

Software, a real game changer for 24/7 operation

Life hacks for your automation tasks

International Summit on Electrical Automation 2021
Roland Wagner, Head of Product Marketing

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Failure safety

2

Preparation

3

Replacement

4

Redundancy

5

Conclusion

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Failure safety

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Conclusion

Fail-safe?



Source: stern.de / planespottermania



Source: eurosport.de / Fotocredit: Imago

Remember:

- **Murphy's Law:**
“Anything that can go wrong will go wrong.”
- **One thing is certain: failures are unavoidable!**
→ In reality, there is no such thing as failure safety.
- **Crucial: Minimize risks!**
- **Learn from the pros!**

How to minimize your risks

- **Know your „players“ and their statuses**
 - In use for how long?
 - Signs of wear detectable?
- **Keep adequate replacements at hand**
 - How big is the FC Bayern Munich squad this season?
 - How many aircraft does Lufthansa have?
- **Provide redundancies**
 - Cost / risk in case of failure? Per hour / day? ...
 - Number of parallel FCS in one aircraft?
 - Number of parallel control systems in a nuclear power plant?

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Conclusion

... is crucial

- **Always be up to date what is going on! But how?**
- **Centralize information!**
- **Use a Server!**

In control and automation technology

- Monitoring of the "players" via digital twin
- Example: CODESYS Automation Server

PLCs / List View

PLCs

Topology Views

List View

Network Scan

Gateways

Applications

Licenses

Template




































































Tickets

List View

Q





Search

X

Name 	Version	Status	Device	Sync	Tags	Actions	<input type="checkbox"/>
BGH-IMX6_PMar	1.22.3.0		Vendor Berghof Automation GmbH Name DC2004W Q TS 0.8S 1131		<div>Tags...</div>	   	<input type="checkbox"/>
CODESYS_CubePLC_RaSPS_1	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi MC SL		<div>Tags...</div>	   	<input type="checkbox"/>
CODESYS_CubePLC_RaSPS_2	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi MC SL		<div>Tags...</div>	   	<input type="checkbox"/>
emPC_RPI_CAS_Demo	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi SL		<div>Tags...</div>	   	<input type="checkbox"/>
IOT2000_Live	3.5.15.30		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for IOT2000 SL		<div>Tags...</div>	   	<input type="checkbox"/>
PFC100-4566D3_CAS	3.5.15.20		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for PFC100 SL		<div>Tags...</div>	   	<input type="checkbox"/>
pixtend_um	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi SL		<div>Tags...</div>	   	<input type="checkbox"/>
Raspi_Touch_PMar	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi MC SL		<div>Tags...</div>	   	<input type="checkbox"/>
RevPi	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi SL		<div>Tags...</div>	   	<input type="checkbox"/>
UniPi	3.5.15.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi MC SL		<div>Tags...</div>	   	<input type="checkbox"/>
Wago_TP600	3.5.16.10		Vendor 3S - Smart Software Solutions GmbH Name CODESYS Control for Raspberry Pi SL		<div>Tags...</div>	   	<input type="checkbox"/>

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Detailed information

- Application
- Parameters
- Visualization
- Project /
Online debugging

The screenshot displays the CODESYS Automation Server web interface. The left sidebar contains navigation options: PLCs / List View, Topology Views, List View, Network Scan, Gateways, Applications, Licenses, Template, and Tickets. The main content area shows the 'List View / PLC Details: BGH-IMX6_PMar' page. It features a PLC icon, a 'Debug mode' toggle, and a 'New tag' section with 'links' and 'DemoCube' buttons. A red box highlights the 'PLC Information' and 'Device Identification' sections. The 'PLC Information' section includes fields for Device name, Serial number, Project, [object Object], and Gateways. The 'Device Identification' section includes fields for Name, Vendor, Device type, Firmware version, Runtime version, and Target ID. A red box also highlights the 'CODESYS' logo in the bottom left corner of the main content area. The bottom of the interface shows a 'Replace PLC' button and a footer with copyright information.

CODESYS Automation Server

en PMar

PLCs / List View

List View / PLC Details: BGH-IMX6_PMar

General State Information Configuration Analyzer Projects

BGH-IMX6_PMar

PLC Information

Device name	BGH-IMX6_PMar
Serial number	CAS-54CA1E8D-E41A-4F96-950B-68187C0CEC77
Project	PanelPLCdc2004
[object Object]	Established
Gateways	DemonstratorGateway

Device Identification

Name	DC2004W Q TS 0.8S 1131
Vendor	Berghof Automation GmbH
Device type	Softmotion3S
Firmware version	1.22.3.0
Runtime version	3.5.14.40
Target ID	274268162

Debug mode

New tag

links DemoCube

CODESYS

Replace PLC

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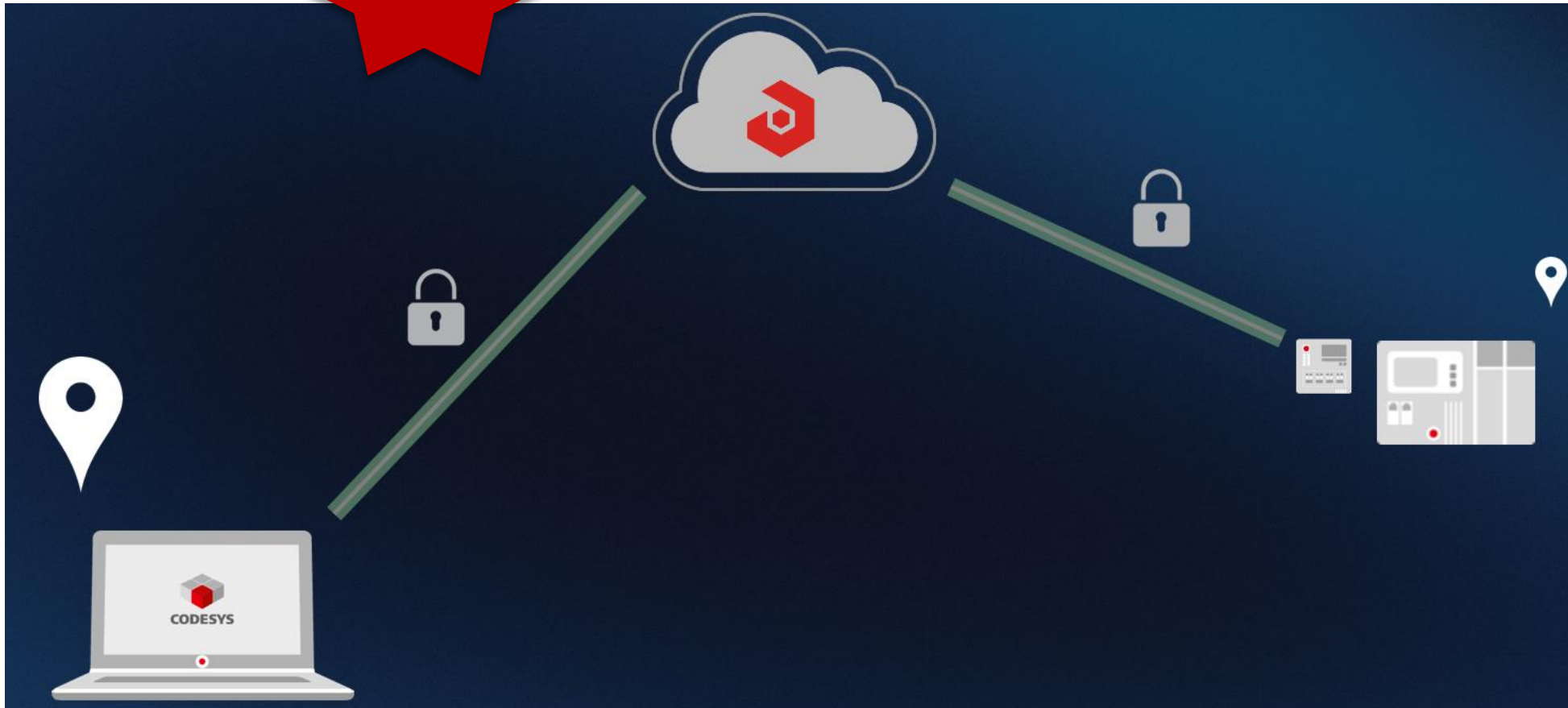
CODESYS Group | We software Automation.

Monitoring via web browser

- **Target device irrelevant (PC, tablet, smartphone)**
- **Device location irrelevant**
- **More information optional**
 - Operating time vs. max. operating time (according to manufacturer's specification)
 - Number of switching cycles vs. maximum number (according to manufacturer's specification)
 - Actual behavior vs. normal behavior (taught-in data)
- **Secured access**
 - Encapsulation from local network via edge gateway
 - End-to-end encrypted communication via TLS based on X.509 certificates
 - User accounts with different roles
 - Additional fine-granular object rights
 - Two-factor authentication

Is this really secure?

YES!



[The latest security certificate was issued on 10 September 2021 by TG Alpha ↗](#)

Failure

Can be avoided. How?

- Timely updates in maintenance windows
- Preventive device replacement: upper limits (soon) reached
- Detection of signs of wear (anomalous behavior)



Source: sportnews.bz

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Conclusion

Hardware is essential ...

... because it is hardware that fails.

- Store replacement device / order in good time
- Change on site by available electrician

When changing hardware: Where to get the right software?

- **It is the software that determines the operation of the device!**
- **Helpful:**
 - Backups of application / current parameters
 - Structured archiving
 - Central access
 - Installation without toolchain (installation / licenses etc.)
 - Unique connection to the used device
- **How to implement?**
- **Server!**



Source: sportnews.bz



PLCs

Applications

CODESYS Projects

Licenses

Template

Tickets

CODESYS Projects

Project MultDataSources 11/19/2020, 2:19:43 PM m.decker	Commit Removed b (BOOL)			
Project EncryptedProject 11/18/2020, 8:27:41 PM m.decker	Commit Initial upload			
Project worker_reduced_SAN 11/17/2020, 11:25:24 AM r.wagner	Commit IrSpeed geändert			
Project RobotFactory 10/13/2020, 9:43:24 AM PMar	Commit Minor Update			
Project PanelPLCdc2004 8/31/2020, 2:18:58 PM PMar	Commit 1st commit			
Project PanelVisu 5/7/2020, 3:35:37 PM	Commit Background cool			
Project PFC100_Demonstrator 2/19/2020, 9:39:08 AM	Commit Initial upload			
Project RevPi 1/27/2020, 2:55:19 PM	Commit Initial upload.			
Project Chromatic 1/27/2020, 12:05:53 PM	Commit Initial upload (LEDs colored)			
Project	Commit			



Just in case: Quick replacement

The screenshot displays the CODESYS Automation Server interface. The top bar shows the logo, 'CODESYS Automation Server', language 'en', a grid icon, a user profile 'PMar', and a dropdown arrow. The left sidebar contains a menu with 'PLCs / List View' (expanded), 'Topology Views', 'List View' (selected), 'Network Scan', 'Gateways', 'Applications', 'Licenses', 'Template', and 'Tickets'. The main area is titled 'List View / PLC Details: BGH-IMX6_PMar'. It features a PLC icon, a 'Debug mode' toggle (currently off), and a 'New tag' section with 'links' and 'DemoCube' buttons. Below these is a 'CODESYS' logo. On the right, the 'BGH-IMX6_PMar' details are shown under the 'General' tab. The 'PLC Information' section lists: Device name (BGH-IMX6_PMar), Serial number (CAS-54CA1E8D-E41A-4F96-950B-68187C0CEC77), Project (PanelPLCdc2004), [object Object] (Established), and Gateways (DemonstratorGateway). The 'Device Identification' section lists: Name (DC2004W Q TS 0.8S 1131), Vendor (Berghof Automation GmbH), Device type (Softmotion3S), Firmware version (1.22.3.0), Runtime version (3.5.14.40), and Target ID (274268162). At the bottom of the details panel, a row of icons includes a refresh icon, a grid icon, a settings icon, a document icon, a lock icon, and a trash icon. The 'Replace PLC' button, located below the refresh icon, is highlighted with a red box. The footer contains copyright information: '© 2019 - 2021 CODESYS Development GmbH | A member of the CODESYS Group' and the logo 'CODESYS Group | We software Automation.'

CODESYS Automation Server

en PMar

PLCs / List View

PLCs

Topology Views

List View

Network Scan

Gateways

Applications

Licenses

Template

Tickets

List View / PLC Details: BGH-IMX6_PMar

BGH-IMX6_PMar

General State Information Configuration Analyzer Projects

PLC Information

Device name BGH-IMX6_PMar

Serial number CAS-54CA1E8D-E41A-4F96-950B-68187C0CEC77

Project PanelPLCdc2004

[object Object] Established

Gateways DemonstratorGateway

Device Identification

Name DC2004W Q TS 0.8S 1131

Vendor Berghof Automation GmbH

Device type Softmotion3S

Firmware version 1.22.3.0

Runtime version 3.5.14.40

Target ID 274268162

Replace PLC

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Roll-out by service technicians on site

- **Required:**

- Internet access
- Browser
- E-Mail with ticket ID

→ e.g. PC, tablet, smartphone

The screenshot displays the CODESYS Automation Server web interface. On the left is a sidebar menu with options: PLCs, Applications, Licenses, Template, and Tickets. The main area is titled 'Create Ticket: Replace PLC'. It contains several sections: 'PLC to be replaced' with 'PLC Information' (Name: emPC_RPI_CAS_Demo, Serial number: 000000007850e88a) and 'Device Identification' (Name: CODESYS Control for Raspberry Pi SL, Vendor: CODESYS Group, Device type: Softmotion3S, Firmware version: 3.5.15.10, Runtime version: 3.5.15.10, Target ID: 16). Below this is the 'Ticket Information' section with fields for Title, Description, and Service technician. The Title field is pre-filled with 'Replace the PLC 'emPC_RPI_...'. The Description field contains the text 'Gerät auswechseln, Seriennummer des neuen Geräts eingeben und bestätigen'. The Service technician dropdown is set to 'Angus McGyver'. A 'Create Ticket' button is at the bottom. A red rectangle highlights the Title, Description, and Service technician fields. The footer shows copyright information for CODESYS Development GmbH and the CODESYS Group logo.

CODESYS Automation Server

en PMar

PLCs Applications Licenses Template Tickets

Create Ticket: Replace PLC

PLC to be replaced

PLC Information

Name emPC_RPI_CAS_Demo
Serial number 000000007850e88a

Device Identification

Name CODESYS Control for Raspberry Pi SL
Vendor CODESYS Group
Device type Softmotion3S
Firmware version 3.5.15.10
Runtime version 3.5.15.10
Target ID 16

Ticket Information

Title: Replace the PLC 'emPC_RPI_...

Description: Gerät auswechseln, Seriennummer des neuen Geräts eingeben und bestätigen

Service technician: Angus McGyver

Create Ticket

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Roll-out via web interface

CODESYS Automation Server

en PMar

PLCs Applications Licenses Template Tickets

CODESYS Projects / Application: Chromatic_App

General Deployment Parameters

Commit: Initial upload (LEDs col...)

1/27/2020, 12:05:53 PM

Delete Application

Filter by tag

State	Installed PLC	Deployed Commit	Deploy (0)	Remove (0)
🟢	🔄 CODESYS_CubePLC_RaSPS_1 Frontseite DemoCube	Initial upload (LEDs colored) 1/27/2020, 12:05:53 PM	<input type="checkbox"/>	Parameters <input type="checkbox"/>
🟢	🔄 CODESYS_CubePLC_RaSPS_2 Frontseite DemoCube	Initial upload (LEDs colored) 1/27/2020, 12:05:53 PM	<input type="checkbox"/>	Parameters <input type="checkbox"/>
🔄	🔄 Raspi_Touch_PMar Frontseite DemoCube		<input type="checkbox"/>	Parameters <input type="checkbox"/>
🚫	🚫 UniPi rechts DemoCube		<input type="checkbox"/>	Parameters <input type="checkbox"/>

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Apply Changes

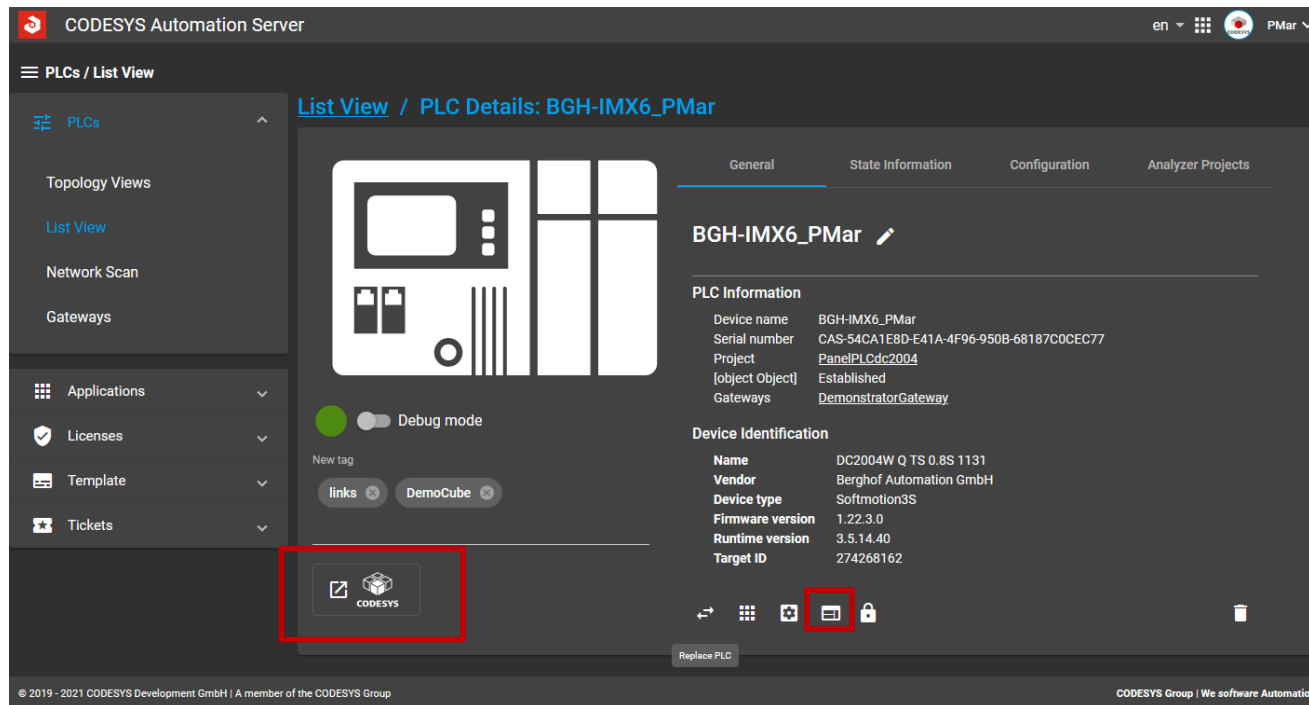
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Readjustment

Direct intervention:

- Via web visualization
- Via remote debugging / update



Source: spiegel.de / Martin Meissner/ AP

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Conclusion

The same "player" active multiple times

- In soccer ⇒ forbidden / impossible
- In other industries: ⇒ uneconomical / impossible
- In automation: ⇒ no problem

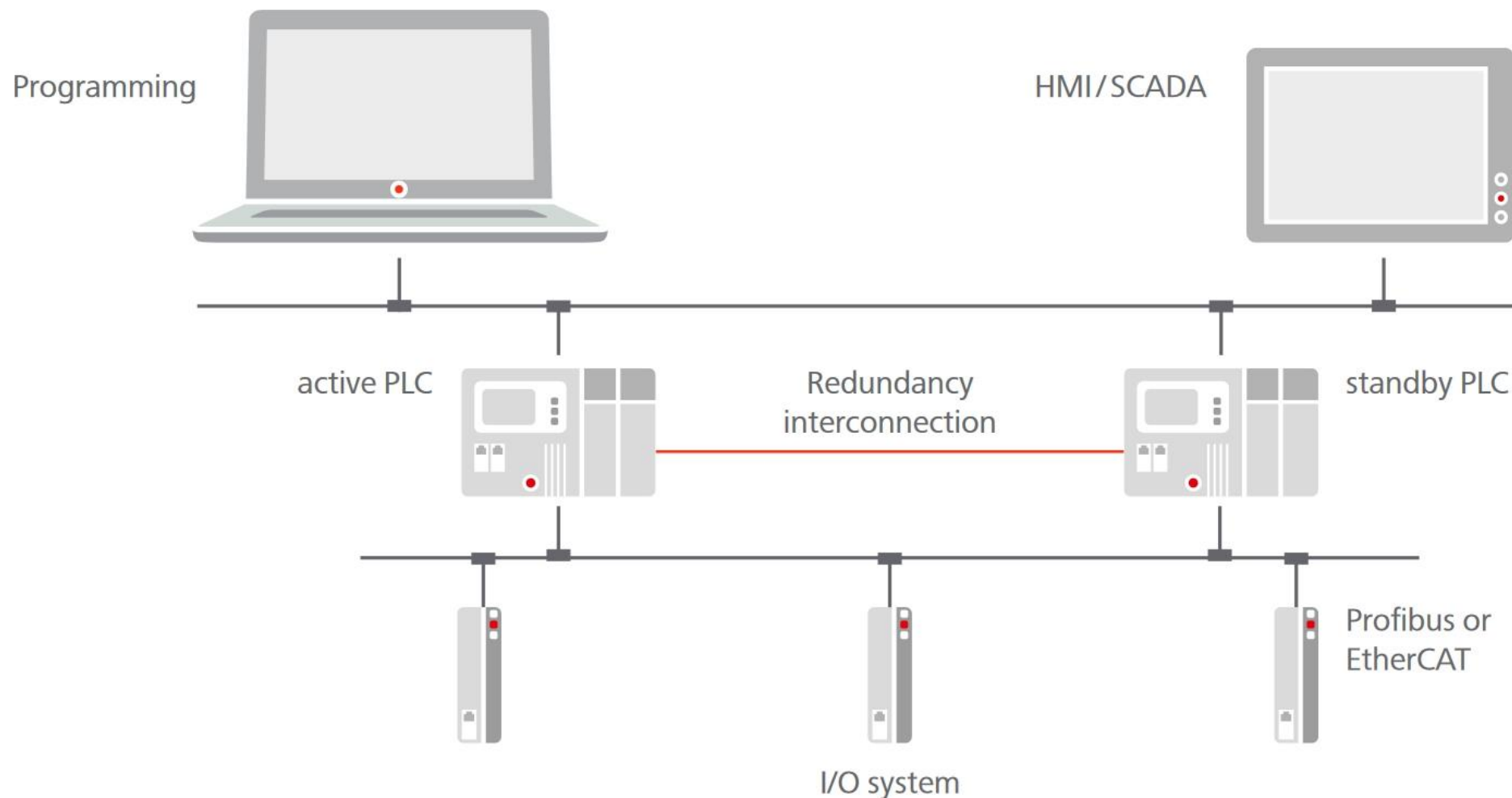


Source: dpa-infocom GmbH / bearbeitet

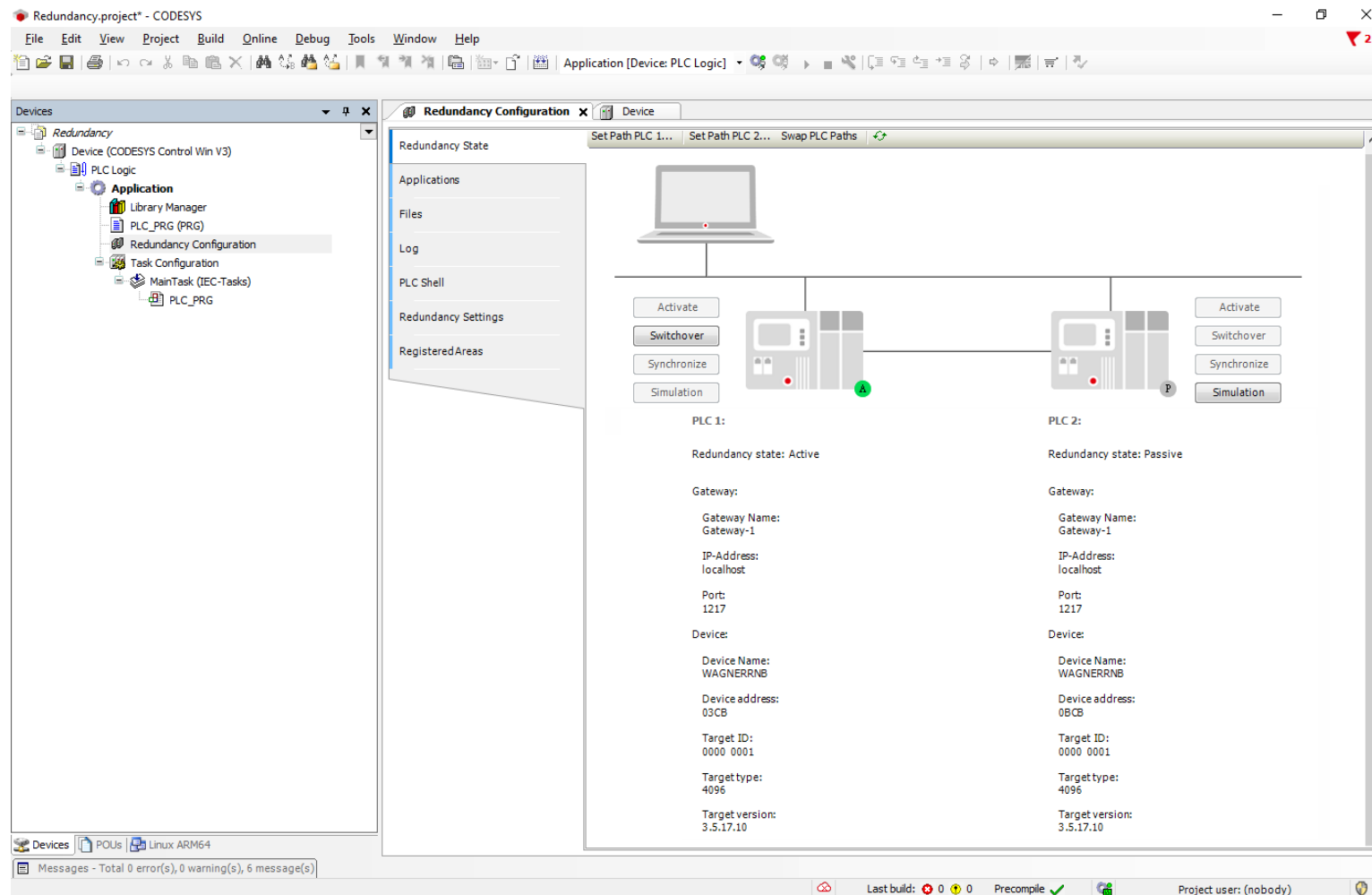


Source: © Colourbox / bearbeitet

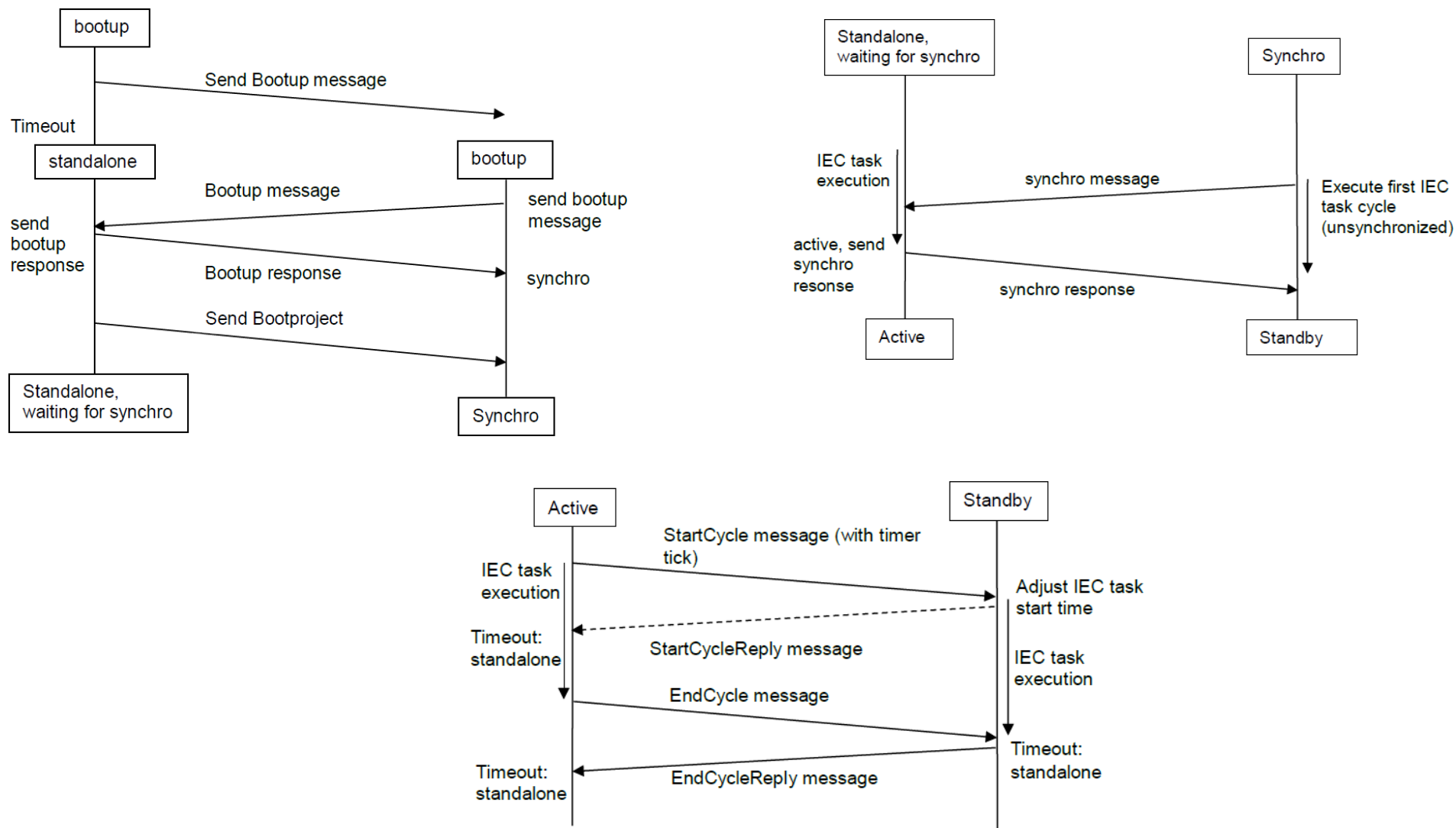
Redundant PLCs: Principle



Redundant PLCs: Configuration



Redundant controllers: Bootup, synchronizing, executing



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Failure safety

- Enhance ⇒ Yes
- Guarantee ⇒ Hardly

Risk of failure

- **Minimize!**
- **How to:**
 - Always be up to date about what is going on!
 - Observation of the current situation
 - Preparation for or pro-active replacement of players
 - Server-based administration of the application
 - Easy monitoring / remote readjustment

Intelligent software: CODESYS

- Provides overview
- Supports management and preparation
- Supports fast and smooth replacement
- Enables true redundancy
- Minimizes risk

➔ **Software is the game changer!**



Source: esmuellert.de

The background of the slide is a high-angle, blue-tinted photograph of two men working at a desk. One man is pointing at a laptop screen while the other looks on. The laptop screen displays a complex technical diagram. There are papers and a cup on the desk as well.

Thank you for your attention.

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