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APPLICATION EXAMPLE

SIMATIC PCS 7 Remote I/O Upgrade Guideline

Upgrading SIMATIC ET 200M to SIMATIC ET 200SP HA

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1. Introduction

This document is meant as a guideline for projects which are using the SIMATIC ET 200M periphery system in SIMATIC PCS 7, to simplify upcoming modernization considerations.
Due to the planned product phase out of ET 200M, starting at October 1st, 2023 – an upgrade to the state-of-the-art periphery system for process automation SIMATIC ET 200SP HA should be considered.

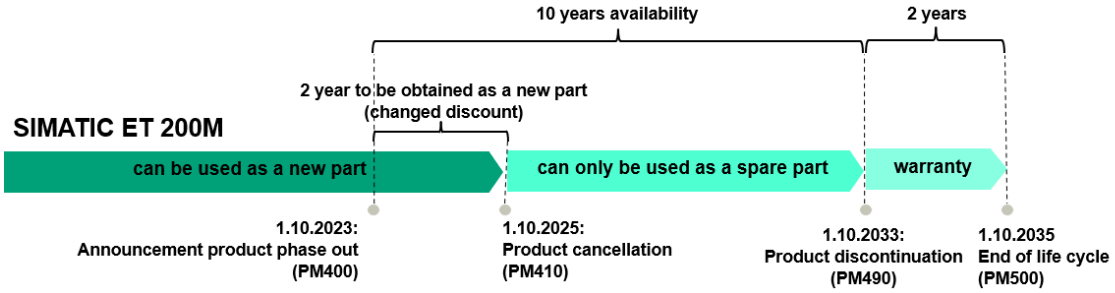
An upgrade to SIMATIC ET 200SP HA is a chance to implement next generation technologies with all their benefits to brown field projects. While in some cases a one-by-one replacement might be the only option to ensure almost continuous production, the biggest advantages can be achieved by a complete modernization concept. In this document, all relevant technical aspects are briefly described to ensure that no important aspects are left out and to find the best and most cost-efficient upgrade strategy for each plant.

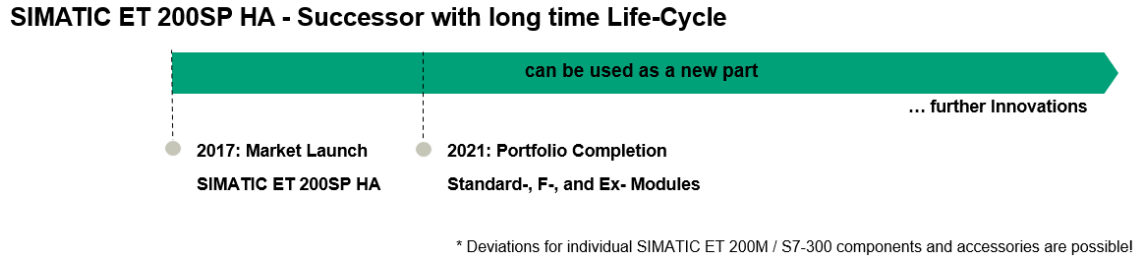
All presented solutions can be used in an SIMATIC PCS 7 environment, but with regard to a later evolution to SIMATIC PCS neo, some approaches are recommended over others.

1.1. Product Lifecycle

The SIMATIC S7-300 / SIMATIC ET 200M system family, as a part of the SIMATIC product portfolio are going to be available until October 1st, 2023 (PM400). The product cancelation will take effect on October 1st, 2025 (PM410). For single components this date might be earlier.

During the period from October 1st, 2023, to the product cancelation on October 1st, 2025, greenfield projects can be planned and realized – also it's possible to order components for later usage. With declaration of the product cancelation, the components are only available as a spare part - planned until October 1st, 2033.





Further details are available at the following SiePortal page:

[Information about the product phase-out of S7-300 / ET 200M components (ID: 109809890)]

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1.2. ET 200SP HA Advantages

Compared to SIMATIC ET 200M, the ET 200SP HA periphery system has a bunch of advantages as it was designed for the demands of process industries and will be the main IO line for SIMATIC DCS systems. The greatest advantages with respect to brown field requirements are:

- New SIMATIC longterm PA-Periphery system
- SIMATIC PCS neo ready
- Highest availability
- PA-Ready (CiR, MRP, S2, R1, SoE)
- Suitable for harsh environmental conditions
- More signals at each station → less I/O stations in total
- Easy maintenance & short MTTRs
- Advanced diagnostics of device and network
- Various functions in one station (I/O, F, Ex-Zone, pneumatics, weight cells, motor starters, etc.)

	SIMATIC ET 200M	SIMATIC ET 200SP HA
IO modules per station	12	56
High density, width	40 mm	22,5 mm
Temperature range	0 - 60 °C	-40 - 70 °C (Standard)
Conformal Coating	No	Yes
NAMUR NE 21 conform	No	Yes
Media redundancy	Via OLM Ring	Integrated system feature: MRP
Redundant fieldbus connection (Redundant interface module)	PROFIBUS DP, max. 12 Mbit/s	PROFINET R1 100 Mbit/s
Interface module (FO)	No	Yes
Media converter for interface module (FO and Cu)	No	Yes
Module exchange without touching the field wiring	No	Yes
Direct IO wiring	No - Front plug with common L-	Yes - 1:1 push in terminals
IO module redundancy	External MTA with diodes needed	Built in side by side - no MTA needed
FW updates of modules	Only selected	All
Safety signals (SIL3)	Yes	Yes
Multi-HART support	No	Yes

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	SIMATIC ET 200M	SIMATIC ET 200SP HA
Isolation tested	500 V DC/min	1500 V DC/min 4200 V DC/min (galvanic isolated)
Highly accurate time stamping (1 ms)	Yes	Yes

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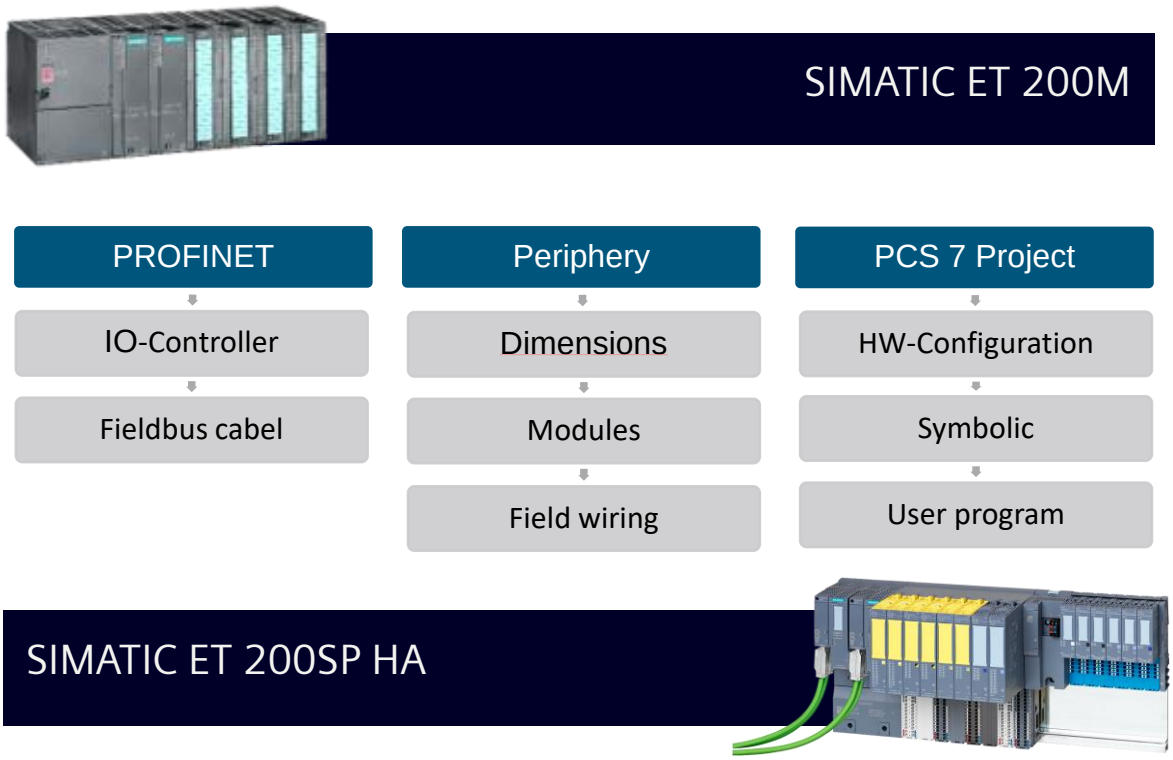
1.3. Upgrade Requirements

Upgrading the existing SIMATIC ET 200M stations in a plant, requires detailed knowledge of the actual situation, conscientious planning and a strategy coordinated with the customer.
There are essentially three main aspects to be taken into account during planning:

- Fieldbus based on PROFINET
- Selection of ET 200SP HA periphery components
- Adjustments of the SIMATIC PCS 7 projects with APL channel blocks



In this document we provided guidelines and some food for thoughts, to find a good answer and possible solutions, for all upcoming challenges in the plants to be modernized. We divided each main aspect into different subcategories.

Depending on how close the plant is to the state of the art, individual steps in the modernization process can differ greatly or are not necessary at all.

With respect to the wide range of features of the SIMATIC ET 200SP HA and an evolution to SIMATIC PCS neo later on, recommended solutions are highlighted with a green star, which means that this solutions ensures the full scope of features are applicable and the components are qualified for usage in SIMATIC PCS neo.

Recommended Solution

NOTE

The usage of APL channel blocks e.g. “Pcs7AnIn” instead of PCS 7 Library blocks like “CH_AI” are mandatory to use with SIMATIC ET 200SP HA, but it is not necessary to replace the technological function blocks to APL.

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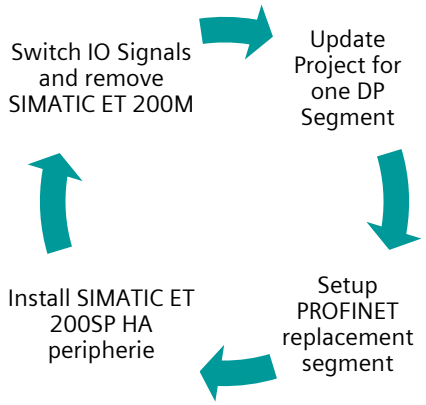
2. Upgrade strategies

Depending on the actual state of the plant, the available time slots for modernization tasks and of course also the total amount of existing SIMATIC ET 200M, there are different approaches how a modernization can be made to a success story.

1. ***"All at once"***

2. ***"Upgrade in two Steps"***

3. ***"Modernization in operation"***



NOTE

For all scenarios, but especially in case of a long-term modernization concept fits best to the plants requirements, the SIMATIC Plant Automation Accelerator (PAA) is a power full software tool which helps to carry out the necessary changes in a standardized manner and should be considered.

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2.1. “All at once” - Full upgrade

An upgrade of all existing SIMATIC ET 200M stations to SIMATIC ET 200SP HA in a single step, might be the first thing a customer asks for. As the upgrade to SIMATIC ET 200SP HA has some dependencies to the SIMATIC PCS 7 project, the used AS and the existing fieldbus system an upgrade in a single step approach is recommended for:

- Small-sized plants
- Plants with APL channel blocks
  AND
- PROFINET fieldbus

In case there are no APL channel blocks being used and there is no PROFINET fieldbus available, the upgrade in two steps is recommended.

2.2. Upgrade in two Steps

Upgrading the SIMATIC PCS 7 plant in two steps is recommended in most cases, when there is no PROFINET infrastructure available or the PCS 7 project itself needs modifications with respect to the APL channel blocks. As SIMATIC ET 200M is also fully supported by APL channel, it is a viable approach to prepare the SIMATIC PCS 7 project, and the fieldbus infrastructure including the S7 CPU first, if necessary. In the next subproject, attention can be fully focused on the exchange of the SIMATIC ET 200M.

This approach is recommended for:

- Medium sized plants
- Sufficient downtime available

Obviously, not every plant operation, allows sufficiently large periods of time to apply all hardware changes. In this case also mixed usage of SIMATIC ET 200M and SIMATIC ET 200SP HA in one CPU is possible.

NOTE The SIMATIC PCS 7 project must not necessary completely be changed to APL V9 channel blocks. In exceptional cases, it is possible to combine APL V9 and PCS 7 Library channel blocks in an AS. See the following FAQ for more information.

When extending your existing SIMATIC PCS 7 system with one or more ET 200SP HA modules, how can you use their functions? (ID: 109811013)

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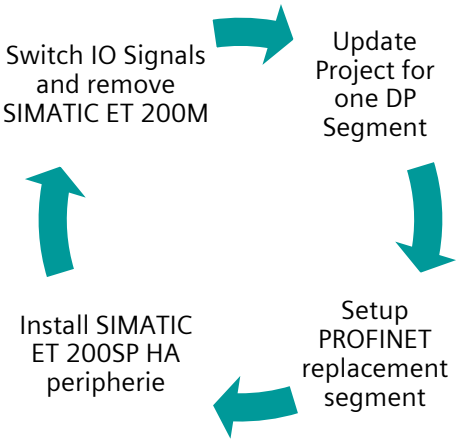
2.3. Modernization in Operation

In case a plant reaches a certain size with several S7 CPUs, an upgrade in one or two steps is neither realistic nor recommend. In such cases it is the best way SIMATIC ET 200SP HA upgrades to be included in a long-term modernization strategy, with respect to the PCS neo evolution at some stage.



This approach is especially recommended for:

- Large sized plants
- Short scheduled time periods for upgrades

Each DP subsegments of the plant can be prepared and upgraded one by one, within every possible maintenance window. The IO Adapter can be used for a fast and fault tolerant modernization of a cabinet – see Chapter 4.1.3 “IO Adapter ET 200M to ET 200SP HA” for more Information.

As the SIMATIC ET 200M modules are likely to be still in a good condition, this approach brings the benefits, that all SIMATIC ET 200M components which are removed at the existing cabinets, can be used as a spare part for parts of the plan which are not modernized yet.

2.4. Upgrade of SIMATIC ET 200M Ex I/O

If Ex signals are used in the existing system, there are two main options for replacing the SIMATIC ET 200M, depending on the fieldbus and installation location:

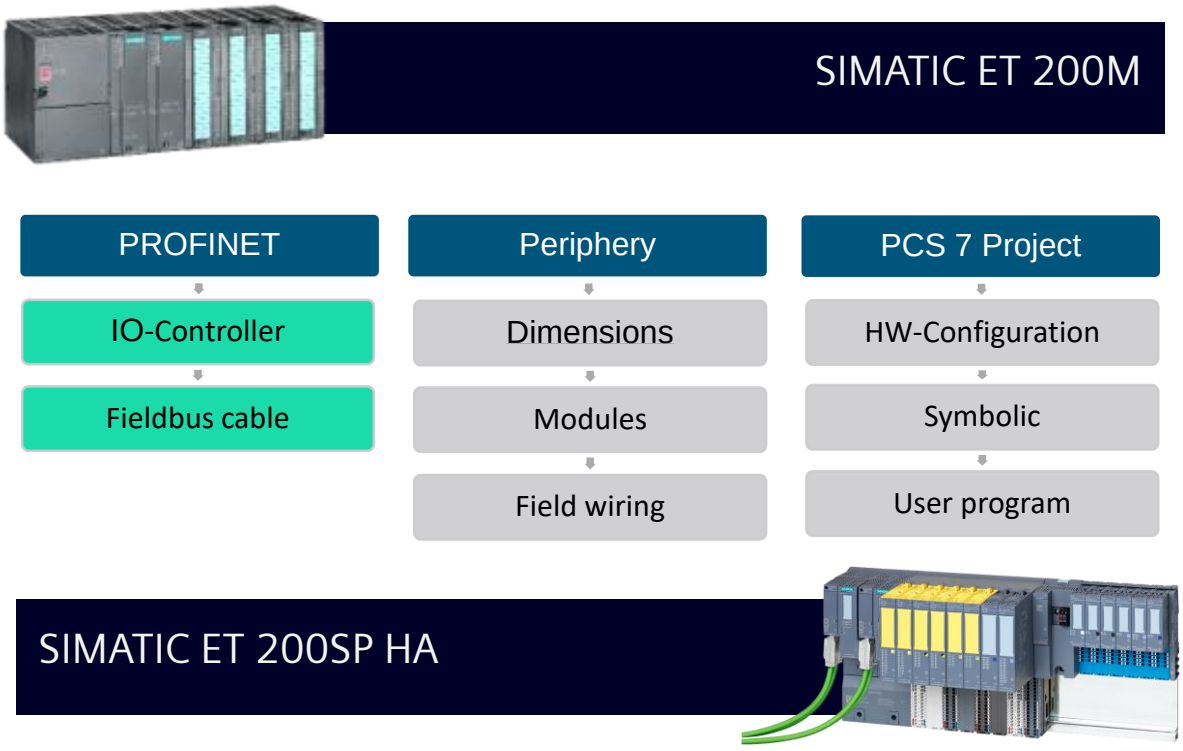
- SIMATIC ET 200SP HA is designed for use in the control cabinet.
  SIMATIC Distributed I/O System ET 200SP HA / ET 200SP Modules for devices in a hazardous area (ID: 109795533)
- SIMATIC ET 200iSP can be installed in Ex zones 1 and 2 as well as in non-hazardous areas. PROFIBUS DP connection is possible and existing cables could be used.
  SIMATIC ET 200iSP Distributed I/O system (ID: 109827554)

The associated I/O modules of SIMATIC ET 200SP HA and ET 200iSP offer channels to connect intrinsically safe field devices up to Ex zone 0.
Application example for optical connection with PROFINET in Ex zone (ID: 109931163)

3. PROFINET Fieldbus

The first major aspect which needs to be considered within a SIMATIC ET 200SP HA upgrade project, is the PROFINET fieldbus as a mandatory precondition. The PROFINET topic, is divided in two subcategories which are:

- PROFINET IO-Controller
- Fieldbus cables



In case the plant is already running with a SIMATIC S7 410-5H CPU, the first sub-chapter can be skipped, as this PA-CPU is fully compatible with the SIMATIC ET 200SP HA and qualified for later usage with PCS neo. However, if there is no SIMATIC S7 410-5H CPU is in use now, it does not mean a new CPU is required in all plants.

The following chapter will give answers to various questions, which components can be used further on, if there are restrictions you need to think about and what solutions are available to reduce the effort of complete rewiring the fieldbus.

For general information, and example PROFINET topologies in SIMATIC PCS 7 environments, more information is available at SiePortal:

PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

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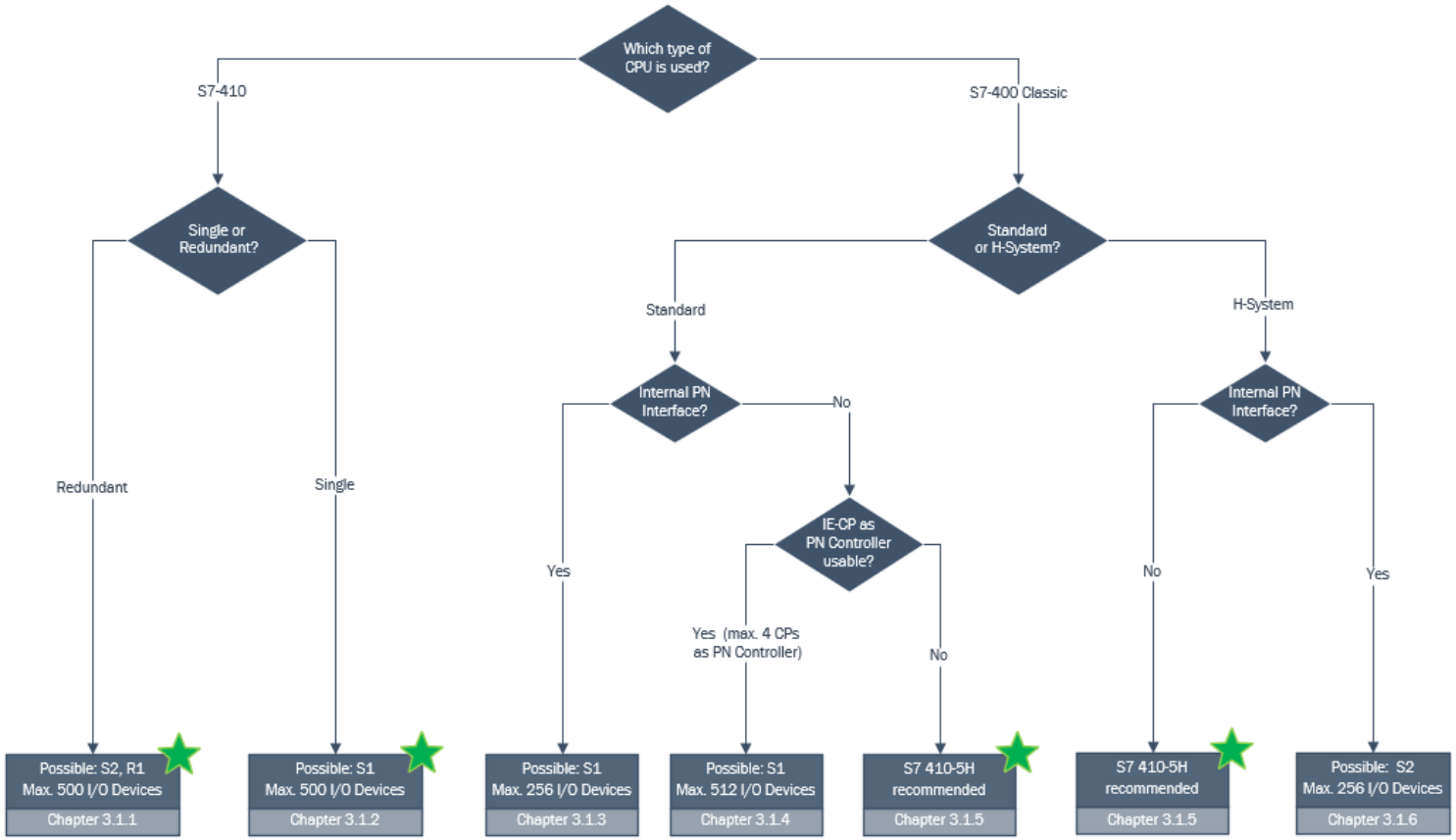
3.1. IO Controller

This decision tree can be used as a guideline, which upgrades of existing hardware is possible, and on the other hand which network topologies and quantities are covered with these specific options.



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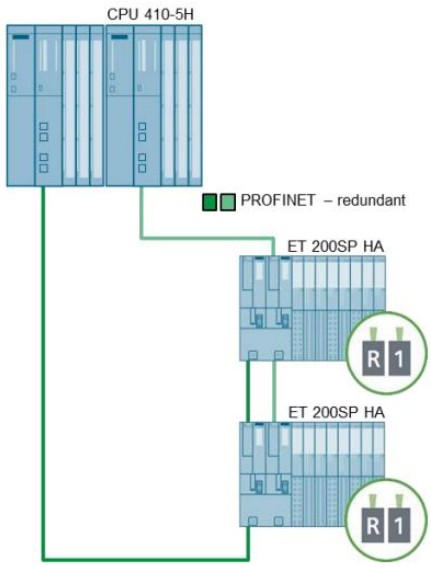
3.1.1. SIMATIC S7 410-5H - 500 IO Devices, S2 & R1

When a SIMATIC S7 410-5H is being used in the project, full PROFINET capability is given, all advanced SIMATIC ET 200SP HA functions can be used and readiness for SIMATIC PCS neo is achieved.

A SIMATIC S7 410-5H is recommended for upgrades, as it provides:

- SIMATIC PCS neo readiness
- Configuration in Run (CiR), Sequence of Events (SoE)



The shown example with system redundancy R1 is only one possible solution, PROFINET provides various options, and an individual network planning is recommended to find the best architecture.

NOTE Any other PROFINET IO devices e.g., frequency converters, at the PROFINET network, must support at least system redundancy S2.

Example PROFINET topologies in SIMATIC PCS 7 environments and more information are available at SiePortal:

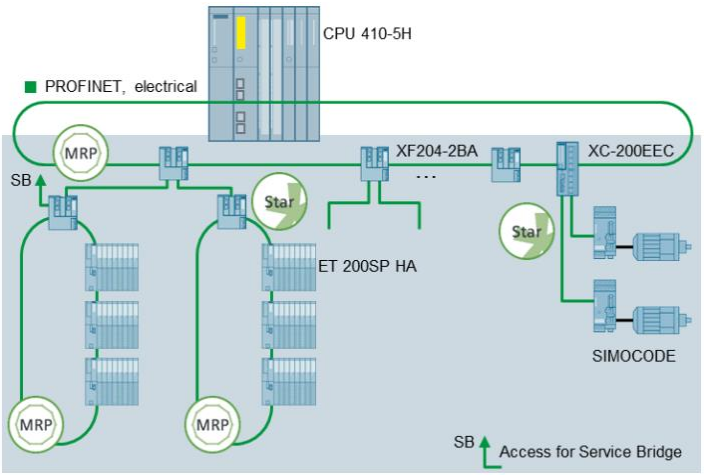
PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

3.1.2. SIMATIC S7 410-5H - 500 IO Devices, S1

When a SIMATIC S7 410-5H is being used in the project, full PROFINET capability is given, all advanced SIMATIC ET 200SP HA functions can be used and readiness for SIMATIC PCS neo is achieved.

A SIMATIC S7 410-5H is recommended for upgrades, as it provides:

- SIMATIC PCS neo readiness
- Configuration in Run (CiR), Sequence of Events (SoE)



The shown example with one MRP ring is only one possible solution, PROFINET provides various options, and an individual network planning is recommended to find the best architecture.

Example PROFINET topologies in SIMATIC PCS 7 environments and more information are available at SiePortal:

PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

3.1.3. SIMATIC S7 41x - 256 IO Devices, S1

SIMATIC S7-400 Classic CPUs (all non SIMATIC S7 410-5H models) which have an internal PROFINET IO Controller, can be used for up to 256 IO devices in S1 networks topologies.

NOTE	SIMATIC S7-400 Classic CPUs doesn't provide PA-Ready features, like CiR, TCiR or SoE. SIMATIC PCS neo will not support this CPU.

This solution is possible, but not recommended as not all features of SIMATIC ET 200SP HA are available. A replacement by SIMATIC S7 410H should be considered (See Chapter 3.1.5).

3.1.4. SIMATIC S7 41x - 512 IO Devices, S1

SIMATIC S7-400 Classic CPUs (all non SIMATIC S7 410-5H models) which are not H-CPUs, neither H-CPUs in single operation, can be used with up to four industrial ethernet CPs 443-1 Ext, for up to 512 IO devices (4x 128) in S1 networks topologies.

NOTE

S7-400 Classic CPUs doesn't provide PA-Ready features like CiR, TCiR or SoE.
SIMATIC PCS neo will not support this CPU.

This solution is possible, but not recommended as not all features of SIMATIC ET 200SP HA are available. A replacement by SIMATIC S7 410H should be considered (See Chapter 3.1.5).

3.1.5. Change to SIMATIC S7 410-5H

In case a standard SIMATIC S7 400 Classic CPU is not suitable, as the limited functions of an industrial ethernet CPs 443-1 Ext as an PROFINET controller is not sufficient for the requirements, or an existing standard SIMATIC S7 400H Classic CPU can not be used anymore, an upgrade to an SIMATIC S7 410H CPU is recommended and mandatory for upgrading SIMATIC ET 200M to SIMATIC ET 200SP HA.

For useful information, how a CPU 41x can be replaced with the S 410-5H, the mentioned SiePortal entry was released:

How do you replace a CPU 41x with the CPU 410-5H Process Automation (ID: 85014617)

Example PROFINET topologies in SIMATIC PCS 7 environments and more information are available at SiePortal:

PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

3.1.6. SIMATIC S7 41xH - 256 IO Devices, S2

SIMATIC S7-400H Classic CPUs (all non S7 410-5H models) which have an internal PROFINET IO Controller, can be used for up to 256 IO devices in S2 networks topologies.

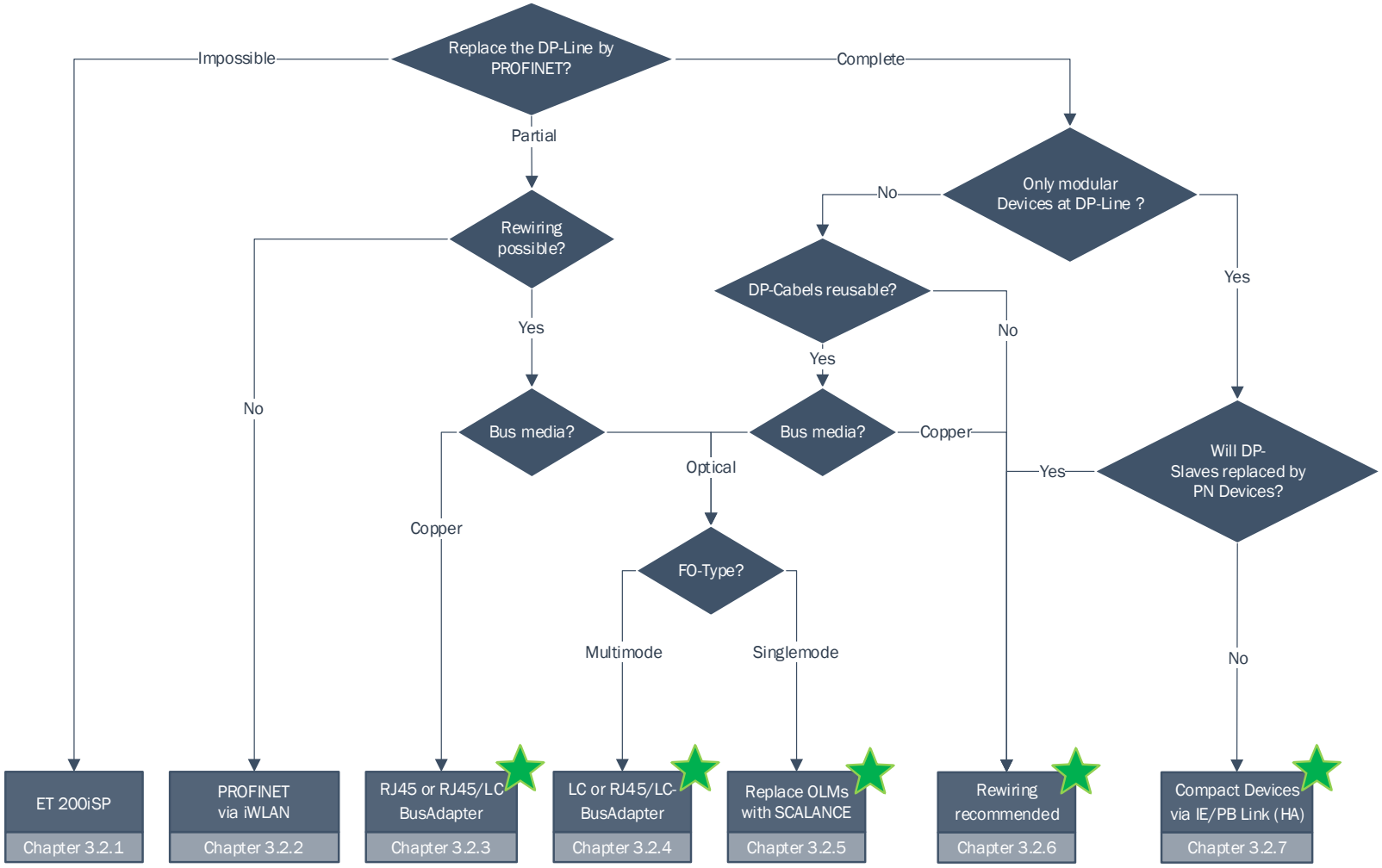
NOTE

SIMATIC S7-400 Classic CPUs doesn't provide PA-Ready features like R1, CiR, TCiR or SoE.
SIMATIC PCS neo will not support this CPU.

This solution is possible, but not recommended as not all features of SIMATIC ET 200SP HA are available. A replacement by SIMATIC S7 410H should be considered (See Chapter 3.1.5).

3.2. Fieldbus cable

While PROFIBUS DP with copper cables are based on a RS 485 two-wire interface, PROFINET requires four-wire-cables. But this does not mean the existing wiring cannot be used anymore and must be replaced in all cases. Each PROFIBUS DP-Line should be evaluated according to this decision tree.



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3.2.1. SIMATIC ET 200iSP

There might be cases were a change from PROFIBUS DP to PROFINET fieldbus technology is not applicable. The SIMATIC ET 200iSP can be used instead of ET 200M, especially because this periphery line has a redundant fieldbus interface and is supported in SIMATIC PCS neo.

The interface modules are possible to replace by PROFINET interface modules (S1, S2 or R1) at some later point, without changes to the field wiring.

Detailed information of the SIMATIC ET 200iSP periphery are available at SiePortal:

SIMATIC Distributed I/O ET 200iSP (ID: 109811501)

Details about SIMATIC ET 200iSP periphery with PROFINET Interface:

PROFINET interface module IM 152-1PN for SIMATIC ET 200iSP (ID: 109817601)

NOTE The SIMATIC ET 200iSP is a high-quality periphery system and is designed for applications where intrinsically safety is required. Please contact a sales or presales consultant to clarify if this solution is applicable in a specific plant.

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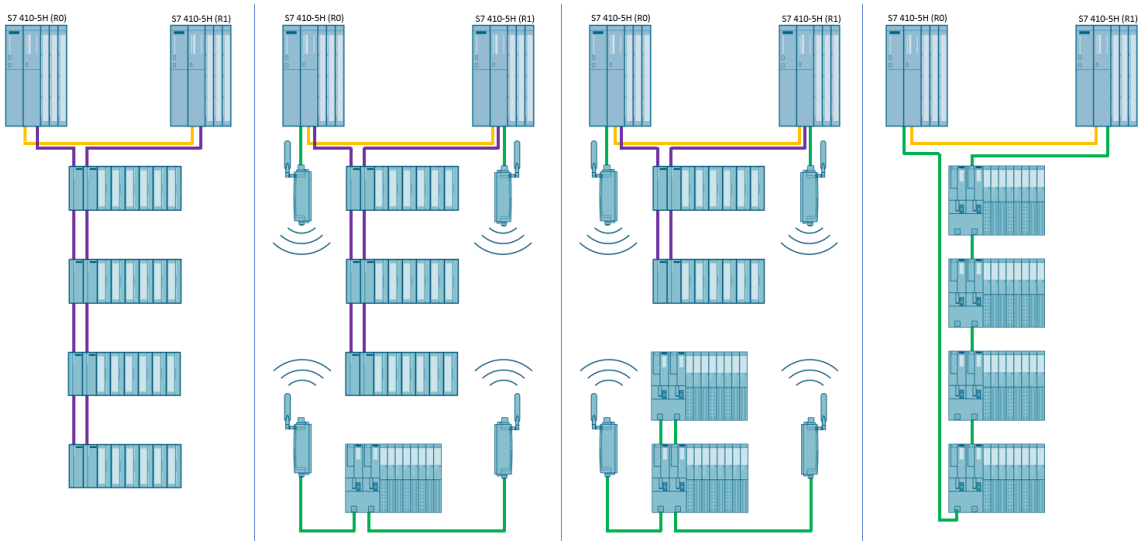
3.2.2. PROFINET via iWLAN

Wireless network is not only suitable for private or business networks, PROFINET with iWLAN is also released for usage in SIMATIC PCS 7 environments. With respect to high availability requirements in process industries, an iWLAN based solution is not applicable in every facility, but it can also be used temporary while the cable-based infrastructure is not available for PROFINET.



NOTE

An iWLAN based solution for PROFINET requires a detailed analysis on site, including a feasibility evaluation. contact a sales or presales consultant to clarify if this solution is applicable in a specific plant.

Example PROFINET topologies in SIMATIC PCS 7 environments, technical restrictions and more information are available at SiePortal:

PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

3.2.3. RJ45 or LC/RJ45 BusAdapter

In comparison with SIMATIC ET 200M, which is also available with a PROFINET interface module, the SIMATIC ET 200SP HA interface modules are equipped with a flexible bus adapter system. While the RJ45 BusAdapter (6DL1193-6AR00-0AA0) can be used with standard RJ45 connectors analog to the SIMATIC ET 200M PROFINET interface module, the LC/RJ45 BusAdapter (6DL1193-6AG20-0AA0) can be used for a change of the bus media – from copper to multi-mode fiber optic or revers. This gives more flexibility of using already installed FO-cables without separate media converters.

More details are available SiePortal:

PROFINET IO BusAdapter for distributed I/O (ID: 109804897)

3.2.4. LC or RJ45/LC Bus Adapter

In comparison with SIMATIC ET 200M, which is also available with a PROFINET interface module, the SIMATIC ET 200SP HA interface modules are equipped with a flexible bus adapter system. While the RJ45 BusAdapter (6DL1193-6AR00-0AA0) can be used with standard RJ45 connectors analog to the SIMATIC ET 200M PROFINET interface module, the LC BusAdapter (6DL1193-6AG00-0AA0) can be used for already installed FO-cables or the LC/RJ45 BusAdapter (6DL1193-6AG20-0AA0) can be used for a change of the bus media from copper to multi-mode fiber optic or revers. This gives more flexibility of using already installed FO-cables without separate media converters.

More details are available at SiePortal:

PROFINET IO BusAdapter for distributed I/O (ID: 109804897)

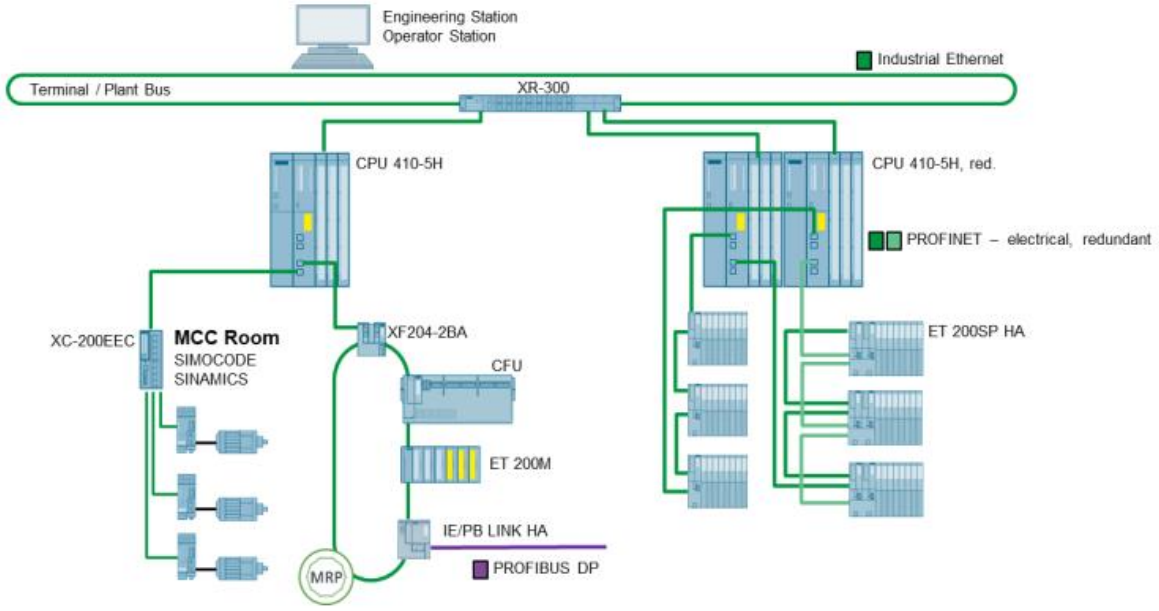
3.2.5. Replace OLMs with SCALANCE

The usage of Optical Link modules (OLM) are not required for PROFINET anymore as the SIMATIC ET 200SP HA provides various options of BusAdapters directly connectable to FO cables. In case the previous installed FO-cables are single-mode FO or longer distances are required to cover, which is not possible anymore with standard BusAdapters, SCALANCE switches can be used instead of OLMs. For this purpose, all SIMATIC PCS 7 released SCALANCE switches can be used as long es they are equipped with a suitable SFP-port.

SIMATIC Process Control System PCS 7 Released modules (ID: 109821117)

3.2.6. Fieldbus rewiring

When new wiring is required, its recommended to rethink what's the most useful topology with PROFINET, not just replacing the PROFIBUS DP network, as there is much more flexibility and the possibly of a higher availability due to Media Redundancy Protocols (MRP) even with single AS systems.



Example PROFINET topologies in SIMATIC PCS 7 environments and more information are available at SiePortal:

PROFINET in Process Automation with SIMATIC PCS 7 (ID: 72887082)

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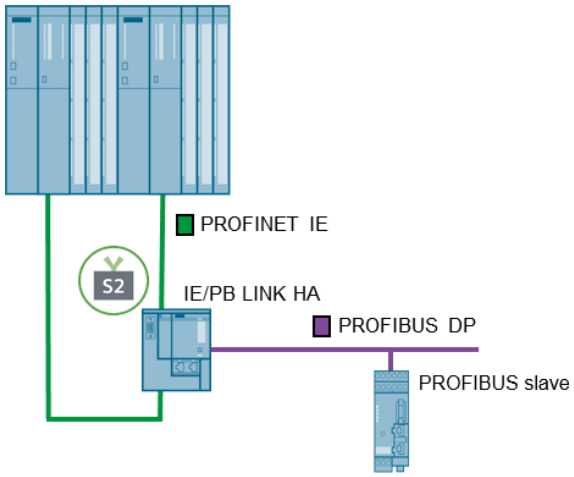
3.2.7. DP-Devices at IE/PB Link HA

Upgrading an existing plant with PROFINET, it is also recommended to replace not only the remote IO stations by PROFINET devices, it's also a good idea to connect compact devices to the S7 400 CPU with PROFINET. However, sometimes it's not possible to replace them in the first stage. In this case the IE/PB Link HA, is a useful solution to integrate those devices to PROFINET topologies. Even PROFIBUS PA devices can still be used with Field Device Coupler SIMATIC FDC 157 including ring redundancy mechanism, although the use of SIMATIC CFU is the preferred solution for PROFIBUS PA in PROFINET networks (see also Chapter 4.1.2).



NOTE Compared to a PROFIBUS DP Y-Link, all DP-Slaves can use the maximum PROFIBUS DP telegram length of 244 Byte In/Out each, but all connected DP-Slaves are counted as a PROFINET device each.

NOTE In case of using any 3rd party components, e.g. frequencies converters with addon driver libraries, the compatibility with IE/PB Link HA must be checked

More details are available at SiePortal:

- How do you connect PROFIBUS DP slaves to a redundant CPU? (ID: 109807303)
- SIMATIC NET: Industrial Ethernet / PROFIBUS IE/PB LINK (ID: 109744280)

4. Periphery System

The second major aspect to be considered, is the replacement of the periphery itself. Many years available at the market, SIMATIC ET 200M had a wide range of modules available and it is not always that easy to figure out which SIMATIC ET 200SP HA module is the successor, as the complete periphery line was new developed for process automation purposes.

SIMATIC ET 200M

PROFINET	Periphery	PCS 7 Project
I/O-Controller	Dimensions	HW-Configuration
Fieldbus cable	Modules	Symbolic
	Field wiring	User program

SIMATIC ET 200SP HA

The next chapters will provide decision trees to covers the three subcategories with helpful documents and recommendations to bring the greatest benefits of an SIMATIC ET 200SP HA upgrade to the plants.

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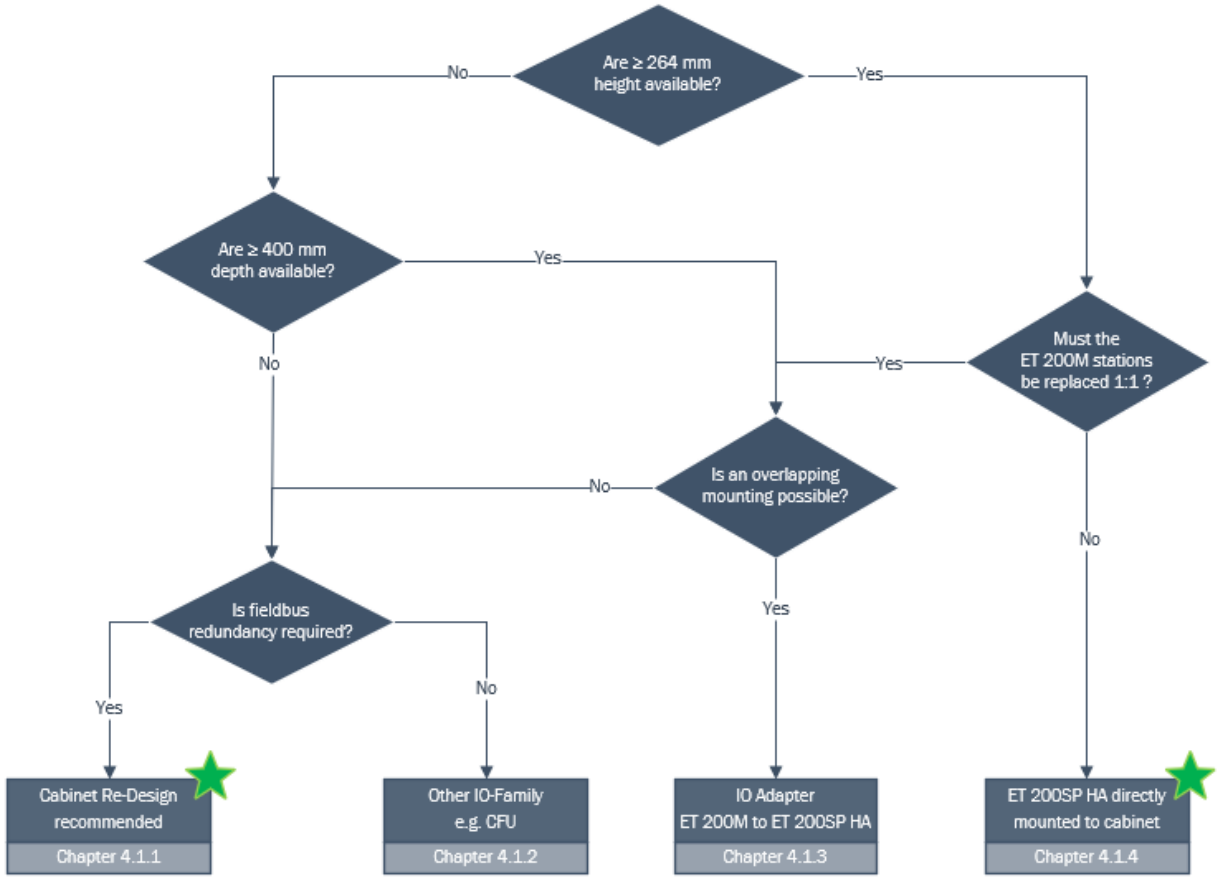
4.1. Dimensions

While for greenfield projects or extensions of existing plants the physical size of the periphery system is less important than the signal density, brownfield projects need to be checked at each cabinet to figure out, what's the best way for the upgrade. The major point is the available height, as the SIMATIC ET 200SP HA including space for waste heat requires a little more space than SIMATIC ET 200M – but it is also about the wiring to the instruments and actuators including loop checks.



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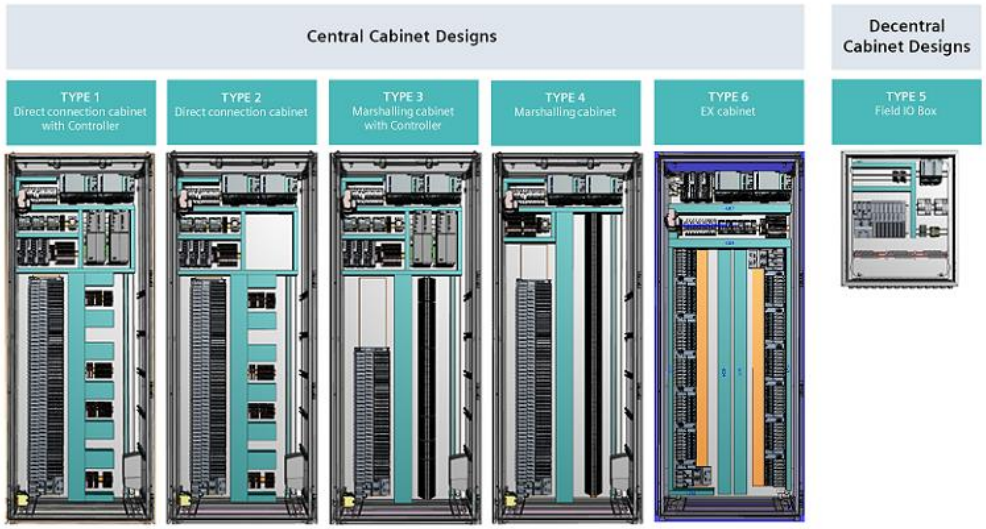
4.1.1. Cabinet Re-Design

The biggest advantages of a remote IO periphery upgrade can be reached with a redesign of the cabinet, as the higher signal density can be fully played.

But it is not simply a saving of space, it is more room and flexibility for maintenance which results in lower meantime to repair (MTTR) and faster maintenance.

A wide range of cabinet templates are available for AutoCAD, EPLAN and in PAA (Plant Automation Accelerator) making it easy for the cabinet builder to customize them for all requirements.

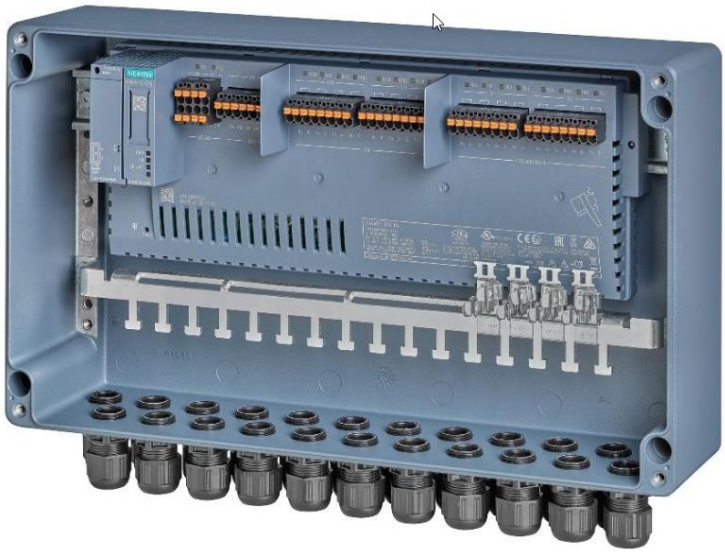


More details are available at SiePortal:

Cabinet Designs with ET 200SP HA (ID: 109775414)

4.1.2. Other I/O Family

The SIMATIC ET 200M had a wide range of use cases in the past. While cabinets with several SIMATIC ET 200M stations, are a common case – there are also SIMATIC ET 200M being used in field cabinets with smaller IO sizes. For such applications, the SIMATIC Compact field unit can be pointed out as a good solution as well. Due to the smaller height, compared to SIMATIC ET 200SP HA, the SIMATIC CFU can be used also for standard IOs beside of PROFIBUS PA applications.



More details are available at SiePortal:

Smart field distributor – SIMATIC Compact Field Unit (ID: 109749357)

4.1.3. IO Adapter ET 200M to ET 200SP HA

Whenever the available shutdown which is available for the upgrade of the periphery system is very limited, the time-consuming loop-check becomes an issue to the responsible project manager. One smart solution is the usage of IO Adapters, where the existing wiring of SIMATIC ET 200M front connector can be mounted into an adapter which connects the signals with pre-commissioned D-SUB cable to D-DUB terminal blocks at SIMATIC ET 200SP HA.

ET 200M	ET 200SP HA	Function
6ES7321-1BL00-0AA0	6DL1131-6BL00-0PH1	DI 32Ch 24V DC
6ES7321-7BH01-0AB0	6DL1131-6BH00-0PH1	DI 16Ch 24V DC
6ES7321-7TH00-0AB0	6DL1131-6TH00-0PH1	DI 16Ch NAMUR
6ES7322-1BL00-0AA0	6DL1132-6BL00-0PH1	DQ 32Ch 24V DC
6ES7322-8BH10-0AB0	6DL1132-6BH00-0PH1	DQ 16Ch 24V DC
6ES7331-7HF01-0AB0	6DL1134-6TH00-0PH1	AI 8Ch current 2-wire

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ET 200M	ET 200SP HA	Function
6ES7331-7PF01-0AB0	6DL1134-6JH00-0PH1	AI 8Ch RTD 2-3-4-wire
6ES7331-7PF11-0AB0	6DL1134-6JH00-0PH1	AI 8Ch TC
6ES7331-7TF01-0AB0	6DL1134-6TH00-0PH1	AI 8Ch current 2-wire HART
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch voltage measurement
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch current 2-wire
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch current 4-wire
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch R/T-measurement
6ES7332-5HF00-0AB0	6DL1135-6TF00-0PH1	AQ 8Ch current 2-wire
6ES7332-8TF01-0AB0	6DL1135-6TF00-0PH1	AQ 8Ch current2-wire HART

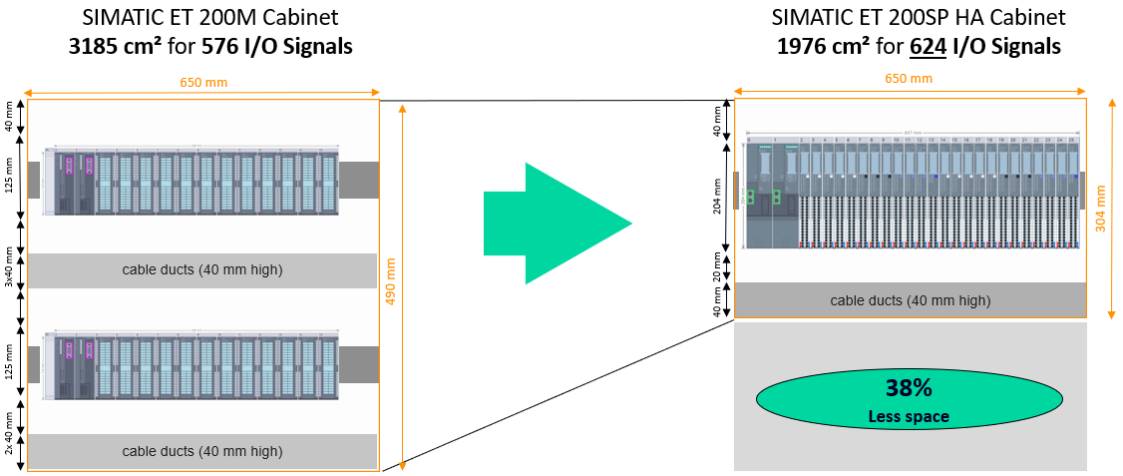
More details are available at SiePortal:

IO adapter for upgrade from ET 200M to ET 200SP HA (ID: 109823570)

4.1.4. ET 200SP HA directly mounted

When the required height of 264 mm or more is available at the cabinet, a replacement of the SIMATIC ET 200M in the existing cabinet design is likely.

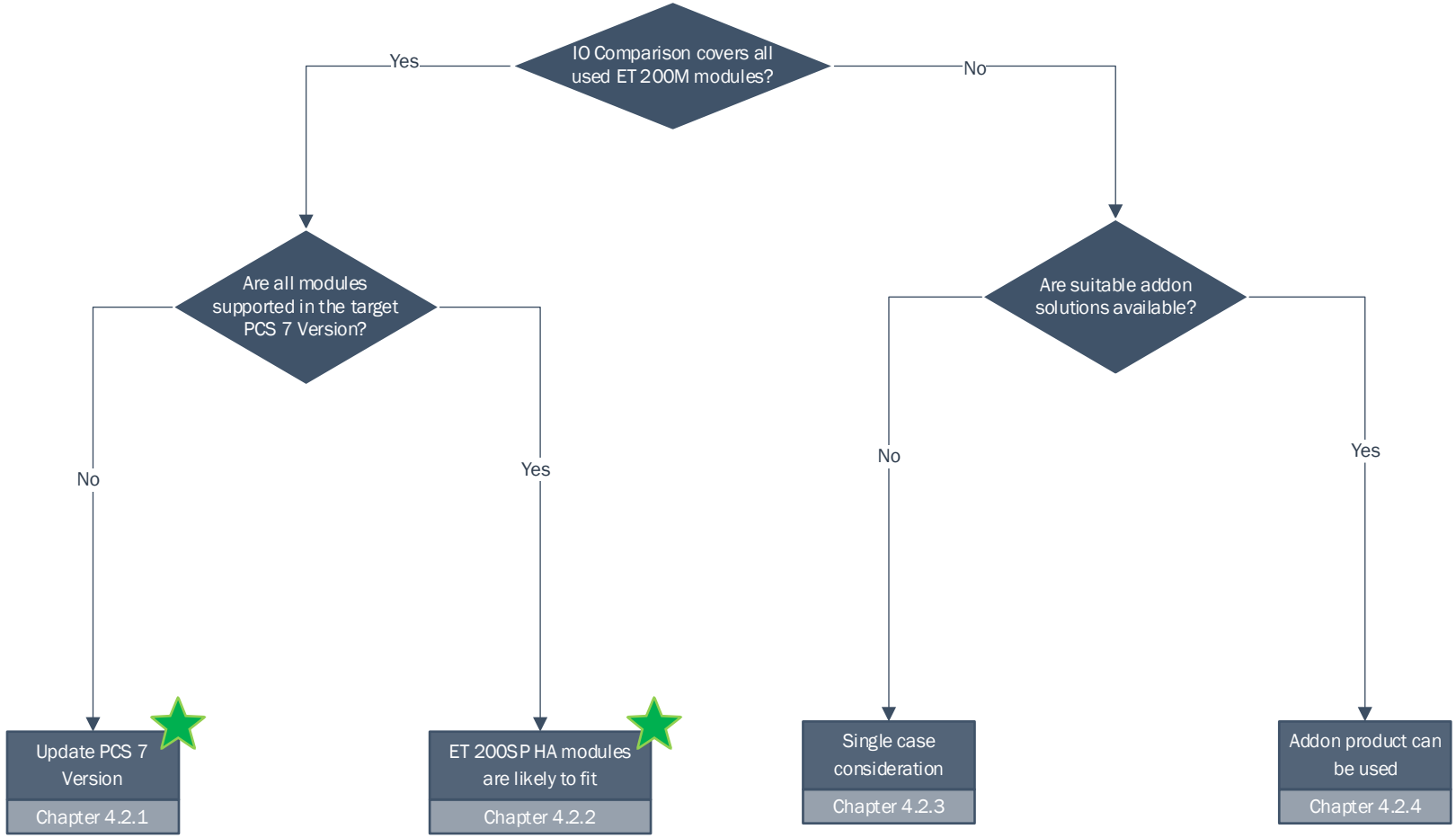
Even the design of the cabinet must not be exchange because of physical restrictions, a redesign may still be useful by reducing multiple SIMATIC ET 200M stations by only one new SIMATIC ET 200SP HA station.



See also chapter 4.1.1 “Cabinet Re-Design” for more useful information.

4.2. Modules

To check which SIMATIC ET 200SP HA modules are suitable as an functional successor to SIMATIC ET 200M, the Phase out plan S7-300 ET 200M at SiePortal can be used. Find more details about the requirements for each module, and what are the alternatives in case the SIMATIC ET 200SP HA standard modules are not covering the required functions. With the SIMATIC management Console the used ET 200M modules can be identified.



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4.2.1. New SIMATIC PCS 7 Version required

The SIMATIC ET 200SP HA is released for SIMATIC PCS 7 V9.0, previous branches must be updated to a V9.0 or later. As not all SIMATIC ET 200SP HA modules were released with SIMATIC PCS 7 V9.0, it's also necessary to ensure all modules are released in the target SIMATIC PCS 7 version.

An overview about the compatibility of SIMATIC PCS 7 version, SIMATIC ET 200SP HA and the firmware version of the interface modules can be looked up SiePortal:

Which IO modules of the ET 200SP HA are released in SIMATIC PCS 7 with which interface modules? (ID: 109801065)

In case the SIMATIC PCS 7 version is required to upgrade, SIMATIC PCS 7 Upgrade Services providing a wide range of service to simplify this step.

Upgrade Factory offers DCS modernization à la carte

4.2.2. ET 200SP HA modules are likely to fit

In most cases the recommended SIMATIC ET 200SP HA successor modules for SIMATIC ET 200M can be used. Nevertheless, there might be some difference regarding the used wiring on field level, e.g. 3-wire or 4-wire interface to field devices which cannot be replaced one by one, and should be checked in advance to be on the safe side.

In case of doubts, please contact your responsible technical consultant.

4.2.3. Single case consideration

In rare case of a functional requirement which cannot be covered by SIMATIC ET 200SP HA, nor available addon products, a look at the roadmap of planed modules is worth a try, as the portfolio is planned to be extended in future.

In case of doubts or if another solution is required, please contact your responsible technical consultant to figure out the best way how to meet the demands of the project.

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4.2.4. Addon products can be used

There are specific requirements, for SIMATIC ET 200SP HA, which can be met by SIMATIC ET 200SP modules connected to SIMATIC ET 200SP HA after the last SIMATIC ET 200SP HA module on the mounting rail. As some of them are not part of the SIMATIC PCS 7 system portfolio, they can be integrated with addon solutions.

- SIWAREX Weighing modules
- Buerkert pneumatic valves
- CM PtP - Modbus Advanced Library
- SITRANS Library

More details are available in System brochure SIMATIC ET200SP HA at SiePortal:

SIMATIC ET 200SP HA Distributed I/O system (ID: 109747953)

Additional ET 200SP HA modules:

Which additional modules can be used on the SIMATIC ET 200SP HA and what do you have to watch out for in the slotting sequence? (ID: 109811985)

ET 200SP CM PtP – Modbus RTU Master Library:

Modbus Advanced for ET 200SP HA with CM PtP– Master (ID: 109822812)

SIMATIC PCS 7 Add-On Catalog:

Catalog ST PCS 7 AO - Add-ons for the SIMATIC PCS 7 Process Control System (ID: 109745636)

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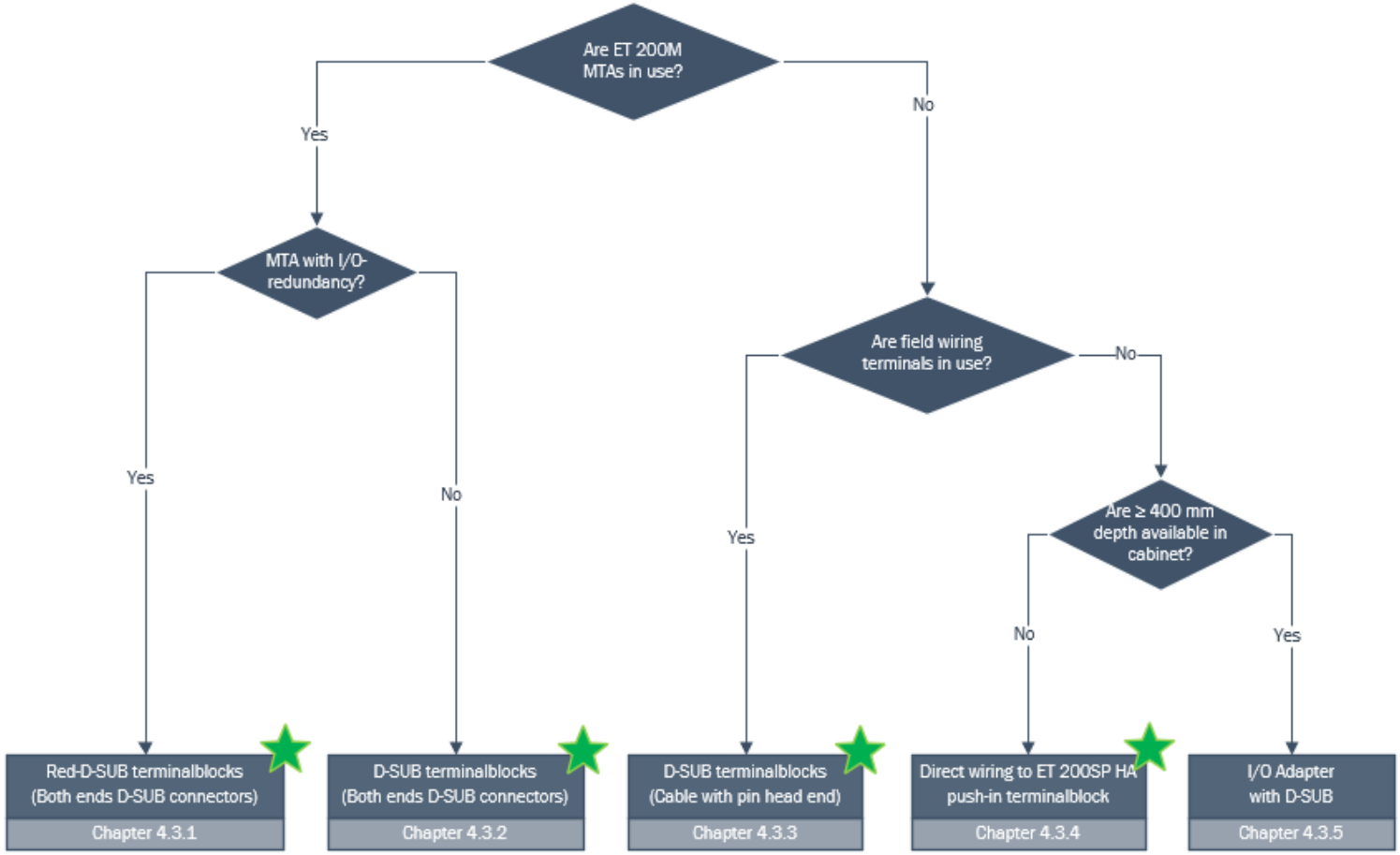
4.3. Field wiring

The field wiring between field devices like sensor or actuators to SIMATIC ET 200SP HA modules can be realized in different ways, the graphic below shows various options how D-SUB terminal blocks can be used upgrading SIMATIC ET 200M.



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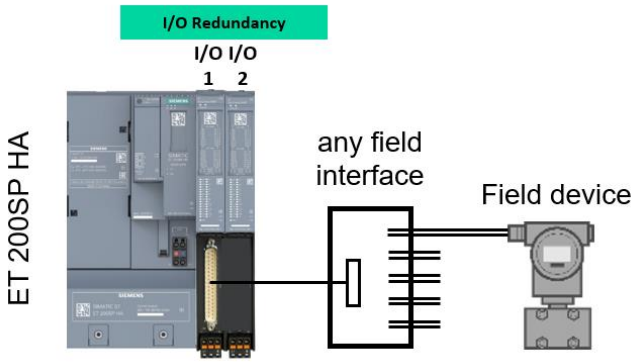
4.3.1. Redundant D-SUB Terminal blocks

In the past, SIMATIC ET 200M provided I/O-Redundancy based on two independent SIMATIC ET 200M modules or stations, where an MTA was required to feed one signal from the sensor onto two channels at the periphery. The redundancy of the signal was realized inside the S7 400 CPU by software.

The SIMATIC ET 200SP HA IO redundancy concept is slightly different, with the consequence, that there is no need to MTAs or special software libraries anymore. The field wiring can be kept by using any field interfaces with D-SUB connecter instead of MTAs, directly connected to the redundant D-SUB terminal block at the SIMATIC ET 200SP HA station.



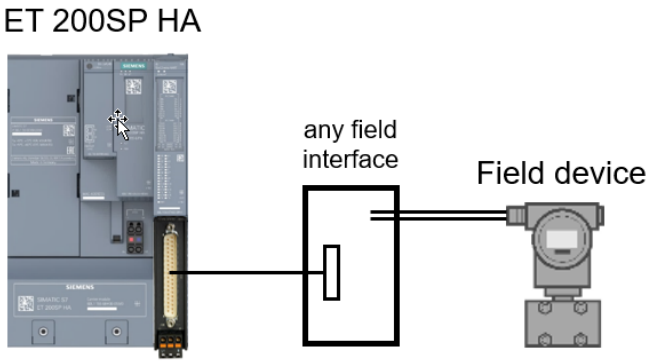
More details are available at SiePortal:

SIMATIC ET 200SP HA Distributed I/O system (ID: 109747953)

Sales and Delivery Release: Terminal blocks with D-SUB connector for SIMATIC ET 200SP HA distributed I/O system (ID: 109793826)

4.3.2. D-SUB Terminal blocks (D-SUB at both ends)

Pre-commissioned D-SUB cables and matching field interfaces are offered by third party vendors specifically developed for usage with SIMATIC ET 200SP HA D-SUB terminal blocks e.g. Weidmueller or Phoenix Contact. These solutions are easy applicable and robust against mounting mistakes with self-commissioned cables.



More details are available at SiePortal:

SIMATIC ET 200SP HA Distributed I/O system (ID: 109747953)

Sales and Delivery Release: Terminal blocks with D-SUB connector for SIMATIC ET 200SP HA distributed I/O system (ID: 109793826)

Delivery release: Two new types of connecting cable for SIMATIC ET 200SP HA from SIMATIC TOP connect (ID: 109954708)

4.3.3. D-SUB Terminal blocks (D-SUB with pin head end)

Any field terminal or signal management in between field devices and the SIMATIC ET 200SP HA, can also be connected with pre-commissioned D-SUB cables with pin head ends at one side, making it fast and easy to replace the existing SIMATIC ET 200M IO periphery.

More details are available at SiePortal:

SIMATIC ET 200SP HA Distributed I/O system (ID: 109747953)

Sales and Delivery Release: Terminal blocks with D-SUB connector for SIMATIC ET 200SP HA distributed I/O system (ID: 109793826)

Delivery release: Two new types of connecting cable for SIMATIC ET 200SP HA from SIMATIC TOP connect (ID: 109954708)

4.3.4. Direct wiring to ET 200SP HA Push-In Terminal blocks

Connecting the field signals directly to standard SIMATIC ET 200SP HA push-in terminal blocks, is always the preferred solution, whenever no field terminals are being used. Compared to SIMATIC ET 200M, the push-in terminal blocks are an advantage against vibration to screw terminals.
Furthermore it is not necessary to install resistors to not used reserve channels, as it is possible to deactivate every single channel separately.

4.3.5. IO Adapter ET 200M to ET 200SP HA

Whenever the available shutdown which is available for the upgrade of the periphery system is very limited, the time-consuming loop-check becomes an issue to the responsible project manager. One smart solution is the usage of IO Adapters, where the existing wiring of SIMATIC ET 200M can be mounted into an adapter which connects the signals with pre-commissioned D-SUB cable to D-DUB terminal blocks at SIMATIC ET 200SP HA.

ET 200M	ET 200SP HA	Function
6ES7321-1BL00-0AA0	6DL1131-6BL00-0PH1	DI 32Ch 24V DC
6ES7321-7BH01-0AB0	6DL1131-6BH00-0PH1	DI 16Ch 24V DC
6ES7321-7TH00-0AB0	6DL1131-6TH00-0PH1	DI 16Ch NAMUR
6ES7322-1BL00-0AA0	6DL1132-6BL00-0PH1	DQ 32Ch 24V DC
6ES7322-8BH10-0AB0	6DL1132-6BH00-0PH1	DQ 16Ch 24V DC
6ES7331-7HF01-0AB0	6DL1134-6TH00-0PH1	AI 8Ch current 2-wire
6ES7331-7PF01-0AB0	6DL1134-6JH00-0PH1	AI 8Ch RTD 2-3-4-wire
6ES7331-7PF11-0AB0	6DL1134-6JH00-0PH1	AI 8Ch TC
6ES7331-7TF01-0AB0	6DL1134-6TH00-0PH1	AI 8Ch current 2-wire HART
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch voltage measurement
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch current 2-wire
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch current 4-wire
6ES7331-7KF02-0AB0	6DL1134-6AF00-0PH1	AI 8Ch R/T-measurement
6ES7332-5HF00-0AB0	6DL1135-6TF00-0PH1	AQ 8Ch current 2-wire
6ES7332-8TF01-0AB0	6DL1135-6TF00-0PH1	AQ 8Ch current2-wire HART

More details are available at SiePortal:

IO adapter for upgrade from ET 200M to ET 200SP HA (ID: 109823570)

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5. PCS 7 Project

The third major aspect to be considered, is the SIMATIC PCS 7 project, what are the changes within the upgrade procedure and which tools are available to reduce the effort and avoid faults made by mistake implementing the changes.

PROFINET	Periphery	PCS 7 Project
I/O-Controller	Dimensions	HW-Configuration
Fieldbus cable	Modules	Symbolic
	Field wiring	User program

The next chapters will provide decision trees to covers the three subcategories with helpful documents and recommendations to point out which steps are mandatory to do, how they can be resolved.

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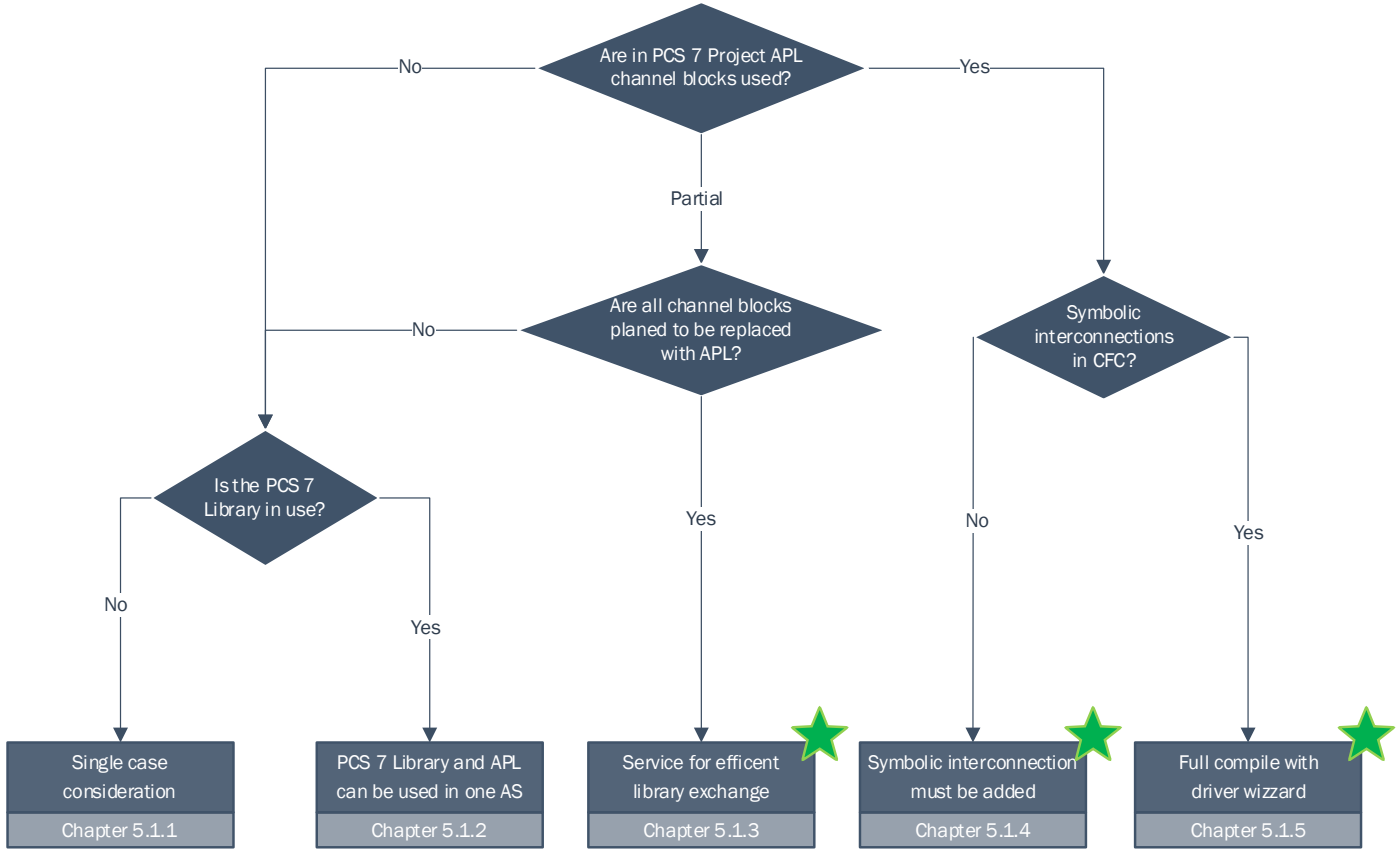
5.1. User program

The usage of APL V9 channel blocks are mandatory in SIMATIC PCS 7 environments, to use ET 200SP HA. But it is not necessary to change the technological function blocks to APL also, nor it is necessary to change all PCS Library blocks in the AS to APL in every case. The following decision tree will help you find out what is necessary to do.



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5.1.1. Single case consideration

In rare case there might neither the APL nor the PCS 7 Library was used to integrate SIMATIC ET 200M to SIMATIC PCS 7 projects, for example if a s branch specific library is in use. Such cases should be evaluated, to find a suit able upgrade strategy for the customer.

In case of doubts or if another solution is used instead of PCS 7 Library or APL, please contact your responsible regional technical consultant to figure out the best way to prepare the project for SIMATIC ET 200SP HA.

5.1.2. PCS 7 Library and APL in one AS

There are no possibilities using the PCS 7 Library with SIMATIC ET 200SP HA modules, but this does not necessarily mean all channel blocks must be replaced at once, when some measuring points will be kept with SIMATIC ET 200M.

- APL V9 Channel blocks for all ET 200SP HA based measuring points
- PCS 7 Library V7.1 SP3 Update 4 for PCS 7 Library based measuring points

NOTE	Even if it is possible to use PCL Library and APL simultaneously in one AS it is not recommended. It would be better to have the old blocks replaced, e.g. by the Upgrade Factory service (see section 5.1.3). Additionally, the SIMATIC ET 200M is also supported by APL.

More details are available at SiePortal:

When extending your existing SIMATIC PCS 7 system with one or more ET 200SP HA modules, how can you use their functions? (ID: 109811013)

5.1.3. Service for efficient library exchange

SIEMENS provides Upgrades of existing SIMATIC PCS 7 projects as a Service. Depending on the actual state of the project and the used components, the Upgrade Factory provides a wide range of “a la carte” services to carry out SIMATIC PCS 7 upgrade starting with software upgrades only up to complete modernization projects including hardware, FAT and on-site commissioning.

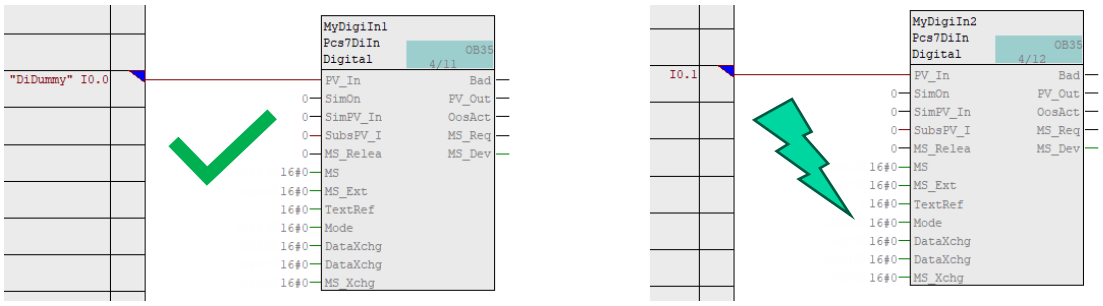
More details are available at SIEMENS Digital Enterprise service Portal:

Upgrade Factory

In case of doubts, please contact your responsible regional technical consultant to figure out the best way to prepare the project for SIMATIC ET 200SP HA.

5.1.4. Symbolic interconnection

A symbolic interconnection within the CFC charts at the channel blocks are recommended. When the symbolic connections to the APL channel block for SIMATIC ET 200M already exists, the final stage of the upgrading to SIMATIC ET 200SP HA is a compile with driver wizard, after the hardware configuration has been changed and the symbolic table was updated.



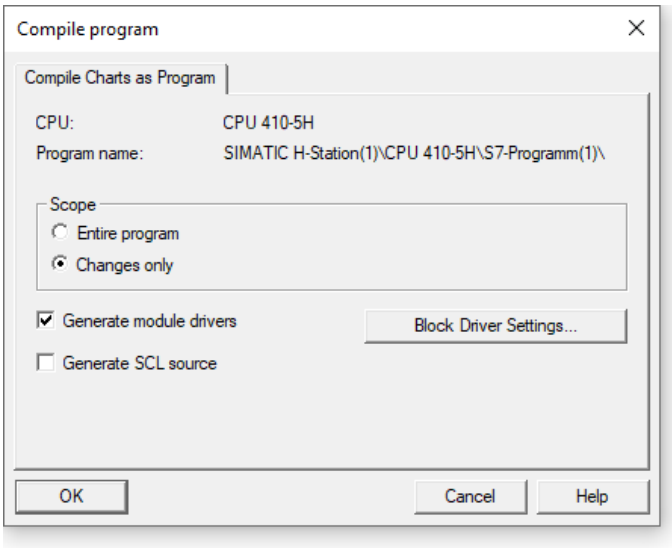
NOTE

Without symbolic interconnection, all addresses of SIMATIC ET 200SP HA must be modified by the engineer manually, as the existing address space will be extended by quality information bits (QI-Bits).

5.1.5. Compile with driver wizard

The final step, to prepare to project for download to the S7 400 CPU is compiling the charts with driver generator – all required diagnostics will be generated automatically. Pre-conditions are:

- ET 200SP HA configured in HW-Config
- Symbolic addresses updated
- APL channel blocks



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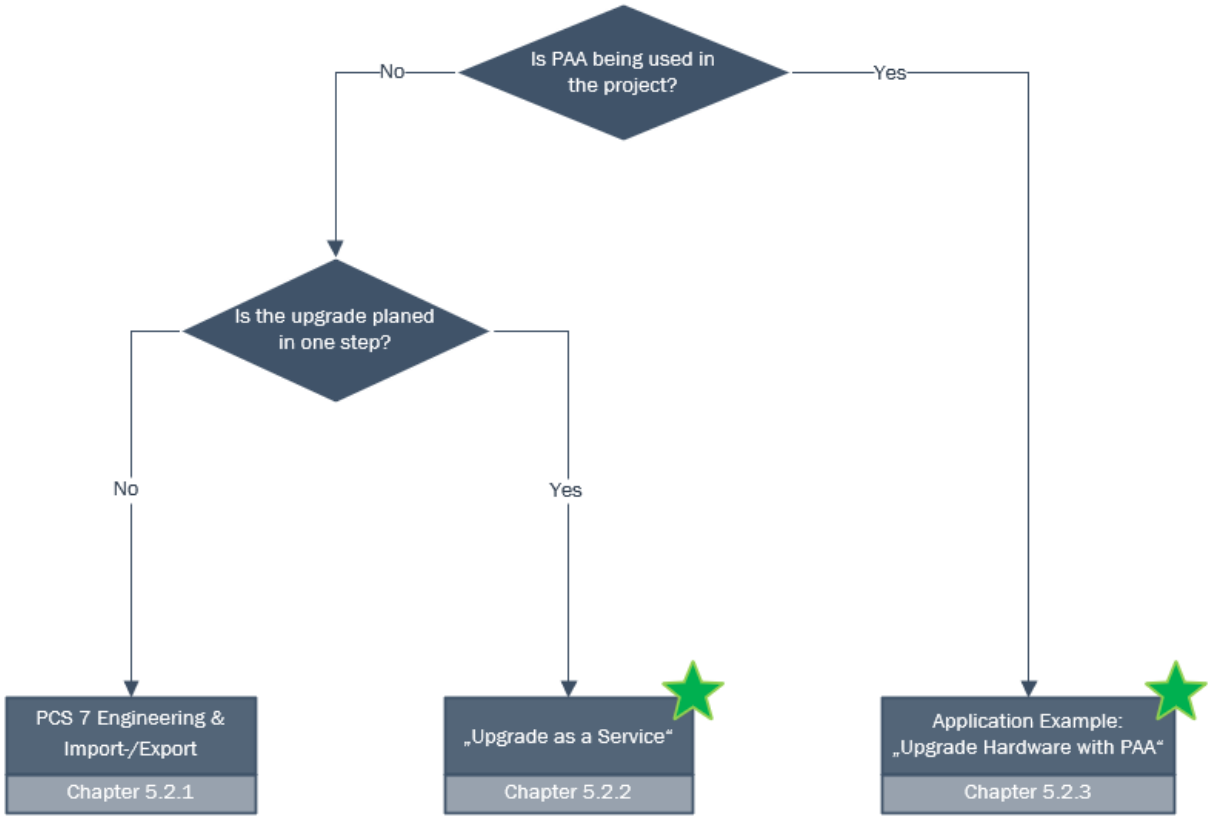
5.2. HW Configuration & Symbolic

To apply the required changes to the Hardware configuration, the Plant Automation Accelerator (PAA) is a powerful software tool – nevertheless it is not mandatory, but it might save a lot of engineering work.



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5.2.1. PCS 7 Engineering & Import/Export

All changes at an existing SIMATIC PCS 7 project can be realized with standard PCS 7 functions and mechanism, including the Import- & Export function of the symbol table.

For small projects or continuous small upgrades as a part of a long term upgrade strategy, this might be sufficient, but with increasing project size, alternatives as described in chapter 5.2.2 “Upgrade as a Service” or chapter 5.2.3 “Application Example: Upgrade Hardware with PAA” should be considered, as they have the potential to save a lot of engineering effort.

5.2.2. Upgrade as a Service

SIEMENS provides Upgrades of existing SIMATIC PCS 7 projects as a Service. Depending on the actual state of the project and the used components, the Upgrade Factory provides a wide range of “a la carte” services to carry out SIMATIC PCS 7 upgrade starting with software upgrades only up to complete modernization projects including hardware, FAT and on-site commissioning.

More details are available at SIEMENS Digital Enterprise service Portal:

Upgrade Factory

5.2.3. Application Example: Upgrade Hardware with PAA

During the planning- and detail-engineer-phase of an SIMATIC ET 200M to SIMATIC ET 200SP HA upgrade project, the SIMATIC PCS 7 Plant Automation Accelerator (PAA) software solution can simplify tasks and helps with efficient engineering. E.g., with the hardware configuration tool to create the SIMATIC ET 200SP HA hardware or queries to set the HW parameters by bulk engineering or to copy the symbol from SIMATIC ET 200M channel to the SIMATIC ET 200SP HA channel.

Additional Information how to upgrade an existing project to SIMATIC ET 200SP HA can be found at the following application example at SiePortal:

Upgrade from ET 200M to ET 200SP HA via PAA (ID: 109823905)

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6. Appendix

6.1. 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:

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:

siemens.com/SupportRequest

SITRAIN – Digital Industry Academy

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:

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:

support.industry.siemens.com/cs/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:

support.industry.siemens.com/cs/ww/en/sc/2067

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6.2. Industry Mall

The Siemens Industry Mall is the platform on which the entire siemens Industry product portfolio is accessible. From the selection of products to the order and the delivery tracking, the Industry Mall enables the complete purchasing processing – directly and independently of time and location:
mall.industry.siemens.com

6.3. Application support

Siemens AG
Digital Industries Division
Process Automation
DI PA AE SUP SPS
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

6.4. Links and literature

Table 6-1

Nr.	Thema
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/109824203

6.5. Change documentation

Table 6-2

Version	Date	Modifications
V1.0	08/2023	First version
V2.0	03/2025	Added information about Ex I/O, general update

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