PCD3.M6860

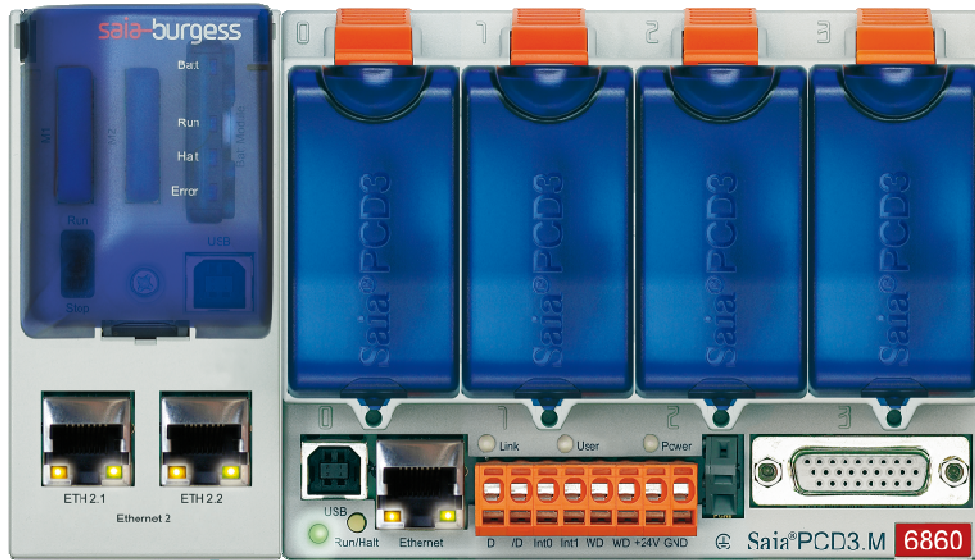## Power CPU with 2 Ethernet interfaces

April 2013, U. Jäggi & M. Montani

Program

- Introduction
- Features and use cases
- IP addressing
- Life demonstration → Michael Montani
- Good to know

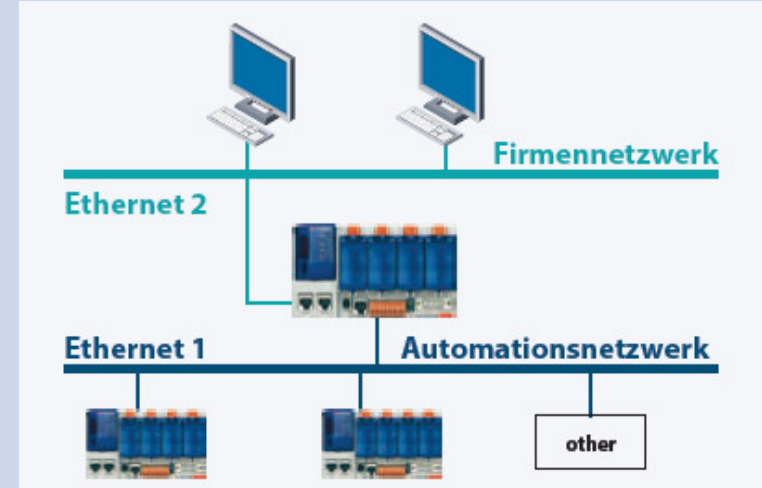# New application possibilities with CPU PCD3.M6860
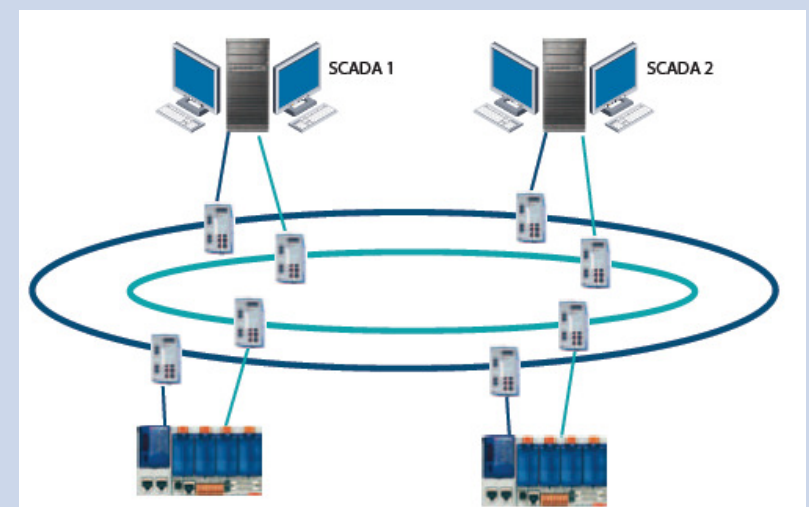

Ethernet 2
(2 port switch)

Ethernet 1

Based on PCD3.Mxx60 CPU platform
Technical data are identical to PCD3.M5560
apart from the second Ethernet interface (in
place of the serial interfaces)
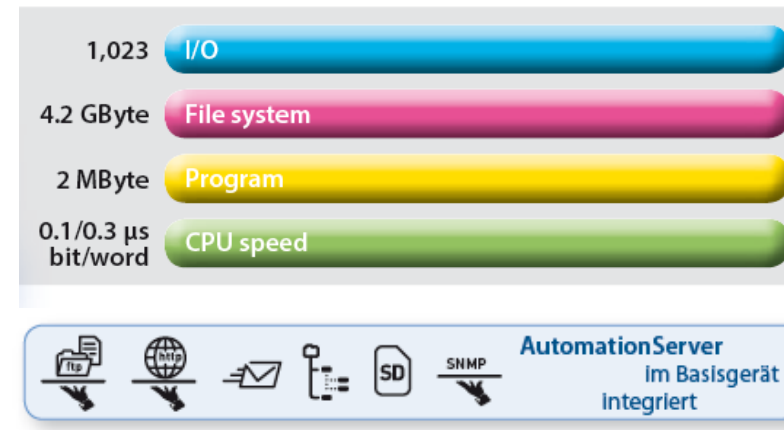
Separating Ethernet networks

Redundant Ethernet networks

PCD3.M68060 features and technical data
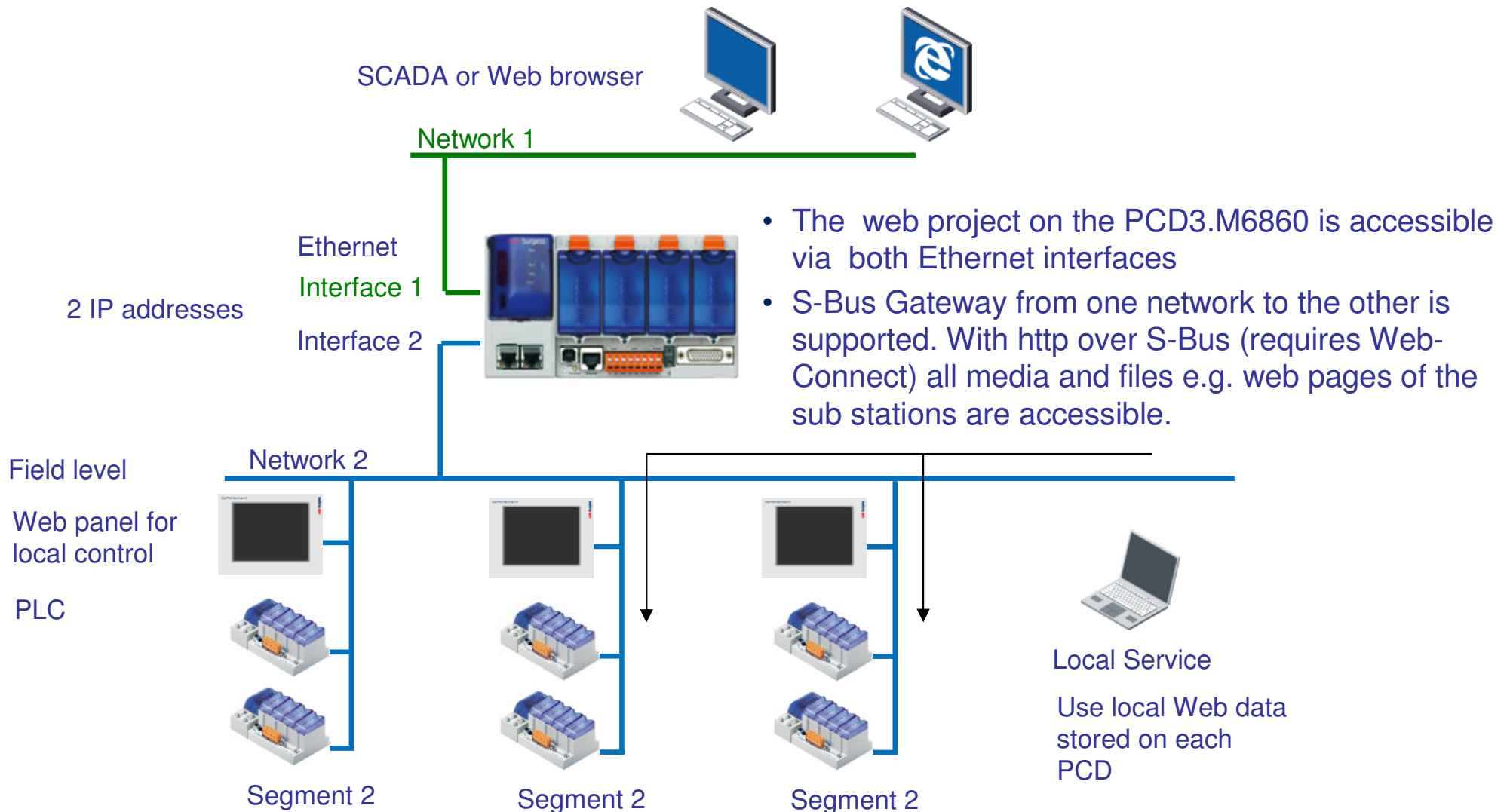
Based on PCD3.Mxx60 CPU platform

- Both Ethernet interfaces have independent IP configuration. The IP addresses must not be in the same subnet
- IP routing between the two interfaces is not supported
- S-Bus Gateway function between the two interfaces is supported
- BACnet and LonIP are supported on Ethernet interface 1 only !
- Other IP protocols (HTTP, SNMP, SNTP, SMTP, S-Bus, Modbus-IP, etc.) are supported on both interfaces simultaneously
- The AutomationServer and PCD data (R, F, DB/Text,…) are accessable via both interfaces simultaneously
- Access with PG5 programming tool via both interfaces
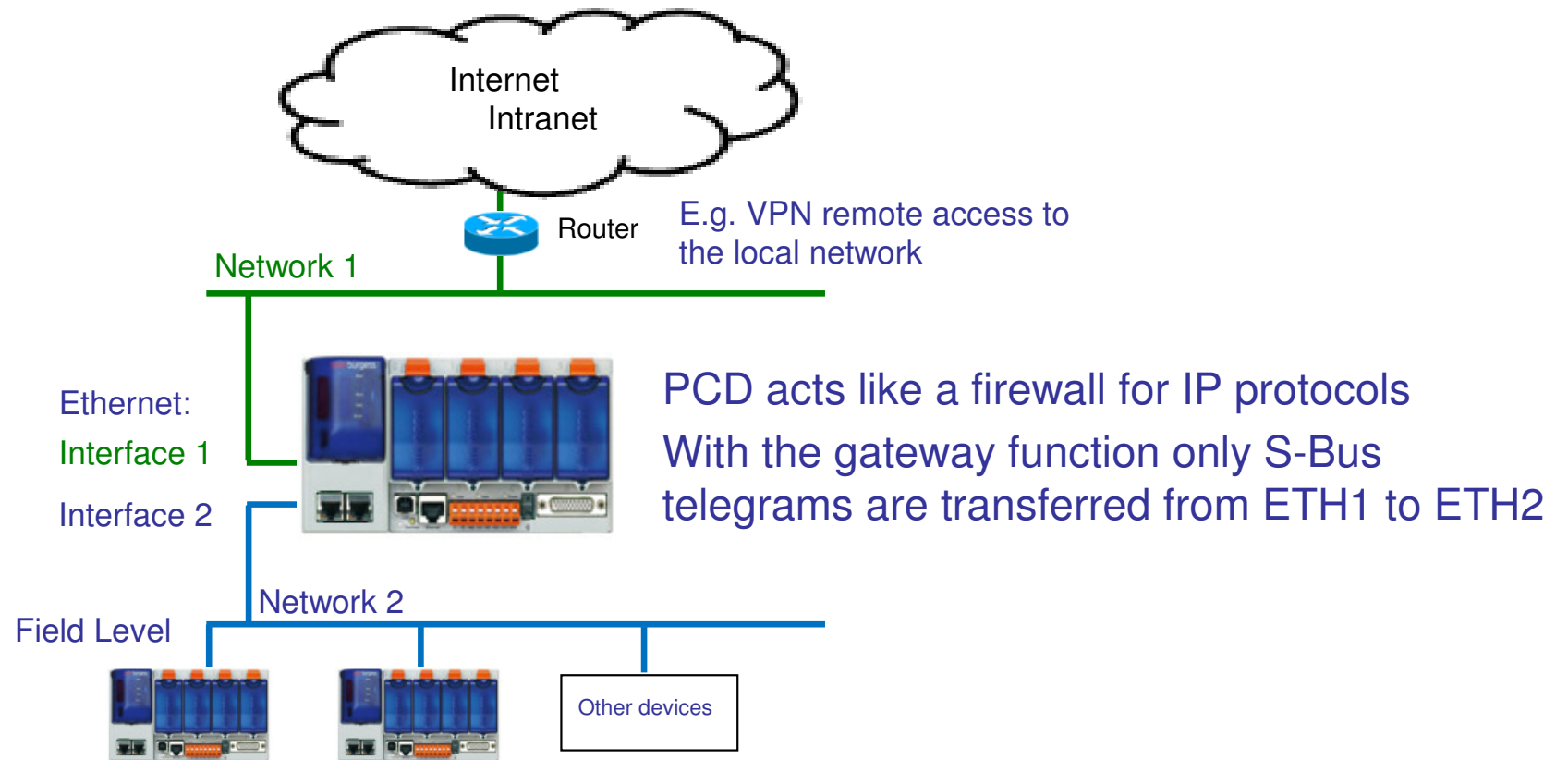
Use case A separate networks
1) 'Local' Access
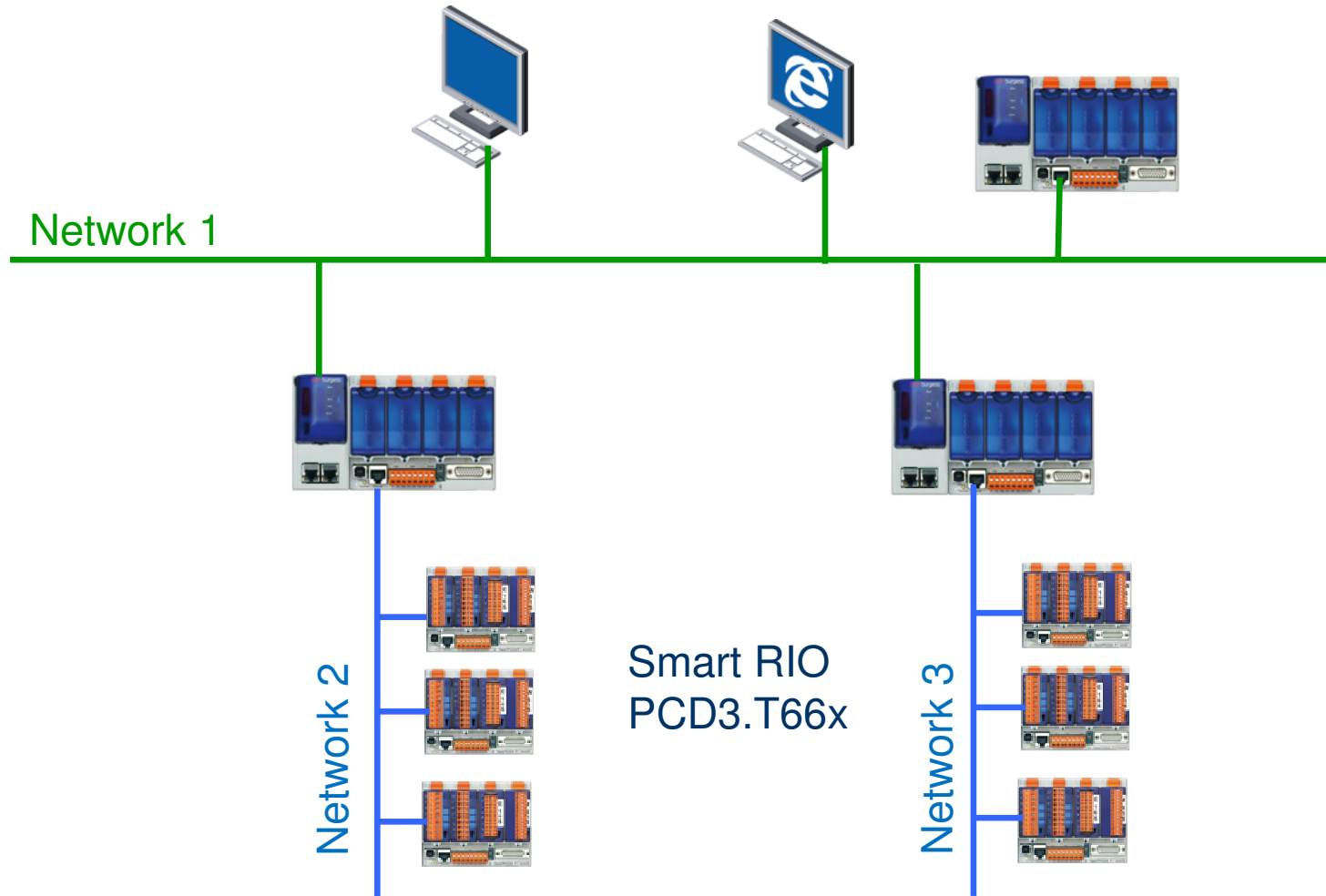
Separate management network from "control" network.

SCADA or Web browser

Network 1

Ethernet
Interface 1

2 IP addresses

Interface 2

- The web project on the PCD3.M6860 is accessible via both Ethernet interfaces
- S-Bus Gateway from one network to the other is supported. With http over S-Bus (requires Web-Connect) all media and files e.g. web pages of the sub stations are accessible.

Field level

Network 2

Web panel for local control

PLC

Local Service

Use local Web data stored on each PCD

Segment 2   Segment 2   Segment 2

Use case A separate networks
2) Remote Access idem to A1)

Internet
Intranet

Router

E.g. VPN remote access to
the local network

Network 1

Ethernet:

Interface 1

Interface 2

Network 2

Field Level

Other devices

PCD acts like a firewall for IP protocols

With the gateway function only S-Bus
telegrams are transferred from ETH1 to ETH2

Use case A separate networks
3) Smart RIOs on separate network for each CPU

Network 1

Network 2

Network 3

Smart RIO
PCD3.T66x

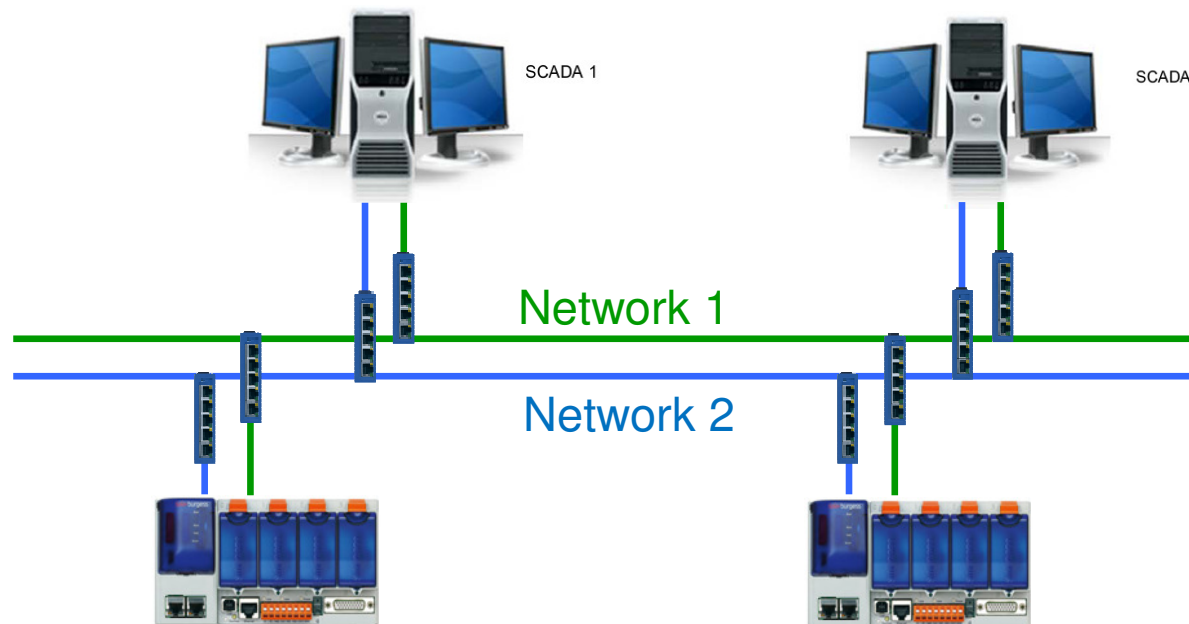# Use case A separate networks
4) Smart RIOs and CPU's on common network
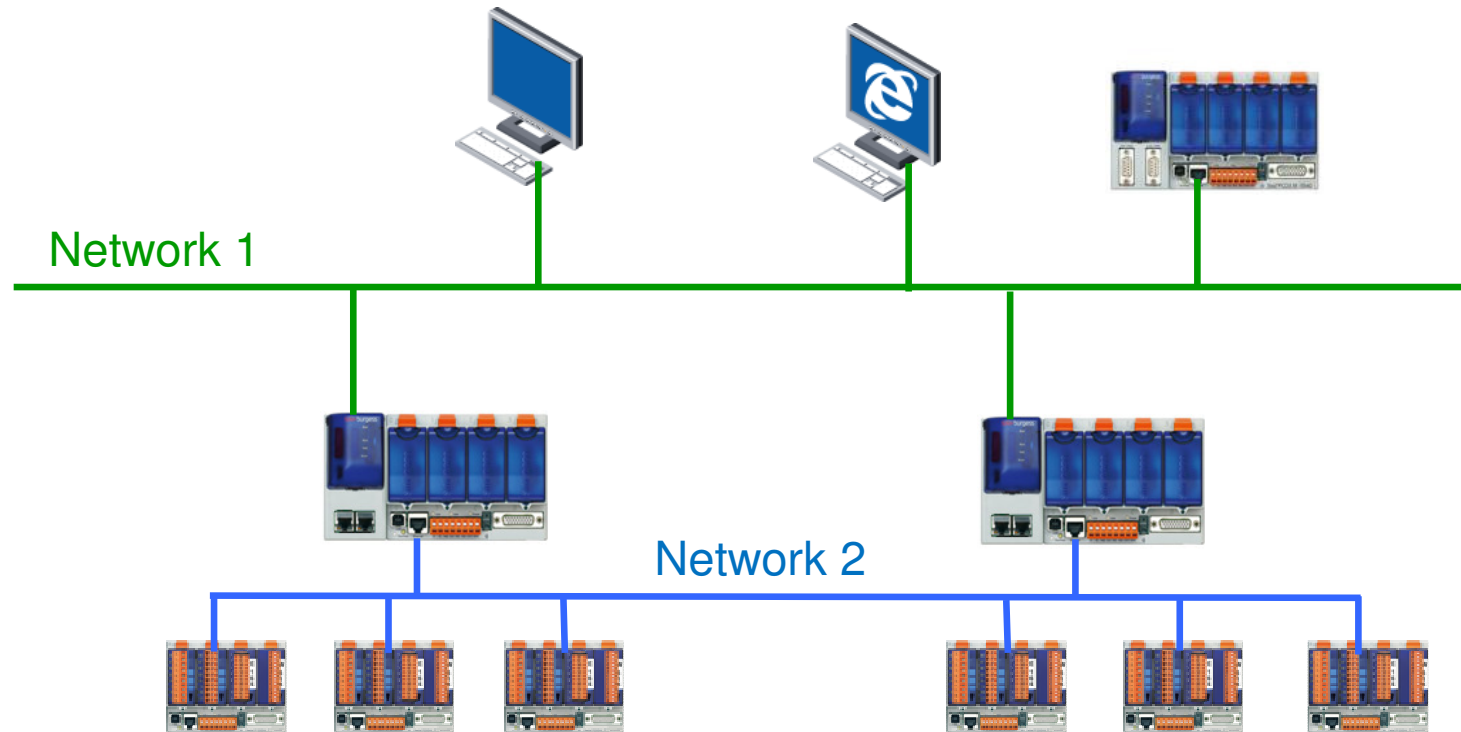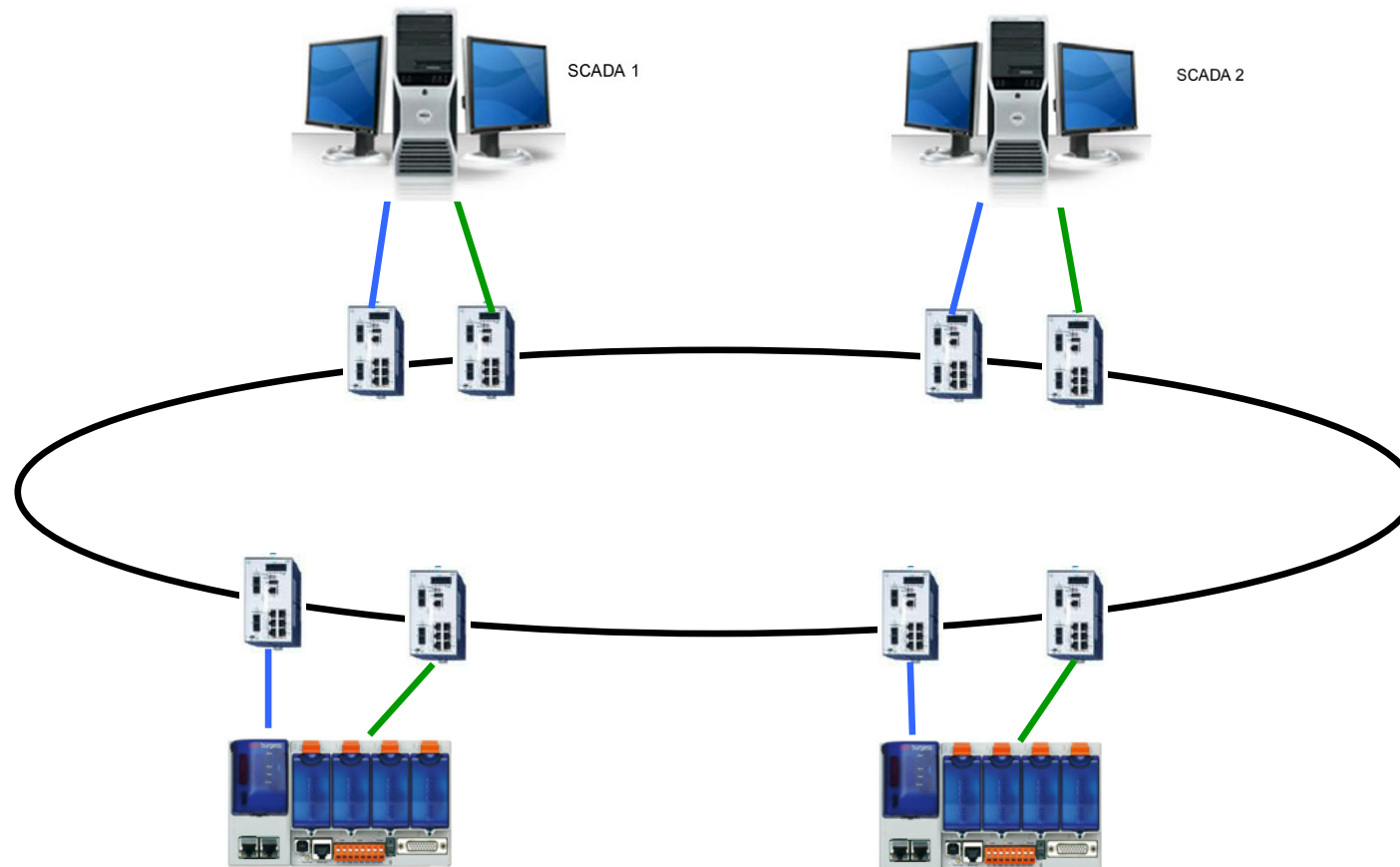

Network 1

Network 2

RIOs can be on the same physical network

Use case B: redundant communication on network
1) Line/Star topology using standard network components

SCADA 1

SCADA 2

Network 1

Network 2

Use case B: redundant communication on network
1) one simpe ring

SCADA 1

SCADA 2

The Switches must support ring topology

Use case B: redundant communication on network
2) two seperate rings

SCADA 1

SCADA 2
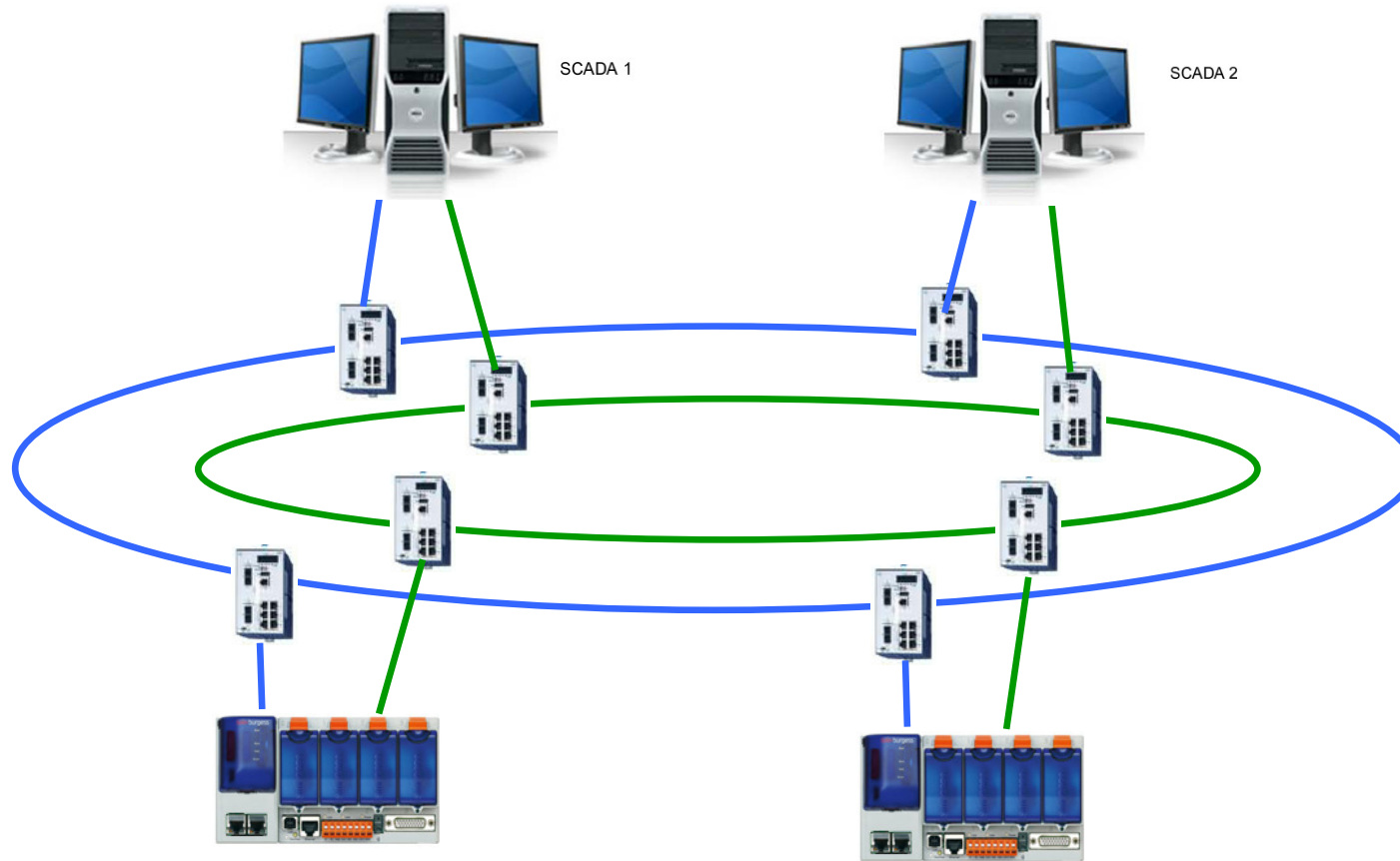
IP addressing general rules

Ethernet 2
IP: 172.23.1.1
Subnet mask:
255.255.255.0
Default gateway:
0.0.0.0

Ethernet 1
IP: 172.23.2.1
Subnet mask:
255.255.255.0
Default gateway:
172.23.2.10

IP address	172	23	2	1
	10101100	00010111	00000010	00000001
AND				
	11111111	11111111	11111111	00000000
Subnet mask	255	255	255	0
=				
Net address	10101100	00010111	00000010	00000000
	172	23	2	0

Net ID — Host ID
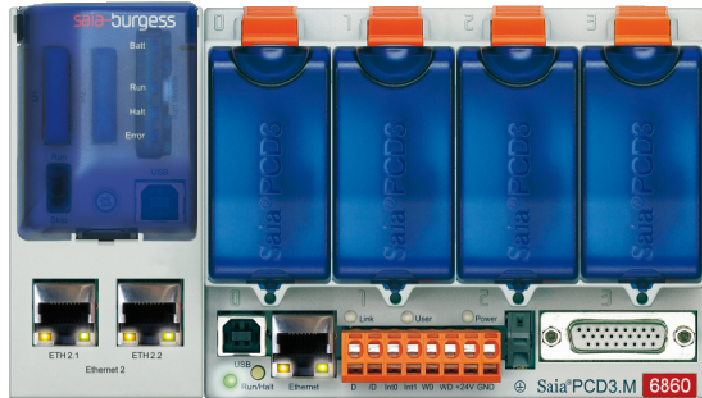
- Both interfaces are separate and have independent IP configuration
- The IP addresses must not be in the same subnet
- The selection of Ethernet interface 1 or 2 is done automatically according to the IP configuration
  More info http://de.wikipedia.org/wiki/Netzmaske
- If the destination station is neither in network 1 nor 2 then the telegram is always sent to the default gateway (router) of Ethernet interface 1. Static routes or metric is not supported
  More info http://de.wikipedia.org/wiki/Metrik_(Netzwerk)

Examples:
Destination station: 172.23.2.54
→ transmission via Ethernet 1

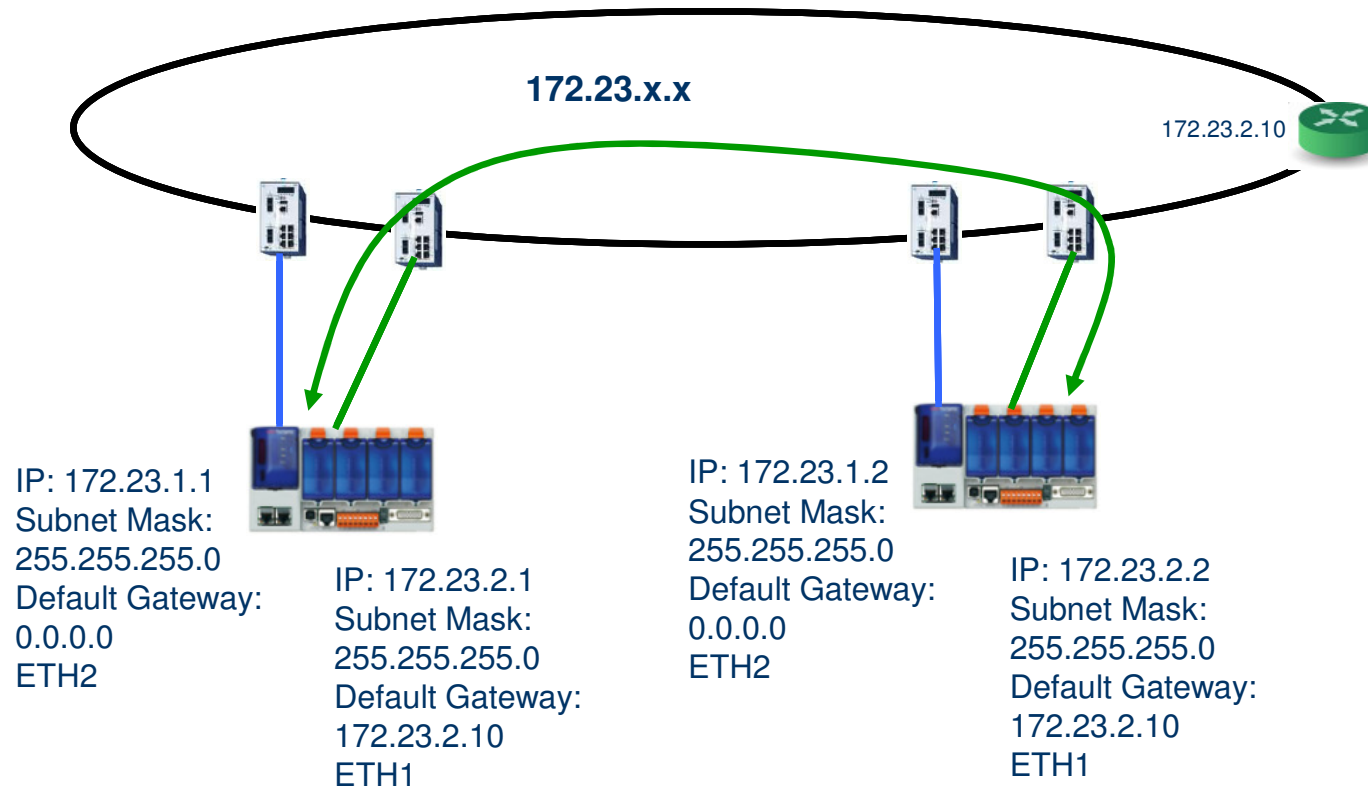Destination station: 172.23.1.12
→ transmission via Ethernet 2

Destination station: 192.168.12.143
→ transmission via Ethernet 1 to the default gateway

IP addressing example for redundant communication programmed in the PG5 user application program

172.23.x.x

172.23.2.10

IP: 172.23.1.1
Subnet Mask:
255.255.255.0
Default Gateway:
0.0.0.0
ETH2

IP: 172.23.2.1
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.2.10
ETH1

IP: 172.23.1.2
Subnet Mask:
255.255.255.0
Default Gateway:
0.0.0.0
ETH2

IP: 172.23.2.2
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.2.10
ETH1

Left PCD communicates with PCD on the right
- Default communication interface is Ethernet 1
→ Destination station 172.23.2.2 → Ethernet 1 is used
In case this does not work destination station 172.23.1.2 has to be used
→ Ethernet 2 is used
For more details refer to the PG5 programming example

IP addressing example for redundant communication to remote stations via router

IP: 172.23.1.55
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.1.0

SCADA 2

Router
IP: 172.23.2.0
Subnet Mask:
255.255.252.0
Default Gateway:
192.168.12.1

IP: 192.168.12.143
Subnet Mask:
255.255.255.0
Default Gateway:
192.168.12.1

SCADA 2

172.23.x.x   172.23.2.0   192.168.12.1   **192.168.12.x**

Router
IP: 192.168.12.1
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.2.0

IP: 172.23.1.1
Subnet Mask:
255.255.255.0
Default Gateway:
0.0.0.0
ETH2

IP: 172.23.2.1
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.2.0
ETH1

IP: 172.23.1.2
Subnet Mask:
255.255.255.0
Default Gateway:
0.0.0.0
ETH2

IP: 172.23.2.2
Subnet Mask:
255.255.255.0
Default Gateway:
172.23.2.0
ETH1

The PCD on the right communicates with the PC 192.168.12.143
→PCD checks: 192.168.12.143 in the subnet as Ethernet 1? → NO
→PCD checks: 192.168.12.143 in the subnet as Ethernet 2? → NO
→PCD sends telegram to the default gateway 172.3.2.0 via Ethernet 1

The same scenario applies for the communication between two PCDs on different subnets
→ Since telegrams to a router are only transmitted via Ethernet 1, redundancy is not possible in routed networks

Communication via router

Communication to routers via Ethernet 1 only!

Internet
Intranet

Ethernet 2

Ethernet 1

Router
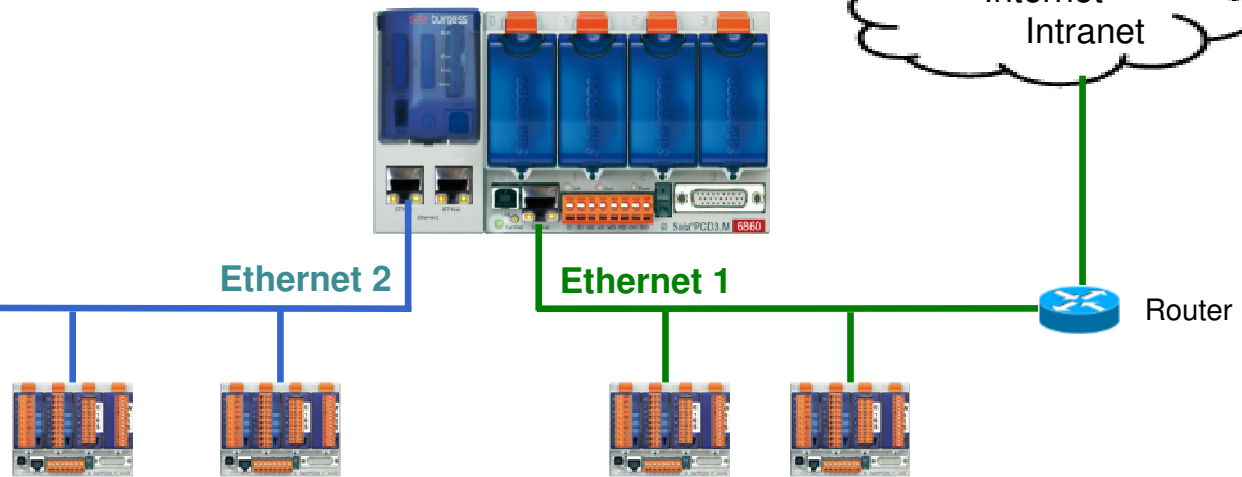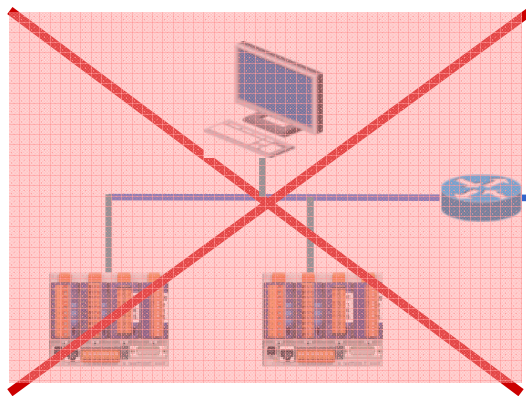
Software/Firmware versions and documentation

PG5: **from $2.1.030, recommended V2.1.100**

Firmware main CPU: in production 1.20.25, recommended 1.20.31

Firmware Ethernet extension: 1.20.31

Booter Ethernet extension: 1.20.20

Firmware update: PCD3.M6860_FW_update_description.pdf

Quick start guide: GettingStarted_PCD3.M6860 E2.pdf

System Catalogue:

Page 23

Page 200

PG5 settings in device configurator

Common IP settings for ETH1 and ETH2

Separate IP settings for ETH1 and ETH2
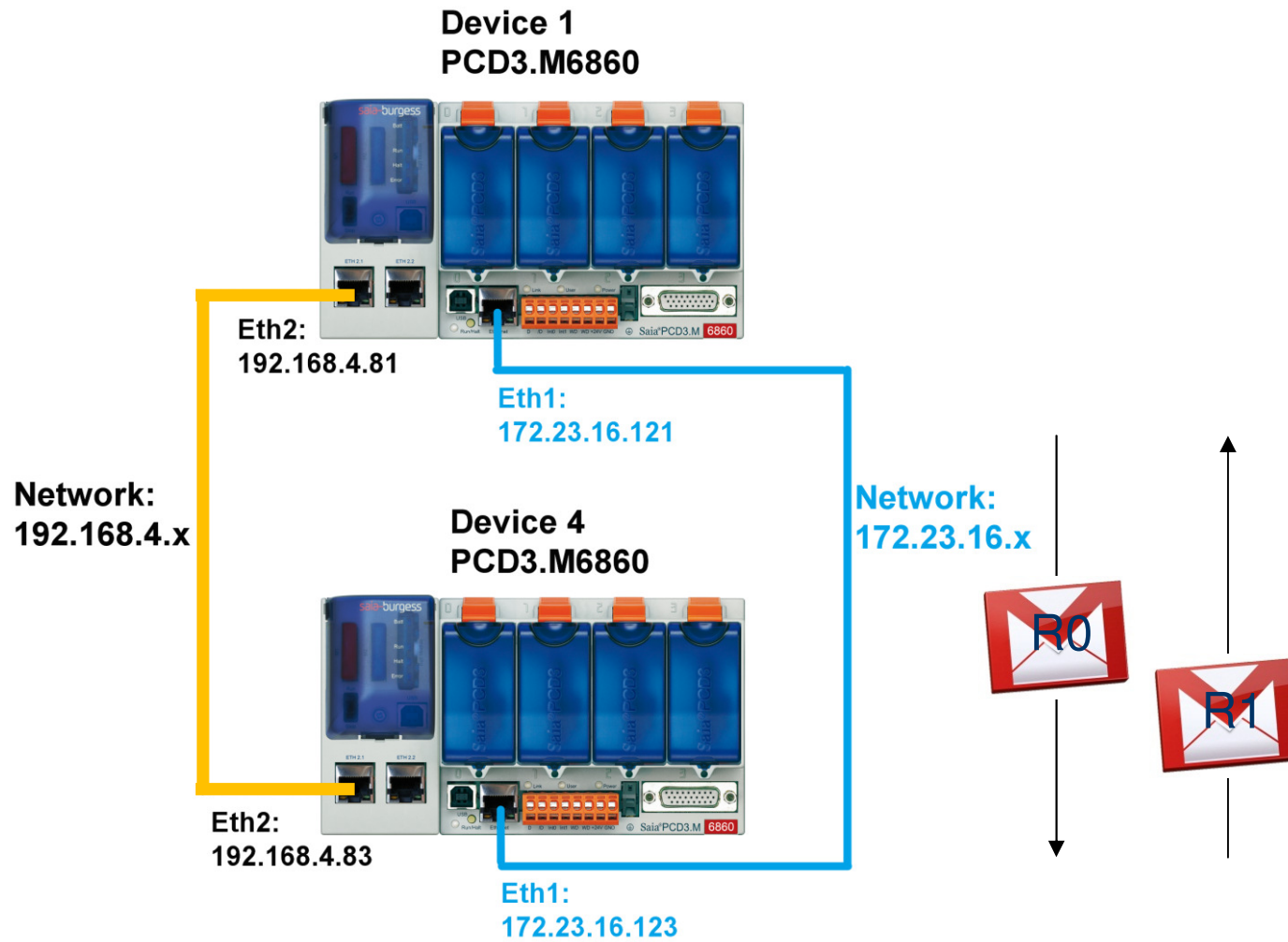
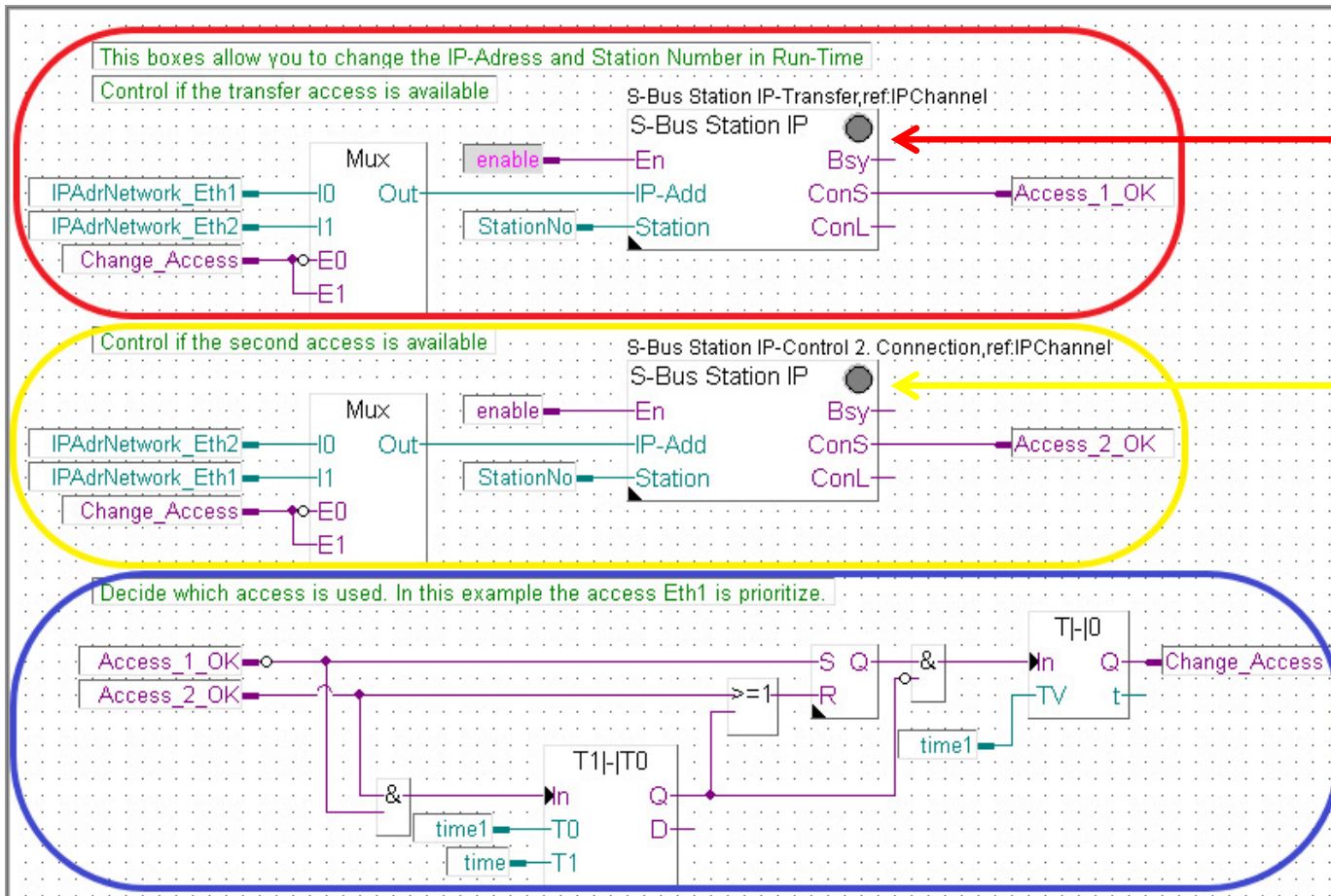- PG5 project for redundant PCD-PCD communication
- Communication with OPC-Server

The PG5 programming examples can be downloaded from the support homepage under the GettingStarted
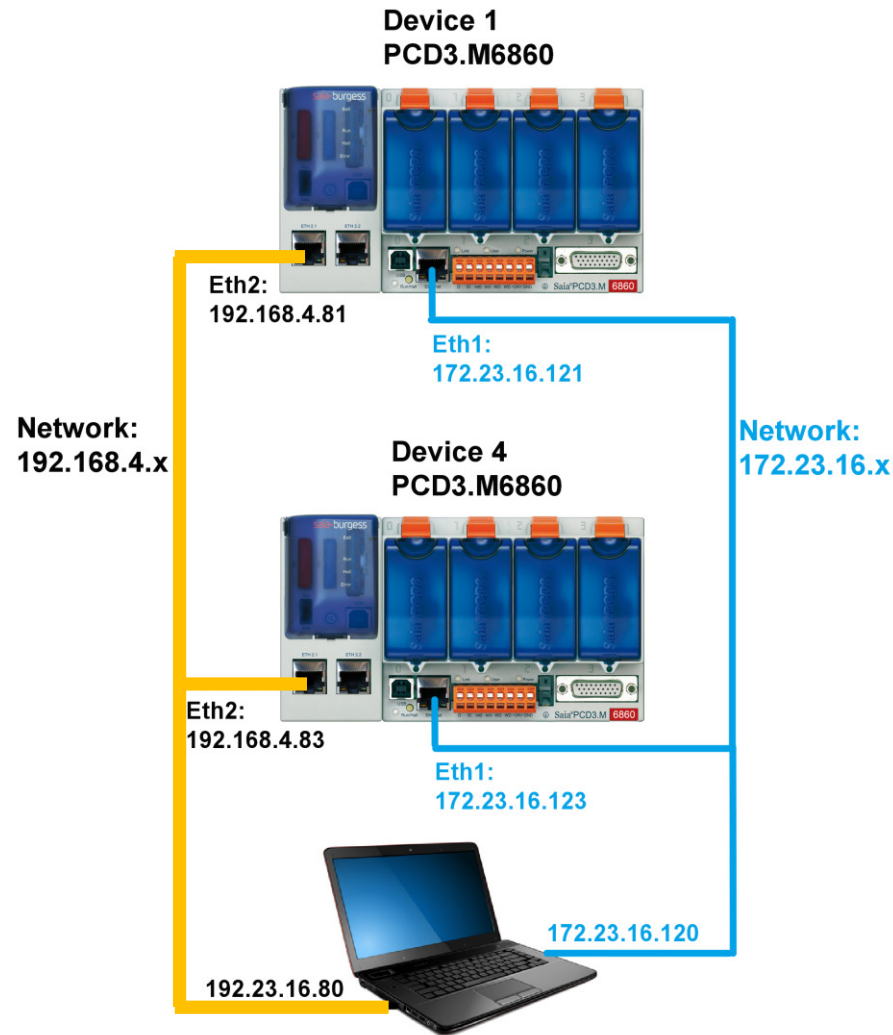
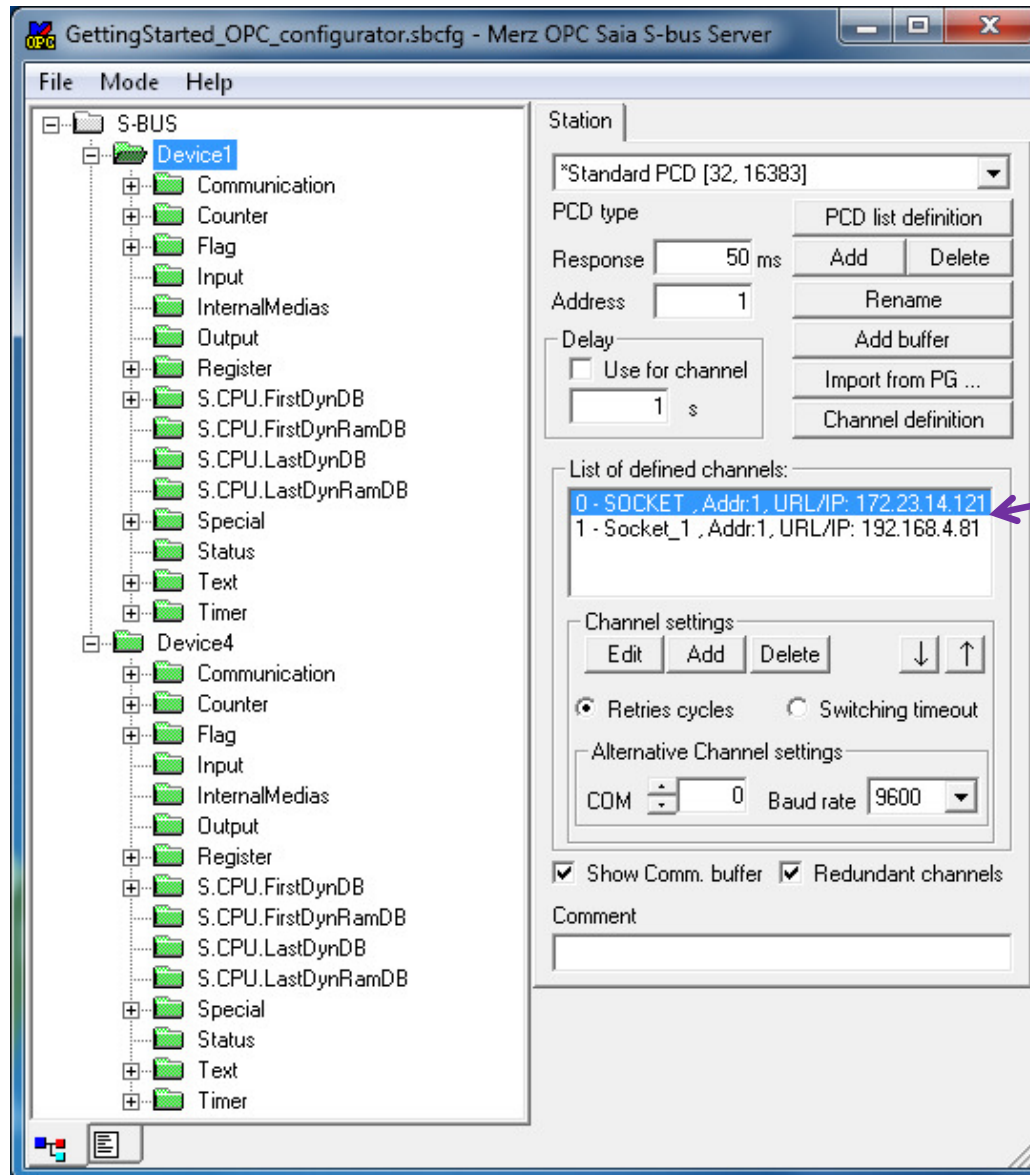**Redundant Network with two PCD3.M6860**

Reference Fbox over the Registers are send.

Reference Fbox which control the second IP-Address.

Decide which IP-Address should be used

Communication with OPC Server

Device 1
PCD3.M6860

Eth2:
192.168.4.81

Eth1:
172.23.16.121

Network:
192.168.4.x

Network:
172.23.16.x

Device 4
PCD3.M6860

Eth2:
192.168.4.83

Eth1:
172.23.16.123

172.23.16.120

192.23.16.80

Merz OPC-Server

Set both IP-Addresses

Matrikon OPC Explorer

IP-Address which is used
0 = blue network
1 = yellow network

Force which IP-Address should be used
0 = blue network
1 = yellow network
-1= automatic mode

set device active

value of Register

Good to know

USB connector on extension is not used. Can only be used for FW download if there is no FW (Booter only). FW download normally goes via USB 1 and Ethernet (1 or 2).

Performance

▪There are 2 Ethernet interfaces but only one CPU which processes the communication → communication performance is not increased

▪Communication via Ethernet 2 uses (about 2x) more CPU power than communication via Ethernet 1

▪Communication via Ethernet 2 is slower (about 2x) than via Ethernet 1

▪If there is heavy communication on both Ethernet interfaces the user program execution is slowed down correspondingly