PROFIBUS • PROFINET

# PROFINET

# The leading Industrial Ethernet Standard

## The Benefits of PROFINET

# New Functions available in the Market



**Overview**

**MRP**

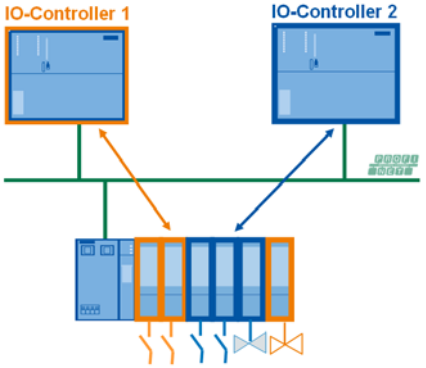
**Shared Device**

**I-Device**

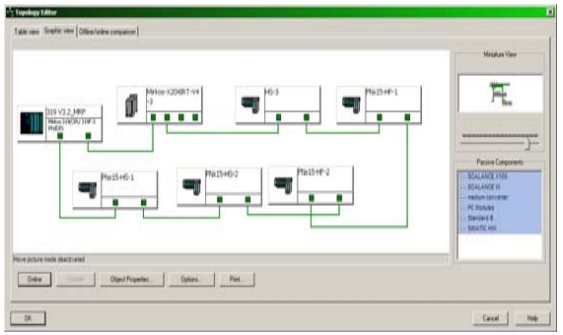
**Web on Controller**

## New Functions of PROFINET

- Shared-Device
  - Access from multiple IO-Controllers to one IO-Device




- I-Device (Intelligent Device)
  - Controller as Intelligent IO-Device



- Redundancy
  - MRP – Media Redundancy Protocol
- Web on Controller
  - Userdefined Web Pages
- IRT and Clocksynchronisation (OB6x)


# MRP – Media Redundancy Protocol



Overview
MRP
Shared Device
I-Device
Web on Controller

- IEC 61158-5-10
- Edition 1.0 2007-12

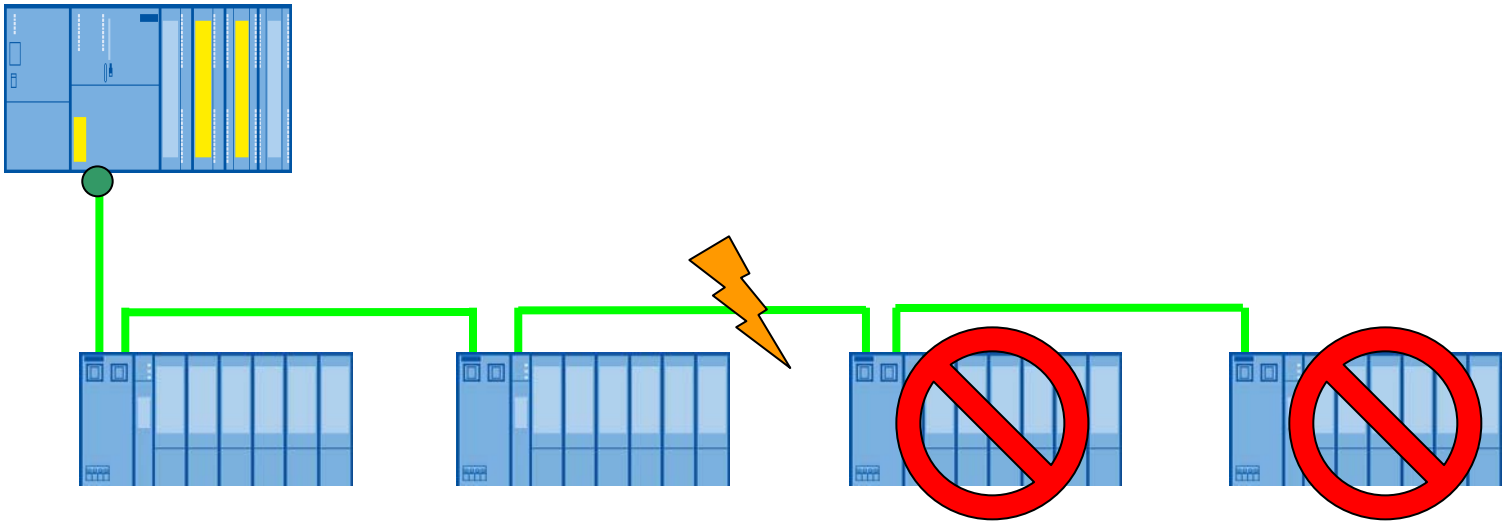
**INTERNATIONAL Standard**

- Based on ring topology.
- Max. number (50) of ring nodes
  - PN IO controller
  - PN IO devices
  - Network infrastructure components (switches)
- Configuration and Diagnostic in Engineering
- Reconfiguration time 200ms

# Todays configuration possibility



- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller

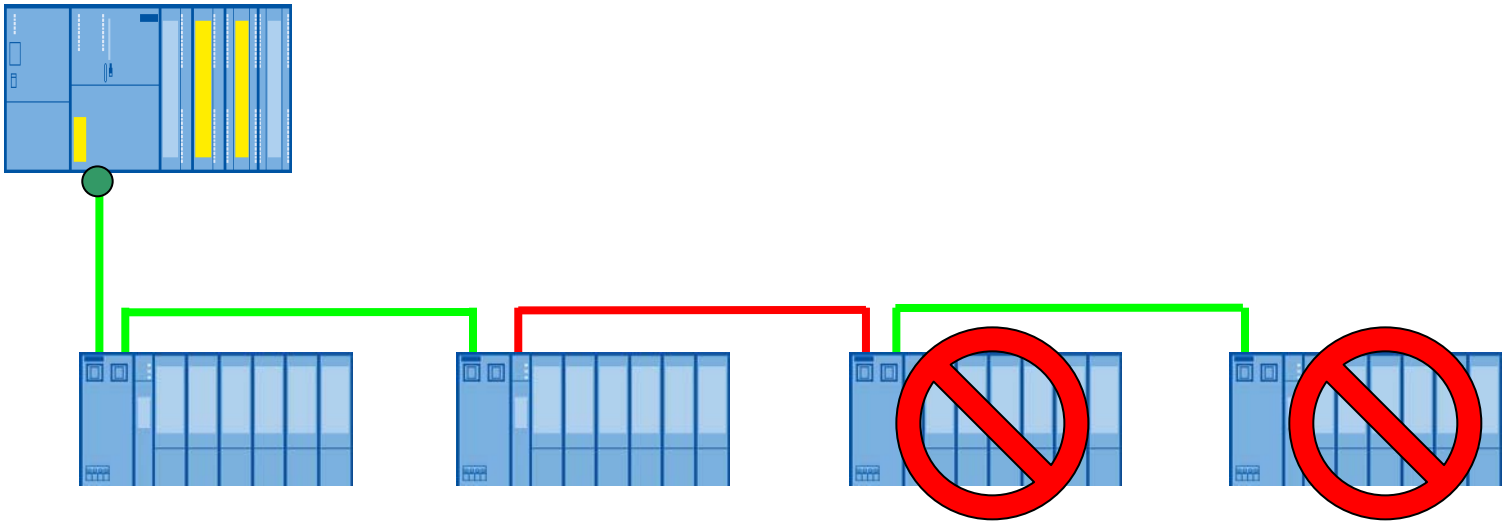


**Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!**

# Todays configuration possibility



- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller

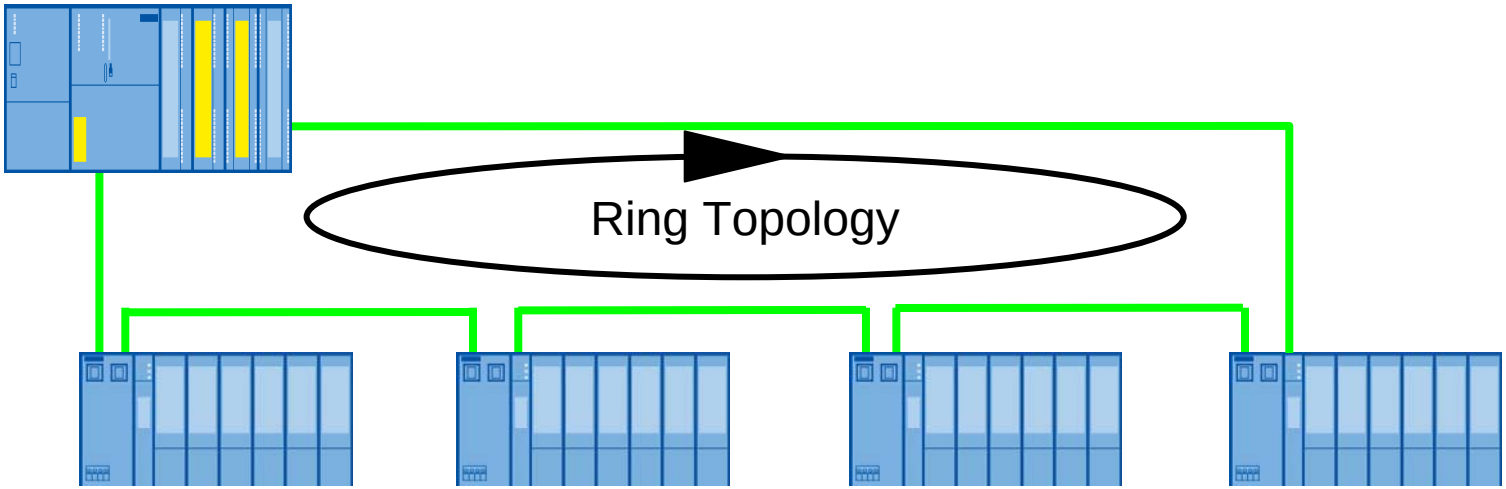


**Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!**

# Now MRP comes in….



- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller

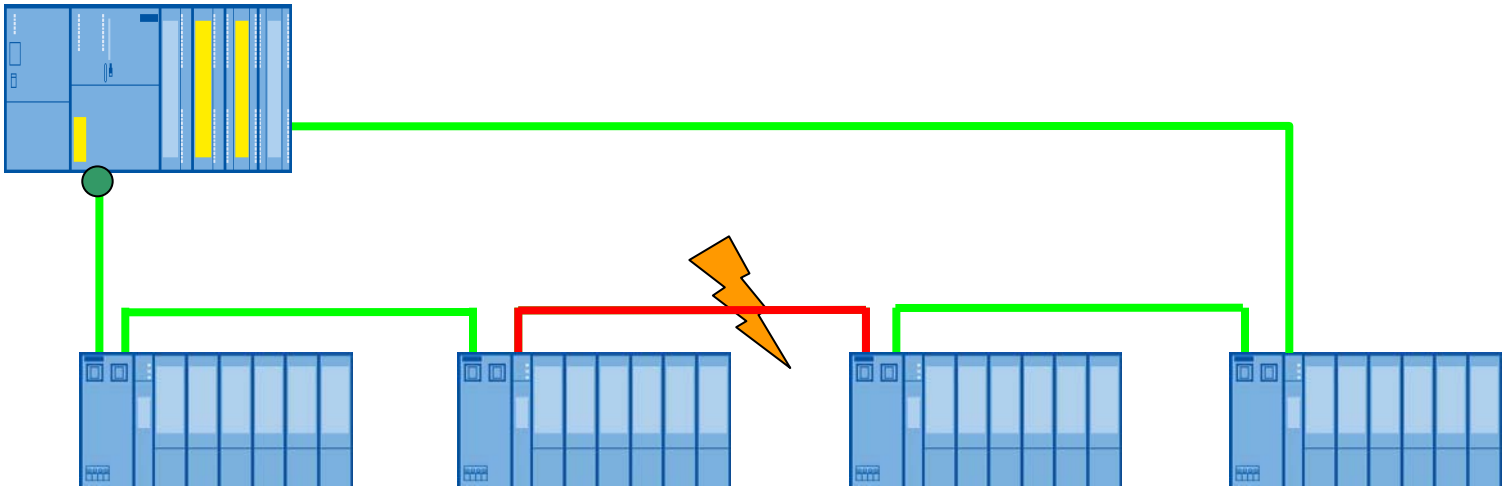



**No switches needed, the function in implemented into the PROFINET Products!**

# Now MRP comes in….



- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller

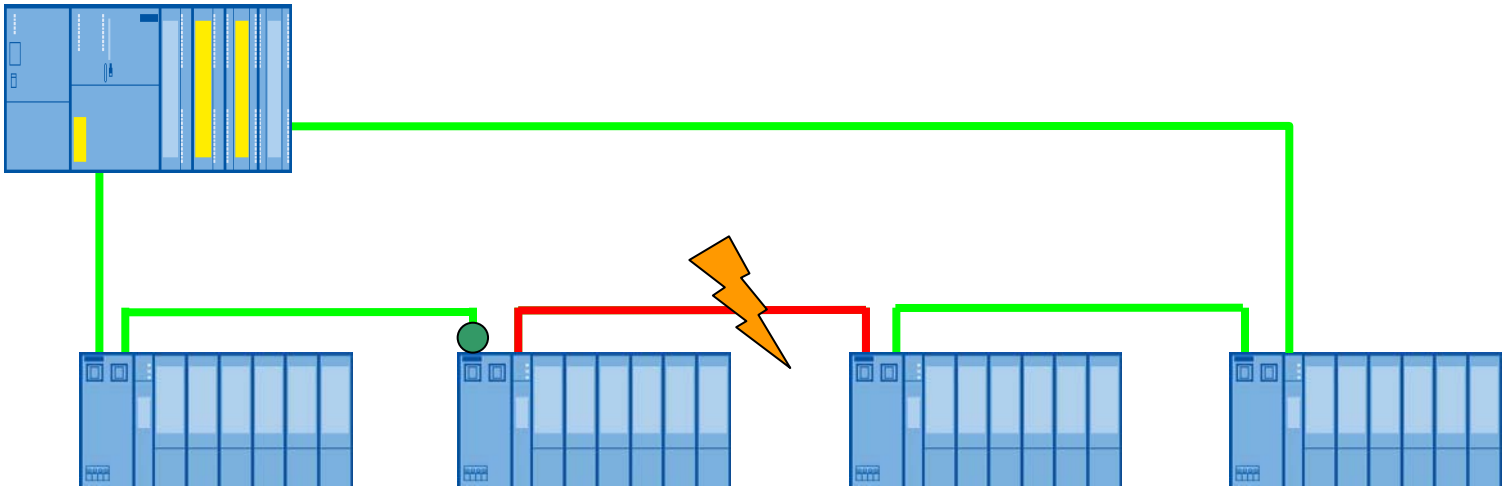


**Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!**

# Now MRP comes in….



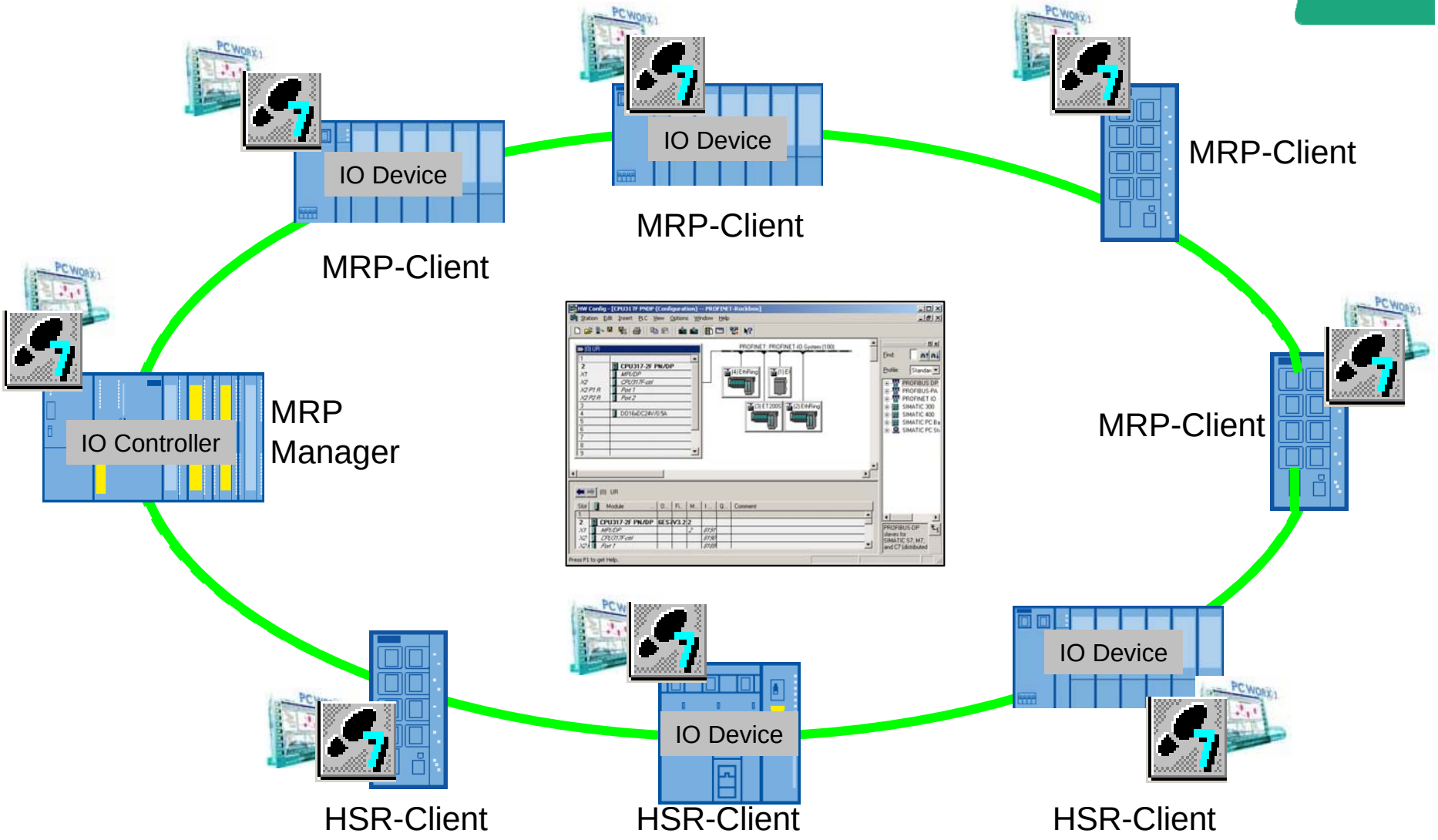
- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller



**Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!**

# Working Concept



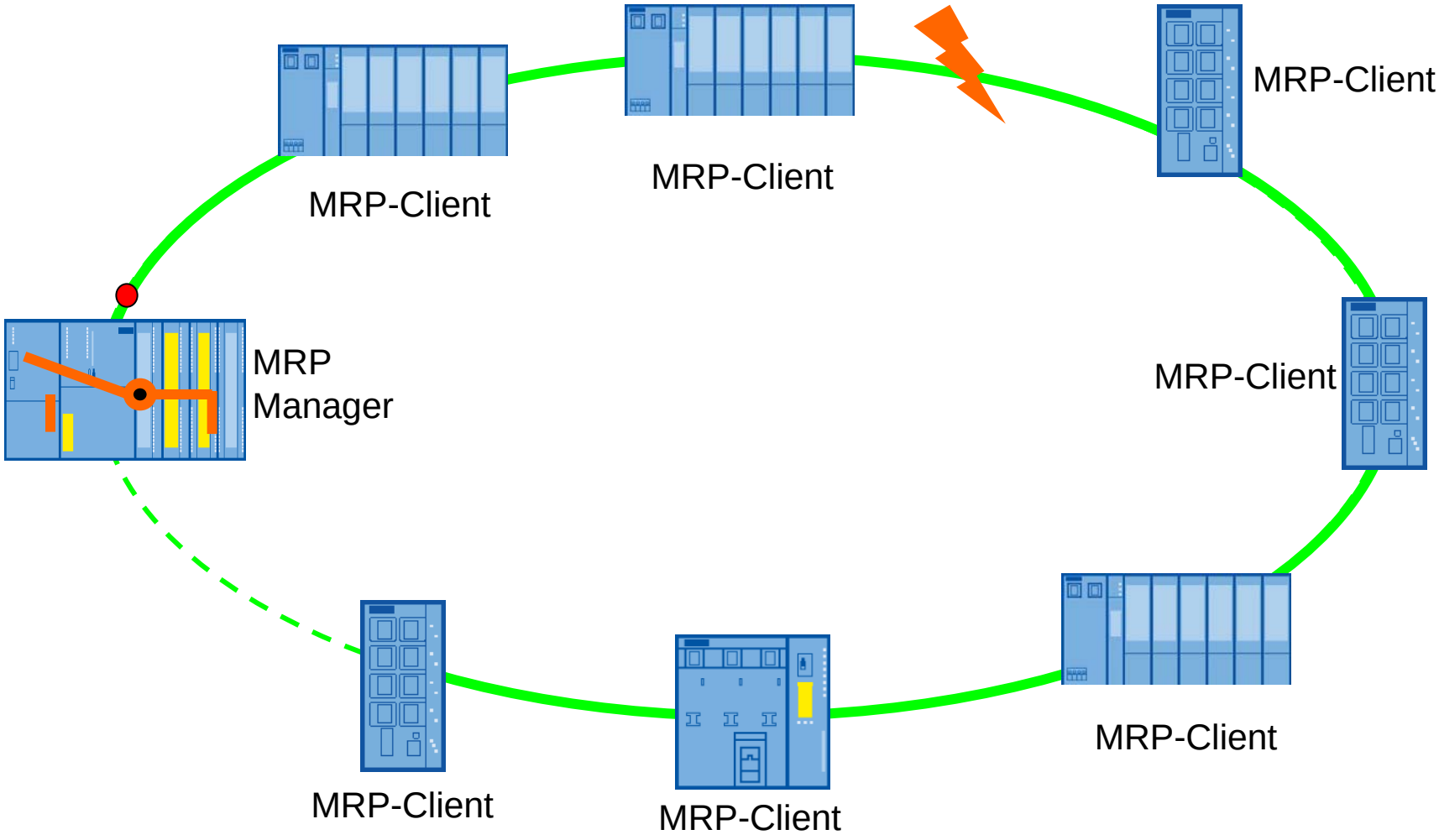



**Every Device in the Ring needs to have configured ports for the ring**

**Configuration via Engineering**

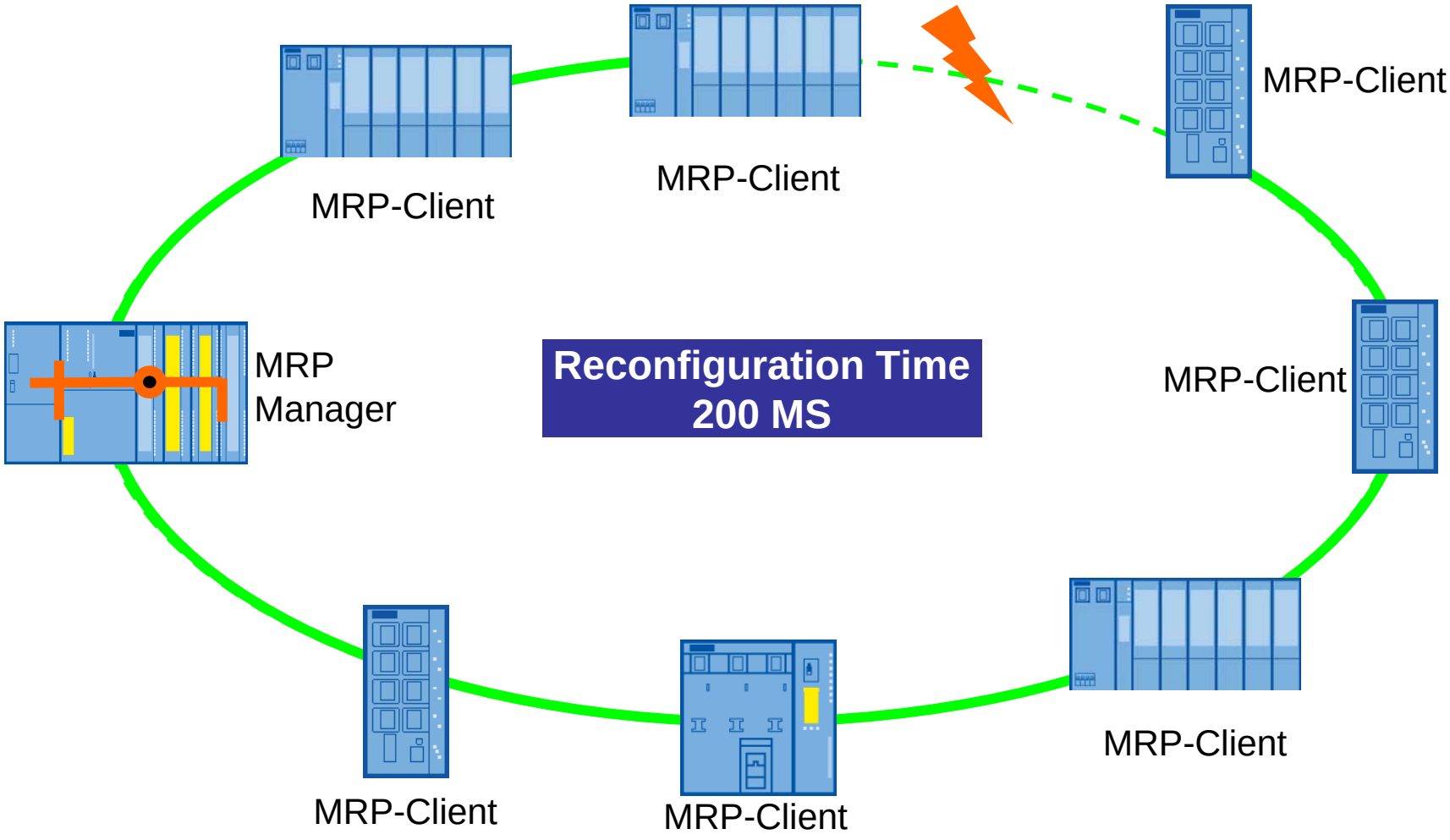
# Working Concept





# Working Concept

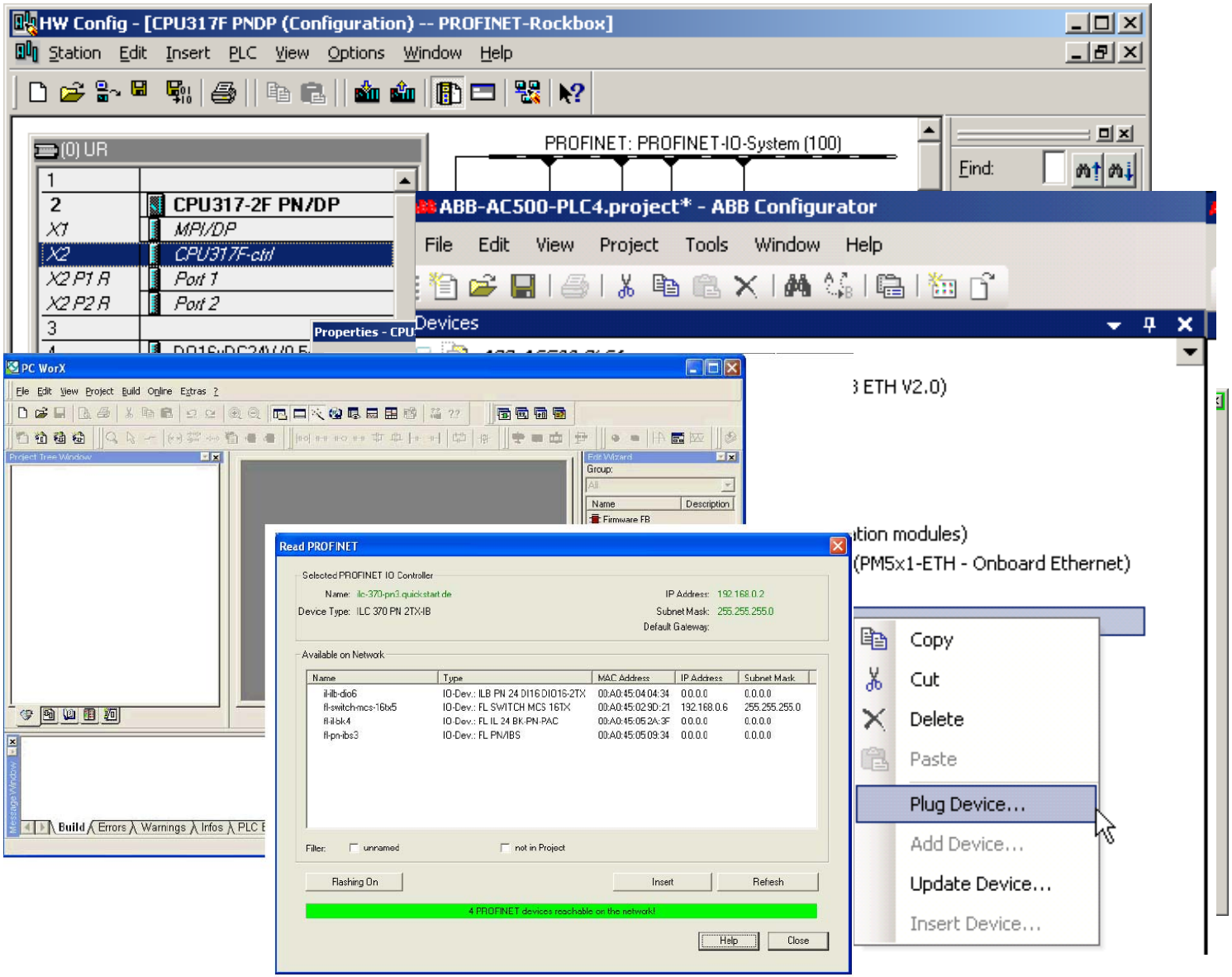




# Configuration in Engineering



- Overview
- MRP
- Shared Device
- I-Device
- Web on Controller



# Fast error recognition



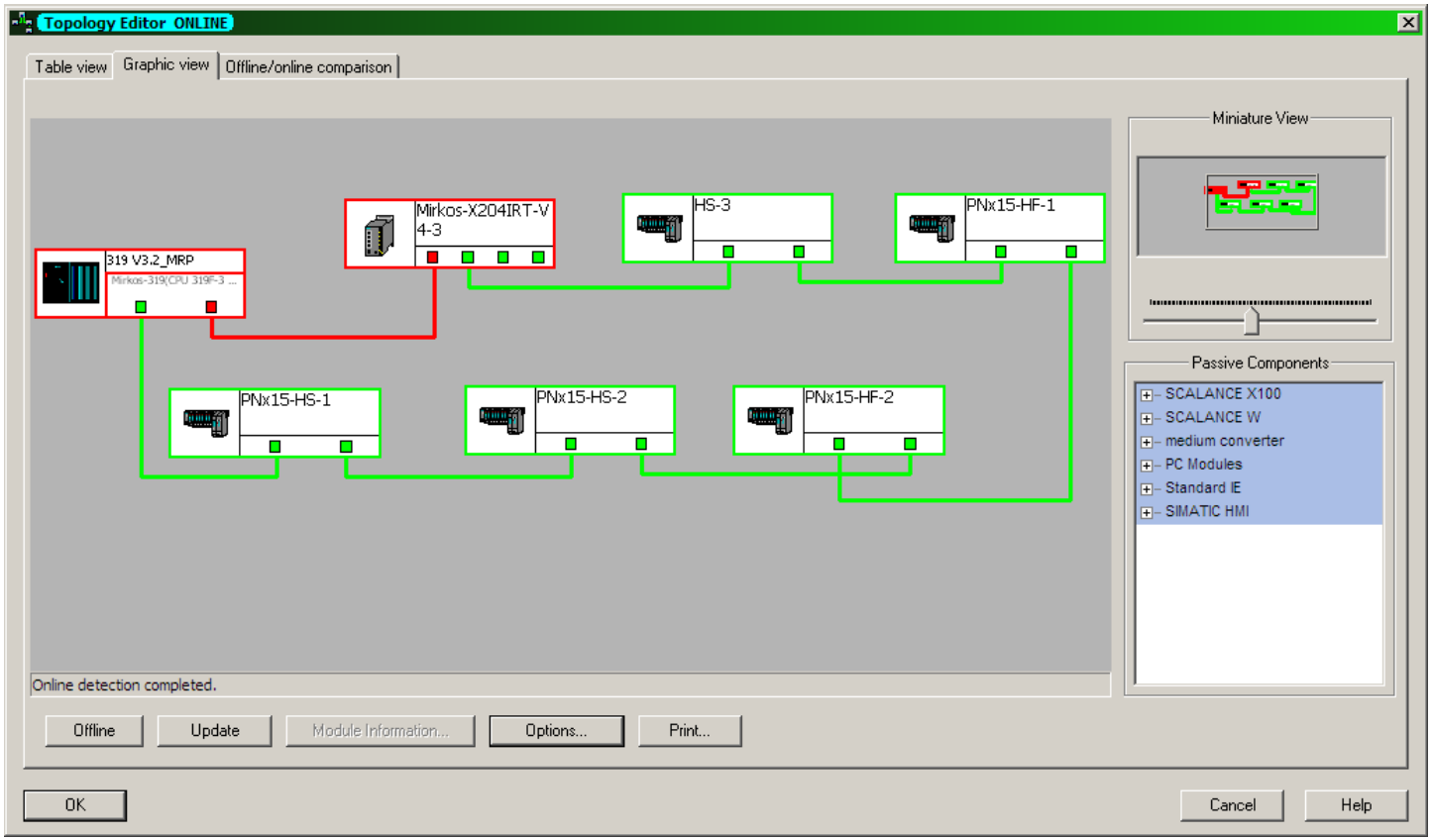

Overview

MRP

Shared Device

I-Device

Web on Controller

# MRP Performance Data



Overview
MRP
Shared Device
I-Device
Web on Controller

| | MRP |
|---|---|
| **Standard** | IEC 61158-5-10 |
| **Max. Devices in a Ring** | 50 |
| **Reconfiguration time** | 200ms |
| **Standby Redundancy possible?** | No |
| **Configuration** | Engineering Software (i.e. STEP7, PCWorkx) or Switch Management |
| **Devices** | Switches which are specified to IEC, IO-Controller, IO-Devices which support MRP and IEC |

# Shared Device

# Shared Device



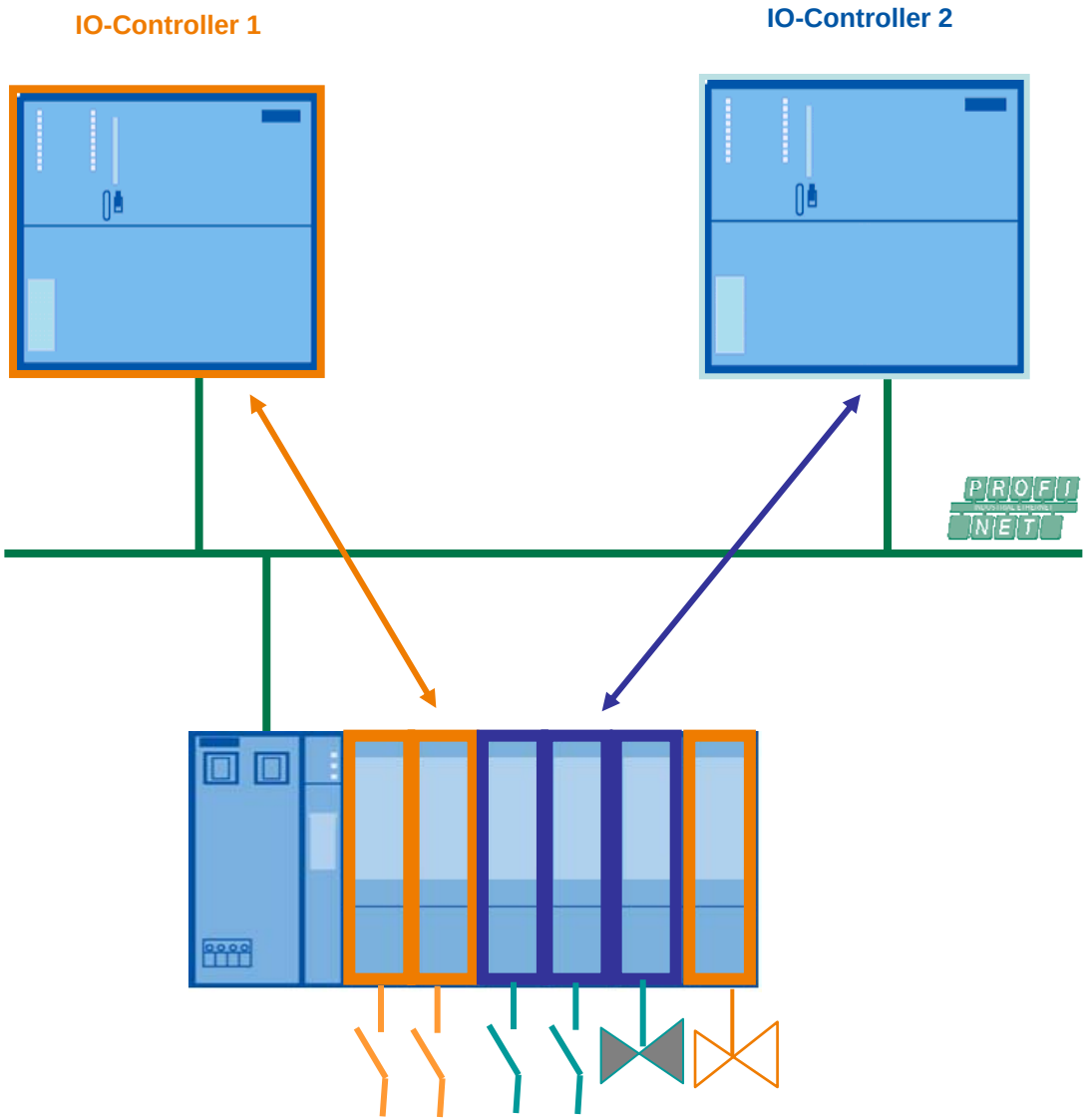
Overview

MRP

Shared Device

I-Device

Web on Controller



# Shared Device



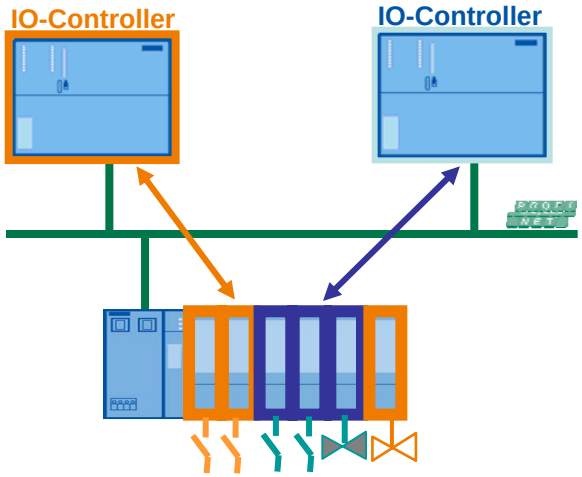
Overview
MRP
Shared Device
I-Device
Web on Controller

## Function

- flexible assignment of Submodules (I/Os) from one device to different controllers.
- One Submodule is clearly assigned to one controller.

## Use

- simpler and more cost efficient setup of plants.
- especially advantages in project where standard and F-technique is separated.



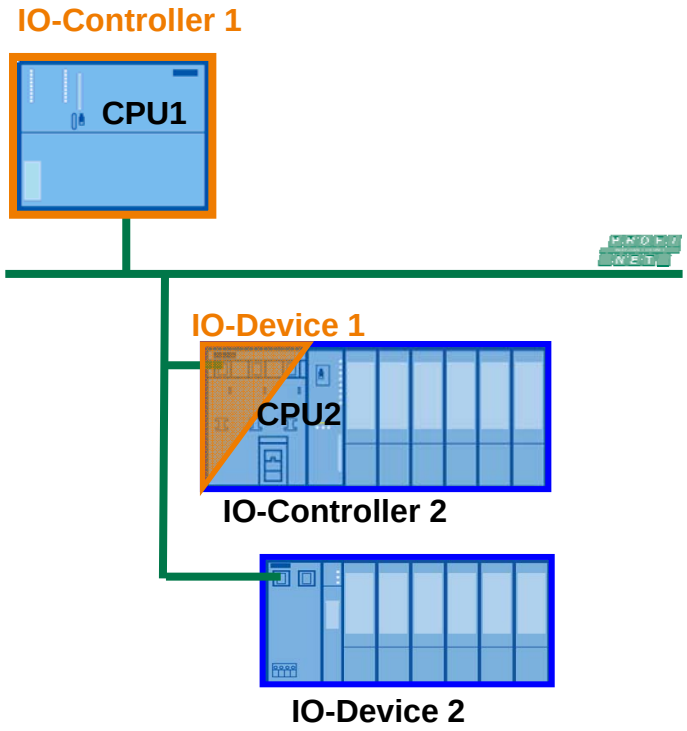
# I-Device and Web Services

# I-Device - Use



Overview
MRP
Shared Device
I-Device
Web on Controller

- IO-Controller and additionally function as IO-Device
- Parallel operation of IO-Controller and IO-Device (I-Device)




**I-Device**

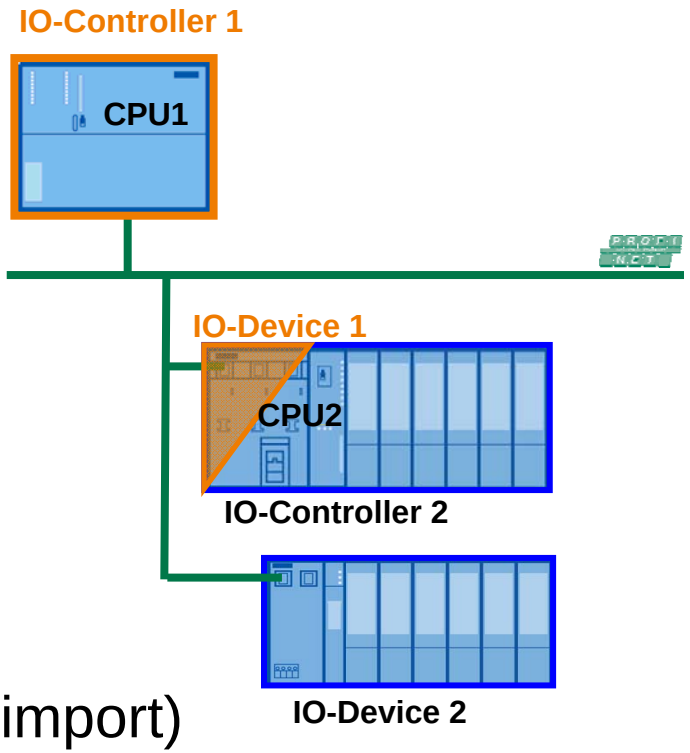
- Simple and known IO-Connections of CPUs
- Connection of CPUs in different Projects
- Connection to third party controller possible
- No PNPN-Coupler necessary

# Advantage of I-Device



Overview
MRP
Shared Device
I-Device
Web on Controller

- Controller and Device function at the same time
- Preprocessor in the I-Device
- Distribute intelligence
- Fast Controller-Controller communication (~1ms with 1440Bytes)
- Easy to use PROFINET Communication between PROFINET-Controller from different Vendors (GSDML import)

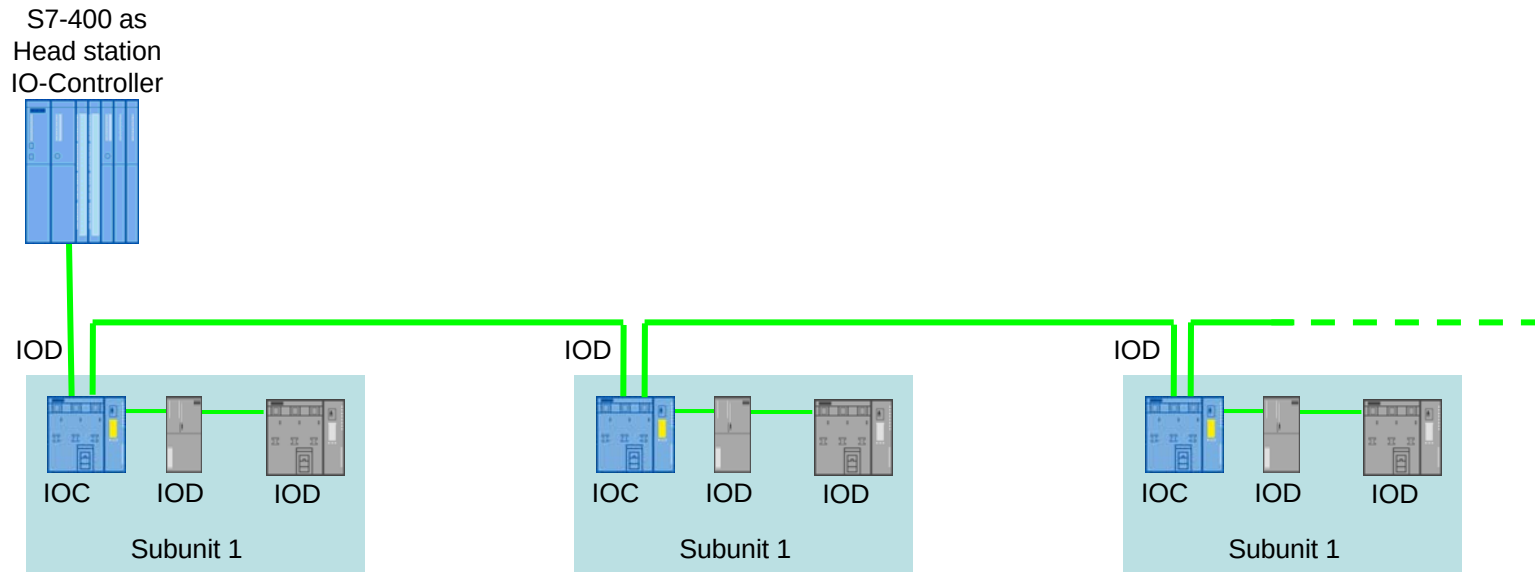


# Example: Distributed Intelligence



Overview
MRP
Shared Device
I-Device
Web on Controller

- Distributed an local control of the process
  - Spread automation tasks into different levels
- Coordination of Head station in this example S7-400
  - Preprocessor in the Subunits




IOD = IO-Device
IOC = IO-Controller

# Example: Distributed Intelligence



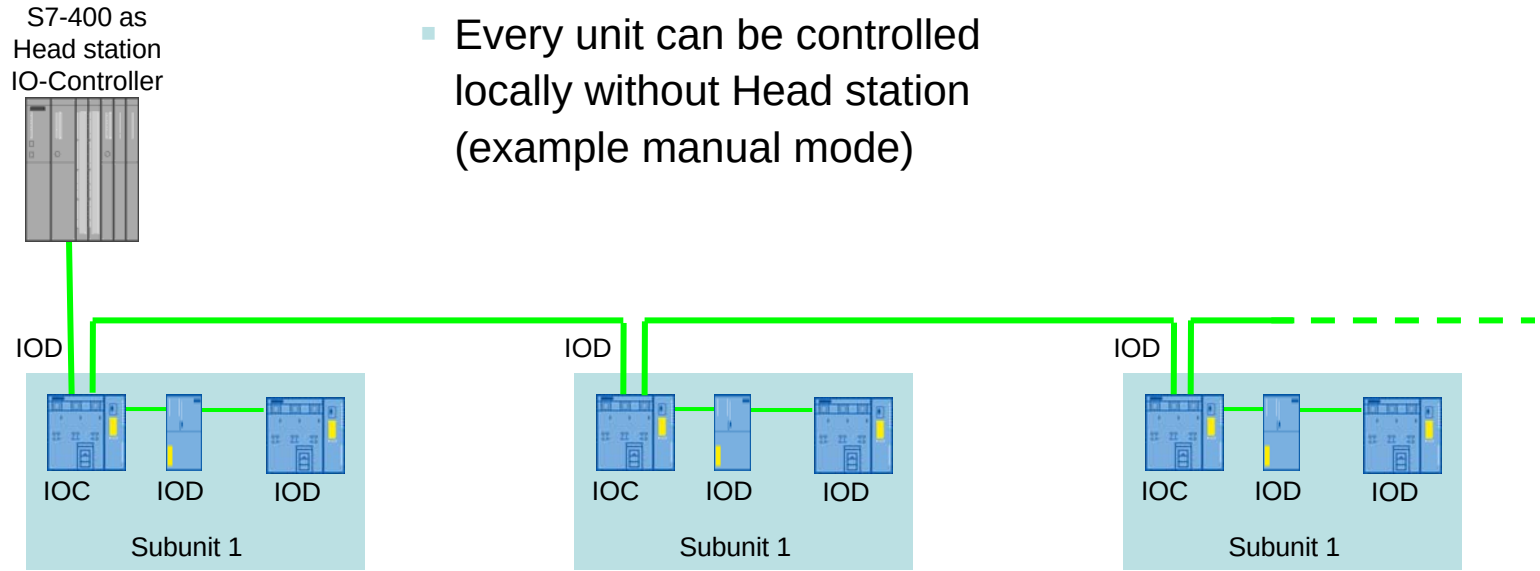
**Overview**

**MRP**

**Shared Device**

**I-Device**

**Web on Controller**




- Every unit can be controlled locally without Head station (example manual mode)

IOD = IO-Device
IOC = IO-Controller

# Web mechanism




Overview

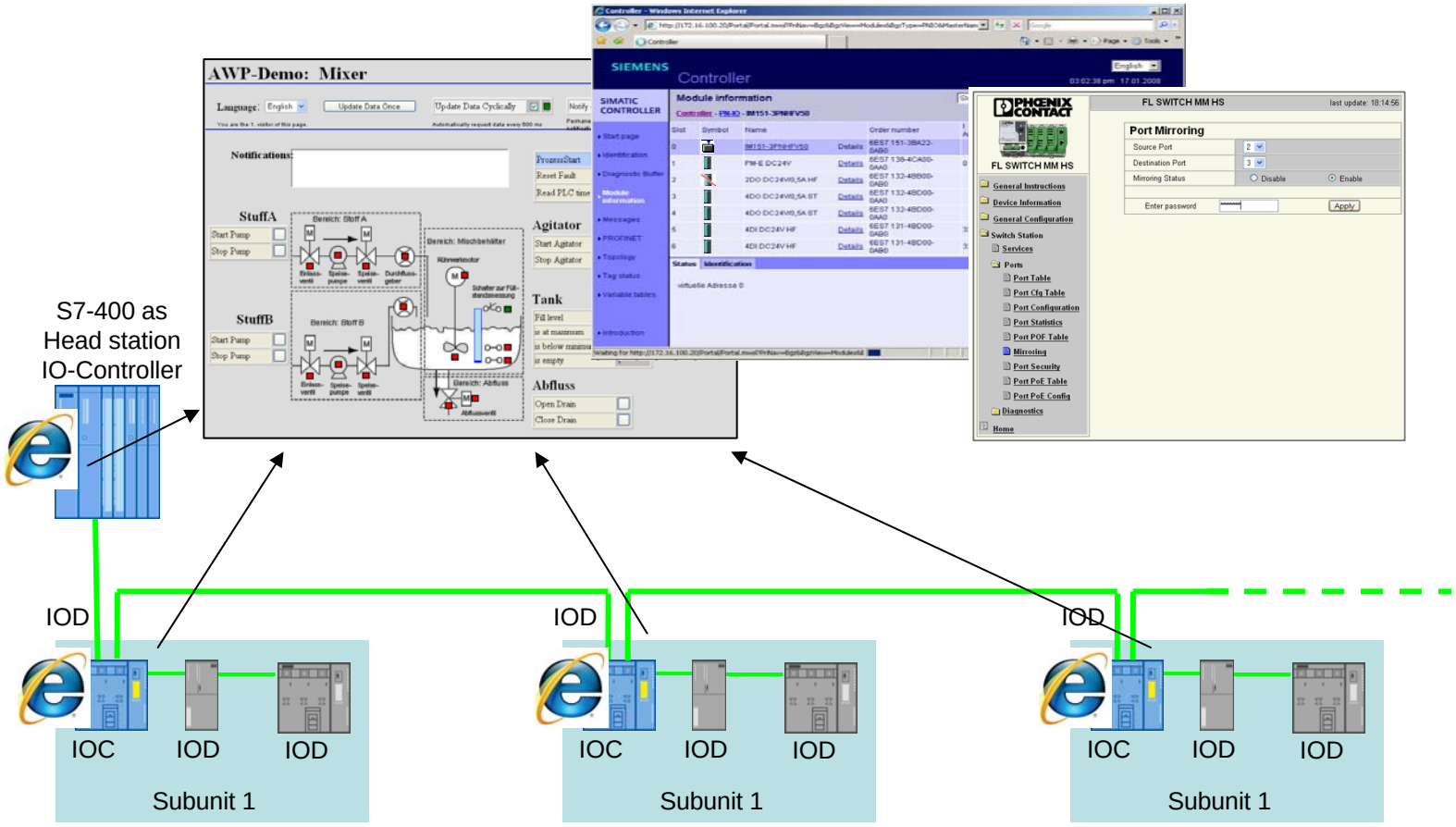
MRP

Shared Device

I-Device

Web on Controller


- Webdiagnostics and Unser defined WebPages to access Process value



# Advantages of Web



Overview

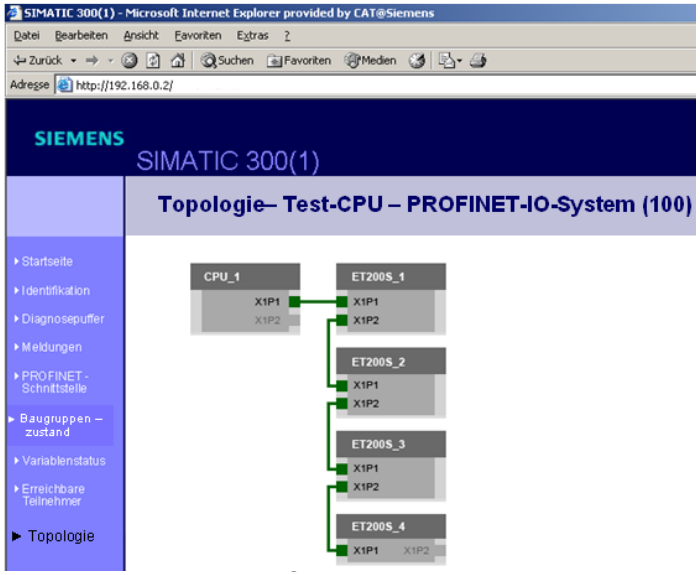
MRP

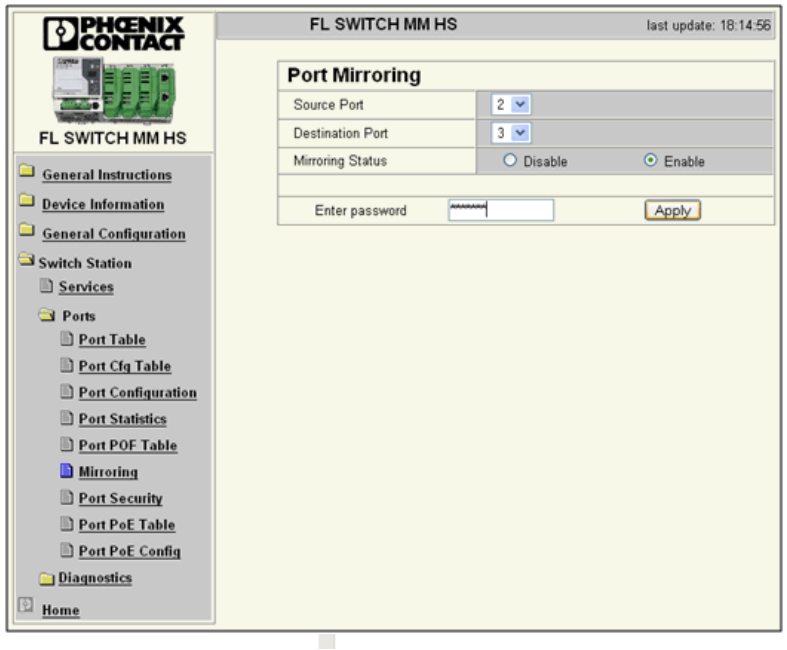
Shared Device

I-Device

Web on Controller

- No Knowledge of any Engineering Software required
- Only Web browser needed to read out Diagnostic data (Internet Explorer, Firefox,…)
- Remote Service via Internet
- Accessible with every PC or Smartphone which has a web browser



PROFIBUS • PROFINET

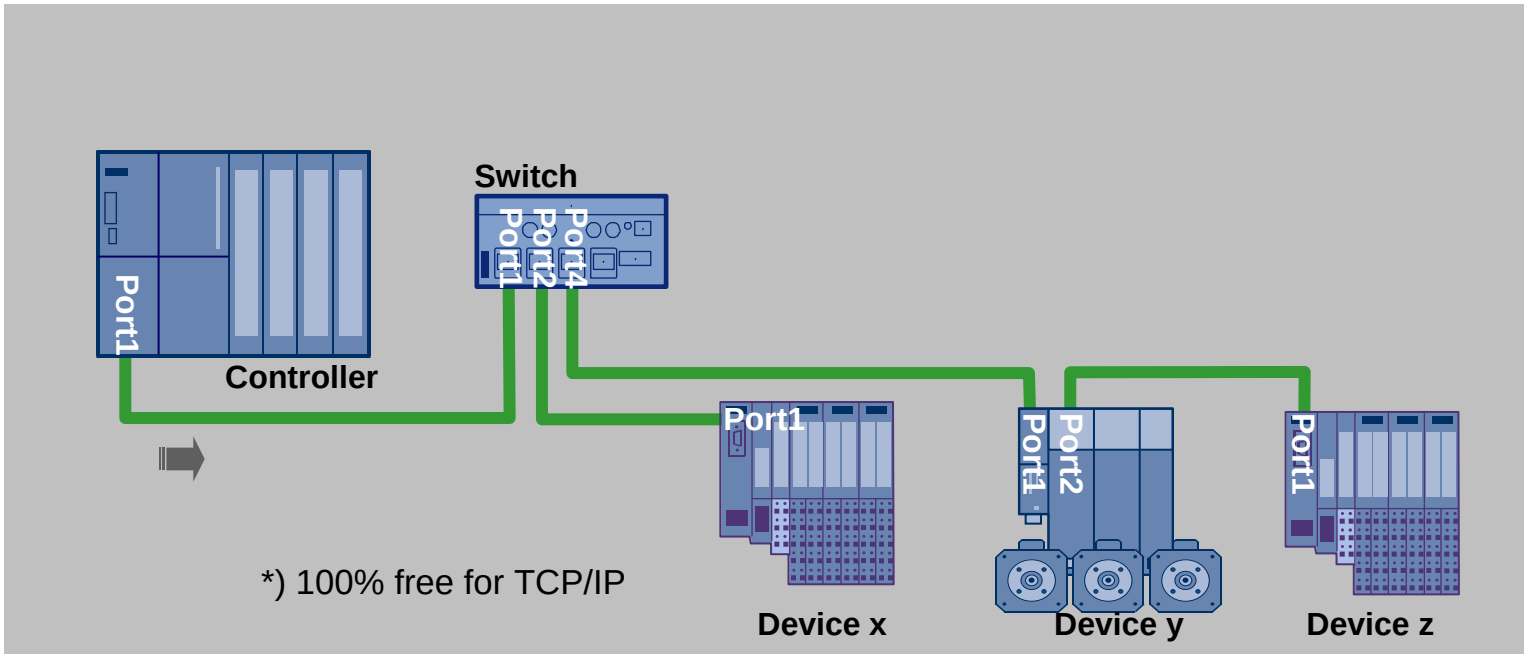
# Clocksynchronisation / IRT

# Clocksynchronisation on PROFINET



Overview
MRP
Shared Device
I-Device
Web on Controller

- Isochronous data transmission through bandwidth allocation
  - Configuration of the topology (routing)
  - Automatic optimization of message frame traffic (scheduling)
- Cycle times up to 250µs with jitter <1µs
- Unrestricted TCP/IP communication

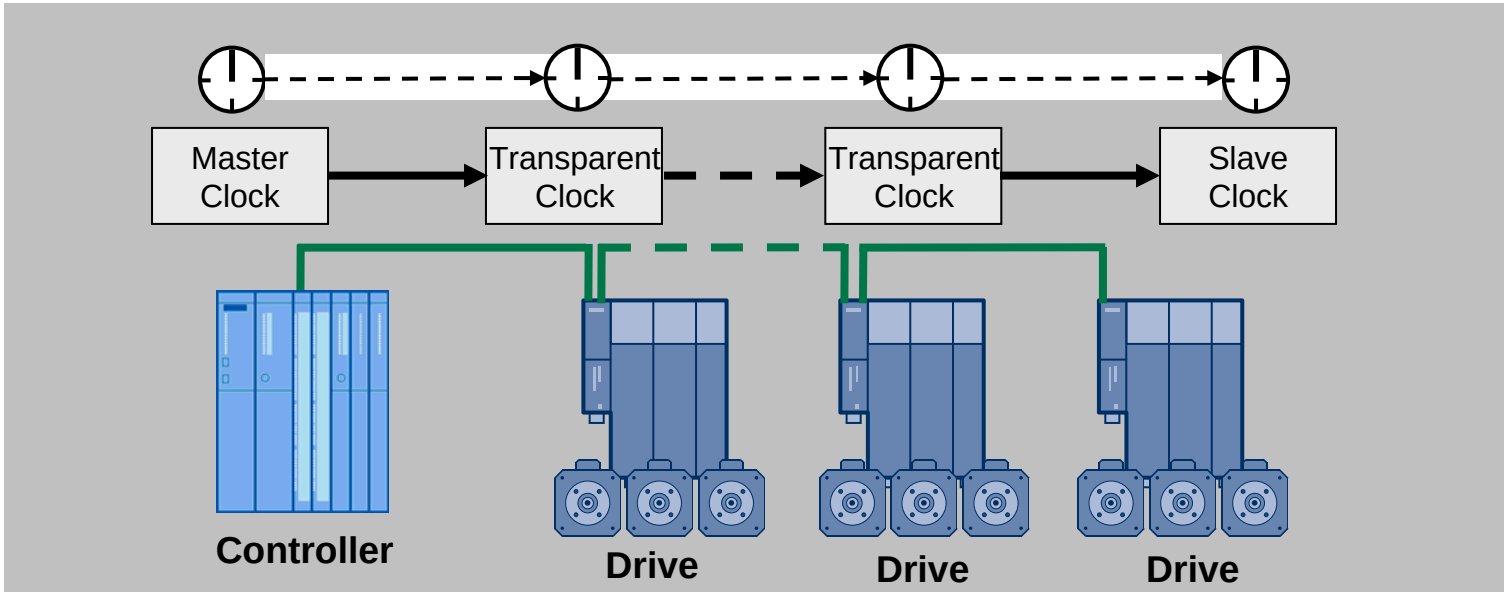


# Isochronous Real-Time (IRT)



Overview
MRP
Shared Device
I-Device
Web on Controller

Synchronisation, all times on the networks will be adjusted to a isochronous cycle



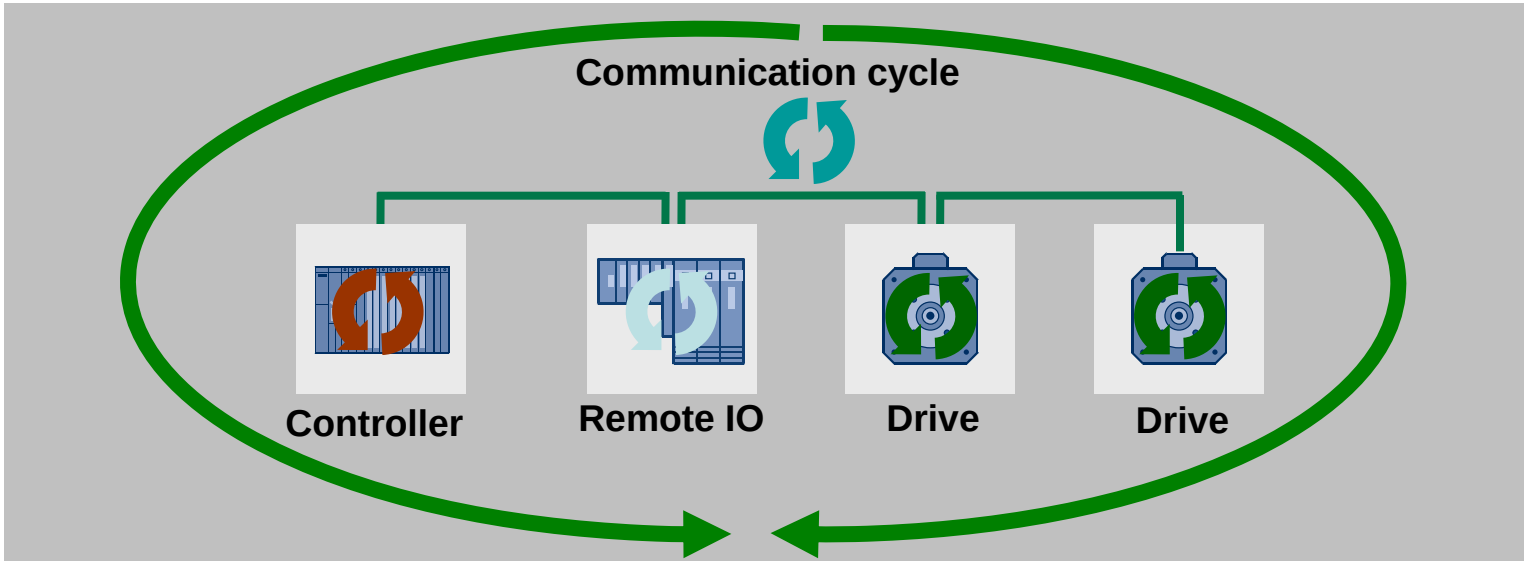

**Line topology with a high jitter logic (deterministic)**

# Axis Synchronization



Overview
MRP
Shared Device
I-Device
Web on Controller

- Synchronization of drive control within on buscycle
- Close loop control via Network
- Isochron synchrized capturing of position setpoint
- Isochron synchrized activation of setpoints




**Perfect for distributed Motion control tasks like: Synchronism, ... Multiple Axis applications**

# Performance, Speed, Determenistic



Overview
MRP
Shared Device
I-Device
Web on Controller

**Performance values for Motion Control applications with PROFINET and IRT**

| | | | |
|---|---|---|---|
| Cycle time | 1 ms | 500 µs | 250 µs |
| Number of nodes*) | 272 | 128 | 56 |
| Jitter | <1 µs | <1 µs | <1 µs |
| Reserved for open communication with standard IT protocols | 50% | 50% | 50% |

*) Number of devices each with 40 bytes input data and 40 bytes output data on a controller with 4 ports
The limits of a specified controller regarding I/O area, cycle time and number of nodes must be considered

- **Reserve capacity is an advantage, e.g. for**
  - dynamic transfer of cam discs
  - Parallel and unrestricted IT communication
  - ...

**Reserve PROFINET capacity is benchmark –
and more than sufficient for the foreseeable future.**

# Summery



Overview
MRP
Shared Device
I-Device
Web on Controller

- Save Hardware and experience new possibilities with Shared Device and I-Device Functions
- Make Diagnostic and Maintenance easier with Web Functionality
- Be fast, deterministic with synchronized communication besides the standard TCP/IP Traffic
- Use wireless communication even with Safety
- Use all the functions on one physical network!

**PROFINET is the solution for all automation tasks with only one communication medium which Industrial Ethernet!**

# Thank you for your attention!





- PROFIBUS Association South East Asia
- Bernd Lieberth (Secretary)
- 1, Scotts road, #21-07, Shaw Centre
- Singapore-228208

- E-Mail: southeastasia@profibus.com
- E-Mai: Bernd.Lieberth@siemens.com


Join us at