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Configuration Examples for S7-400H with PROFINET

SIMATIC S7-400H as of V6.0

http://support.automation.siemens.com/WW/view/en/66644434

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1 Introduction

Purpose of this document

The topic of “fault tolerance” comprises a number of application options, including the field level as well as the connection to the plant PCs.

As of V6.0 for the H-CPUs, PROFINET can now also be used as field bus.

This opens a number of connection possibilities, varying more or less regarding complexity and application case.

The document on hand shows a number of such connection options; for the field level, for the connection of plant PCs to the H-controllers, and for the combination ob both.

This gives you an overview of the configurations which can be realized with PROFINET. Additional notes on advantages and selection criteria complete the statements made in order to support you in planning the application of an H-CPU or an H system.

PROFIBUS/PROFINET

This document focuses on configurations with PROFINET. All previous statements on configurations with PROFIBUS remain valid independent of PROFINET. PROFIBUS and PROFINET have no mutual impact on each other.

Required knowledge

Understanding this document requires

- general SIMATIC knowledge
- basic knowledge on H systems
- basic knowledge on the PROFINET communication standard

The terms “system redundancy” and “media redundancy”, frequently used in this document, are explained in the chapters below.

Usable H-CPUs

All statements in this document refer to H-CPUs as of version 6.0.

Topics not covered by this application

The following points are not covered in this document:

- configuration instruction
- communication with PROFIBUS
- communication via radio

2 System and Media Redundancy

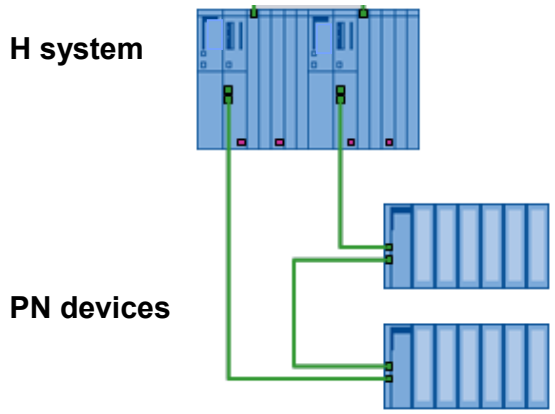
What will you learn here?

The terms “system redundancy” and “media redundancy” are frequently used in this document. To also address readers without previous experience in the application of H systems or PROFINET, these terms were explained first before looking at the individual configuration options in the subsequent chapters.

System redundancy

Requirement for realizing the system redundancy is the application of an H system. The H system consists of two fault-tolerant controllers (master and reserve CPU). If one H-CPU fails, the other automatically takes over.

System redundancy is a connection of IO devices via PROFINET (PN devices), for which there is a communication connection between each PN device and each of both H-CPUs (see picture below).



The IO devices need to support the system redundancy; otherwise, they can be operated in the same network, however only one of both H-CPUs can be assigned (unilateral periphery).

The used topology (line, star, ring) plays no role for the system redundancy. This distinguishes the system redundancy from the media redundancy.

System redundant periphery is often also referred to as switched I/O. This does **not** refer to the fault tolerance between I/O groups or systems.

An example for switched I/O (system-redundant I/O) are PN devices, which support the system redundancy and can be assigned to an H system (e.g. ET 200M). In contrast, the ET 200S, for example, can only be assigned to an H-CPU unilaterally (no H system).

Media redundancy

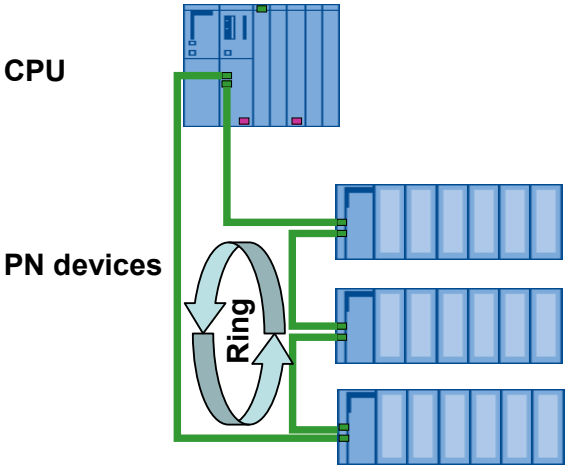
Media redundancy ensures the network availability and contributes to increasing the plant availability.

The ring topology is used here. The media redundancy protocol (MRP) ensures that when one transmission path fails, an alternative communication path is available.

The nodes with PROFINET interface interconnected in the ring use MRP as of V6.0, if MRP-capable. MRP is part of the PROFINET standardization according to IEC 61158.

For media redundancy with MRP, one device is the media redundancy manager (MRM), all other devices are redundancy clients. In the picture below, the CPU is the MRP-Manager.

In the case of a failed connection, the MRM selects the alternative communication path.



Context

System and media redundancy have no mutual impact on each other.

3 Functionalities of the H-CPUs as of V6.0

This chapter gives you supplementary and compact information on updates for the H-CPUs as of V6.0. This information is an extract for a brief overview and does not claim to be complete.

Synchronization module

- New synchronization modules, however, cables as before (connector of HF-Sync interfaces is compatible with the previous one)
- Color coded local and remote coupling at the locking clamp.
  - black refers to local coupling (6ES7 960–1AA06–0XA0)
  - blue refers to remote coupling (6ES7 960–1AB06–0XA0)
- Furthermore, exchange under voltage possible
- Additional diagnosis of synchronization modules (temperature, aging, …)

PROFINET interface

- User data transfer
  - In the H system, a maximum of 256 PN devices is supported at both integrated PN interfaces. It does not matter whether these can be configured unilateral or switched.
- For an I-Device, only unilateral operation is possible.
- The H-CPU itself cannot be operated as I-Device.
- Shared device viewed from the IO controller (only in single operation)
- Media redundancy (MRP); changeover time approx. 200ms
- System redundancy
- Time synchronization
  - The synchronization occurs via MMS time-of-day messages (Manufacturing Message Specification). The advantage of this method is the generally higher precision as opposed to the NTP method.
- Supporting the device exchange without exchangeable medium
- Not supported:
  - H-CiR for PROFINET
  - Web server
  - CBA

Note The connection of an external IO controller (CP) is not supported in V6.0 of the H-CPU.

- Various functionalities of the CP 443-1 also exist in the integrated PROFINET interface (S7 clock time synchronization, H-connections,…)

Master/reserve changeover

The master/reserve changeover (MRU) can also be programmed (SFC 90 “H-CTRL”).

4 Configuration Examples

What will you learn here?

In this chapter you find configuration options for operating a single H-CPU or an H system in PROFINET networks.

For better clarity, the connection with the field level and the connection with the plant PCs are initially displayed separately. Subsequently, possible combinations of both connection options are displayed.

The chapter on hand is divided into the following sub-chapters:

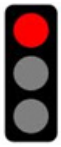
- Chap. 4.1: PROFINET communication between H-CPU and **field level**
- Chap. 4.2: PROFINET communication between H-CPU and **plant PCs**
- Chap. 4.3: **combination** of field level and plant PC

This chapter provides you with an overview on the possible H configurations and when to replace the CP 443-1 with the internal PN interface.

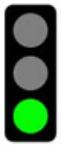
4.1 Communication between H system and field level via PROFINET

In this chapter, possible configurations between the H system and the field level are considered and various respective failure scenarios discussed.

The pictures of the failure scenarios are marked with a signal light for better clarity. The following convention applies:



Availability cannot be compensated

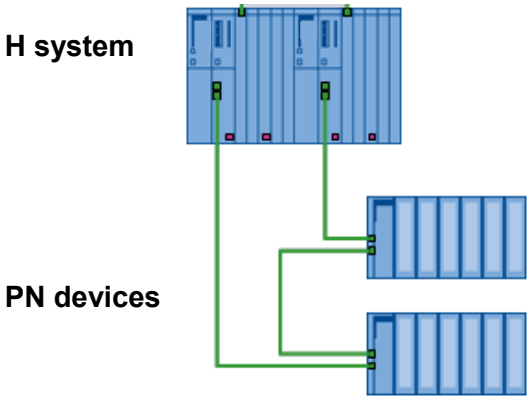


Availability is mantained

4.1.1 Standard configuration “open ring”

Description

The picture below shows a system-redundant connection in a so-called open ring.



For the open ring, the PN devices are set up as single channel. After the H system has gone from single operation to redundant system state, both H-CPUs process the same program in synchronism. However, process data are only exchanged with the PN device by one H-CPU.

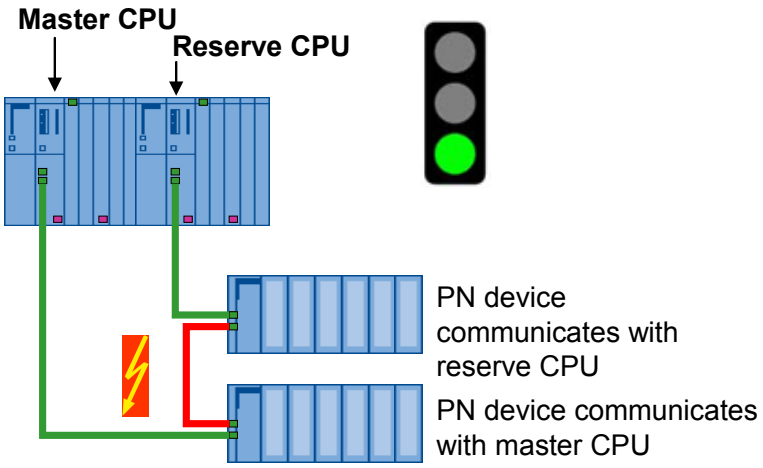
The function of the controller remains at the following faults:

- failed master CPU, since the reserve CPU automatically takes over.
- failed I/O station
- wire break

For I/O station failure or wire break, the respectively accessible I/O stations are controlled by both H-CPUs (advantage over a non-H system).

Failure scenarios

The picture below shows a media failure due to wire break as a failure scenario example.

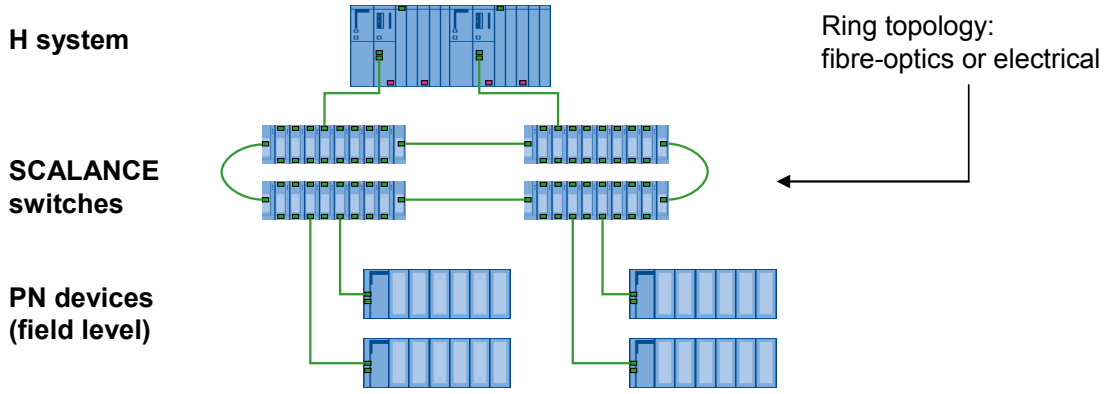


To maintain the functionality by the system redundancy it is unnecessary here which of the three connections fails. Both PN devices can exchange process data with the respective controller process data.

4.1.2 Star-connected PN devices at the MRP ring

Description

The subsequent picture shows the application of an H system for controlling PN devices of the field level. The PN devices are connected at the MRP ring in star topology



In this configuration, the system as well as the media redundancy can become effective:

system redundancy is enabled by using an H system.

The system redundancy is supplemented by media redundancy which is achieved by a ring-interconnection of the (external) SCALANCE switches.

Combining media and system redundancy can compensate an additional error (failure of an H-CPU) on top of a media failure.

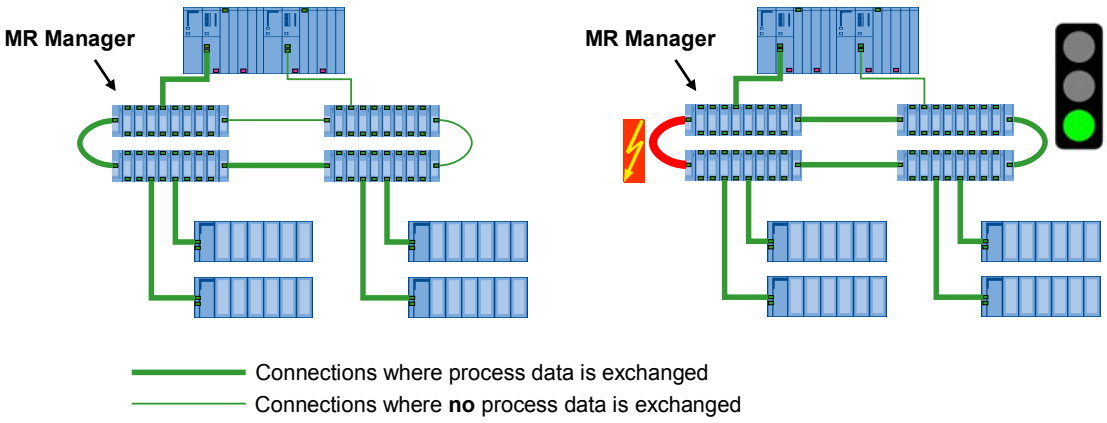
System and media redundancy have no mutual impact on each other.

All ring nodes must be compatible with the media redundancy protocol (MRP). The hardware components that can be used as media redundancy manager (MRM) are available in the following entry:

http://support.automation.siemens.com/WW/view/en/23498599

Failure scenario 1: effects of the media redundancy

The following pictures show the path changes through the MRP after a media failure.

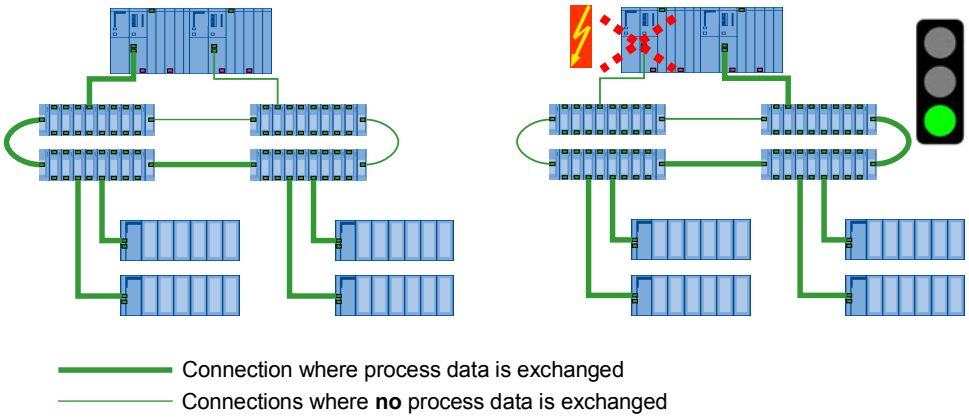


The master CPU exchanges process data with the PN devices (left picture).

When a connection fails (media failure) within the ring (right picture) the MR manager ensures an alternative path to continue a guaranteed data exchange with the PN devices.

Failure scenario 2: effects of the system redundancy

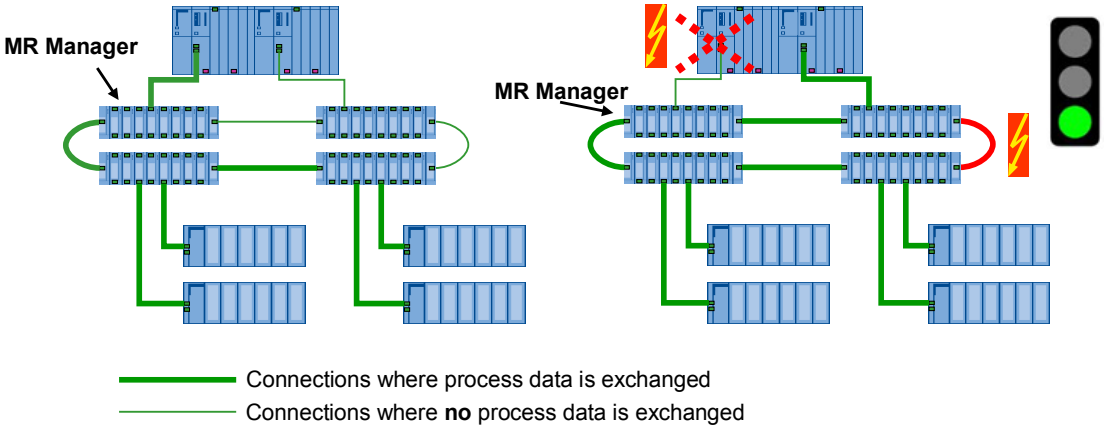
The pictures below show the path changes due to a failed master CPU.



The process is maintained bumpless by means of the reserve CPU. The media redundancy is not required for the failure scenario.

Failure scenario 3: effects of media and system redundancy

The pictures below show the path changes after a failed master CPU and a media failure in the (MRP ring).



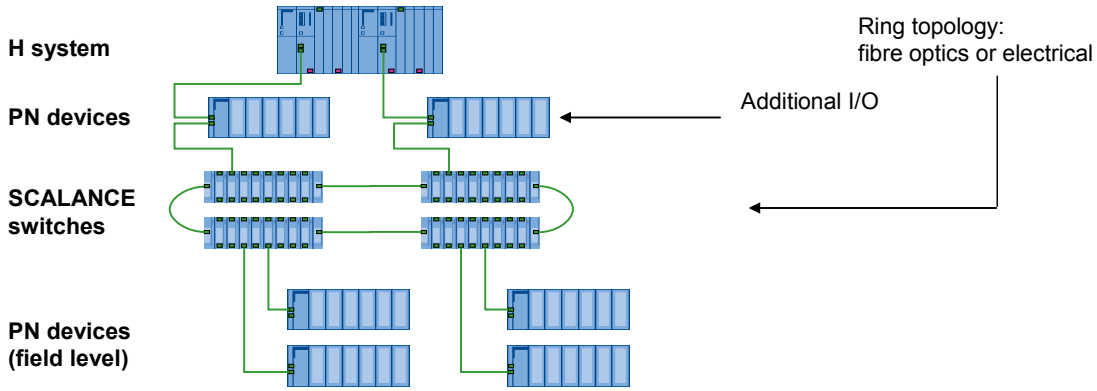
The availability remains due to the media and system redundancy. Despite of the failure of the master CPU and the failure of a ring-connection, the demanded functionality is maintained.

4.1.3 Star-connected PN devices at the MRP ring in the ring feed

Description

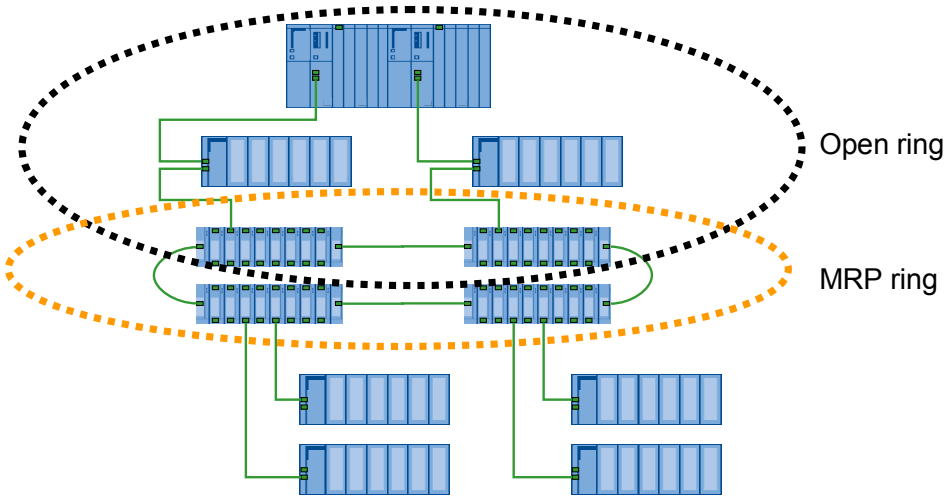
The picture below shows the application of an H system for controlling PN devices of the field level. The PN devices are connected at a MRP ring in star topology

In contrast to chapter 4.1.2, there is additional periphery here between the H-CPUs and the MRP ring.



SCALANCE switch in the ring

Each SCALANCE switch is still located in only one ring (maximum number permitted). Apart from the MRP ring, the additionally integrated periphery creates an additional open ring, however, this variant is permitted for a SCALANCE switch to maintain media redundancy. An open ring is not considered a ring here.

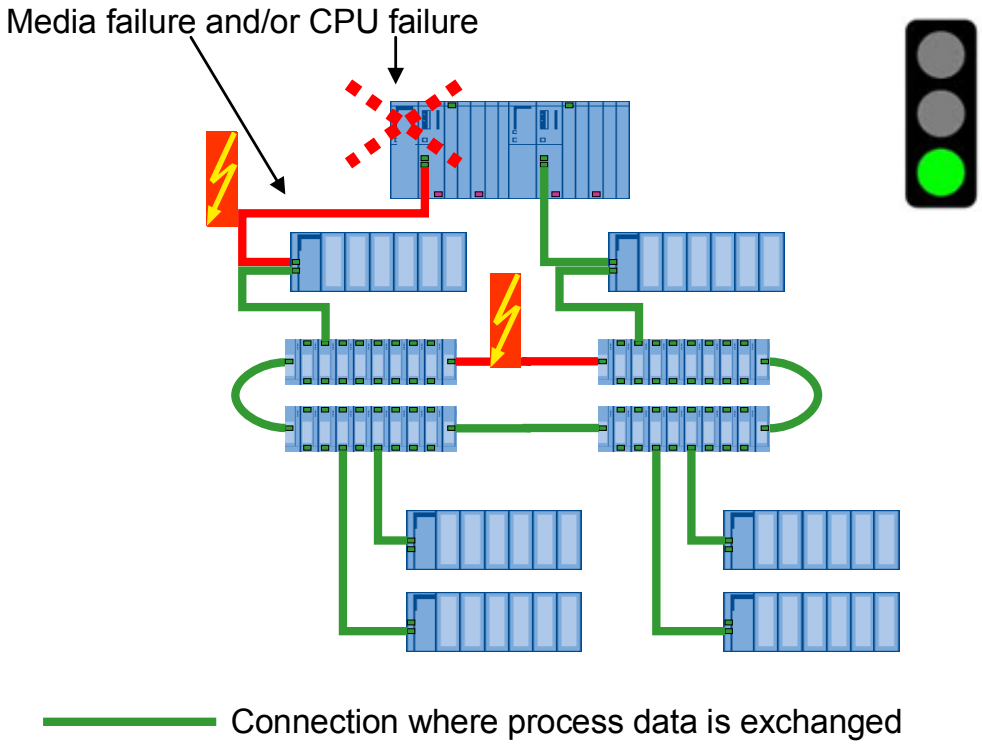


All ring nodes must be compatible with the media redundancy protocol (MRP). The hardware components that can be used as media redundancy manager (MRM) are available in the following entry:

http://support.automation.siemens.com/WW/view/en/23498599

Failure scenario: media failure and/or CPU failure

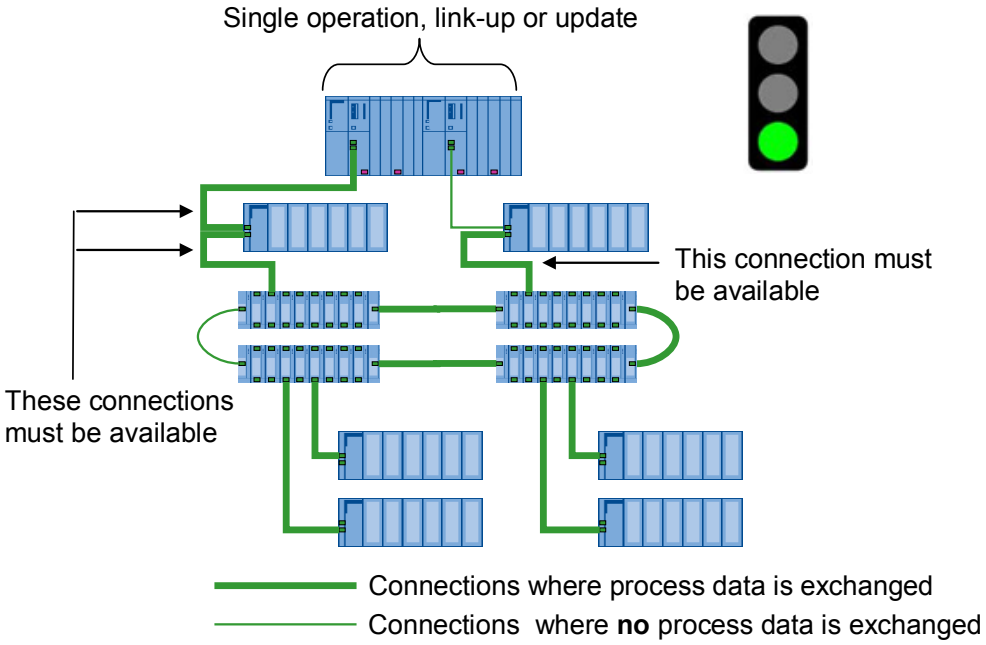
The picture below shows a failure scenario in which the availability of the system is maintained even though there are several failures.



When the master CPU and/or the connection from the master CPU fails, the overall system can tolerate a further media failure in the MRP ring. It is irrelevant here at which point the MPR ring is disconnected.

For this scenario, which shows a combination of system and media redundancy, all intact connections for the exchange of process data are not necessary.

Generally the following applies: in the system states single operation, link-up or update for the S7-400H, the connections between the PN devices in the ring feed and the MRP ring must exist (see next picture). A failure of these connections in the so-called system states cannot be compensated regarding the overall availability.



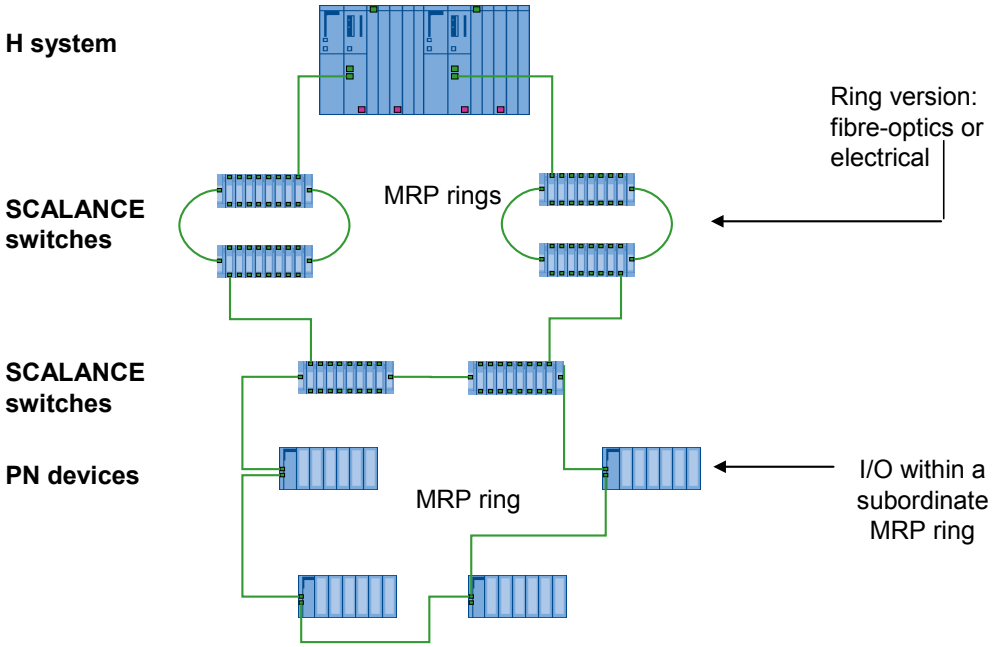
The hardware components that can be used as media redundancy manager (MRM) are available in the following entry:

http://support.automation.siemens.com/WW/view/en/23498599

4.1.4 MRP ring for distance bridging and in the subordinate ring

Description

The picture below shows the application of an H system for controlling the switched PN devices within a subordinate MPR ring of the field level.



Each H-CPU is preceded by an MPR ring via the PROFINET interface (two SCALANCE switches per H-CPU). It only serves for bridging the distance to the sub-ordinate MRP ring.

System redundancy is enabled by using an H system. The system redundancy is supplemented by media redundancy which is achieved by a ring-interconnection of the (external) SCALANCE switches.

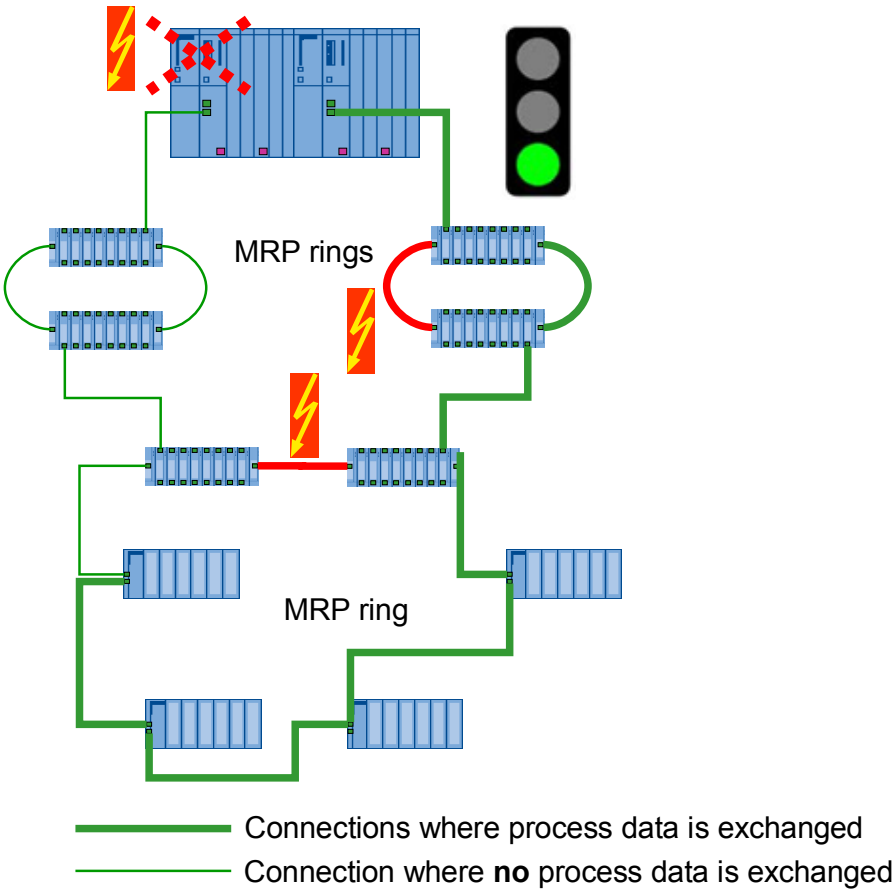
The sub-ordinate MRP ring need not necessarily be connected via SCALANCE switches, but can also be directly connected at the PN devices of the subordinate MRP rings; however, a prerequisite here is the compatibility of the ring nodes with the media redundancy protocol (MRP). A node is used here as media redundancy manager (MRM).

The hardware components that can be used as media redundancy manager (MRM) are available in the following entry:

http://support.automation.siemens.com/WW/view/en/23498599

Failure scenario 1: media failure in the upper and lower MRP ring

The picture below shows which further failures can still be compensated by the overall system after a CPU failure.



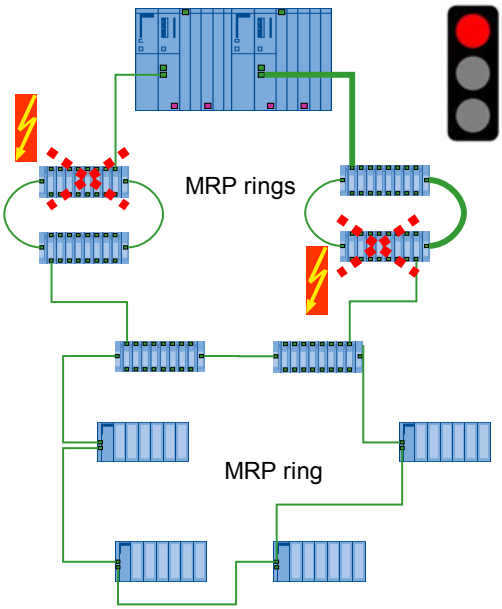
In addition to the failure of the master CPU, the following can fail in the line in which process data is exchanged:

- any connection in the upper MRP ring **and**
- any connection in the lower MRP ring.

The overall availability of the system still remains.

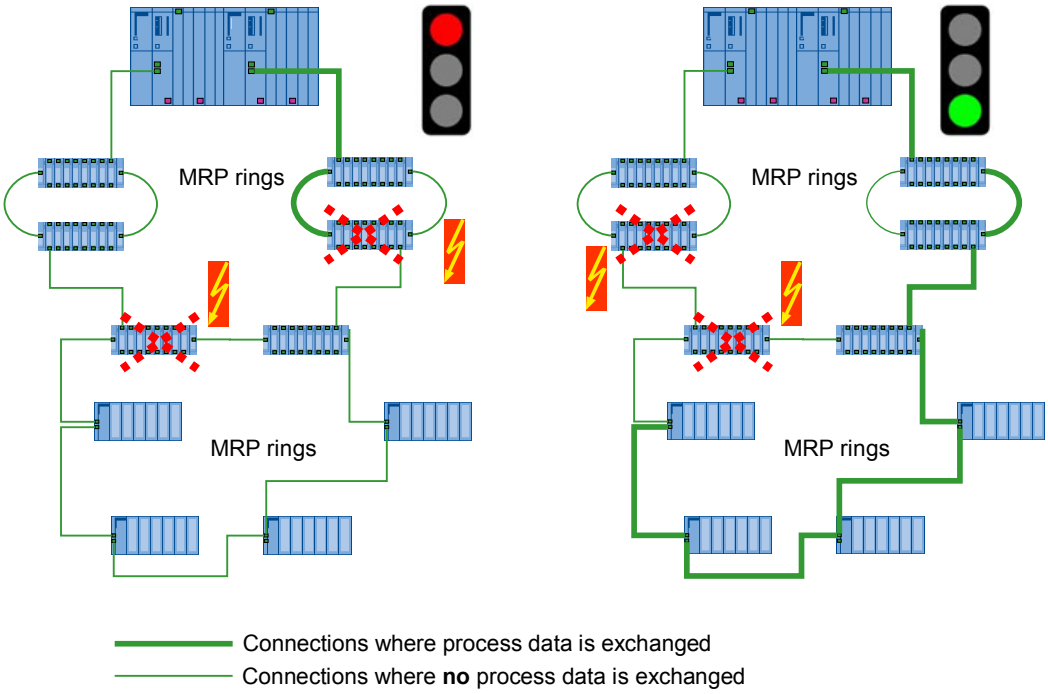
Failure scenario 2: failure of a SCALANCE switch in the upper MRP ring

A failure of a SCALANCE switch in any of both upper MRP rings cannot be compensated regarding the overall availability.



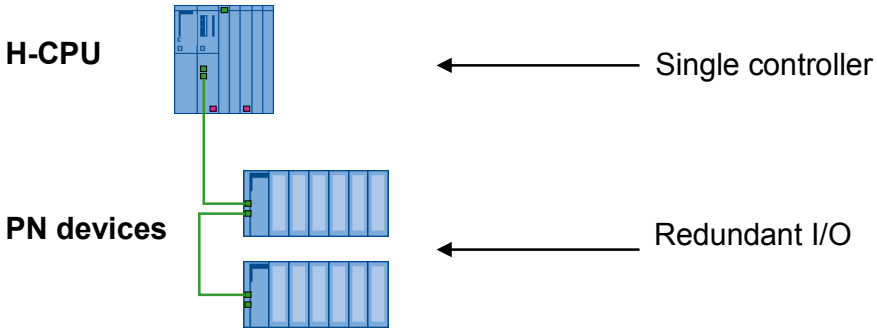
Failure scenario 3: failure of a SCALANCE switch in the upper and subordinate MRP ring

When a SCALANCE switch fails in the upper **and** in the subordinate MRP ring, it is important regarding the overall availability which SCALANCE switches fail.



4.1.5 Increasing the availability when using an H-CPU as single controller

The picture below shows an H-CPU as single controller. Redundant PN devices are connected via the internal PN interface.

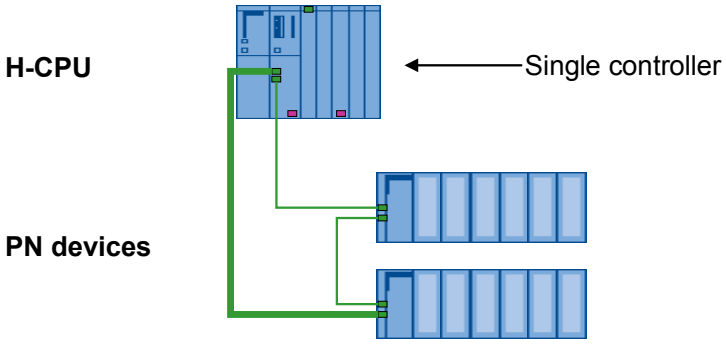


When an H-CPU (IO controller) fails, the entire process periphery is no longer available due to missing system redundancy.

When a PN device fails, the functionality of the redundant PN device can only be maintained if the subordinate of both PN devices in the line fails. If the upper PN device fails, the lower can no longer be accessed.

Increasing the availability

The availability of the PN devices can be increased in a simple way: An MPR ring can be established by an additional connection. A prerequisite is the MPR-capability of the nodes, where a node performs the function of the media redundancy master (MRM).

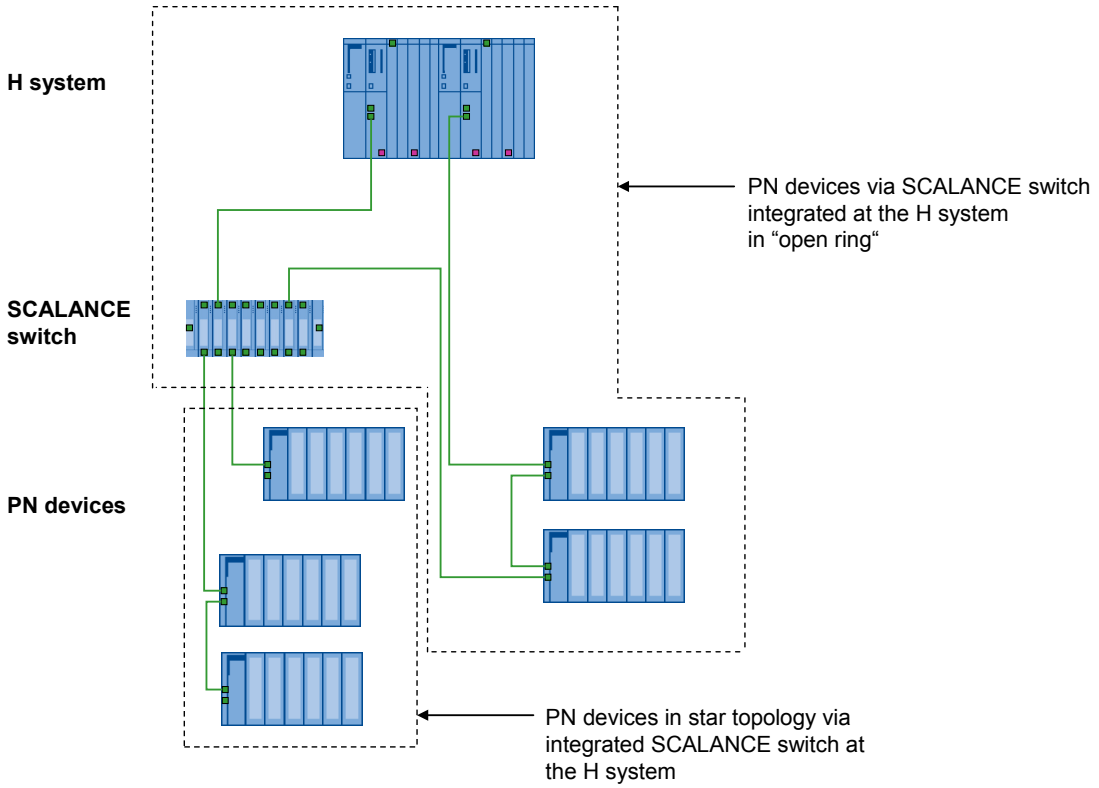


4.1.6 Switched PN devices via a switch integrated in the “open ring” and as single I/O via the same switch in star topology

Description

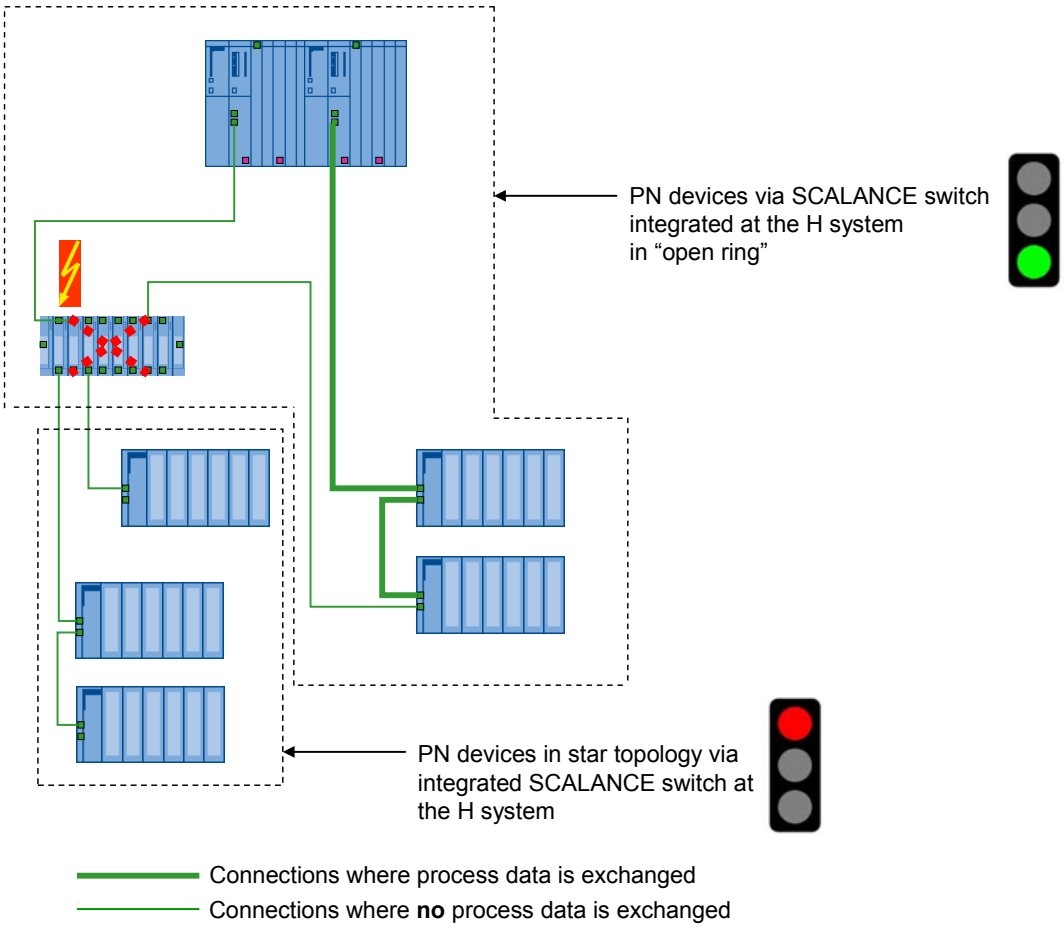
The picture below shows a PN IO configuration for which the periphery is connected to an H system via open ring and SCALANCE switch. Additionally, individual PN devices are connected via a star configuration.

Both H-CPUs (IO controller) each communicate via the internal PROFINET interface with the respective redundant assigned PN devices.



Failure scenario 1: failure of the SCALANCE switch

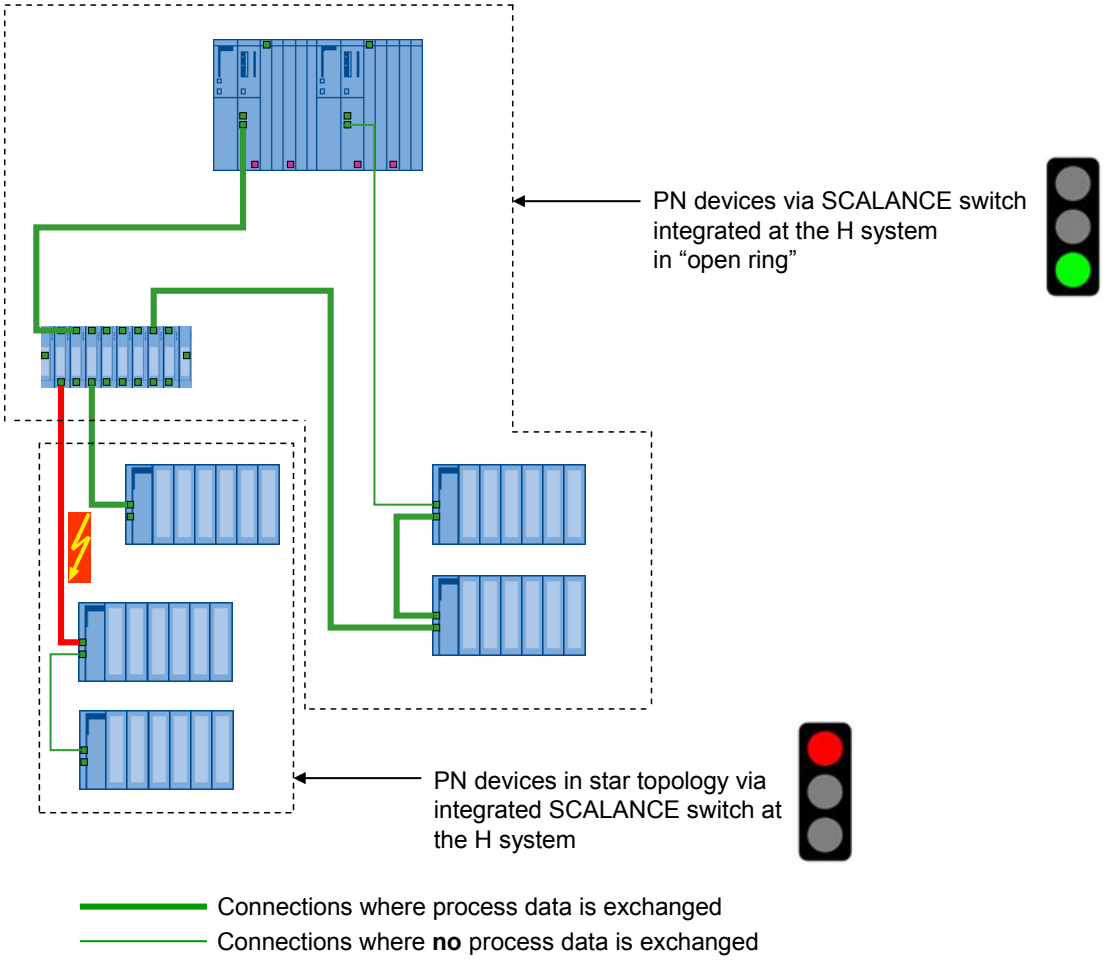
The pictures below show the effects during a failed SCALANCE switch.



A failure of a SCALANCE switch causes the PN devices connected in star topology to fail. The PN devices in the open ring remain available.

Failure scenario 2: media failure for PN device connected in star topology

The picture below shows the effects of a failed connection between SCALANCE switch and the PN devices connected in star topology.



In this example, the central PN switch connected in star topology fails. The availability of the lower PN switch could be increased by connecting it directly to the SCALANCE switch instead of the central PN device.

Otherwise, the following applies: for a connection failure of the PN devices connected in star topology, the PN device connected at the failed connection fails.

The PN devices of the open ring remain unaffected and are still available.

4.2 Communication between H-CPU and plant PCs

General

Due to their hardware and software properties, PCs are not fault-tolerant. However, they can be aligned redundant in a plant. The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy.

Communication takes place via fault-tolerant S7 connections. Connecting to PC stations via fault-tolerant S7 connections only supports Industrial Ethernet.

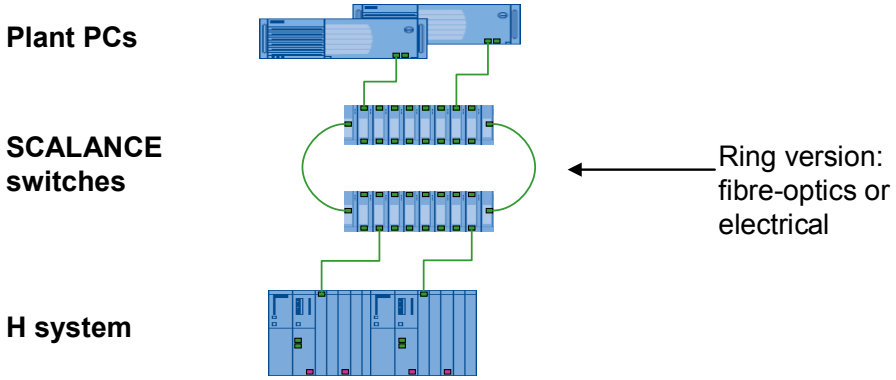
Using fault-tolerant S7 connections between a fault-tolerant system and a PC requires the "S7-REDCONNECT" software package on the PC. It permits connecting a PC to a network with a CP or at a redundant bus system with 2 CPs. Please use the latest version of this software. This software is part of the SIMATIC NET CD.

As of version 8.1.2, the communication via ISO-on-TCP is supported. The product information on the SIMATIC NET PC software informs you of the CPs you can use on the PC side.

4.2.1 PC connection to an H system via a single ring

Description

The picture below shows the application of an H system for communication with the plant PCs. Communication with an H system is performed via a single ring.



The application of two SCALANCE switches enables achieving media redundancy over larger distances (e.g. up to 26 km with SCALANCE X-200).

PC interface

As CP for the plant PC, the CP 1613, CP 1613 A2, CP 1623 or CP 1628 can be used (software package "S7-REDCONNECT" required).

For changing from CP 1613 A2 to CP 1623, certain requirements must be fulfilled. These are discussed in entry below.

http://support.automation.siemens.com/WW/view/en/50710358

The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy. Please use the latest version of this software.

Application software

Applicable software for communication between PC and H system are for example WinCC V7.2 or SIMATIC Net OPC, which access over the S7-REDCONNECT interface on the control level.

CP 443-1 or internal PN interface?

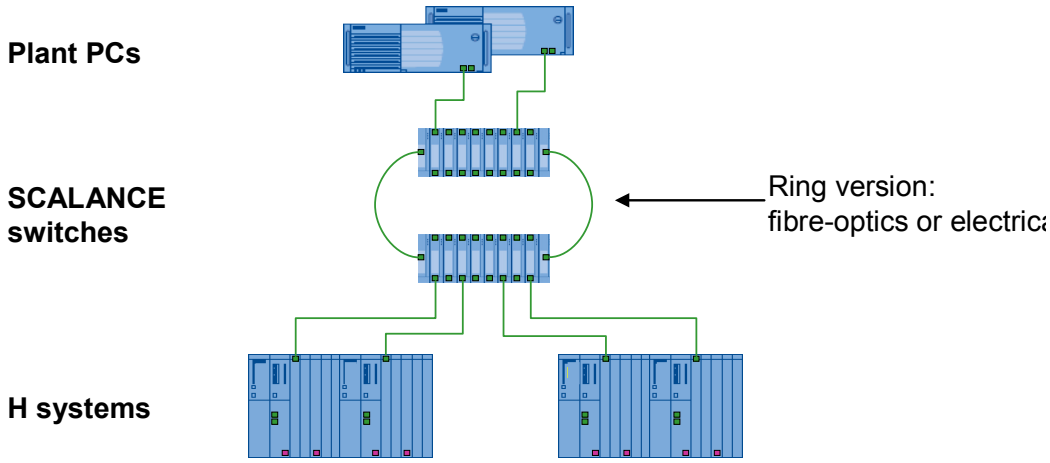
In the above picture the CP 443-1 is used (based on ISO or ISO-on-TCP). Alternatively, the PN interface can also be used (based on ISO-on-TCP).

The interne PN interface can perform PN-IO (integrating distributed field devices) and communication to other controllers at the same time. The distributed field devices must be PN-IO.

4.2.2 PC connection to two H systems via a single ring

Description

The figure below shows an expansion of the alignment from chapter 4.2.1, Instead of with one, the plant PCs communicate with two H systems. The connection for the communication is also handled via a single ring.



The application of two SCALANCE switches enables achieving media redundancy over larger distances (e.g. up to 26 km with SCALANCE X-200).

PC interface

As CP for the plant PC, the CP 1613, CP 1613 A2, CP 1623 or CP 1628 can be used (software package "S7-REDCONNECT" required).

For changing from CP 1613 A2 to CP 1623, certain requirements must be fulfilled. These are discussed in entry below.

http://support.automation.siemens.com/WW/view/en/50710358

The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy. Please use the latest version of this software.

Application software

Applicable software for communication between PC and H system are for example WinCC V7.2 or SIMATIC Net OPC, which access over the S7-REDCONNECT interface on the control level.

CP 443-1 or internal PN interface?

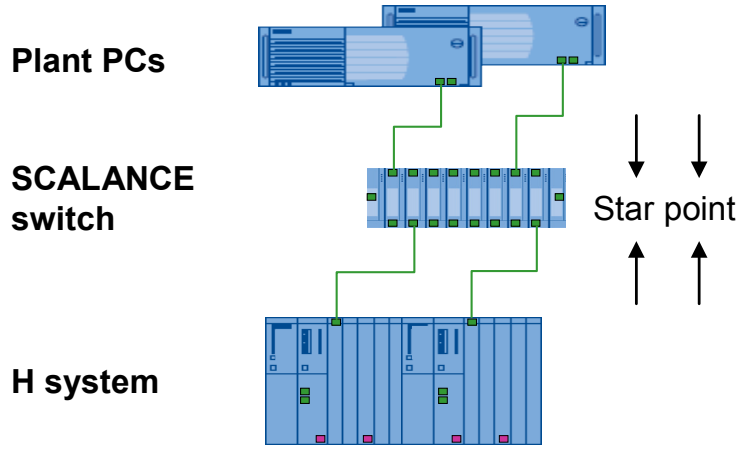
In the above picture the CP 443-1 is used (based on ISO or ISO-on-TCP). Alternatively, the PN interface can also be used (based on ISO-on-TCP).

The interne PN interface can perform PN-IO (integrating distributed field devices) and communication to other controllers at the same time. The distributed field devices must be PN-IO.

4.2.3 PC connection to one H system via a star point

Description

The picture below shows the application of an H system for communication with the plant PCs.



Additionally, a second SCALANCE switch (as in chapter 4.2.1 and 4.2.2) can be integrated. The higher procurement costs are countered by the option of reaching media redundancy across larger distances (e.g. up to 26 km with SCALANCE X-200).

PC interface

As CP for the plant PC, the CP 1613, CP 1613 A2, CP 1623 or CP 1628 can be used (software package "S7-REDCONNECT" required).

For changing from CP 1613 A2 to CP 1623, certain requirements must be fulfilled. These are discussed in entry below.

http://support.automation.siemens.com/WW/view/en/50710358

The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy. Please use the latest version of this software.

Application software

Applicable software for communication between PC and H system are for example WinCC V7.2 or SIMATIC Net OPC, which access over the S7-REDCONNECT interface on the control level.

CP 443-1 or internal PN interface?

In the above picture the CP 443-1 is used (based on ISO or ISO-on-TCP). Alternatively, the PN interface can also be used (based on ISO-on-TCP).

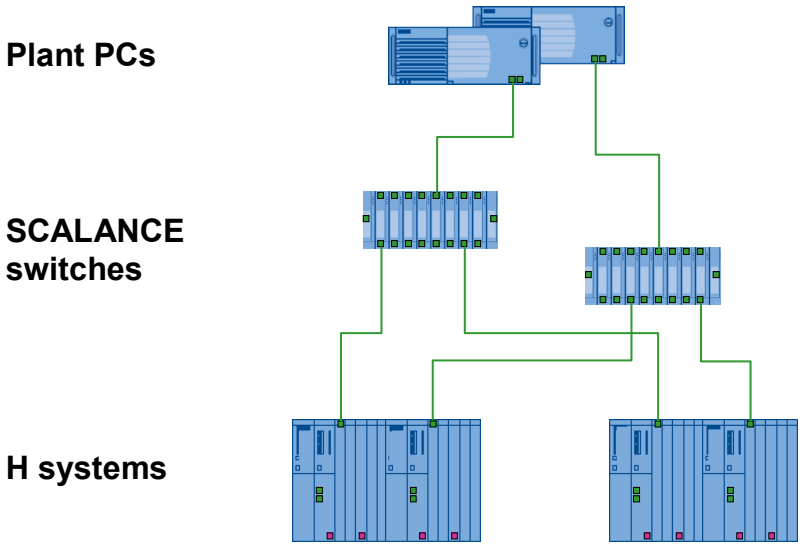
The interne PN interface can perform PN-IO (integrating distributed field devices) and communication to other controllers at the same time. The distributed field devices must be PN-IO.

4.2.4 PC connection to two H systems via two star points

Description

The picture below shows the application of two H system for communication with plant PCs of redundant design.

Each PC is directed to both H systems via line topology.



PC interface

As CP for the plant PC, the CP 1613, CP 1613 A2, CP 1623 or CP 1628 can be used (software package "S7-REDCONNECT" required).

For changing from CP 1613 A2 to CP 1623, certain requirements must be fulfilled. These are discussed in entry below.

http://support.automation.siemens.com/WW/view/en/50710358

The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy. Please use the latest version of this software.

Application software

Applicable software for communication between PC and H system are for example WinCC V7.2 or SIMATIC Net OPC, which access over the S7-REDCONNECT interface on the control level.

CP 443-1 or internal PN interface?

In the above picture the CP 443-1 is used (based on ISO or ISO-on-TCP). Alternatively, the PN interface can also be used (based on ISO-on-TCP).

The internal PN interface can perform PN-IO (integrating distributed field devices) and communication to other controllers at the same time. The distributed field devices must be PN-IO.

Increased availability

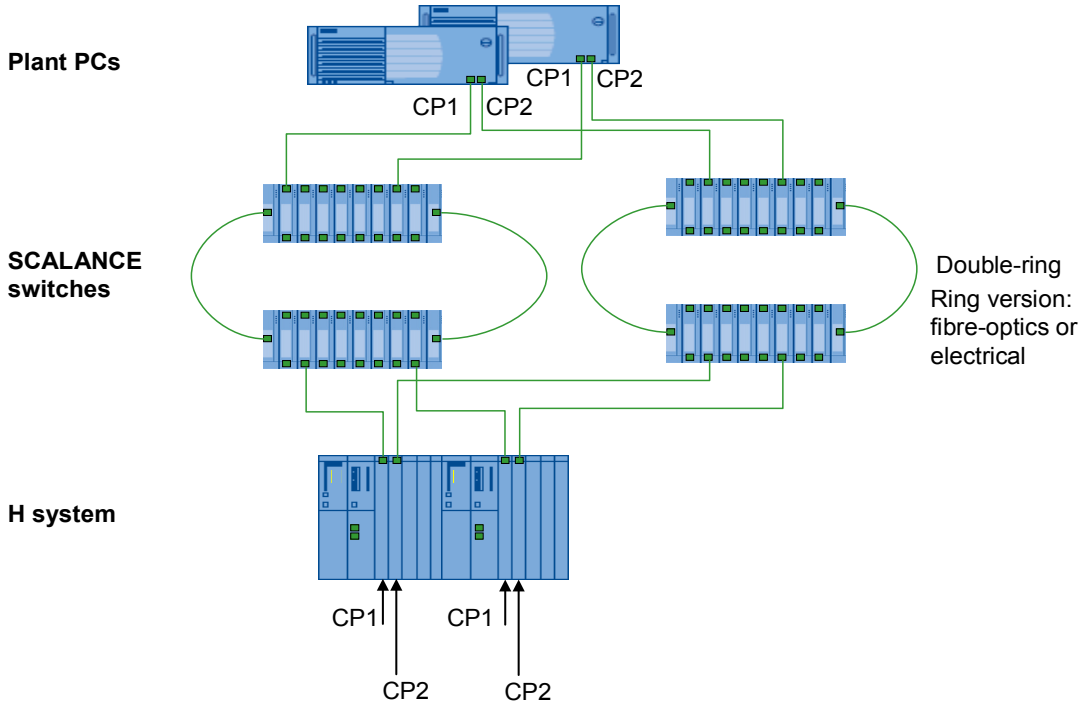
Optionally, both SCALANCE switches can also be interconnected to increase the availability, if desired and achievable.

4.2.5 PC connection to an H system via a double ring

Description

The picture below shows redundant plant PCs, with each PC having two CPs. The redundant communication connection is achieved via the double ring.

Two CPs are also assigned to each H-CPU of the H system (high degree of availability).



The application of two SCALANCE switches enables achieving media redundancy over larger distances (e.g. up to 26 km with SCALANCE X-200).

PC interface

As CP for the plant PC, the CP 1613, CP 1613 A2, CP 1623 or CP 1628 can be used (software package "S7-REDCONNECT" required).

For changing from CP 1613 A2 to CP 1623, certain requirements must be fulfilled. These are discussed in entry below.

http://support.automation.siemens.com/WW/view/en/50710358

The availability of such a PC system and its data management is ensured by a suitable software such as WinCC Redundancy. Please use the latest version of this software.

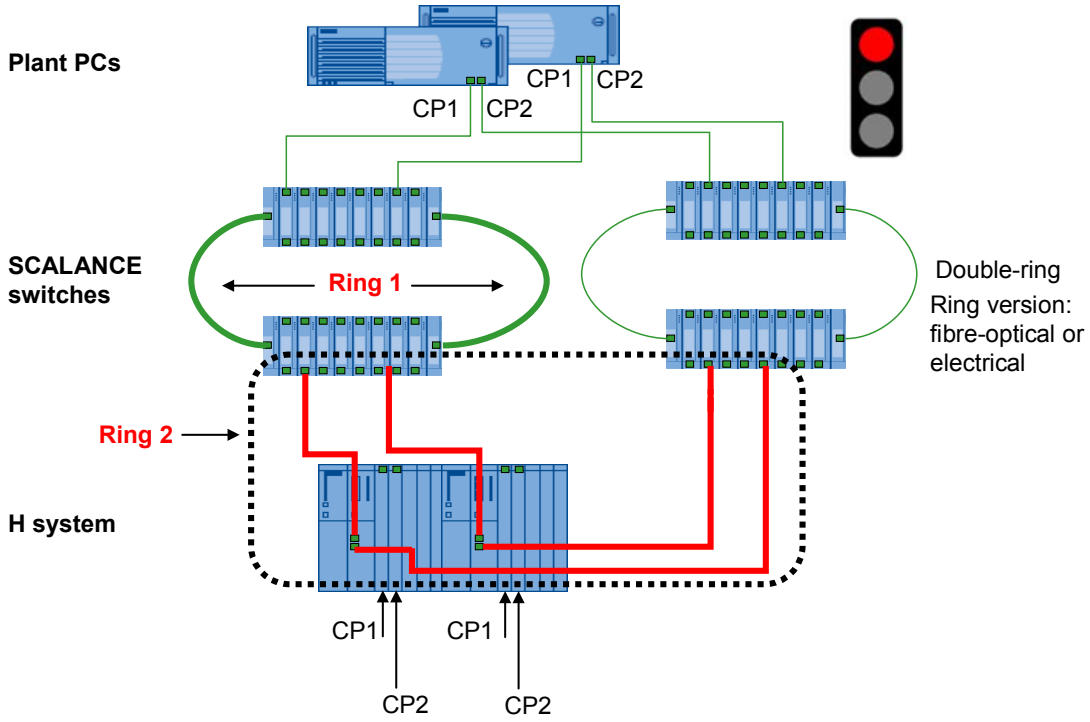
Application software

Applicable software for communication between PC and H system are for example WinCC V7.2 or SIMATIC Net OPC, which access over the S7-REDCONNECT interface on the control level.

CP 443-1 or internal PN interface?

In the above picture, the CP 443-1 is used. The PN interface cannot be used.

The picture below shows, that a SCALANCE switch will be located in two rings, if the internal PN interface is applied.



4.3 Interfaces of the H system between superimposed PCs and subordinate field levels

What is this about?

When setting up the communication with H systems, there are basically two options for integrating the H-CPU:

- using a CP 443-1 or
- using the internal PN interface

This chapter checks various configuration variants for preference.

In the preceding chapters 4.1 and 4.2 we have already made these considerations; in this chapter we additionally evaluate the networks which are created when superimposed PCs and I/O of the subordinate field level are connected to an H system together.

Why not generally use the PN interface?

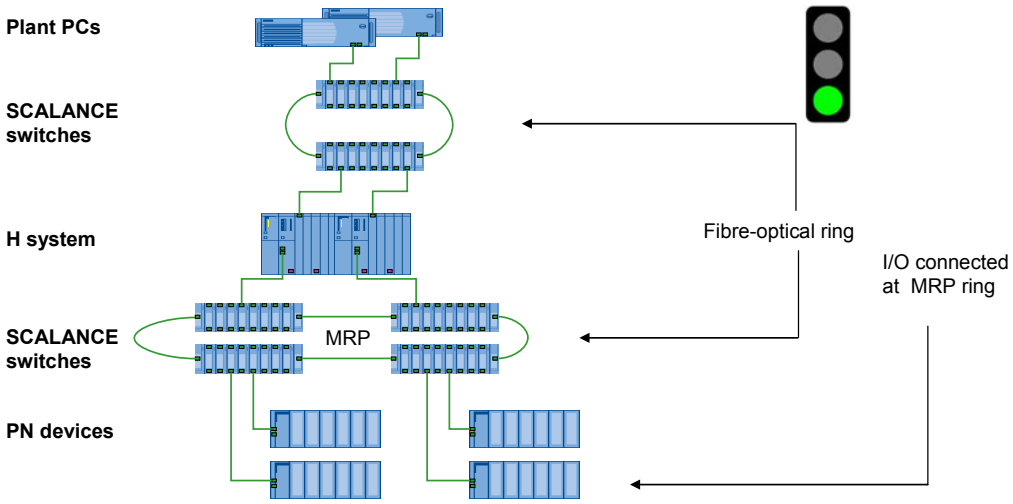
In configurations in which the H system shall be integrated in a combination of superimposed plant PCs and I/O of the field level, multiple rings for the SCALANCE switches can easily occur.
Each SCALANCE switch, however, must only work in one ring in order to guarantee media redundancy.

Multiple rings can be avoided using CP 443-1 (instead of the internal PN interface).

Note Depending on the configuration, in may happen, that a SCALANCE switch is located simultaneously in a ring and in an open ring. Such a configuration is permitted for maintaining media redundancy for a SCALANCE switch. An open ring is not considered a ring here.

4.3.1 Star-connected via single ring and switched PN devices in star topology at the MRP ring

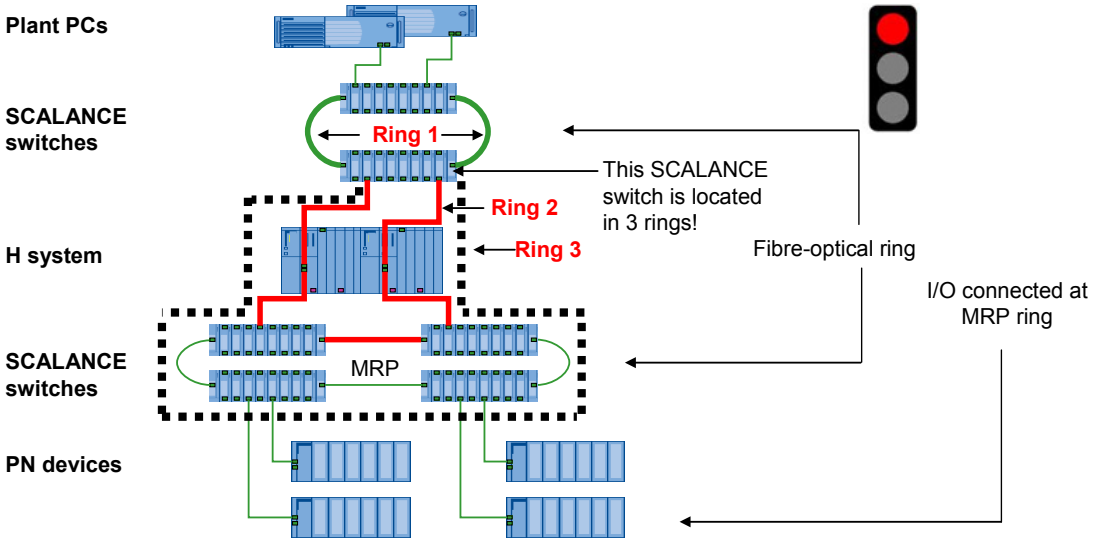
The picture below shows the usage of the CP 443-1 (PC connection) and the PN interface (subordinate field level).



The SCALANCE switches above the H system for connecting the plant PCs are used for bridging the distance and can use the MRP (not mandatory). There are several possibilities of a redundancy mechanism for bridging occurring failures, such as

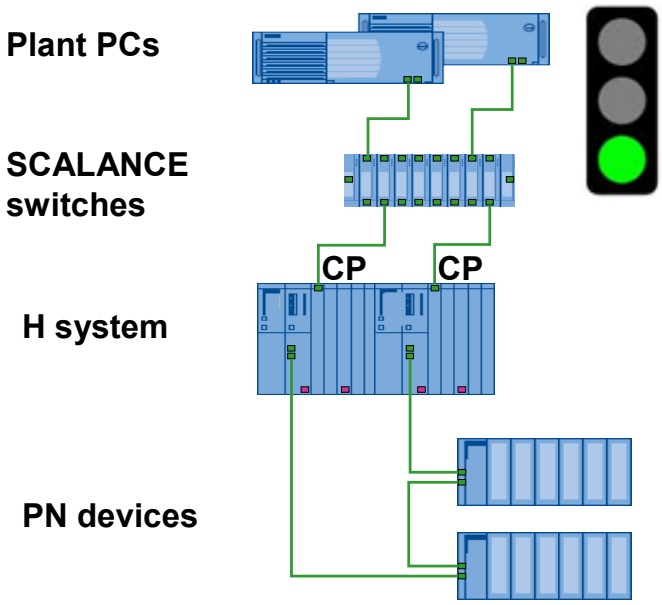
- High Speed Redundancy (HSR)
- Spanning Tree (SPT)
- Rapid Spanning Tree (RSPT)

The CP 443-1 can in this configuration not be replaced by the internal PN interface, since this produces multiple rings (see picture below).

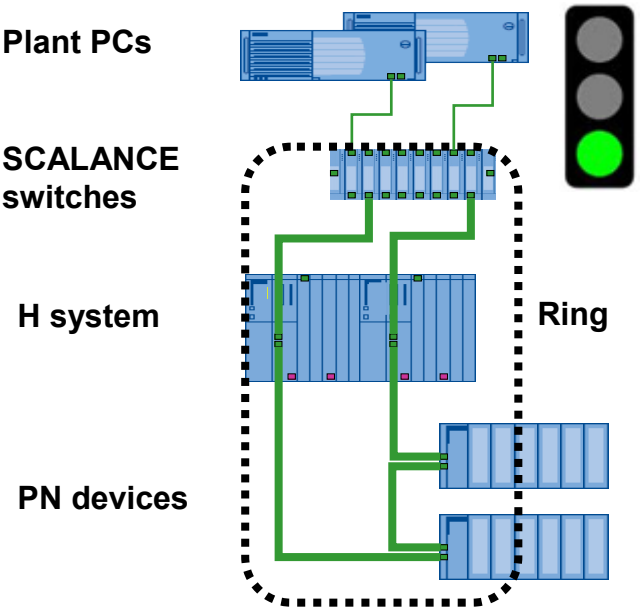


4.3.2 PC connection to an H system via CP 443-1 and standard configuration open ring

The picture below shows the usage of the CP 443-1 (PC connection) and the PN interface (subordinate field level).

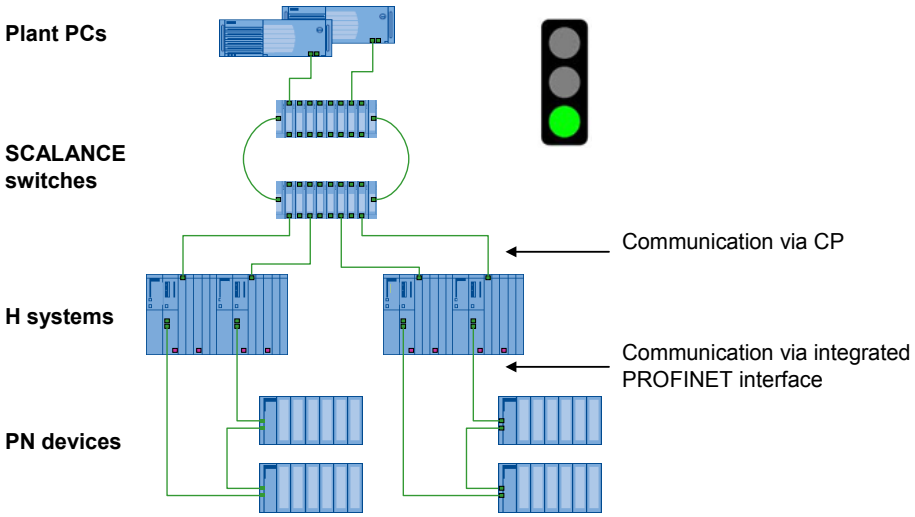


The SCALANCE switch is not integrated in any ring. If the CPs 443-1 are replaced by the PN interface, a ring is produced (next picture). For this configuration, the CP 443-1 can be replaced by the PN interface.

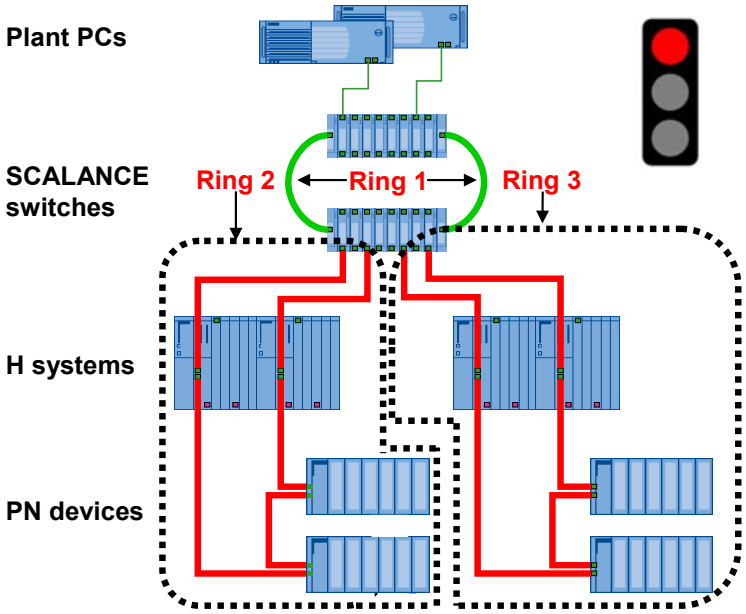


4.3.3 PC connection to two H systems via CP 443-1 and standard configuration “open ring”

The picture below shows the usage of the CP 443-1 (PC connection) and the PN interface (subordinate field level).



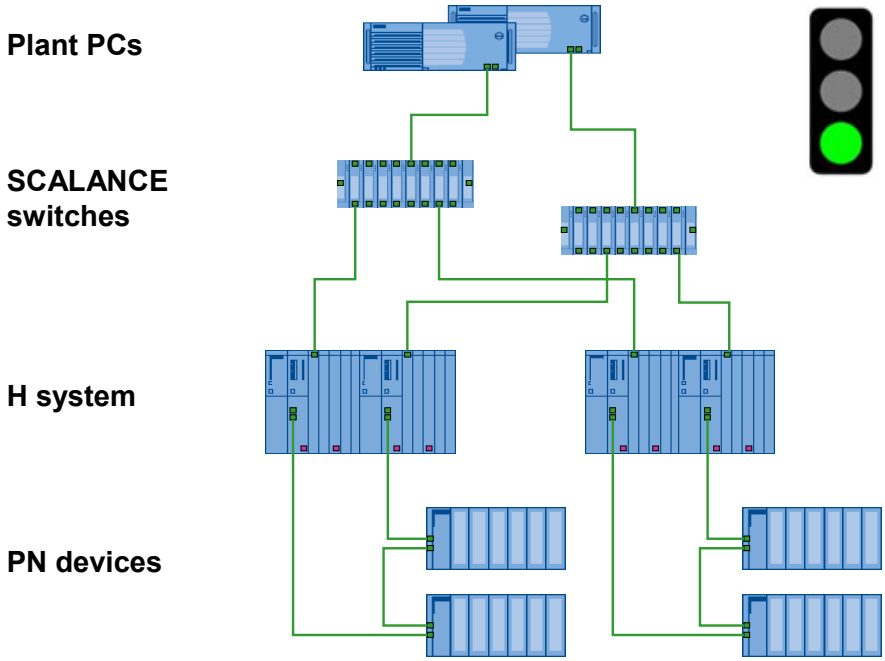
Each SCALANCE switch is located in a ring. If the CPs 443-1 are replaced by the PN interface, a total of three rings is produced (next picture). For this configuration, the CP 443-1 cannot be replaced by the PN interface.



Rings 2 and 3 are not located within the open ring between PN device and H system (compare chapter 4.1.3, where the SCALANCE switch is located within an open ring which is not counted as a ring).

4.3.4 PC connection via double-line and standard configuration “open ring”

The picture below shows the usage of the CP 443-1 (PC connection) and the PN interface (subordinate field level).



For this configuration, the CP 443-1 can be replaced by the PN interface.

5 Further Points to consider

General information

Generally, there are various options for realizing the application of H-CPUs or H systems. Regarding the setup options, we have introduced some concise example configurations in the previous chapters.

Additionally, there are further points which should also be considered. A number of these points is represented below in a compact format.

CP or PN interface?

The decision for or against an external CP or the internal PN interface at the H-CPU depends on various considerations.

The decision always stretches across the overall consideration of the network. Multiple rings for the SCALANCE switches must not be created.

When using the internal PN interface, the H-CPU, for example, can be integrated into a ring. Furthermore, there are no more costs for the CP 443-1.

On the other hand, the CP 443-1 gives you the option of setting up additional communication paths. A slot reservation should always be planned for the PC connection.

Common Cause Failure

For the topic of redundancy, the common cause failure must always be taken into account. It is switched before and in line with the redundancy, i.e. an error affects all successive redundant equipment which cuts off the availability.

An example noted here are tripping hazards as common case failure at the plant PCs. In such a case, both PC cards would be affected, which would cut off the availability.

MTBF

The application of redundant modules strongly increases the MTBF (Mean Time Between Failure) of a system. The MTBF specifies the average operating time between two failures and is therefore a measure of the reliability of a module or a system.

The MTBF can either be statistically determined via system which are in operation, or be calculated via the failure rates of the employed components.

MTBF values for SIMATIC components are given together with further explanations on the MTBF under the following link:

http://support.automation.siemens.com/WW/view/en/16818490

Switching times for MRP

The switching times for MRP depend on the ring. The changeover time of 200 ms applies here for maximal 50 PN devices in the ring.

Fault-tolerant and fail-safe

Together with an additional license, your H system does not only enable fault-tolerance but fail-safety as well. The PROFIsafe safety profile used there can also be used for PROFINET, so your fault-tolerant and fail-safe application runs via a the same communication bus.

6 Related literature

Reference

The following list is by no means complete and only provides a selection of appropriate information.

Table 6-1

	Topic	Title
\1\	Siemens Industry Online Support	Automating with STEP 7 in STL and SCL Author: Hans Berger Publicis MCD Verlag ISBN 978-3-89578-412-5
		http://support.automation.siemens.com/WW/view/en/66644434

Internet Links

Table 6-2

	Topic	Link
\1\	Link to this document	http://support.automation.siemens.com/WW/view/en/66644434
\2\	Siemens Industry Online Support	http://support.automation.siemens.com
\3\	System Manual S7-400H	http://support.automation.siemens.com/WW/view/en/60458386

7 History

Table 7-1

Version	Date	Modifications
V1.0	01/2013	First issue
V1.1	01/2013	Changed picture in chapter 2
V1.2	02/2014	Additions in chapter 4.2