Redundancy in WinCC V7.x and WinCC Professional

WinCC V7; WinCC Professional / Redundancy

https://support.industry.siemens.com/cs/ww/en/view/109772627

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1 Introduction

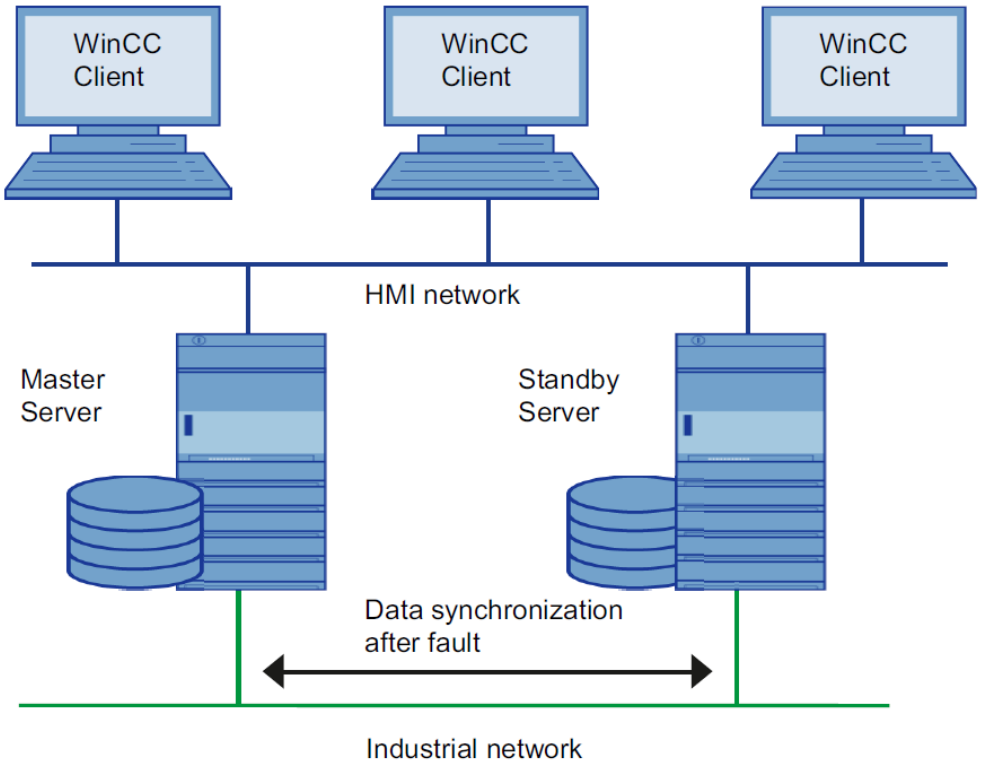
1.1 Overview

Motivation

Automation systems are high-precision systems that play an essential role in the production of a company. The failure of individual components can lead to problems or malfunctions which, in the worst case, can cause the system to come to a halt. This danger is considerably reduced by the redundant design of important components.

The redundant design of the HMI Servers offers a significant increase in the availability of the system through parallel operation of the two interconnected Servers.

Figure 1-1



Main contents of the application example

In this application example you will learn:

- Basic information on how WinCC redundancy works
- Possible failure scenarios with redundant systems
- Helpful information for setting up the network and Windows user settings
- Necessary configuration steps for successful implementation of redundancy in WinCC V7.X and WinCC Professional
- Diagnostics options for redundancy testing and troubleshooting

Benefits

The described contents regarding redundancy offer you the following advantages:

- Time and cost savings through detailed step-by-step instructions
- Deeper understanding of the behavior of redundant Servers, system tags, and connected Clients in case of failures
- Quick overview of the necessary requirements and functions of WinCC redundancy

1.2 Components Used

This application example was created using these software components. The exact use of the respective software and license is described in Chapters 3.2 and 4.2:

Table 1-1

Components	Item number
SIMATIC WinCC V7.5 RT	6AV63.1-…7-5…
SIMATIC WinCC/Redundancy V7.5	6AV6371-…7-5…
SIMATIC WinCC V7.5 RC	6AV63.1-…7-5…
SIMATIC S7 STEP7 V5.6	6ES7810-4C.11-0Y..
SIMATIC WinCC/Server V7.5	6AV6371-1.A07-5AX0
SIMATIC WinCC RT Professional V15.1	6AV2105-0...5-0...
SIMATIC WinCC Redundancy for Runtime Professional V13 and higher, Option for WinCC (TIA Portal)	6AV2107-0FB00-0B.0
SIMATIC WinCC Professional V15.1	6AV2103-0....-0...
SIMATIC WinCC Server for Runtime Professional Option for WinCC (TIA Portal)	6AV2107-0EB00-0B.0
SIMATIC WinCC Client for Runtime Professional V15.1 in the TIA Portal	6AV2107-0DB..-0A.0

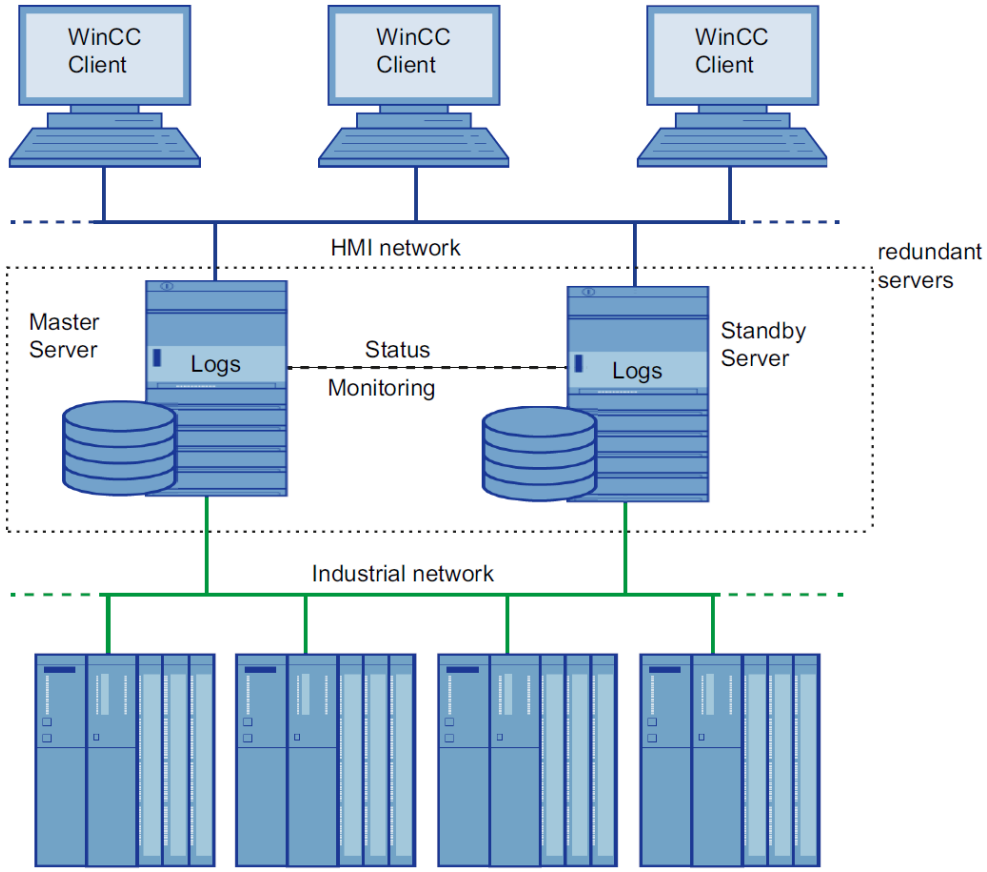
2 Fundamentals of Redundancy in WinCC

2.1 Overview

Introduction

A redundant WinCC project consists of two WinCC Servers that are configured with identical functions and run in parallel: a Master Server and a Standby Server. The two Servers are networked with the Automation Stations and the Clients.

Figure 2-1



The functions of WinCC redundancy

WinCC Redundancy provides the following functions:

- Automatic switching of the Clients in case of Server failure or failure of the process connection
- Automatic synchronizing of message archives, process value archives, and user archives after a failed Server is brought back online or the process connection fault has been eliminated.
- Online synchronization of messages
- Online adjustment of tags that support tag synchronization
- Online synchronization of user archives
- “Application Health Check” function for monitoring the WinCC applications
- “SelfDiagnosis” function for monitoring the hardware and software of the local system

Note The “Project Duplicator”, for duplicating a project on the redundant Server, is only available with WinCC V7.X.

“Application Health Check” function

The term “Application Health Check” describes the cyclical sign-of-life monitoring of important applications.

After detecting a software error, the sign-of-life monitoring does the following:

- Sets the Server status in the “@RedundantServerState” system tag to “Fault”
- Switches the connected Clients to the redundant Server
- Informs the user about the software error with a process control message. If the Alarm Server causes the failure, no process control message is triggered.

Note If a software error was detected by the “Application Health Check” function and Client switching was initiated, the relevant Server must be restarted. Only then can the Clients be reconnected to that Server. The archives are synchronized retroactively up to the point where the software error was detected.

“SelfDiagnosis” function

The “SelfDiagnosis” function comprises the following tasks to ensure availability and stability of the redundant system:

- Monitoring and reporting local HW and SW problems
- Monitoring local system performance
- Monitoring the state of the data volume
- Switch Servers, if necessary

The following tasks are performed in case of malfunction:

- Restarting of applications
- Setting the Server status to “Fault” and switching Servers (if the fault requires this)
- Creating a log entry
- Triggering a system message

Note You can find more information on the “SelfDiagnosis” function in the FAQ “Why does the ‘Self-Diagnosis’ message appear in WinCC Runtime and how can this be checked (WinCC V7, PCS 7 and WinCC Runtime Professional)?” https://support.industry.siemens.com/cs/ww/en/view/109767365

2.2 Functionality of Redundancy

WinCC archiving in normal operation

Normally, Master Server and Standby Server run completely parallel in Runtime. Each Server computer has its own connection to the process bus and has its own data archives. The process data and messages from the Automation Stations are sent to both Servers simultaneously and processed by both.

The Servers monitor each other during Runtime to allow for the early recognition of a failing Partner Server, which is then indicated by a process control message.

User archives, messages, and internal tags are constantly synchronized online.

Both Servers work equally, independently of each other and are available to the user. Should one of the Servers fail, the Partner Server is always available as an equivalent redundancy.

Communication between the redundant Servers for the purpose of archive synchronization takes place via the terminal bus. The network is a PC-LAN network with TCP/IP protocol.

For the exact determination of the Master or Standby status (status monitoring), an additional connection via a network adapter and/or a serial connection between the Servers is necessary. This is used for status monitoring, but not for archive synchronization.

Server failure

Server failure refers to the physical failure of a Server, e.g. by a power cut or by turning off the Server without turning it off properly.

If a Server fails, the Server which is still operating receives and archives the process values and messages from the Automation Stations. This ensures complete data integrity.

The Clients will automatically be switched from the failed Server to the redundant Partner Server. After a brief switching period, all operator stations will be available again.

Factors triggering the Client switch

The switch of the Clients from the default (master) Server to the Partner Server during a Server failure is performed automatically by the system. The following factors lead to Client switching:

- Network connection to Server failed
- Server failure
- Malfunction of process connection
- The “Application Health Check” function has detected a defective WinCC application and triggers a switchover.
- The project is deactivated.

Factors triggering archive synchronization after the Server is brought back online

The synchronization of the archives between the Servers will be initiated after the following errors have been eliminated:

- Failure of the process connection (switching the process connection monitoring on and off is possible).
- Network connection failure to the Partner Server
- Server failure
- Project is not activated.

Synchronization after the Server is brought back online

After the failed Server is brought back online, the redundancy performs an archive synchronization for the down time. The gap in the archives caused by the failure is closed by transferring the missing data to the failed Server. This action equalizes and makes both Servers available again.

The following archives are synchronized:

- Message archive
- Process value archive
- User archive
- internal Tags

The failed Server receives its data with a time delay caused by the failure. The archive synchronization runs in the background, parallel to the process management and archiving of WinCC. This allows the system to be operated and monitored at any time.

Synchronizing internal tags

The internal tags must have the property “Tag synchronization”.

Internal tags are compared on partner computers as soon as one of the tags is modified on one of the redundant Servers.

The internal tags also include the system tags that begin with the “@” character, such as “@Current_User” or “@RM_Master”.

Note The “Synchronization” option must not be used for system tags (e.g. “@RM_Master”).

Synchronization after process connection error

If a network fault occurs between a Server and one or more Automation Stations during operation, a synchronization is automatically started after the fault has been rectified – if this has been configured.

Online synchronization

A direct Server-to-Server synchronization (online synchronization) takes place during alarm logging for messages, in user archives, and with internal tags with tag synchronization.

Synchronizing blocked messages

After the failed Server is brought back online, actively blocked messages are identified and synchronized in Alarm Logging with the help of the general switchboard of the Automation Station.

If a message is blocked passively, i.e. only on one Server, then the blocking information is compared.

2.3 Requirements for Redundant Systems

The following requirements must be fulfilled for WinCC Redundancy:

- Only computers with Server operating systems may be used for redundant WinCC Servers with multi-user operation.
- The Servers must be connected via the network.
- The WinCC redundancy option has been installed and the license has been added. This is necessary for both redundant computers.
- The two redundancy Servers must be identically configured functionally. This means that the redundant Servers must be installed and parameterized in the same way and use the same WinCC project.
- The Servers are time-synchronized. It is recommended to time-synchronize the entire system.

- Process values, messages, and active message blocks are sent to both Servers in parallel from the subordinate Automation Stations.
- At least one of the following connections should exist between the redundant Servers:
  - Serial cable
  - Additional network connection via a LAN adapter

This additional connection ensures exact definition of the “Master” or “Standby” status.

Note The IP address of the additional network connection must not be located in the same subnet as the terminal bus and must be configured via an additional network adapter.

Note To safely exit WinCC in the event of a power failure, the use of an uninterruptible power supply (UPS) is recommended.

Note During commissioning, WinCC Runtime is often activated and deactivated on the Server computers. This repeated starting with an activated WinCC Redundancy causes the archives to be synchronized every time. This may result in a notable deterioration of the WinCC runtime behavior. We therefore recommend that you deactivate WinCC Redundancy during commissioning.

2.4 System Behavior in the Event of a Fault

2.4.1 General Information on the Functionality of WinCC Redundancy

Introduction

We use some failures that occur in reality to illustrate how WinCC Redundancy works.

WinCC Redundancy either detects the current error itself or reacts to error messages with the following actions:

- Storing timestamps of specific events
- Archive synchronization
- Changing the “Master” and “Standby” identifiers
- Switching Clients
- Triggering of messages

Starting the Server

A redundant system consists of two functionally identical Servers. One Server is the “Master” Server and the other is the redundant Partner Server.

The Servers have the following status in the undisturbed operating status:

- The Master Server has the status “Master” if the Partner Server is not active during startup.
- The redundant Partner Server has the status “Standby” if the Partner Server is already active during setup.

Clients are connected to the respectively configured, Preferred Server, or to the Master Server if no Preferred Server has been specified.

As soon as both Servers are in Runtime, the process connection monitoring is activated. WinCC Redundancy cyclically determines the number of defective logical connections of the Master Server and the redundant Partner Server.

If the Master Server has more defective logic connections than the redundant Partner Server, the state of the Server is set to “Fault” in the system tag “@RedundantServerState”. The Clients are switched over to the redundant Partner Server, which now has the “Master” status.

System behavior of WinCC redundancy

The status of the Server computer is saved in the “@RM_MASTER” system tag.

Table 2-1

Status of Server computer	“@RM_MASTER” status
Master	1
Standby	0

The “@RM_MASTER_NAME” tag contains the name of the Server system that has the “Master” status, e.g., “Server1”.

The “@RedundantServerState” tag displays the redundancy status for each redundant Server, e.g., “Standby”.

The redundancy component only sets the mentioned tags. Both Servers are always completely equal.

These tags can be evaluated by scripts or other applications. Only the “@RM_MASTER” tag can be changed.

Exchanging Status information

The status of the redundancy is controlled via a separate connection. The connection can be established as follows:

- Using a network adapter
- Via a serial interface

Connection via a network adapter is to be preferred to serial connection.

Note Note that the archive synchronization is performed via the terminal bus. The archive synchronization is not executed via the status connection.

2.4.2 Scenario 1: Project on Server Computer not in Runtime

Introduction

This scenario shows the behavior of WinCC Redundancy when the project on Server2 was deactivated. Before deactivation, Server1 is the Standby Server and Server2 is the Master Server.

The following actions will be triggered:

- Server1 stores the downtime with date and time of Server2.
- Server1 will report the failure of Server2 through a system message.
- Server1 assumes the role of the Master Server. The “@RM_MASTER” tag is set and the “@RM_MASTER_NAME” and “@RedundantServerState” tags are changed.
- The Clients connected to Server2 switch over to Server1.

Server2 starts Runtime again

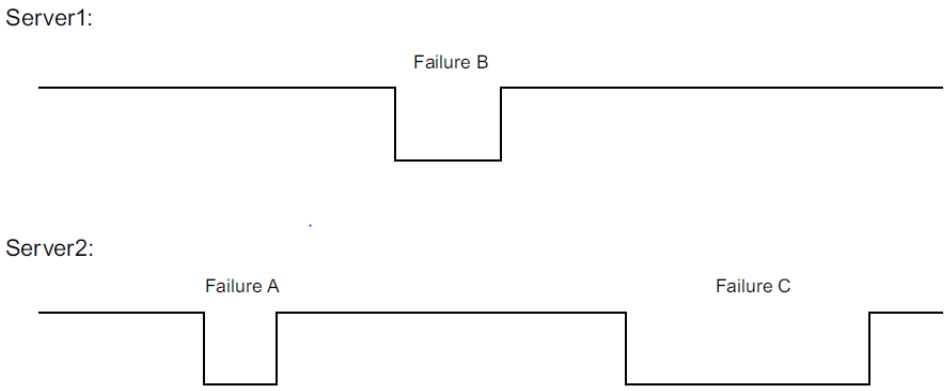
The downtime means that there is a gap in the archives of Server2. This gap will be filled by the following measures:

- Server1 stores the return time with date and time of Server2.
- Server1 reports the return of Server2 through a system message.
- There is a redundant synchronization for internal tags, messages, process data, and user archives from Server1 to Server2.
- With Server1 “@RM_MASTER” remains set, with Server2 “@RM_MASTER” is reset.
- For both Servers “@RM_MASTER_NAME” and “@RedundantServerState” remain unchanged.
- Clients, which are configured with Server2 as their Preferred Server, switch back to Server2.

Alternating failure of the Server

If failures alternate between the two Servers, they are synchronized one after the other. After the synchronization, all data is available in both archives.

Figure 2-2



Failure A (Server2 fails)

When Server2 is brought back online, Server1 passes all values to Server2.

Failure B (Server1 fails)

When Server1 is brought back online, Server2 passes all values to Server1.

Failure C (Server2 fails)

When Server2 is brought back online, Server1 passes all values to Server2.

All these processes run automatically in the background. They are independent of the parallel archiving of process values and messages from the subordinate Automation Stations.

2.4.3 Scenario 2: Terminal Bus Connection Failure to the Partner Server

Introduction

This scenario shows the behavior of redundancy in the case of a connection failure to the Partner Server. Prior to the occurrence of this event, both Servers run in Runtime without failures.

The described connection failure occurs when the connection from the Server to the terminal bus fails.

Initial Situation 1

When the connection failure occurs, Server1 is the Master Server and Server2 is the Standby Server.

Connection failure to Server1 occurs

The following reactions are triggered when the connection fails:

- Server2 becomes the Master Server and saves the time of the failure with date and time.
- Server2 displays a system message stating that the Partner Server has failed and Server2 is now the Master Server.
- Tags “@RM_MASTER”, “@RM_MASTER_NAME” and “@RedundantServerState” are adapted accordingly on both Servers.

Connection is restored

The following measures are carried out:

- Master Server2 stores the time of the return.
- Server2 displays by way of a system message when the Partner Server was brought back online.
- Redundant synchronization is performed from the Master Server to the Standby Server
- Through online synchronization of the Alarm Logging, the following is reported from Server1 to Server2 and display on Server1 as a system message:
  - An error has occurred in the redundant operation.
  - Server1 has switched to “Standby” status.
  - Return of Server1
- The “@RM_MASTER”, “@RM_MASTER_NAME” and “@RedundantServerState” tags remain unchanged on the two Servers.

Initial Situation 2

When the connection fails, Server 1 is the Standby Server and Server 2 the Master Server.

Connection failure to Server1 occurs

The following reactions are triggered when the connection fails:

- Server2 remains the Master Server and saves the time of the failure with date and time.
- Server2 displays the failure of the Partner Server by means of a system message.
- The tags “@RM_Master”, “@RM_MASTER_NAME” and “@RedundantServerState” remain unchanged on both Servers.

Connection is restored

The following measures are carried out:

- Master Server2 stores the time of the return.
- Server2 displays by way of a system message when the Partner Server was brought back online.
- Redundant synchronization of the Master Server with the Standby Server.
- Through online synchronization of the Alarm Logging, the following is reported from Server1 to Server2 and display on Server1 as a system message:
  - An error has occurred in the redundant operation.
  - Return of Server1.

- The “@RM_MASTER”, “@RM_MASTER_NAME” and “@RedundantServerState” tags remain unchanged on the two Servers.

2.4.4 Scenario 3: Network Connection to the Client is Disrupted

Introduction

In scenario 3, there is a disturbance in the network connection between Server2 and the “CL5” Client belonging to Server2. Server1 is the Master Server.

The following reaction is triggered:

Client “CL5” automatically switches over from disturbed Server2 to running Server1.

End of the network disturbance to the Client

- The “@RM_MASTER”, “@RM_MASTER_NAME” and “@RedundantServerState” tags remain unchanged on the two Servers if Server1 was already the Master Server before the failure.
- The Client “CL5” switches back to the Preferred Server, Server2.

2.4.5 Scenario 4: Malfunction of Process Connection

Introduction

In this scenario, there is a fault on the process connection on Master Server2 due to an interrupted network connection to the Automation Stations.

Failure of a connection to an Automation Station

The connection failure to an Automation Station is recognized in WinCC Redundancy if the connection to a Server is faulty.

An interruption in the connection of an Automation Station to both Servers is not a failure in terms of redundancy.

Reaction to an error

If WinCC recognizes a failure on Server2, the following actions will be triggered:

- The disturbance of the process connection is reported on Server2.
- Server1 receives a message that Partner Server2 has failed.
- Server1 saves the time of the error on Server2 with date and time.
- If you have configured the “Client switch with disturbance in the process connection” option in the “Redundancy” Editor, the Clients connected to this Server are switched over to the Partner Server.
- With Server1, the “@RM_MASTER” tag is set to “Master”, with Server2 to “Standby”. The “@RM_MASTER_NAME” and “RedundantServerState” tags are adapted accordingly. The “@RedundantServerState” tag is set to “Fault” at Server2.

End of the process connection error on Server2

Provided process connection monitoring has been activated, the gap in the archive of Server2 will be filled by the following measures:

- Server1 stores the return time of Server2.
- A redundant synchronization is carried out from Server1 to Server2, since no faults were found for process connection on Server1. The data from all Automation Stations are synchronized. This means that the data of Automation Stations that have not failed will also be synchronized.

- With Server2, the “@RedundantServerState” tag is changed from “Fault” to “Standby”
- The correction of the process connection error on Server2 is announced by a system message

2.4.6 Scenario 5: Software Failure

Introduction

In this scenario, an error occurs on Server2 in software that is being monitored. At this time of the failure, Server2 has the “Master” status and Server1 the “Standby” status. Several Clients are connected to both Servers.

“Application Health Check” function

If the “Application Health Check” function detects an error in the WinCC software, the following actions are initiated:

- “Application Health Check” reports the fault to WinCC Redundancy. The status of Server2 is set to “Fault” in the “@RedundantServerState” tag. The “@RM_Master” tag is set to “Standby”.
- The Server1 “@RM_Master” tag is set to “Master”. “@RM_MASTER_NAME” and “RedundantServerState” are adapted accordingly.
- The Clients connected to Server2 switch over to Server1.
- A process control message informs users of the software error if the Alarm Server itself has not caused the error.

Measures after the end of the software malfunction on Server2:

Deactivate the affected Server2 project. Restart Server2.

- Automatic synchronization of the archives after activation of the project on Server2
- Set “@RedundantServerState” to “Standby” for Server2; Server1 remains the “Master”.
- Server1 stores the return time of Server2 with date and time.
- Reconnecting the Clients to this Server is now possible. Archive synchronization is only performed retroactively to the moment when the software error of Server2 was detected.

2.5 Error Handling

2.5.1 System Tags of WinCC Redundancy

Overview

The “@RM_MASTER” and “@RM_MASTER_NAME” system tags are used by WinCC Redundancy for Master/Standby control of the two redundant Servers and for Client switchover. You can read the tags with other applications or scripts, but only “@RM_MASTER” can be changed.

Table 2-2

WinCC system tags	Meaning
@LocalMachineName	This tag contains the local computer name.
@RedundantServerState	The tags shows the redundancy status of this Server. 0: Undefined status (start value) 1: Server is “Master”

WinCC system tags	Meaning
	2: Server is “Standby” 3: Server is “Fault” 4: Server is standalone (no redundant operation)
@RM_MASTER	This @RM_MASTER tag is set to identify the Server computer as “Master”. If the Server computer is “Standby”, the @RM_MASTER tag is reset.
@RM_MASTER_NAME	The tag “@RM_MASTER_NAME” contains the name of the Master Server, for example “SERV_4”.
@RM_SERVER_NAME	This tag contains the name of the Server to which a Client is connected.
@RM_UA_ONL_”Archivename”	Used only used for diagnosis. A separate tag with the corresponding tag name is inserted for each user archive. The tag will be set to 1 if the user archive has been changed. After the online synchronization, the tag will be reset to 0.
@RM_Offline_UA_Name	Used only used for diagnosis. This tag contains the name of the user archive that has just been matched.

2.5.2 WinCC Redundancy System Messages

Overview

WinCC Redundancy provides the following system messages. In the TIA Portal, these system messages can be read in the System Messages tab of the HMI Messages Editor.

In WinCC V7.0 to V7.2, the command “WinCC System Messages…” must be selected in the “Tools” menu to use the system messages in the Alarm Logging Editor.

To use system messages in V7.3, follow the instructions in the appropriate manual. You can find them under the following link
https://support.industry.siemens.com/cs/ww/en/view/102754925/63676576779

To use system messages in V7.4, follow the instructions in the appropriate manual. You can find them under the following link
https://support.industry.siemens.com/cs/ww/en/view/109736220/81548863115

To use system messages from V7.5 onwards, follow the instructions in the appropriate manual. You can find them under the following link
https://support.industry.siemens.com/cs/ww/en/view/109760739/81548863115

Table 2-3

Number	Effect/causes
1012200	Partner Station failure
1012201	Partner Station back online
1012202/only WinCC V7.x	Projects not functionally equivalent
1012203	Archive synchronization failure
1012204	Redundancy internal failure
1012205	Connection to Partner failed
1012206	Connection to Partner restored
1012207	Partner Server – WinCC not started
1012208	Archive synchronization launched
1012209	Archive synchronization finished
1012214	User Archive synchronized
1012215	User Archive synchronization complete
1012216	Synchronization interrupted
1012217	Partner Server project not activated
1012218	Client switched automatically

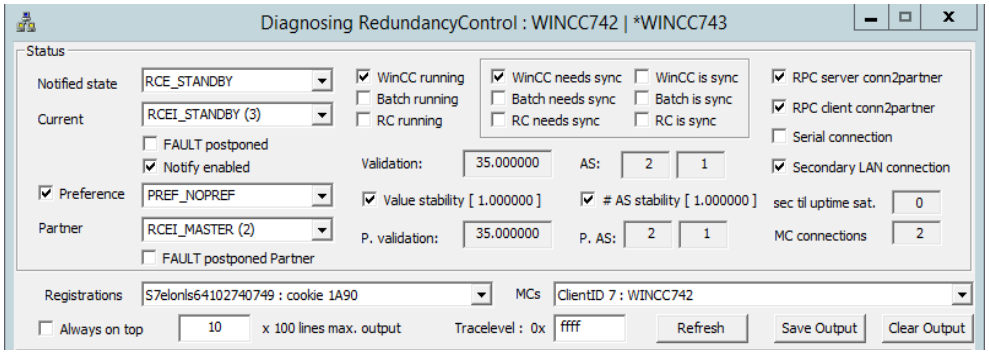
Number	Effect/causes
1012219	Client switched manually
1012220	Synchronization not ready for all User Archives
1012221	Synchronization ready for all User Archives
1012222	Main connection interrupted
1012223	Main connection ready for operation
1012224	Reserve connection failure
1012225	Reserve connection ready for operation
1012226	Partner Server Project activated
1012227	Error: Partner computer is not a Server
1012240	RedundancyControl failure triggered switchover
1012241	RedundancyControl: Switch to status
1012244	Overload during online adjustment of alarm logging
1012245	RedundancyControl: Loss of serial connection
1012246	RedundancyControl: Serial connection reestablished
1012247	OS Server (standby) redundancy error
1012248	OS Server (standby) redundancy reestablished
1012349	Connection of network card (MAC) address lost
1012350	Possible inconsistency of the archive databases
1012351	System blockage detected. Switch to Fault status
1012352	System blockage detected. Restart the computer as soon as possible
1012353	Status changed to FAULT, but Partner Server is not available
1012354	Status changed to FAULT, but Server isolation not activated.
1012355	Status changed to FAULT, but Server isolation is blocked by @1%s@. Reason: @2%s@
1012356	Status changed to FAULT => Server is isolated
1012357	Status changed to FAULT, but automatic restart is not activated
1012358	Status changed to FAULT, but automatic restart is disabled because network adapter is disconnected and DHCP is enabled
1012359	Computer restart disabled by @1%s@. Reason: @2%s@
1012360	Computer restart canceled because the previous restart took place less than @1%s@ seconds ago
1012361	Computer restart canceled because no additional restart is permitted for @2%s@ seconds after @1%s@ restarts
1012362	Computer will be restarted in @1%s@ seconds

2.5.3 Redundancy Control Diagnostics Tool

You can find the WinCC Diagnostic Tool Redundancy Control is available under “C:\Program Files (x86)\Common Files\Siemens\ace\bin\RedundancyControlDiagnosis.exe”.

Note The RedundancyControlDiagnosis diagnostic tool is available starting from versions V7.2 and TIA Portal V13.

Figure 2-3



Different scenarios regarding redundancy can be tested. Both redundant Partners must be accessible before the start of the test. If the redundancy was configured correctly, both Servers will have the same values for “Validation”, “P.validation”, and “MC connections”. (The explanation of the individual terms follows below) In case of differences, the Server with the higher validation value becomes the Master. This may cause the Master to switch over. Missing AS connections lead to switchover. If AS and P.AS are different, appropriate changes must be made to the WinCC project. “RPC Server/Client conn2partner” must be activated a few seconds after starting the Servers.

The most important points/flags of the tools are explained below:

Table 2-4

Diag. RedundancyControl	Explanation
Notified State	External redundancy status (Uninitialized, Standalone, Master, Standby, Fault)
Current State	Internal redundancy status (Initialized, Standalone, Master, Standby, Fault, Disabled, SwitchUp, SwitchDown)
Preference	Differences between the two Servers: • PrefPartner: Partner Server is more up to date • NoPref: Both Servers are up to date • PrefSelf: Local Server more up-to-date than Partner Server
Partner state	Partner status
Registrations	Monitored WinCC Applications
Notify enabled	External status is communicated to the Partner
WinCC running	Local WinCC Server is in Runtime
WinCC needs sync	Synchronization successful
WinCC is sync	Synchronization completed
Validation and P.validation	Value of the local and Partner Server
Value stability	Time to determine the validation has expired. This is a buffering function that is intended to prevent toggling of the

Diag. RedundancyControl	Explanation
	status.
AS and P.AS	Server and Partners have connection to x ASn
AS stability	Time for determining the ASn has expired (buffering)
RPC Server conn2partner	Server has a connection to the Partner
RPC Client conn2partner	Partner has a connection to the Server
Serial connection	Serial connection established
Secondary LAN connection	Second LAN connection established
MC connections	Number of connected Clients

2.5.4 Additional Log Files

In the TIA Portal, all log files are located in the standard WinCC Diagnostics directory: “C:\Program Files (x86)\SIEMENS\Automation\SCADA-RT_VXX\WinCC\diagnostics”.

In WinCC V7.5, all log files are located in the standard WinCC Diagnostics directory: “C:\Program Files (x86)\SIEMENS\WinCC\diagnostics”.

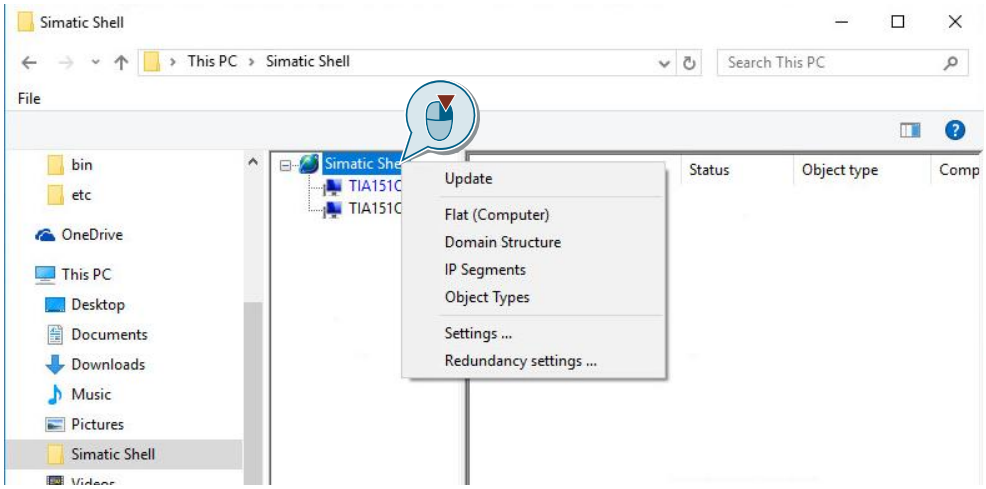
All errors/redundancies are documented in the standard WinCC Runtime log files (WinCC_Sys_XX.log). Each system message is recorded in the log file as an entry and often provided along with more information.

2.6 Settings in the SIMATIC Shell

Most often, the redundancy cannot be established after the configuration has been completed. The reason for this is usually found in the network settings, not the WinCC redundancy settings.

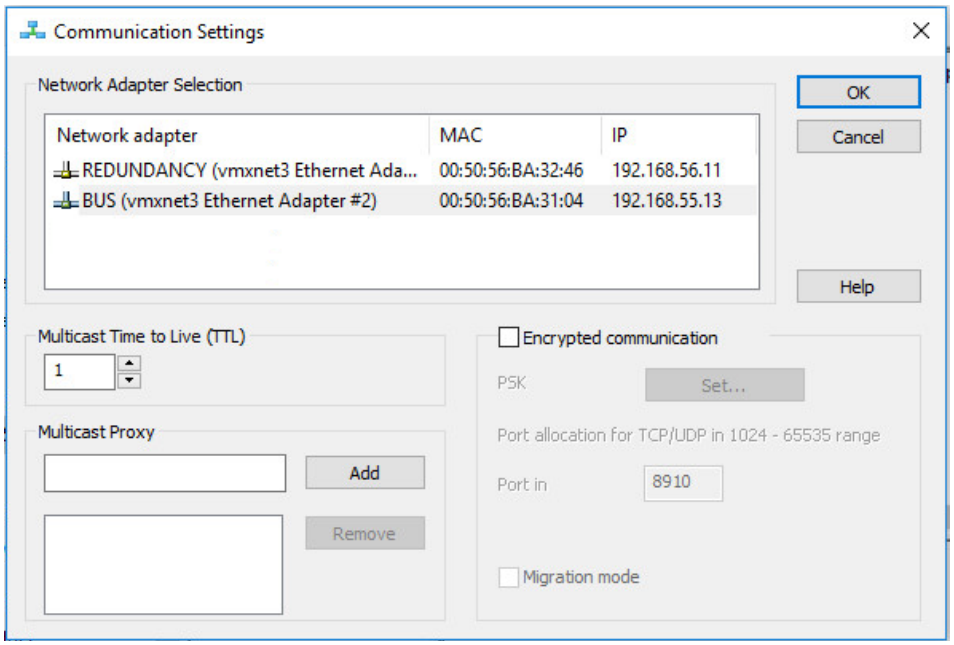
If the connection to the Partner Server is not established, you should check in the SIMATIC Shell whether the WinCC Servers are listed. If the network settings are correct, all WinCC Servers and Clients can be seen in the SIMATIC Shell. The computer on which you are currently located is shown in blue letters. In the SIMATIC Shell, the settings for the terminal bus and the redundancy settings must also be checked. These settings are opened by right-clicking the “SIMATIC Shell”.

Figure 2-4



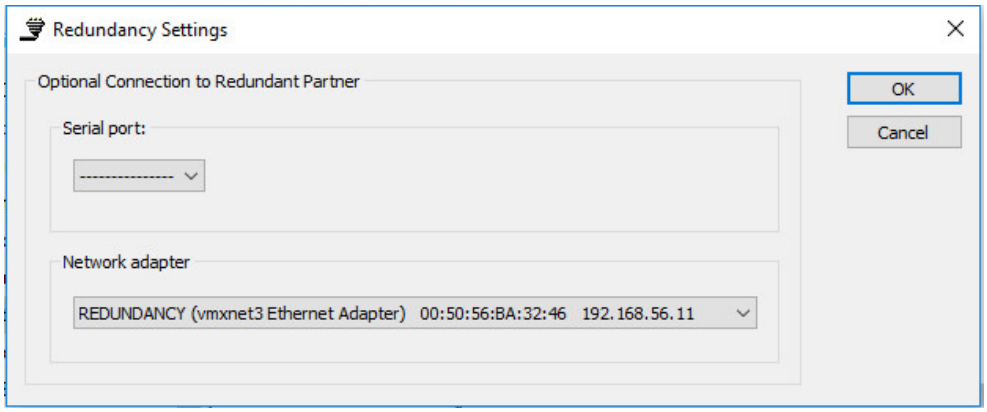
The terminal bus is configured in the “Settings”. The set network adapter is highlighted in gray. To change the network adapter, click the desired network adapter and click “OK” to confirm.

Figure 2-5



The “Redundancy settings…” show the settings of the additional connection for redundancy. The network adapter used for the redundancy status synchronization must be set here.

Figure 2-6

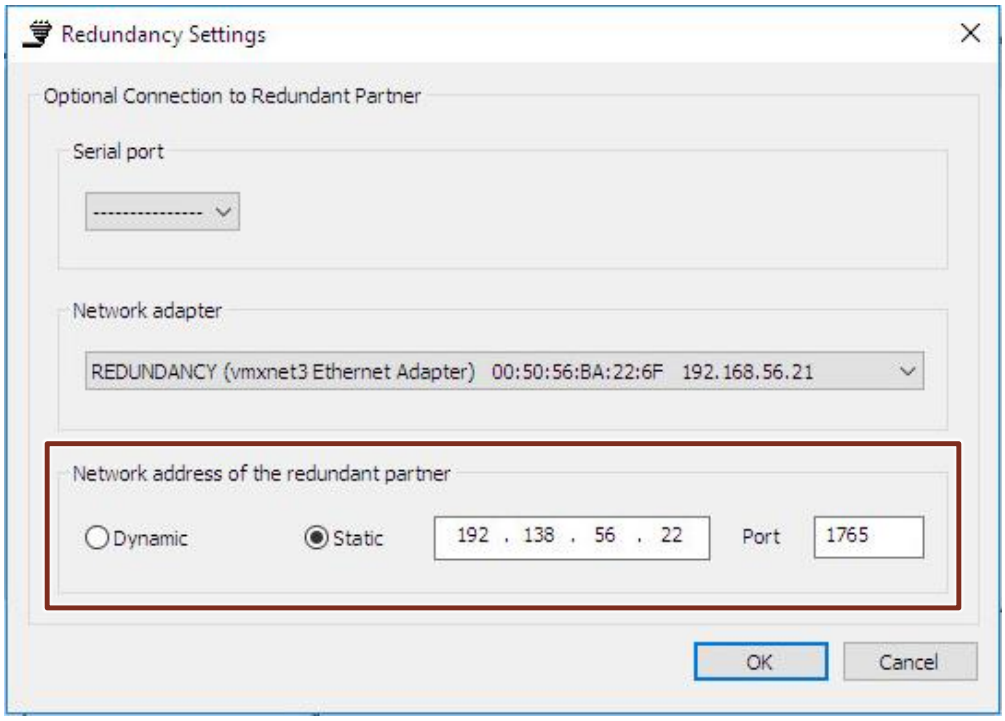


If the WinCC Servers are not listed in the SIMATIC Shell, the settings listed in the FAQ “What are the requirements for operating SIMATIC WinCC on a Windows network”, https://support.industry.siemens.com/cs/ww/en/view/868014, should be checked.

Furthermore, all requirements listed in Chapter 2.3 must be met.

As of version V7.5, “Remote Communication” must be activated in the SIMATIC Shell. In addition, a dynamic or static IP can be assigned both in the WinCC redundancy Editor and in the SIMATIC Shell redundancy settings. This is particularly important if you want to create redundancy across network boundaries by using routers.

Figure 2-7



3 Configuration of Redundancy in WinCC 7.X

The following example explains how to configure two redundant single-user stations. Additionally, in Chapter 3.10, a separate Engineering Station (ES) is used to configure the redundancy as an integrated WinCC project by means of the SIMATIC Manager.

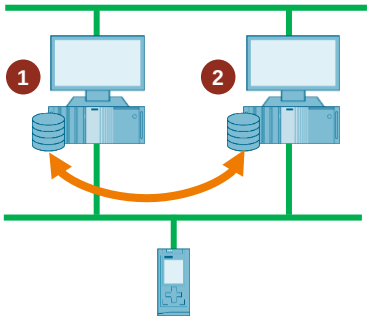
3.1 Hardware Setup

Two computers with identical functions are used to configure the redundancy. The computers must have a network connection for both the terminal bus and the redundancy status. For Chapter 3.10, an additional Engineering Station is used, which is connected to the redundant Operator Stations (OS) via the terminal bus.

3.2 Licensing

The WinCC V7.X application example uses two redundant WinCC single-user stations. One of the two individual workstations is used for WinCC configuration.

Figure 3-1



1 WinCC redundanter Server 1

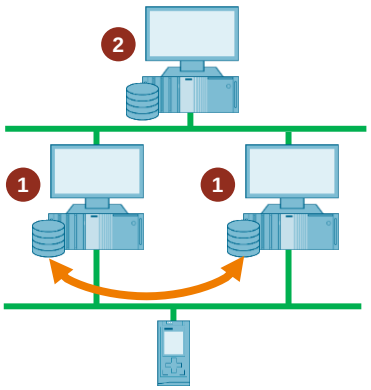
- WinCC V7.5 RC
- WinCC V7.5 Redundancy (1 Packet für 2 PCs)

2 WinCC redundanter Server 2

- WinCC V7.5 RT
- WinCC V7.5 Redundancy (1 Packet für 2 PCs)

To implement the integrated project in Chapter 3.10, the licenses shown in Figure 3-2 are required. Two redundant WinCC individual workstations are used, which are configured with the Engineering Station.

Figure 3-2



1 WinCC Einzelplatz

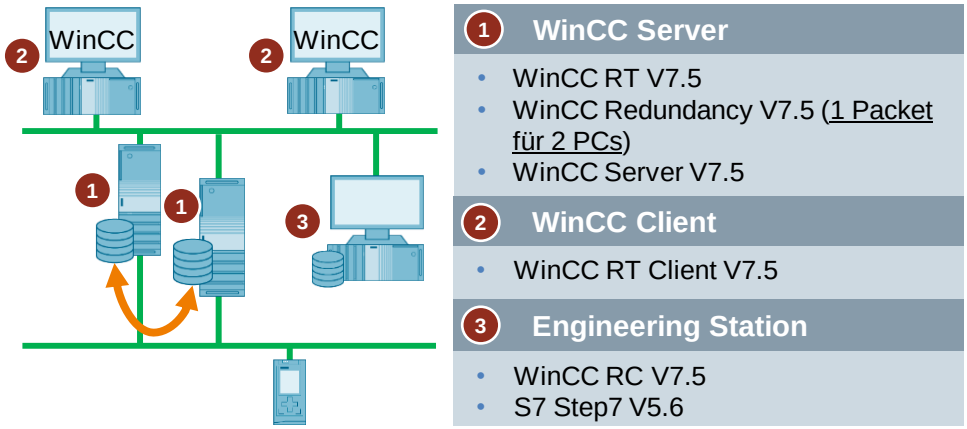
- WinCC RT V7.5
- WinCC Redundancy V7.5 (1 Packet für 2 PCs)

2 Engineering Station

- WinCC RC V7.5
- S7 Step7 V5.6

Figure 3-3 shows an example of a configuration in which WinCC Clients access the redundant Servers. An Engineering Station is used for parameterization of WinCC.

Figure 3-3



3.3 General Procedure

This chapter shows how to set up two WinCC stations redundantly.

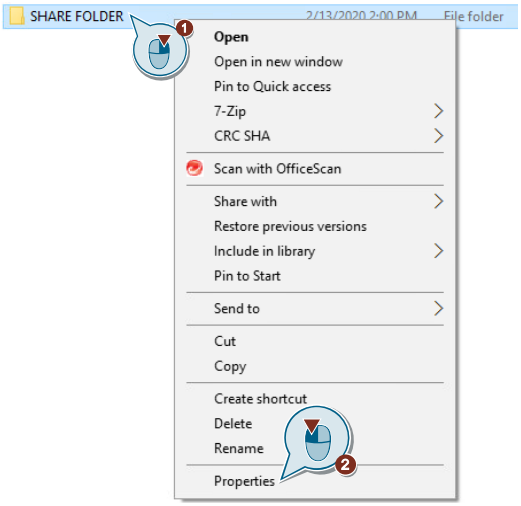
The two redundant Servers must be set up with the same hardware and software functions.

First you install WinCC, configure the network, test the connection with the SIMATIC Shell, and configure the Windows user settings. Please follow the instructions of the following “What Must Be Observed when Loading from the WinCC/PCS 7 Engineering Station to the Operator Station (ES-OS load)?” FAQ: https://support.industry.siemens.com/cs/ww/en/view/59216666

A folder must be created on each of the two OS computers and shared for the Windows user group “SIMATIC HMI”. The project is loaded into this folder. The folder path must be identical on both WinCC stations. Folder sharing is described below:

1. Right-click the folder you want to share.
2. Open “Properties”.

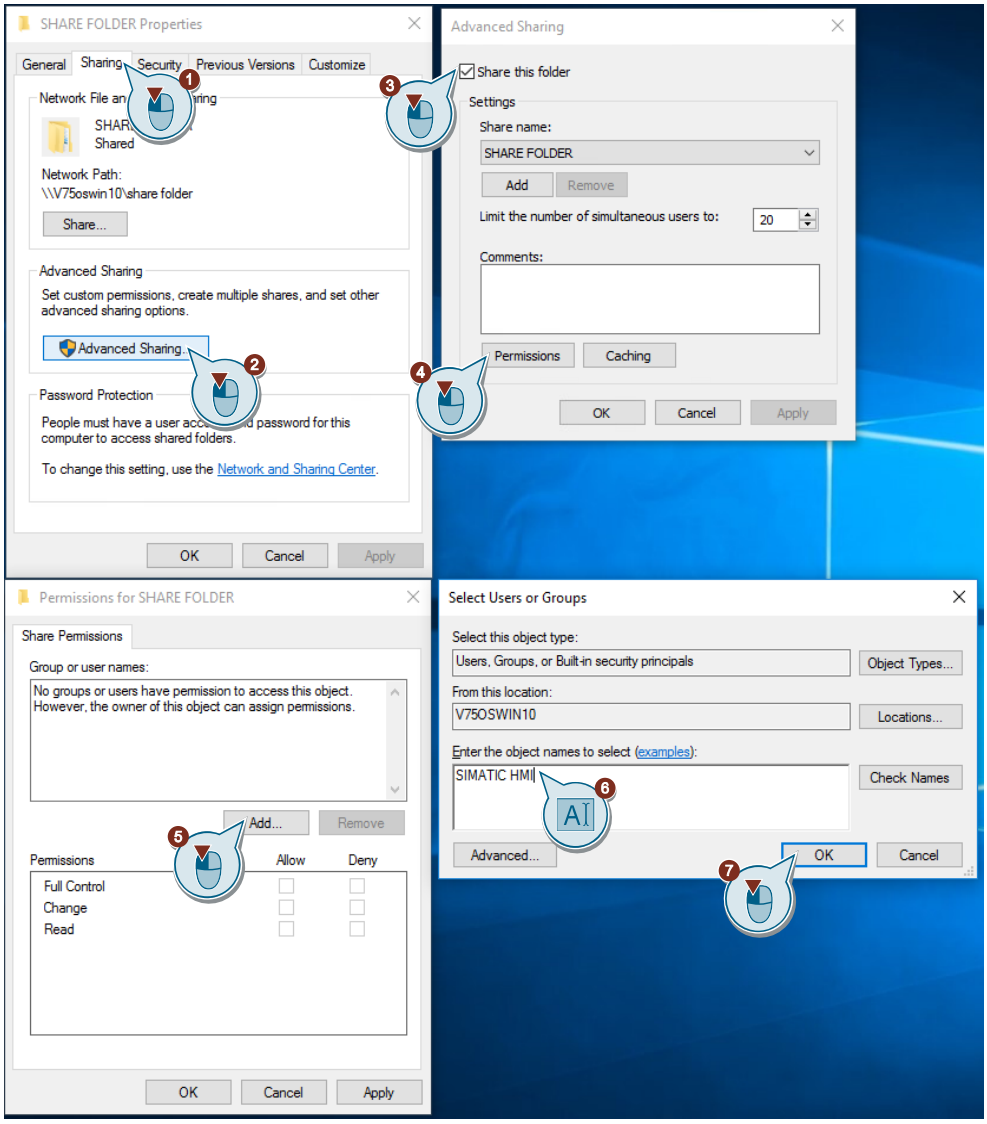
Figure 3-4 Ensure folder sharing



A window for defining the share settings opens:

1. Click the “Sharing” tab.
2. Open the “Advanced Sharing…” settings.
3. Check the “Share this folder” check box.
4. Open “Permissions”.
5. Click “Add…”.
6. Enter “SIMATIC HMI” to assign the permission for the entire group.
7. Click “OK” to confirm the entry.

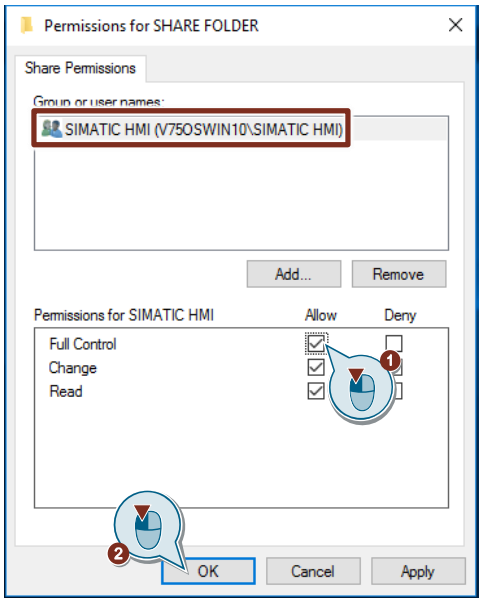
Figure 3-5



The user group appears in the folder sharing window.

1. Activate the “Full Control” check box.
2. Click “OK” to confirm your selection.

Figure 3-6



Then confirm all other open windows by clicking “OK”.

3.4 Configuration of the Redundant WinCC Stations

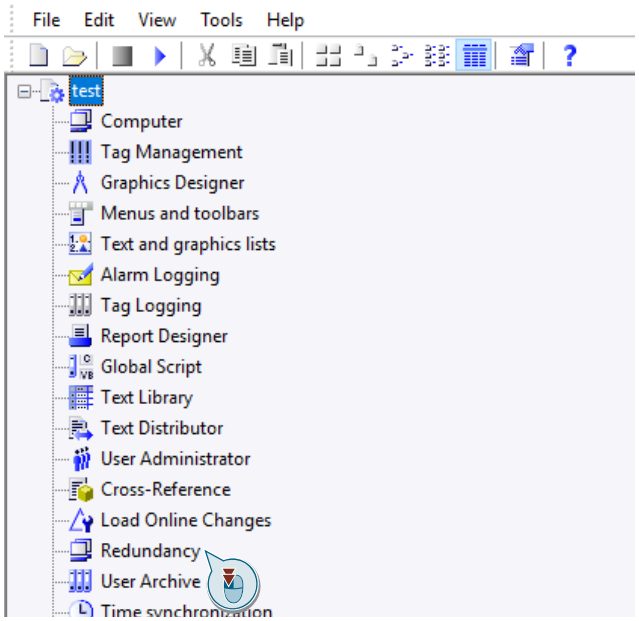
Introduction

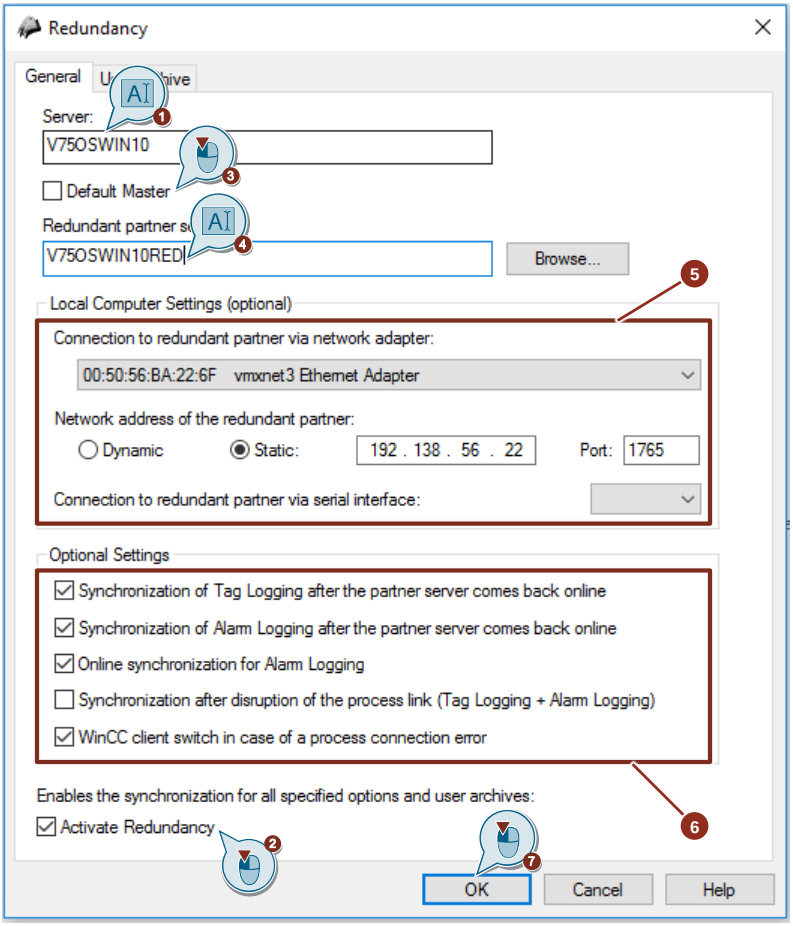
Use the “Redundancy” Editor in WinCC Explorer to configure the redundant WinCC station and synchronization of the archives.

Procedure

The following steps must be performed for the configuration:

Table 3-1

No.	Action
1.	Open the “Redundancy” Editor in WinCC Explorer. 

No.	Action
2.	The following steps must be performed in the Editor: 1. Enter the name of the WinCC station. 2. Check the “Activate Redundancy” check box. 3. Check the “Default Master” check box if you want the computer entered as the Server to be activated as the Master by default when the Servers are started up at the same time. 4. Enter the computer name of the Partner Server or click “Browse…” to select a computer in the network. 5. Specify the connection settings for status monitoring. Connection via a network adapter is to be preferred to serial connection. If you want to use a serial connection, select the corresponding interface. As of version V7.5, a dynamic or static IP can be assigned in both the WinCC redundancy Editor and in the SIMATIC Shell redundancy settings. Select the “Static” option to enter the fixed network address and the port of the redundant Partner, or select “Dynamic” to assign a dynamic IP. This is particularly important if you want to create redundancy across network boundaries by using routers. 6. By activating the check boxes of the optional settings, you can determine what synchronization is performed during a malfunction or when the Server is brought back online. 7. Click “OK” to save your settings. 
3.	Restart WinCC to apply the settings.

3.5 Configuration of User Archive Synchronization

Introduction

User Archives can be processed by operations, independent programs or automation systems. For redundant systems configure the automatic synchronization of the user archives.

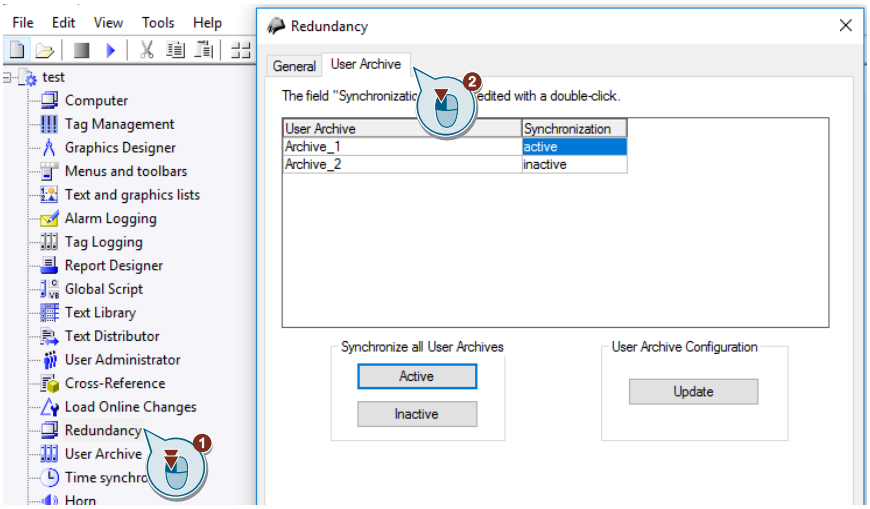
Requirements

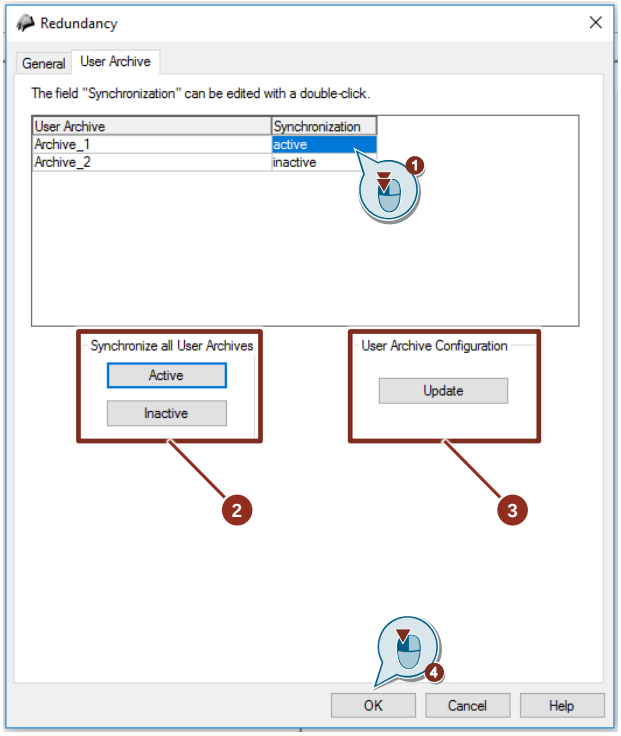
The configuration of the user archives must be identical on both redundant Servers. Use the Project Duplicator for this purpose (see Chapter 3.6).

Procedure

The following steps must be performed to configure the synchronization of user archives.

Table 3-2

No.	Action
1.	Perform the following steps to navigate to the Configuration Editor for synchronizing the User Archives: 1. Open the “Redundancy” Editor in WinCC Explorer. 2. Open the “User Archive” tab. 

No.	Action
2.	You have the following settings options: 1. Activate or deactivate the synchronization of the individual user archives by double-clicking the “Synchronization” column. 2. The two buttons at the “Synchronize all User Archives” field are used to activate or deactivate the synchronization of all displayed user archives. 3. If the configuration has changed after starting the Editor, click “Update” to apply the current configuration of the User Archives. 4. Click “OK” to save your settings. 

3.6 Duplicating a Project for Redundant Servers with the Project Duplicator (Non-Integrated Project)

Introduction

This chapter deals with redundant systems that use non-integrated projects and, therefore, do not require SIMATIC STEP 7. The redundant project is downloaded by the Project Duplicator.

After finishing the WinCC configuration, and after each modification of the WinCC project, you must duplicate the WinCC project or the respective modifications to the redundant Partner.

The Project Duplicator performs the following:

- Copying of all associated project data, such as screens, scripts and archives to the redundant Partner.
- Configure all necessary settings on the target computer.

You should check computer-specific settings (such as the computer name and redundancy settings) manually afterwards.

Note You should not use Windows Explorer to transfer a project to a redundant Server.

Principle

In Project Duplicator, select the non-integrated project that you want to duplicate. You then specify to which target computer—and in which folder—the project is duplicated. The project folder is automatically created in this destination folder.

You cannot duplicate a project on the local computer. Always duplicate a project to another computer in the network (to which you have access rights).

Depending on the status of the project, you can duplicate the configuration data and Runtime data to the selected folder:

Table 3-3

Status of the project	Configuration data	Runtime data
Project closed	+	+
Project open and deactivated	+	-
Project in Runtime	+	-

You can only duplicate the entire project and the entire folder structure. You cannot exclude any data or folders from the duplicate operation.

Requirements for carrying out the configuration

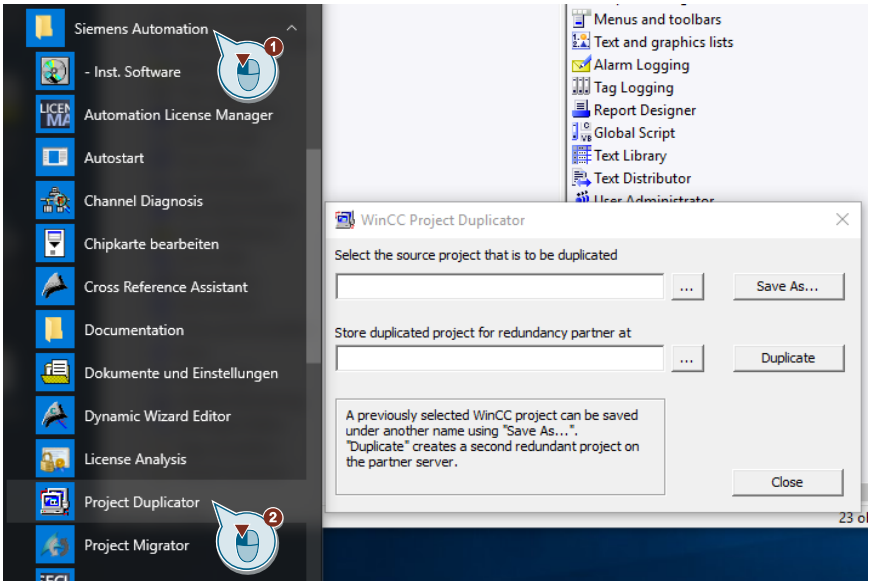
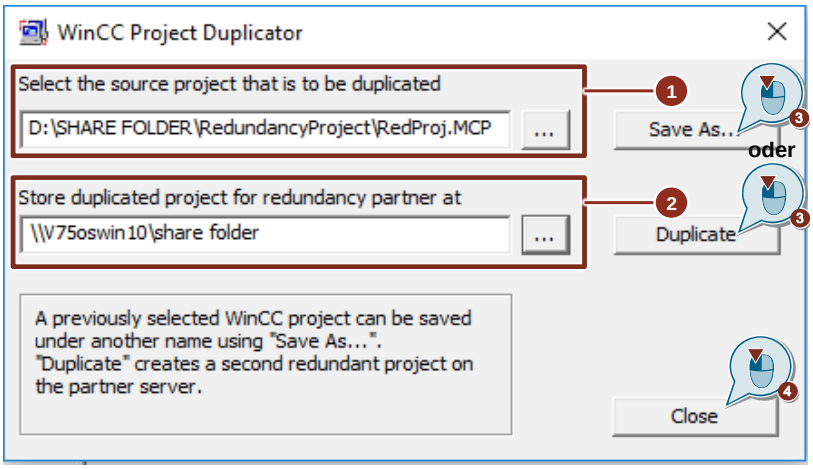
In addition to the settings described in 3.3, the following requirements must be met:

- The target computer has enough free space on the hard disk.
- The target computer must have been started.
- Runtime is deactivated on the target computer.
- The project is closed on the target computer.
- If the configuration and Runtime data are to be transferred, Runtime must be deactivated on both computers and the project must be closed.

Note As of V7.5, “Remote Communication” must be activated in the SIMATIC Shell settings.

Procedure

Table 3-4

No	Action
1.	Select the “Project Duplicator” tool from the “Siemens Automation” folder in the Windows Start menu. The WinCC Project Duplicator is opened. 
2.	Perform the following steps in the Duplicator project: 1. In the “Select the source project that is to be duplicated” field, enter the project you want to duplicate. Enter the path and the <PROJECT>.MCP project file directly or search by clicking the ... button. 2. Enter the path where the duplicated project will be stored in the “Store duplicated project for redundancy partner at” box. Enter the folder path directly or search using the ... button. 3. Click “Duplicate”. The “Copy” window is opened. During duplication, the Project Duplicator displays the files and folders with a progress bar. 4. Click “Close” to close the Project Duplicator. 

No	Action
4.	Check the settings in the duplicated project and change them if necessary. Check the following: • The computer name • The settings in the Redundancy Editor • If necessary, the settings in the Editors

Note If you duplicate an open WinCC project on the source computer, no progress bar will be displayed.

3.7 Duplicating a Project During Operation

If you edit a redundant project, you can also update the project on the redundant Server during operation.

You can save minor changes with the Load Online Changes function and then transfer them to the Servers in runtime.

Some configurations cannot be saved by the Load Online Changes function. In this case, you must generate a duplicate of the project to the redundant Server using the Project Duplicator.

You can find more detailed information about loading online changes in the “Working with WinCC” manual under the following link:

https://support.industry.siemens.com/cs/ww/en/view/109773058/128317971339

Note For changes during normal operation, you must deactivate the Partner Server. During this time, no redundancy is available.

Requirements

In addition to the settings described in 3.3, the following requirements must be met:

- The target folder has been created.
- You have access rights for the target folder.
- The redundant Server on which the copied project will be stored has enough free hard disk space.

Procedure

This Chapter describes an example of the procedure for a redundant system with the two redundant individual workstations, Server1 and Server2.

Table 3-5

No.	Action
1.	Exit Runtime on the redundant Server1 and close the project.
2.	Make the configuration changes on Server2 in Runtime and save the changes.
3.	Start the Project Duplicator on Server2.
4.	Click “Duplicate” to duplicate the project on Server1 to the destination folder of the deactivated project, thereby overwriting the project.
5.	Open the project on Server1. Runtime is started automatically.

No.	Action
6.	Wait for the redundancy adjustment.
7.	Check the settings.

Upgrading of a redundant system during operation

The upgrade consists of the following phases:

1. Upgrading the Standby Server
2. Upgrade WinCC Clients
3. Upgrading Master Server
4. Defining the Master Server

A Client may only be connected to one Server, and the Server must have the same WinCC version installed. An upgrade in WinCC ServiceMode is not possible in logged off state.

3.8 Duplicating a Project with Project-Based Access Protection

SIMATIC STEP 7 must be installed in order to transfer a WinCC project with project-based access protection to a redundant Server.

When you click “Duplicate” in the “WinCC Project Duplicator” dialog, you must enter the password for the STEP 7 project.

If SIMATIC STEP 7 is not installed or you enter the wrong password, the Project Duplicator aborts with an error message.

3.9 Configuring Redundancy/Clients with Redundant Servers

Introduction

If you use redundant servers, the Preferred Server is configured on the Client of a distributed

or multi-user system.

A Preferred Server is the Server of a redundant Server pair to which the Client preferably connects. The Client receives data from the Preferred Server as long as it remains available.

The Preferred Server can be defined individually for each Client so that the Clients can be distributed among the redundant Servers to ensure permanent operability. If there is a network interruption to the configured Server, the Client switches over to the redundant Partner Server. When the Server is available again, the Client switches back to the Preferred Server.

By distributing the Clients among the redundant Servers, the load is distributed and the performance of the entire system is improved.

Information and help for fundamental Client–Server configuration systems are described in this application example:

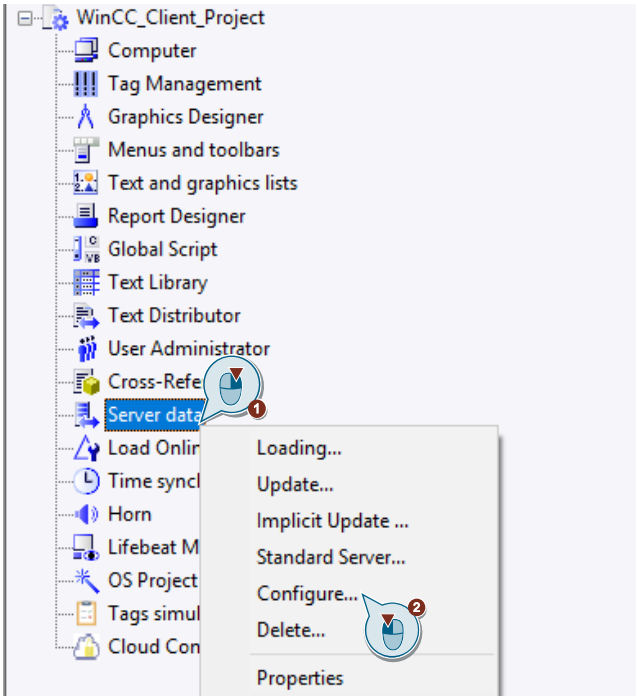
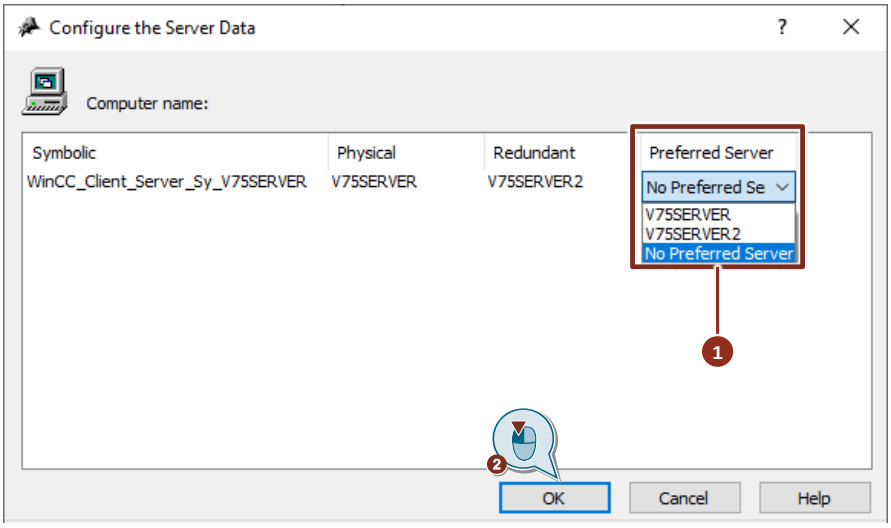
https://support.industry.siemens.com/cs/ww/en/view/109771695

Procedure

The Preferred Servers for the Clients in distributed systems and multi-user systems are configured differently:

Configuring a Preferred Server for Clients in a distributed system

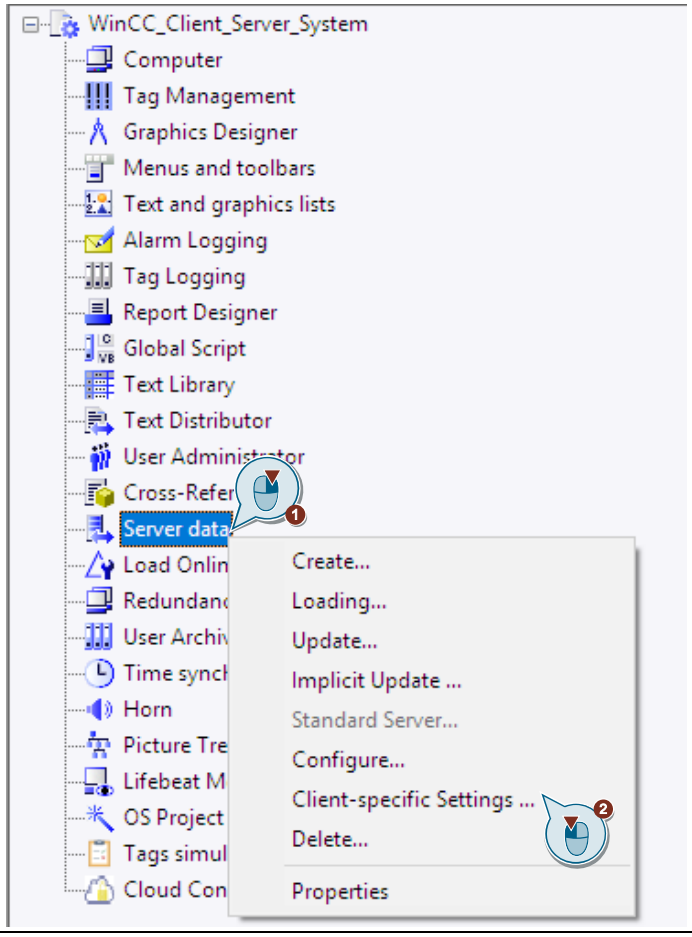
Table 3-6

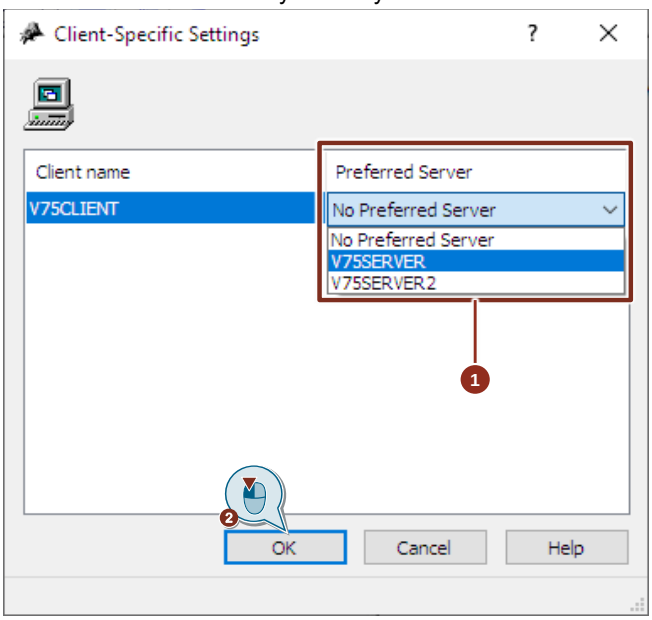
No	Action
1.	1. Right-click the “Server data” entry in the WinCC Explorer on the Client. 2. Click “Configure…”. 
2.	The list contains the symbolic and physical computer names of all Servers from which packages are provided on the Client. A redundant Server pair has only one common symbolic name by which the Servers are addressed. 1. Select a Server from the redundant Server pairs as the Preferred Server. 2. Click “OK” to confirm your entry. 

Configuring a Preferred Server for Clients in a multi-user system

The Clients must be entered in the Server's computer list.

Table 3-7

No	Action
1.	1. Right-click the "Server data" entry in the WinCC Explorer on the Client. 2. Click "Client-specific Settings…" 

No	Action
2.	A list of all Clients entered in the Server's computer list appears. 1. Select the desired Client and choose one of the two redundant Servers in the "Preferred Server" column as the Preferred Server. 2. Click "OK" to confirm your entry. 

3.10 Configuring the Redundancy as an Integrated Project Using the SIMATIC Manager

Redundant WinCC projects can be created using the SIMATIC Manager. In this example, one Engineering Station and two redundant OS individual workstations are used.

Benefits of integrated projects

The configuration of SIMATIC WinCC in an integrated environment provides the following advantages:

- Simple transfer of tags and texts into the WinCC project
- Direct access to STEP 7 symbols during process connection
- Downloading the configuration data on the Runtime OS
- Simplified management of Master and Standby in redundant systems (creation, parameterization, configuration, and overall loading)

Requirements for carrying out the configuration:

In addition to the settings described in 3.3, the following requirements must be met:

- The target computers have sufficient memory available.
- The target computers have been started.
- Runtime is deactivated on the target computers.
- The project is closed on the target computer.
- If the configuration and Runtime data are to be transferred, Runtime must be deactivated on both computers and the project must be closed.

Note

The corresponding version of the SIMATIC Manager must be installed on the Engineering Station. If you wish to integrate WinCC in STEP 7, you must implement an installation of WinCC as well as an installation of SIMATIC STEP 7. The following installation sequence is recommended for a new installation:

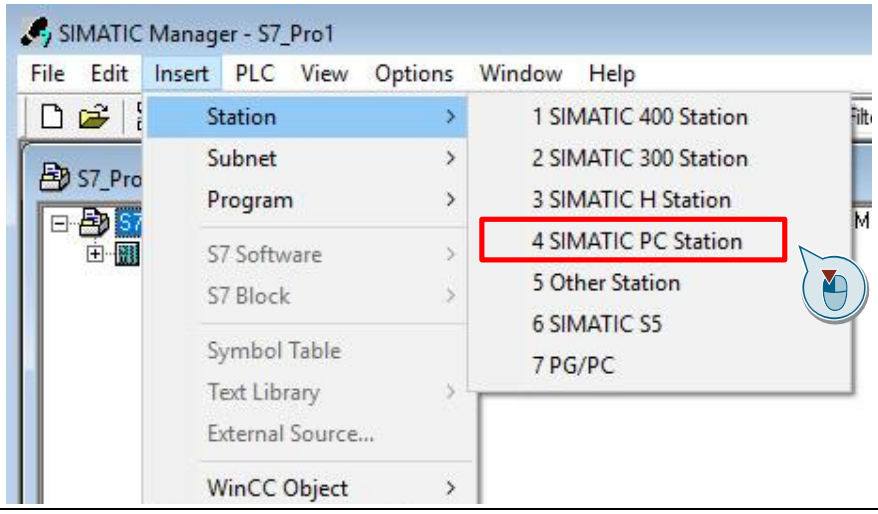
- Installation of SIMATIC STEP 7
- User-defined installation of WinCC

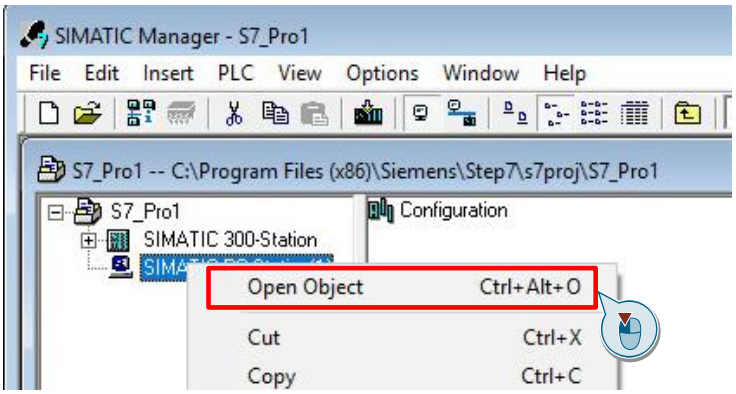
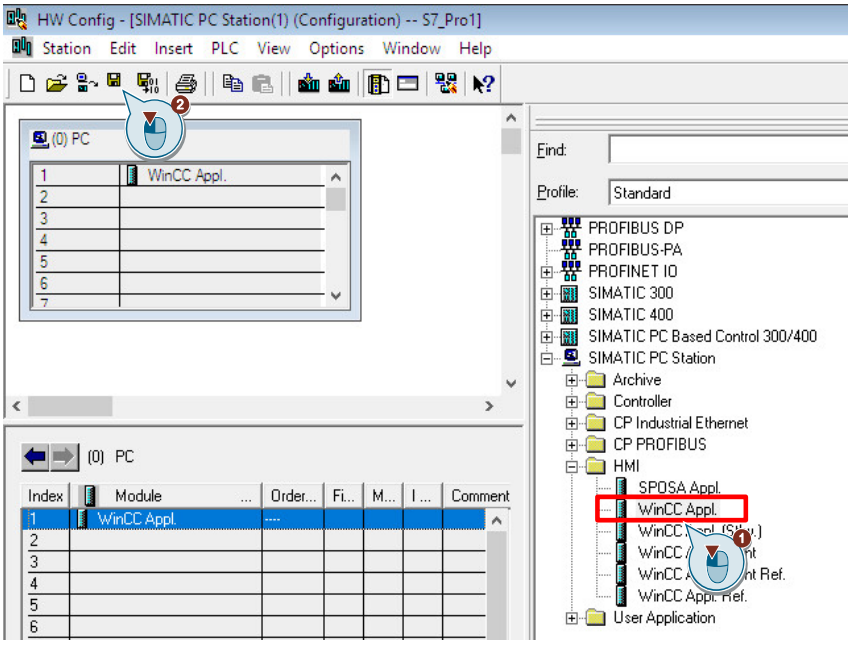
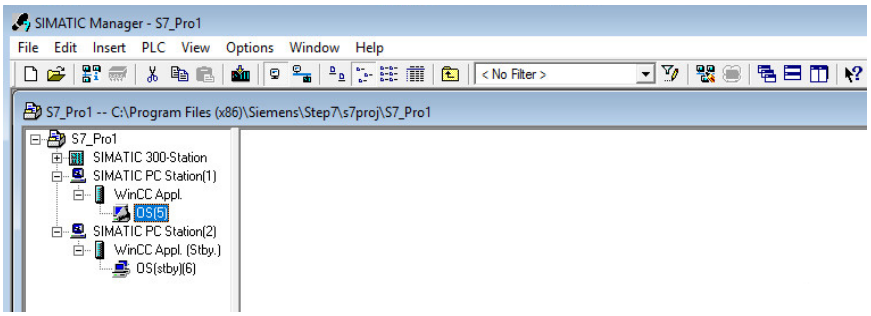
In the described sequence you may install the required WinCC components at the same time. You may also install SIMATIC STEP 7 at any time thereafter. You might then have to install individual WinCC components afterwards.

Procedure for creating the PC stations

The following steps must be performed:

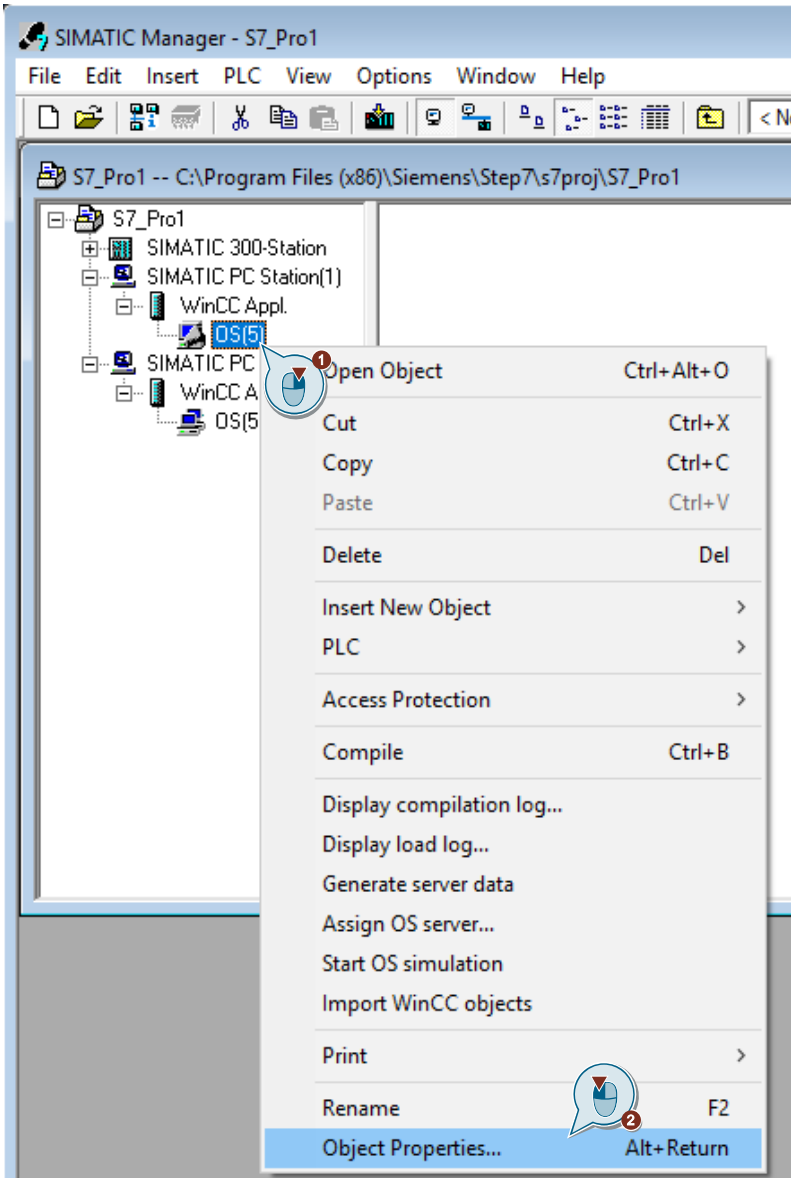
Table 3-8

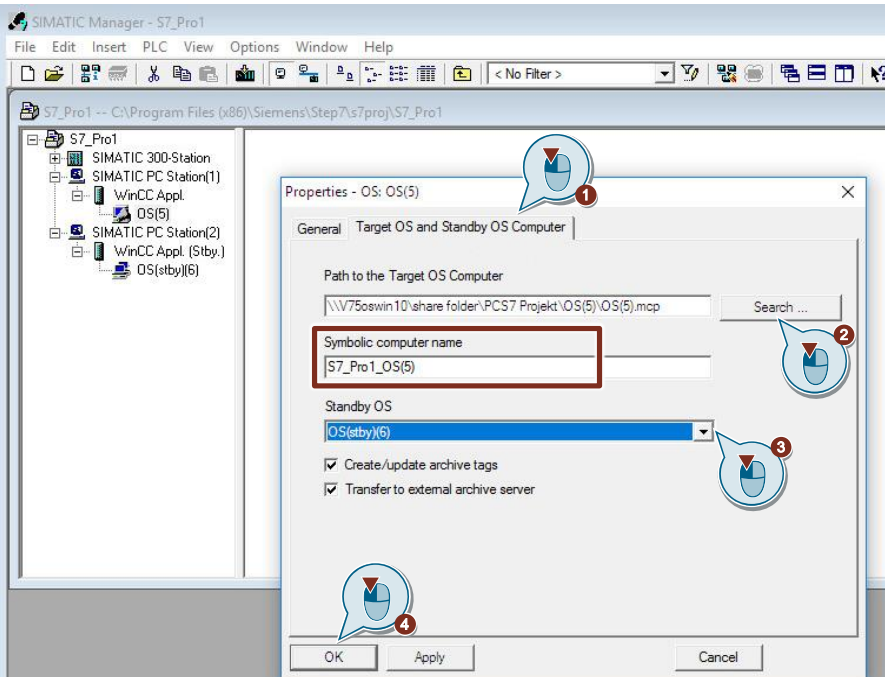
No.	Action
1.	Creating the Master in the SIMATIC Manager • Open the SIMATIC Manager • Create a new project
2.	Add the SIMATIC PC station of the Master Server. 

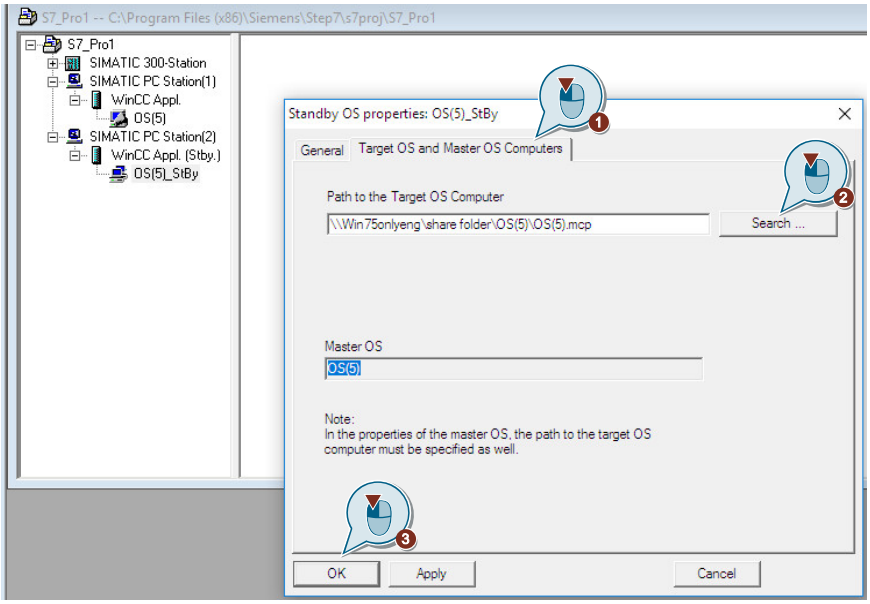
No.	Action
3.	Open a new object. 
4.	Perform the following steps in “HW Config”: 1. Add a “WinCC Application” in “HW Config”. 2. Save the setting. 
5.	Repeat steps 2–4 for the PC station of the Standby Computer. Instead of “WinCC Appl.”, “WinCC Appl. (Stby.)” must be selected. This creates two SIMATIC PC stations.  The WinCC project can now be created, and the Master Server OS object can be edited.

Procedure for entering target paths

Table 3-9

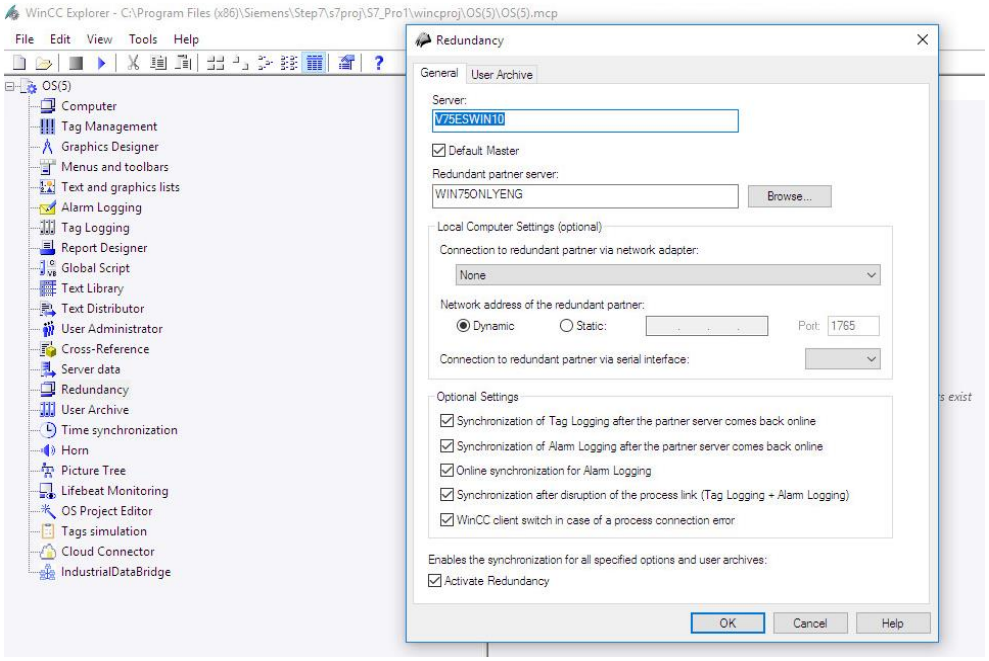
No	Action
1.	Select “Object properties…” under the OS object of the SIMATIC Manager: 1. Right-click your created OS object (OS(5)). 2. Open the “Object Properties…”. 

No	Action
2.	Implement the following settings in the WinCC Appl.: 1. Select the “Target OS and Standby OS Computer” tab. 2. Define the target path of the already shared folder. 3. Select the Standby OS Server. 4. Click “OK” to confirm the entry.  Note: If you want to modify the symbolic computer name, you need to make this modification now. A later change is only possible at an additional cost.

No	Action
3.	Make the following settings for the Standby Station: 1. Select the “Target OS and Standby OS Computer” tab. 2. On the Standby Server, select the target path of the shared folder. 3. Click “OK” to confirm the entry. 

The collective name of the two stations has been changed. In the example, OS(5) is retained and OS(6)_StBy became OS(5)_StBy. The redundancy settings in the WinCC project of the Master Server are adjusted automatically. To check this, you can open the redundancy settings of the WinCC project. Adjust the default settings to the desired configuration, if necessary.

Figure 3-7

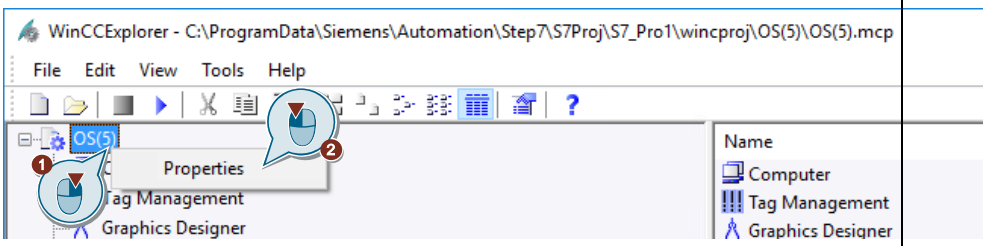
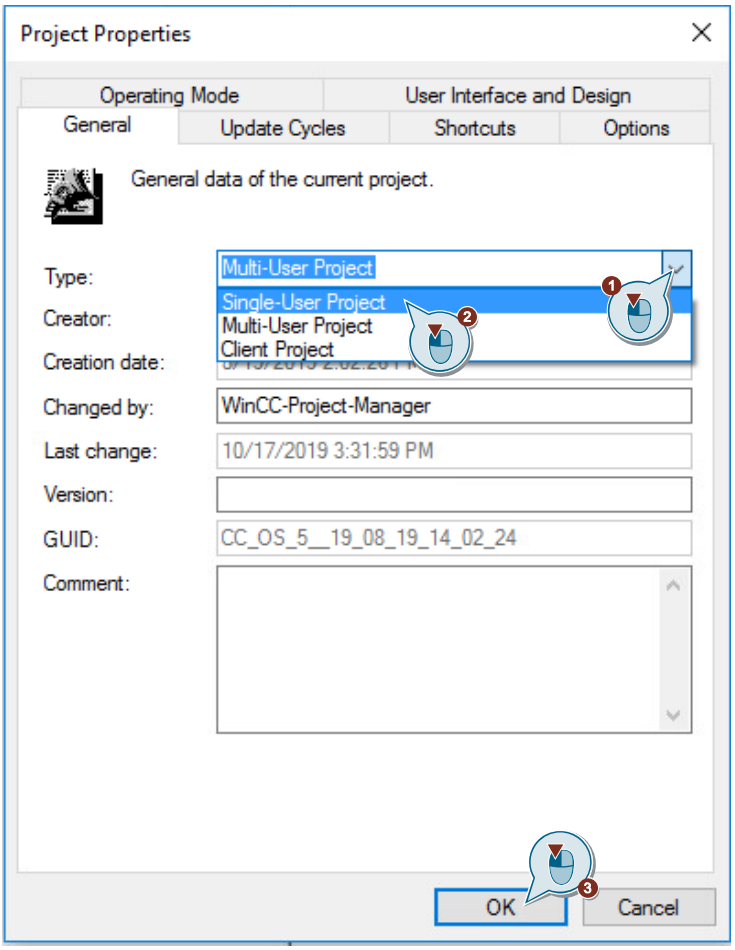


It is not necessary to configure the Server data within WinCC.

Changing the project to a single-user project

In this application example, no Clients are connected to the redundant computers (see Figure 3-2). Therefore, a conversion to a single-user project is necessary.

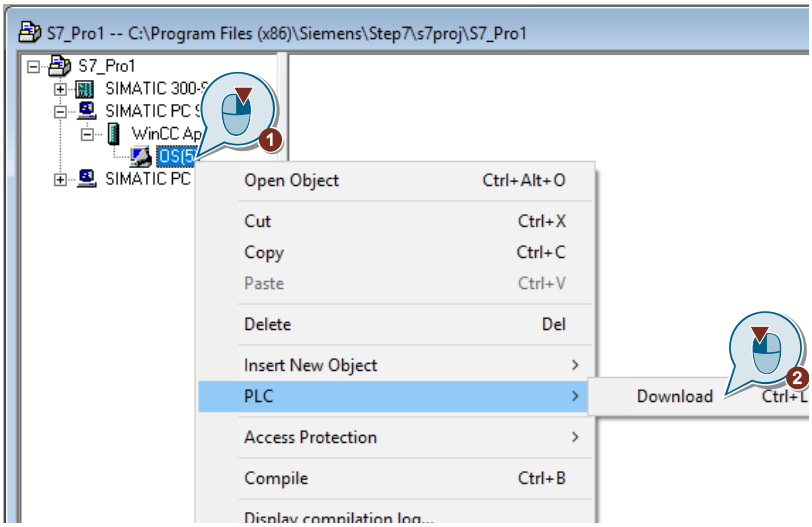
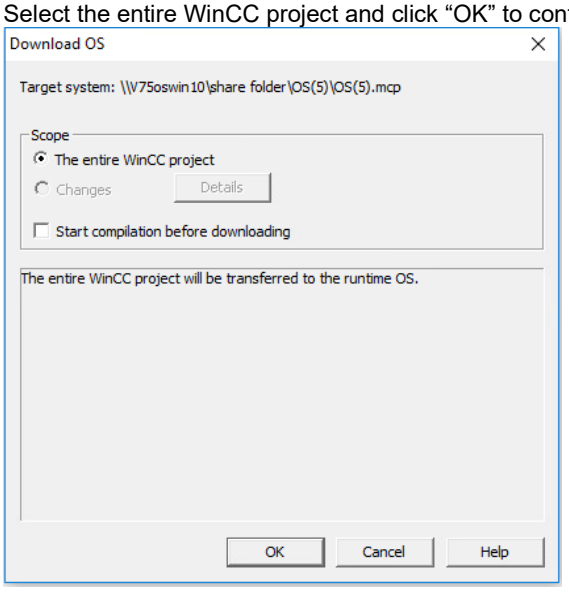
Table 3-10

No	Action
1.	Open the WinCC project on the ES and access the Project Properties. Right-click your created OS object (OS(5)). Open the “Object Properties…”. 
2.	Change the project type to “Single-User Project” and click “OK” to confirm the settings. 

Downloading the objects

The following steps must be carried out to download the WinCC applications:

Table 3-11

No.	Action
1.	Download the project to the redundant OS Server using the SIMATIC Manager: 1. Right-click the WinCC application. 2. Click “PLC”, then click “Download” from the resulting menu. 
2.	Select the entire WinCC project and click “OK” to confirm. 
3.	Perform steps 1 and 2 for the redundant WinCC station (WinCC Appl. Stby.).

The entire WinCC project is downloaded the first time this is done. The respective project is loaded into the shared folders and can now be launched.

Subsequently, changes are only downloaded if both redundant WinCC Servers are in Runtime. If a download is to be performed when Runtime is not activated, the “Entire WinCC project” option must be configured under “Settings for compilation/download”. To download the entire project, both Runtime and the WinCC project must be closed on both Servers.

Note Termination of Runtime and the WinCC project is performed automatically during the download. A message will notify you of this.

If error messages occur, you can find them in the Download log.

4 Configuring Redundancy in the TIA Portal with WinCC Professional

This chapter explains how to configure WinCC redundancy in the TIA Portal for two redundant WinCC RT Servers, as well as for Clients using a sample project.

The following example explains how to configure two redundant OS Servers. For configuration, a separate Engineering Station is used to configure the redundancy using the TIA Portal.

The following operating systems are approved for use with WinCC redundancy:

- Single-station system: Windows 7/10 or Windows Server 2008/2012
- Multi-station system: Windows Server as of Version 2008 R2 Standard Edition SP

Overview

A redundantly structured project is implemented with two Servers running in parallel and configured with identical functions. The two Servers are networked with the Automation Stations, the Clients, as well as with each other. An additional network adapter is required on both redundant Servers for status monitoring. Both Servers are configured and displayed in the TIA Portal as one redundant system. The user must ensure that both Servers are configured identically.

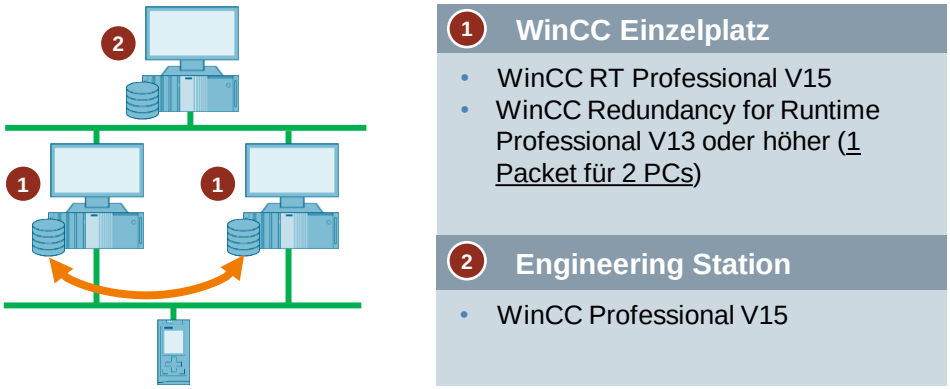
4.1 Hardware Setup

For redundancy configuration, two computers with identical functions are used as WinCC Servers. The computers must have a network connection for both the terminal bus and the redundancy status. Additionally, an Engineering Computer with TIA Portal is used in the application example, which is connected to the redundant WinCC computers via the terminal bus.

4.2 Licensing

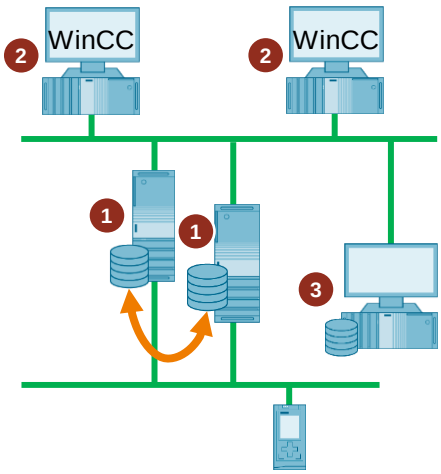
For the WinCC redundancy configuration on WinCC RT Servers, two redundant WinCC Servers are used in Chapter 4.4, which are parameterized with an Engineering Station. The following licenses are used for this.

Figure 4-1



In Chapter 4.5, in addition to the two redundant WinCC Servers, two Clients with access to the redundant Servers are parameterized. An Engineering Station is used for parameterization of WinCC.

Figure 4-2



1 WinCC Server

- WinCC RT Professional V15
- WinCC Redundancy for Runtime Professional V13 oder höher (1 Packet für 2 PCs)
- WinCC server for Runtime Professional (versionlos)

2 WinCC Client

- WinCC client for Runtime Professional V15

3 Engineering Station

- WinCC Professional V15

4.3 General Procedure

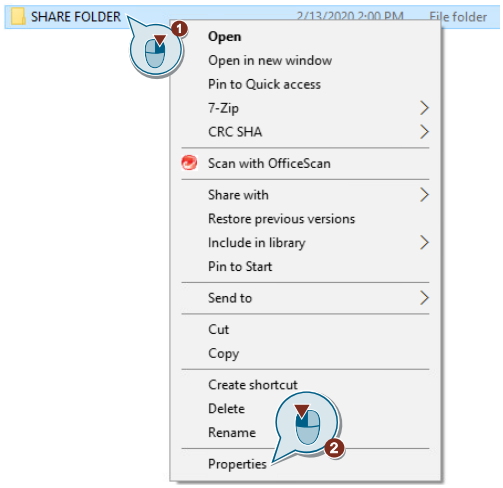
This chapter explains the procedure for creating WinCC Runtime OS redundancy. The two redundant Servers must be set up with the same hardware and software functions.

First you install WinCC, configure the network, test the connection with the SIMATIC Shell, and configure the Windows user settings. To do this, please follow the instructions in the following FAQ, “What must be observed when downloading WinCC Runtime Professional from the Engineering Station to the Operator Station (Runtime PC)”: https://support.industry.siemens.com/cs/ww/en/view/88780011

A folder must be created on each of the two OS computers and shared for the Windows user group “SIMATIC HMI”. The project is loaded into this folder. The folder path must be identical on both WinCC stations. Folder sharing is described below:

1. Right-click the folder you want to share.
2. Open “Properties”.

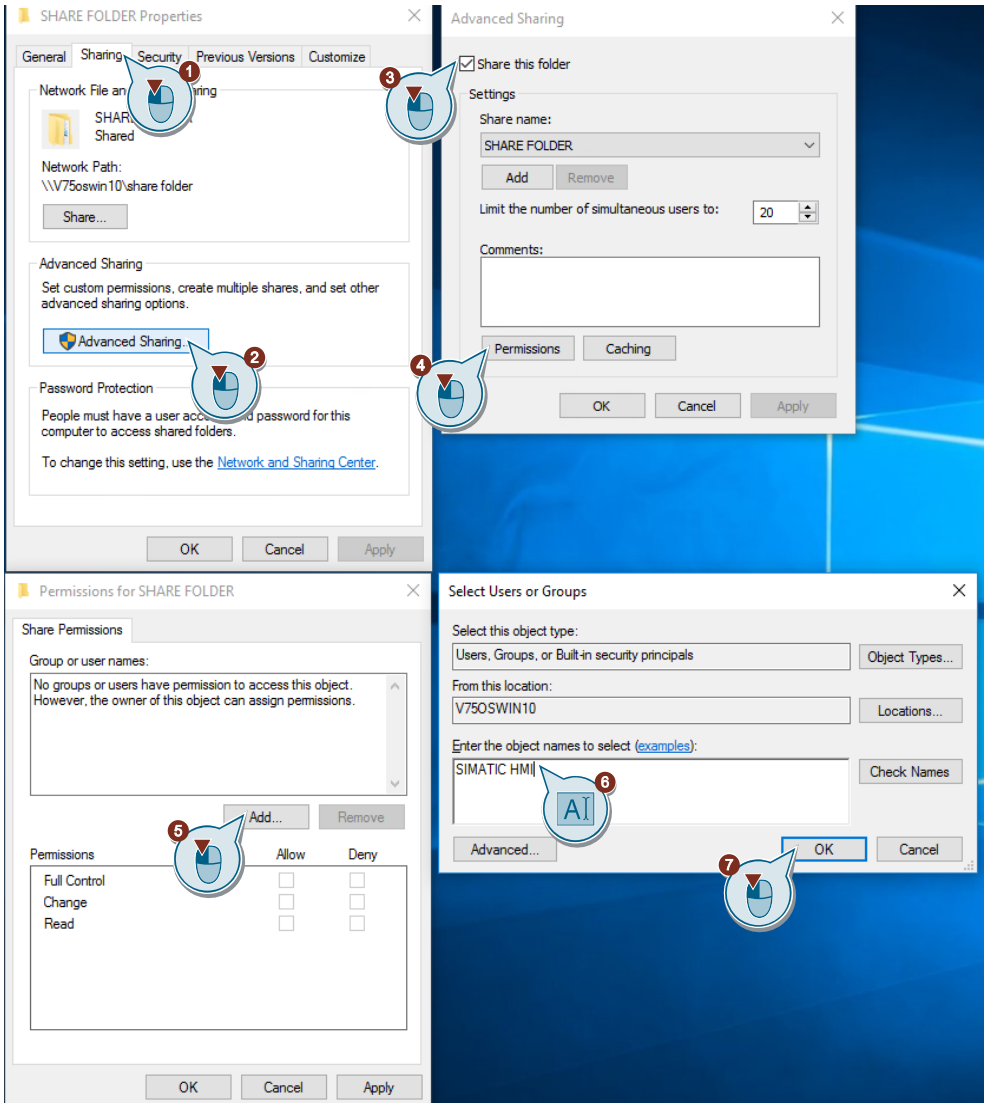
Figure 4-3 Ensure folder sharing



1. Click the “Sharing” tab.
2. Open the “Advanced Sharing…” settings.
3. Check the “Share this folder” check box.
4. Open “Permissions”.

5. Click “Add…”.
6. Enter “SIMATIC HMI” to assign the permission for the entire group.
7. Click “OK” to confirm the entry.

Figure 4-4

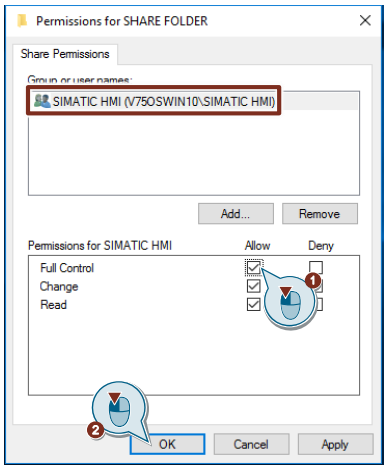


The user group appears in the folder sharing window.

1. Activate the “Full Control” check box.
2. Click “OK” to confirm your selection.

Click “OK” to confirm all other open Windows Explorer windows.

Figure 4-5



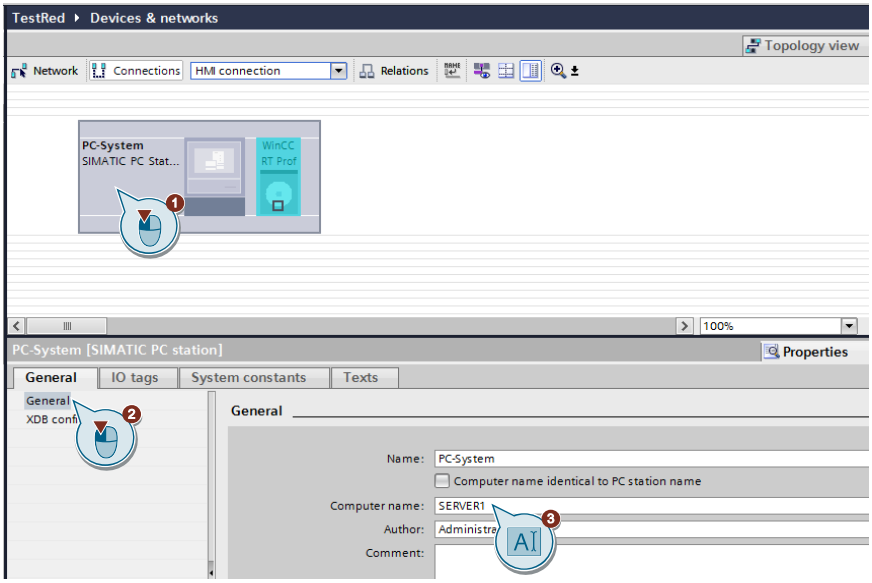
Click “OK” to confirm all other open Windows Explorer windows.

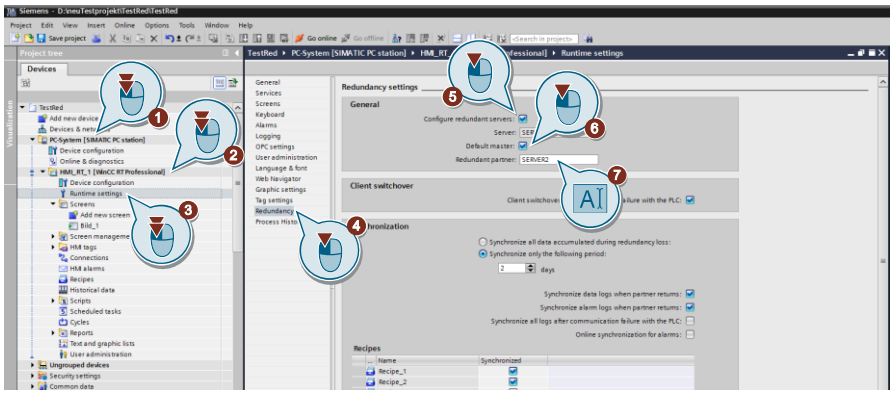
4.4 Redundancy Configuration for WinCC RT Server

The WinCC RT Server (PC systems → general PC → PC station) is created in the TIA Portal under “Devices & Networks”, and WinCC RT Professional is added to the PC station (SIMATIC HMI Application → WinCC RT Professional).

Configuring the Master Server

Table 4-1

No	Action
1.	Configuration of the Server PC system: 1. In the Network View, click the newly created Server. The Inspector window opens below the work area. 2. In the Inspector window, click the “General” tab and select the “General” selection. 3. In the “Computer name” field, enter the name of the Server used for redundancy. 

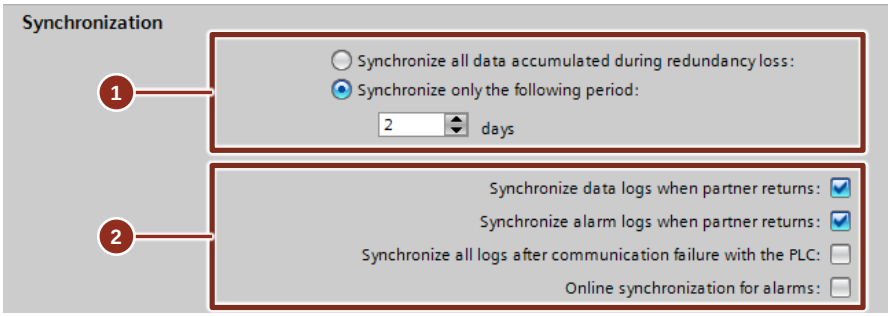
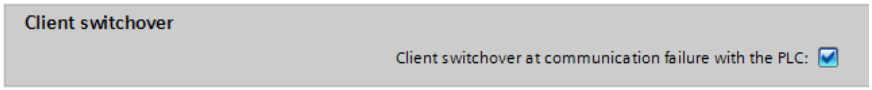
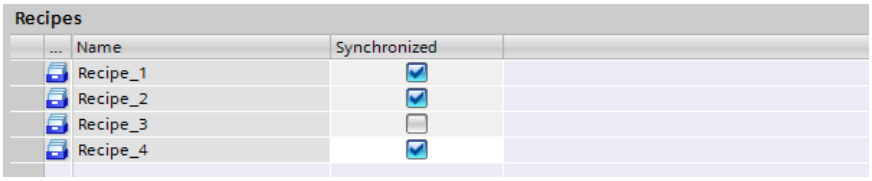
No	Action
2.	Perform the following steps to configure the redundancy: 1. Double-click “PC System”. The project navigation is expanded with additional settings options. 2. Double-click “HMI_RT_1 [WinCC RT Professional]”. The project navigation is expanded with additional settings options. 3. Double-click “Runtime settings”. The Runtime Editor of the Server is opened in the Working window. The “General” settings are opened by default. 4. Click “Redundancy” in the Runtime Editor navigation. The Runtime Editor window opens. 5. Check the “Configure redundant Servers” check box to activate redundancy. 6. Optionally, you can define the Server as “Default master” by checking the relevant check box. 7. Enter a name for the redundant Partner Server in the “Redundant Partner” input field. 

Note Only one device is displayed in the work area. The redundant Servers, consisting of the Master Server and the Standby Server, are combined within this device.

Configuring Server response

In the Runtime settings, detailed redundancy settings can be configured for synchronization, Client switching, and recipe synchronization.

Table 4-2

No.	Action
1.	The following settings are configured for synchronization: 1. Check the “Synchronize all data accumulated during redundancy loss” check box. All data stored during a Server failure will be synchronized when the failed server is brought back online. OR Check the “Synchronize only the following period” check box, then enter the desired time interval for periodic synchronization into the input field. 2. Select the data you want to synchronize after a failure using the four check boxes. 
2.	Check the “Client switchover at communication failure with the PLC” check box to activate the automatic switchover of Clients to the Partner Server in the event of communication errors. 
3.	The recipes from your Recipe Archive are entered into the “Recipes” list. Select the recipes you want to synchronize after a Server failure by selecting the corresponding check boxes in the “Synchronized” column. 
4.	Save the project.

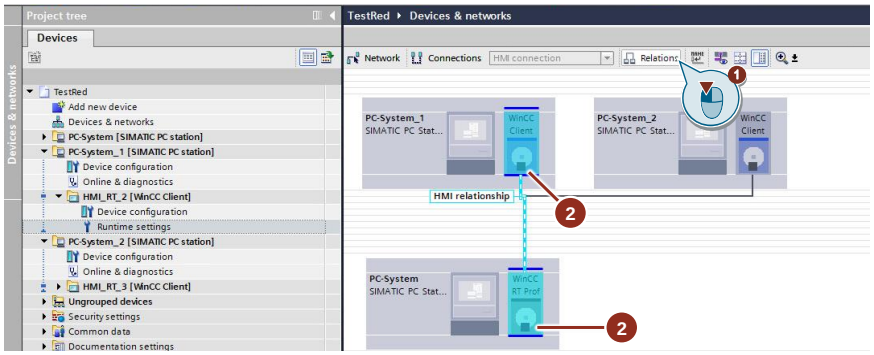
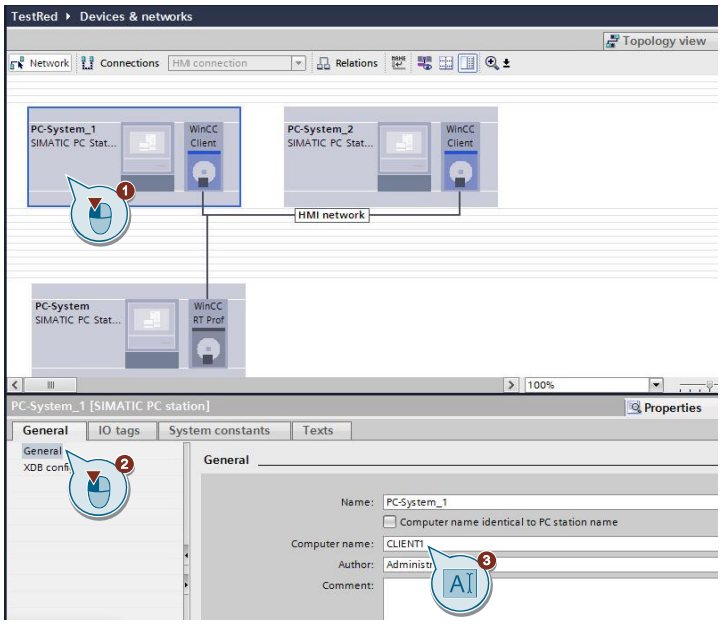
4.5 Configuring Redundancy/Clients with Redundant Servers (RT Professional)

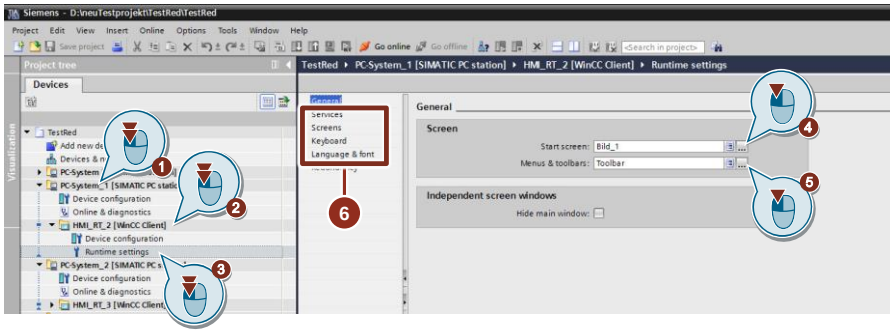
Configuring Client redundancy settings

The WinCC Clients (PC systems → general PC → PC station) are created in the TIA Portal under “Devices & Networks”, and the WinCC Clients are added to the PC station (SIMATIC HMI Application → WinCC Client).

Perform the following steps to configure the Clients:

Table 4-3

No	Action
1.	Configuration in the “Devices & Networks” Editor: 1. Click “Relationships” in the Editor. 2. Using drag & drop, network the Server with the Clients to create a relationship between the Server and the respective Client. 
2.	Client settings: 1. In the Network View, click in the newly created Client. The Inspector window opens below the work area. 2. In the Inspector window, click the “General” tab and select the “General” selection. 3. Enter the name of the Client used for redundancy in the “Computer name” field. 

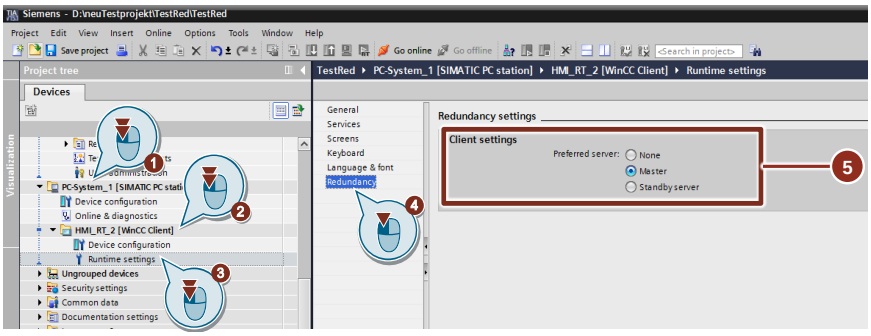
No	Action
3.	Client Runtime settings: 1. Double-click “PC-System_1”. The project navigation is expanded with additional settings options. 2. Double-click “HMI_RT_2 [WinCC Client]”. The project navigation is expanded with additional settings options. 3. Double-click “Runtime settings”. The Working window opens the Runtime Editor of the Client. The “General” settings are opened by default. 4. Select a WinCC Server screen to be the Start Screen. 5. Under “Menus & Toolbars”, select a WinCC Server configuration. 6. Under “Services”, activate the required Client Runtime services—for example, for the task scheduler. Select additional design features under “Screens”. Select a Runtime language for the WinCC Server under “Language & font”. 
4.	Repeat steps 2 & 3 for WinCC Client 2.

Note When creating relationships—in contrast to connections—the physical connection (network) and the logical connection (Client–Server relationship) are always created and deleted together. When you configure a relationship, the devices are automatically networked.

Configuration of redundancy for WinCC RT Client computer

To configure the redundancy settings of already-configured Clients, proceed as follows:

Table 4-4

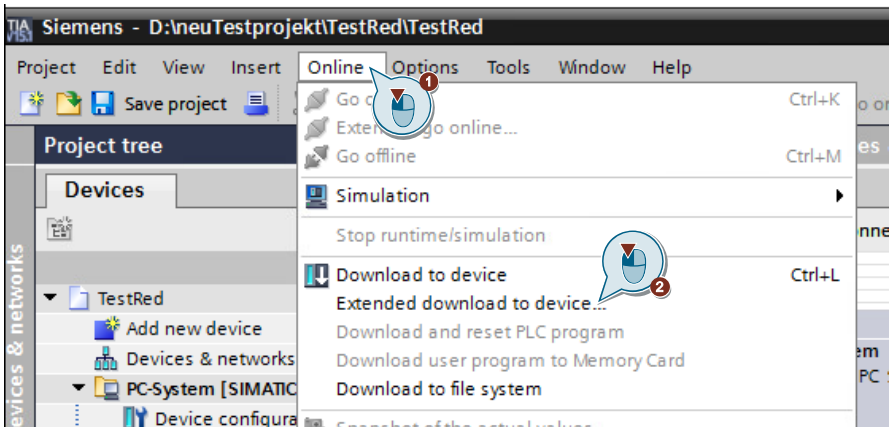
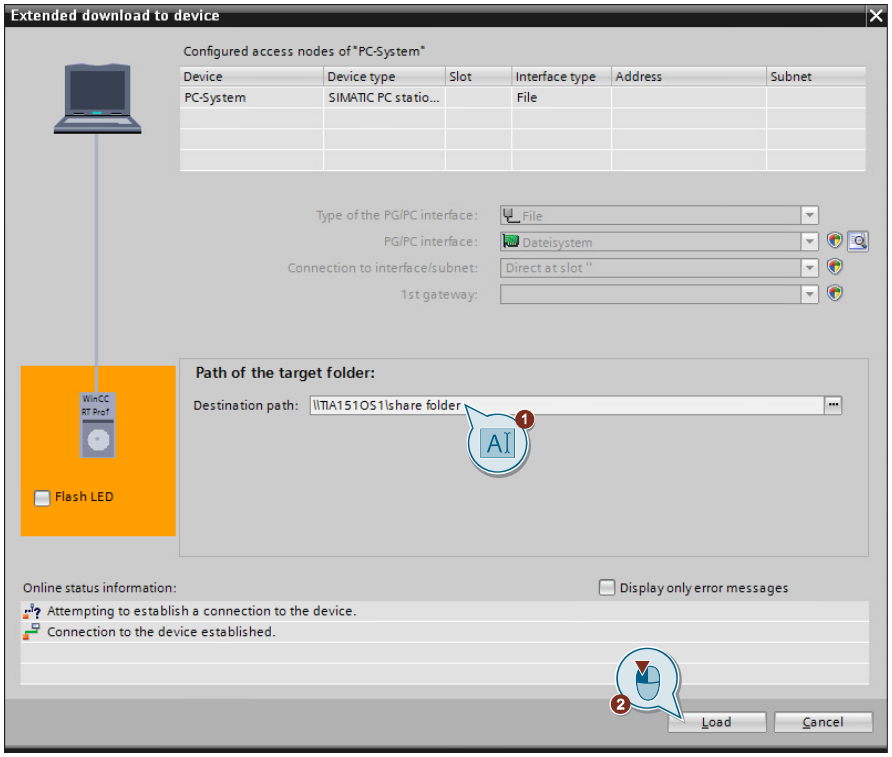
No	Action
1.	To configure the Client, perform the following steps: 1. Double-click the name of the Client in the project navigation. The project navigation is expanded with additional settings options. 2. Double-click “HMI_RT_2 [WinCC RT Client]”. The project navigation is expanded with additional settings options. 3. Double-click “Runtime settings”. The Runtime Editor of the Server is opened in the Working window. The “General” settings are opened by default. 4. Click “Redundancy” in the Runtime Editor navigation. You can specify the Client’s Preferred Server at this point. 5. Specify the required Client option by clicking in the appropriate input box. • None: The current Master is always used. After a change of Master due to a failure, the Client remains with the most recent Master, even after the failed Server is brought back online. • Master: The Master redundant Server is always preferred. After a failure of the Master, the Client switches back to the Master Server after the Master is brought back online. • Standby (Standby Server): The Standby redundant Server is always preferred. After a failure of the Standby, the Client switches back to the Standby Server after it is brought back online. 
2.	Save the project.

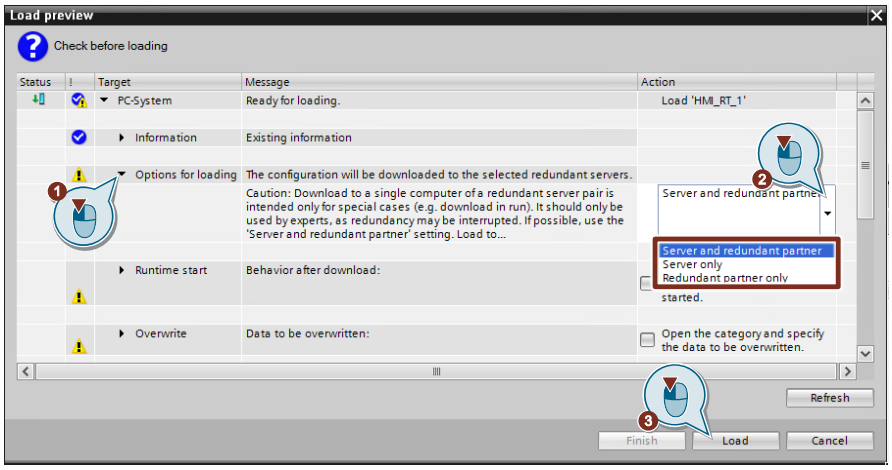
The configuration of the redundant system is now complete.

An additional activation of the redundant system is not necessary.

4.6 Downloading a Redundant Project to the Device

Table 4-5

No.	Action
1.	To download the configuration to the device, perform the following steps: 1. Click “Online” in the menu bar. 2. Click “Extended download to device…”. 
2.	Perform the following steps to download to the device: 1. Set the path of the destination folder. Click the field at the end of the target path. A dialog box opens in which you set the target path. The target path is then displayed. 2. Click “Load”. 

No.	Action
3.	The “Load preview” window opens. In this window, you can set options for downloading: 1. Expand the “Options for loading” row. 2. Select the desired action. There are three options to choose from: • Server and redundant Partner • Only Server • Only redundant Partner Optionally, you can implement additional settings (such as whether Runtime should be started after the download). 3. Click “Load”. 

Note It is not possible to download projects from a redundant Server onto the file system. You can only download redundant projects onto the Server from an Engineering System.

A subsequent download of changes is possible afterwards, e.g. after changes to the hardware or software of the devices have been made.

Note If different logins are required for the computers involved, create the connections to the respective computers manually before downloading. To do this, navigate to the Standby Computer in the Windows Explorer, for example, and log in there.

4.7 Upgrading Redundant System During Operation

Introduction

Redundant systems can be upgraded during operation. The Automation Station is always in Runtime. All processes can be operated without interruptions.

To upgrade redundant systems during operation, a separate download must be performed on the Master Server and on the Standby Server of the redundant system.

Note During the upgrade, the system is not secure against failure.

To avoid failures and redundancy losses, we recommend a complete download to both systems after upgrading the system. To perform a complete download to both

systems, select the “Server and redundant Partner” setting under “Options for loading” in the “Load preview” dialog.

If you upgrade your system from an older version to version V14 or higher, you need the following licenses:

- Upgrade license for WinCC Runtime Professional
- Upgrade license for WinCC Client for WinCC Runtime Professional
- Upgrade license for WinCC WebNavigator and WinCC DataMonitor (if you use these options)

Requirements

- Autostart and Service Mode must be disabled on the Master Server and the Standby Server.
- A Preferred Server must be configured on each Client.
- Master Server and Standby Server must be in an error-free state.

Procedure

To upgrade redundant systems during operation, proceed as follows:

Upgrading the TIA Portal on the Engineering Station

Table 4-6

No.	Action
1.	Close your project on the Engineering System and restart your PC.
2.	Upgrade the TIA Portal.
3.	Upgrade and compile the project.

Note While you upgrade the Clients and the Master Server, your system will only run with a single Server. Upgrading the Clients and the Master Server can be done simultaneously.

Upgrading the Clients:

Table 4-7

No.	Action
1.	Disable all Clients that are configured as Preferred Servers for the Master Server.
2.	Close the project on the Clients.
3.	Deactivate the Autostart option.
4.	Restart the Client PC.
5.	Upgrade all disabled Clients.
6.	Enable Autostart (if desired).

Upgrading and downloading the Master Server and configuring the Web Servers

Note Create a backup before upgrading the Master Server.

Table 4-8

No.	Action
1.	Deactivate the Master Server.
2.	Close the WinCC application on the Master Server.
3.	Restart the Master Server.
4.	Upgrade the Master Server.
5.	Execute a complete download via “Load preview > Options for loading”, but only for the Master Server.
6.	Configure the Web Server and DataMonitor Server, if necessary.

Activating the Master Server and Clients

Table 4-9

No.	Action
1.	Activate the Master Server.
2.	Activate all upgraded Clients by connecting them to the Master Server project.
3.	Wait until the archive data is synchronized.

Note The synchronization of the archive data starts after about 10 minutes. Please refer to the system messages for the current status of the synchronization. The duration of the archive synchronization varies depending on the downtime.

Upgrading the Standby Server and its Clients

No.	Action
1.	To upgrade the Standby Server and the Clients connected to it, repeat the steps for upgrading the Master Server and its Clients, but for the Standby Server (see Table 4-7 and Table 4-8).
2.	Perform a complete download for the Master Server and the Standby Server via the “Load preview > Options for loading” dialog with the “Server and redundant Partner” setting activated. By performing the download with the “Server and redundant Partner” option activated, you ensure that the same project runs on both Partner Servers.

Note After the complete download with the “Server and redundant Partner” option activated, a later “Delta” download for the two Servers is possible.

Notice

In order not to interrupt operation of the system, observe the sequence of steps described.

5 Appendix

5.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:
https://support.industry.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:
www.siemens.com/industry/supportrequest

SITRAIN – Training for Industry

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:
www.siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:
https://support.industry.siemens.com/cs/ww/en/sc

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:
https://support.industry.siemens.com/cs/ww/en/sc/2067

5.2 Links and Literature

Table 5-1

No.	Subject
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the article page of the Application Example https://support.industry.siemens.com/cs/ww/en/view/109772627
\3\	Manual; "WinCC V7.5: configuration and communication" https://support.industry.siemens.com/cs/ww/en/view/109760748
\4\	Manual; "SIMATIC WinCC WinCC Engineering V15.1 - Options" https://support.industry.siemens.com/cs/ww/en/view/109755217
\5\	Manual "WinCC Basic Options V7.5: WebNavigator, DataMonitor, WebUX" https://support.industry.siemens.com/cs/ww/en/view/109760754
\6\	FAQ; "What should you watch out for when downloading from the WinCC/PCS 7 Engineering Station to the Operator Station (ES-OS download)?" https://support.industry.siemens.com/cs/ww/en/view/59216666
\7\	FAQ; " What should you watch out for when downloading WinCC Runtime Professional from the Engineering Station to the Operator Station (Runtime PC)?" https://support.industry.siemens.com/cs/ww/en/view/88780011

5.3 Change Documentation

Table 5-2

Version	Date	Change
V1.0	03/2020	First version