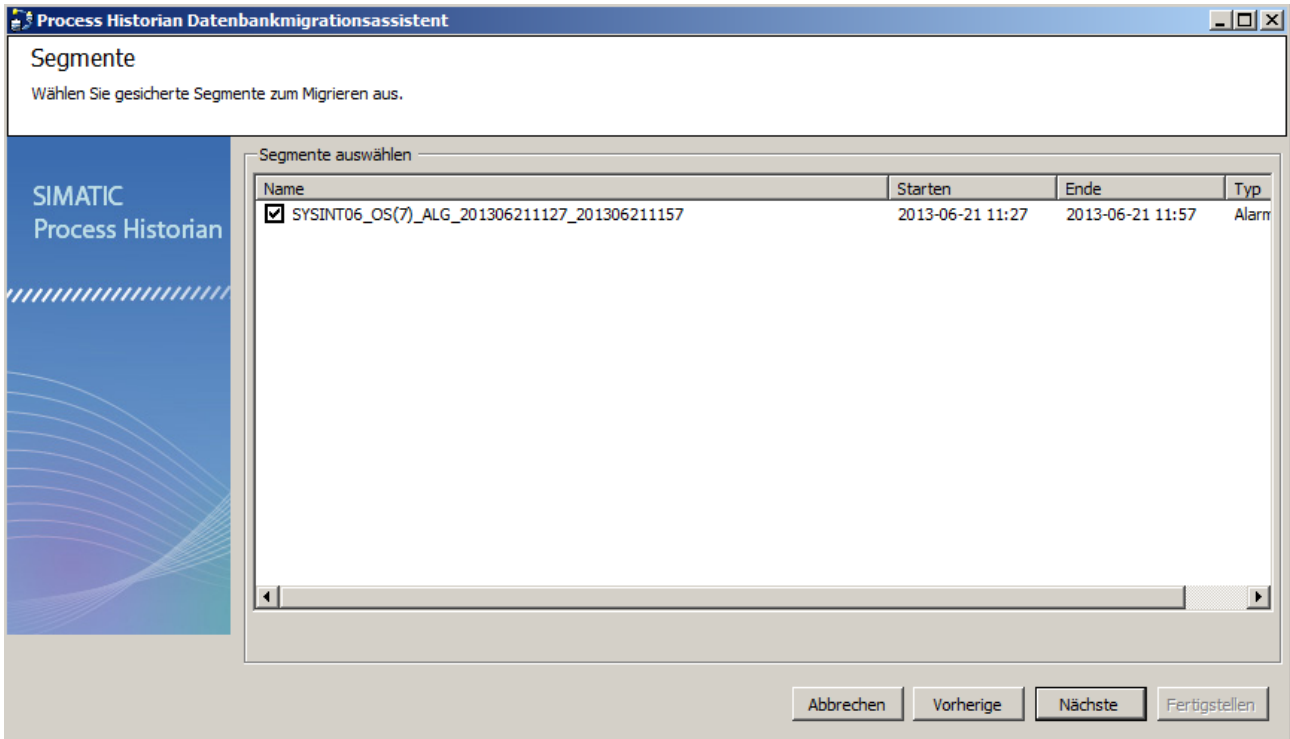
Migrating CAS project backup

1. Start the Process Data Migrator.
2. Select the source and the segment type.
In this example, backup segments of a StoragePlus project or CAS project are migrated.

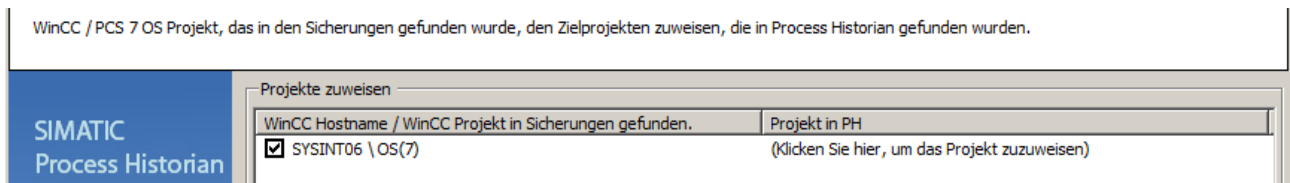


3. In the following dialog, select the "Add segments" or "Add folders" entry under "Add" in the shortcut menu of the displayed field.

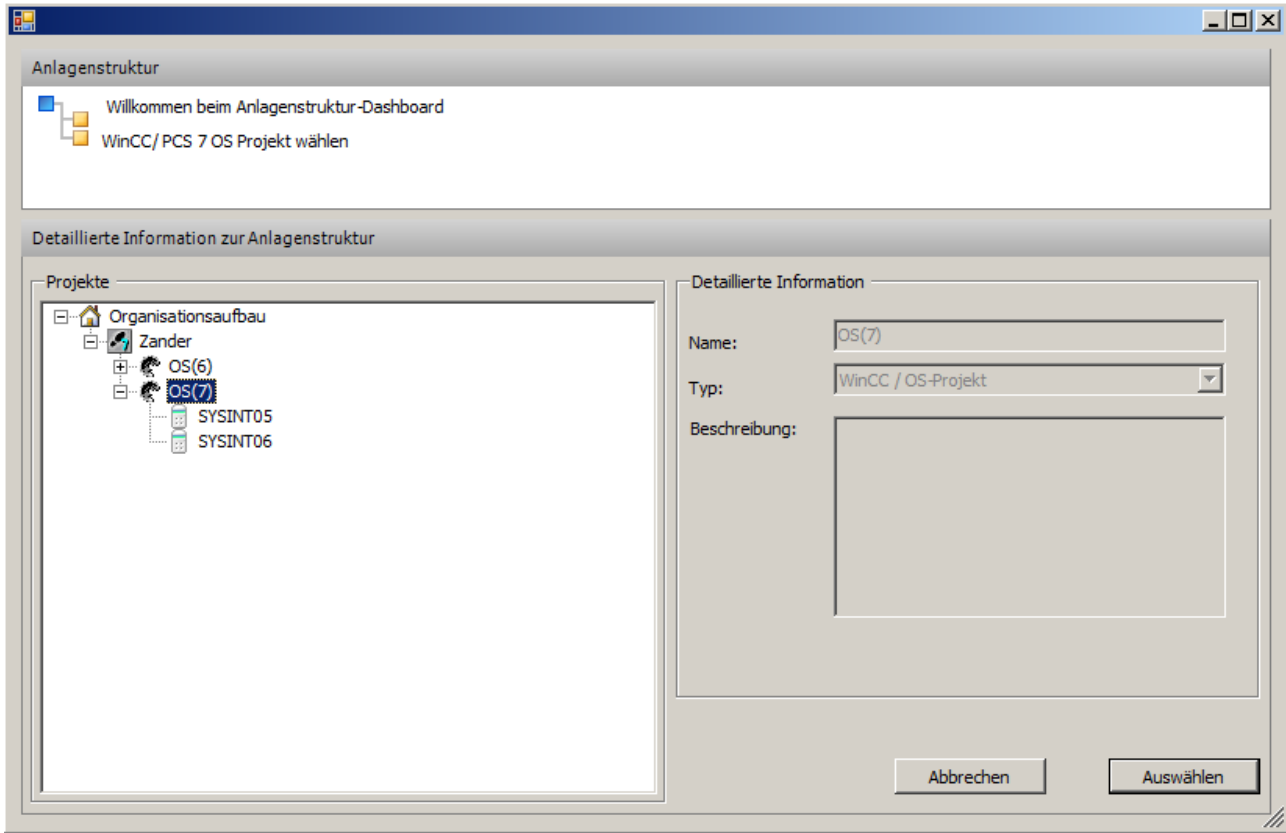
- Select the required segments and confirm with "Open".
In this example the Alarm Logging segment "SYSINT06" is migrated from the project OS(7).



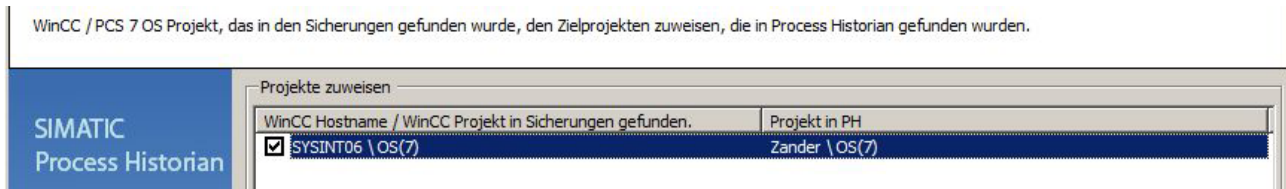
- The Process Data Migrator indicates that the segment was found in the backups. Click in the "Project in PH" column to assign the storage location for the migrated project.



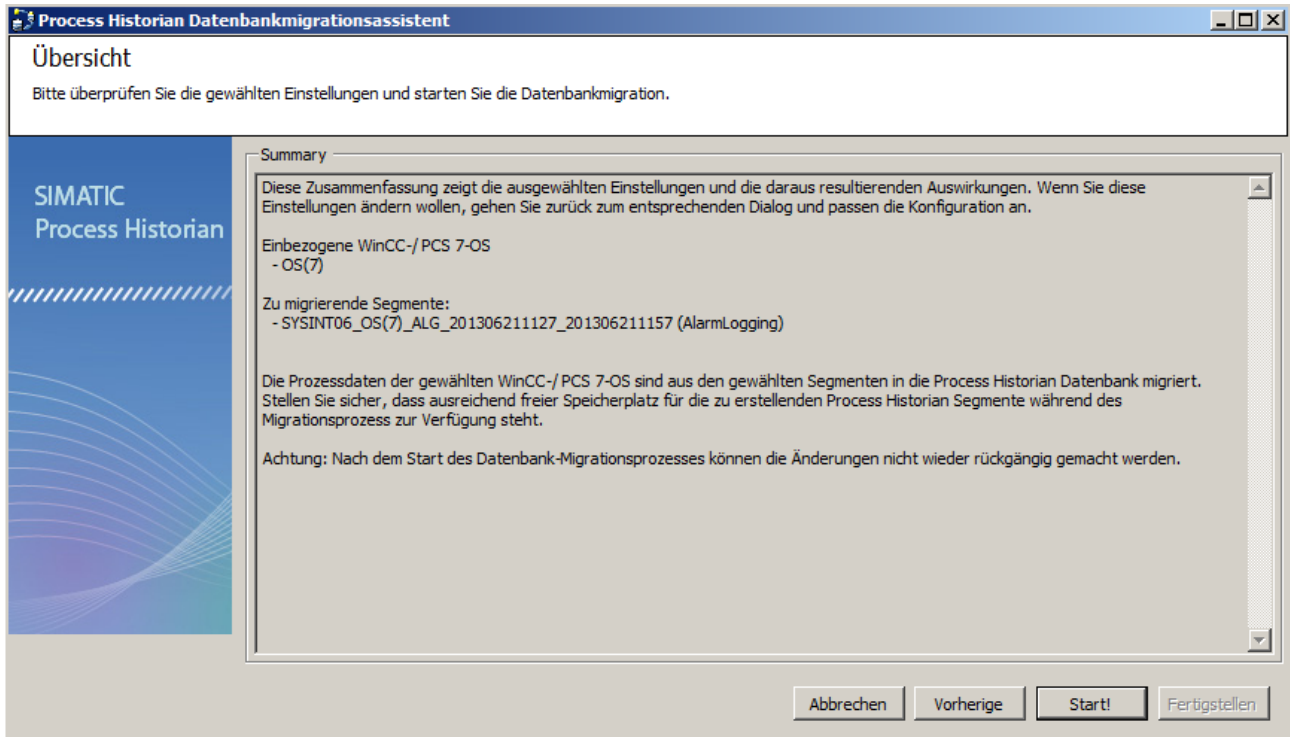
- 6. The plant structure opens.
Select the path in which you want to save the migrated project.



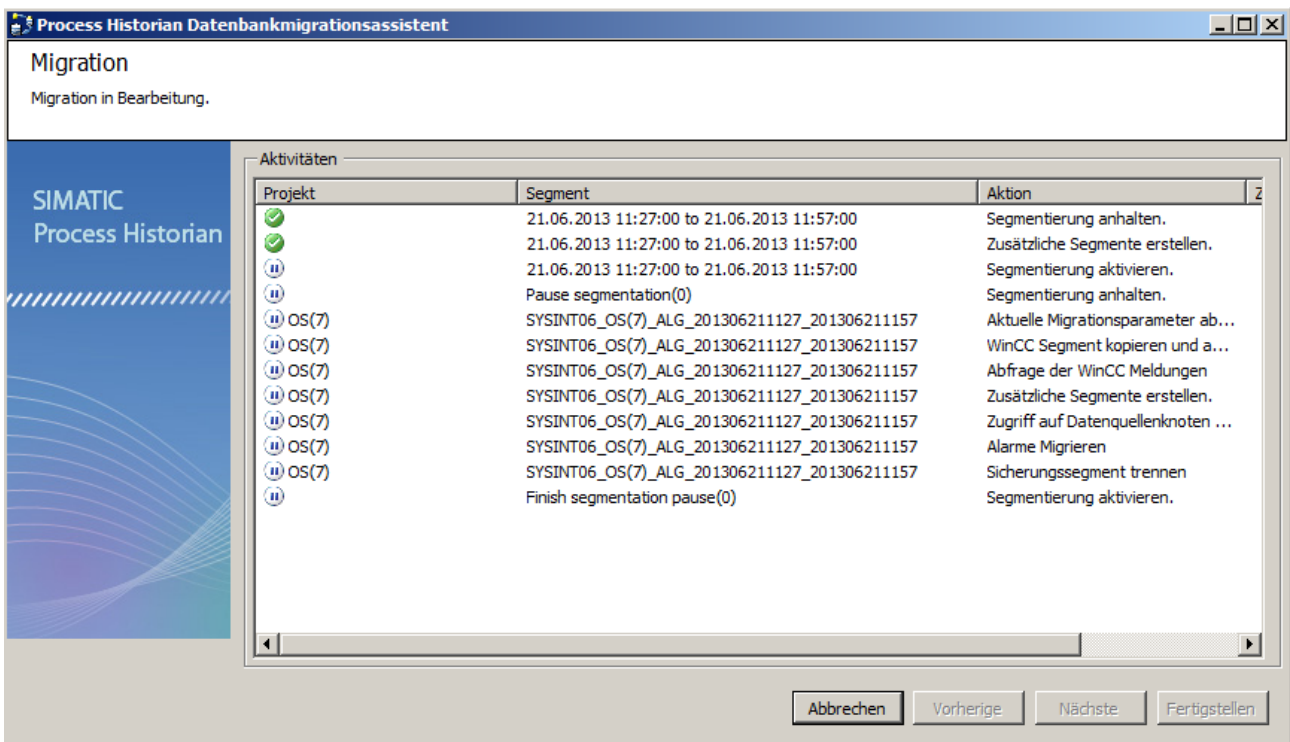
The selected path is displayed.



7. Check the displayed summary of the migration.
If the summary is correct, start the migration.



8. The migration progress is displayed.
When the migration has been completed, exit the Process Data Migrator with "Finish".



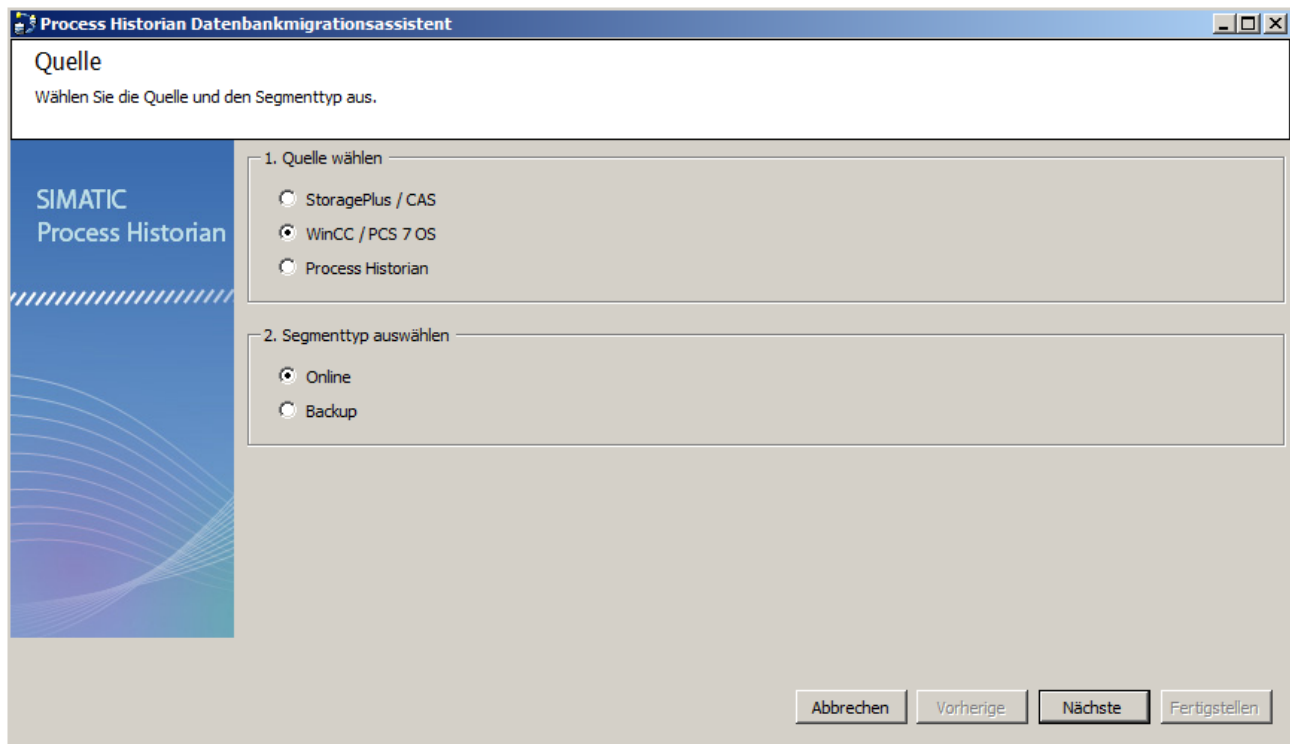
Result

The selected data has been migrated to the current Process Historian database.

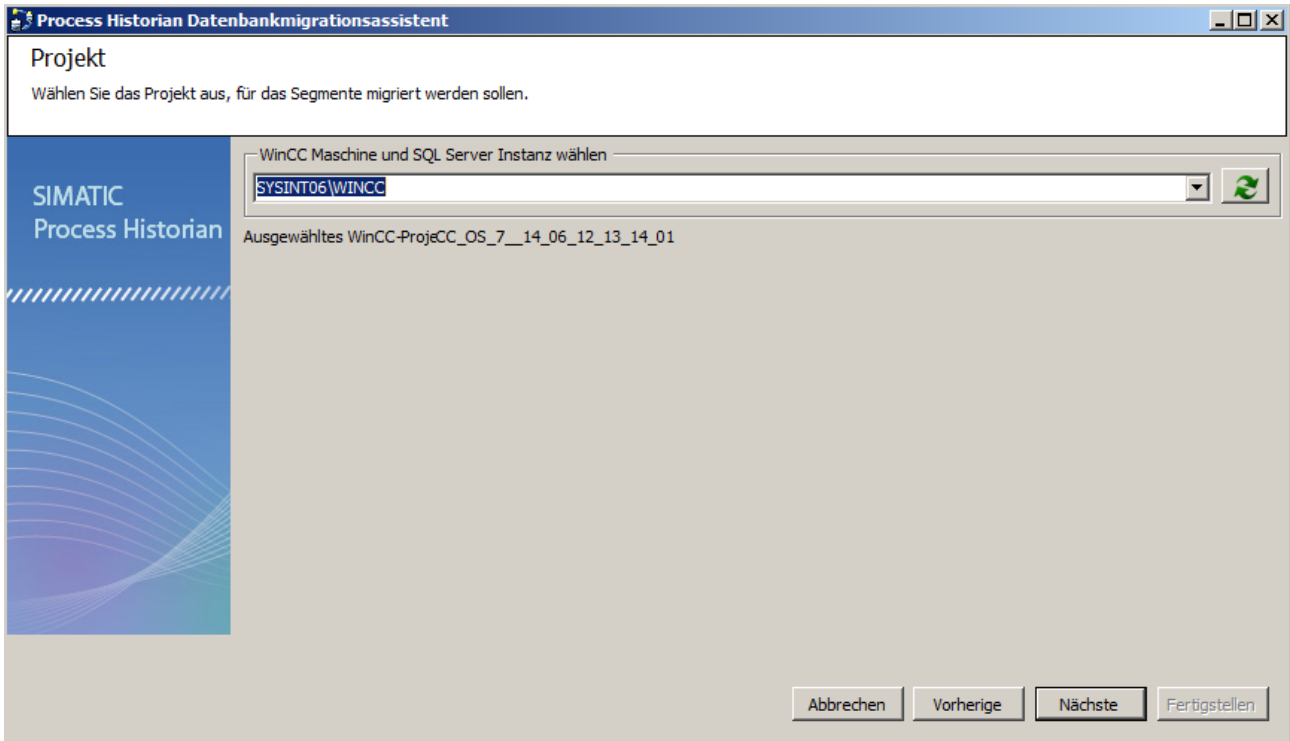
5.2.3 WinCC project online

Migrating a WinCC project online

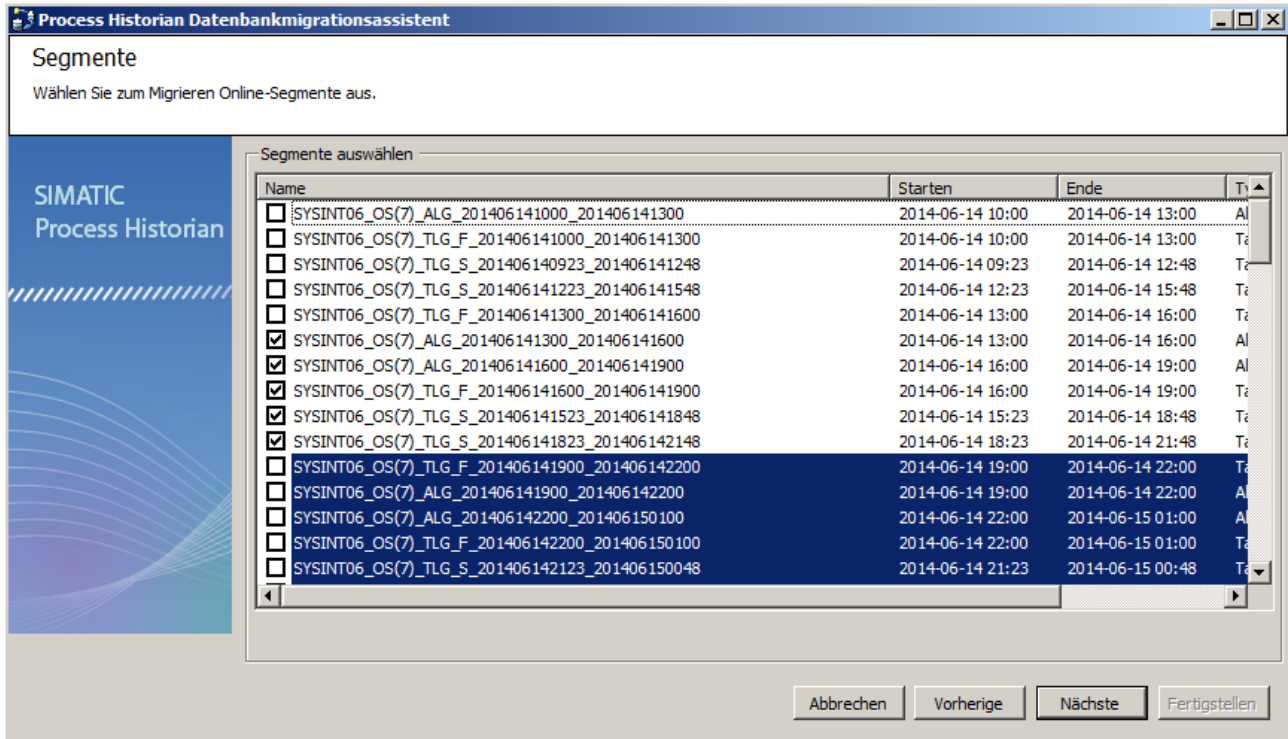
1. Start the Process Data Migrator.
2. Select the source and the segment type.
In this example, online segments of a PCS 7 project or WinCC project are migrated.



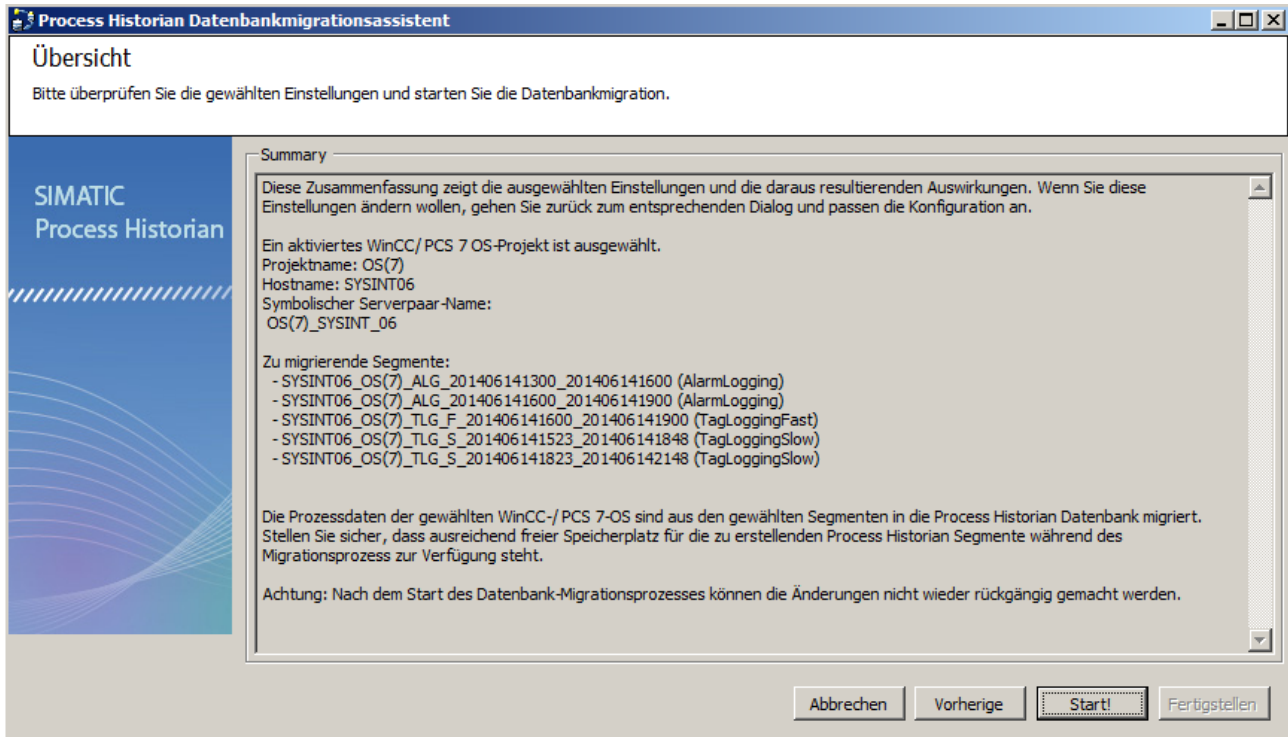
3. The dialog for the source path shows the available SQL instances in the network.
Select the PC with the required project from the selection list.
The selected WinCC project is displayed in the entry field.



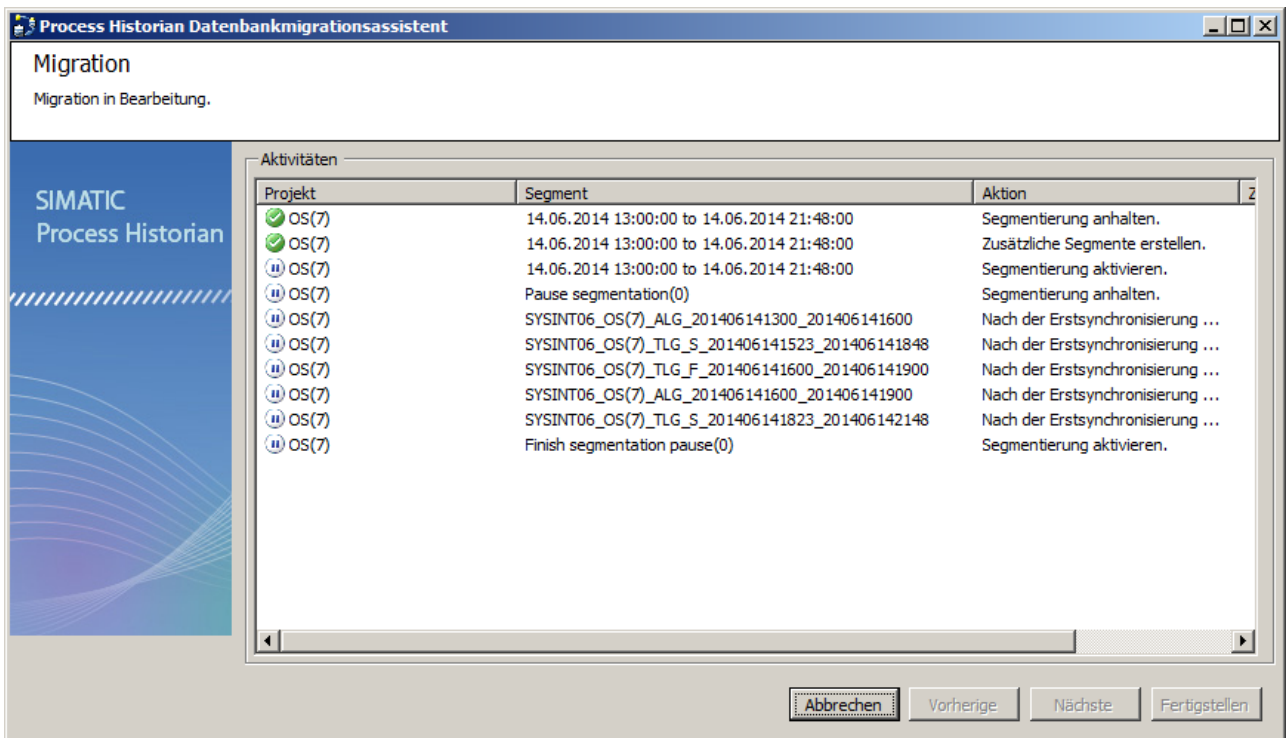
- 4. Select the segments you want to migrate.
Disable all other segments.
Three data segments of the Tag Logging type and two data segments of the Alarm Logging type were selected in this example.



5. Check the displayed summary of the migration.
If the summary is correct, start the migration.



6. The migration progress is displayed.
When the migration has been completed, exit the Process Data Migrator with "Finish".



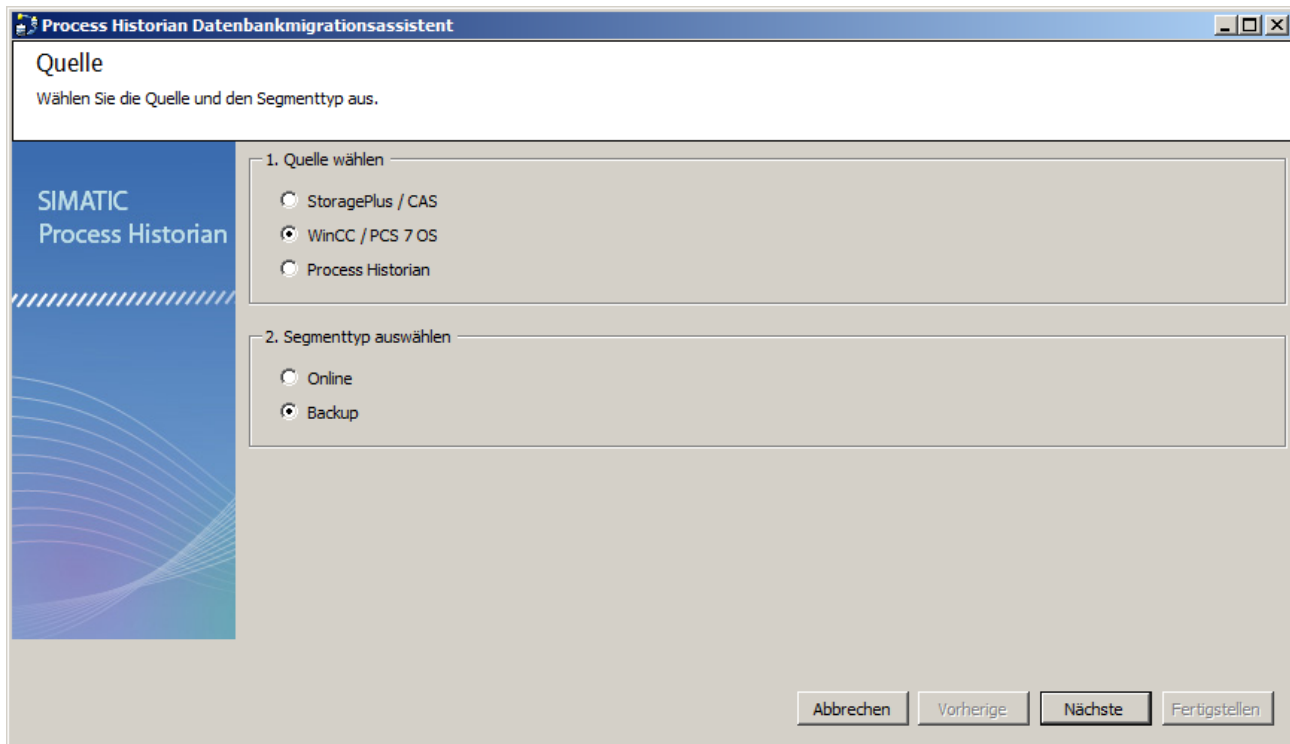
Result

The selected data has been migrated to the current Process Historian database.

5.2.4 WinCC project backup

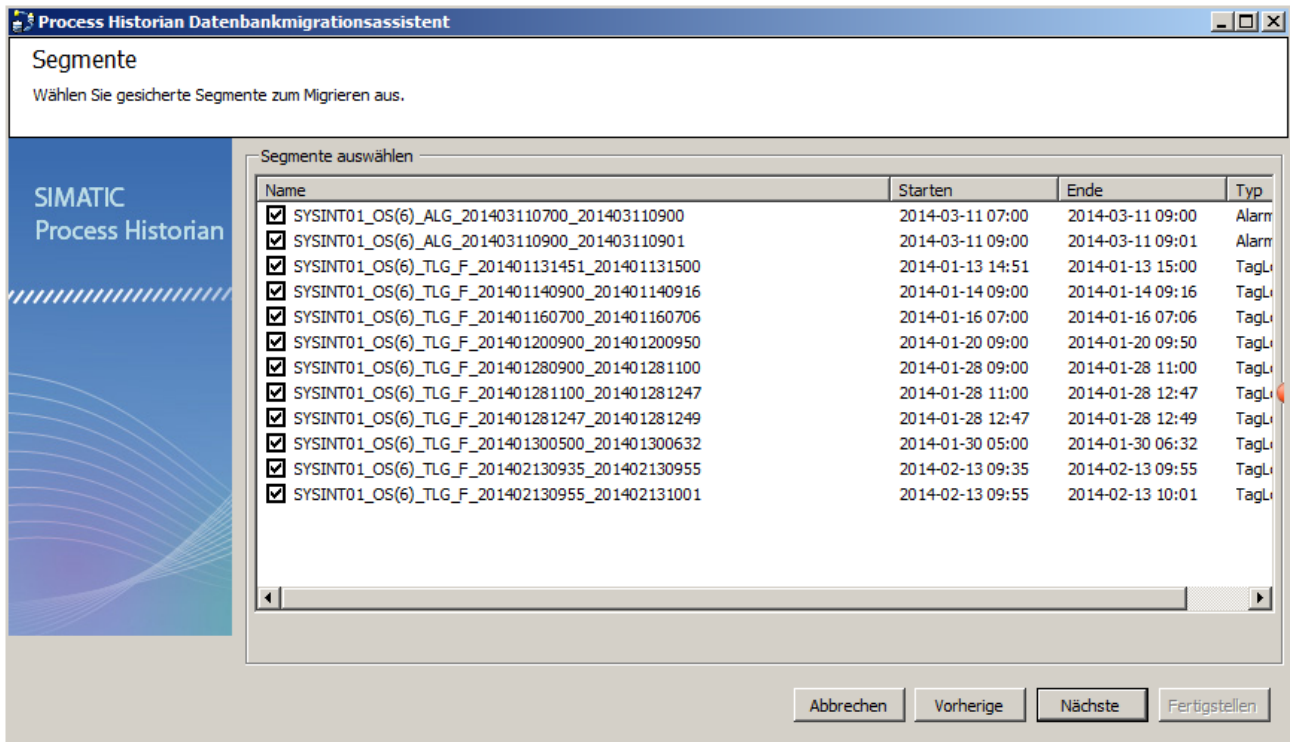
Migrating WinCC project backup

1. Start the Process Data Migrator.
2. Select the source and the segment type.
In this example, backup segments of a PCS 7 project or WinCC project are migrated.

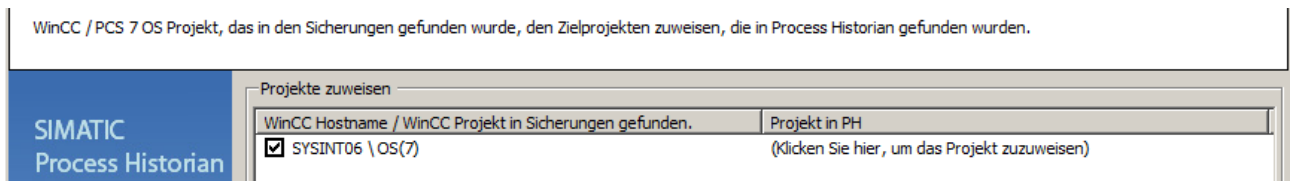


3. In the following dialog, select the "Add segments" or "Add folders" entry under "Add" in the shortcut menu of the displayed field.

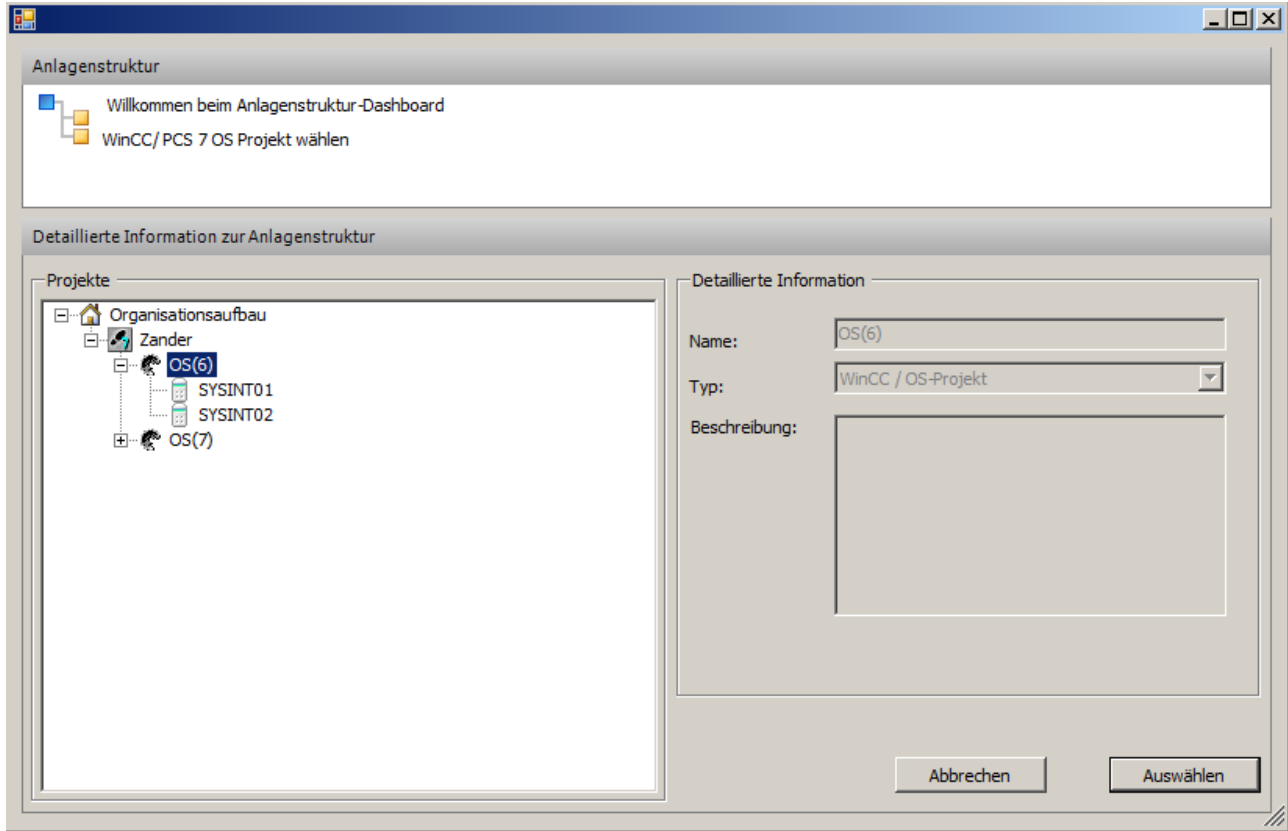
4. Select the required segments and confirm with "Open".



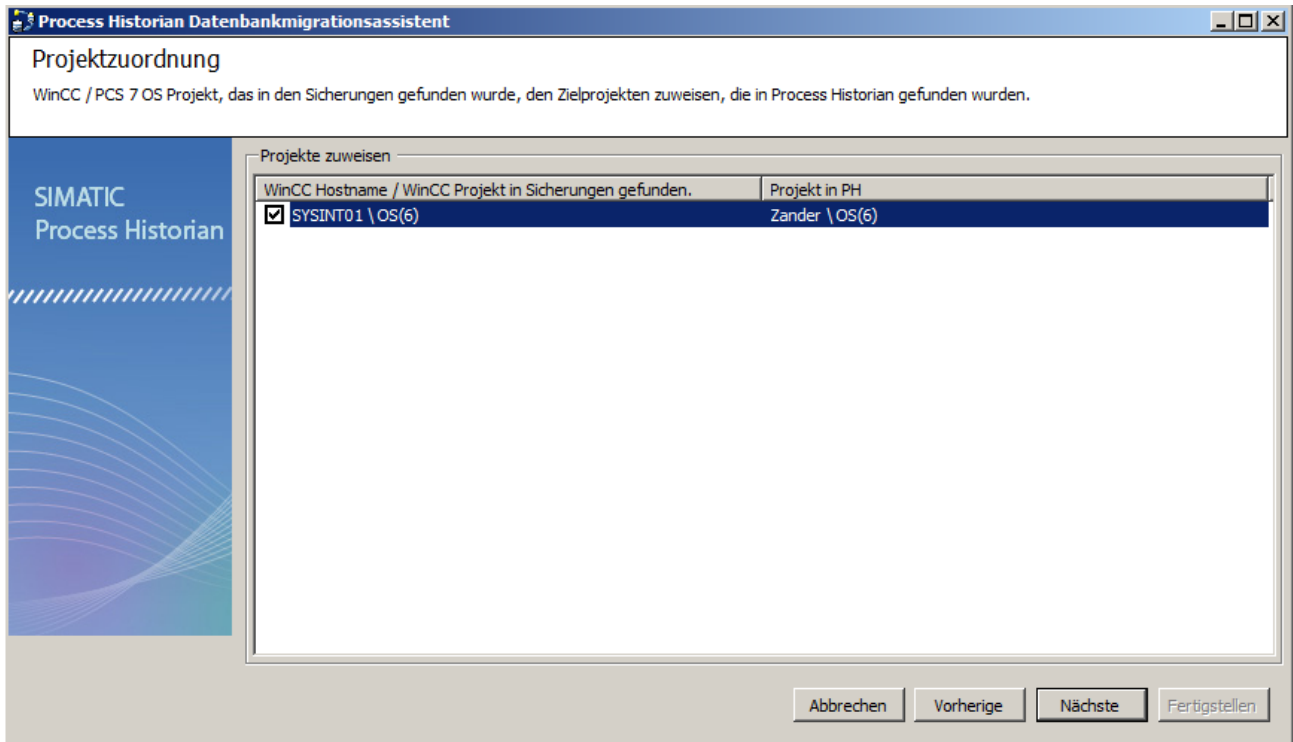
5. The Process Data Migrator indicates that the segment was found in the backups. Click in the "Project in PH" column to assign the storage location for the migrated project.



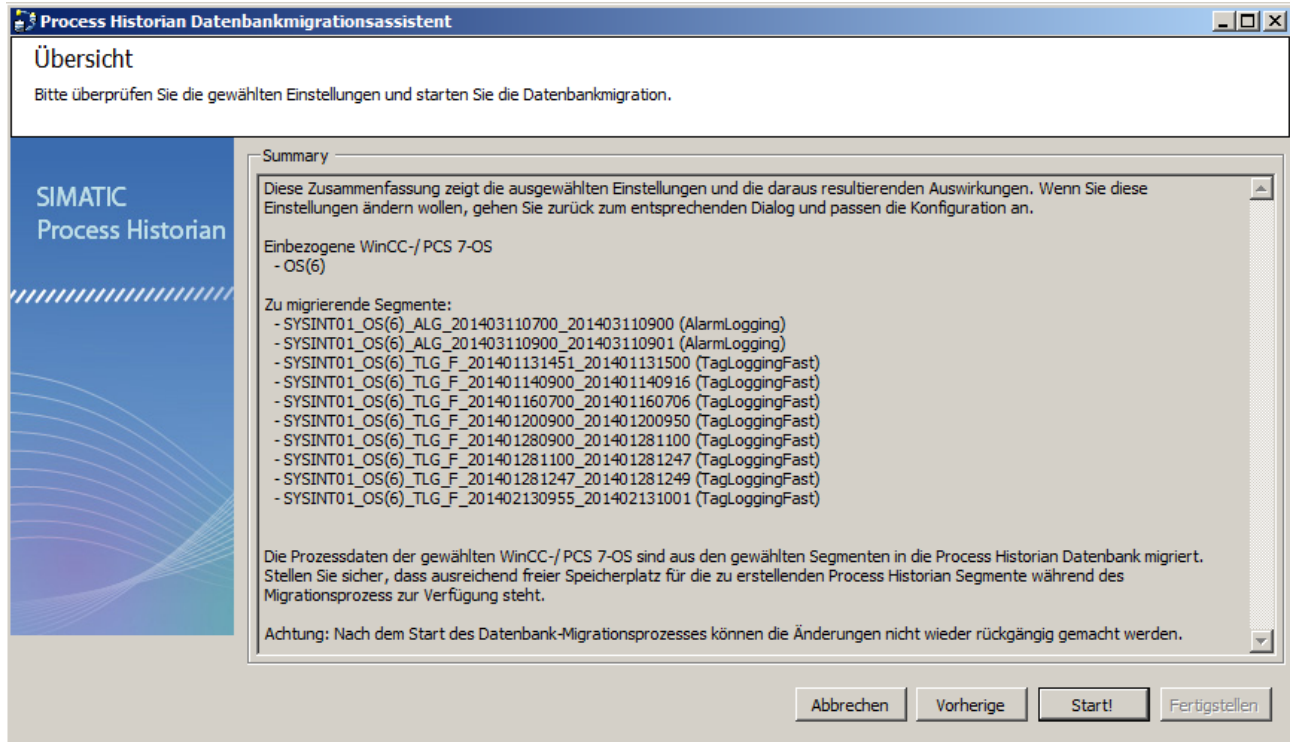
- 6. The plant structure opens.
Select the path in which you want to save the migrated project.



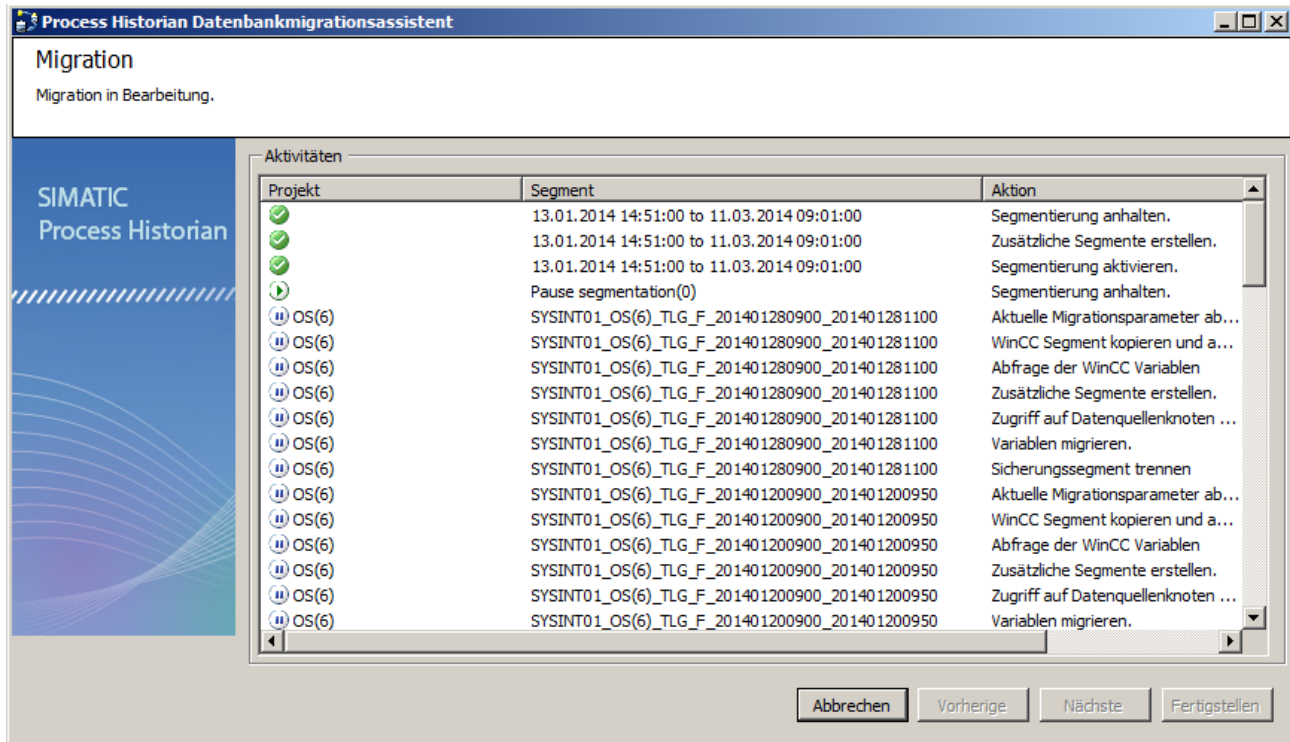
The selected path is displayed.



- Check the displayed summary of the migration.
If the summary is correct, start the migration.



- The migration progress is displayed.
When the migration has been completed, exit the Process Data Migrator with "Finish".



Result

The selected data has been migrated to the current Process Historian database.

5.2.5 Process Historian project online

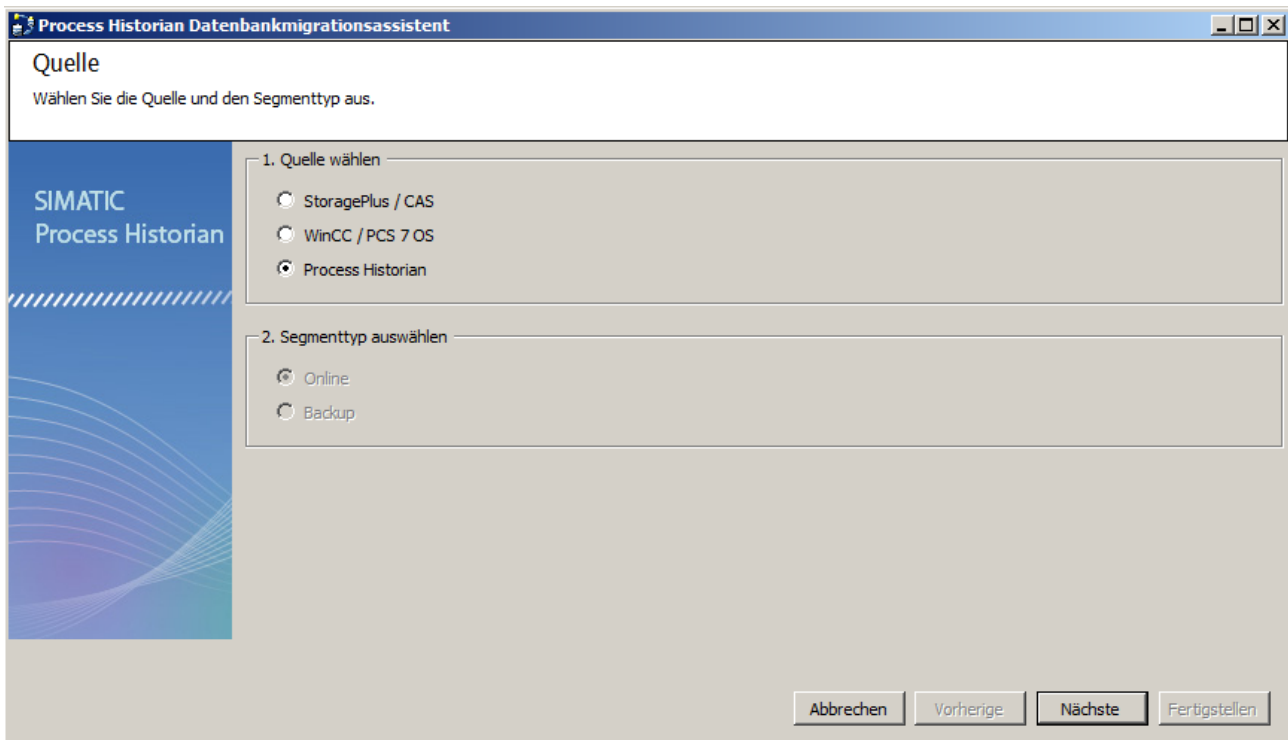
To transfer a Process Historian project to another PC, for example, because the new hardware is more powerful, use the "Process Historian" migration.

Since the time settings for the segmentation can be changed during the switch to another PC, always use the migration function for the move.

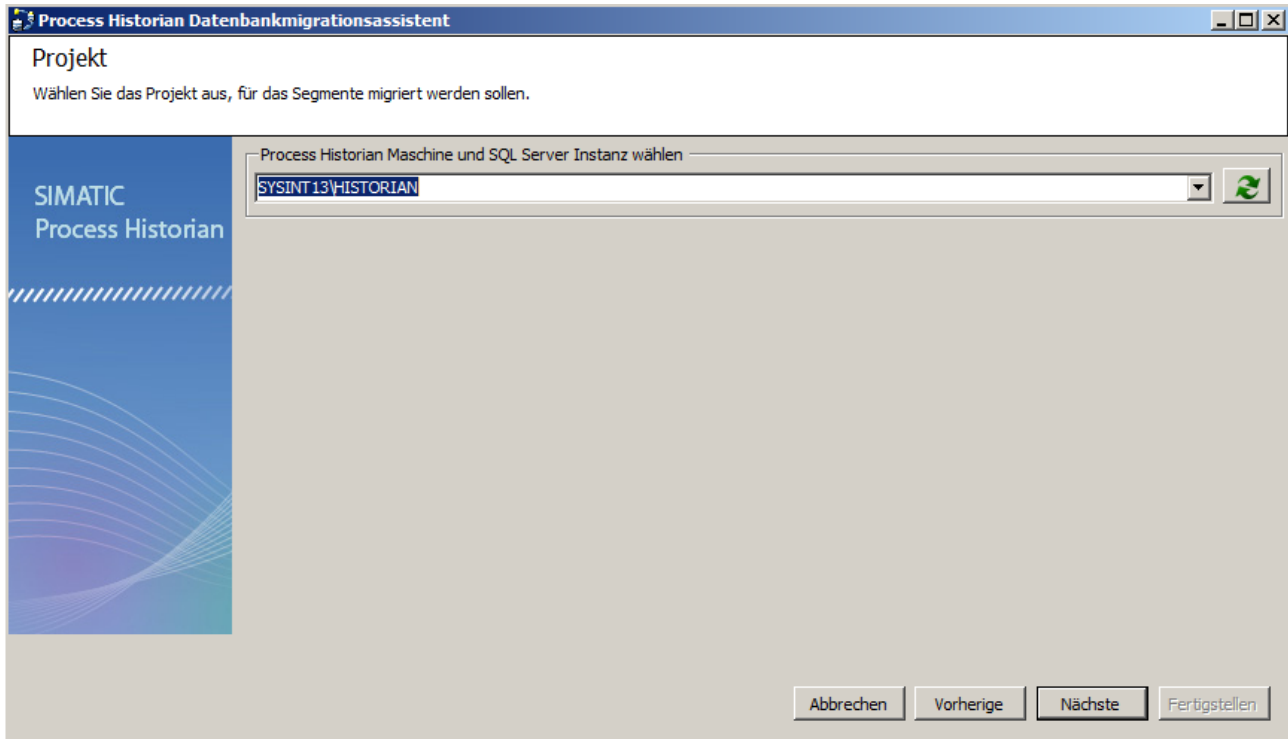
This function is only available for databases that have been created with Process Historian 2014 or later.

Migrating Process Historian database

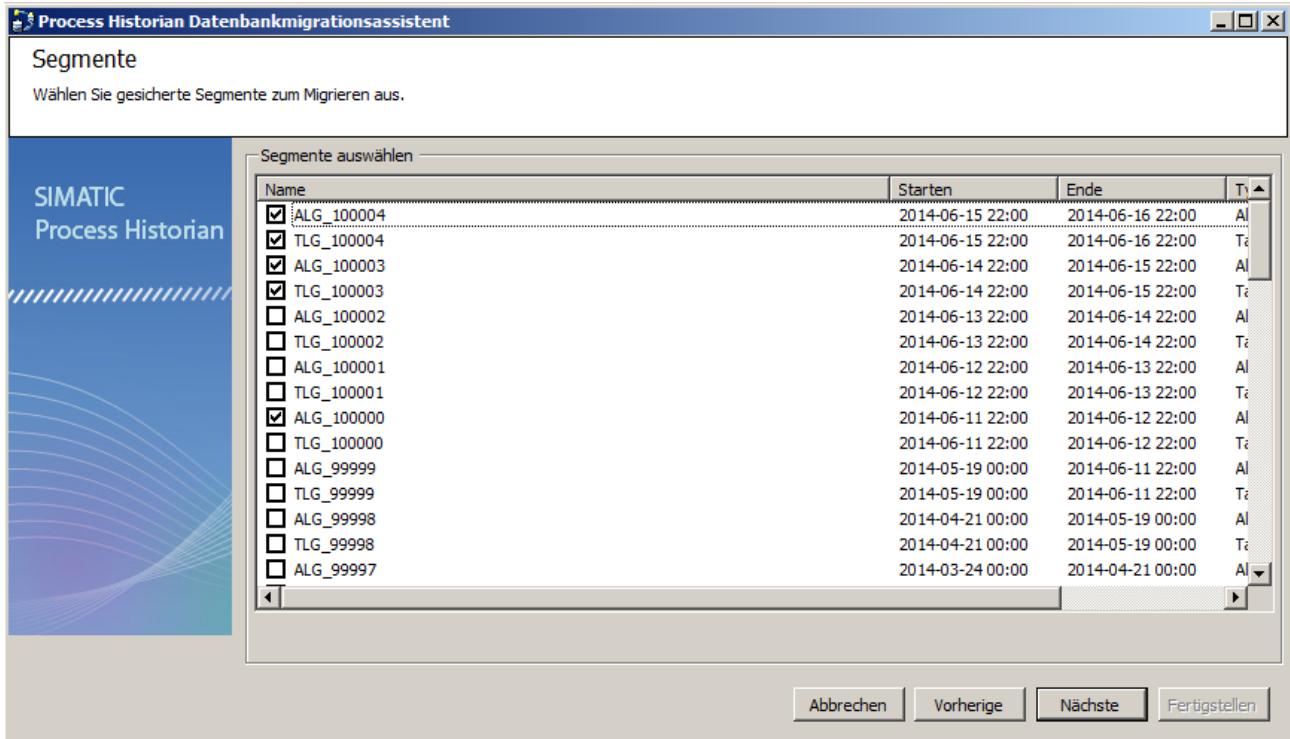
1. Close the process Process Historian in the Process Historian management console on the source PC with "Shut down".
2. Start the Process Data Migrator on the destination PC.
3. Select the source "Process Historian".



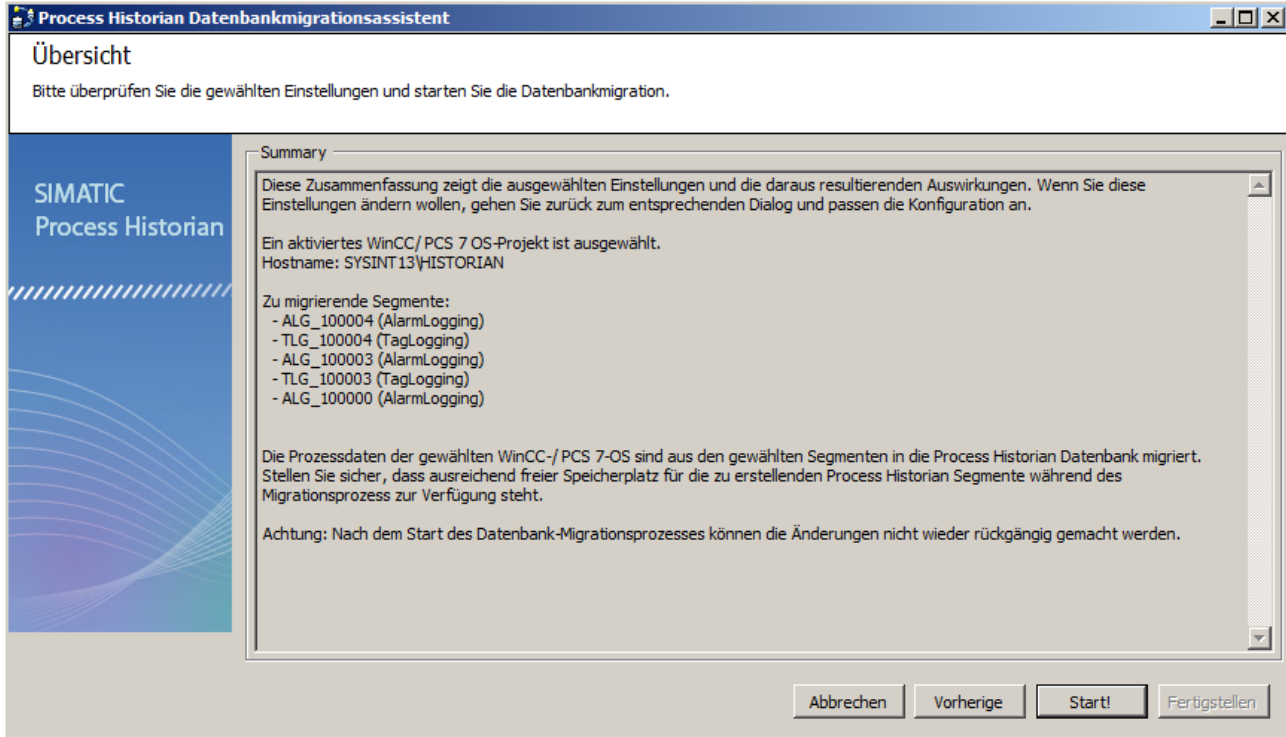
4. The dialog for the source path shows the available SQL instances in the network.
Select the source PC in the selection list.



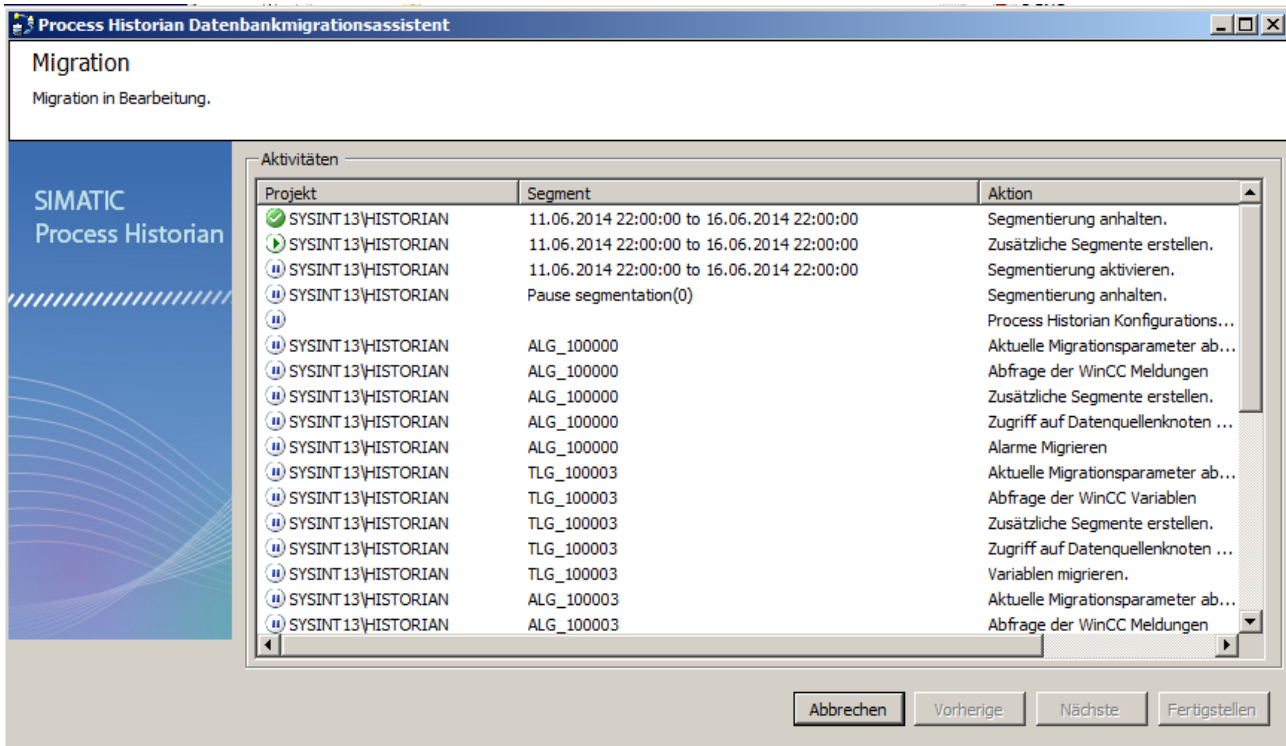
5. Select the segments you want to migrate.
Disable all other segments.
Three data segments of the Tag Logging type and three data segments of the Alarm Logging type were selected in this example.



6. Check the displayed summary of the migration.
If the summary is correct, start the migration.



7. The migration progress is displayed.
When the migration has been completed, exit the Process Data Migrator with "Finish".



8. On the destination PC, activate the Process Historian and connect the PCS 7 OS and WinCC clients in the Process Historian system.
9. If you use Process Historian in the PCS 7 environment, perform the following additional steps:
 - Change the PC name of the Process Historian server in the PCS 7 project.
 - Download the project to all participating operator stations (OS), which means to all clients and servers on which Runtime is activated.

Result

The selected data has been migrated to the destination PC.

Connectivity

6.1 Optimized data transmission

The communication between Process Historian-Ready and Process Historian has been optimized.

The chronological order of process data transmission is retained this way.

Data transmission from PH-Ready to the Process Historian server

Process Historian-Ready saves the process data to a local drive before transmission to the Process Historian .

The process data is then sent in chronological order from the cache to the Process Historian .

Storage path of the cache

The cache is located on the OS in the following path in the installation folder:

- \Siemens\SF-Cache

Note

Reduced performance

The transmission from the WinCC archive can be slower than from the cache of Process Historian-Ready.

The result may be a reduction in performance.

NOTICE

Behavior with reduced memory

The available memory is monitored with Process Historian-Ready.

The cache can grow in the following cases:

- Loss of connection to the Process Historian server
- Reduced performance when processing the transmitted data on the Process Historian server

The cache memory is freed up again once the buffered data is transmitted to the Process Historian server.

Alarm to WinCC

An alarm is sent to WinCC when one of the following situations occurs:

- The available cache memory drops below the limit of 10 GB.
- The available cache memory is less than 13% of the reserved drive capacity.

Interruption of data transmission

Saving to cache and transmission of process data is interrupted when one of the following situations occurs:

- The available cache memory drops below the limit of 5 GB.
- The available cache memory is less than 5% of the reserved drive capacity.

As of this time, the process data is only available in the WinCC archive.

Saving to cache automatically resumes when the available memory is increased.

6.2 Process Historian OPC-UA-Server

6.2.1 PH OPC UA server - Overview

This section describes the OPC UA server for the Process Historian (PH-OPC-UA server). Basic knowledge of communication via OPC is required.

Overview

OPC and OPC UA denote standardized, vendor-independent interfaces and information models of the OPC Foundation.

OPC UA (Unified Architecture) is the successor technology of OPC, which was developed for reliable data exchange in automation engineering and other areas of applications. OPC UA has the following characteristics:

- Platform-independent
- Vendor-independent
- Use of standardized protocols as the communication medium (e.g. TCP, HTTP)
- Integrated security concept (authentication and authorization, encrypted communication and data integrity using signing)
- High-performance information model and provision of all data in a single address space (DA, HDA, A&C)

OPC UA for Process Historian

Process Historian offers an integrated OPC UA server as an option.

The OPC UA server enables external OPC UA applications to communicate with the Process Historian server.

The external applications have read access to the following data of the local Process Historian server:

- Configuration data:
 - Project structure of the Process Historian server
 - Tag configuration and process values
 - Alarm system
- Archived data:
 - Tag archive
 - Message archive

The OPC UA server for the Process Historian supports the "OPC UA 1.02" specification of the OPC Foundation.

You can find detailed information about OPC UA specifications on the OPC Foundation website:

- <http://www.opcfoundation.org> (<http://www.opcfoundation.org>)

6.2.2 Installing the PH OPC UA server

How it works

The PH-OPC-UA server is installed as a Windows service.

The server is started automatically when you start the computer. However, you can only use the OPC UA server when the local Process Historian server is running.

Licensing

The PH-OPC-UA server runs with the following license:

Product	Version	License type	Validity
PH-OPC-UA server	2014	Single	Unlimited

Installation

Requirement

- The Process Historian is installed on the PC.

Procedure

1. Run the setup.
2. Carry out the installation.
Read the "Process Historian Installation Notes" for more on this.
3. Select under "Custom installation":
 - "Options" > "Process Historian OPC UA 2014 SP1" program package
4. To complete the installation, reboot the system.

Configuration

The PH OPC UA server is pre-configured during installation.

If required, you can change the server configuration using the OpcUaServerPH.xml configuration file. For additional information, refer to "How to configure the OPC UA server (Page 102)".

You access the PH-OPC-UA server via the following URL:

- "opc.tcp://[HostName]:[Port]"

Parameter	Description
HostName	Placeholder for the computer name. Is used automatically
Port	TCP/IP port number The default is "4852".

The PH-OPC-UA server only supports the binary OPC UA protocol for communication (communication profile "UA-TCP UA-SC UA Binary"). The used port number is adjustable.

Discovery Server

The OPC UA Local Discovery Server (LDS) of the OPC Foundation is installed along with the PH-OPC-UA server. The LDS allows OPC UA client applications to determine information about available OPC UA servers.

Depending on its configuration, the PH-OPC-UA server registers itself with zero, one or multiple Discovery servers. These servers can be installed either on the same PC or on another PC.

See also

How to configure the OPC UA server (Page 102)

6.2.3 Security concept of OPC UA

The OPC UA security concept is based largely on:

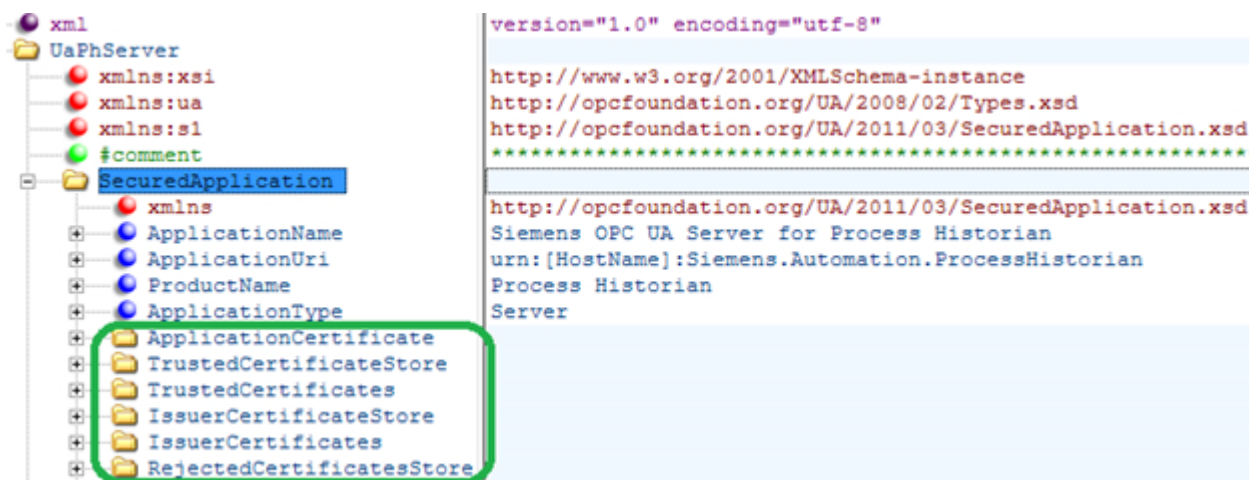
- Authentication and authorization of applications and users involved
- Ensuring the integrity and confidentiality of messages exchanged between the applications

You can find technical details in the OPC UA specification, "Part 2".

Certificates

Certificates are the method used for authentication of the OPC UA applications. Each application has its own instance certificate with which it identifies itself in the public key infrastructure (PKI).

The certificates used by the PH-OPC-UA server are stored in the settings in the "OpcUaServerPH.xml" configuration file:



Instance Certificate of PH-OPC-UA server

For secure operation, each PH-OPC-UA server requires its own instance certificate with a private key. The certificate is only valid on the corresponding computer and may only be used by the PH-OPC-UA server installed on that computer.

A self-signed certificate of the server instance is created when the server is installed. The instance certificate is stored both in the certificate folder of the server as well as in the certificate store of the OPC UA Local Discovery Server.

The private key for the certificate is only stored in the certificate folder. You must restrict access to the folder with the private key to:

- The server itself
- The system administrator

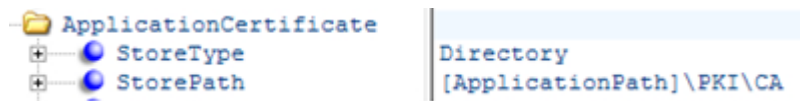
NOTICE
Access to the folder with the private key
For security reasons, no other users or applications apart from the server and the system administrator may have access to the private key of the PH-OPC-UA server.

The instance certificate generated upon installation and the corresponding private key can be replaced by the administrator of the system. In accordance with the applicable security concept for the system, the new instance certificate can be either self-signed or issued by a certification authority.

You specify the storage location for the instance certificate of the PH-OPC-UA server in the configuration file of the server. If necessary, the storage location can be changed by the system administration:

Parameter	Value	Meaning
StoreType	Directory	Type of certificate storage. The storage location must be "Directory".
StorePath	[ApplicationPath]\PKI\CA	The certificate and the private key are stored under this folder.

Example of instance certificate configuration



The instance certificate of the server in this case is in the directory "PKI\CA\Certs". The private key is in the directory "PKI\CA\Private".

Trusted client certificates

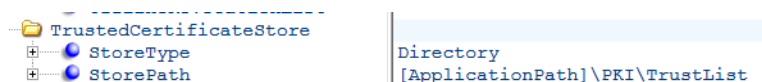
The PH-OPC-UA server supports secure communication with trusted clients only. A client is trustworthy under the following conditions:

- The client has a valid self-signed certificate which is stored in the trusted certificates certificate memory of the PH-OPC-UA server
- The valid certificate of the client has been issued by a certification authority. The valid certificate from the certification authority must be located in the trusted certificates certificate memory of the PH-OPC-UA server.
In this case, only the certificate from the certification authority is required. The client instance certificate does not need to be located in the trusted certificates certificate memory.

You specify storage settings for trusted certificates using the PH-OPC-UA server configuration file:

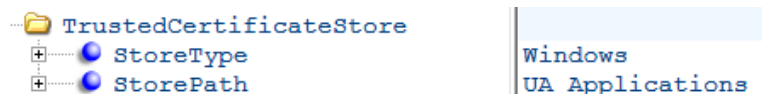
Parameter	Meaning
StoreType	Type of certificate storage. The storage location can be either "Directory" or "Windows".
StorePath	The certificates of trusted clients are stored under this folder.

Example of configuration with "Directory" storage



In this case, the PH-OPC-UA server trusts all clients whose instance certificates are located in the "PKI\TrustList\Certs" folder.

Example of configuration with "Windows" storage



For this storage option, the instance certificates of the clients must be located in the certificate memory of the operating system under "<Local computer>\UA Applications".

Certificates issued by a certification authority

Certificates from certification authorities that are required for verifying a client certificate chain are stored in the certificate memory of the certification authorities. You specify storage settings using the PH-OPC-UA server configuration file:

Parameter	Meaning
StoreType	Type of certificate storage. The storage location can be either "Directory" or "Windows".
StorePath	The certificates of trusted certification authorities are stored under this folder.

Note

Trustworthiness of CA certificates

Certificates from the memory of the certification authorities are not automatically trusted.

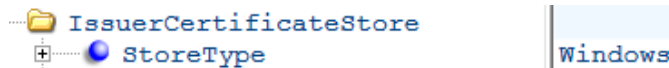
For a certification authority to be trusted, its certificate must be located in the memory for trusted certificates.

Example of configuration with "Directory" storage



The certificates of trusted certification authorities are in this case located in the "PKI\CA\Certs" folder.

Example of configuration with "Windows" storage



The "StorePath" parameter is not relevant. The certificates from certification authorities must be stored in the Windows certificate memory in accordance with the operating system requirements.

Certificates are trusted if they are located in one of these paths:

- <Local computer>\Trusted root certification authorities
- <Local computer>\Third-party root certification authorities

Note

CA certificates: Preconditions

- The storage location for the server certificate must be "Directory".
- The two storage locations for trusted client certificates and for certificates from certification authorities must have the same StoreType, i.e. both must either be "Directory" or "Windows".

Client certificates not accepted

If a UA client accesses the PH-OPC-UA server whose certificate is not trusted, the PH-OPC-UA server rejects the secure communication. The PH-OPC-UA server copies the client's certificate into the folder for rejected certificates.

You specify storage settings for rejected certificates using the PH-OPC-UA server configuration file:



Note

Only the StoreType "Directory" is supported.

To enable secured communication with this client, you need to move the rejected certificate to the certificate memory for trusted certificates.

6.2.4 Configuring the security mechanisms

Introduction

The following is ensured at the communication level:

- UA application authenticity
- The confidentiality of messages exchanged
- The integrity of messages exchanged

The security mechanisms used, for example algorithms for encrypting and signing, are set in standardized security policies. You can find technical details in the OPC UA specification under "Part 2", "Part 4" and "Part 7".

The security policies supported by the PH-OPC-UA server are set using the server configuration file in "ServerConfiguration" and "SecuredApplication".

ServerConfiguration

The XML element "SecurityPolicies" under "ServerConfiguration" contains the list of all available "Security Profile" and "Message Security Mode" combinations for the server.

Security Profile	Message Security Mode	Description
http://opcfoundation.org/UA/SecurityPolicy#None	None	Unsecured communication
http://opcfoundation.org/UA/SecurityPolicy#Basic128Rsa15	Sign or SignAndEncrypt	Secure communication, signed or encrypted and signed messages
http://opcfoundation.org/UA/SecurityPolicy#Basic256	Sign or SignAndEncrypt	Secure communication, signed or encrypted and signed messages

Note

Secure communication

The following additional requirements apply to secure communication:

- Instance certificates for server and client
- Correct configuration of the certificate store

Example of a configuration file with maximum functional scope

The image shows a configuration file structure on the left and its corresponding XML content on the right. The left pane shows a tree view with folders for 'SecuredApplication', 'ServerConfiguration', 'DiscoveryRegistration', 'UserTokenPolicies', and 'SecurityPolicies'. Under 'SecurityPolicies', there are four 'SecurityPolicy' entries, each containing 'ProfileUri' and 'MessageSecurityModes' elements. The right pane shows the XML code for these elements, including namespace declarations and the specific URIs and security modes for each policy.

```

UaPhServer
- xmlns:xsi
- xmlns:ua
- xmlns:s1
- #comment
- SecuredApplication
- #comment
- ServerConfiguration
  - DiscoveryRegistration
  - UserTokenPolicies
  - SecurityPolicies
    - SecurityPolicy
      - ProfileUri
      - MessageSecurityModes
    - SecurityPolicy
      - ProfileUri
      - MessageSecurityModes
    - SecurityPolicy
      - ProfileUri
      - MessageSecurityModes
    - SecurityPolicy
      - ProfileUri
      - MessageSecurityModes

http://www.w3.org/2001/XMLSchema-instance
http://opcfoundation.org/UA/2009/02/Types.xsd
http://opcfoundation.org/UA/2011/03/SecuredApplication.xsd
.....
.....
http://opcfoundation.org/UA/SecurityPolicy#None
None
http://opcfoundation.org/UA/SecurityPolicy#Basic128Rsa15
Sign
http://opcfoundation.org/UA/SecurityPolicy#Basic128Rsa15
SignAndEncrypt
http://opcfoundation.org/UA/SecurityPolicy#Basic256
Sign
http://opcfoundation.org/UA/SecurityPolicy#Basic256
SignAndEncrypt
    
```

SecuredApplication

In accordance with the OPC UA specification, the security mechanisms and explicitly enabled and disabled with the "SecurityProfileUris" element under "SecuredApplication".

The diagram below shows a SecuredApplication in which unsecured communication is disabled:

```

UaPhServer
- xmlns:xsi
- xmlns:ua
- xmlns:s1
- #comment
- SecuredApplication
  - xmlns
  - ApplicationName
  - ApplicationUri
  - ProductName
  - ApplicationType
  - ApplicationCertificate
  - TrustedCertificateStore
  - TrustedCertificates
  - IssuerCertificateStore
  - IssuerCertificates
  - RejectedCertificatesStore
    - StoreType
    - StorePath
  - BaseAddresses
  - SecurityProfileUris
    - SecurityProfile
      - ProfileUri
      - Enabled
    - SecurityProfile
      - ProfileUri
      - Enabled
    - SecurityProfile
      - ProfileUri
      - Enabled
  
```

```

http://www.w3.org/2001/XMLSchema-instance
http://opcfoundation.org/UA/2008/02/Types.xsd
http://opcfoundation.org/UA/2011/03/SecuredApplication.xsd
.....
http://opcfoundation.org/UA/2011/03/SecuredApplication.xsd
Siemens OPC UA Server for Process Historian
urn:[HostName]:Siemens.Automation.ProcessHistorian
Process Historian
Server

Directory
[ApplicationPath]\PKI\CA\rejected

http://opcfoundation.org/UA/SecurityPolicy#None
false

http://opcfoundation.org/UA/SecurityPolicy#Basic128Rsa15
true

http://opcfoundation.org/UA/SecurityPolicy#Basic256
true
  
```

The PH-OPC-UA server thereby supports the two security strategies "Basic128Rsa15" and "Basic256" in runtime. "Message Security Modes Sign" and "SignAndEncrypt" are supported, but unsecured communication is not ("None"). When communication is established, the UA clients select the required Policy from this list.

Note

Unsecured communication between client and server

Use the "None" setting only for test and diagnostics purposes.

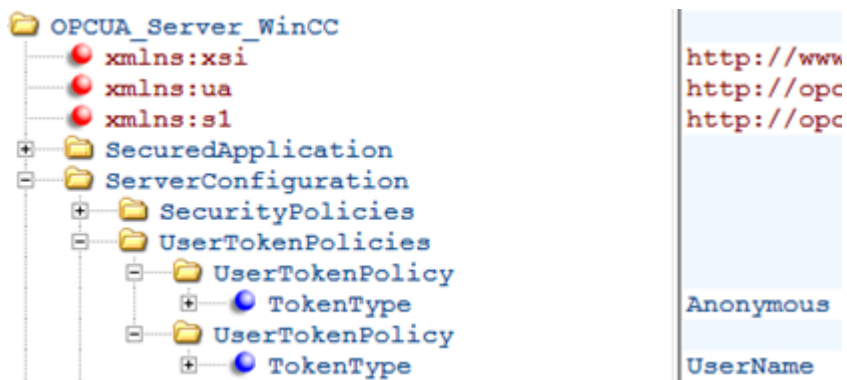
For a secure communication between client and server, use at least the following settings during productive operation:

- SecurityPolicy: Basic 128Rsa15
- Message Security Mode: Sign

User identity

In addition to the security mechanisms of the communication level, the PH-OPC-UA server also supports user authentication for the client applications using UserTokenPolicy "UserName". The client application must provide a valid combination of user name and password when communication is established. The PH-OPC-UA server verifies the combination in the user management of the operating system.

You specify the UserTokenPolicy using the configuration file of the PH-OPC-UA server:



The PH-OPC-UA server uses this configuration to support both anonymous users and the Policy "UserName"..

See also

How to configure the OPC UA server (Page 102)

6.2.5 Supported OPC UA services and profiles

OPC UA services

The following table sets out the functionality supported by OPC UA server 1.0.2:

OPC UA Service Sets	Services	Comment
Discovery Service Set	FindServers GetEndpoints	-
Secure Channel Session Service Set	All	-
View Service Set	Browse BrowseNext	Determination of the PH tags and objects
Attribute Service Set	Read HistoryRead	Example: <ul style="list-style-type: none"> • Read property value • Read tag values or messages archived in the PH
Subscription Service Set	CreateSubscription SetPublishingMode Publish RePublish DeleteSubscription	-
MonitoredItem Service Set	CreateMonitoredItems SetMonitoringMode DeleteMonitoredItems	Only for standard UA tags, e.g. Server/ServerStatus/State

OPC UA profile and Conformance Units

The PH-OPC-UA server supports the following OPC UA profiles 1.02 without restrictions:

- 6.5.3 Base Server Behaviour Facet
- 6.5.14 A & C Base Condition Server Facet
- 6.5.30 Historical Raw Data Server Facet
- 6.5.107 UA-TCP UA-SC UA Binary
- 6.5.125 SecurityPolicy - Basic256
- 6.5.124 SecurityPolicy - Basic128Rsa15
- 6.5.123 SecurityPolicy - None

The PH-OPC-UA server supports the following OPC UA profiles shown in the following table, however with restrictions:

Profile	"Group"	Not supported "Conformance Unit"
6.5.8 Standard DataChangeSubscription Server Facet	Monitored Item Services	ModifyMonitoredItems DeadBand Filter Monitor MinQueueSize_02
6.5.9 Enhanced DataChange Subscription Server Facet	Monitored Item Services	Monitor MinQueueSize_05
6.5.47 Standard UA Server Profile	Attribute Services	Attribute Write StatusCode & Timestamp

6.2.6 Configuration file

The PH-OPC-UA server is configured using the "OpcUaServerPH.xml" configuration file.

This chapter describes the layout of the configuration file. The "How to configure the OPC UA server (Page 102)" section describes how the PH-OPC-UA server is configured.

You can find the configuration file in the installation folder under the following path:

- \Siemens\ProcessHistorian\bin

NOTICE

Changing the server configuration

Changing the server configuration incorrectly can cause malfunctions and/or security vulnerabilities

The server configuration may only be performed by qualified personnel.

Section <Secured Application>

In this section, the OPC UA application security is set in compliance with OPC UA Specification / Part 6 / § "Security Settings Management".

<Secured Application>	
<BaseAddresses> <...></...> </BaseAddresses>.	Configuration of the URL for the OPC UA server.
<SecurityProfileUris> <SecurityProfile> <...></...> </SecurityProfile> ... </SecurityProfileUris>	Configuration of the supported security policies Use the "none" setting only for test and diagnostics purposes
<ApplicationCertificate> <TrustedCertificateStore> <TrustedCertificates> <...>	Revision of the default certificate configuration according to OPC UA Specification / Part 6. (optional)
</Secured Application>	

Section <Server Configuration>

In this section you can set further server-specific parameters.

<Server Configuration>	
<SecurityPolicies> <SecurityPolicy> <...></...> </SecurityPolicy> ... </SecurityPolicies>	Configuration of the message security modes. Use the "none" setting only for test and diagnostics purposes
<UserTokenPolicies> <UserTokenPolicy> <...></...> </UserTokenPolicy> ... </UserTokenPolicies>	Configuration of user identification Use the "Anonymous" setting only for test and diagnostics purposes
<Server Configuration	

See also

How to configure the OPC UA server (Page 102)

6.2.7 How to configure the OPC UA server

The PH-OPC-UA server is configured using the "OpcUaServerPH.xml" configuration file.

You can find the configuration file in the installation folder under the following path:

- \Siemens\ProcessHistorian\bin

You can find additional information on the configuration file under "Configuration file (Page 101)".

NOTICE**Changing the server configuration**

Changing the server configuration incorrectly can cause malfunctions and/or security vulnerabilities

The server configuration may only be performed by qualified personnel.

Changing the port number of the OPC UA server

If necessary, change the port number 4852 under <BaseAddresses>.

Do not use a port number that is already assigned to another application. Also observe the firewall settings (see "Firewall settings (Page 134)").

The parameter [HostName] is the placeholder for the computer name and is determined during runtime.

Example:

```
<BaseAddresses>
```

```
<ua:String>opc.tcp://[HostName]:5210</ua:String>
```

```
<BaseAddresses>
```

Specifying security settings

You can find additional information on security settings under "Configuring the security mechanisms (Page 97)".

1. Make the security settings for communication.
2. Under `<SecurityProfileUris>`, you configure the supported "Security Policies".
 - Enable the setting with "true".
 - Disable the setting with "false".

Example:

```
<SecurityProfile>
  <ProfileUri>http://opcfoundation.org/UA/SecurityPolicy#None</
ProfileUri>
  <Enabled>>false</Enabled>
</SecurityProfile>
```

3. Under `<SecurityPolicies>`, you configure the associated "Message-security-modes". To deactivate a setting, delete the entire entry `<SecurityPolicy>... </SecurityPolicy>`.

Example:

```
<SecurityPolicy>
  <ProfileUri>http://opcfoundation.org/UA/SecurityPolicy#None</
ProfileUri>
  <MessageSecurityModes>None</MessageSecurityModes>
</SecurityPolicy>
```

Specifying user identification

You can find additional information on security settings under "Configuring the security mechanisms (Page 97)".

Specify the user identification for setting up the connection under `<UserTokenPolicies>`.

To deactivate a setting, delete the entire entry.

Example

```
<UserTokenPolicy>
<TokenType>Anonymous</TokenType>
</UserTokenPolicy>
```

See also

Installing the PH OPC UA server (Page 92)

Configuring the security mechanisms (Page 97)

Configuration file (Page 101)

Firewall settings (Page 134)

6.2.8 Information model of PH OPC UA server

Information model

The PH-OPC-UA server provides OPC UA clients with a hierarchical name area and access to the following runtime data:

- Process Historian configuration data:
 - Project structure: Organizational Structures, Data Sources, Tag/Message Configuration Data
 - Metadata: Additional Info / Tag Value Context
- Historical Process Historian data:
 - Archived tag values (Historical Data Access)
 - Archived messages (Historical Event Access)

The PH-OPC UA information model is described in detail in the document "OPC UA Information Model".

This document is available on the Internet in English.

Process control messages

Overview

Process Historian contains process control messages that visualize specific system states. These pre-defined messages only contain information about process control states and do not return process status data.

The table below provides an overview of the process control messages generated in Process Historian.

The following messages are generated by the SIMATIC service Process Historian Ready:

Message no.	Message text	Event
1012500	PHRDY: Start recovery for Process Historian	The transfer of missing data is started after restoration of the communication connection between WinCC and the Process Historian.
1012501	PHRDY: Recovery for Process Historian complete	The transfer of the data to the Process Historian is terminated.
1012502	PHRDY: No communication with Process Historian possible	The connection to the Process Historian cannot be established.
1012503	PHRDY: Communication with Process Historian is interrupted	Writing and/or reading of data to/from the Process Historian is not possible.
1012504	PHRDY: Communication with Process Historian is restored	Writing and/or reading of data to/from the Process Historian is possible once again.
1012505	PHRDY: Process Historian server offline since <Date Time>	The SIMATIC Process Historian service is not available. Read access to the data is possible.
1012506	PHRDY: Buffer limit channel <Channel name> exceeded	The configured maximum available buffer memory of the selected communication channel (MSMQ) was exceeded.
1012507	PHRDY: Buffer limit channel <Chanel name> normal	The buffer memory is again operating within the configured limits.
1012508	PHRDY: Less than <number> GB of free memory space on the data carrier '<drive>' for communication with the Process Historian.	The available memory space on the WinCC station has fallen below a specified limit.
1012509	PHRDY: Communication of the Process Historian was terminated. Less than <number> GB free memory on data carrier '<drive>'.	No more memory space available on the WinCC-station.
1012510	PHRDY: Connection to the Process Historian could not be established (check configuration).	Process Historian Ready is incorrectly configured (for example, service without user logon, configuration error in the configuration file, ...).

The following messages are generated by the Process Historian and sent to all clients:

Message no.	Message text	Event
1012600	PH: Data memory filled to <number %>	The warning limit of the data memory of the monitored drive was reached.
1012601	PH: System out of resources	The total load of all CPUs has been over 70% for at least 30s.
1012602	PH: Redundancy failed	The connection to the redundancy partner has failed.
1012603	PH: Redundancy restored	The connection to the redundancy partner has been restored.
1012604	PH: Available licenses exceeded. Shutdown in <number> days	No adequate licenses available.
1012605	PH: PH-Ready <PC name> has failed	The Process Historian has lost the connection to the referenced PC.
1012606	PH: An automatic redundancy switchover of the Process Historian server has taken place.	An automatic redundancy switchover of the Process Historian server has taken place.
1012607	PH: Less than <number> GB of free memory space for the Process Historian database.	The warning limit of the memory for the Process Historian database was reached.
1012608	PH: Less than <number> GB of free memory space for the "tempdb" database.	The warning limit of the memory for the "tempdb" database was reached.
1012609	PH: Less than <number> GB of free memory space for the emergency restore operation.	The warning limit of the memory for the emergency restore operation was reached.
1012610	PH: New backup for the emergency restore operation failed. Too little memory space.	The creation of a complete backup failed.
1012611	PH: An unknown error occurred when creating backup for emergency restore operation.	The creation of a complete backup failed, unknown error.
1012612	PH: Storage path <path> not accessible for emergency restore operation.	The storage path for the database backup is not available.
1012613	PH: The emergency threshold for drive <number %> was reached. Process Historian is therefore locked.	

Appendix

8.1 Database installation wizard

The database installation wizard guides you through the installation of the Process Historian database.

You configure the following settings with the database installation wizard:

- Creating a Process Historian database (Page 111)
- Recovering a Process Historian database (Page 124)
- Select the path of the SQL server instance
- Define the work memory limit of the Process Historian database
- Specifying the storage paths
- Select master (Principal) or standby (Mirror)

The DatabaseInstallationWizard.exe is available in the installation path under:
\\Siemens\ProcessHistorian\bin\DatabaseInstallationWizard.exe

8.1.1 Memory requirement

Defining the memory requirements of the Process Historian Server

You define the expected memory requirements for an individual segment after installation in the database installation wizard.

The database installation wizard displays the estimated memory requirements during the configuration.

Note

The more measured values or messages archived per second, the smaller the segments should be so that the individual segments do not get too large. 50,000 tags per second is the high limit that should not be exceeded.

Memory requirement for process values per second

The total memory requirement for process values is calculated as follows:

(number of prepared segments + 2) x segment size from the process values table x 2 data groups

Process values/ s	Time period of the segment unit	Segment size (uncompressed)
500	Daily	~ 2.75 GB
3.000	Daily	~ 16.5 GB
10.000	Daily	~ 55 GB
20.000	Daily	~ 110 GB
50.000	Daily	~ 275 GB
100.000	Daily	~ 550 GB
100	Weekly	~ 3.85 GB
250	Weekly	~ 10 GB
500	Weekly	~ 20 GB
3.000	Weekly	~ 120 GB
10.000	Weekly	~ 390 GB
100	Monthly	~ 16.5 GB
250	Monthly	~ 42 GB
500	Monthly	~ 84 GB

Memory requirement for messages per second

The total memory requirement for messages is calculated as follows:

(number of prepared segments + 2) x segment size from the messages table x number of data groups *)

*) The default number of data groups is set to 2.

Messages/ s	Time period of the segment unit	Segment size (uncompressed)
10	Daily	~ 1 GB
50	Daily	~ 4 GB
100	Daily	~ 8 GB
10	Weekly	~ 6 GB
50	Weekly	~ 29 GB
100	Weekly	~ 58 GB
10	Monthly	~ 25 GB
50	Monthly	~ 124 GB
100	Monthly	~ 248 GB

Average memory requirement

The table below shows the average memory requirement of the measured variables:

Measured variable	Memory requirement	Description
Process value	63 bytes	Average memory requirement per archive tag datum. The following information is saved: <ul style="list-style-type: none"> • Timestamp • Process value • Quality code
Message	~ 1024 bytes	Average memory requirement per message. The memory requirement of a message depends to a large extent on the language used and the length of the message.

8.1.2 Creating a Process Historian database

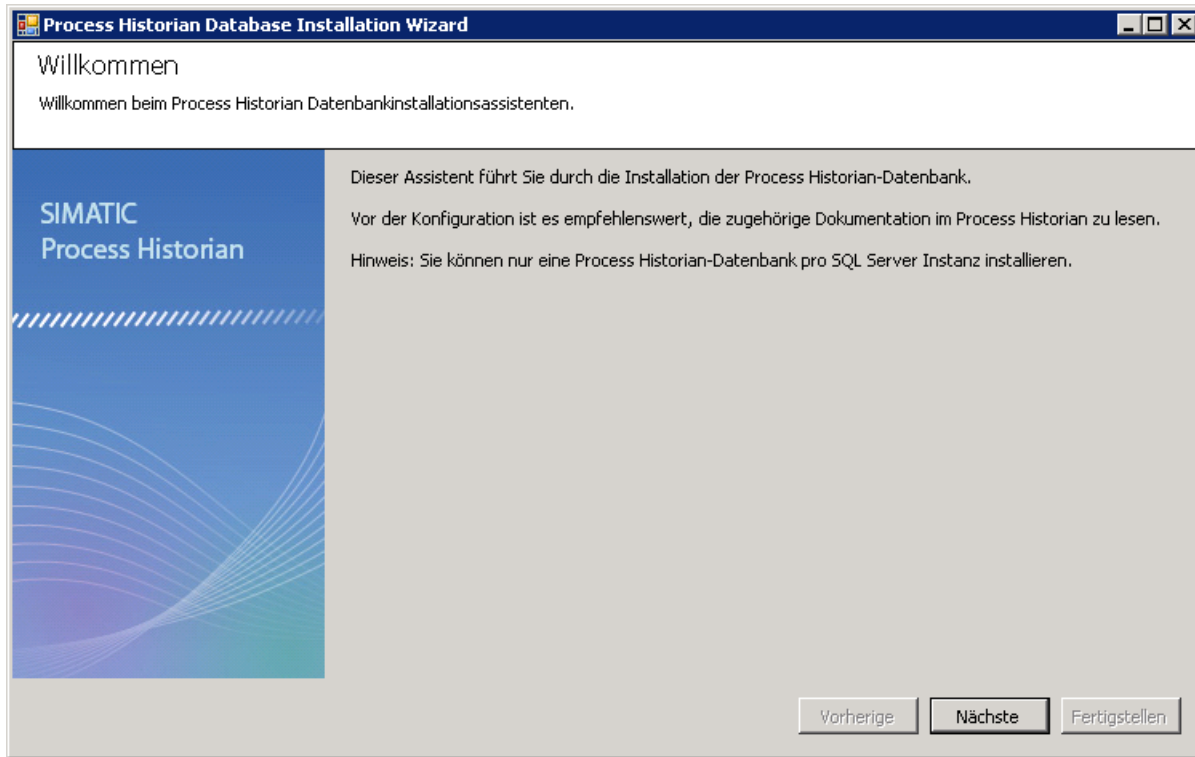
Installation of a Process Historian database

This section describes the installation of a Process Historian database based on an example.

If a database has not been installed on the computer yet, the "DatabaseInstallationWizard.exe" is started automatically when you insert the DVD. The database installation wizard guides you through the configuration of the database.

Installing the database

The "DatabaseInstallationWizard.exe" has been started.

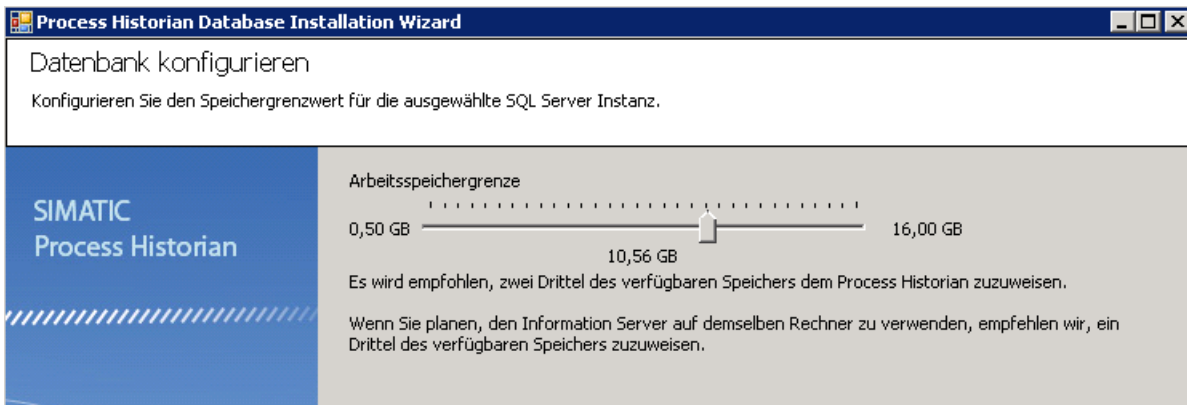


1. Click "Next".
2. Enter a path for your new SQL Server instance or select an existing SQL Server instance. The database installation wizard checks if the selected instance can be installed.



3. Confirm with "Next".

4. Use the slider to reserve the maximum work memory for the database.



5. Click "Next".

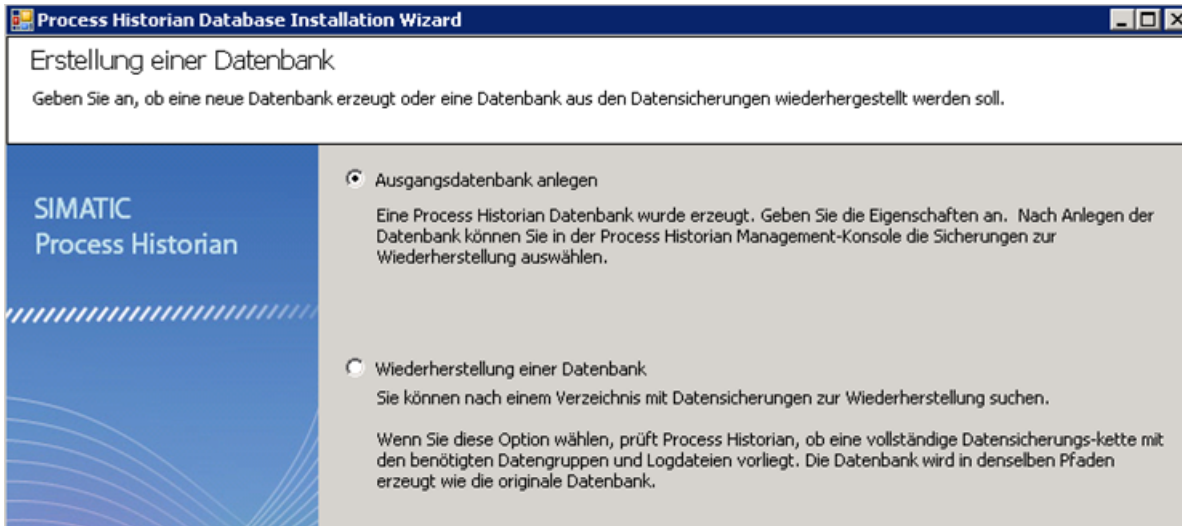
6. Select the server mode:

- For installation on a single system, select the option "Installation on master server".
- For installation on a redundant system, select the option "Installation on master server" for the first computer.
- For installation on the second computer of the redundant system, select the option "Installation on standby server".



7. Click "Next".

8. Select the "Create an initial database" option.

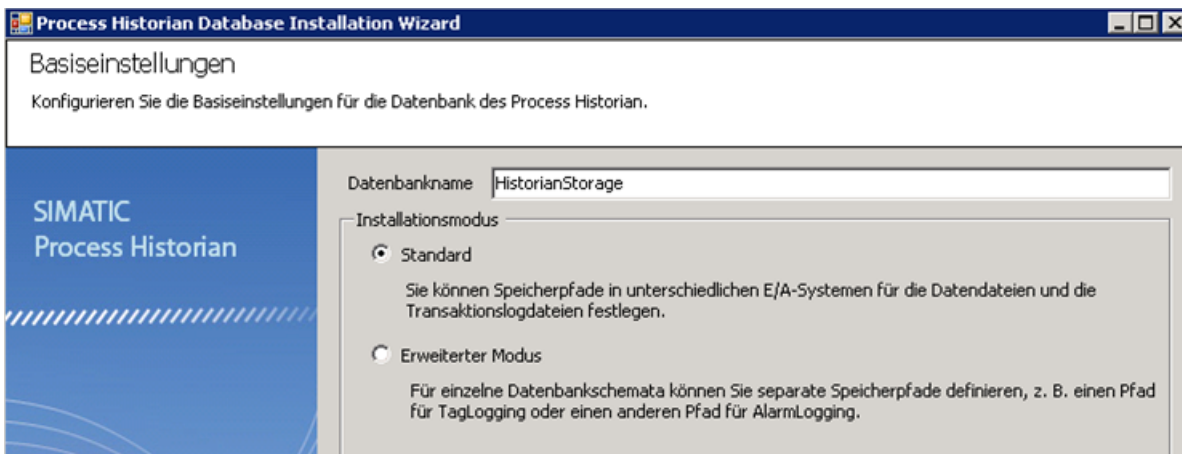


9. Click "Next".

10. Enter the name of the database.

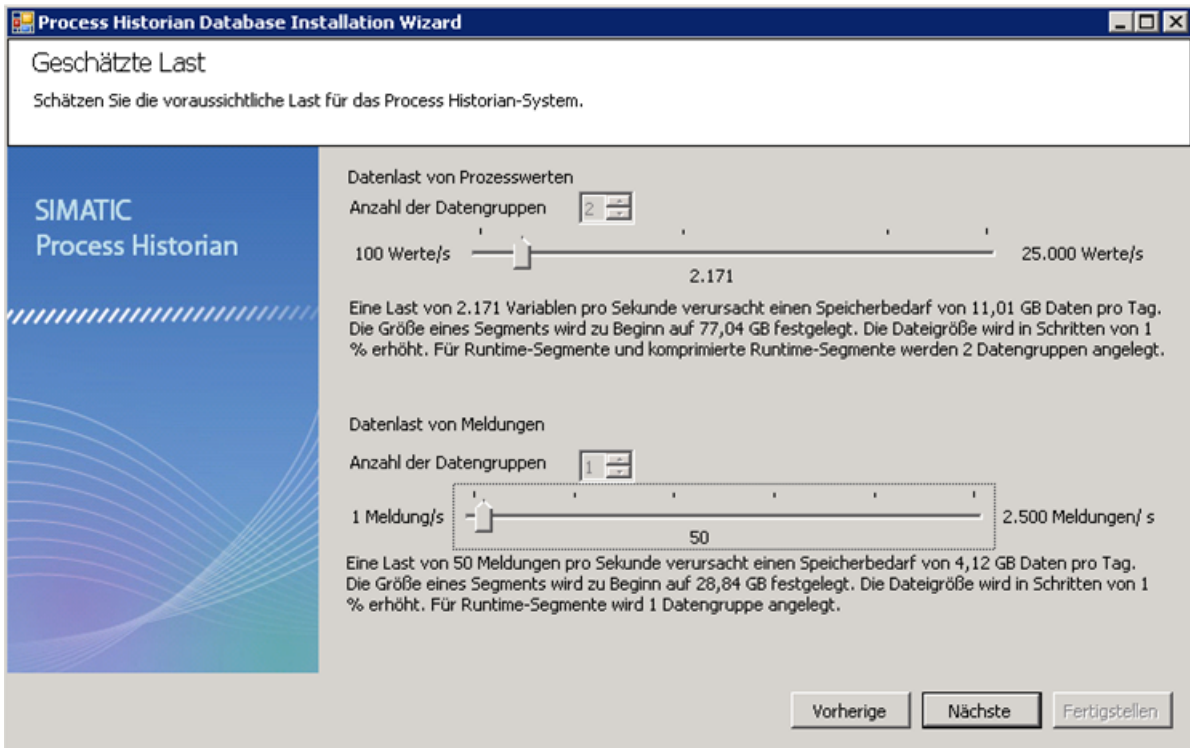
The "Standard" installation mode is selected in this example.

The installation with "Advanced mode" is described in the next section.



11. Click "Next".

12. Set the slider in the dialog box below to an estimated setting.



13. Click "Next".

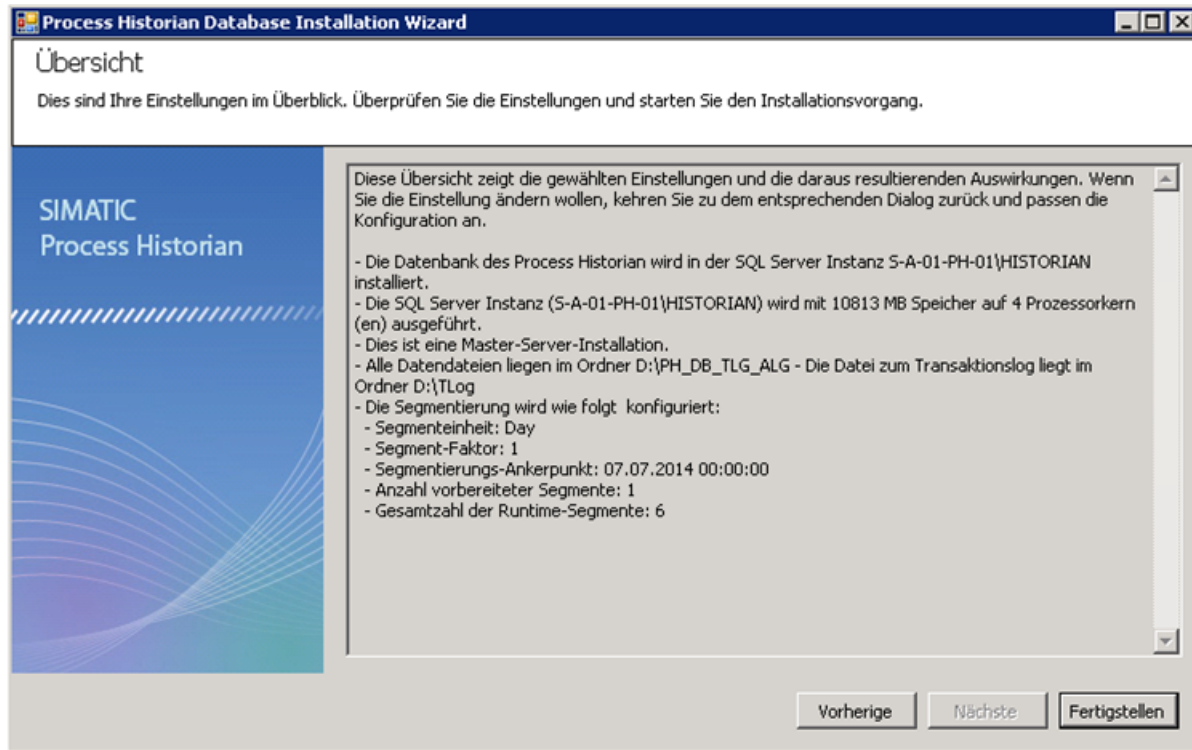
14. Set the paths for the database files. Only local destination paths are permitted.



An overview of your configuration settings is displayed.

15. Check this overview. If all information is correct, click "Finish".

If there are errors in the settings, go back with "Previous" and correct the settings.



The database is now created. The progress of the database installation is documented in a window.



Once database installation is complete, the message "Database successfully installed." is displayed.

16. Close the database installation wizard with "Close".

17. Shut down the computer and restart it so that all services can be installed.

Result

You have successfully installed a database.

8.1.3 Creating the Process Historian database in advanced mode

Installation of a Process Historian database

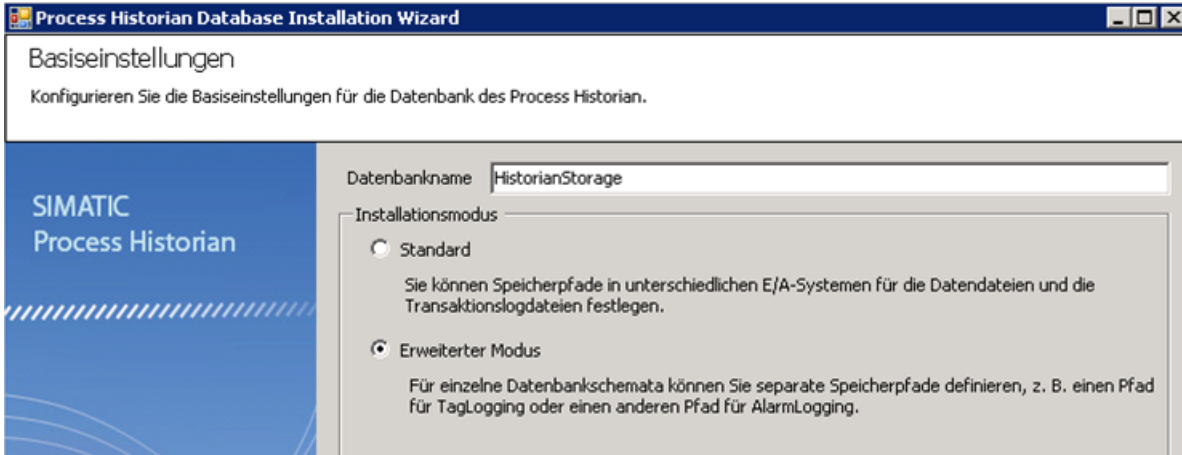
This section describes the installation of a Process Historian database in advanced mode based on an example. In advanced mode, you can also configure the storage segments.

Requirement

You have arrived at this point after installation according to the instruction in general mode. You want to continue the installation in advanced mode.

Installing the database in advanced mode

1. Enter the name of the database in the text box.
2. Select "Advanced mode" as installation mode.



3. Click "Next".

4. Configure the memory segments.

The total number of displayed runtime segments is set to 6 in this example; one segment is reserved for use in the future.

You can select from the following time intervals for the segments:

- Day
- Week
- Month
- Factor

The factor determines the number of time intervals per segment.

You can set a factor between 1 and 52. The factor is set to "1" and the time interval to "Week" in the example. In this setting, a segment maps the time interval of one week.

You can set "Date" and "Hour" of the start time as anchor of the segments.

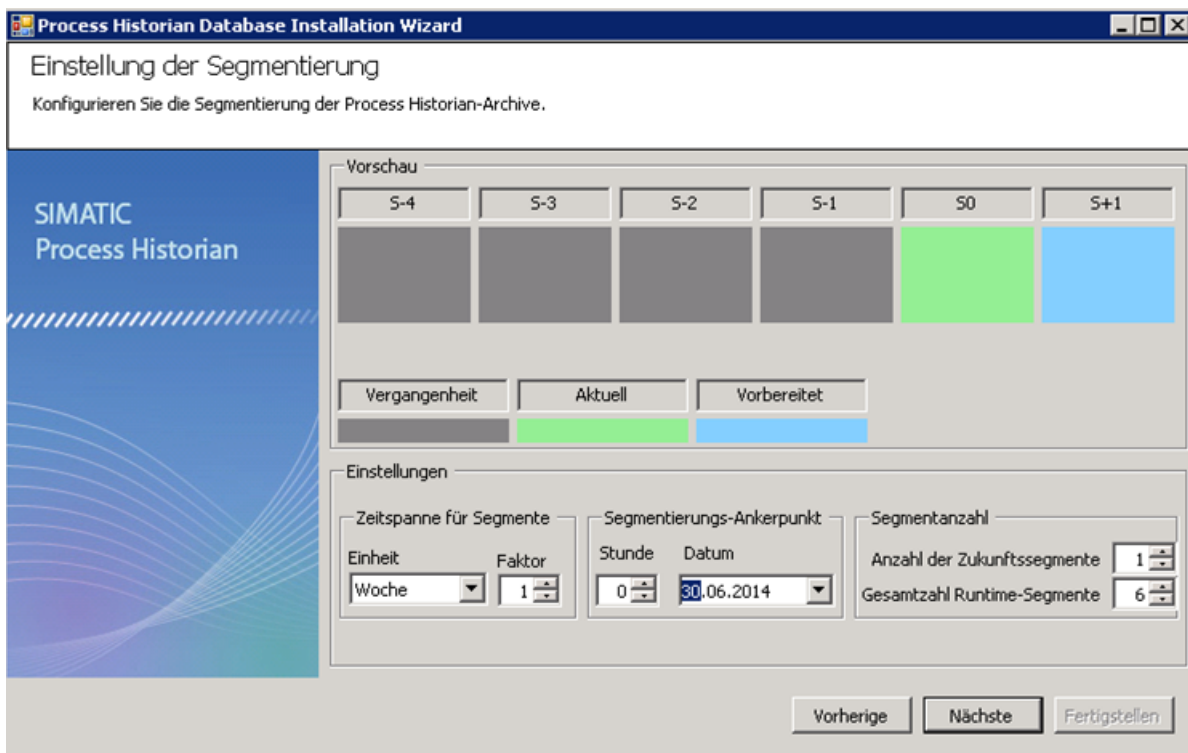
All displayed segments are runtime segments.

The time intervals of the runtime segments S-1 to S-4 are in the past. The time interval of the active runtime segment S0 is in the actual local time. The prepared future segment S +1 is reserved for the next time interval in the future.

When the current segment S0 drops out of the local time interval, it becomes segment S-1. All subsequent segments are shifted one spot further into the past. The prepared future segment becomes the current segment.

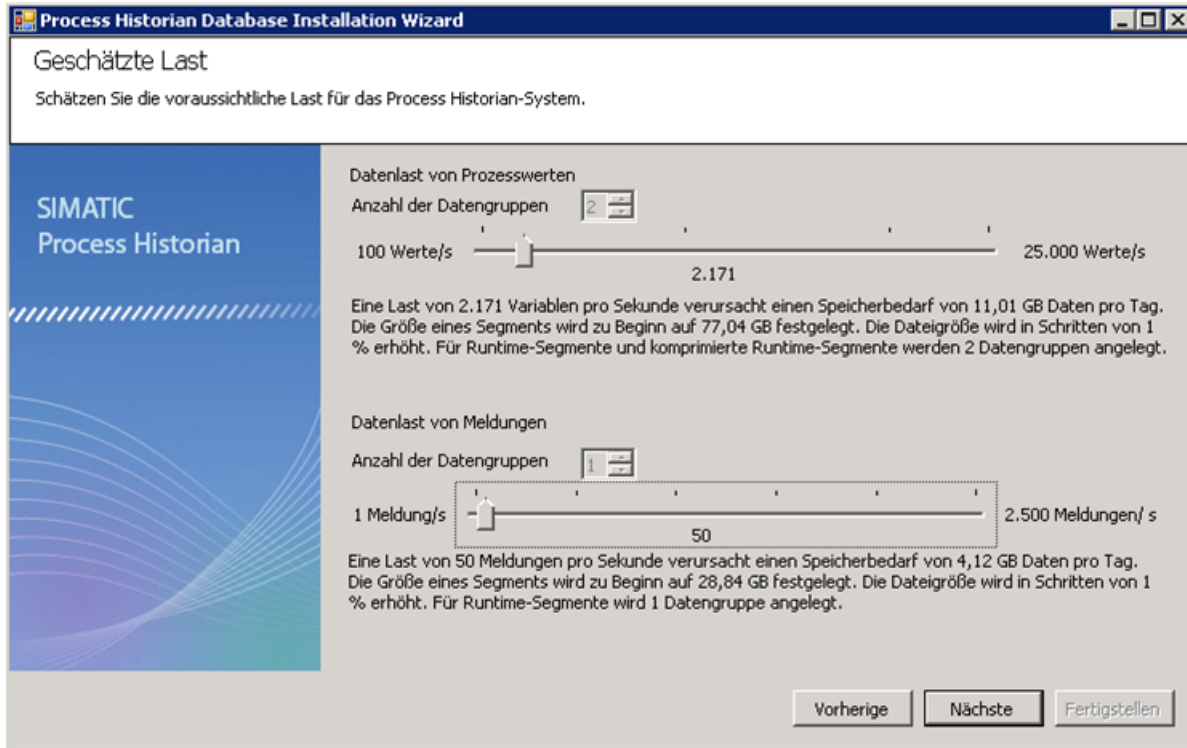
The different runtime segments are color coded:

- Blue: Reserved memory for future segment
- Green: Current segment
- Gray: Current archive segment not saved yet.



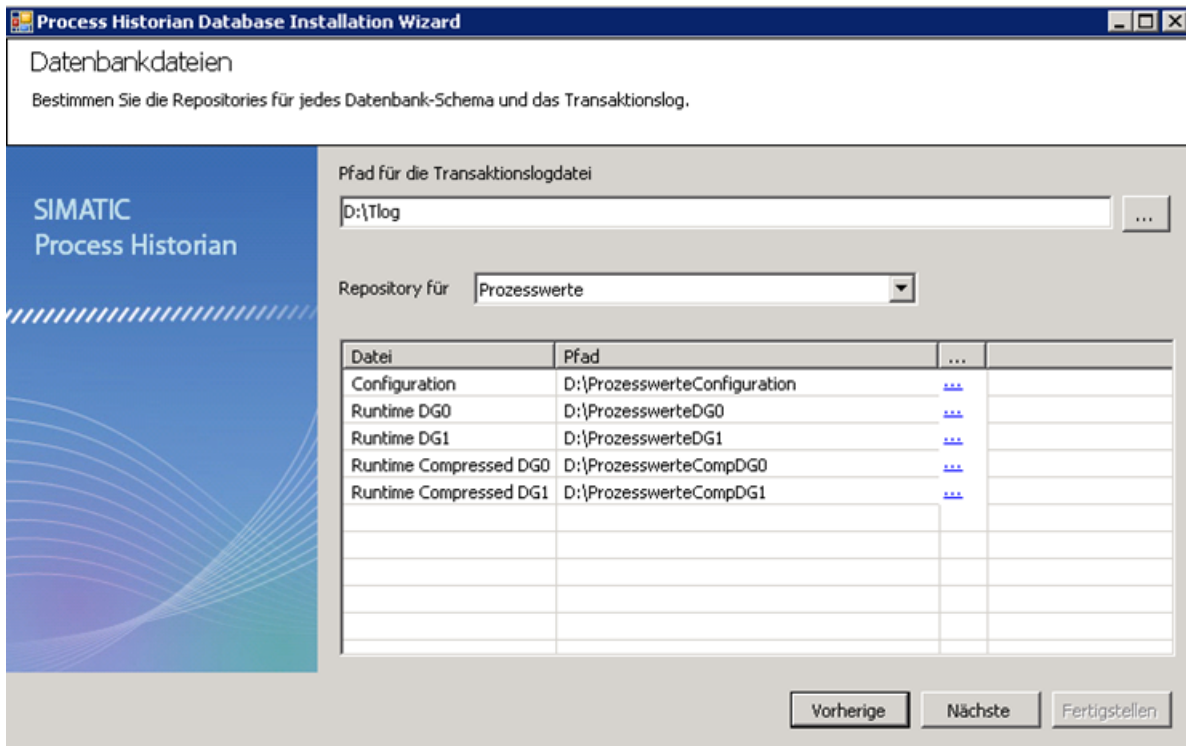
8.1 Database installation wizard

5. Configure the segments to meet your requirements.
6. Click "Next".
7. Set the slider in the dialog box below to an estimated setting.



8. Click "Next".

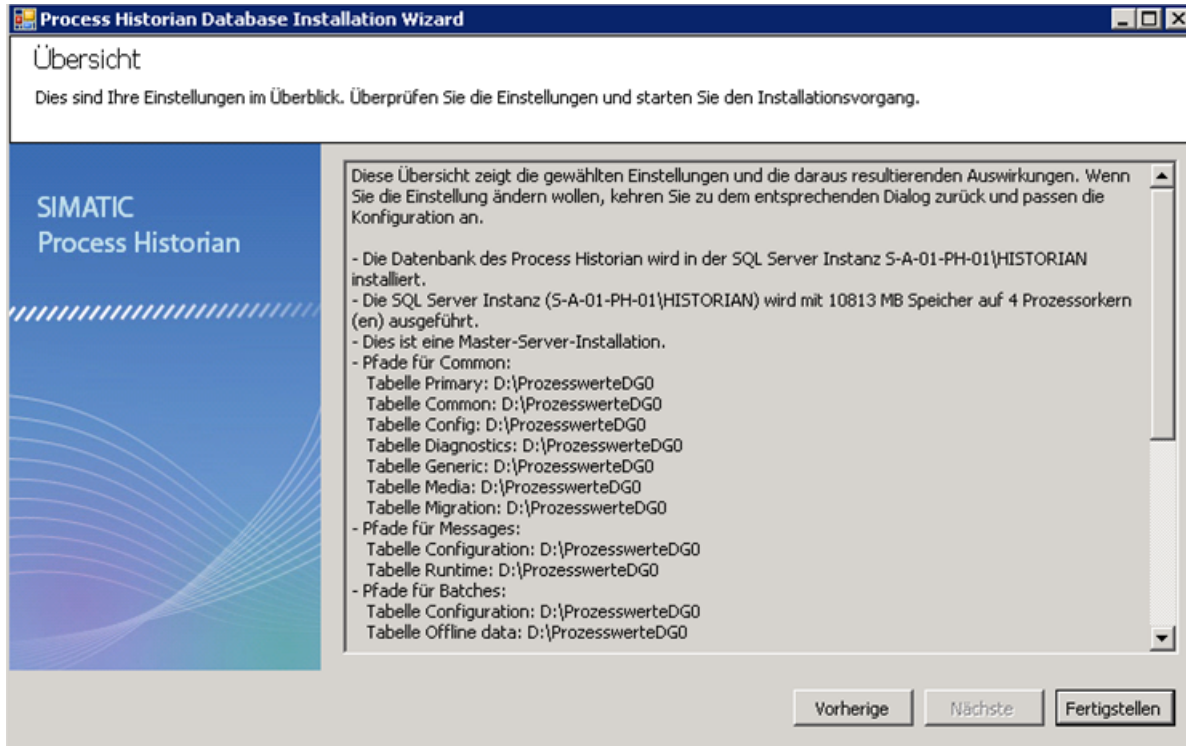
9. Set the paths for the database files. Compared to standard mode, the database schema can be much more finely structured in advanced mode. Define the path for the transaction log in the text box. You must define and create paths for the following types of values in the repository:
 - General
 - Messages
 - Batches
 - Process values



An overview of your configuration settings is displayed.

10. Check this overview. If all information is correct, click "Finish".

If there are errors in the settings, go back with "Previous" and correct the settings.

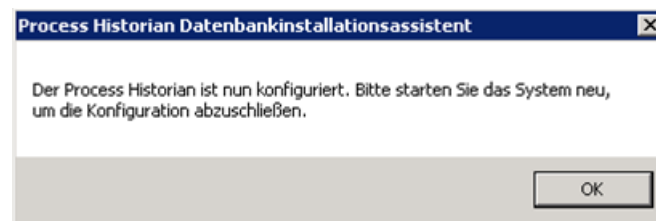


The database is now created. The progress of the database installation is documented in a window.



Once database installation is complete, the message "Database successfully installed." is displayed.

11. Close the database installation wizard with "Close".
The restart note is displayed.



12. Click "OK".
13. Shut down the computer and restart it so that all services can be installed.

Result

You have successfully installed a database.

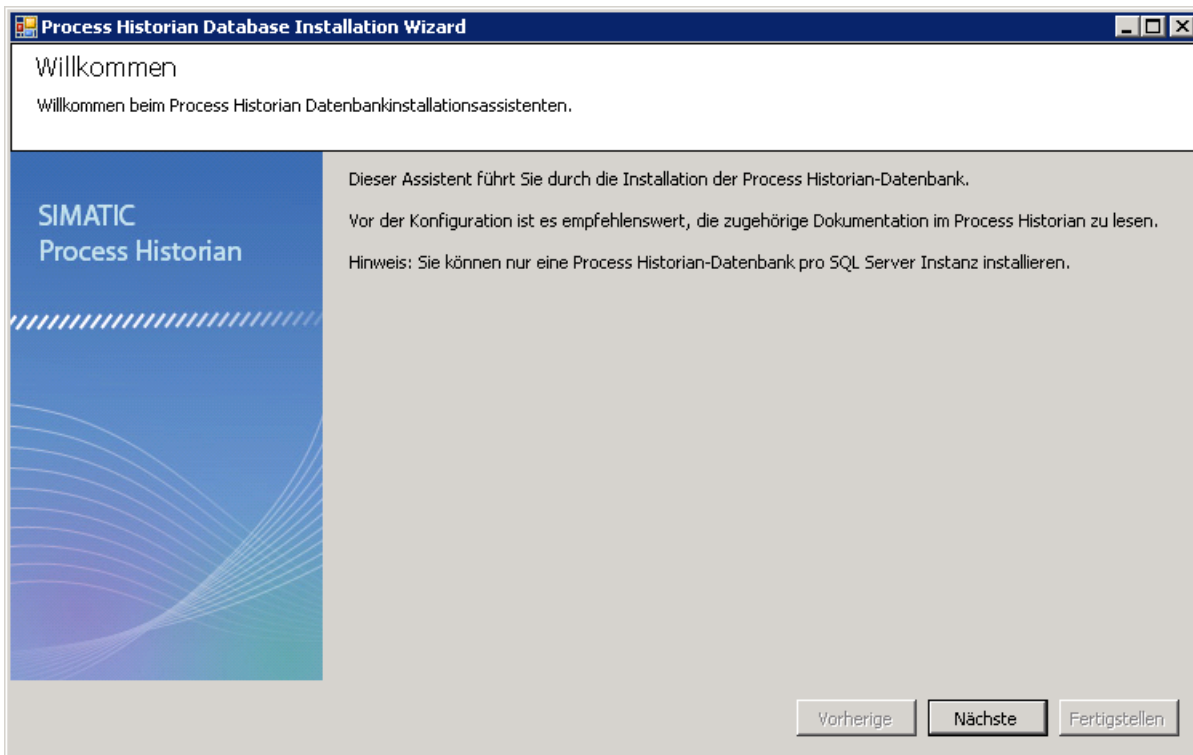
8.1.4 Recovering a Process Historian database

Recovery of a Process Historian database

This section describes how you recover a Process Historian database based on an example.

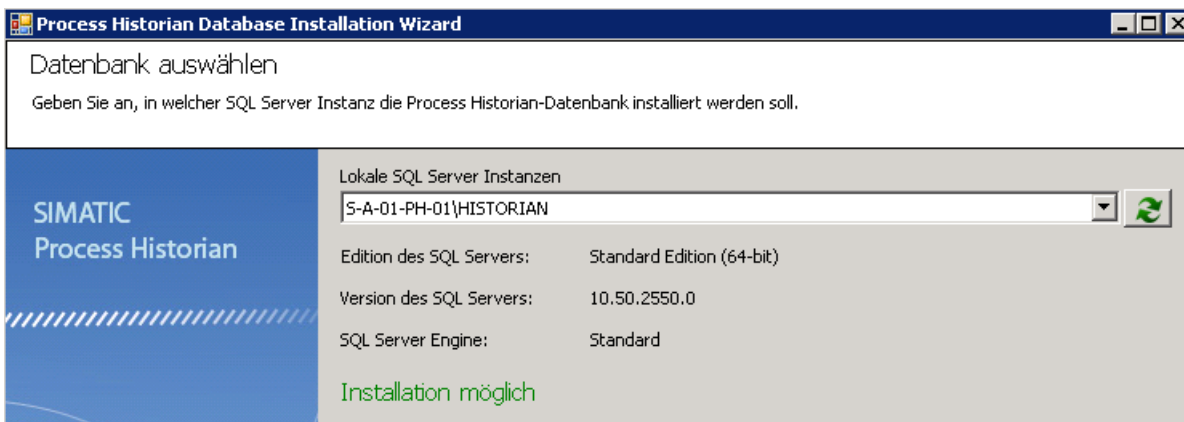
Recovering a database

1. Start "DatabaseInstallationWizard.exe".



2. Click "Next".

The SQL Server instances are displayed. Usually there is one instance on the SQL Server.



3. Select the required instance and confirm with "Next".
4. Use the slider to reserve the maximum work memory for the database.
5. Click "Next".

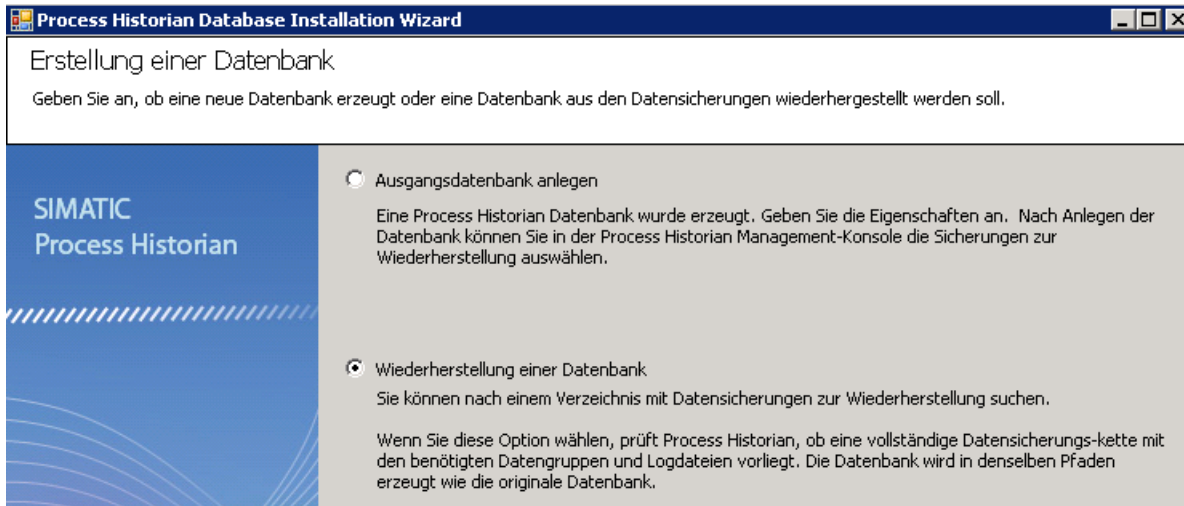


6. Select the server mode:
For recovery of a database, select the option "Installation on master server".
7. Click "Next".



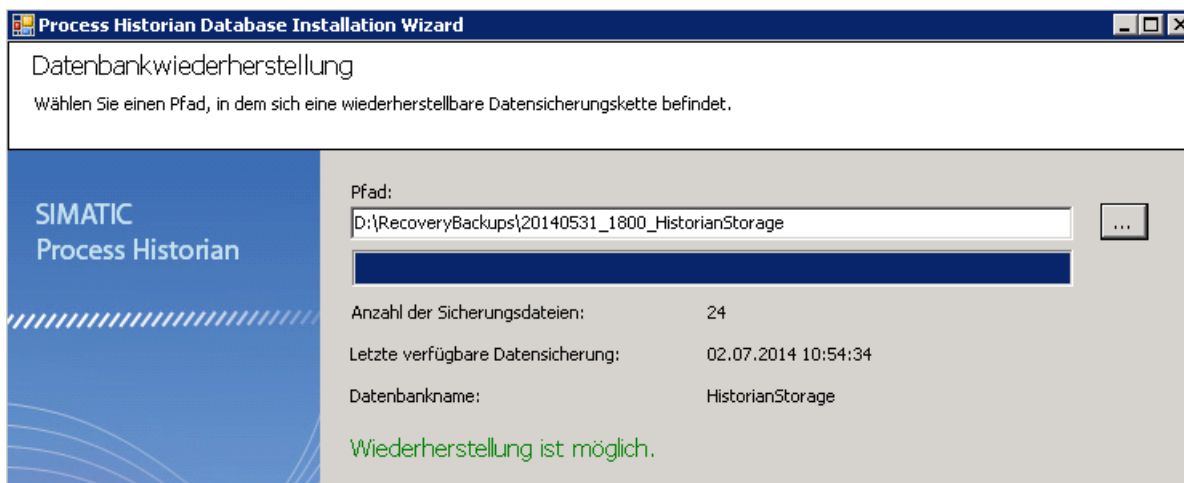
8. Select the option "Database recovery".

9. Click "Next".



10. Enter the path of the required database backup.

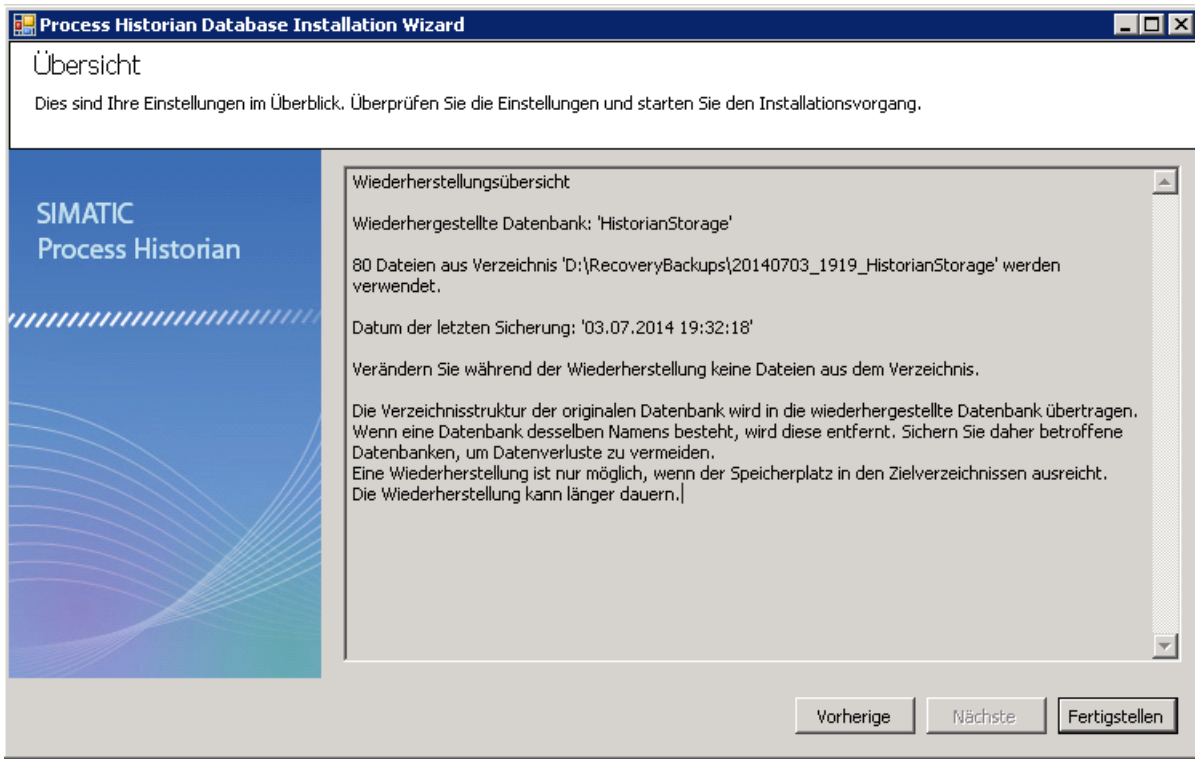
The database backup is checked to determine if it can be recovered.



11. Select the required backup.

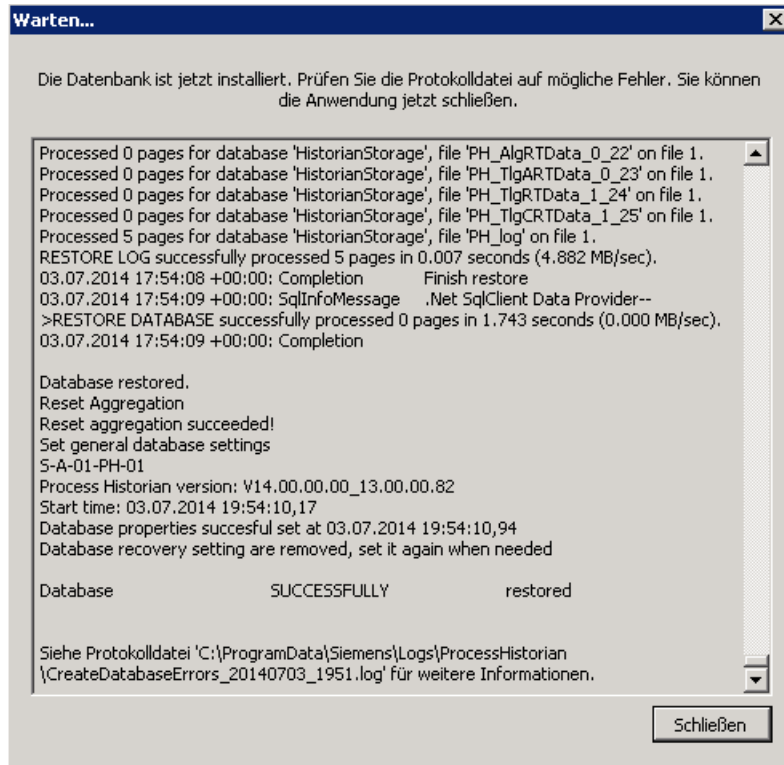
12. Click "Next".

Before recovery starts, a recovery overview of your information is displayed.



13. Check the information in the overview. If there is incorrect information in the overview, go back with "Previous" the number of required steps and correct the information.

14. If all information is correct, click "Next".
 Recovery of the database is now started.
 The recovery progress is displayed.



Successful completion of the database recovery is displayed at the end with the following message:

"Database SUCCESSFULLY restored".

15. Close the database installation wizard with "Close".
16. You must shut down the computer and restart it for all services to be installed.
 After restart, database backup is set to "Disable".

Result

You have successfully recovered a database.

8.2 Segments Basics

This section contains basic information on the segment types used and on changing between the segment types.

The following segment types are used:

- Runtime segments
- Archive segments
- Repository segments

Runtime segments

Runtime segments (RT segments) Runtime segments are segments which can be written and are used for storing data. Each runtime segment has a sequential number, starting at 100 000. Future runtime segments have the highest number.

RT segment	Description
Future Runtime Segment (F-RTS)	Segmentation is colored blue in the dashboard.
Current Runtime Segment (F-RTS)	Segmentation is colored green in the dashboard.
Older Runtime Segment (O-RTS)	Segmentation is colored gray in the dashboard.

Creation: The first time the Process Historian starts, the configured number of runtime segments are created, see Segmentation dashboard.

Cyclic segmentation in operation:

1. A new future runtime segment is created.
2. If the configured number of runtime segments is available, the oldest runtime segment is an archive segment.

Archive segments

It is not possible to write to archive segments.

Only archives segments can be saved and swapped out (set offline).

Archive segments	Description
Non-compressed Archive Segment (NC-AS)	The oldest runtime segment is an archive segment. Compression begins at this time, if it is enabled. Visible in the 'Backup/Restore' dashboard, top list 'Status' column = 'Online', 'Compressed' column = 'No'.
Compressed Archive Segment (C-AS)	If compression is completed for a non-compressed archive segment, then this archive is a compressed archive segment. Visible in the 'Backup/Restore' dashboard, top list 'Status' column = 'Online', 'Compressed' column = 'Yes'.
Past Archive Segment (P-AS)	These are created by the migration of the process data for the time period that was prior to the commissioning of the Process Historian. These segments have a sequential number lower than 100'000 and normally include a period of one month. The Migrator itself can write all archive segments.

Saved Archive Segment (S_AS)	Created after saving an archive segment, a backup file (backup file) is created thereby. The date of the backup is shown in the 'Backup/Restore' dashboard', top list in the 'Backup created" column.
Offline (swapped out) Archive Segment (O_AS)	Created after the setting a saved archive segment offline. The data of this segment are only in the backup file. There is no data from this segment in the Process Historian database; only the information about a backup and the offline setting is available. All segments in the 'Backup/Restore' dashboard are included in the list below.
External Archive Segment	Created by restoring (setting to online) a backup file for an offline archive segment. The data is not stored in the Process Historian database, but rather in an external database. Visible in the 'Backup/Restore' dashboard, top list 'Status' column = 'External'.

Repository segments

Repository segments contain the data from time periods outside of the runtime segments. This includes data for all types of archive segments, since it is no longer possible to write to these segments.

These segments are created by the Database Installation Wizard when the Process Historian database is created.

Subtype	Description
CAL segment	Contains all data from time periods older than the oldest runtime segment. This happens, for example, when an OS has not transfer data to the PH for a long time, and then tries to catch up, and thereby sends data with a date outside the runtime segments. If values are stored in the CAL segment for an offline segment, this is indicated in the 'Backup/Restore' dashboard in the lower list where the 'New data' column = 'Yes'. These offline segments must then be restored and backed up again. When you perform the backup, data from the CAL segment are entered in the backup file of the archive segment.
CAL segment	Contains all data from time periods more recent than the most recent runtime segment. For the segmentation, the data are transferred from the CAU segment into the latest future runtime segment, which has the same time period.

Example of the segment structure over time

Example:

The following is configured in the Segmentation dashboard:

- 1 future segment
- 5 runtime segments total, the future runtime segment is included here.
- The time range for 1 segment is 1 week

Automatic backup scheduling is enabled in the Backup/Restore dashboard:

- The number of delayed segments for offline has been set to 3.

This means that the data is always saved for a time period of 7 (= 5 – 1 + 3) weeks in the Process Historian database.

Actions of the Process Historian system

A segmentation is performed at the end of each week (time period for 1 segment):

- A new future runtime segment is created.
- If there are more than 5 runtime segments, the oldest runtime segment becomes an archive segment.

Furthermore, there is a cyclical check to determine:

- Whether an archive segment can be backed up.
- The oldest saved archive segment is set offline when the number of saved archive segments is greater than the number of delayed segments to be set offline configured in automatic backup.

8.3 Aggregation

A large volume of raw data is generated during operation. Due to the very large volume of raw data, processing a query from raw data can take a very long time.

To speed up processing of queries, aggregates are used.

The aggregates combine raw data and process this raw data together. The aggregates are saved in the database and are available for further processing. Aggregation speeds up further processing of the entire data volume. The additional computing time required to process the aggregates is lower than that for processing queries based on raw data. Approximately 3% to 6% additional space is required in the database to save the aggregates.

Querying the aggregates

The aggregates are available in the database in addition to the raw data. Just like the raw data, they can be called via WinCC or via the Information Server.

Aggregate methods

The following aggregates are used:

MIN	Minimum value over a time interval
MAX	Maximum value over a time interval
SUM	Total value over a time interval
NUM	Number of values of a time interval
INT	Integral over a time interval
AVG	Arithmetic average value over a time interval
WAV	Weighted average value over a time interval

Aggregate intervals

The aggregates are calculated for the following time intervals:

- 1 minute
- 1 hour
- 1 day

Example

For a query, the MAX value over a period of one month is to be calculated and displayed.

Calculation

Without aggregation:

With a raw data cycle of 1 second, the query is calculated from the following volume of raw data:

$$60 \text{ (sec)} \times 60 \text{ (min)} \times 24 \text{ (h)} \times 30 \text{ (d)} = 2,592,000 \text{ values}$$

The query is calculated from 2,592,000 raw data items.

With aggregation:

MAX (30 days)

The query is calculated from 30 aggregate time intervals.

8.4 Firewall settings

During installation, the firewall settings for the locally installed Windows firewall are automatically adjusted.

These ports must remain available if you need to use an additional firewall between the OS server and Process Historian.

Make sure that firewall features that make checks at application level are adjusted, if necessary. For example, the "RPC Filter" feature must be disabled for the SIEMENS Application Firewall.

Firewall security settings

Process Historian Server and PH-Ready require the following settings for operation:

Name	Protocol	Port
PH Discovery Services	TCP	5048
PH Network Discovery	UDP	137
PH Redundancy Services	TCP	60000
PH WCF Message Queue Service (Redundancy Maintenance Service)	TCP	60001
PH WCF Message Queue Service (SQL Mirroring Setup)	TCP	60002
PH WCF Message Queue Service (Maintenance Service)	TCP	60003
PH SQL-Mirroring Port (TCP)	TCP	5022
PH SQL-Mirroring Port (UDP)	UDP	5022
PH SQL-Server Monitor Port	UDP	1434
PH SQL-Server Port	TCP	3723
PH LLMNR-UDP-In	UDP	5355
OPC UA Local Discovery Server	TCP	Any port
OPC UA Local Discovery Server	TCP	Any port
PH RPC for MSMQ	TCP	135

See also

Setting up Process Historian redundancy (Page 60)

8.5 Integrating Process Historian in a domain

This section includes examples of and references to infrastructure management.

In the following example, a Process Historian is transferred from a workgroup to a domain.

Note

Process Historian is generally enabled for operation in a domain or workgroup.

Operation in a domain must be agreed upon with the domain administrator. In the case of user-specific guidelines, remove the PC from the domain before you install Microsoft Message Queuing and Microsoft SQL Server 2008 R2. Log on to the computer concerned locally with administrator rights. Perform the installation. You can reassign the WinCC computer to the domain once the installation is successfully completed.

Note however that domain group policies and restrictions in the domain may also hinder operation. If these restrictions cannot be overcome, operate the WinCC computer in a workgroup.

Integrating Process Historian: Procedure

You can use the Process Historian in workgroups or in domains:

- To operate a Process Historian in a workgroup, install the Process Historian as administrator in this workgroup.
- To operate a Process Historian in a domain, install the Process Historian as administrator in this domain.

Installation of the Process Historian

The example below describes how to transfer the Process Historian to a domain once the Process Historian has been installed in a workgroup.

Installation in a workgroup

Installation of the Process Historian in a workgroup is described in the FAQ "Installing and Commissioning of Process Historian/ Information Server in a PCS 7 Environment":

- <http://support.automation.siemens.com/WWW/view/en/66579062> (<http://support.automation.siemens.com/WWW/view/en/66579062>)

Preparation

For the login information of the services on the OS to remain the same, these services must be operated by a domain or workgroup whose password is not changed. This includes the following services:

- CCCAPHServer Service
- Process Historian Redundancy Service
- Witness server

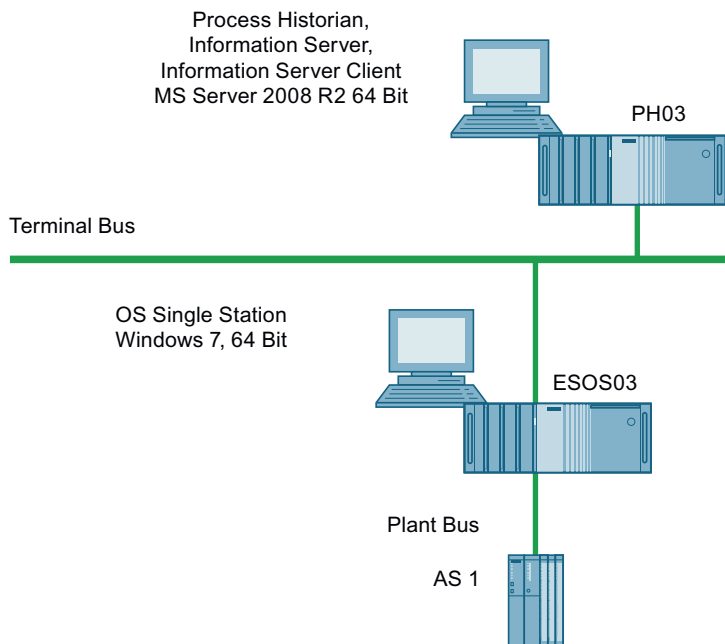
If the passwords are changed, however, the login information of these services must be changed accordingly on the corresponding OS server; this server must then be restarted.

Note the following conditions:

- If you integrate an OS system in a domain, you must register the domain user who logs on in additional local groups.
- To simplify administration and installation, create a domain user as local administrator on the OS server and the Process Historian.
- The domain user who is logged on to the operating system must not be the same user who starts the CCCAPHServer service.
- The domain user who starts the CCCAPHServer service must have the appropriate authorizations in the SQL Server of the Process Historian. Add this user to the local administrator group of the OS system.

Configuration example

The example below shows the transfer of a workgroup installation to a domain installation. For security reasons, the operating system login for the OS server and the Process Historian should only have local user authorizations.



	Name	Comment
.	pcs7sv.local	
Domain	ESOS03	
OS server	PH03	Process Historian and Information Server are running on the same physical PC

Operating system login for OS serv-OSUserDom and Process Historian	The login has local user authorizations.
CCCAPHServer login for OS serverPHReadyUserETest	The login requires local administrator authorization on the OS server.

Integrating ES/OS single station in a domain

In this example, an ES/OS single station is integrated in a domain. We are using the Windows 7 operating system in the 64-bit version for the description.

1. Open the "System Properties" window.
2. Click "Edit".
The "Changing the computer name or the domain" window opens.
3. Enter the name of the domain in the "Member of" text box of the domain option.
4. Click "OK" to confirm the change.
The change is applied and the window is closed.

Enter domain user

The domain user must be entered in the local SIMATIC HMI group and in the local administrator group for the operating system login. Follow the steps below:

1. Open the "Computer Management" window.
2. Open the list of local groups.
3. Open the shortcut menu of the "SIMATIC HMI" user group.
4. Select the "Properties" of the "SIMATIC HMI" user group.
5. In the "Properties" window, click "Add".
The "Select user" window opens.
6. Click "Paths".
You are prompted to authenticate yourself for access to the domain in the "Windows Security" window.
7. Enter your user name and your password in the text boxes. Confirm your entries.
A window containing the domain paths is opened.
8. Select the required domain path and confirm your selection.
A window for selection of users, computers, service accounts and groups opens.
9. In the text box, enter the OS user name you want to log on to the operating system on the OS during runtime. Confirm your selection.
The selection window closes.
The "Properties" window of the "SIMATIC HMI" user group opens.
The new user has been added in the "Members" field.
10. Close the process with "OK".

Local groups for the domain user

Also enter the domain user logged on to the operating system of the ES/OS single station as described above in the following groups:

- User
- Siemens TIA Engineer
- SIMATIC NET

Then restart the ES/OS single station.

Configuring the CCCAPHServer service

The CCCAPHServer service must be started by a domain user. Follow the steps below:

1. Open the "Computer Management" window.
2. Navigate to "Services and Applications>Services".
The list of services is displayed.
3. Open the shortcut menu of the "CCCAPHServer" service.
4. Select "Properties".
The "CCCAPHServer Properties" windows opens.
5. Click the "Logon" tab.
6. Select the "This account" option.
7. Click "Browse".
The "Select user or service account" window opens.
8. Click "Paths".
A window containing the domain paths is opened.
9. Select the domain name under which the user who is to start the CCCAPHServer service has been created.
10. Confirm your selection with "OK".
A window for selection of users, computers, service accounts and groups opens.
11. Enter the domain user in the text box and confirm your entry.
The "CCCAPHServer Properties" windows opens again.
12. Select the "This account" option.
13. Enter the password of the user in the text box and repeat your entry in the text box underneath.
14. Click "OK" to close your input.
The windows are closed.

Result

A service window indicates the successful completion of the process.

Another service window indicates that the new entries will be activated with a restart of the service.

Restart

1. Open the Computer Management again.
2. Open the shortcut menu of the CCCAPHSERVER.
3. Select "Restart".

The CCCAPHSERVER service restarts.

The new entries have been applied.

Entering CCCAPHSERVER users

Enter the CCCAPHSERVER user in the local administrator group:

1. Open the "Computer Management" window.
2. Select "Local Users and Groups>Groups".
3. Open the shortcut menu of the "CCCAPHSERVER" user group.
4. Click "Properties".
5. The "Properties" window of the "CCCAPHSERVER" user group opens.
6. Click "Add".
The "Select user" window opens.
7. Click "Paths".
You are prompted to authenticate yourself for access to the domain in the "Windows Security" window.
8. Enter your user name and your password in the text boxes. Confirm your entries with "OK".
A window containing the domain paths is opened.
9. Select the required domain path and confirm your selection with "OK".
A window for selection of users, computers, service accounts and groups opens.
10. Enter the user name for the CCCAPHSERVER domain in the text box. Click "OK" to confirm your entries.
The selection window closes.
The "Properties" window of the "CCCAPHSERVER" user group opens.
The new user has been added in the "Members" field.
11. Click "OK" to close the process.

Note**Domain user logon**

The domain user must not be logged on to the OS operating system during runtime.

Integrating OS server in a domain

The procedure is the same as for the ES/OS single station. Unlike with the ES/OS single station, you also enter the domain user who is logged on to the operating system in the following groups:

- User
- SIMATIC HMI
- SIMATIC NET

Integrating combined Process Historian / Information Server in a domain

To integrate a combined Process Historian/ Information Server in a domain, follow these steps:

1. Open the "System Properties" window.
2. Click "Edit".
The "Changing the computer name or the domain" window opens.
3. Enter the name of the domain in the "Member of" text box of the domain option.
4. Click "OK" to confirm your entries.
The change is applied and the window is closed.

Creating SQL Server login for domain user

We are using the Microsoft SQL Server 2008 R2 operating system in this example.

To create an SQL Server login for a domain user who is entered for a CCCAPHServer, follow these steps:

1. Go to "Start > Microsoft SQL Server 2008 R2 > SQL Server Management Studio" and open the SQL Server Management Studio.
2. Connect to the SQL instance "HISTORIAN" by clicking "Connect".
3. Within the SQL Server, navigate to the "Security\Logins" folder.
4. Click the "Logins" folder.
5. Create a new login on the SQL Server for the domain user who also starts the CCCAPHServer service on the OS.
6. Click "OK" to confirm your entries.
7. Open the "Login" shortcut menu.
8. Select "New Login".
9. Click "Browse" in the "Login Now" window.
10. Click "Paths" in the "Select user or group" window.
You are prompted to authenticate yourself for access to the domain in the "Windows Security" window.
11. Enter your user name and your password in the text boxes. Confirm with "OK".
A window containing the domain paths is opened.

12. Select the required domain path. Confirm your selection with "OK".
A window for selection of users, computers, service accounts and groups opens.
13. Enter the user name in the input box. Click "OK" to confirm your entries.
The selection window closes.

Result:

The new user name is displayed in the "Login Now" window.

The new login is entered in the login list of the computer management.

Grant login authorizations

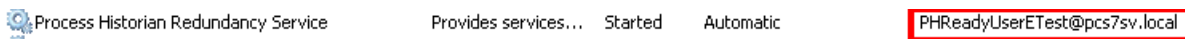
You grant the corresponding authorizations for the SQL Server login in the SQL Server.

1. To do so, open the properties of the newly created SQL Login.
2. Change to the "Server Roles" tab.
The "Login properties PCS7SV\PHReadyUserETest" window opens.
3. Change to the "User Mapping" tab.
4. Map all project databases to the new SQL Server login. Project databases start with DB_Master_XY.
5. Select "public" and "db_owner" as "Database role membership".
6. Do the same for the databases "HistorianStorage", "ReportServer&HISTORIAN" and "ReportServer&HISTORIANTempDB".

The Process Historian services are still started with "Local System".

Redundant Process Historian

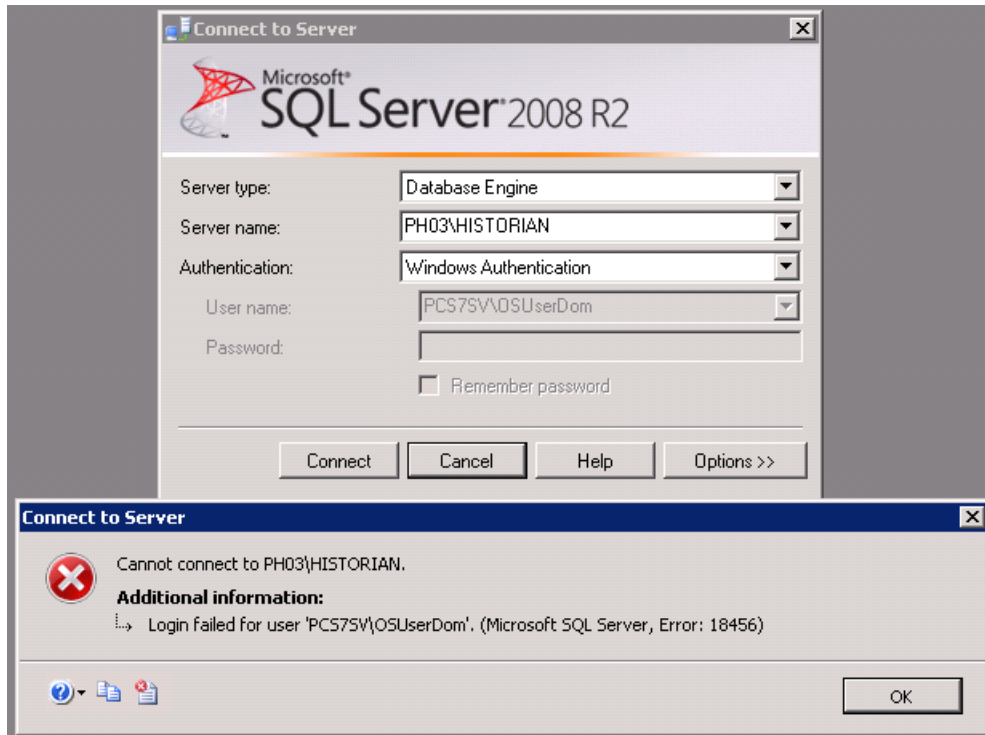
1. Start the Process Historian Redundancy service with the new domain user.
Screenshot as example (temporary):



2. An SQL login with corresponding user assignment must be created for the domain user on the Process Historian server as well as on the Process Historian Witness.

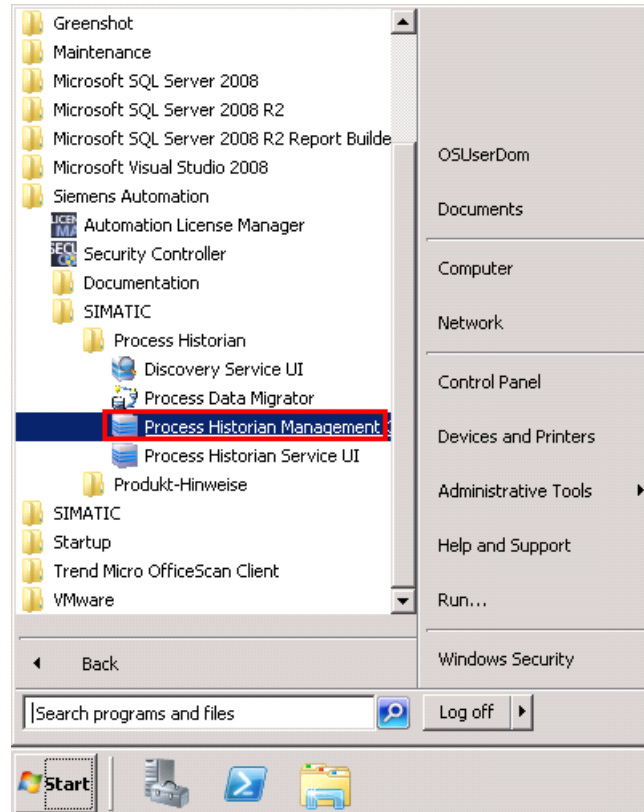
User authorizations on the Process Historian

1. The "OS UserDom" operating system login only has user authorization on the Process Historian. This means the user cannot open the SQL Server Management Studio. The database is therefore protected from manipulations using the SQL Server Management Studio.

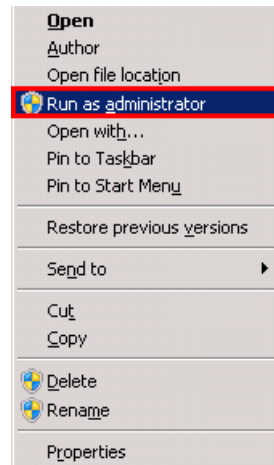


2. If the operating system login only has user authorization on the Process Historian, the Process Historian Management console is not opened automatically at restart. A restart with administrator authorization is necessary to open the Process Historian Management console.
 - Procedure:

- Go to "Start > Siemens Automation > SIMATIC > Process Historian > Process Historian Management Console".



- Right-click "Process Historian Management Console".



- Click "Start as administrator" in the shortcut menu. Authenticate yourself as administrator.
3. To start the Process Historian Management console automatically after a restart, add the domain user to the local administrator group.

See also

<http://support.automation.siemens.com/WW/view/en/66579062> (<http://support.automation.siemens.com/WW/view/en/66579062>)

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