

PLCnext Technology Slides Pool

PLCnext Technology – Status September 2021



Brief
overview



Competitive
Advantages



PLCnext
Control



Functional
Safety



Edge
Computing



Security



PLCnext
Engineer



PLCnext
Stoe



PLCnext
Community

PLCnext Technology Ecosystem

PLCnext Technology

Much more
than just a great vision –
enhanced automation today!



PLCnext Technology[®]
Designed by PHOENIX CONTACT



PLCnext Technology Ecosystem

Motivation

All Electric Society

INDUSTRIAL
INTERNET
OF THINGS

Our solution for a rapidly changing world

PLCnext TechnologyTM
Designed by PHOENIX CONTACT

The open ecosystem for
limitless automation

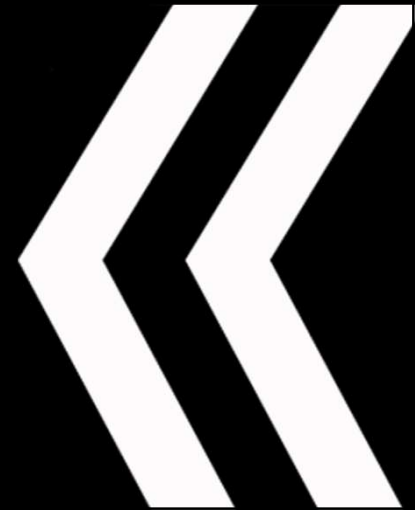
PLCnext Technology[®]

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PLCnext Technology open ecosystem



The open ecosystem for
limitless automation



PLCnext Technology[®]

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PLCnext Control

Open Control Platform

Devices in various performance classes including PLCnext Runtime System and accessories



PLCnext Engineer

Engineering Software

Engineering tool for commissioning, configuring and programming PLCnext Control



PLCnext Store

Software Store

Apps for functional extension of PLCnext Control and PLCnext Engineer



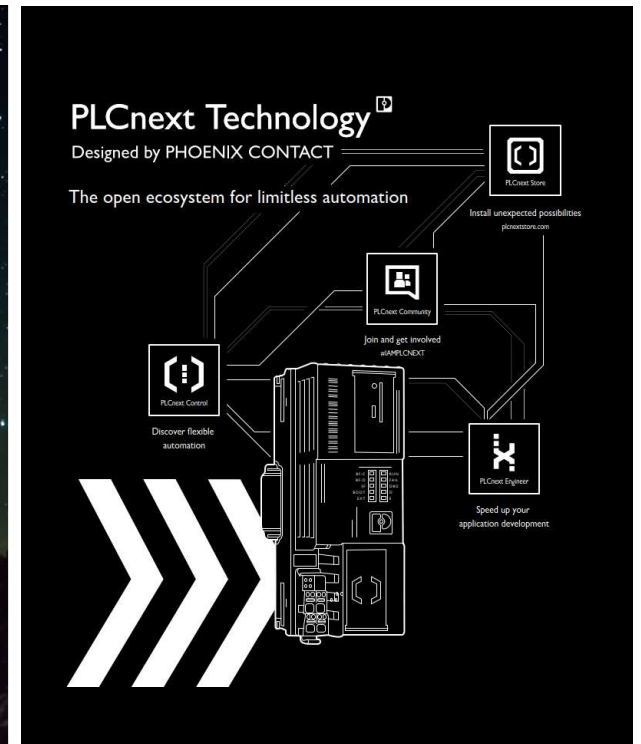
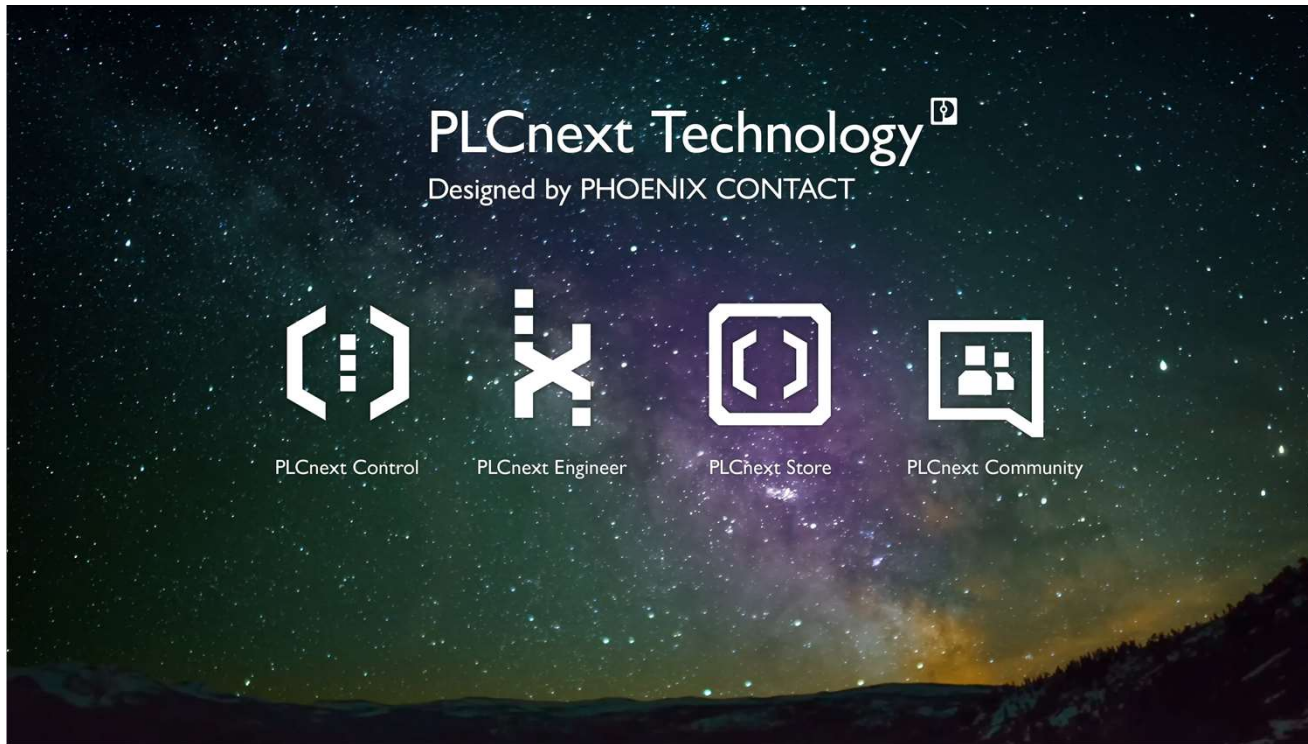
PLCnext Community

Collaboration & Resources

We offer our community Information, support and helpful resources, including FAQs, forums, tutorials, and a GitHub presence

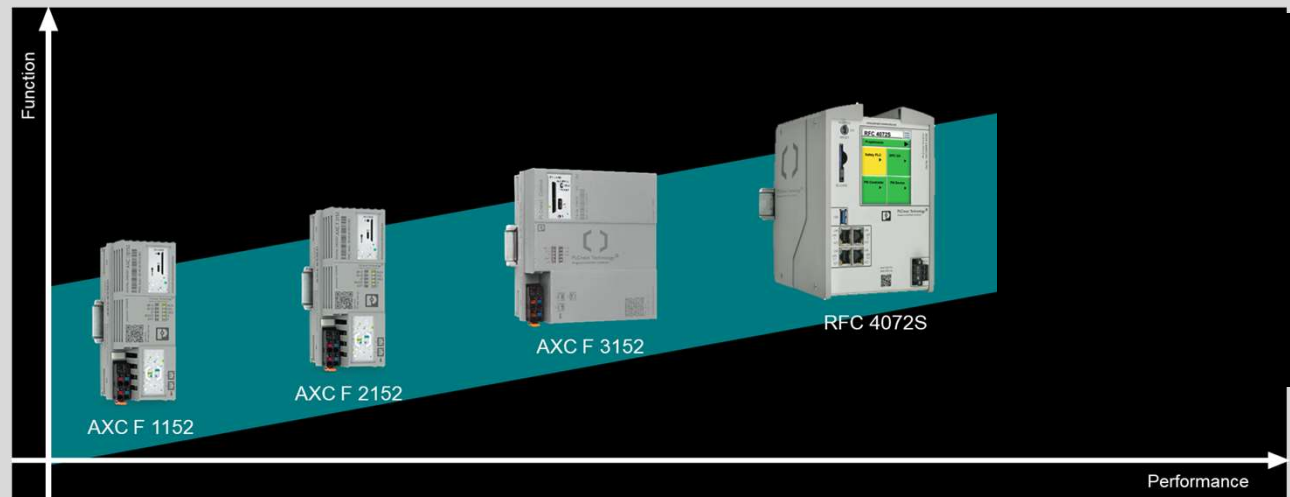
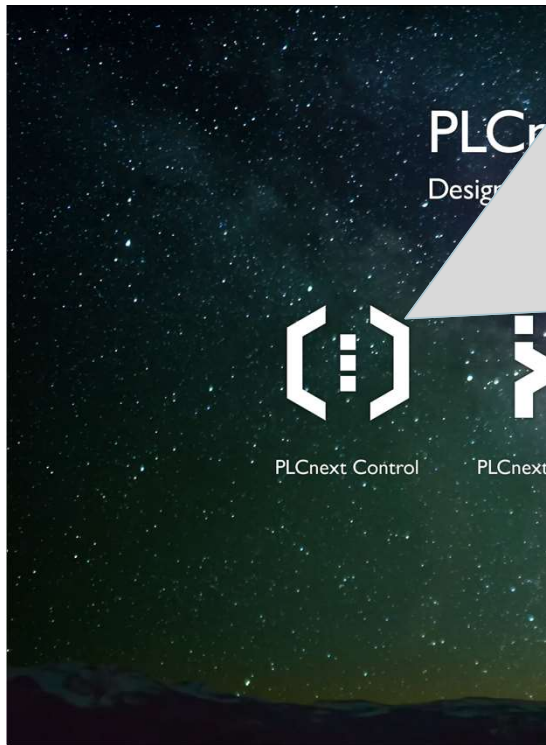
PLCnext Technology Ecosystem

PLCnext Technology



PLCnext Ecosystem

PLCnext Technology

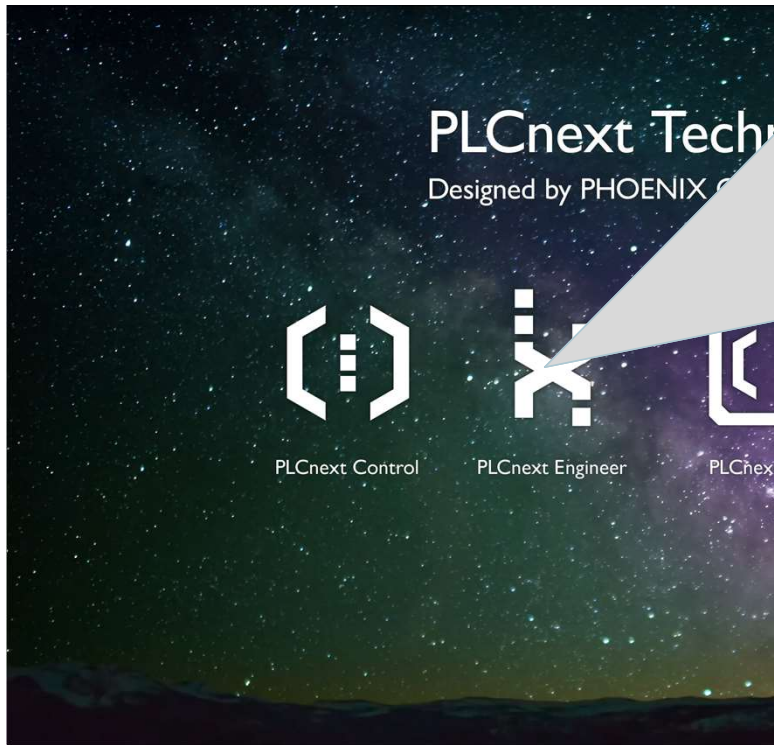


Open Control Platform

PLCs in various performance classes including PLCnext Runtime System and accessories for PLCnext Technology

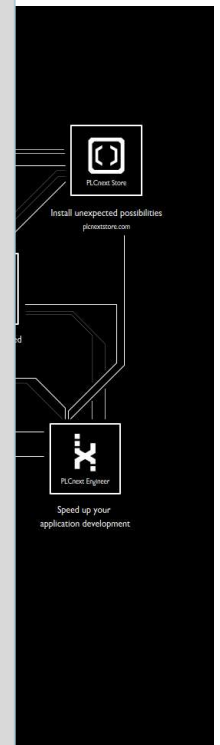
PLCnext Ecosystem

PLCnext Technology



Engineering Software

Engineering tool for commissioning, configuring, and programming PLCnext Controls



PLCnext Ecosystem

PLCnext Technology



PHOENIX CONTACT PLCnext Store

Install unexpected possibilities

Filter: Rating, Price, Type

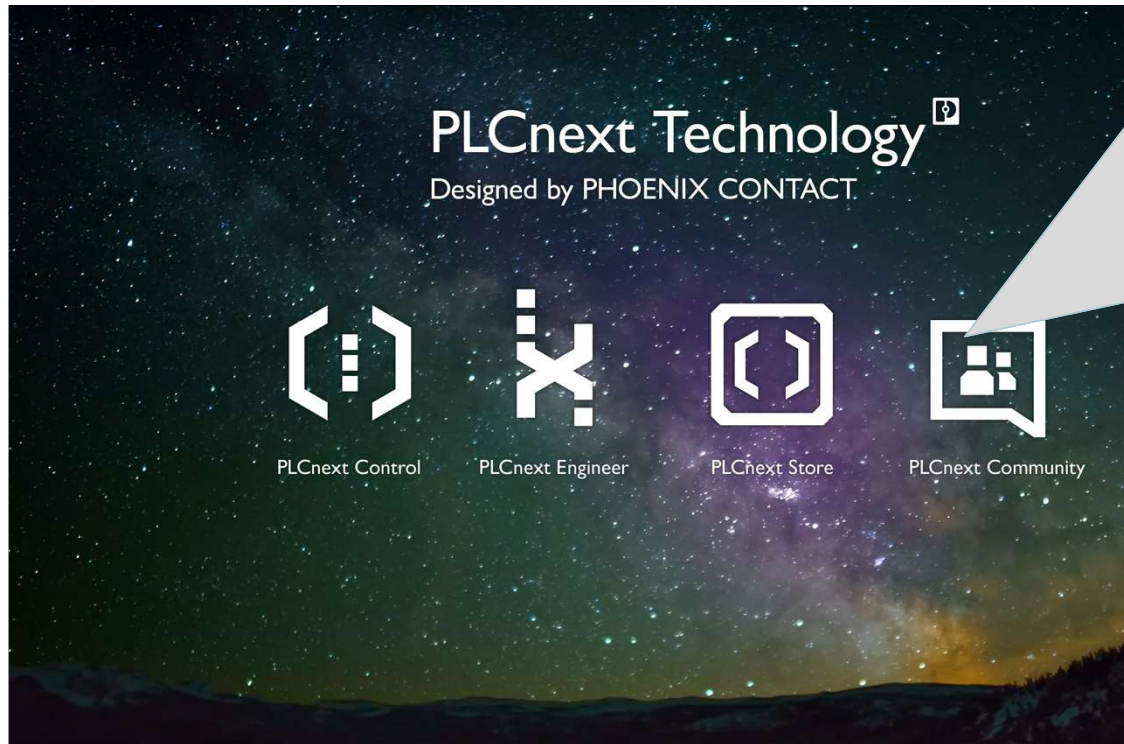
- AnalogTechnology
- Basic Light Control
- Modbus RTU
- Preload Writer
- Pump Station Control

Software Store for Automation
Apps for functional extension of PLCnext Control and PLCnext Engineer

The screenshot shows the PLCnext Store interface. It features a search bar, navigation links, and a list of software applications. Each application card includes an icon, a title, a brief description, a rating, and a 'Download' button. The applications listed are AnalogTechnology, Basic Light Control, Modbus RTU, Preload Writer, and Pump Station Control. The interface is clean and modern, with a dark theme.

PLCnext Ecosystem

PLCnext Technology



Become a part of the PLCnext Community!

#plcnext #amplcnext

- Ask a question in the forum
- Upload or download apps
- Get technical support in the community
- Watch a video for technical support
- Use or share open source code
- Share your experience on Instagram

PLCnext Technology
The ecosystem for limitless automation

In a rapidly changing world, in which more things are now networked together than there are people, industrial automation is also undergoing a fundamental shift. Classic system structures are developing into cyber-physical systems, and future-oriented automation systems must be flexible, open, and networked.

User Collaboration & Resources

Information, support, and helpful resources about PLCnext Technology including FAQs, forums, tutorials and a GitHub presence

PLCnext Technology

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enhanced development

Connected coworking



enhanced connectivity

Open interfaces and cloud integration



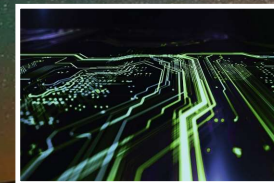
enhanced freedom

Flexible integration of open source software and apps



enhanced convenience

Using your favorite programming tool



enhanced performance

Real-time execution across different programming languages

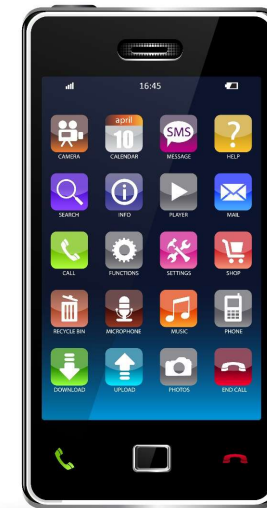
PLCnext Technology

The reliability and robustness
of the classical PLC world



enhances

with the openness and flexibility
of Smart Devices.



PLCnext Technology 
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enhance your automation thinking

PLCnext Technology makes it possible to implement automation projects without the limits of proprietary systems. You work freely with your favorite programming languages and development tools, open-source software and apps. You can also integrate cloud services and future technologies individually.

PLCnext Technology 
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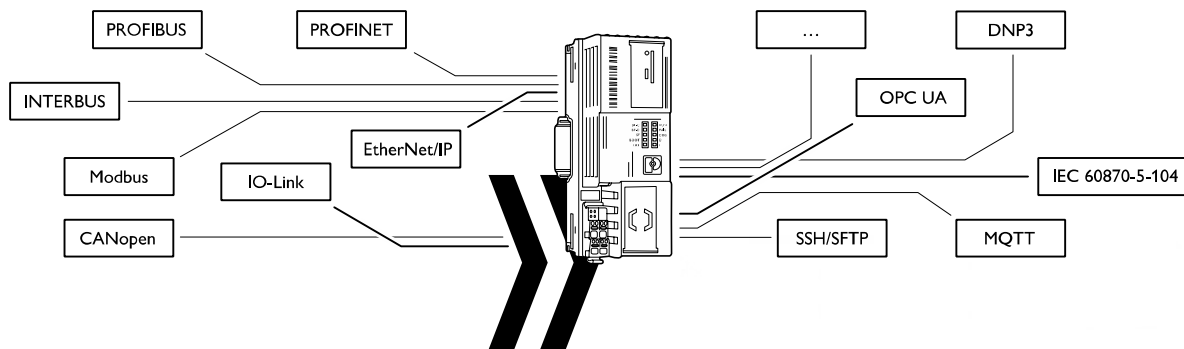
enhanced connectivity

Open interfaces and
cloud integration

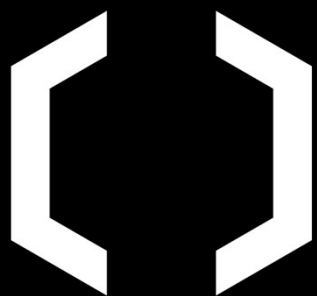
PLCnext Technology enables the integration of current and future interfaces and protocols for open communication in highly networked automation systems. Implement new IoT-based business models through edge computing and/or direct connection to cloud-based services and databases.

enhanced connectivity – Intelligent Networking

Future-proof Connectivity



PLCnext Technology 
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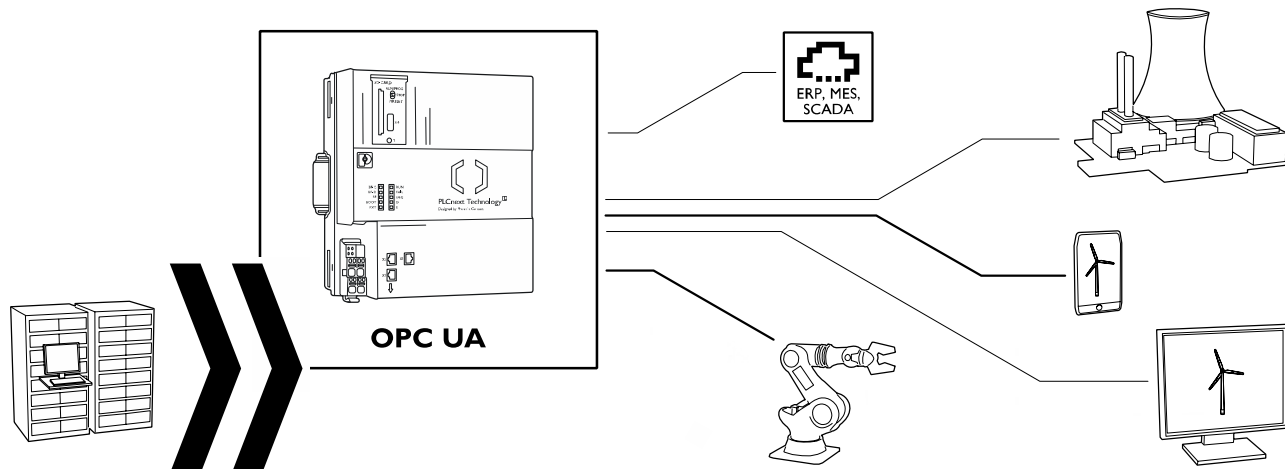


PLCnext Technology enables the integration of current and future interfaces and protocols for open communication in highly networked automation systems.

enhanced connectivity – Intelligent Networking

Integrated OPC UA Server

PLCnext Technology 
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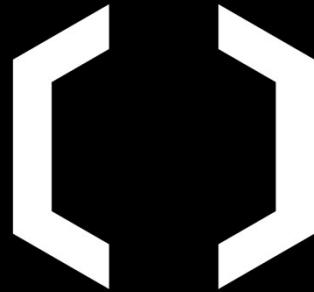


Data Access, Alarms and
Conditions, Programs, Historical
Access, Global Discovery Server

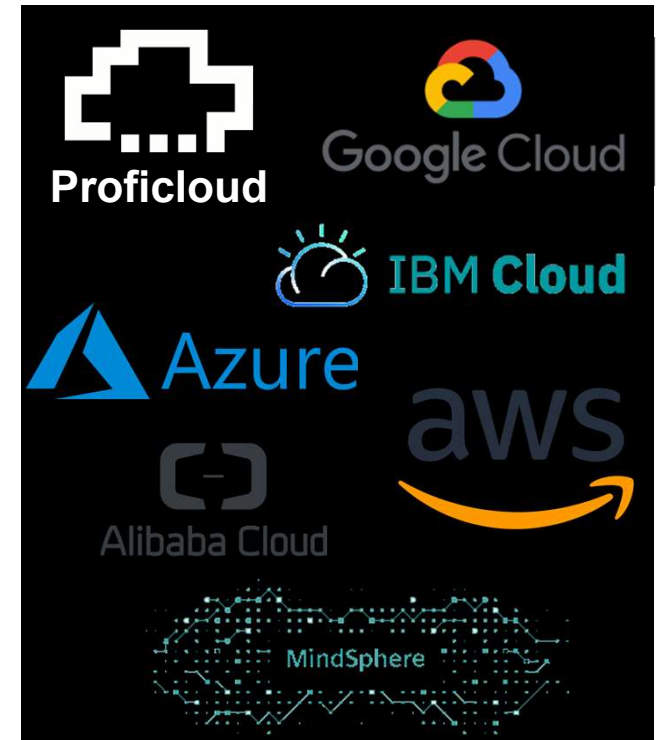
enhanced connectivity – Intelligent Networking

PROFICLOUD, Public Cloud, Private Cloud – any Cloud!

Implement new IoT-based business models through direct connection to cloud-based services and databases.

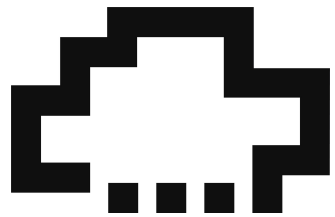


Benefit from the seamless integration of Phoenix Contact's PROFICLOUD and a cloud-agnostic strategy where the PLCnext Store delivers cloud connectors for every cloud. PLCnext Technology supports any customer cloud implementation – public, private, hybrid - including AWS, IBM, Azure, Alibaba, and MindSphere.



Cloud Strategy for Intelligent Networking

Proficloud, Public Cloud, Private Cloud, any Cloud



PROFICLOUD



Alibaba Cloud



Google Cloud



Azure

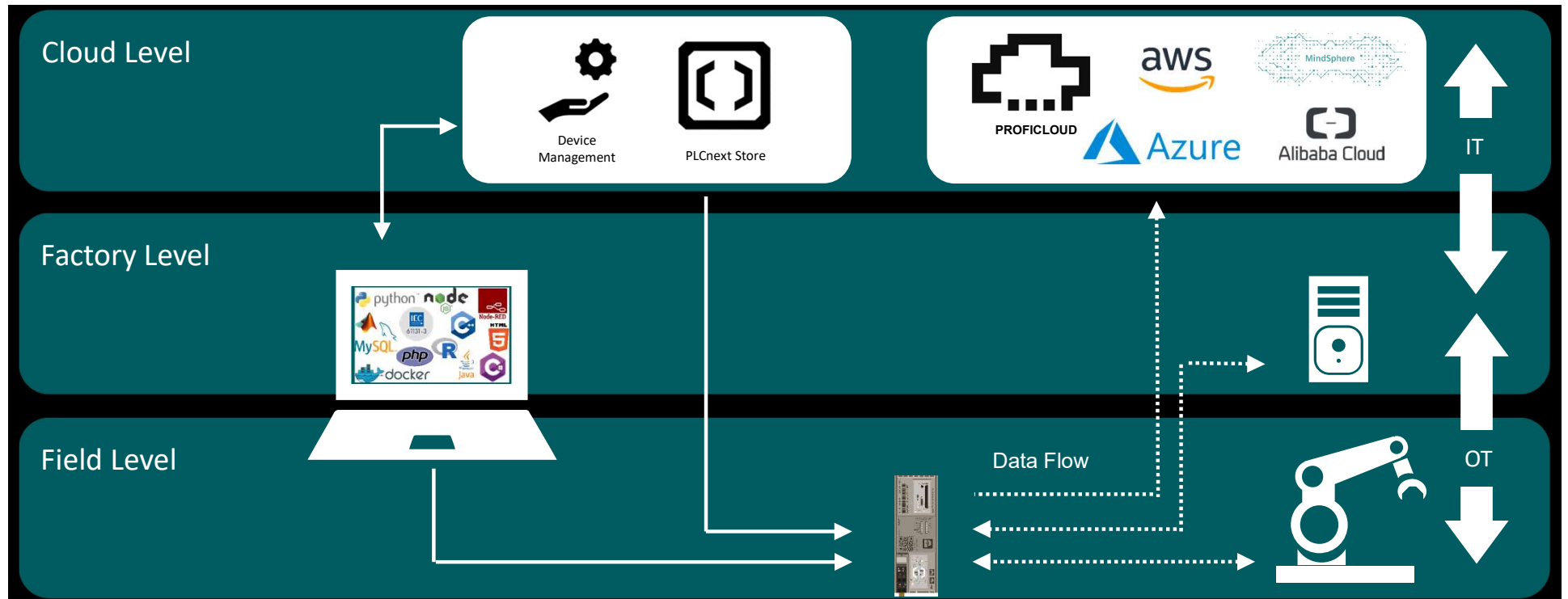


IBM Cloud

Implement new IoT-based business models through direct connection to cloud-based services and databases. With the cloud agnostic strategy, a cloud connector to any cloud can be downloaded via PLCnext Store and a fully integrated Proficloud connectivity, PLCnext Technology provides full support for any cloud strategy - public, private, hybrid - including AWS, IBM, Azure, Alibaba and MindSphere.

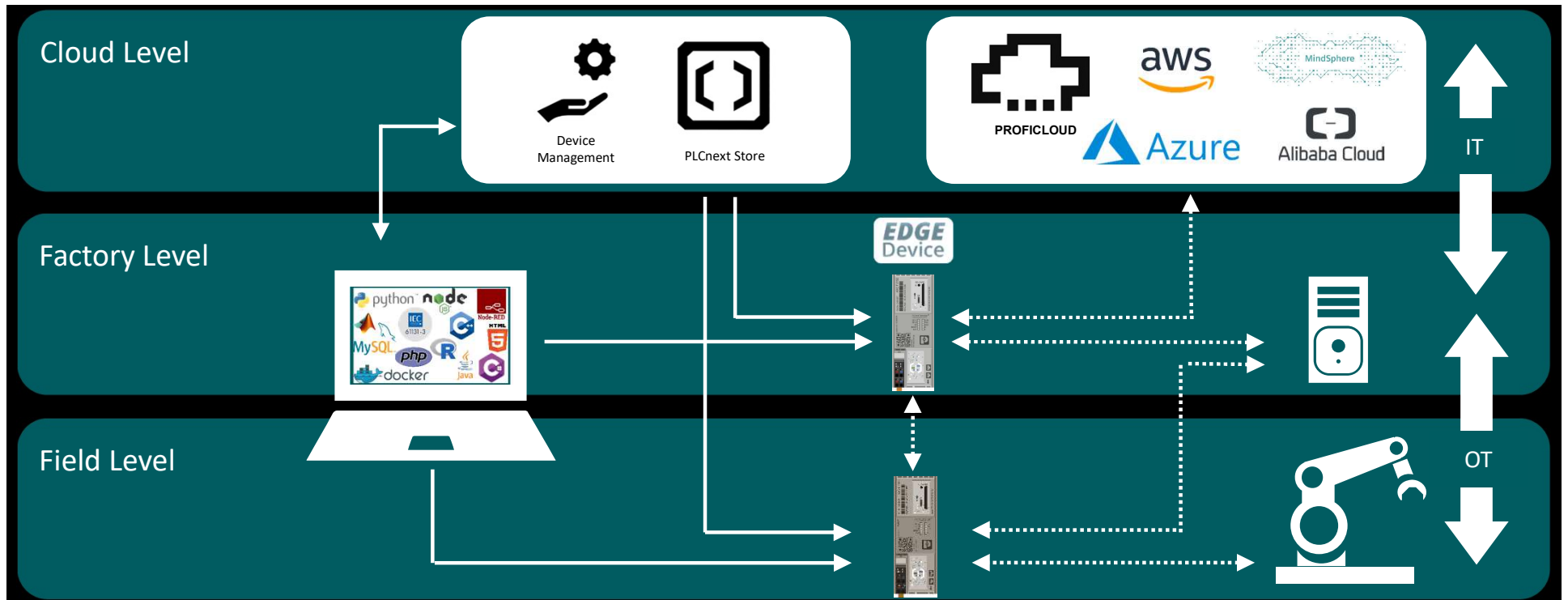
enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as PLC



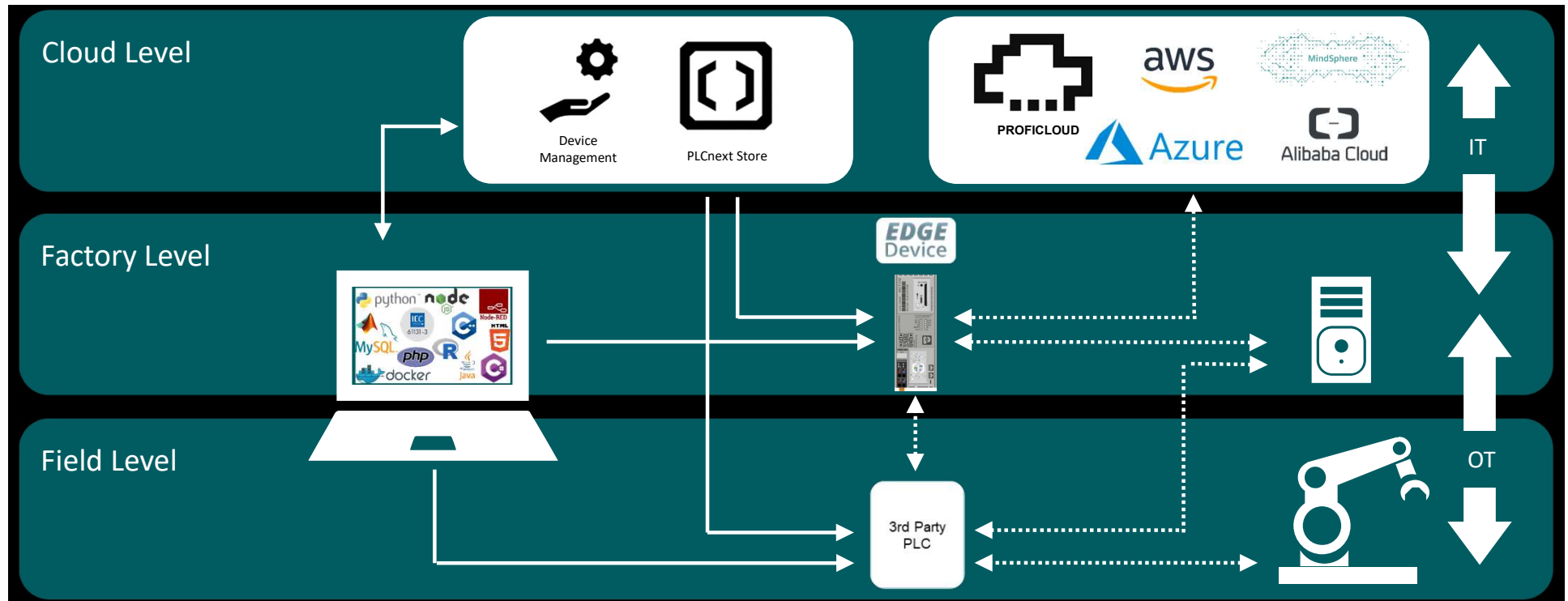
enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as PLC and Edge Device



enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as Edge Device



enhanced freedom

Flexible integration of
open source software and apps

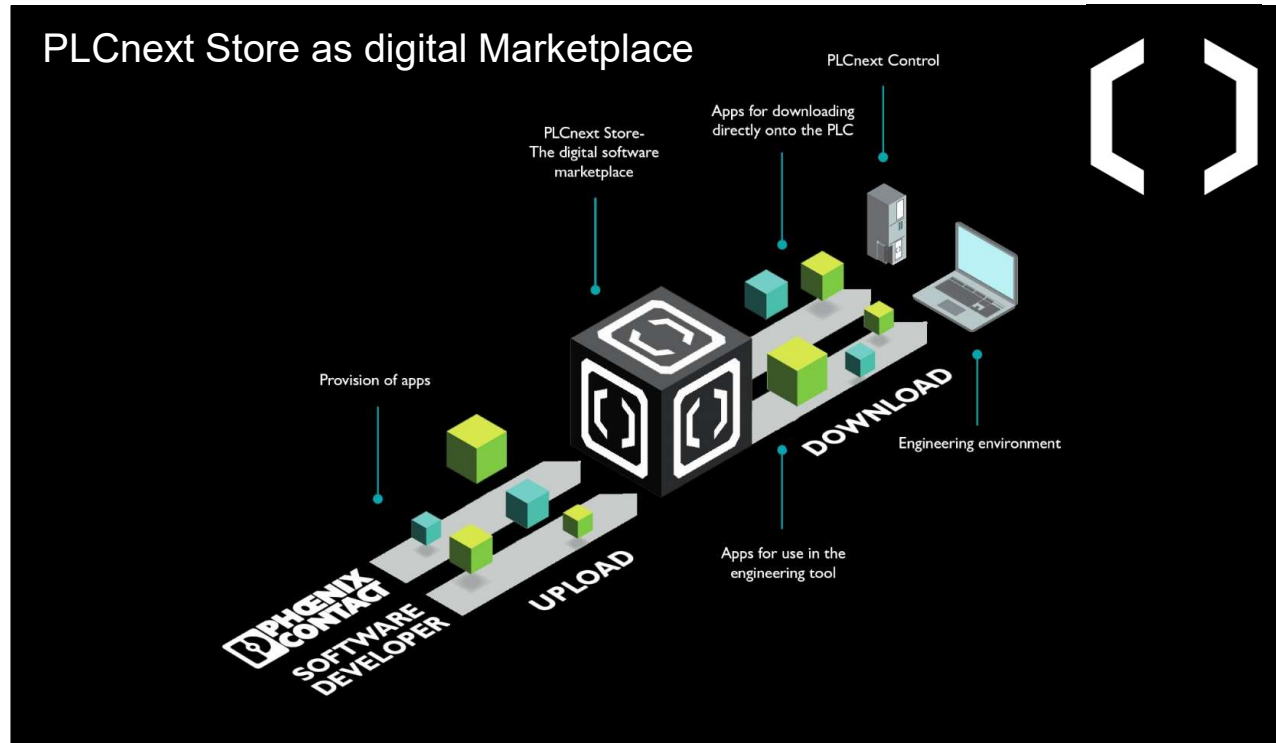
PLCnext Technology enables any desired combination of independently created program parts and complete applications. The use of open-source software and apps, e.g. from our PLCnext Store, improves the efficiency of your development processes. The sky is the limit when it comes to future expansions.

PLCnext Technology 
Designed by PHOENIX CONTACT



enhanced freedom

Limitless Adaption Capability



Open-Source Software



php

C#

node.js

Java

C++

JS

Node-RED

HTML5

docker

MySQL

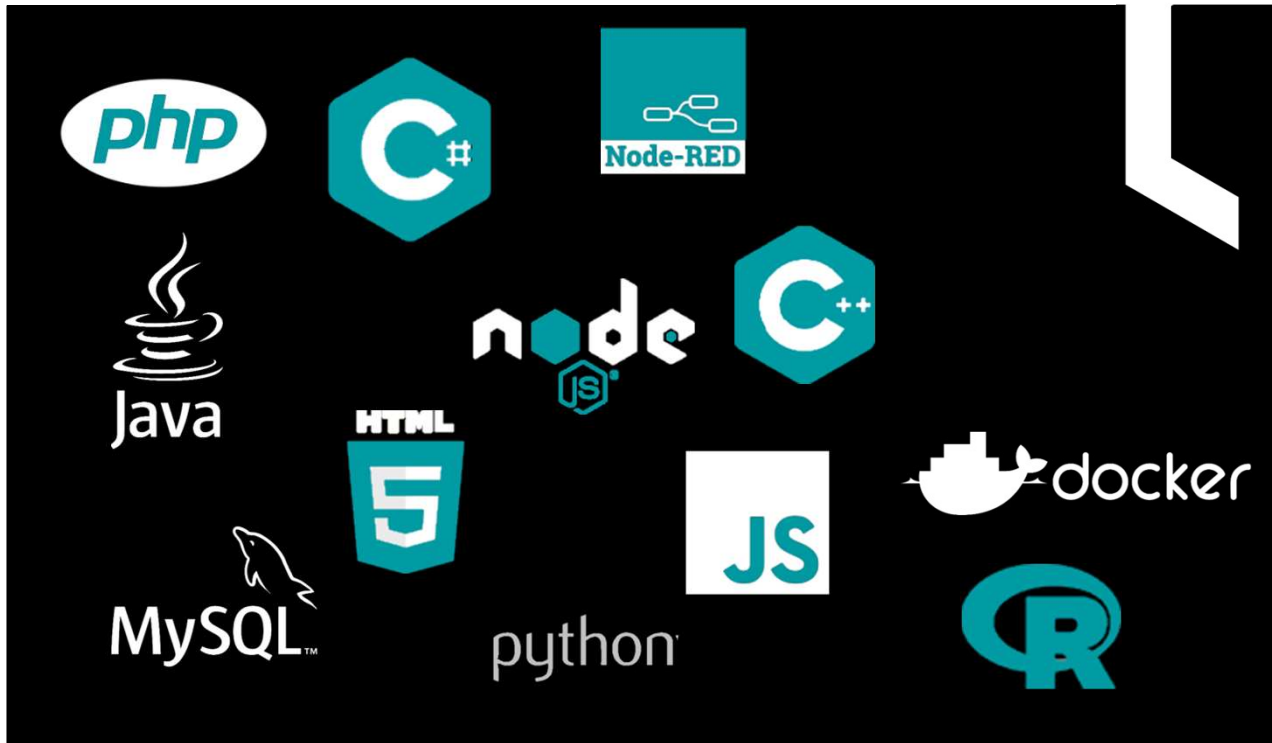
R

python

enhanced freedom

Limitless Adaption Capability

PLCnext Technology 
Designed by PHOENIX CONTACT



PLCnext Technology enables any desired combination of independently created program parts and complete applications. The use of open-source software and apps improves the efficiency of your development processes.



PLCnext Technology 

Designed by PHOENIX CONTACT

The openness of PLCnext Technology makes it possible to use your favorite programming language, be it IEC 61131 or high-level language. Develop your individual solution comfortably in a familiar development environment, such as PLCnext Engineer, Matlab Simulink, Eclipse, or Visual Studio.

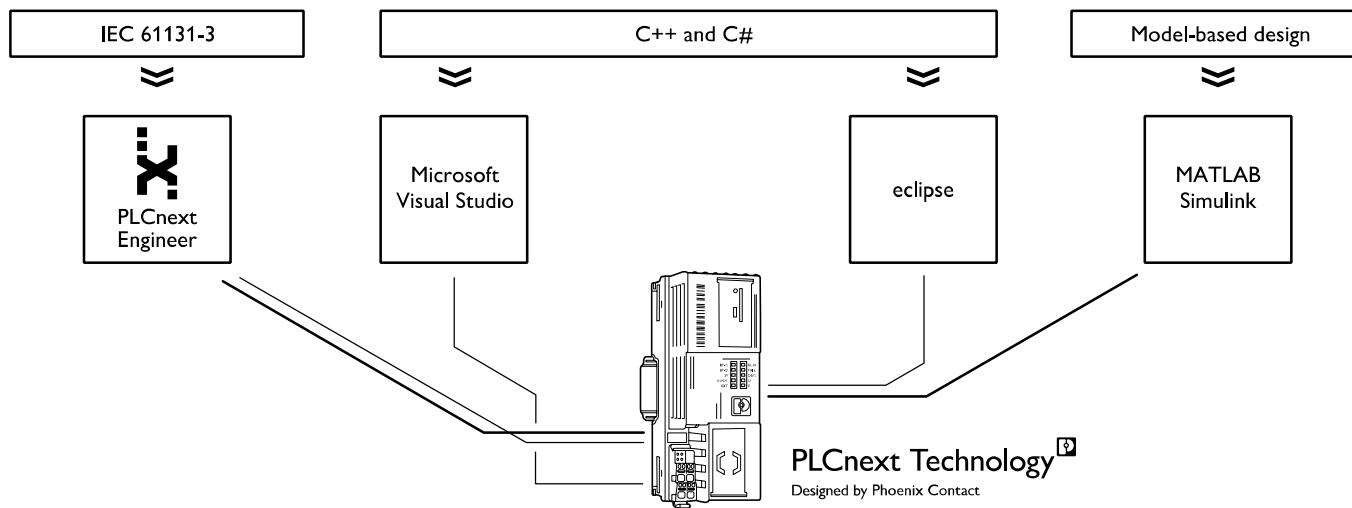
enhanced
convenience

using your favorite
programming tool

enhanced convenience

PLCnext Technology 
Designed by Phoenix Contact

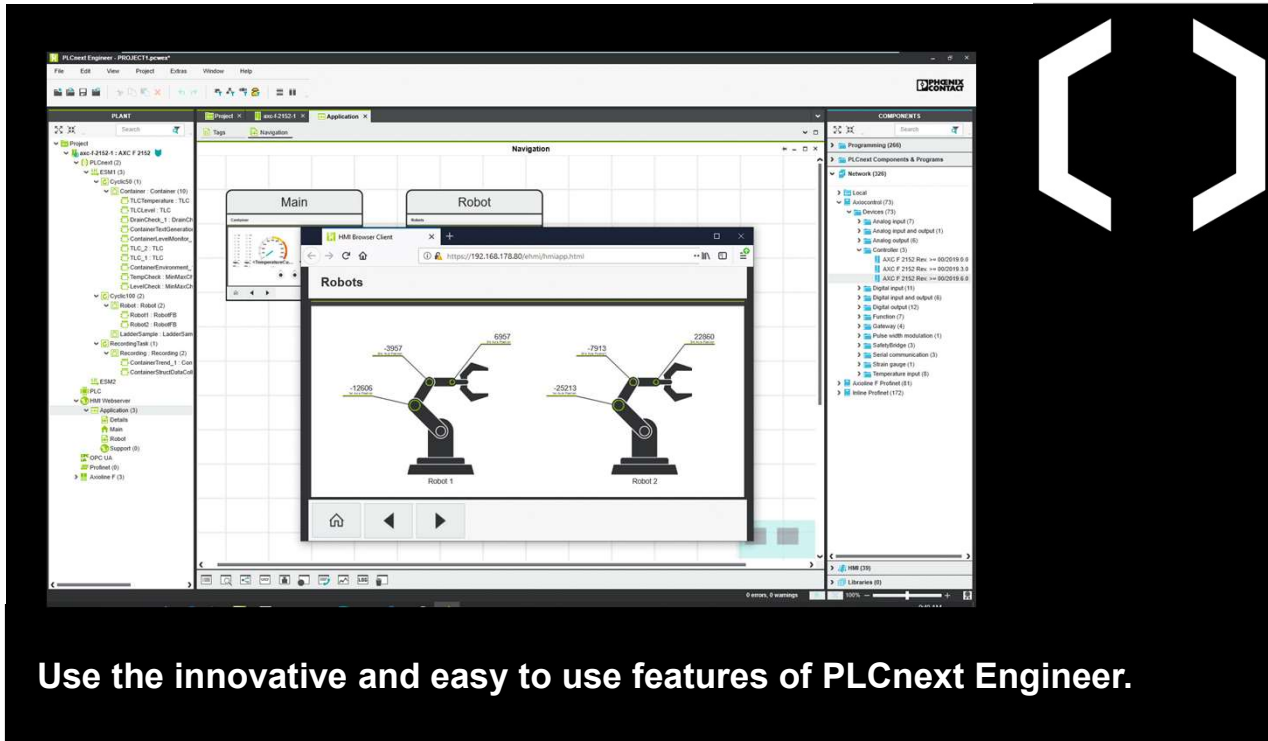
Engineering and Application Development



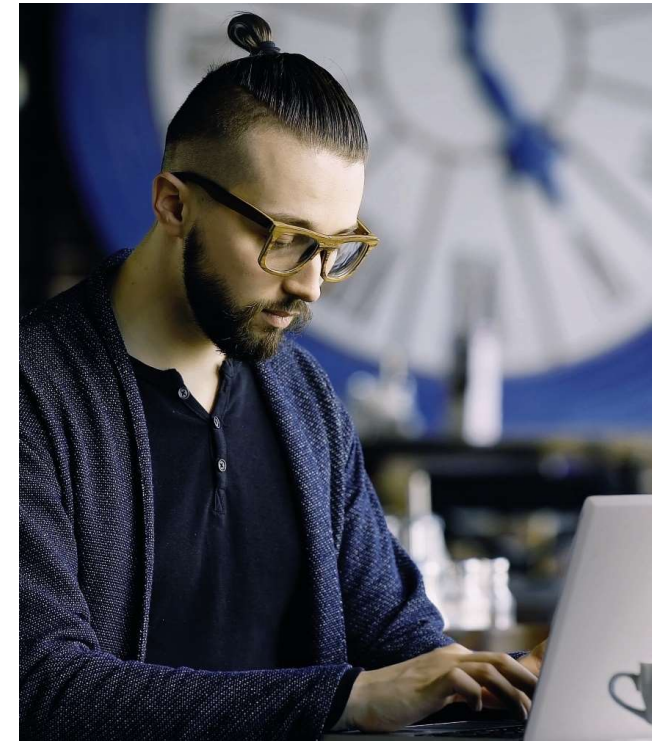
With PLCnext Technology, several developers from different generations, with different skill sets and expertise can work on one controller program, in parallel and yet independently, using different programming languages.

enhanced convenience

IEC 61131-3 Programming with PLCnext Engineer



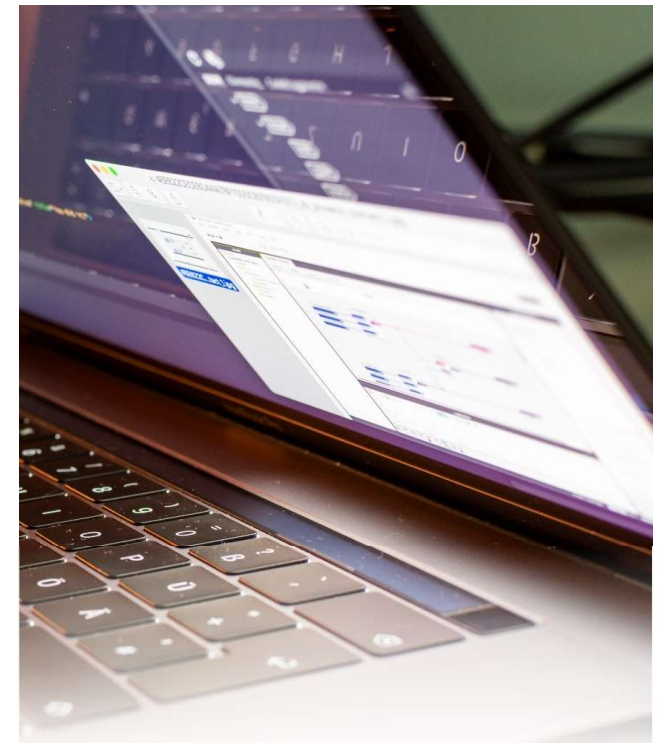
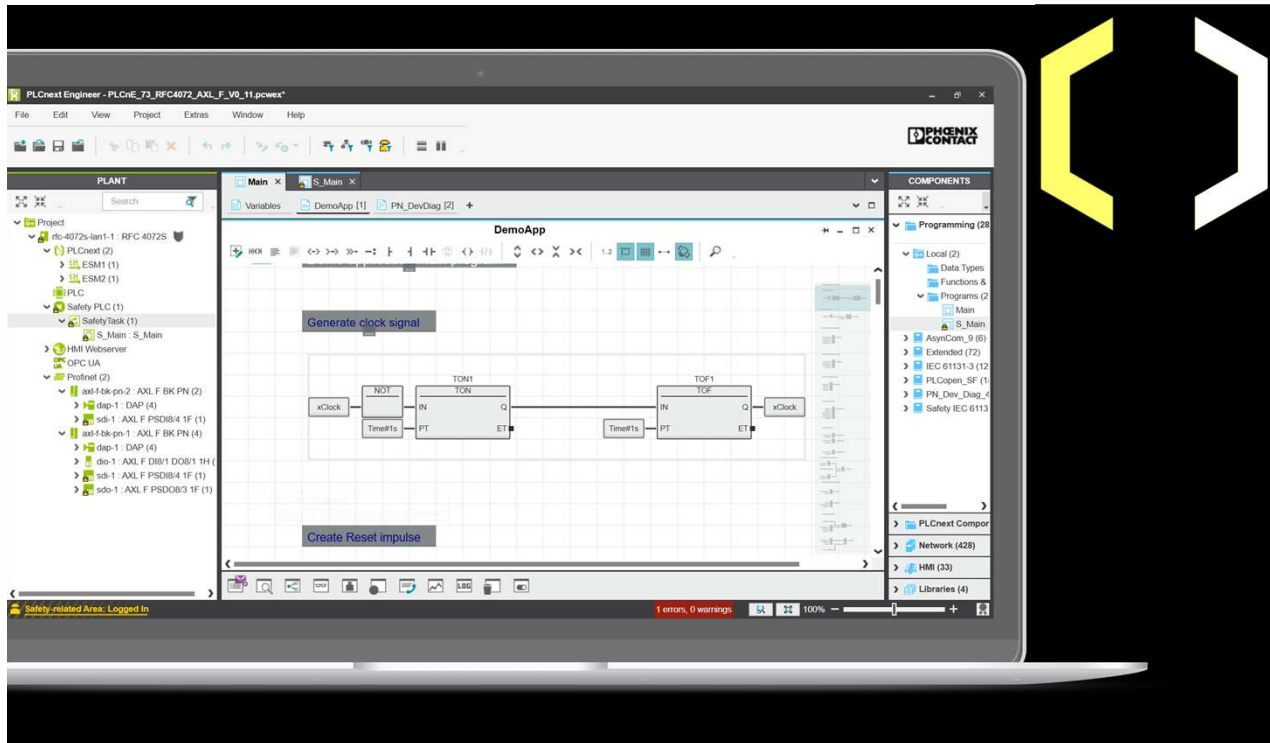
Use the innovative and easy to use features of PLCnext Engineer.



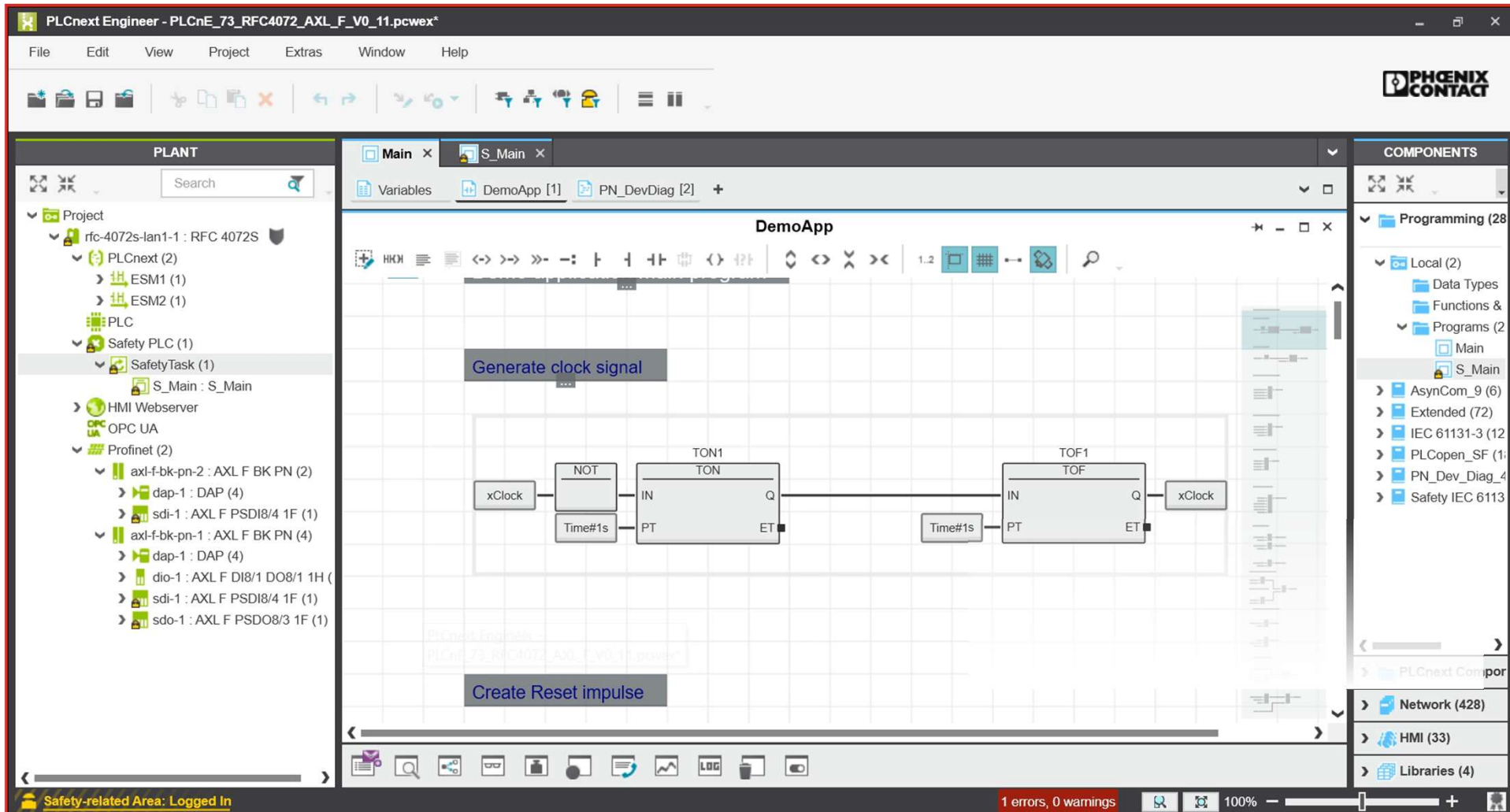
Standard and safety programming in one engineering software

PLCnext Engineer

PLCnext Technology 
Designed by PHOENIX CONTACT



Standard and safety programming in one engineering software



The screenshot displays the PLCnext Engineer software interface. The main workspace shows a ladder logic diagram titled "DemoApp" with the following components:

- Generate clock signal**: A blue button at the top of the diagram.
- TON1 (TON)**: A timer block with an input labeled "xClock" and a pulse generator labeled "Time#1s".
- TOF1 (TOF)**: A timer block with an input labeled "Time#1s" and an output labeled "xClock".
- NOT**: A logic inverter block connected between the "xClock" input and the "IN" of the TON1 timer.
- ET**: End of timer output for both TON1 and TOF1.

The interface includes a left-hand "PLANT" tree view showing a project structure with folders for "PLCnext", "Safety PLC", "HMI Webservice", "OPC UA", and "Profinet". A right-hand "COMPONENTS" panel lists various programming elements like "Data Types", "Functions & Programs", and "Network". The bottom status bar indicates "1 errors, 0 warnings" and "100%" zoom level.

Safety-related Area: Logged In

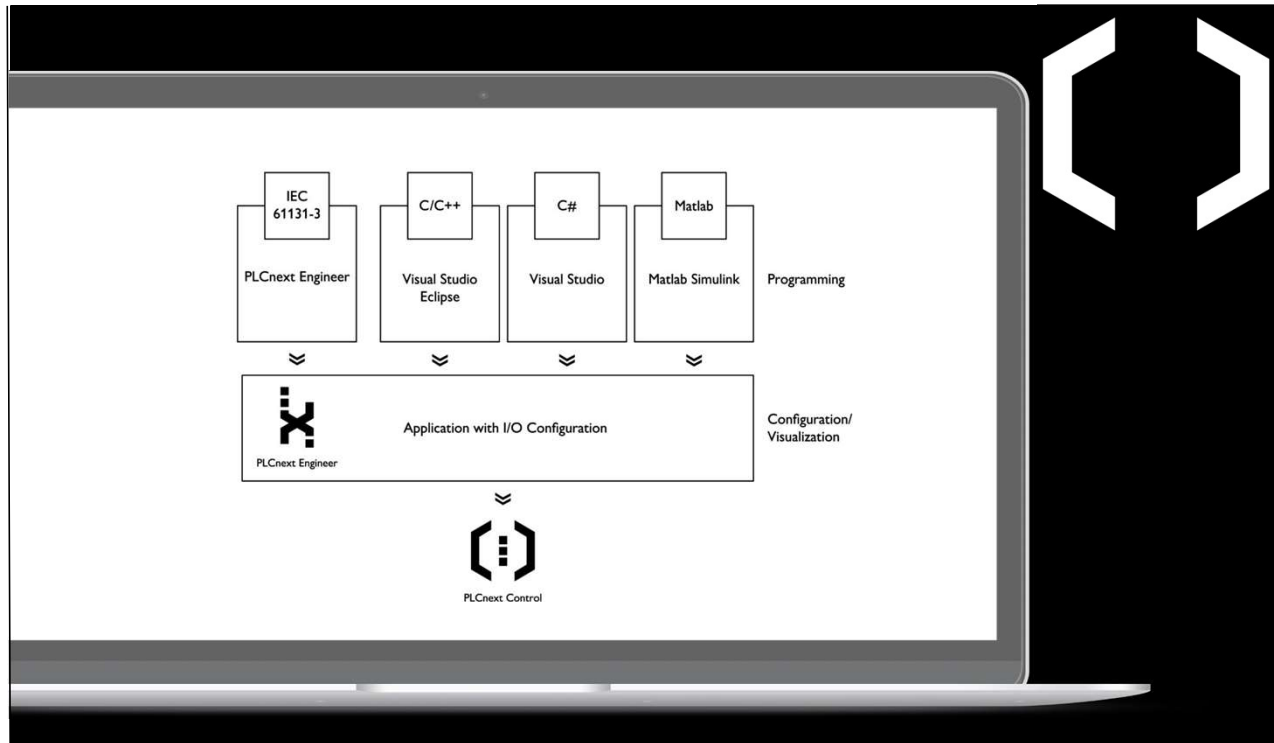
1 errors, 0 warnings

100%

PLCnext Technology – Limitless engineering options

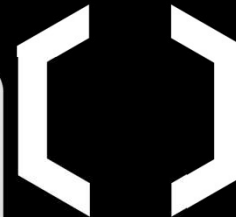
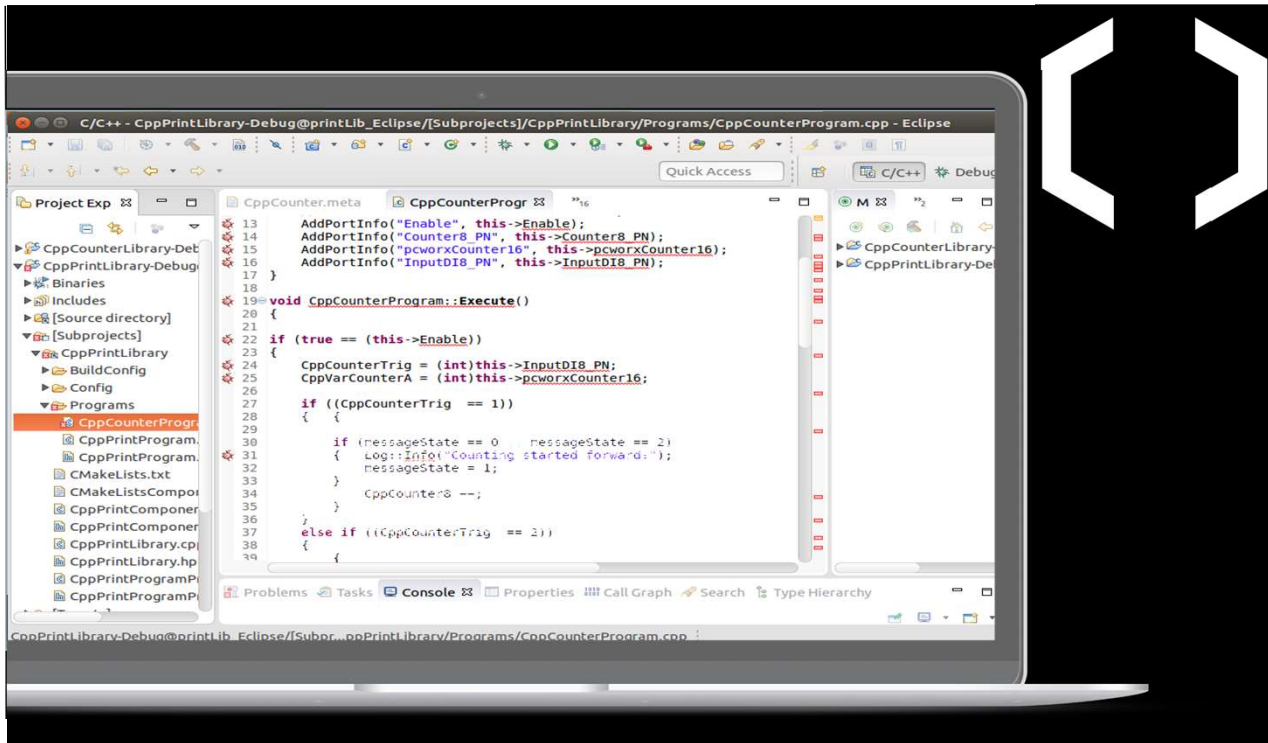
PLCnext Engineer

PLCnext Technology 
Designed by PHOENIX CONTACT



enhanced convenience

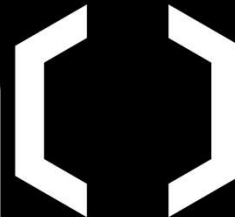
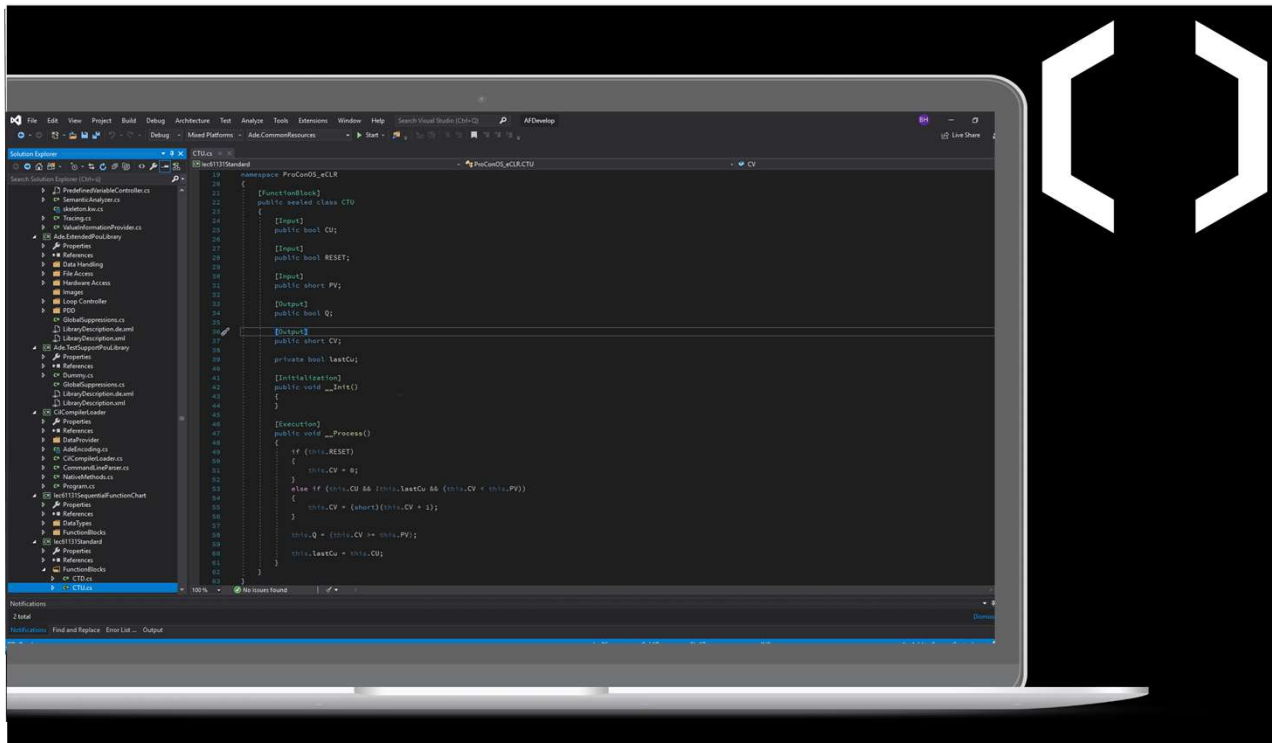
Programming – C/C++



- C/C++ acc. to standard
- Easy interface to the PLCnext Runtime System
- Support of remote debugging
- Use the tool you are familiar with

enhanced convenience

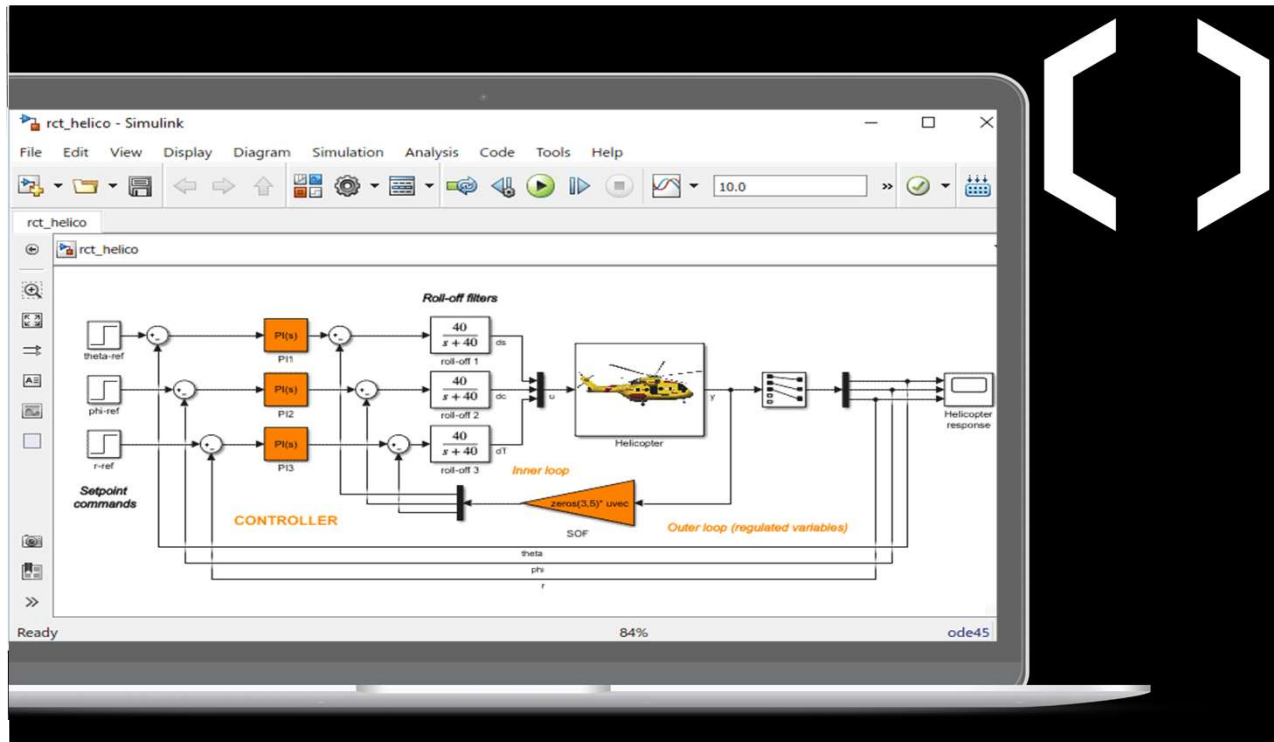
Programming – C/C++



- Development and integration of function blocks with C#
- Dedicated plug-in for Visual Studio.
- Execute C# function blocks in real-time with the eCLR runtime system.

enhanced convenience

MATLAB Simulink

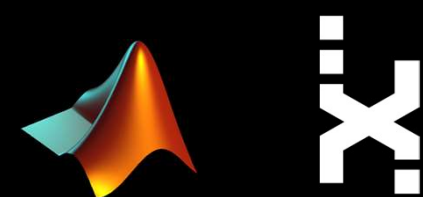
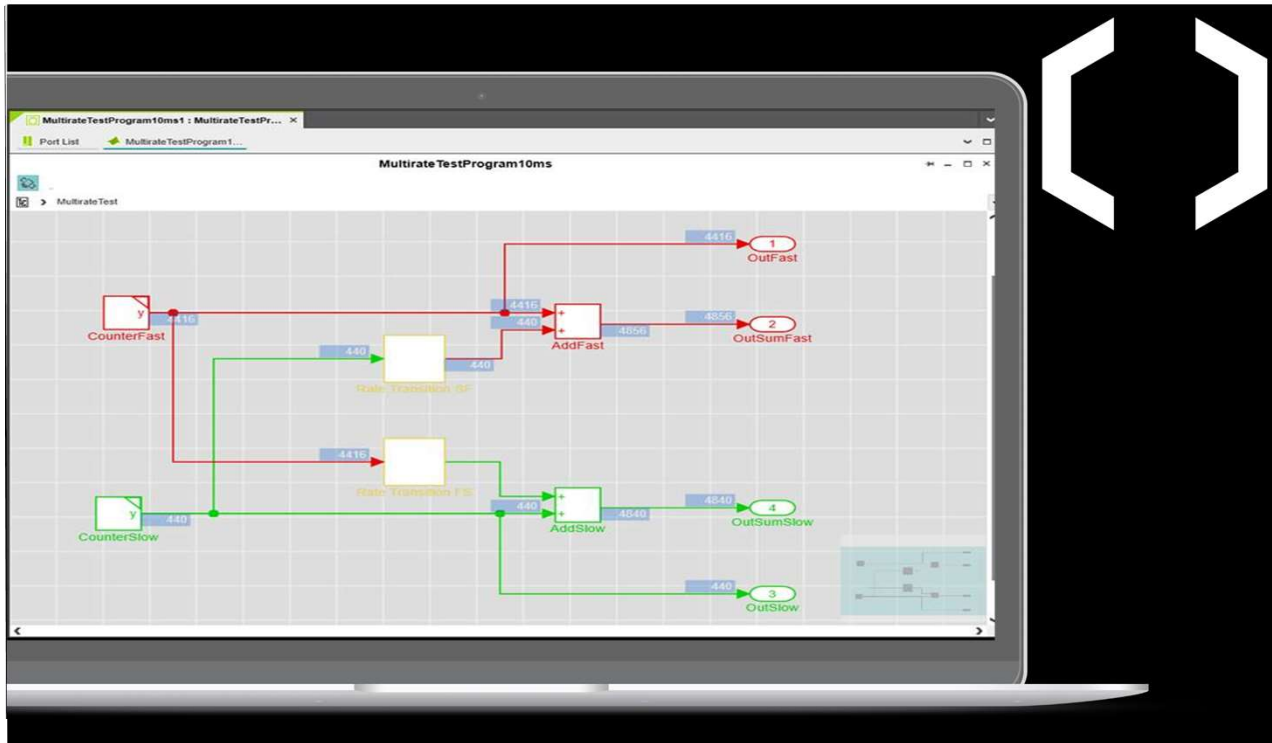


Seamless integration of model-based design & development with MATLAB Simulink.

enhanced convenience

MATLAB Simulink & PLCnext Engineer

PLCnext Technology 
Designed by PHOENIX CONTACT




Seamless integration of model-based design & development with MATLAB Simulink and PLCnext Engineer.

enhanced development

Connected coworking

PLCnext Technology 
Designed by PHOENIX CONTACT

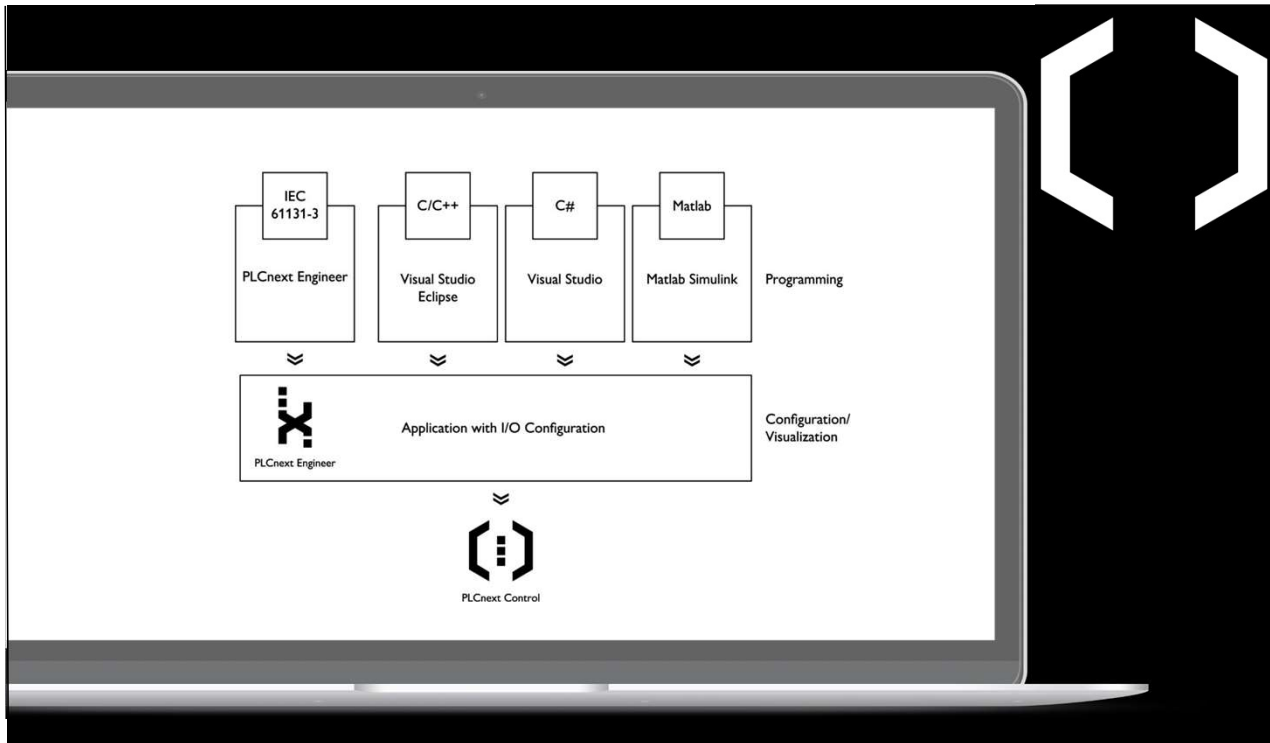


With PLCnext Technology, several developers from different generations can work on one controller program independently of each other using different programming languages. Thus, you can develop complex applications quickly using the advantages of the classic PLC world and the openness and flexibility of PLCnext Technology.

PLCnext Technology – Limitless engineering options

PLCnext Engineer

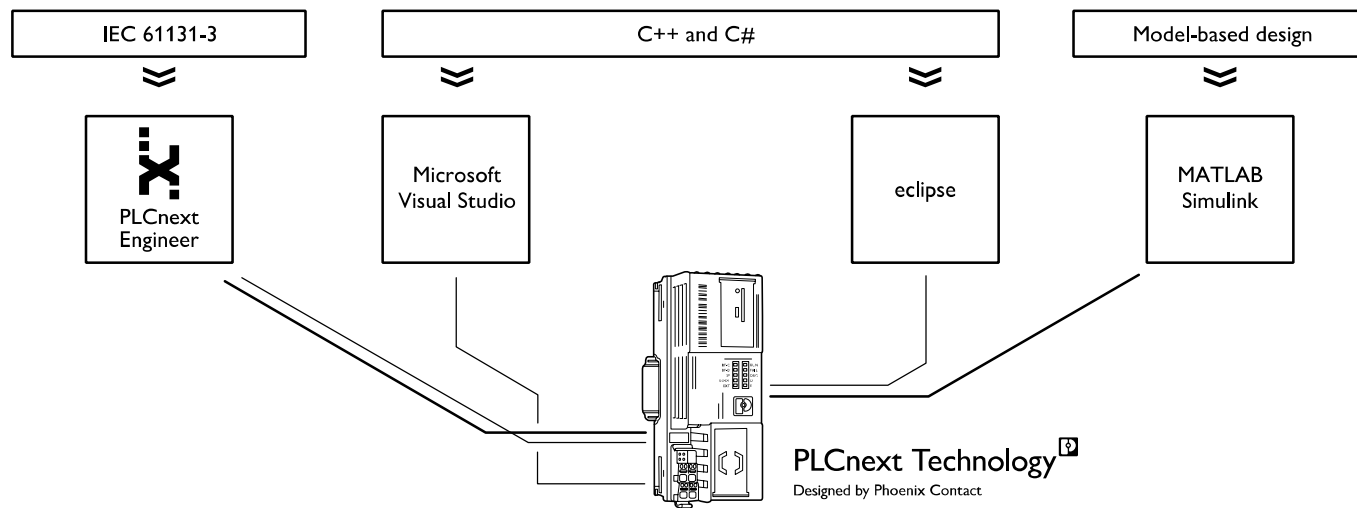
PLCnext Technology 
Designed by PHOENIX CONTACT



enhanced development

Engineering and Application Development

PLCnext Technology 
Designed by Phoenix Contact



With PLCnext Technology, several developers from different generations, with different skill sets and expertise can work on one controller program, in parallel and yet independently, using different programming languages.



PLCnext Technology[®]

Designed by PHOENIX CONTACT

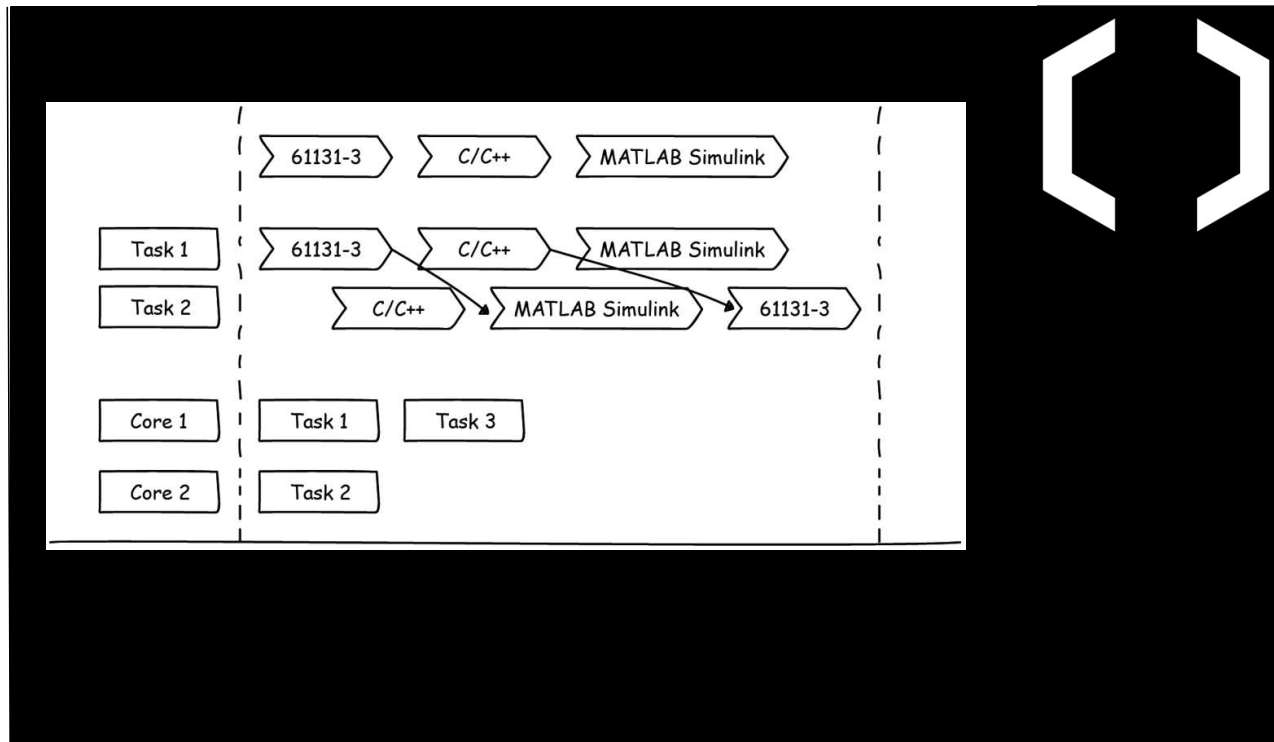
Combine program sequences in different languages into tasks as desired. The task-handling of the PLCnext Technology (patent applied for) lets program routines of different origin run like a classical IEC-61131-PLC-code – Your high-level language programs become automatically deterministic. The platform ensures consistent data exchange and synchronous execution of the program code.

enhanced
performance

Real-time execution across different
programming languages

enhanced performance – PLC-typical Real-time Performance

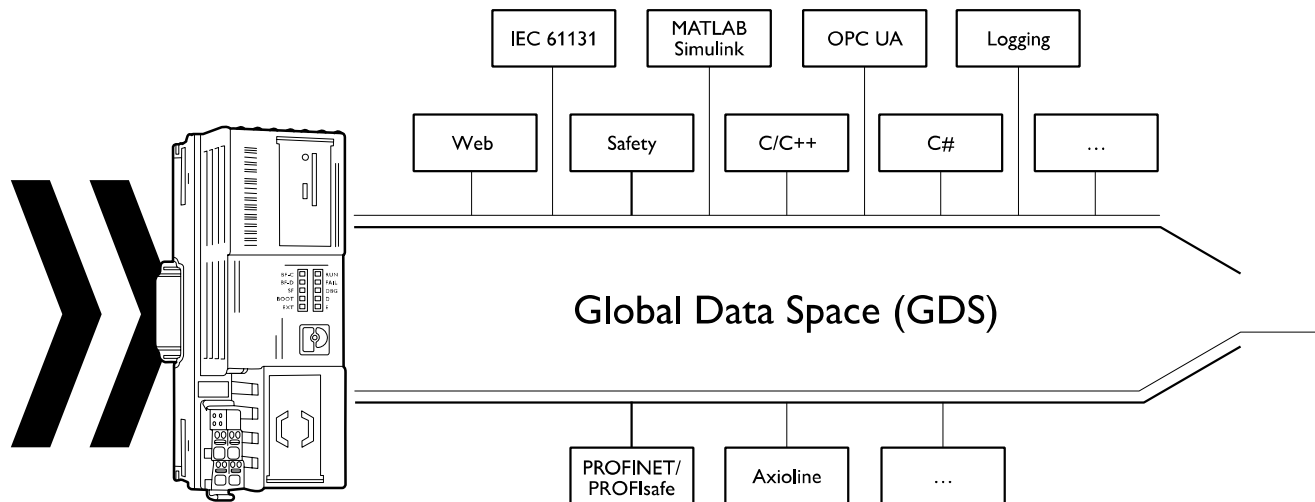
Execution & Synchronization Manager



The patent-applied-for task handling of PLCnext Technology lets program routines of different origin run like classical IEC 61131 PLC code. Your high-level language programs become automatically deterministic.

enhanced performance – Data Consistency

Global Data Space

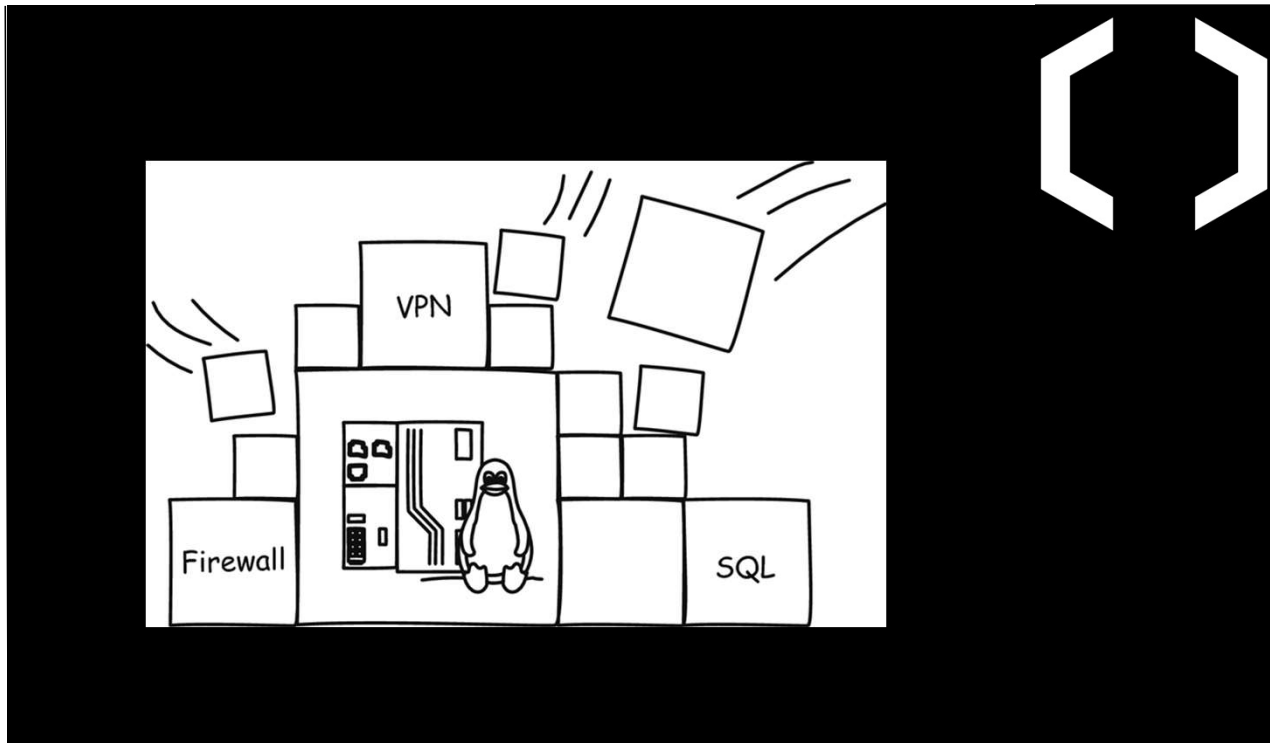


PLCnext Technology 
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Fast and consistent data exchange between user programs, fieldbuses, and system programs. Access via Data Logger, HMI, and OPC UA. Security aspects for user management.

Flexibility of Linux plus the Reliability of a PLC



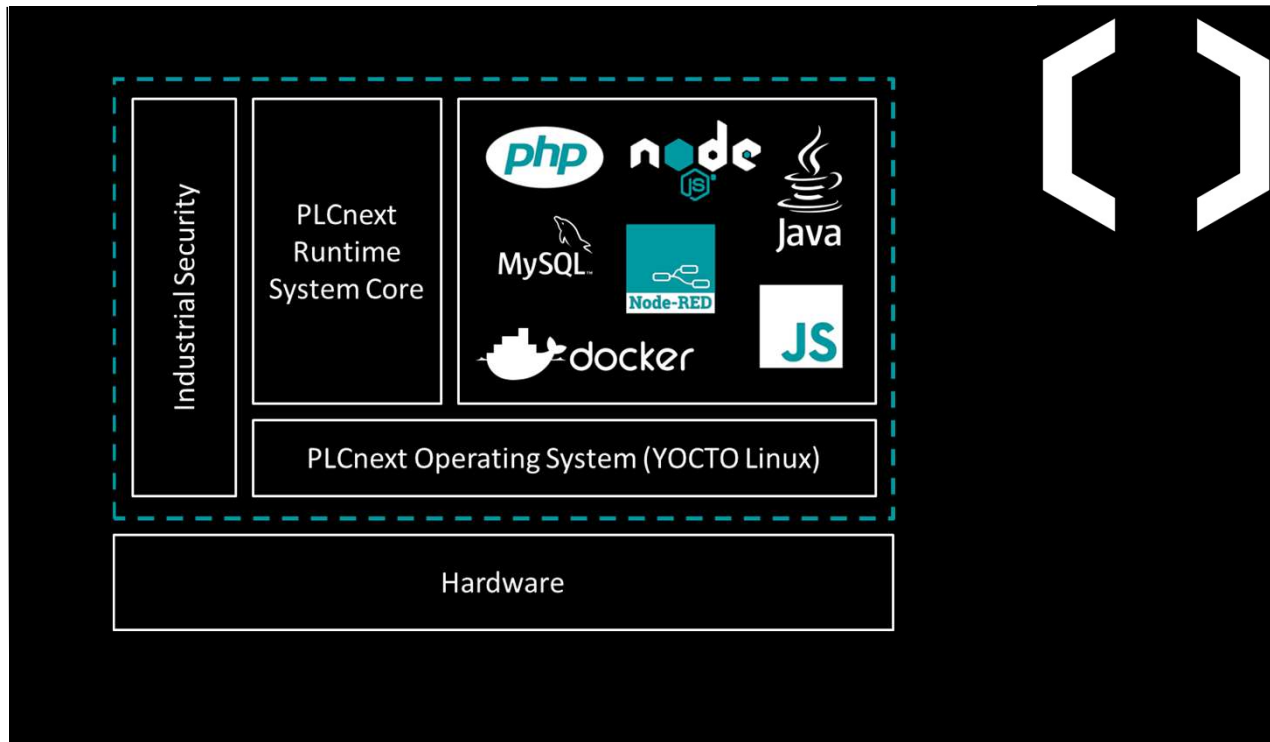
PLCnext Technology is based on Linux...

- Open source Linux Packages
- ...but as performant as a “classic” PLC!
- Easy task management
 - Precise synchronization
 - Cycle-consistent data exchange
 - No Linux knowledge needed

PLCnext Technology – Limitless engineering options

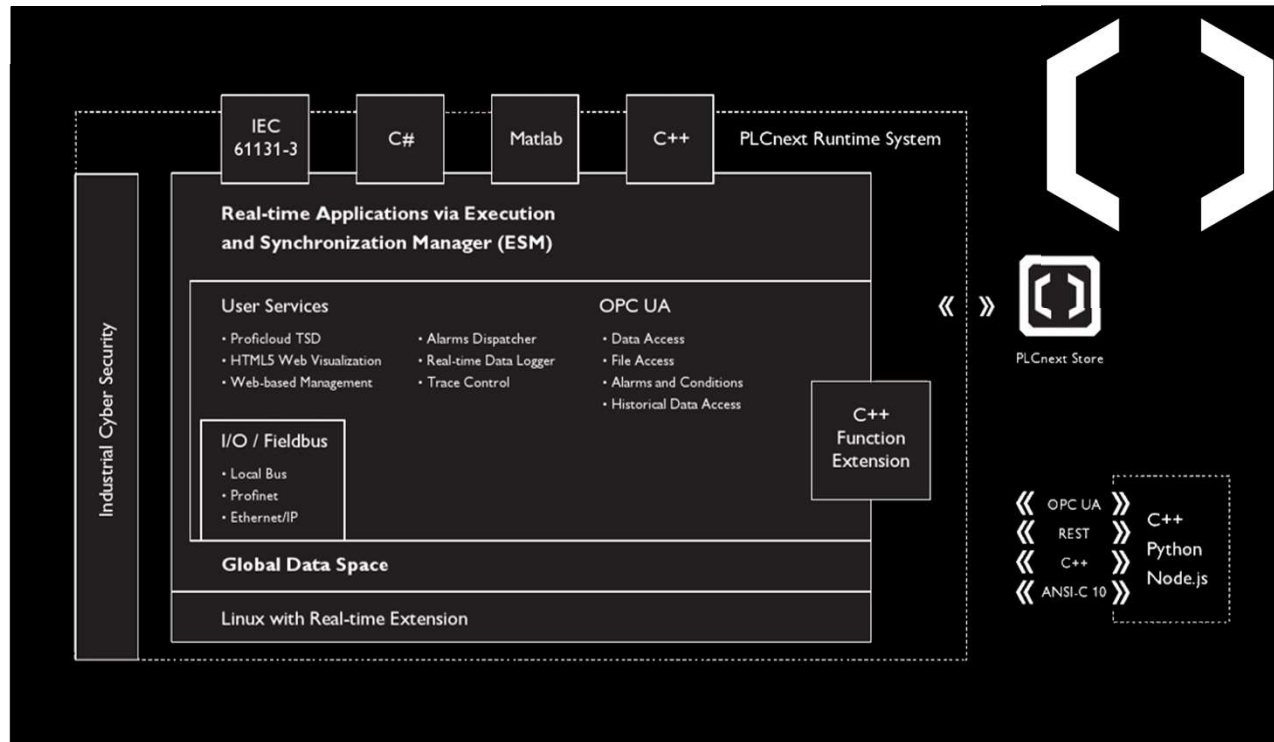
PLCnext Runtime System

PLCnext Technology 
Designed by PHOENIX CONTACT



- Reduced deployment time through the integration of source software
- Connectivity, security & real-time capability are already implemented
- Future-proof, flexible and secure thanks to continuous updates
- Integration of IEC61131-3, high-level languages and open source software possible
- Apps from PLCnext Store easy to implement

PLCnext Runtime System Architecture

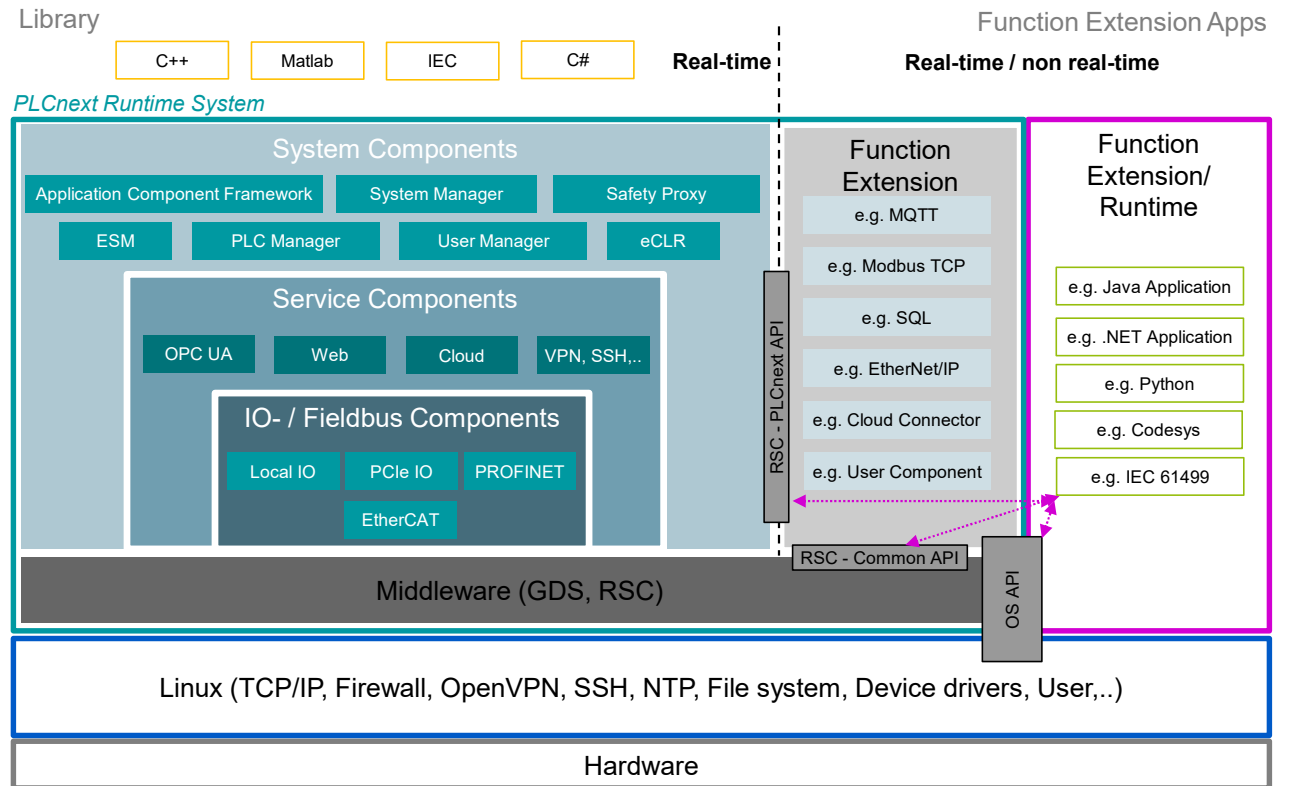


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PLCnext Runtime System Architecture

PLCnext Runtime System Core Components

System Components	Service Components
<ul style="list-style-type: none"> • Execution and Synchronization Manager (ESM) • System Manager • PLC Manager • Device Interface • User Manager • Diagnostic Logger • eCLR • Application Component Framework • Safety Proxy • Event Manager • ... 	<ul style="list-style-type: none"> • OPC UA Server • PROFICLOUD Gateway • Web-based Management • PLCnext Engineer HMI • Data logger • Device HMI • Accessible via OS <ul style="list-style-type: none"> • DHCP, DCP • SFTP, VPN • SSH, NTP • Trace Controller
IO Components	Middleware
<ul style="list-style-type: none"> • Fieldbus Manager <ul style="list-style-type: none"> • PROFINET Controller • PROFINET Device • Axioline • ... 	<ul style="list-style-type: none"> • Global Data Space (GDS) • Remote Service Calls (RSC) • Commons Layer (Common Classes)



IEC 62443: IT-Security for Industrial Automation Control Systems

Authentication

- User accounts
- Authentication of credentials
- Authorization



PLCnext Control

Security by Design

Integrity

- Principle of least privilege
- Defense in depth
- Network segmentation

Confidentiality

- Use of secure protocols
- Secure remote maintenance
- Cryptography
- Protection of expertise

Availability

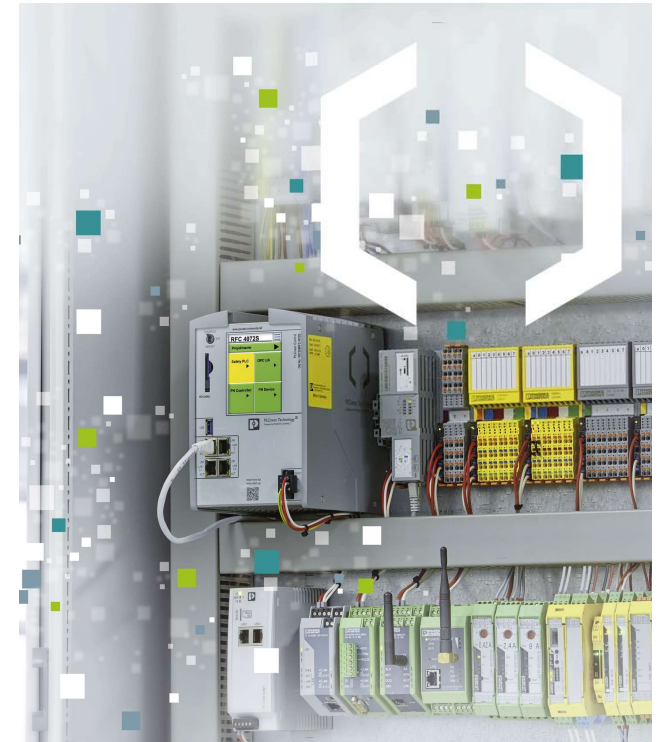
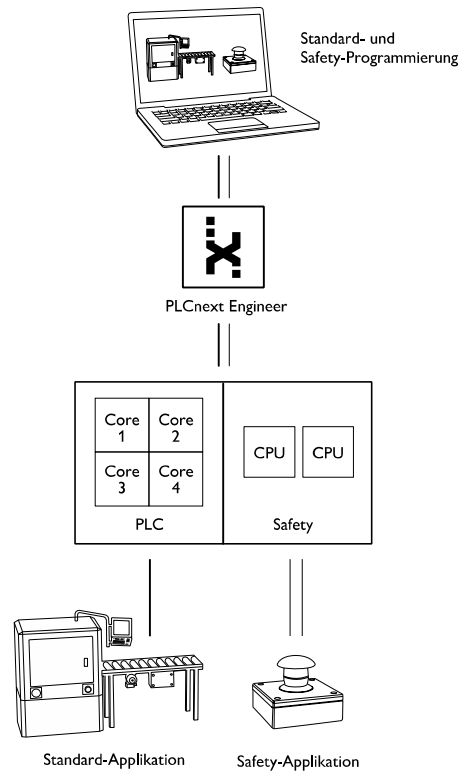
- Monitoring and attack detection
- Tamper protection

IEC 62443

*Industrial Automation
Basis Standard*

Confidential

Functional Safety Integration



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PLCnext Technology Architecture – Competitive Advantages

PLCnext Conceptual Advantages vs. Competitor Solutions

Contents

- Considerations on basic architectural concepts, features comparison & evaluation
- Argumentation guideline for pre-sales customer conversation in terms of openness and integration aspects

Symbols explanation



Proprietary IEC runtime environment



Deterministic real-time capability



Consistent process data exchange

EVALUATION SCALE

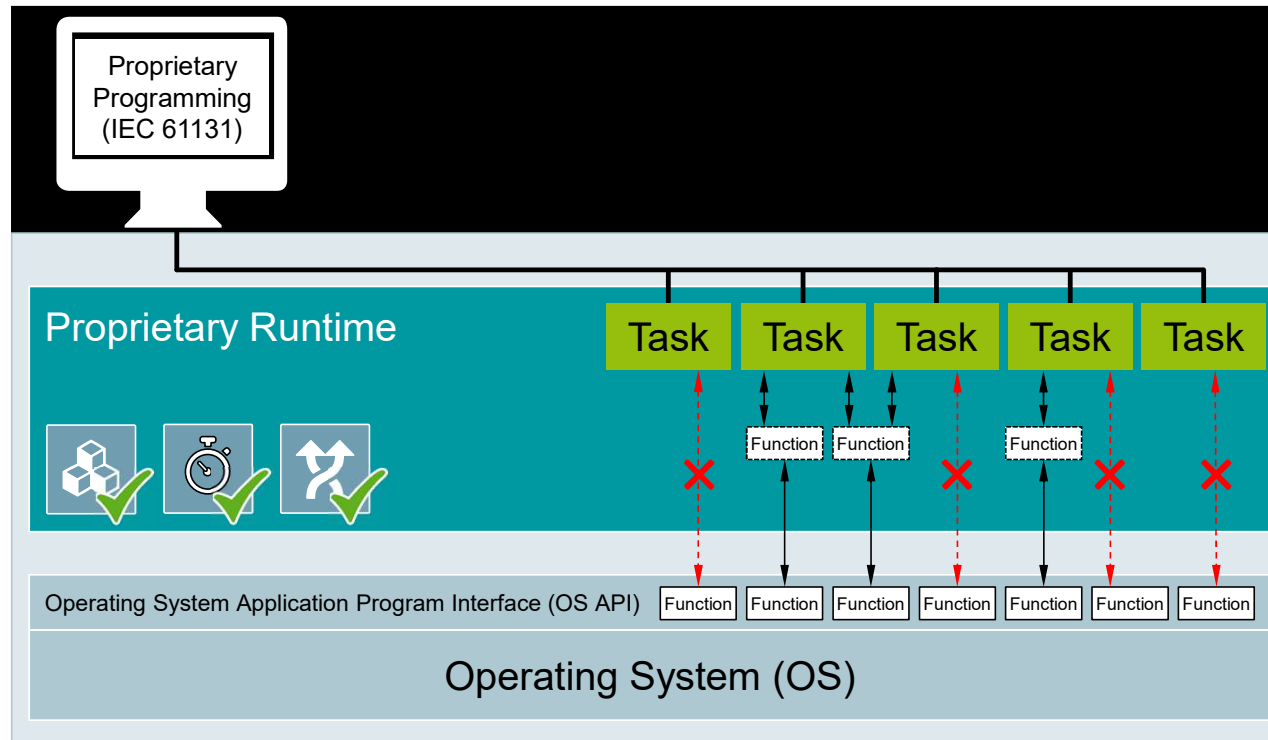
- ✓ Available / implemented / possible
- Partly available / implementation-specific
- x Not available / implemented / possible

EVALUATION CRITERIA

- Open programming tools
- Open application & network interfaces
- Open source & apps integration
- Real-time HLL programs can use OS API
- Future-proof through modular extensibility
- Integrated real-time capability
- Cloud connectivity integrated
- Security integrated

PLCnext Technology Architecture – Competitive Advantages

Classical PLC Architecture



- Only IEC 61131 programming
- High vendor dependency
- No possibility to use HLL programs
- No or limited OS API access

- x Open programming tools
- x Open application & network interfaces
- x Open source & apps integration
- x Real-time HLL programs can use OS API
- x Future-proof through modular extensibility
- ✓ Integrated real-time capability
- Cloud connectivity integrated
- Security integrated

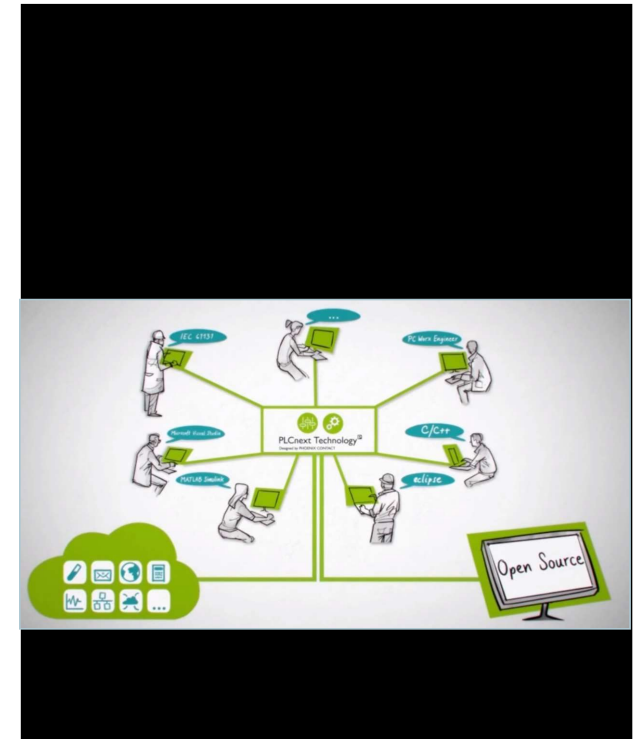
Digital Transformation → Changing Market Requirements

Competitors promote various “open” solutions approaches – with major drawbacks

- Proprietary solutions keep single-vendor dependencies
- “Open” systems tend to neglect classical PLC benefits like real-time and data consistency aspects

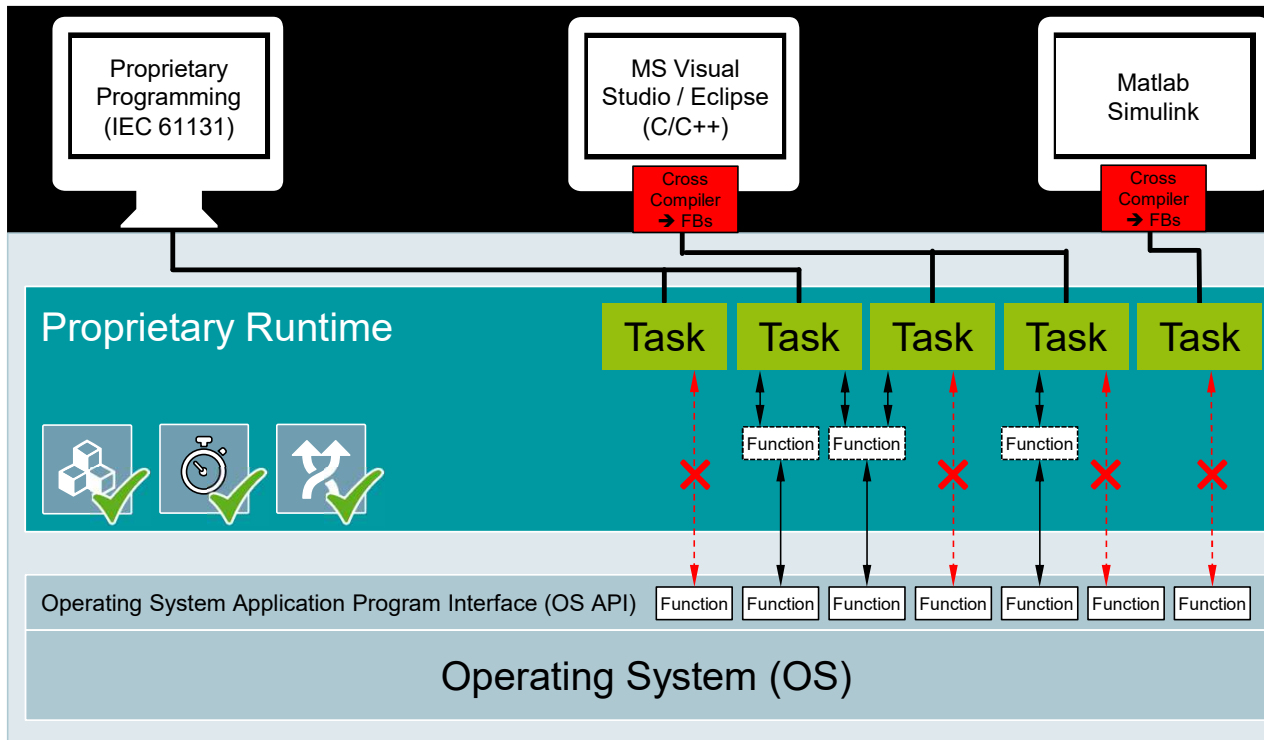
Basic architectural approaches on the market

- A: Modified Classical PLC Architecture
- B: Open Linux-based Architecture
- C: Dual System Approach with Hypervisor
- D: PLCnext Technology



PLCnext Technology Architecture – Competitive Advantages

A: Modified Classical PLC Architecture



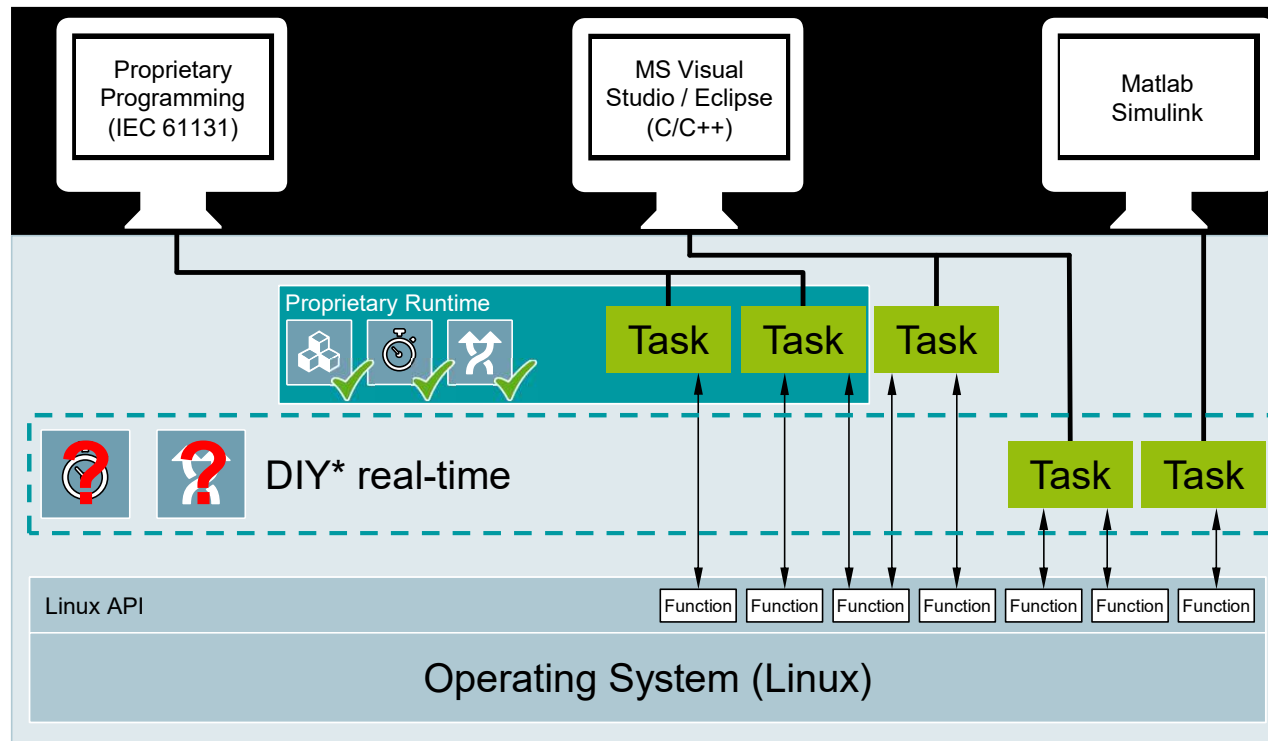
- Proprietary development packages
- HLL cross compilation → proprietary runtime → function blocks in IEC 61131
- High vendor dependency

EVALUATION

- ✓ Open programming tools
- Open application & network interfaces
- x Open source & apps integration
- x Real-time HLL programs can use OS API
- Future-proof through modular extensibility
- ✓ Integrated real-time capability
- Cloud connectivity integrated
- Security integrated

PLCnext Technology Architecture – Competitive Advantages

B: Open Linux-based Architecture



* DIY = Do It Yourself

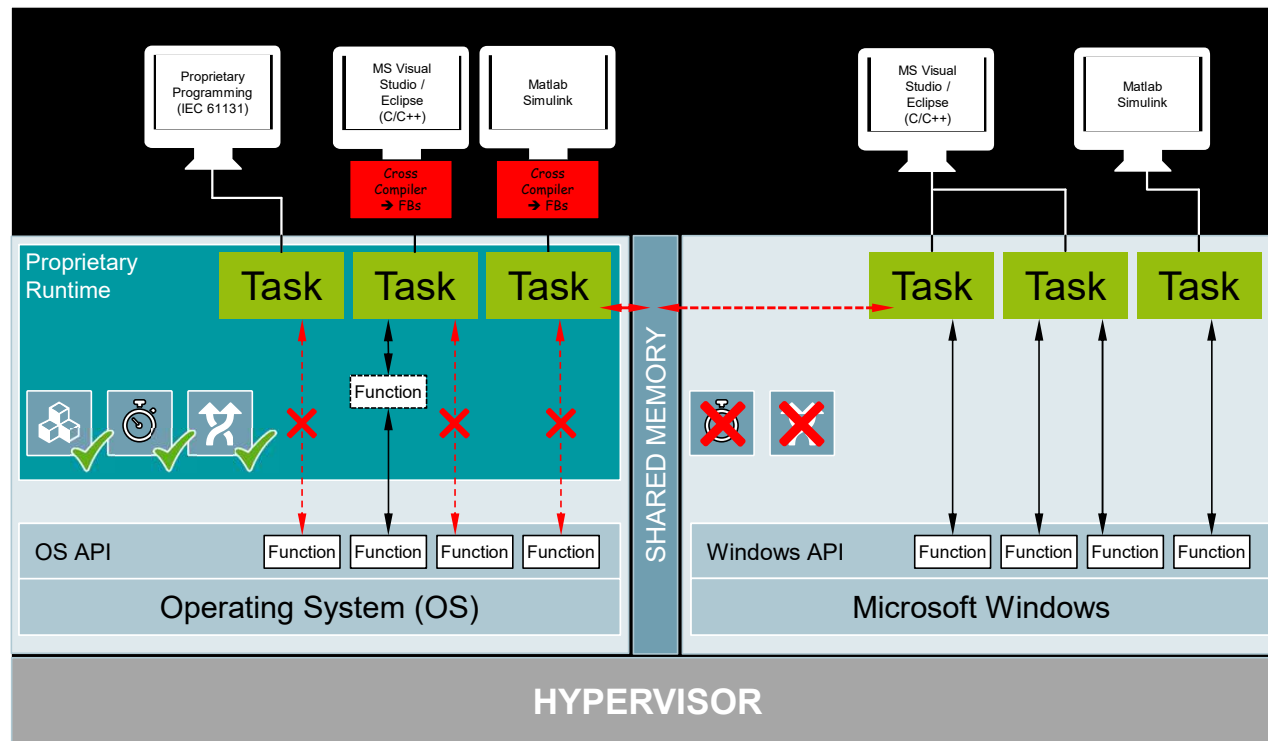
- No specific vendor dependency
- High additional programming effort and expert knowledge needed to solve real-time automation applications

EVALUATION

- ✓ Open programming tools
- ✓ Open application & network interfaces
- ✓ Open source & apps integration
- Real-time HLL programs can use OS API
- ✓ Future-proof through modular extensibility
- x Integrated real-time capability
- Cloud connectivity integrated
- Security integrated

PLCnext Technology Architecture – Competitive Advantages

C: Dual System Approach with Hypervisor



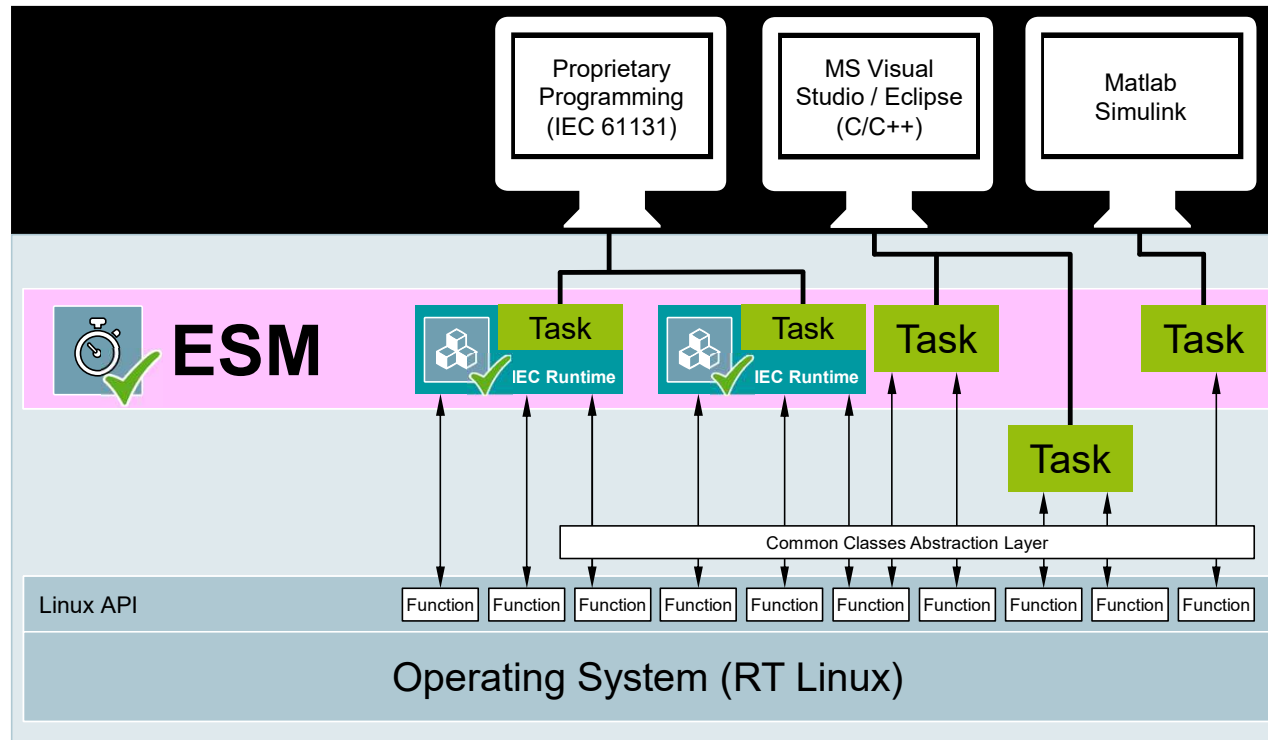
- Costly high-performance HW needed
- Real-time for IEC 61131 and cross-compiled HLL (function blocks) only
- No OS API access HLLs in real-time
 → e.g. no EtherCAT integration etc.

EVALUATION

- ✓ Open programming tools
- ✓ Open application & network interfaces
- ✓ Open source & apps integration
- x Real-time HLL programs can use OS API
- o Future-proof through modular extensibility
- ✓ Integrated real-time capability
- ✓ Cloud connectivity integrated
- ✓ Security integrated

PLCnext Technology Architecture – Competitive Advantages

D: PLCnext Technology Architecture Advantages – ESM



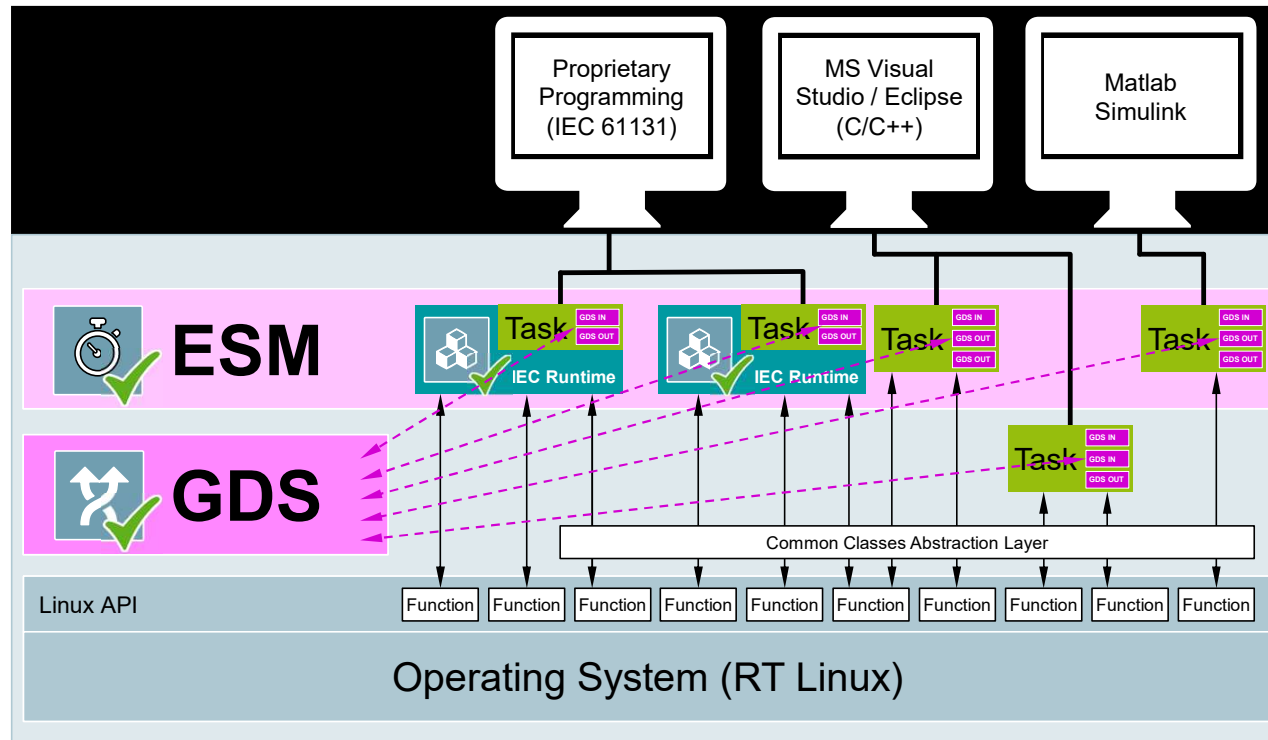
ESM

Execution & Synchronization Manager

- Real-time scheduler for all Linux tasks
 - Separated from IEC 61131 runtime – no mutual dependencies
- Tasks can run inside or outside the real-time context
- Open source and HLL programs are based on Linux
 - Unlimited access to Linux API – directly or via Common Classes
- HLL or Simulink applications possible, also combined with IEC 61131 programs
- No need for in-depth Linux knowledge to implement PLC-like real-time
- Easy configuration via PLCnext Engineer or XML files

PLCnext Technology Architecture – Competitive Advantages

D: PLCnext Technology Architecture Advantages – GDS

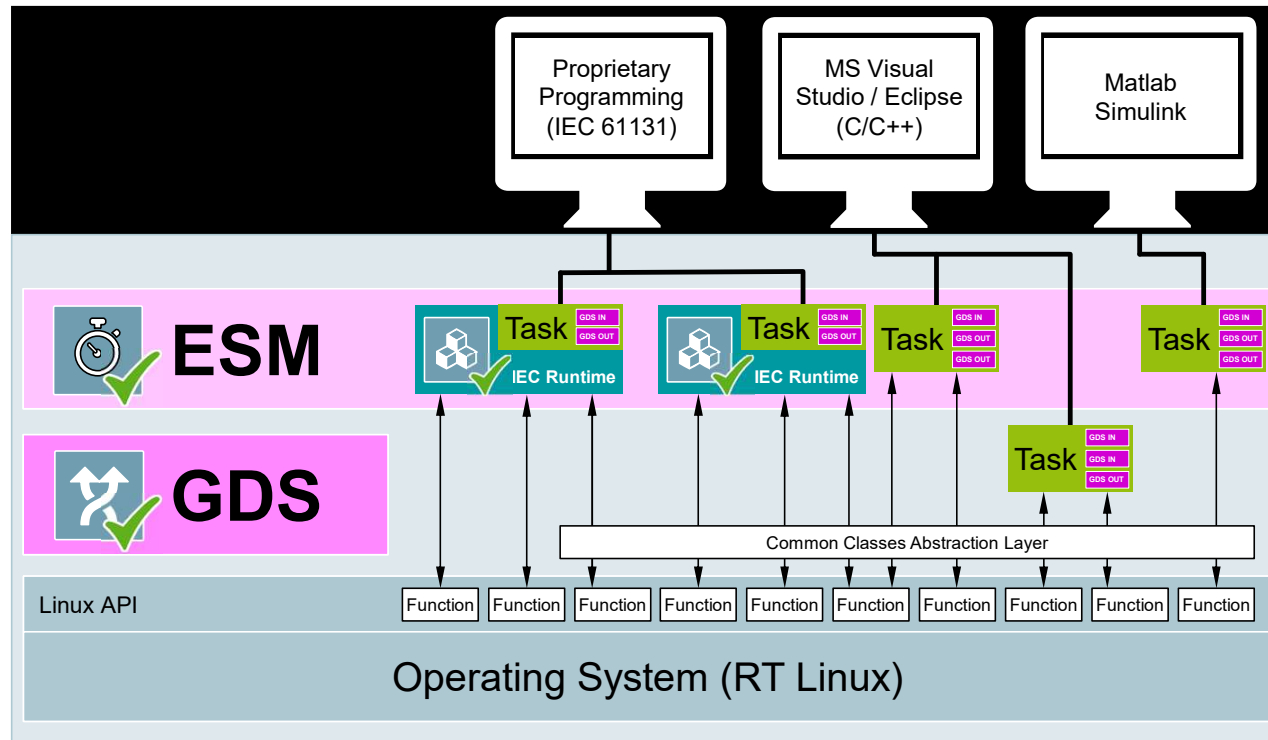


GDS Global Data Space

- Intelligent shared memory
- Port-based process data exchange among tasks via intelligent automatic buffer generation
- No programming effort for consistent and task-synchronous process data exchange (e.g. semaphores, resource blocking, ...)
- No need for in-depth Linux knowledge
- Easy configuration via PLCnext Engineer or XML files

PLCnext Technology Architecture – Competitive Advantages

D: PLCnext Technology Architecture Advantages – Summary



- No vendor dependency
 - Combined use of IEC 61131, HLL, and model-based programs
 - Built-in real-time and data consistency for IEC 61131, HLL, and Matlab
 - Unlimited OS API access
- EVALUATION**
- ✓ Open programming tools
 - ✓ Open application & network interfaces
 - ✓ Open source & apps integration
 - ✓ Real-time HLL programs can use OS API
 - ✓ Future-proof through modular extensibility
 - ✓ Integrated real-time capability
 - ✓ Cloud connectivity integrated
 - ✓ Security integrated

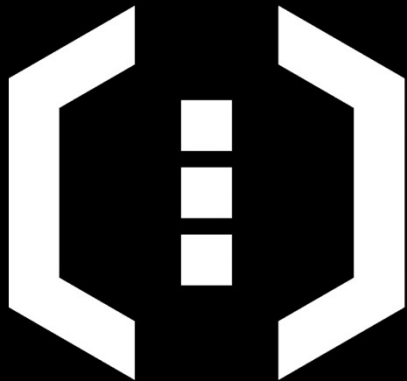


Confidential

PLCnext Technology[®]

Designed by PHOENIX CONTACT

Open control platform for flexible automation



PLCnext Control

Discover flexible
automation



PLCnext Ecosystem – PLCnext Control

PLCnext Control

PLCnext Technology[®]
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PLCnext Technology[®]
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Open control platform for flexible automation

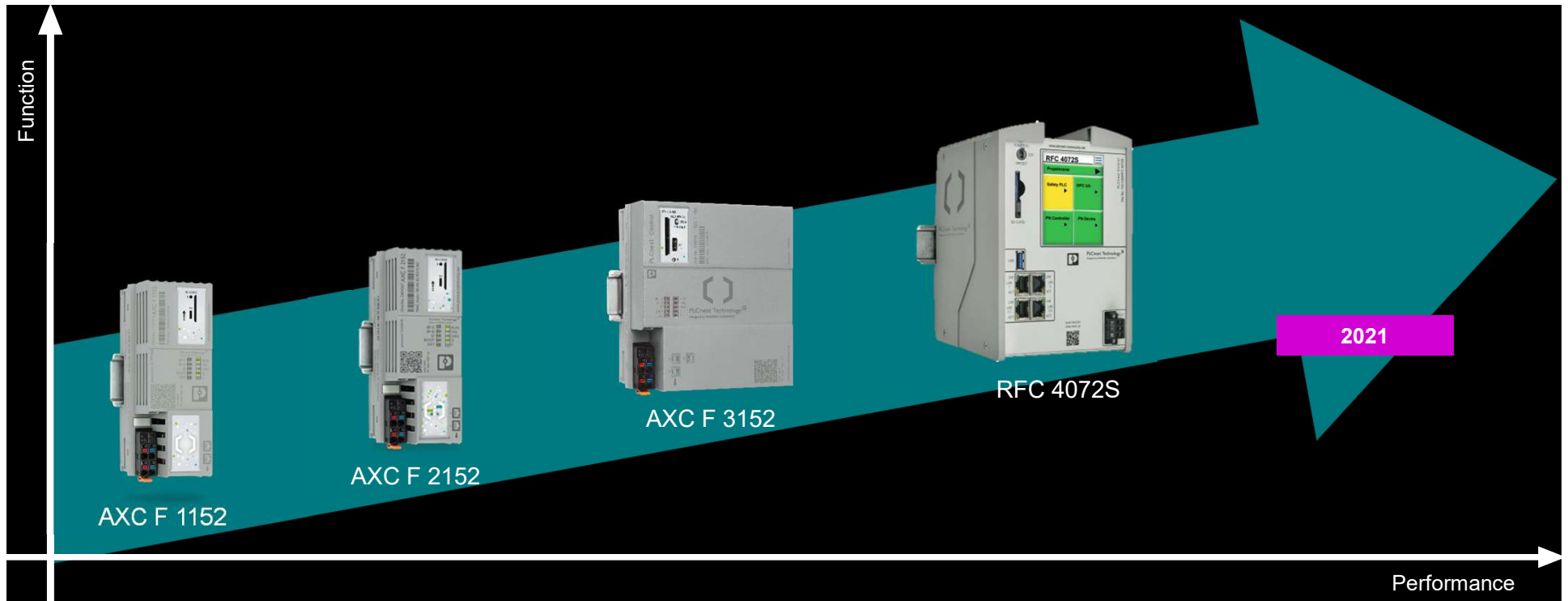
PLCnext Control
Discover flexible automation

BF-DI
BF-DO
EXT
BOOT
FAB
D
E
RUN
STOP

PLCnext Ecosystem – PLCnext Control

PLCnext Control Portfolio Overview

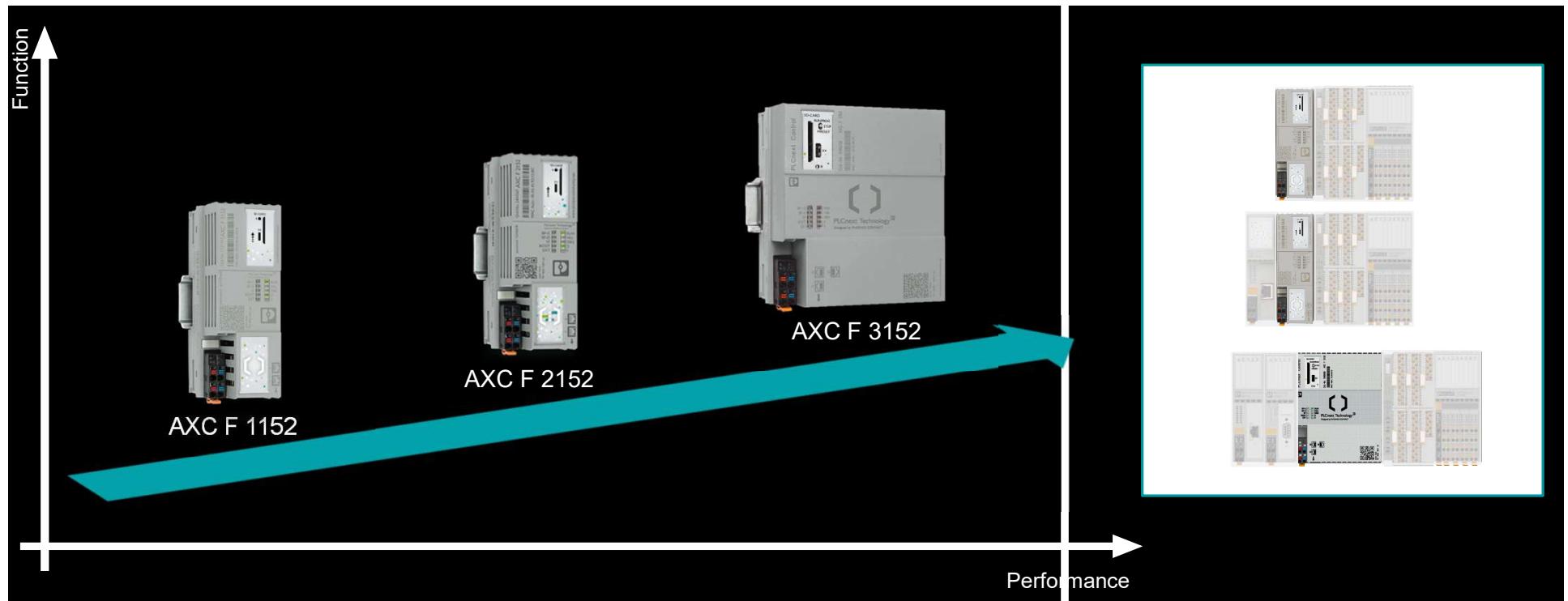
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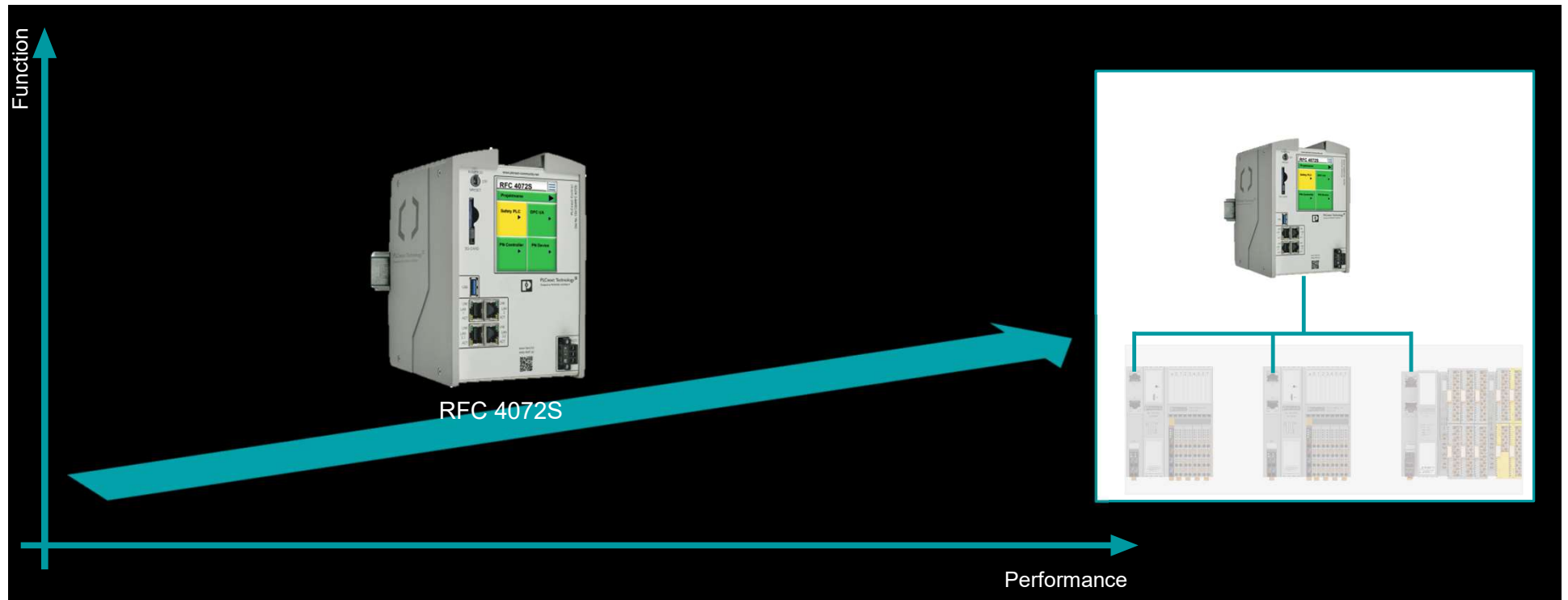
PLCnext Control

PLCnext Technology 
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PLCnext Control for flexible automation with modular hardware platform



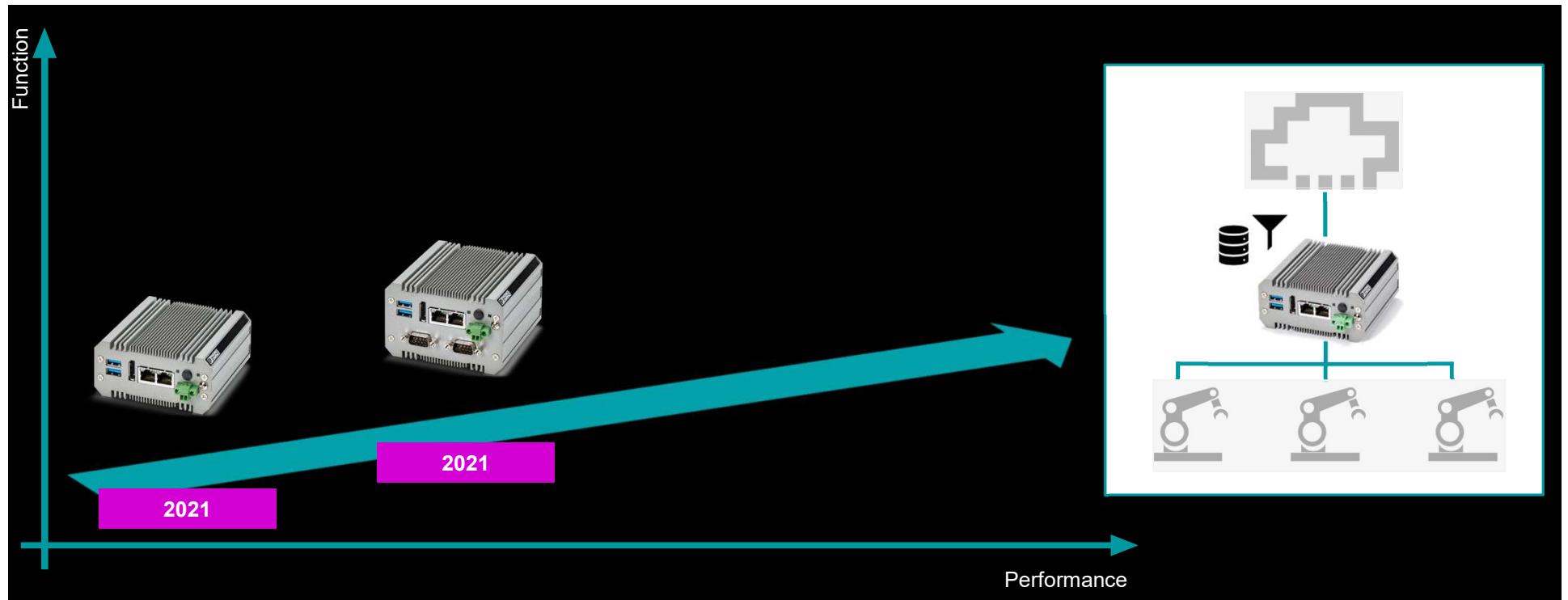
PLCnext Control for centralized applications with decentralized IOs



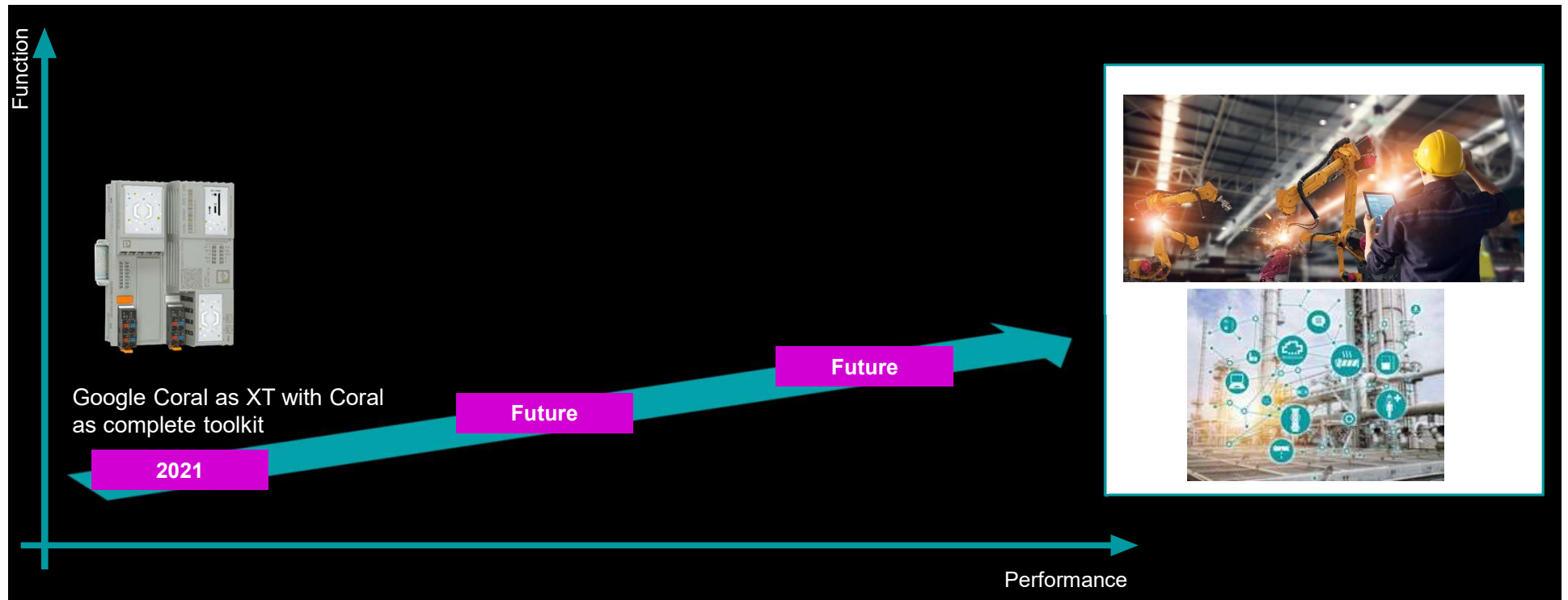
PLCnext Control

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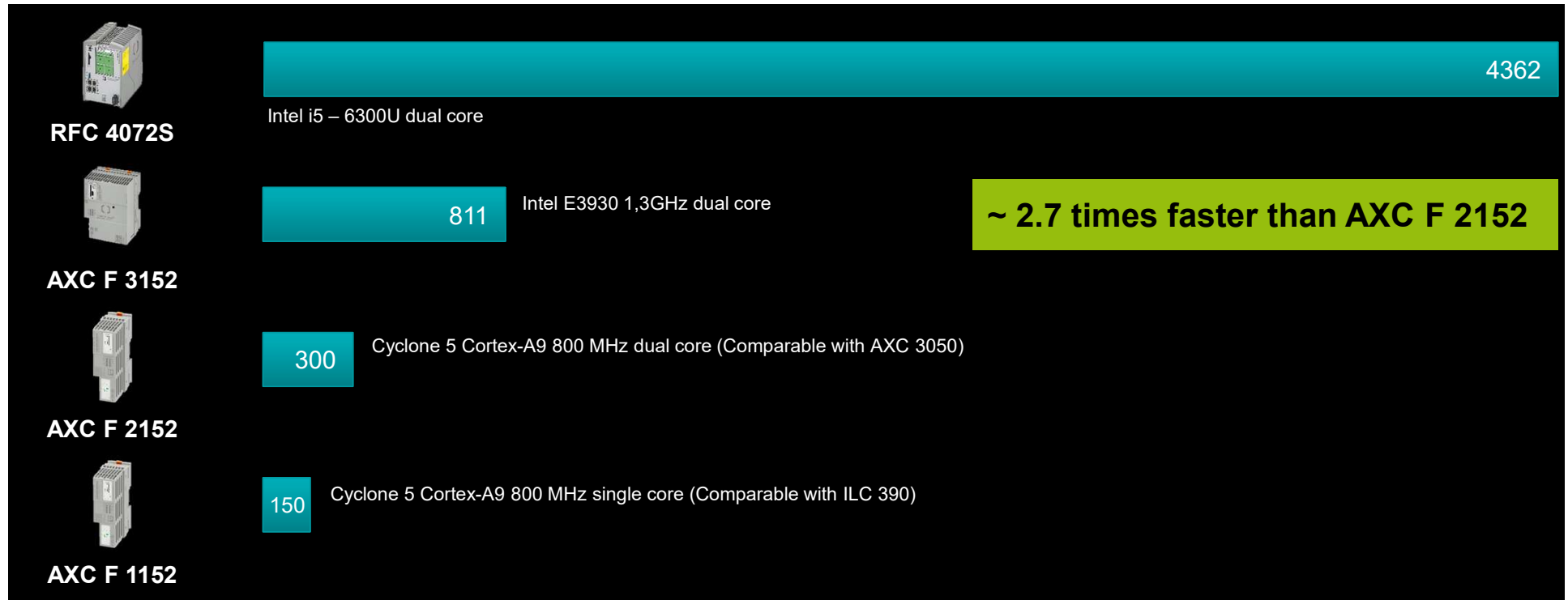
PLCnext Control for Edge Computing



PLCnext Control for intelligent applications with Artificial Intelligence










PLCnext Controls Performance Benchmark



PLCnext Control

PLCnext Control AXC F 1152



Core	Working memory	Temperature
 ARM Cortex-A9 (800 MHz)	 512 Mbytes RAM	 -25°C-60°C
 # control tasks (IEC 61131) 8	 Min. cycle time (IEC 61131) 5 ms	 Security TPM integrated

PLCnext Control

Entry Level – PLCnext Control AXC F 1152


- Cyclone 5 with ARM Cortex-A9 CPU 1 x 800 MHz
- Number Control-Tasks (IEC 61131): 8
- Min. cycle time (IEC 61131): 5 ms
- Profinet Controller & Device with 16 ARs
- 512 Mbytes RAM
- SD Flash card slot
- 1 x ETH-MAC interface (2 x 10/100 Mbit) switched
- Real-time clock
- Supports INLINE and AXIOLINE I/O modules
- Trusted platform module (TPM) for security
- Temperature range: -25°C up to +60°C

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PLCnext Control

PLCnext Control AXC F 2152



The image shows the PLCnext Control AXC F 2152 device, a compact industrial PLC. It features a grey metal casing with a front panel containing a barcode, a QR code, and a status indicator panel with LEDs for RUN, FAIL, DBG, D, and E. The top panel has an SD-CARD slot and a small display. The bottom panel has a terminal block for connections.

Core	Working memory	Temperature
 ARM Cortex-A9 (2x 800 MHz)	 512 Mbytes RAM	 -25°C-60°C
 # control tasks (IEC 61131) 32	 Min. cycle time (IEC 61131) 1 ms	 Security TPM integrated

PLCnext Control

PLCnext Technology 
Designed by PHOENIX CONTACT

Proven Standard – PLCnext Control AXC F 2152

- Cyclone 5 with ARM Cortex-A9 CPU 2 x 800 MHz
- 512 Mbytes RAM
- SD Flash card slot
- 1 x ETH-MAC interface (2 x 10/100 Mbit) switched
- Micro-USB type C
- Real-time clock
- Supports INLINE and AXIOLINE I/O modules
- Left side extension capability
- Trusted platform module (TPM) for security
- Temperature range: -25°C up to +60°C




Feature Set Differences – AXC F 1152 vs. AXC F 2152







Feature	AXC F 1152	AXC F 2152
CPU	Cyclone 5 with ARM Cortex-A9 1 x 800 MHz	Cyclone 5 with ARM Cortex-A9 2 x 800 MHz
Approvals	UL, CE	UL, CE, Marine, ATEX
Max. number of control tasks	8 (1 x 8)	32 (2 x 16)
PLCnext extension support (left-hand side)	No	Yes
PROFINET Features	Controller & Device with max. 16 ARs	Controller & Device with max. 64 ARs
Min. task cycle time	5 ms	1 ms

PLCnext Control

PLCnext Control AXC F 3152



The image shows a grey PLCnext Control AXC F 3152 PLC unit. It features a front panel with a control panel including buttons for RUN/PROG, STOP, and MR/RESET, and an SD-CARD slot. Below the control panel are status LEDs for RUN, STOP, and ERROR. The unit is labeled with 'PLCnext Control', 'AXC F 3152', and 'Designed by PHOENIX CONTACT'. A QR code is visible on the bottom right of the front panel.

Core	Working memory	Temperature
 Intel ATOM x5-E3930 dual-core	 2 GB DDR4 dual-channel RAM	 -25°C-60°C
 # control tasks (IEC 61131) 32	 Min. cycle time (IEC 61131) 500 µs	 Security TPM integrated

More Performance – PLCnext Control AXC F 3152

- Intel ATOM x5-E3930 dual-core CPU (2 x 1,3 GHz)
- 2 GB DDR4 dual-channel RAM
- 3 independent ETH-MAC interfaces (3 x 1 Gbit)
- Supports 2 PLCnext Control extensions (internal PCIe bridge)
- Supports INLINE and AXIOLINE I/O modules
- Integrated uninterruptible power supply (UPS) for targeted application shutdown
- SD card slot
- Diagnostic LEDs
- Real-time clock
- Temperature range: -25°C up to 60°C
 - Optional fan to increase service life




More Performance – PLCnext Control AXC F 3152

- **Based on PLCnext Technology**
 - Linux operating system
 - Supports high-level programming languages
 - PROFICLOUD Connection
- PROFINET Controller (up to 128 devices) + Device
- OPC UA
 - Easy integration of other fieldbus protocols (Linux OS)
- Prepared for TSN
- Trusted platform module (TPM) for security
- Approvals
 - UL (Hazloc), CUL, IEC Ex, ATEX
 - DNV/GL, LR, BV, ABS, ...









PLCnext Control

PLCnext Control RFC 4072S



The image shows a white industrial PLC unit, the RFC 4072S, with a color touchscreen displaying a control interface. The interface includes buttons for 'Proporzion', 'Safety PLC', 'DPC UA', 'PN Controller', and 'PN Device'. The device has various ports on the front, including Ethernet and USB.

Core	Working memory	Temperature
 Intel i5 6300U 2 x 2,4 GHz processor # control tasks (IEC 61131)  32	 4 GB DDR 4 dual channel RAM Min. cycle time (IEC 61131)  500 µs	 0°C up to 55°C with fan Security  TPM integrated

PLCnext Control

PLCnext Control RFC 4072S

- Intel i5 6300U 2 x 2,4 GHz processor
- 4 GB DDR 4 dual channel RAM
- Profisafe integrated (up to 300 F-Devices)
- Operation Mode Switch
- Touch display
- SD Flash card slot
- 3 ETH-MAC interfaces (2 x 1 Gbit, 1 x 100 Mbit switched)
- Real-time clock
- Trusted platform module (TPM) for security
- Temperature range: 0°C up to 55°C with fan


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PLCnext Technology – New Starterkit


PLCnext Technology 
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Start now and become a part of PLCnext Technology




PLCnext Technology 
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Ecosystem for limitless automation

GETTING STARTED
starterkit.plcnextcommunity.com

Getting started 

Online 

Hardware 

PLCnext Control & Axioline Smart Element

starterkit.plcnextcommunity.com



#iamPLCnext

PLCnext Technology 
Welcome to PLCnext Technology
PLCnext Technology is a platform for digital
industrial automation. It provides a
flexible and scalable architecture for
industrial automation. It is designed to
be easy to use and integrate with
existing systems. It is the only platform
that can handle all your industrial
automation needs. #iamPLCnext
@plcnextcommunity
plcnextcommunity.com

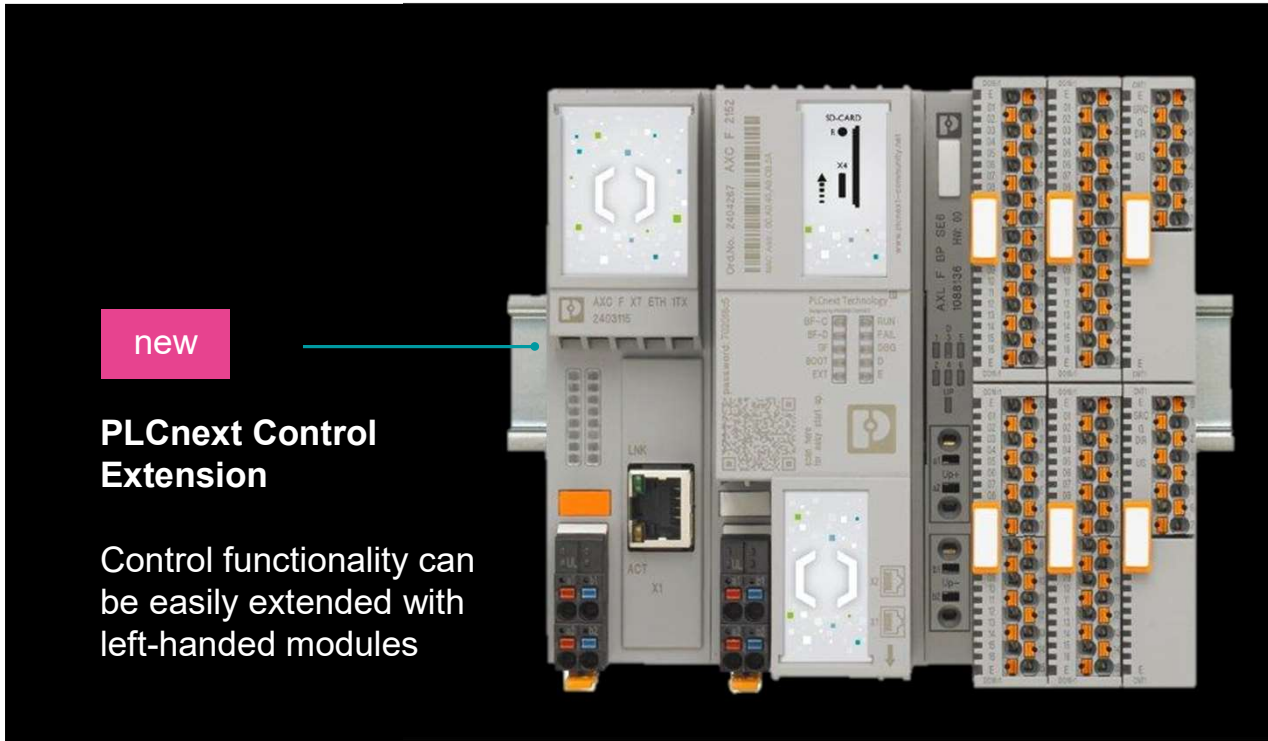
BEST CODER EVER



Countless possibilities in hardware variance

PLCnext Control

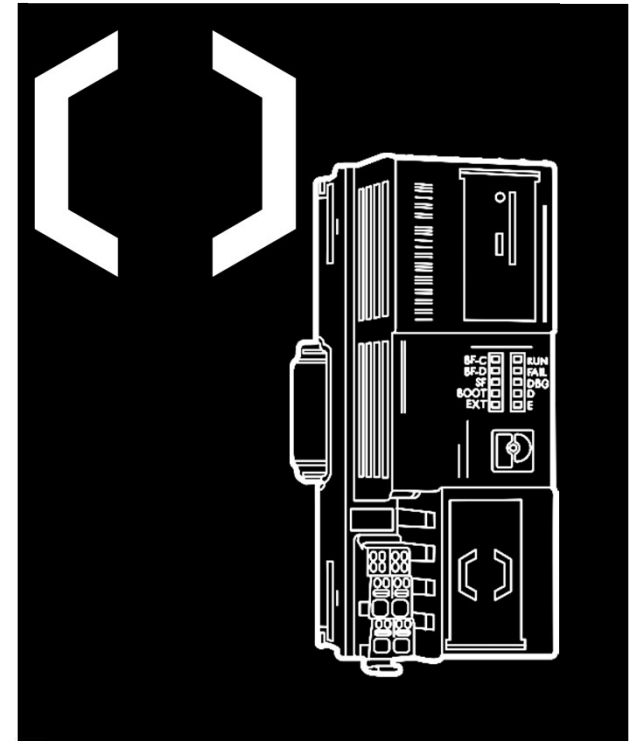
PLCnext Technology ¹²
Designed by PHOENIX CONTACT



new

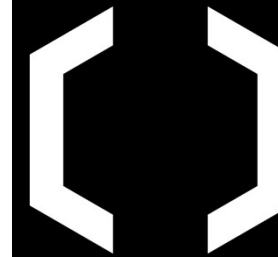
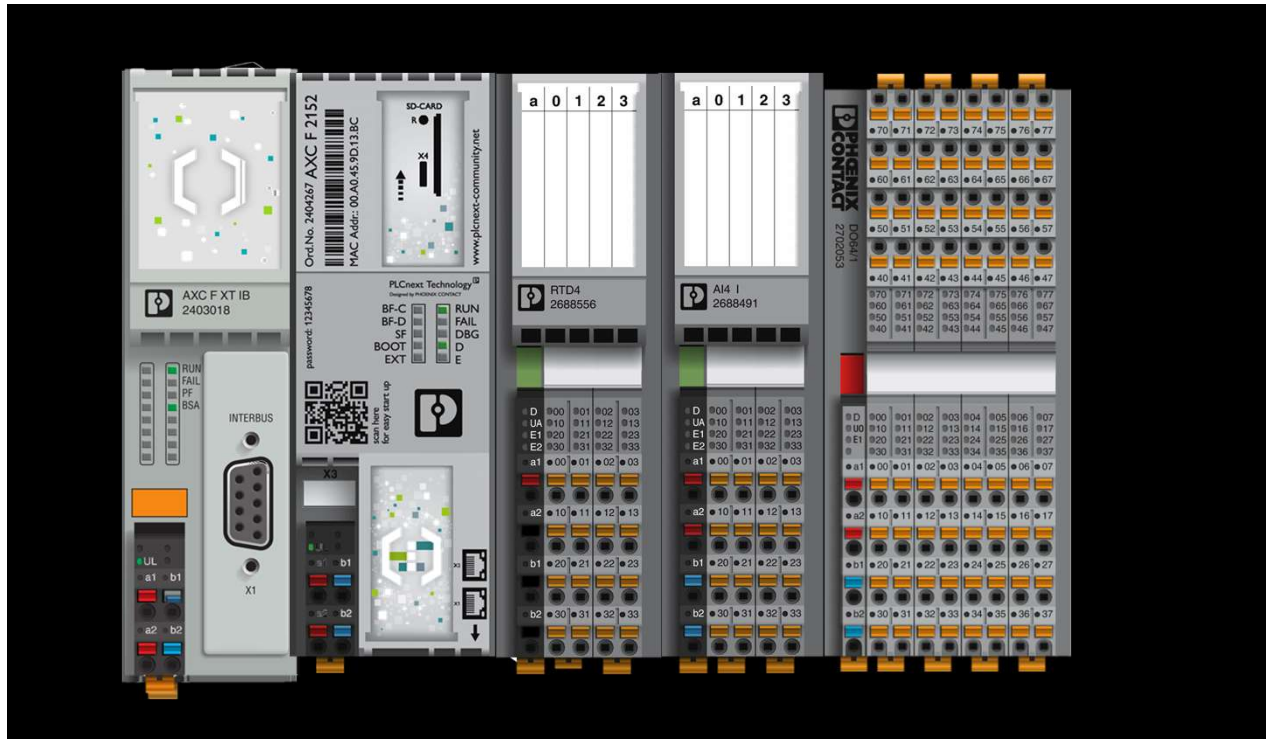
PLCnext Control Extension

Control functionality can be easily extended with left-handed modules



PLCnext Ecosystem – PLCnext Control

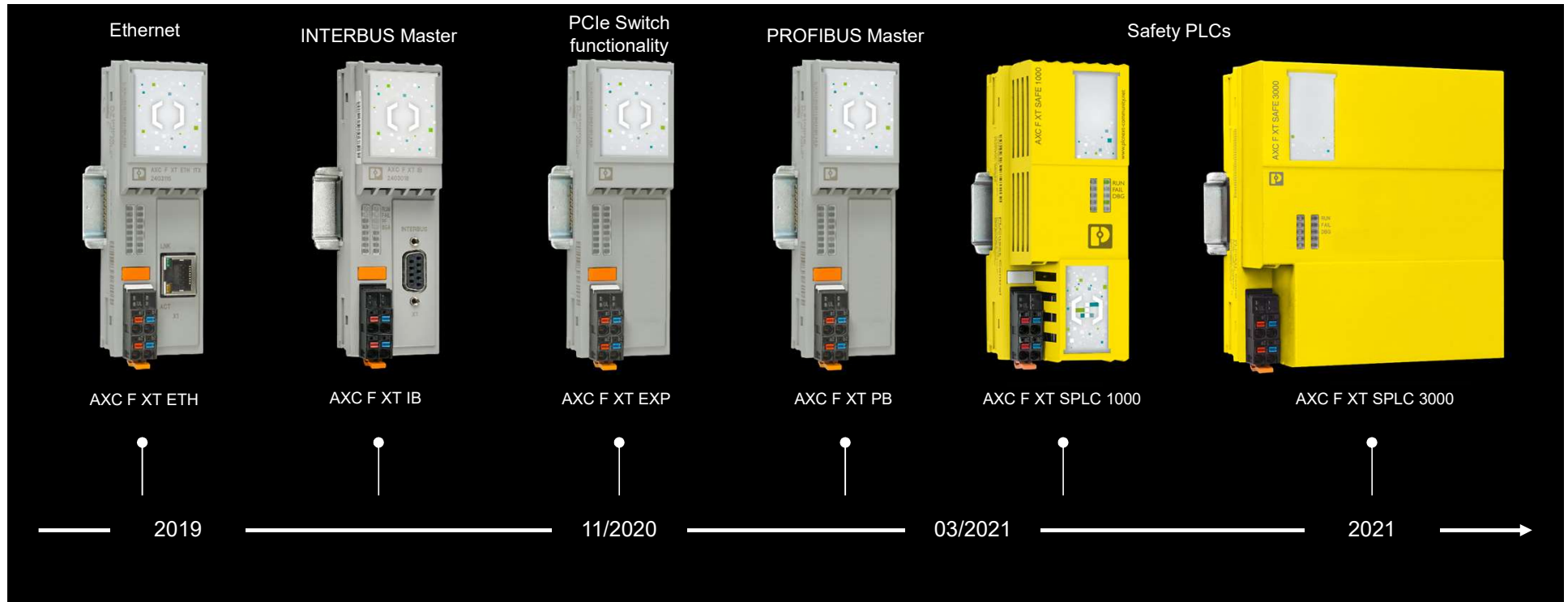
Left-hand side extension possibilities



- Modular expandability of the controller through left-sided expansion modules on the PCI express interface via a corresponding bus socket
- Unlimited expansion possibilities

PLCnext Ecosystem – PLCnext Control

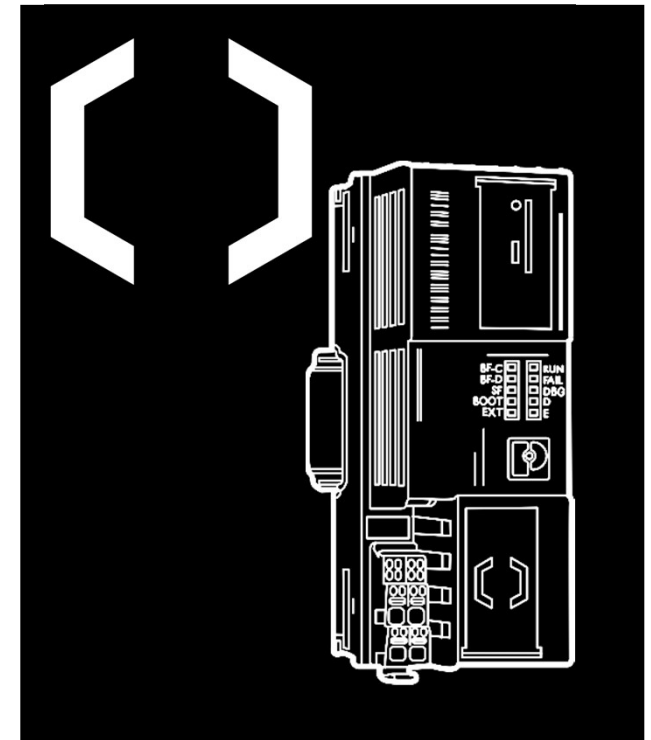
Portfolio PLCnext Control Extensions



PLCnext Extension AXC F XT ETH



- Additional 1Gbit MAC interface
- Temperature range: -25°C up to 60°C
- Profinet Control capability
- Security due to separated interfaces
- Modularity and Flexibility
- Approvals
- UL (Hazloc), CUL
- DNV/GL, LR, BV, ABS, ...
- IEC Ex, ATEX



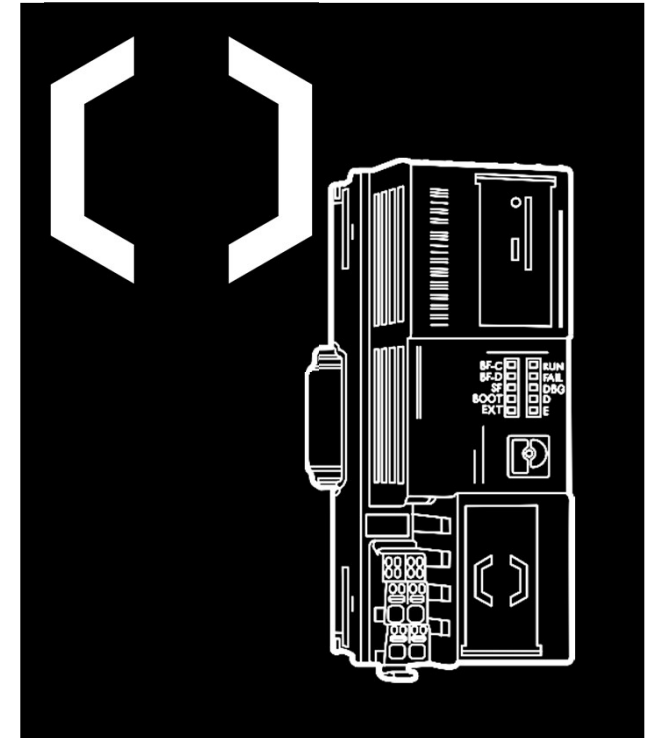
PLCnext Control

PLCnext Extension AXC F XT IB

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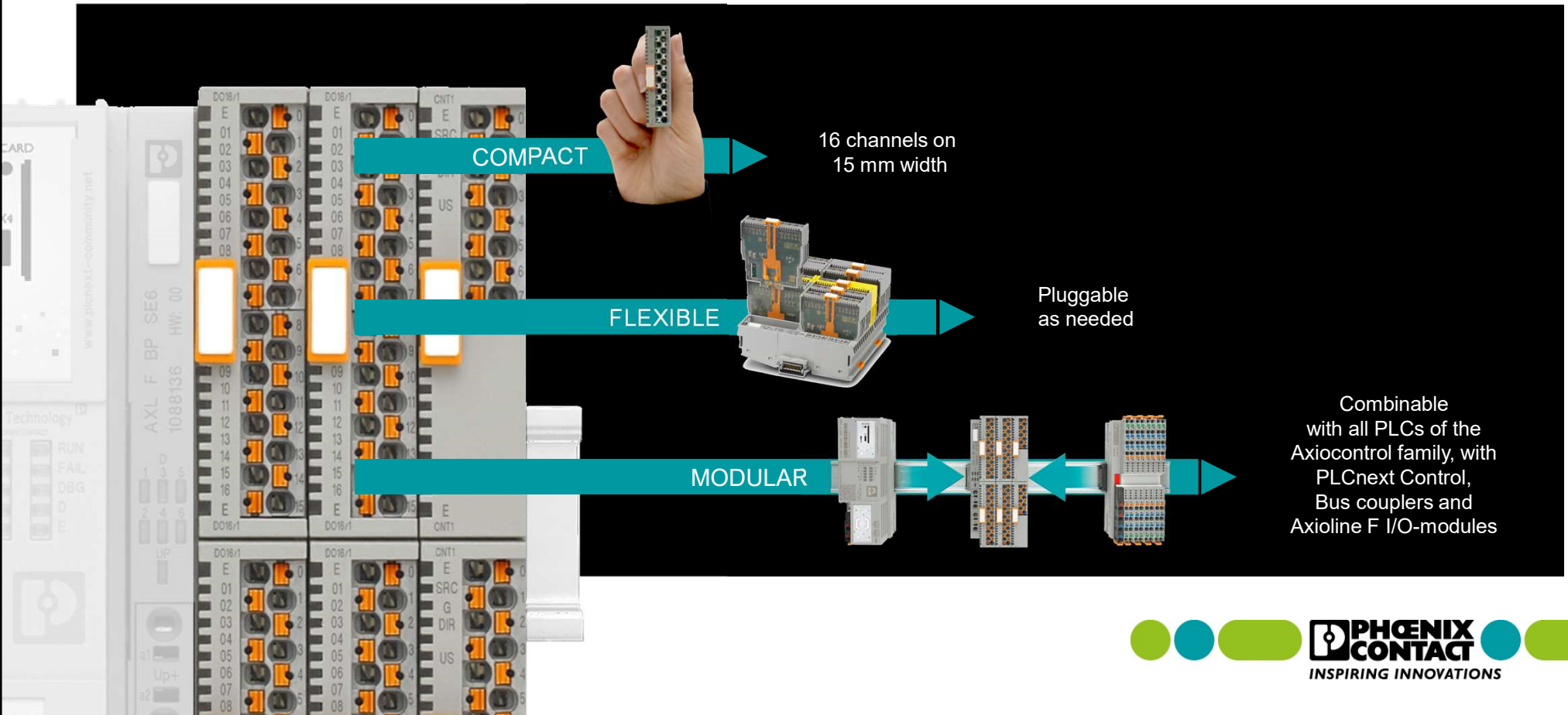


- Additional INTERBUS Master
- Up to 512 Devices, up to 255 Remote Devices
- Up to 126 PCP Devices
- Up to 16 Remote Bus Level
- 4096 Bit Process data
- 500kBit und 2 Mbit
- Ideal for Retrofit applications
- Approvals
 - UL (Hazloc), CUL, IEC Ex, ATEX
 - DNV/GL, LR, BV, ABS, ...
- Temperature range: -25°C up to 60°C



PLCnext Ecosystem – PLCnext Control - IO

Axioline Smart Elements



Axioline Smart Elements

Automate smart and economically



Ready for automation

All necessary functionalities
incl. Safety and IO-Link

DI

SDI

AI

IO-Link

INC

DO

SDO

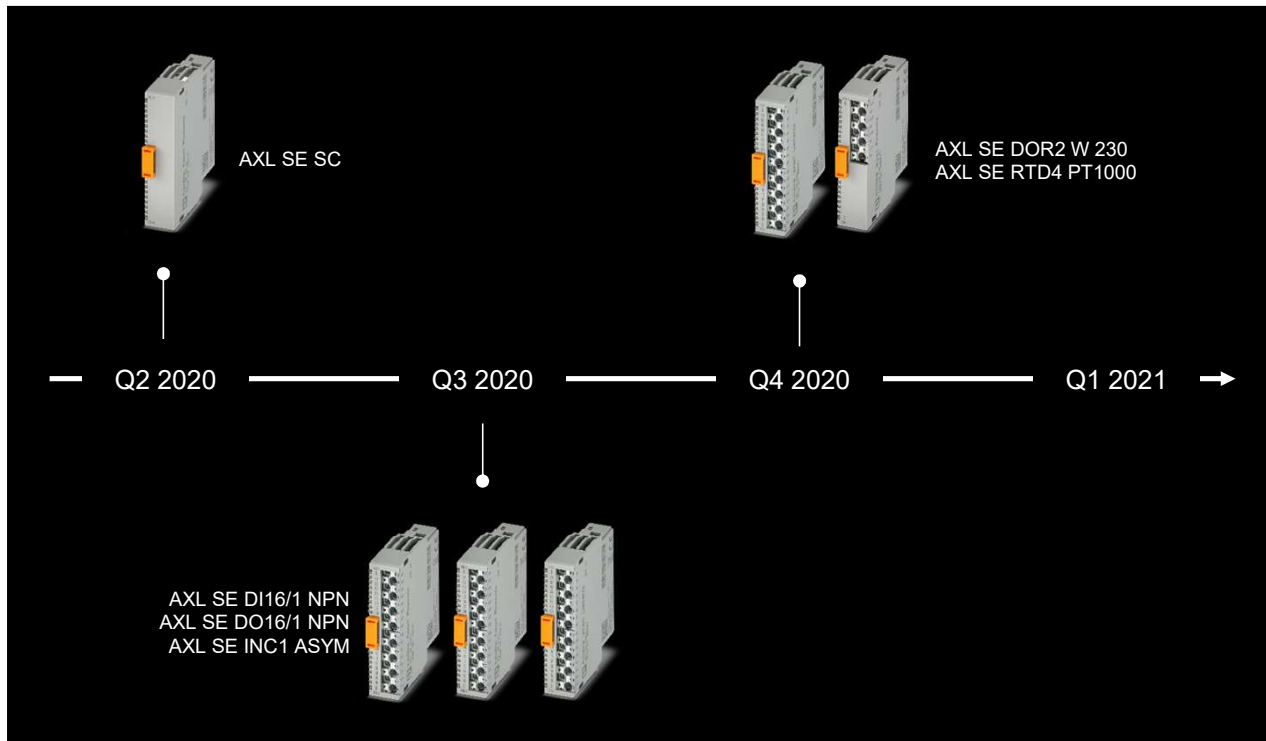
AO

RS485

CNT

Axioline Smart Elements

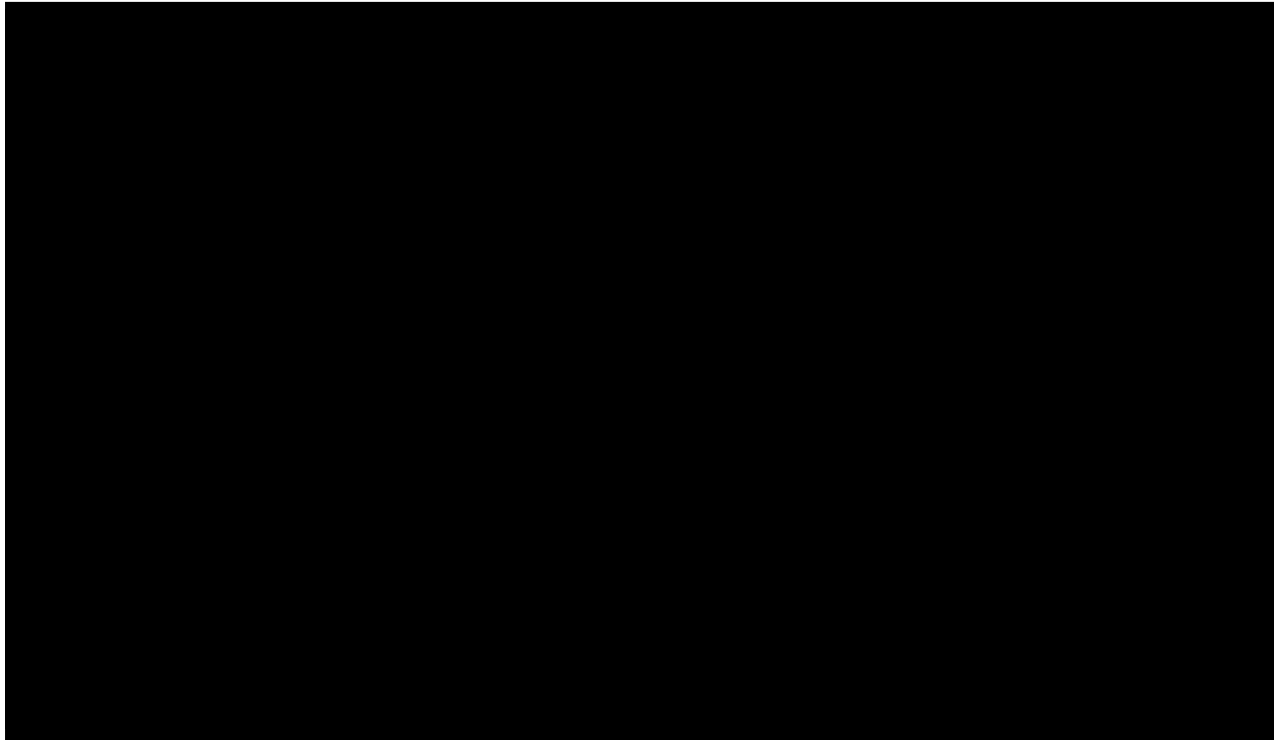
More to come



Check regularly for latest information on new products and management updates.

PLCnext & Axioline Smart Elements

Modular automation system



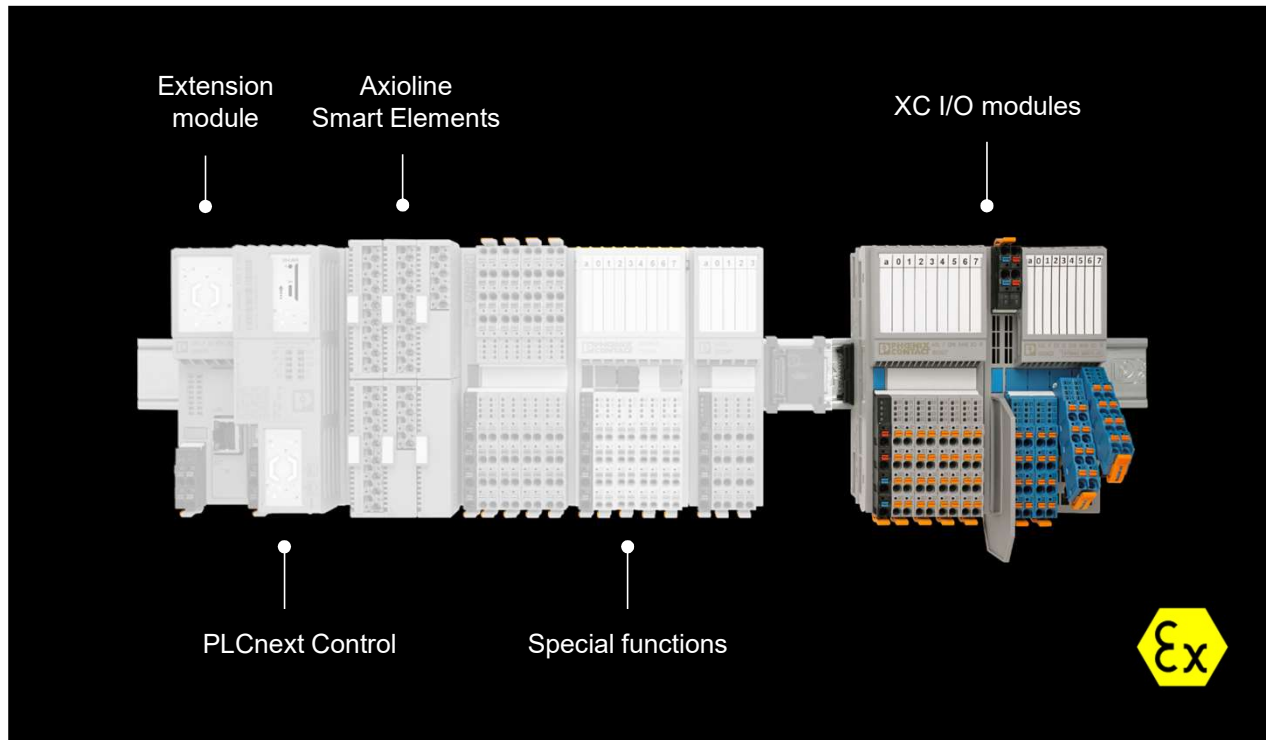
- Scalable automation system for simple to complex assignments
- Large selection of modules according to the modular system principle
- Optimal complement to PLCnext Control
- All components are part of the COMPLETE line system

PLCnext Technology [®]
Designed by PHOENIX CONTACT

COMPLETE line

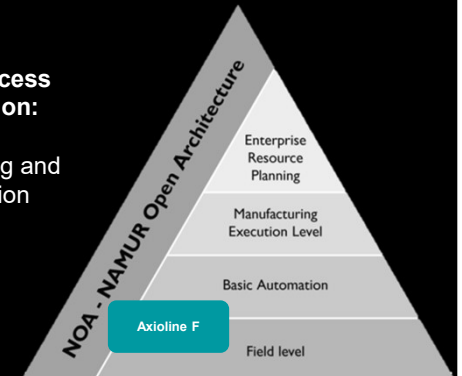

I/O solutions for process industry

Axioline F – Monitoring and Optimization



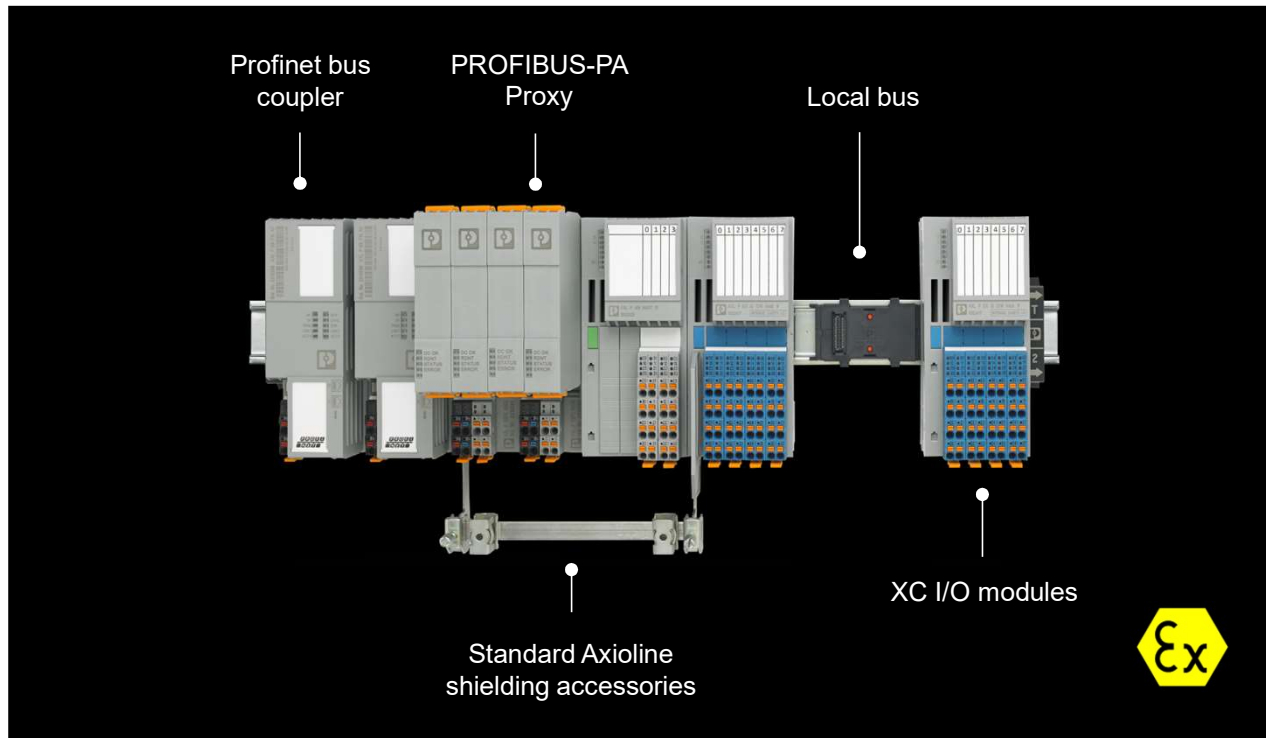
- Extreme condition temperature range
- IECEX/ATEX zone 2 certification
- Intrinsically safe
- HART communication
- NAMUR functionality

Side process automation:
Focus on monitoring and optimization



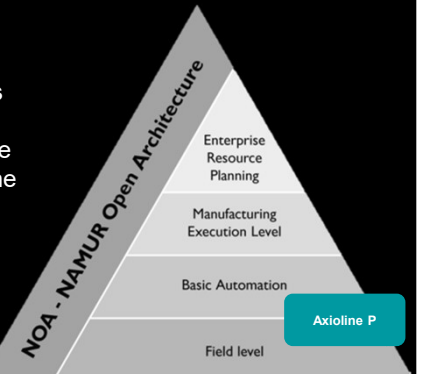
I/O solutions for process industry

Axioline P – high availability with hot-swap

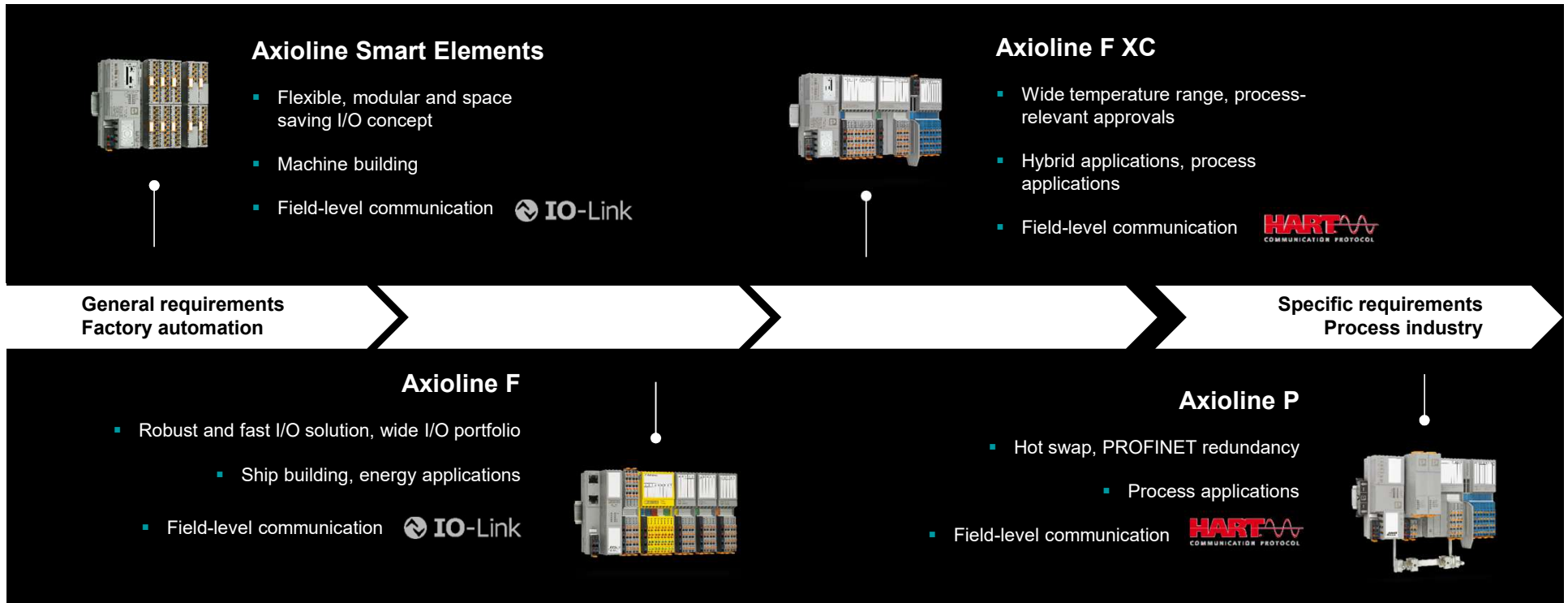


- PROFINET S2 redundancy
- Hot-swap
- Installation in zone 2
- Connection to zone 0/1
- HART communication
- NAMUR functionality

Core process automation:
Connecting the field level to the control room



Overview – Axioline IP20 I/O systems

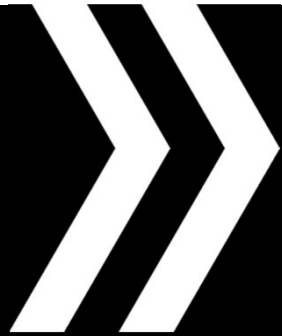


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Functional Safety Integration

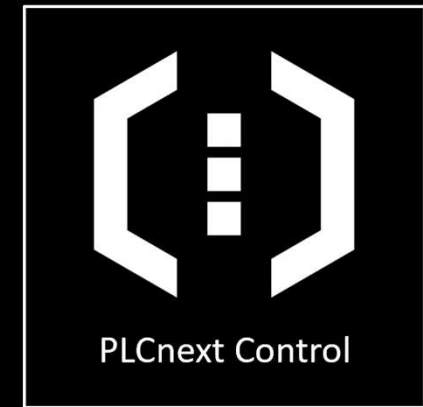
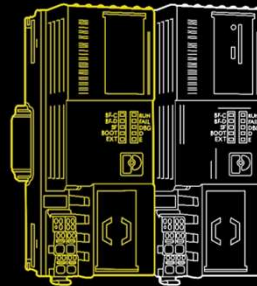
PLCnext Technology

The open ecosystem for limitless automation



Safety

with PLCnext Control




PLCnext Control

Discover flexible
automation

PLCnext Technology

PLCnext Control Extension SPLC 1000



PLCnext Control Extension
AXC F XT SPLC 1000







Out. No. 1198811

Safety

P
C
E

RUN
FS


45mm

Core  2 x Cortex M4	# of Profisafe devices  32	Temperature  -25°C - 60°C
Width  45mm	Approvals  UL, CUL, etc	C Functions  Reloadable







PLCnext Extension AXC F XT SPLC 1000

PLCnext Control

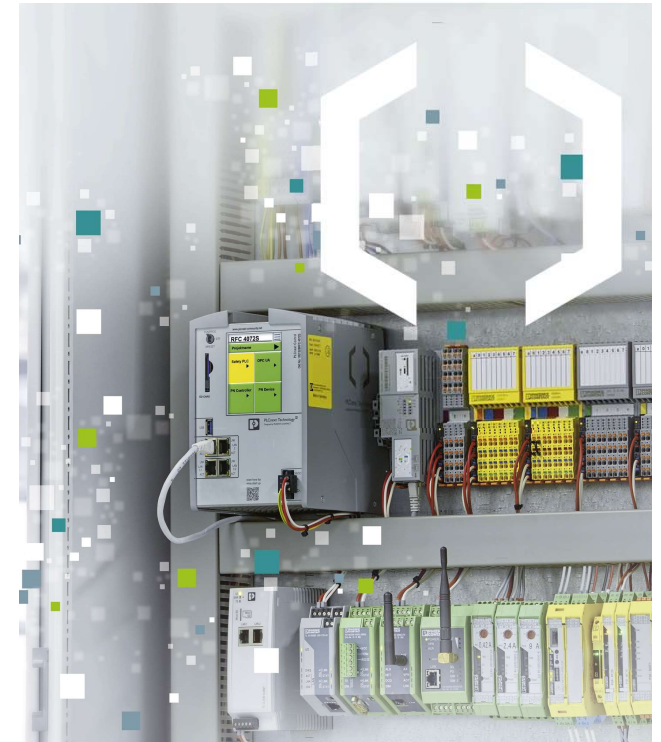
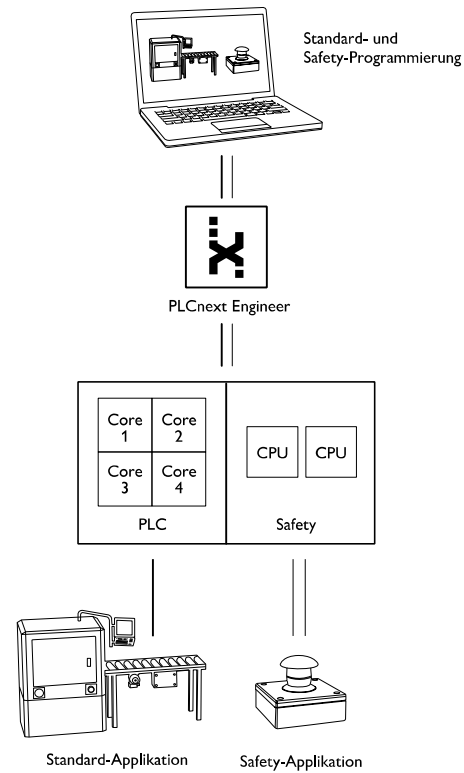
PLCnext Control RFC 4072S



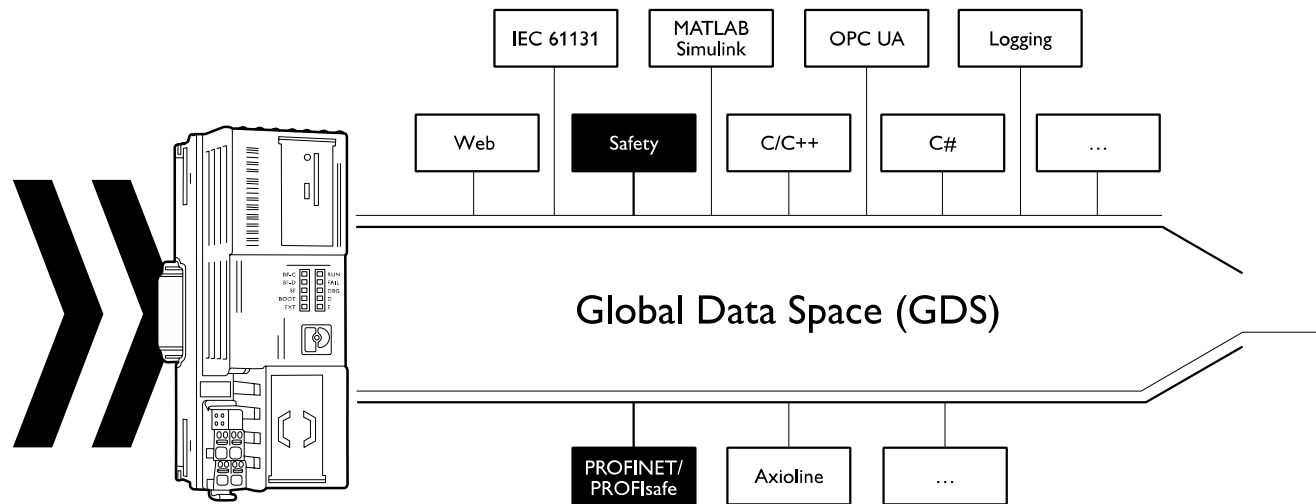
The image shows a white PLCnext Control RFC 4072S unit. The front panel features a color display showing 'RFC 4072S' and several menu options: 'Properties', 'Safety PLC', 'DPC UA', 'PN Controller', and 'PN Device'. Below the display are various ports and a QR code. To the left of the unit are three large white chevrons pointing right.

Core	Working memory	Temperature
 Intel i5 6300U 2 x 2,4 GHz processor	 4 GB DDR 4 dual channel RAM	 0°C up to 55°C with fan
# control tasks (IEC 61131)  32	Min. cycle time (IEC 61131)  0,5 ms	Security  TPM integrated

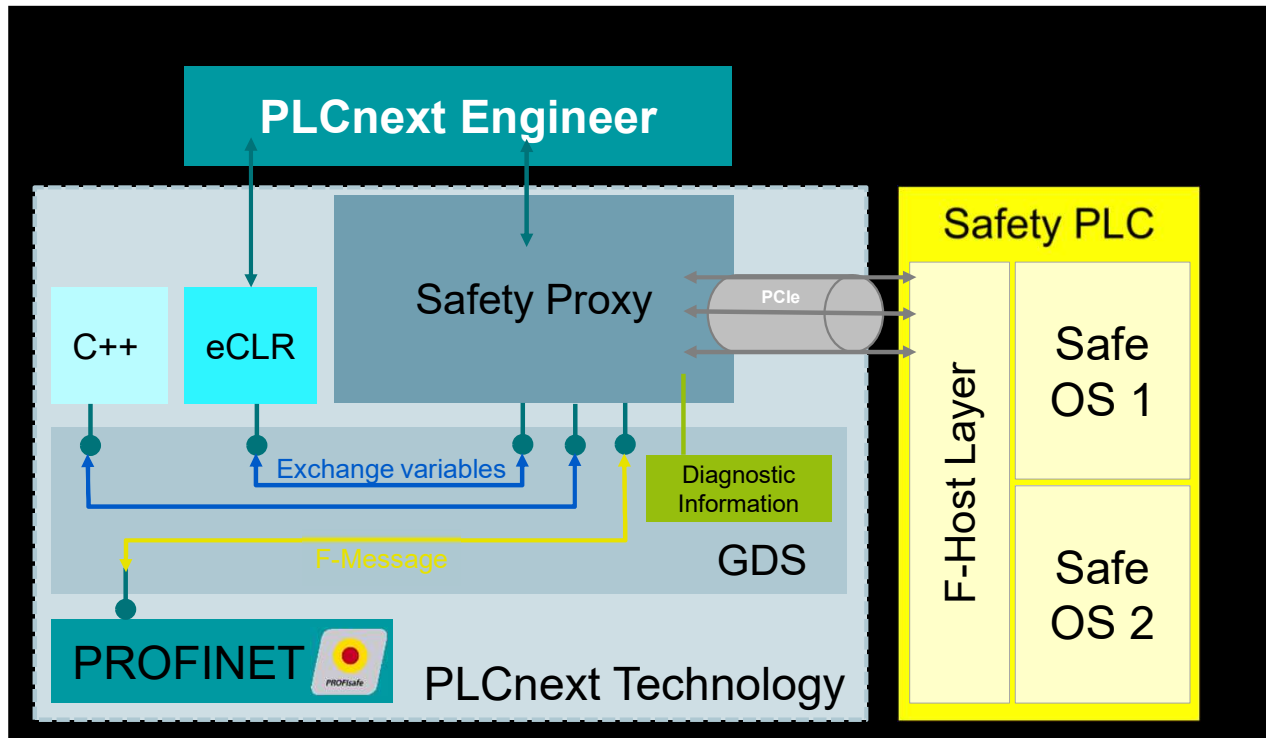
Functional Safety Integration



Safety integrated

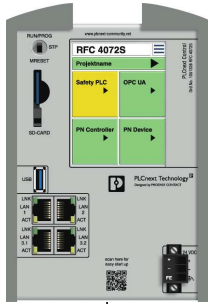


Safety integrated



- Safety integrated (programming, hardware configuration)
- Consistent usability
- SIL 3
- Separate Safety PLC
 - 2 different cores

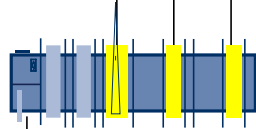
RFC 4072S
(F-Host)



Emergency Stop



Safety I/Os



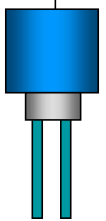
Standard I/Os



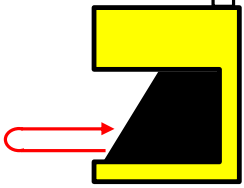
Standard and safety devices in common ethernet network



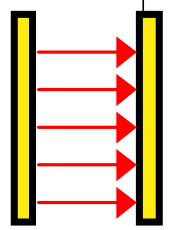
DP/PA



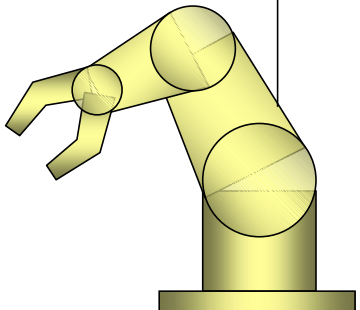
Limit switch



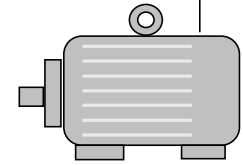
Sick
Safety
Scanner



Light curtain



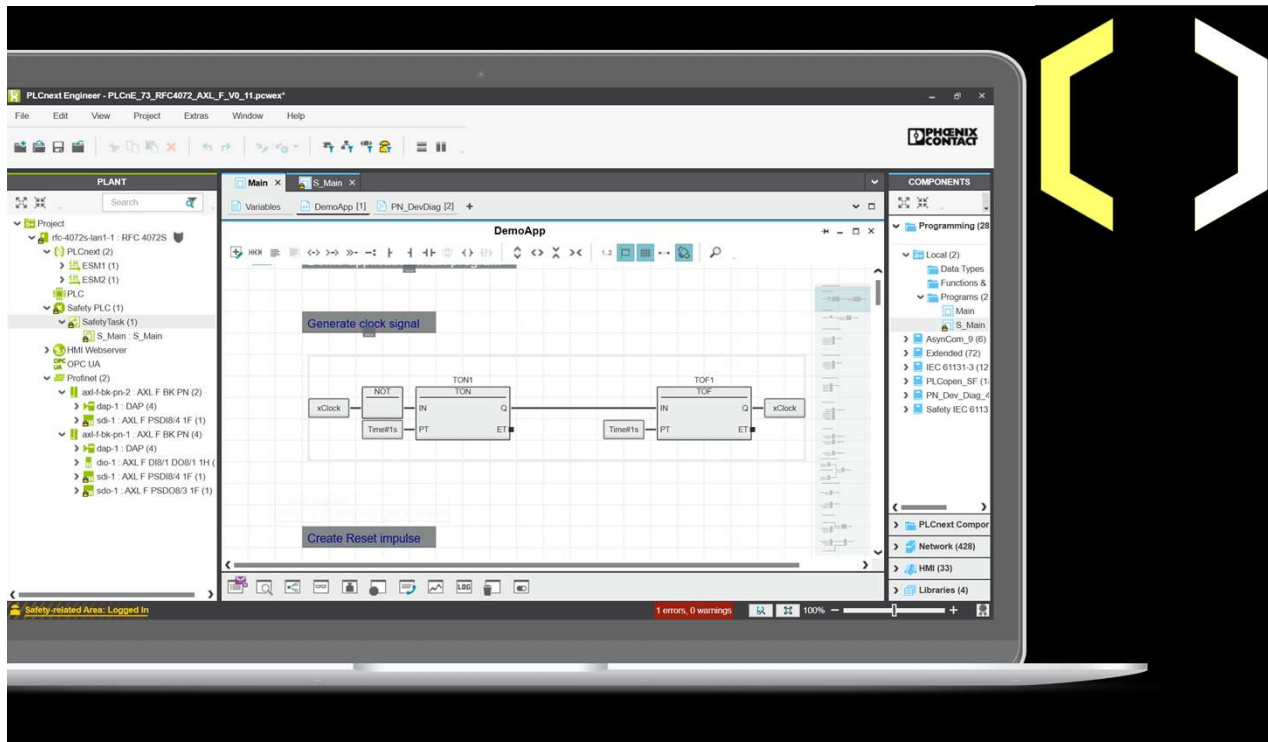
Kuka Robot



E Motors

Standard and safety programming in one engineering software

PLCnext Engineer

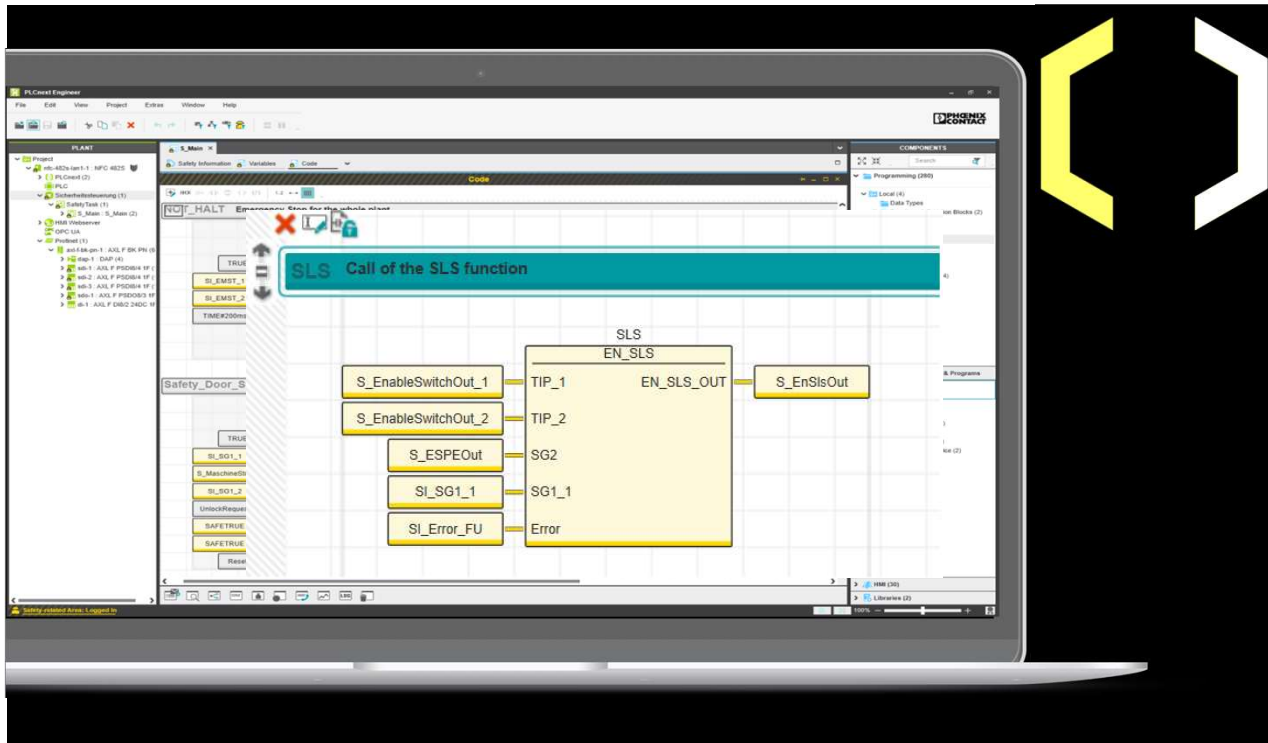


Fully integrated Safety programming

- TÜV Rheinland certified according to IEC 61508
- Editor with common behavior as known from standard FBD or LD editors
- Low Variability Language support
- Network granular CRC checksums
- PROFIsafe Support

Standard and safety programming in one engineering software

PLCnext Engineer

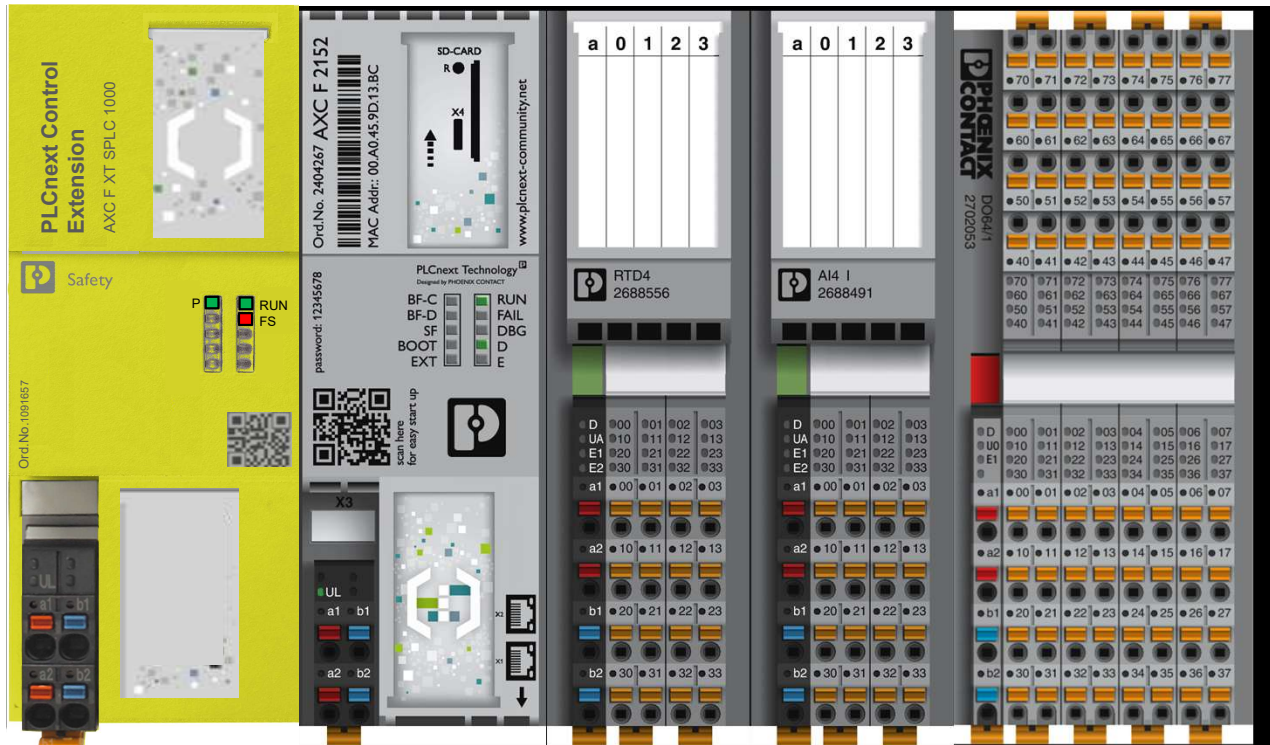


Fully integrated Safety programming

- Individual safety functions can be protected by a verification function
- Background signal path analysis
- Background safe semantic analysis
- Diversely-redundant code generator

Scalable Safe PLCs

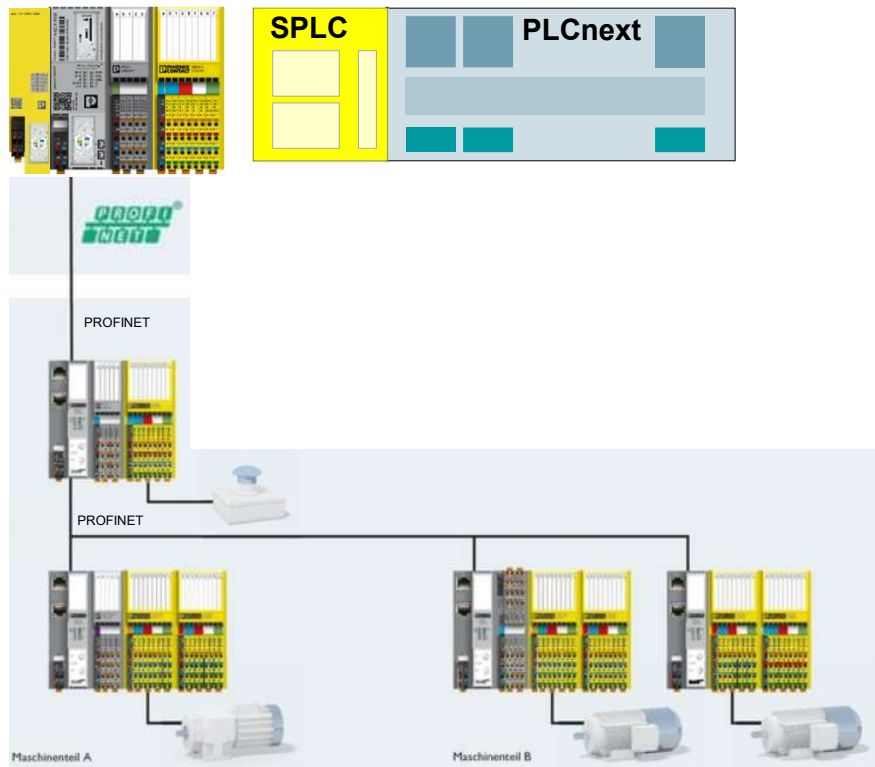
AXC F XT SPLC 1000 – Low-Scale Modular Safe PLC



- Decentralized Small Safe PLC
- Left-hand side connectable to PLCnext Controls
- Supported Safety Protocols:
 - PROFIsafe V2.61 (32 instances)
- Connectable to higher-layer SPLC
 - as F-Device
 - via new OPC UA Safety Protocol

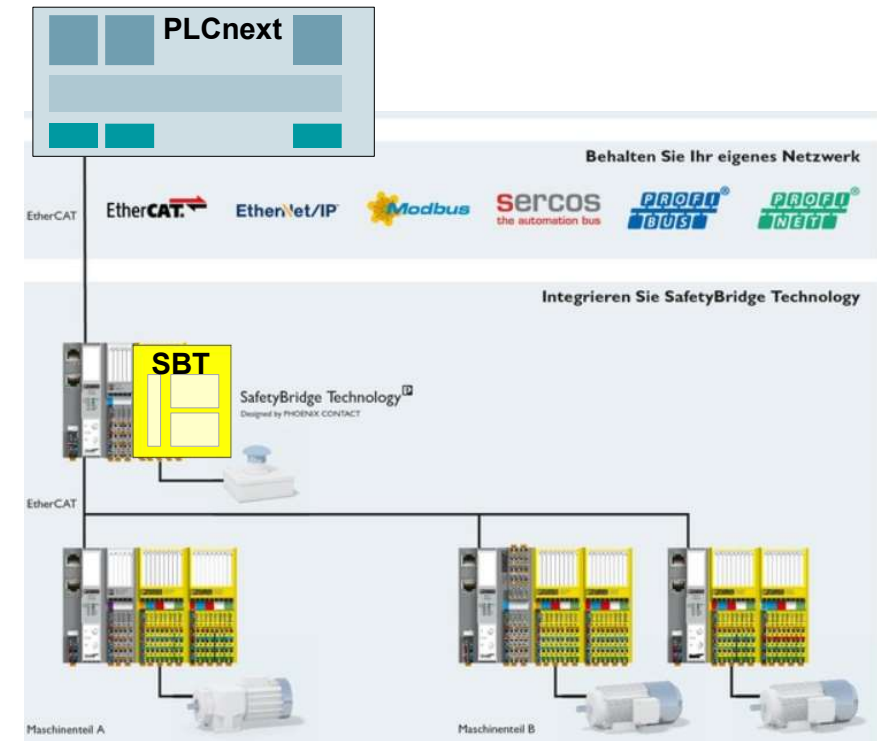
PLCnext Safety / SafetyBridge Categorization

PLCnext Safety



PLCnext Technology 
Designed by PHOENIX CONTACT

SafetyBridge Technology

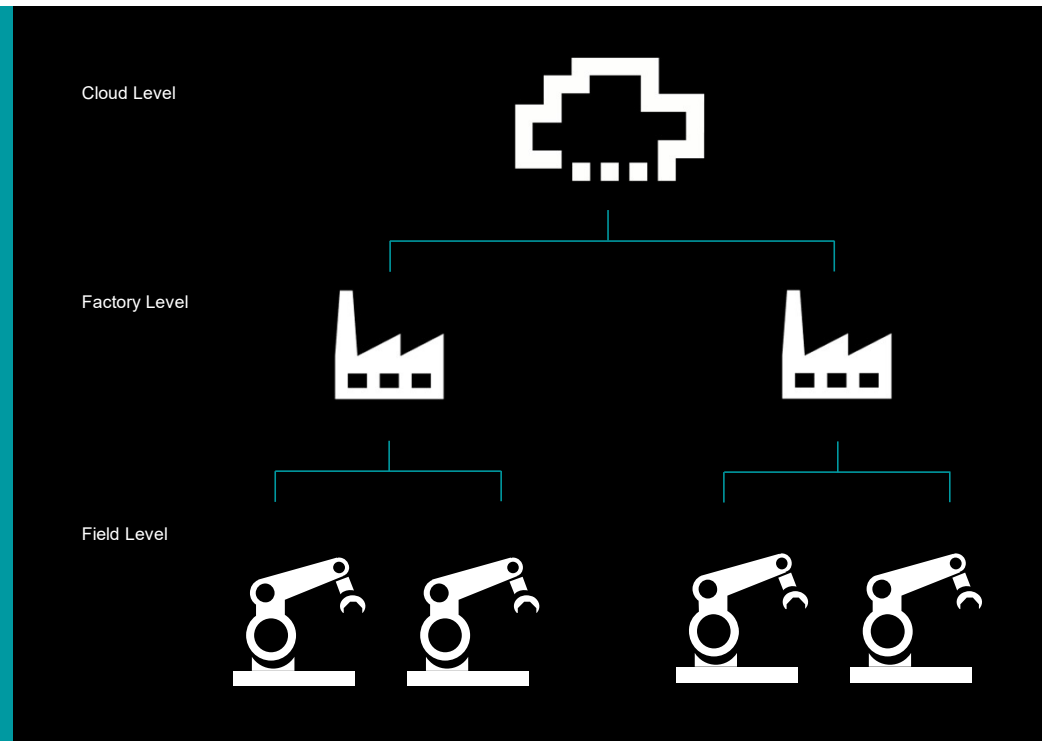


PLCnext Technology 
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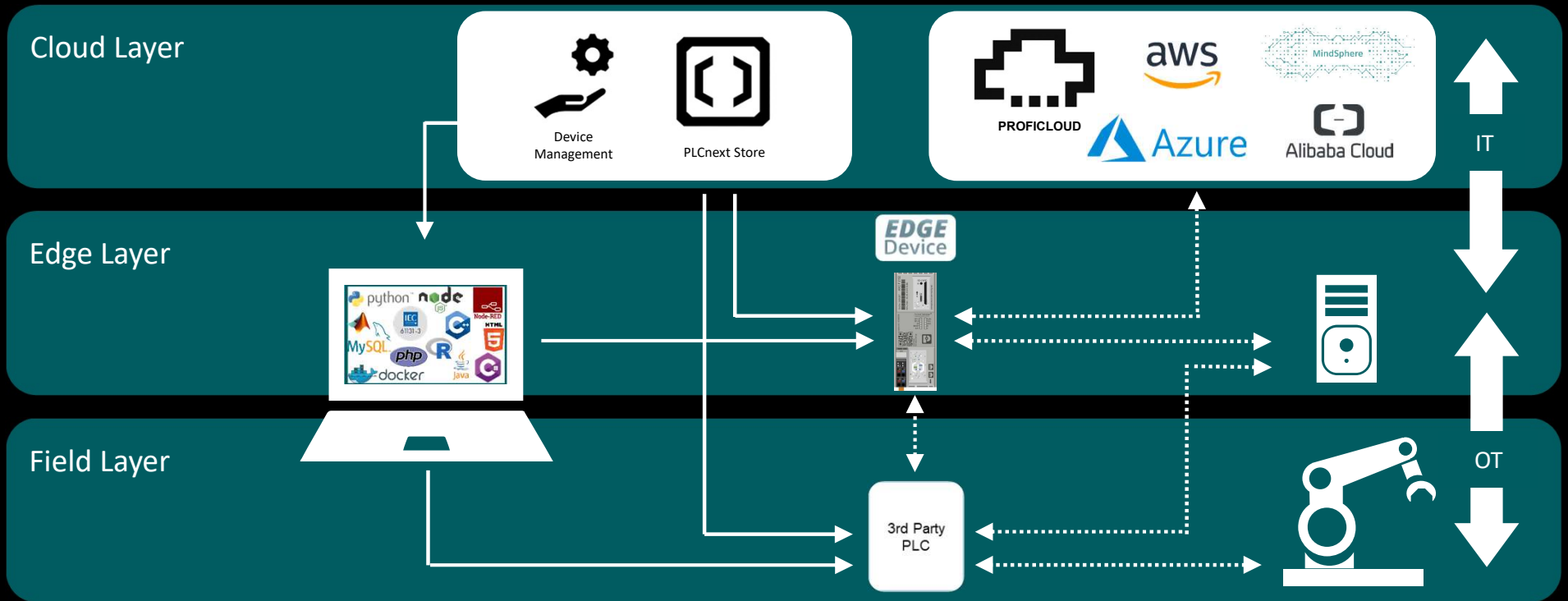
PLCnext Control for Edge Computing

Edge Computing

- Cloud computing has revolutionized how people store and use their data, but...
- Latency, bandwidth, security or a lack of offline access can be problematic
- To solve this problem, users need robust, secure and intelligent on-premise infrastructure for edge computing
- When data is physically located closer to the user who connect to it, information can be shared quickly, securely and without latency

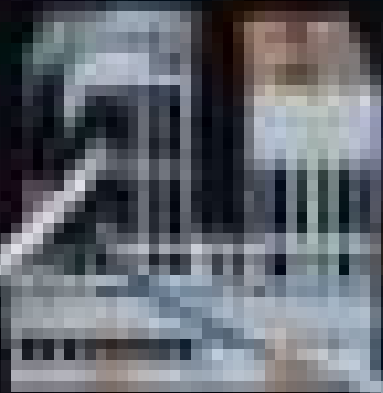


PLCnext Control for Edge Computing



Application Example

State-of-the-art
IIoT and edge
computing
solution

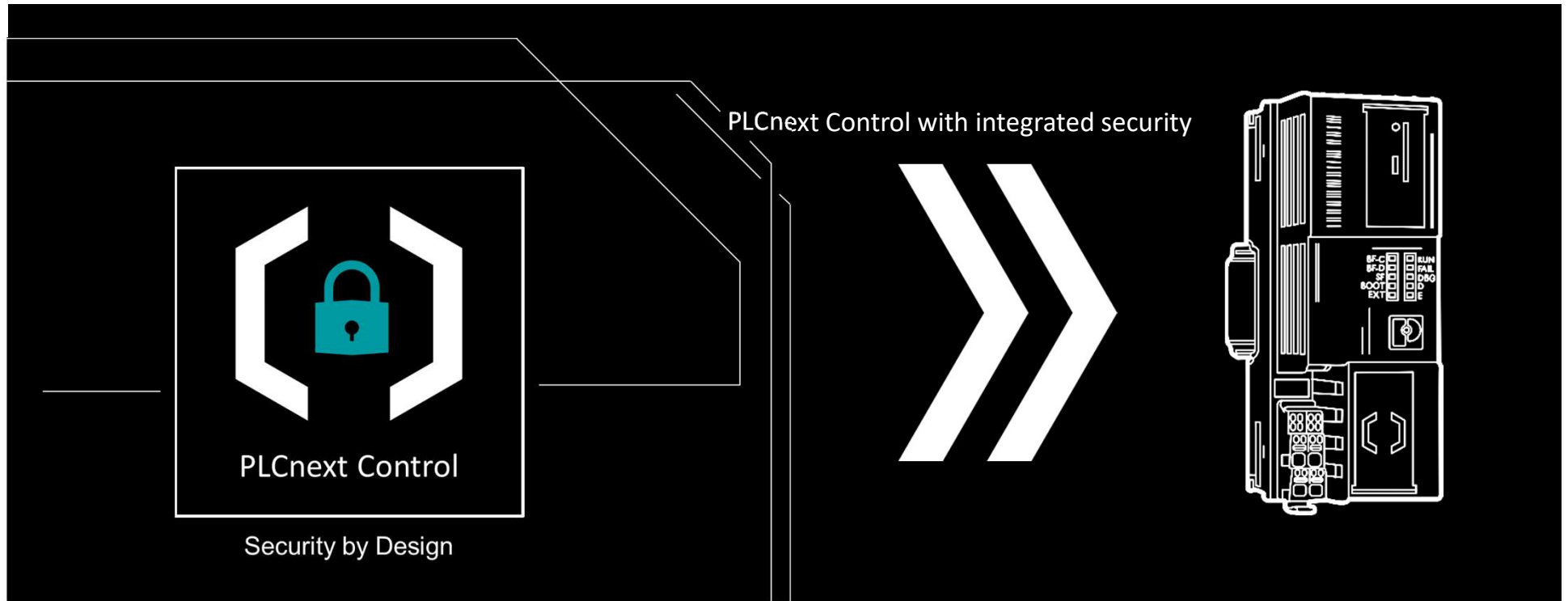


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Security by design
acc. to IEC 62443

PLCnext Ecosystem – PLCnext Control

PLCnext Control according to the standard IEC 62443



Effects of Security Incidents on Production Facilities



PLCnext Control

Security by Design

Plant downtime

Due to security problems, production has to be stopped for hours or days. What are the costs of such a production downtime?

Loss of know-how

A competitor can access your sensitive data (design, engineering,...). Can you quantify the damage economically?

Data loss

Suddenly all data is lost. What would be the cost of reconstructing this data?

Standing

What happens if your reputation for the reliability and security of your company's data is compromised by your partners?

Applicable Security Laws and Standards

Brief Overview of the Most Important Laws & Standards

Security Laws (What must be done?)



IT Security Act (2015)

Asset owner of critical infrastructures must establish and certificate an **ISMS** (Information **S**ecurity **M**anagement **S**ystem) as well as fulfill a set of minimum technical requirements

Version 2.0 in preparation



EU Cybersecurity Act (3/2019)

A comprehensive set of regulations, technical requirements, standards and procedures for certification or conformity assessment of products

Recommendations (What should be done?)



BSI IT Basic Protection Catalogs (asset owner / device manufacturer)

Basic Security Standards (How to implement?)



IEC 62443 Security for industrial automation (asset owner / device manufacturer)



ISO/IEC 2700X Information Technology (asset owner)

Applicable Security Laws and Standards

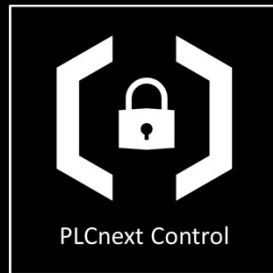
Sector-specific Security Standards

Standard	Target Group	Main Purpose	Geographical / Industry Focus	Certification possible?
BDEW	Device manufacturers / system integrators	Security requirements for suppliers	D, A, CH Energy & water sectors	No
WIB	Device manufacturers / system integrators	Device manufacturer certification	Oil & Gas sector	Yes
ISO/IEC 27019	Asset owners / plant operators	IT security for control systems	Energy sector	Yes
NIST 800-82	Asset owners / plant operators	Technical security recommendations	USA	No
NERC CIP	Asset owners / plant operators	Increasing reliability of energy supply infrastructure	USA, Canada	Yes
IEC 62443	Device manufacturers / system integrators / plant operators	Requirements for secure products, secure solutions, and secure operation	General industry sector	Yes

IEC 62443: IT-Security for Industrial Automation Control Systems

Authentication

- User accounts
- Authentication of credentials
- Authorization



PLCnext Control

Security by Design

Confidentiality

- Use of secure protocols
- Secure remote maintenance
- Cryptography
- Protection of expertise

Integrity

- Principle of least privilege
- Defense in depth
- Network segmentation

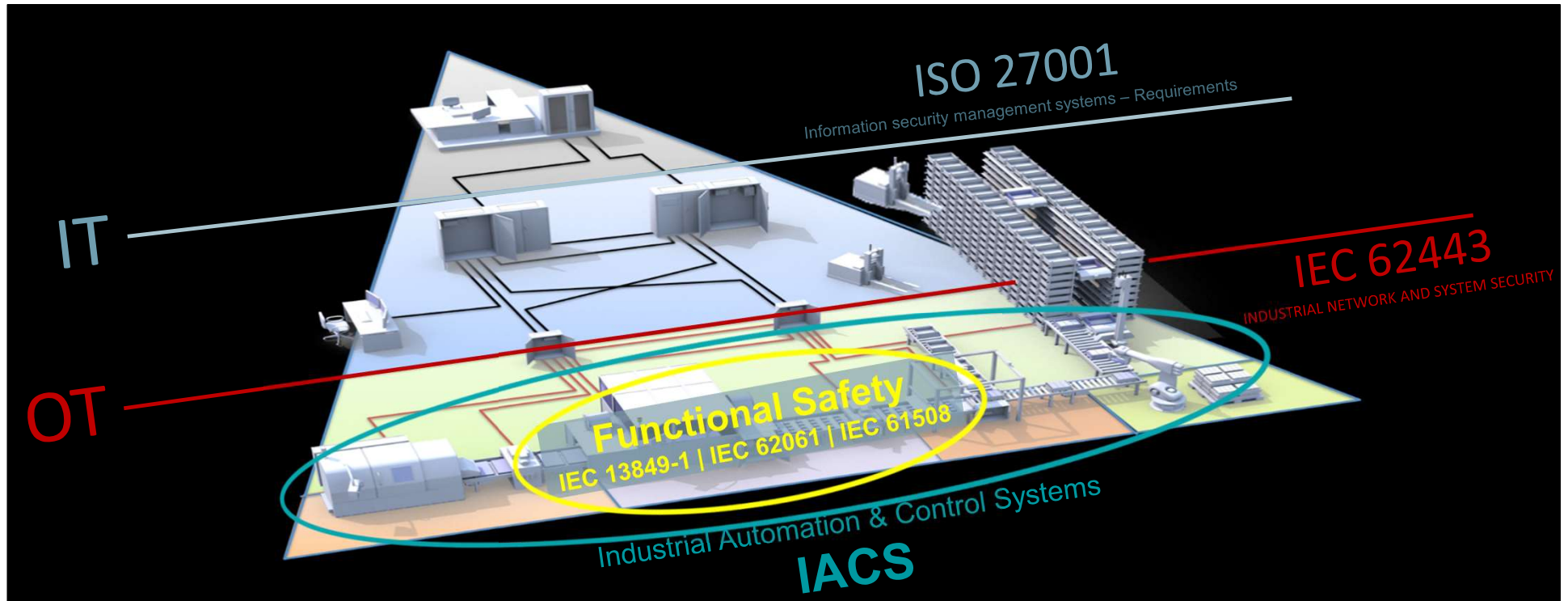
Availability

- Monitoring and attack detection
- Tamper protection



Terminology, Roles, and Tasks in Security Processes

The “Automation Pyramid”

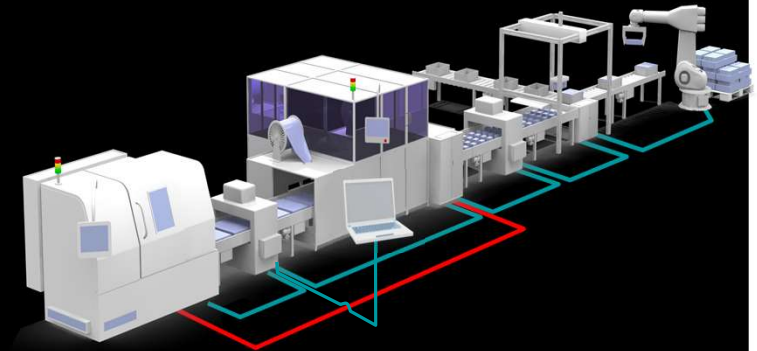


Terminology, Roles, and Tasks in Security Processes

Basic Roles & Purposes of the IEC 62443 Standard

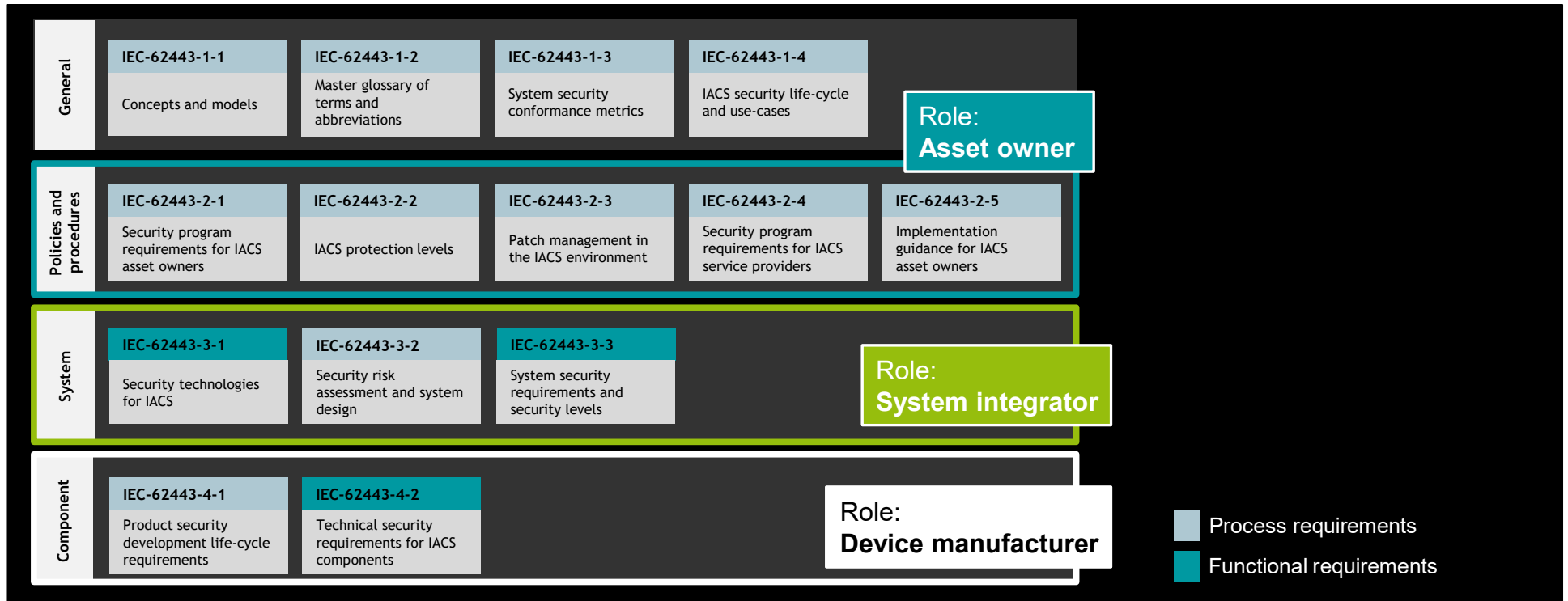
Role	Focus	Interest
Asset owner / plant operator	Operation & maintenance of automation solutions	Secure operation
System integrator / Machine builder	Design & commissioning of automation solutions	Secure solution
Device manufacturer	Design & management of components for automation solutions	Secure devices

Companies can check their automation technology for potential weaknesses and develop protective measures



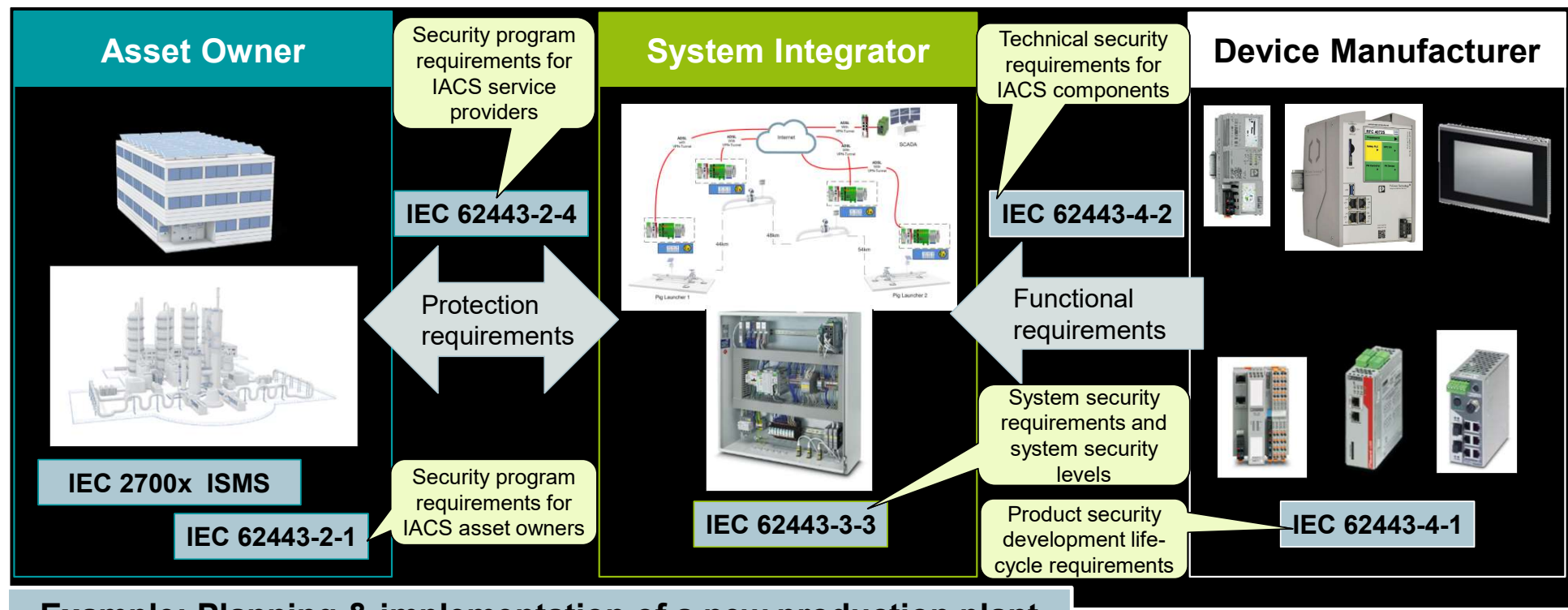
Terminology, Roles, and Tasks in Security Processes

IEC 62443 Structure and Systematics

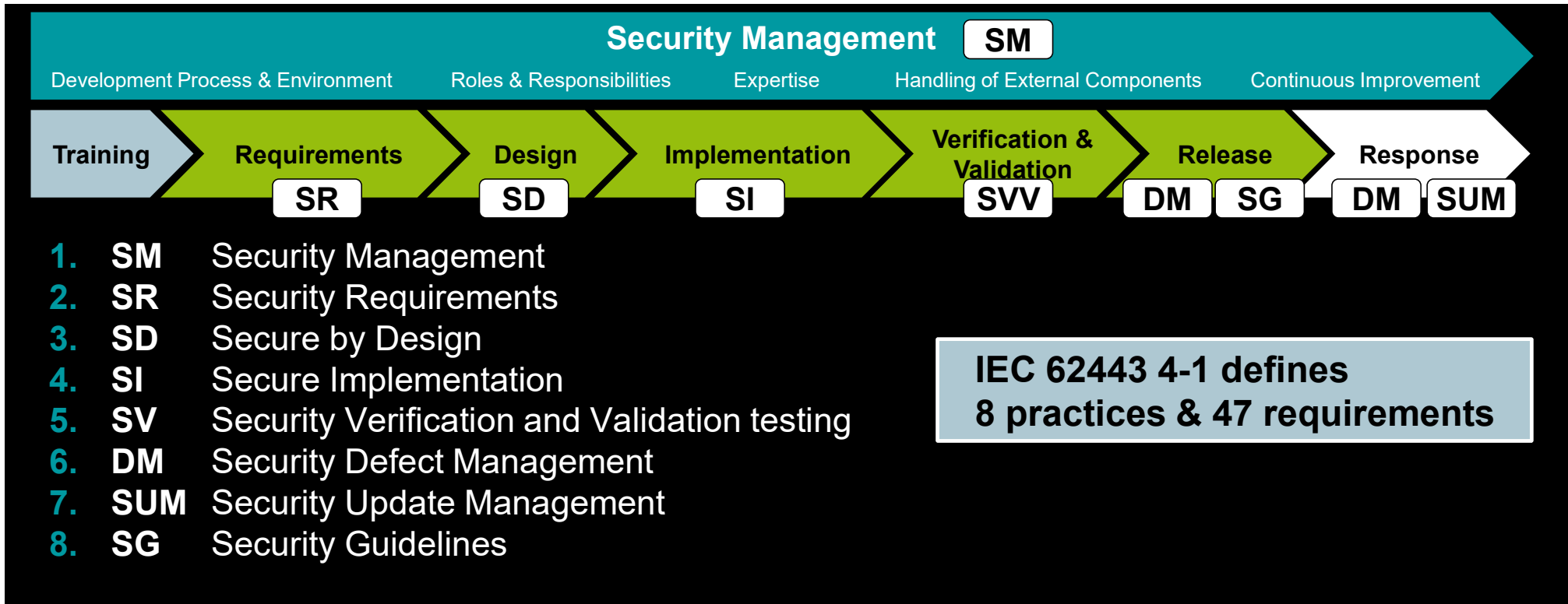


Terminology, Roles, and Tasks in Security Processes

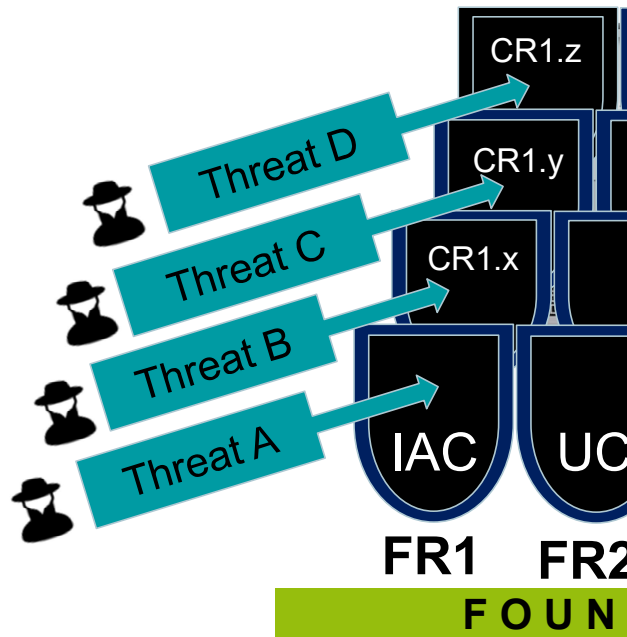
Role Distribution in a Value-added Chain according to IEC 62443



IEC 62443-4-1: Product Development & Lifecycle



IEC 62443-4-2: Functional



Foundational Requirements

- Identification and authentication control (IAC)
Device protection by verifying the identity of any user before enabling communication
- Use control (UC)
Device protection against unauthorized actions by necessary privileges before performing
- System integrity (SI)
Preventing modifications of information by unauthorized persons and systems
- Data confidentiality (DC)
Preventing disclosure of information to unauthorized persons and systems
- Restricted data flow (RDF)
Protection via zones and connections to limit unnecessary data flow
- Timely response to events (TRE)
Collecting, reporting, preserving automatically evidences to ensure timely corrective actions
- Resource availability (RA)
Ability of device functionality in case of demand also during DoS attacks

FR: Foundational Requirements

CR: Component Requirements w, x, y, z => acc. to SL feature table in IEC 62443 4-2 Appendix B

IEC 62443-3-3: Security Level Def

Functional requirements				
Attacker capabilities				
Security Level	Means	Resources		
SL - 0	no protection requirements			
SL - 1	casual or coincidental manipulation			
SL - 2	simple	low		
SL - 3	sophisticated	moderate	IACS specific	moderate
SL - 4	sophisticated	extended	IACS specific	high

Protection against the abilities of...

SL-1
...any Internet user

SL-2
... interested individuals and companies with generic security knowledge

SL-3
... experts and companies that develop and deploy effective, yet cost-oriented attack scenarios with clear goals

SL-4
... governmental organizations which focus on achieving the specifically selected target at almost any price

IEC 62443-3-3: Security Level Definitions

CRs und REs	SL-1	SL-2	SL-3	SL-4
CR 1.1 Human user identification and authentication	✓	✓	✓	✓
RE (1) Unique identification and authentication		✓	✓	✓
RE (2) Multifactor authentication for all interfaces			✓	✓
CR 1.2 Software process and device identification and authentication	✓	✓	✓	✓
RE (1) Unique identification and authentication			✓	✓

CR: Component Requirements

RE: Requirement Enhancements

PLCnext Technology Security Basic Design

- Configurable Linux using Yocto build system
- OS components: Bootloader, Syslog-ng, SSH, Open SSL, Firewall nf-tables, Role Based Access Control (RBAC), Preemptive Real-time Patch (OSADL),
- Hardware design with TPM to store manufacturers roots of trust
- Communication: HTTPS, VPN, NTP/SNTP, OPC UA,
- Overlay File system with capabilities and supporting of SD Cards
- Security Patches supported via second Partition with rollback capability

PLCnext Technology Security Basic Design

- Roots of trust via TPM usage; processes during production and delivery
- Certificate management via trust store for manufacturer, system integrator and asset owner
- NGINX web server supporting HTTPS
- Web Based Management as central entry point for configuration
- Firewall with management of different levels for chains and rules
- VPN configuration supports IPSec and OpenVPN
- TLS 1.2 secured communication
- User Manager supporting roles, permissions and credentials

Security Features PLCnext 2021.0 LTS summary



PLCnext Control

Security by Design

- Security Architecture: Configurable Linux based on Yocto Build System
- Hardware design with: TPM -> IEEE 802.1 AR (Secure Device Identity)
- Network segmentation for Zones and Conduits management AXC F XT ETH 1TX Extension module integrated in the firewall
- Integrity check during boot process
- Secure Communication: TLS, SFTP, VPN, HTTPS,
- User Management with enhanced complexity rules and central AD (LDAP)
- Linux nftables Firewall with netload limiter
- VPN IPsec IKEv1/2 Strongswan and Open VPN file configuration
- SYSLOG for security message management and central storage on server
- OPC UA security signed & encrypted with certificate management via GDS
- SD card activation / deactivation / (encryption 2021.3)
- Device and Patch Management (OPC UA 2021.6)

Secure Product Development

Product Security Incident Response Team



Phoenix Contact 360 Grad Security concept



- Secure Development processes according IEC 62443-4-1
- Security certified products according IEC 62443-4-2
- Security certified Services according IEC 62443-2-4
- Blueprints and customer specific solutions certified according IEC 62443-3-3
- Product Security Incident Response Team
Market Vulnerabilities scans and publishing updates and advisories

Security nach IEC 62443

Cyber Security



TUV SUD CERTIFICATE NO. Q4B 029429 0008 Rev. 00

ZERTIFIKAT ◆ CERTIFICATE ◆ CERTIFICADO ◆ CERTIFICAT ◆ CERTIFIKAT ◆ 認證證書 ◆ CERTIFICATE ◆ CERTIFICATE

 
Product Service

CERTIFICATE
No. Q4B 029429 0008 Rev. 00

Holder of Certificate: PHOENIX CONTACT GmbH & Co. KG
Flächenmarktstr. 8
32825 Blomberg
GERMANY

Certification Mark: 

Scope of Certificate: ICS Security Service Provider

The Certification Body of TÜV SÜD Product Service GmbH certifies that the company mentioned above has established and is maintaining a management system which meets the requirements of the listed standards. The results are documented in a report. See also notes overleaf.

Report No.: 16CR119207

Valid until: 2022-03-17

Date: 2016-03-18 

Page 1 of 2
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Security nach IEC 62443

Cyber Security



Security Certifications

Certifications according to IEC 62443



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Report No.: 18CR11S007

Valid until: 2022-03-17

Date: 2019-03-18
(Andreas Barwald)

3-1-3 Security metrics	IEC-62443-1-4 ICS security life-cycle and use-cases	
3-2-3 Management in environment	IEC-62443-2-4 Security program requirements for IACS service providers	IEC-62443-2-5 Implementation guidance for IACS asset owners
3-3-3 Security events and levels		




CERTIFICATE
No. Q4B 029429 0007 Rev. 00

Holder of Certificate: PHOENIX CONTACT GmbH & Co. KG
Flachmarkstr. 6
32825 Blomberg
GERMANY

Factory(ies): PHOENIX CONTACT Electronics GmbH
Industry Management and Automation
Business Unit Control Systems
Dringenaer Strasse 30, 31812 Bad Pyrmont, GERMANY
PHOENIX CONTACT Software GmbH
Langenbruch 6, 32657 Lemgo, GERMANY

Certification Mark: 

Scope of Certificate: Secure Product Development Lifecycle

Applied Standard(s): IEC 62443-4-1:2018
PPP 15002A:2018 (IEC 62443-4-1 Full Process Profile)

The Certification Body of TÜV SÜD Product Service GmbH certifies that the company mentioned above has established and is maintaining a management system which meets the requirements of the listed standards. The results are documented in a report. See also notes overleaf.

Report No.: 18CR11S007

Valid until: 2021-07-29

Date: 2018-08-01
(Andreas Barwald)

Page 1 of 1
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ICS-Security Service Provider

IEC 62443-2-4 – ICS-Security Service Provider Certificate



As an ICS service provider we are offering

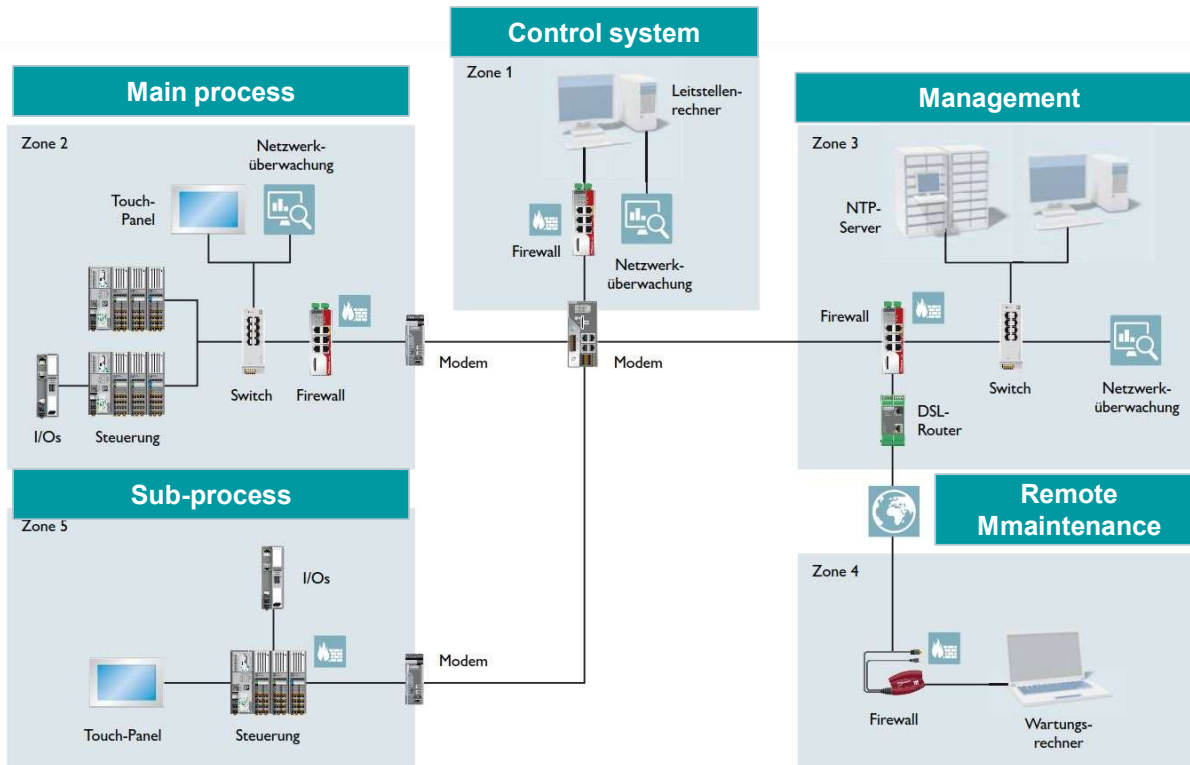
- Security services
- Design and commissioning of an automation system for acceptance as system integrator



ICS = Industrial Control System



Security Context: Security Blueprint Certification










Security Context:

- describes the environment
- describes the operating conditions
- defines the data criticality
- defines the zones and communication relationships
- assumptions the environment must fulfill.
- threat evaluation and priorities

Ecosystem & PLCnext Store

PLCnext Community – Global Exchange & Collaboration

<p>More about PLCnext Technology</p>  <p>plcnextcommunity.com</p>	<p>Upload or download apps</p>  <p>plcnextstore.com</p>	<p>Ask a question in the forum</p>  <p>phoe.co/PLCnextForum</p>	<p>Watch and learn with tutorials</p>  <p>phoe.co/PLCnextTutorials</p>
<p>Use or share open source code</p>  <p>github.com/plcnext</p>	<p>Share your experiences on Instagram</p>  <p>@plcnext</p>	<p>Get in touch on LinkedIn</p>  <p>phoe.co/PLCnextLinkedIn</p>	<p>#PLCnext #IamPLCnext</p>



PLCnext Community

Join and get involved
[#IamPLCnext](#)

Join and get involved

PLCnext Community

PLCnext Technology 
Designed by PHOENIX CONTACT

More about PLCnext Technology



plcnextcommunity.com

Upload or download apps



plcnextstore.com

Ask a question in the forum



phoe.co/PLCnextForum

Use or share open source code



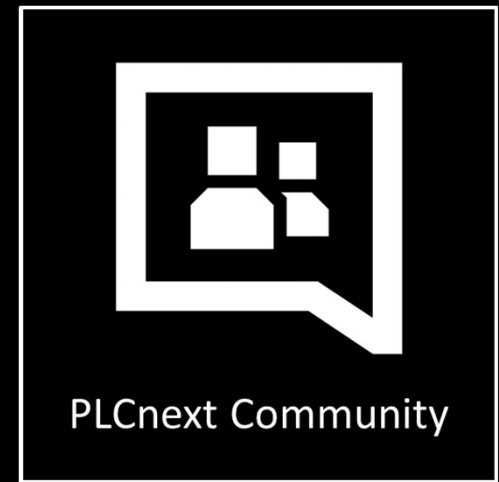
github.com/plcnext

Get in touch on LinkedIn



phoe.co/PLCnextLinkedIn

#PLCnext
#IamPLCnext



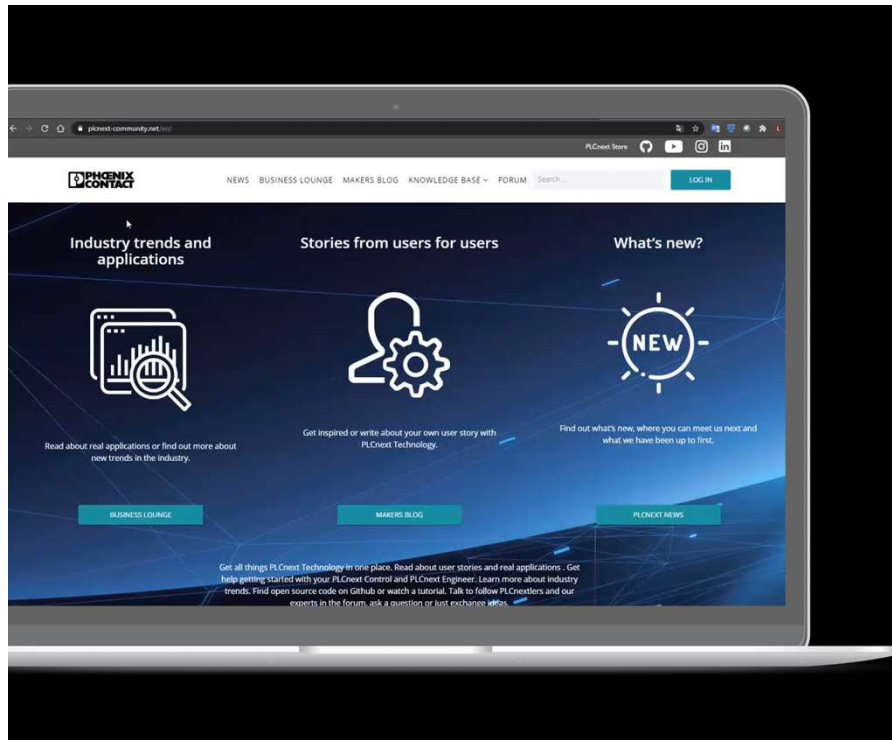
PLCnext Community

Join and get involved
#IamPLCnext

PLCnext Technology

PLCnext Community website

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The PLCnext Community website offers information, support and helpful resources:

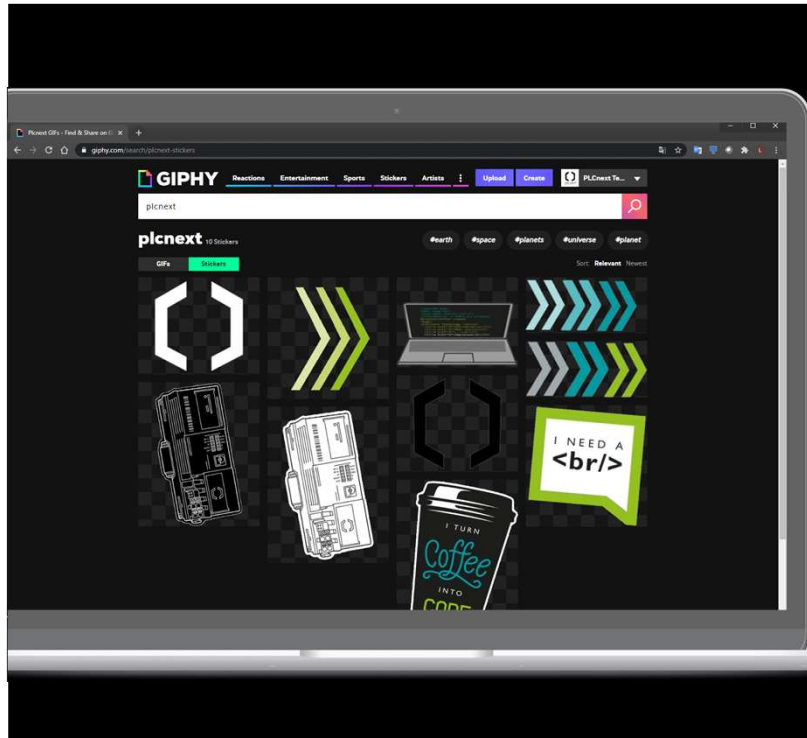
- Forum
- FAQ
- Infocener
- MakersBlog
- Business Lounge

plcnext-community.net

Join and get involved


PLCnext Community

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Use GIPHY Brand Channel

Integration of PLCnext Technology branded Gifs and Stickers eg. On Instagram, Facebook, Snapchat, or Teams

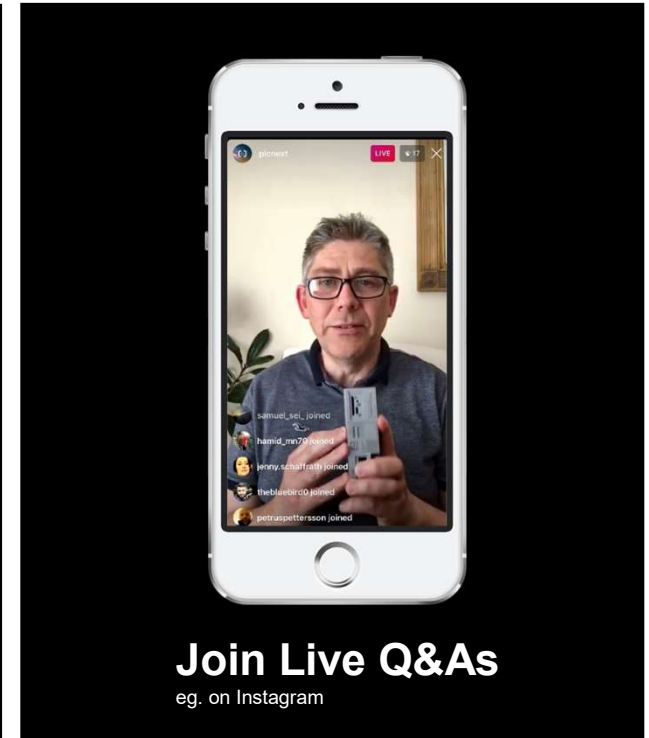


PLCnext Technology IG Story Sticker

HOW TO USE:

1. create a story
2. select GIF
3. type in **plcnext**
4. chose your favorite sticker and have fun

Swipe for a step by step tutorial



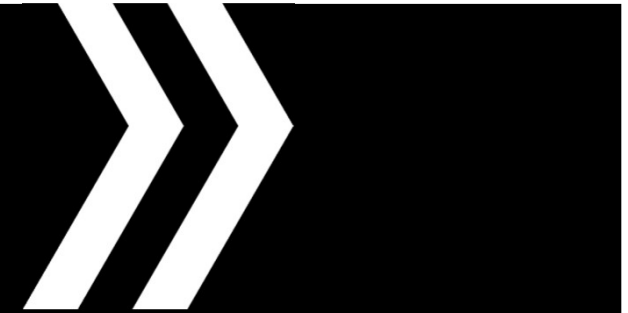
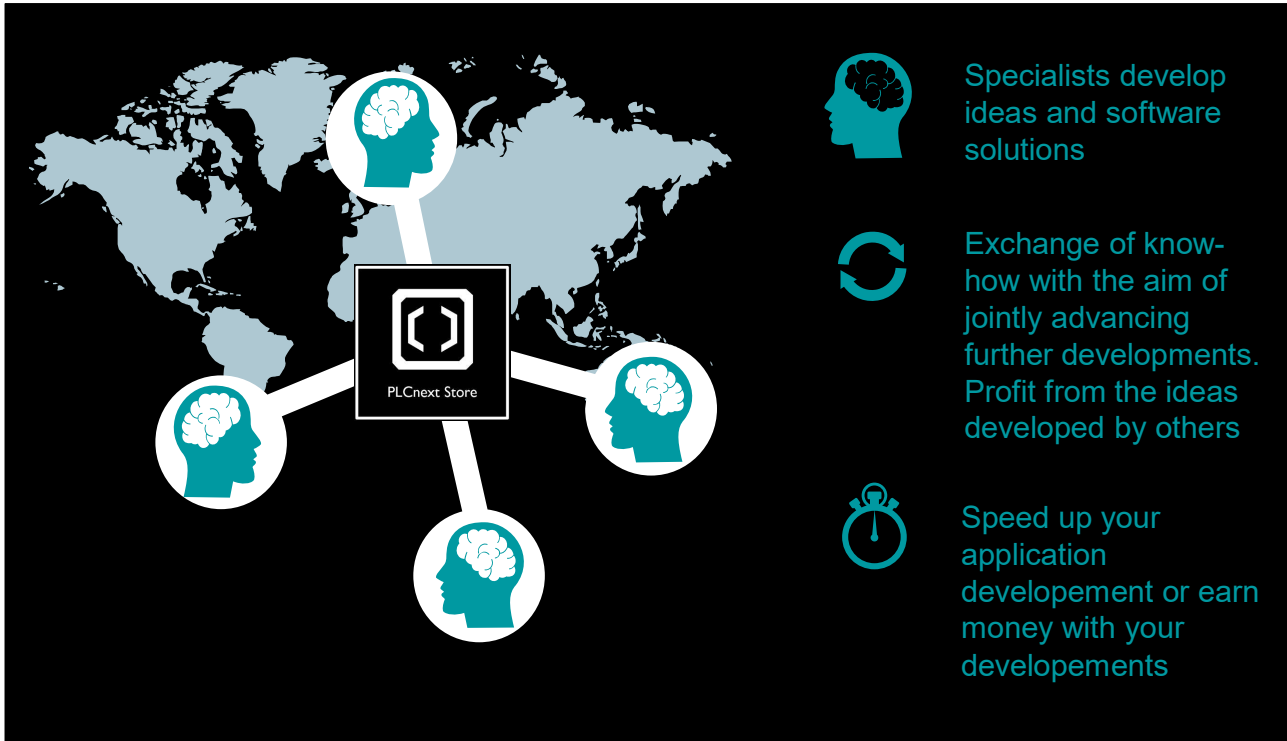
Join Live Q&As

eg. on Instagram

PLCnext Ecosystem – PLCnext Community

Benefit from Crowd Knowledge

PLCnext Technology 
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Market leadership requires speed

We need to make use of Crowd Knowledge

SPS 2019

Made with PLCnext Technology: Demonstration der Use Cases



Collaborating on solutions

Gutshof Rethmar



Combining programming languages

BASF Schwarzheide & TU Dresden



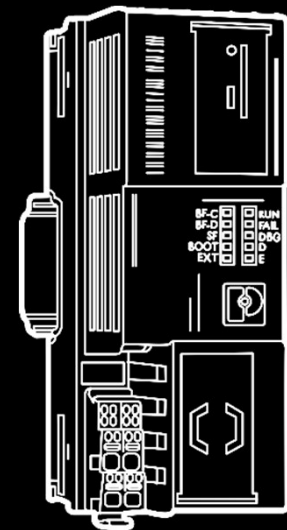
Performing real time

Schweizer Bundesbahnen (SBB)



Upgrading to future technologies

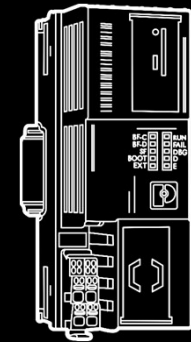
Kraftwerk Huntorf



Made with PLCnext Technology

Craft beer brewery Hanover

PLCnext Technology ¹²
Designed by PHOENIX CONTACT



- » Fast porting
- » Modular expandability
- » Creative Community

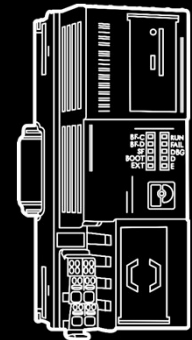
Made with PLCnext Technology

TU Dresden und BASF

PLCnext Technology ¹²
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Combining programming languages

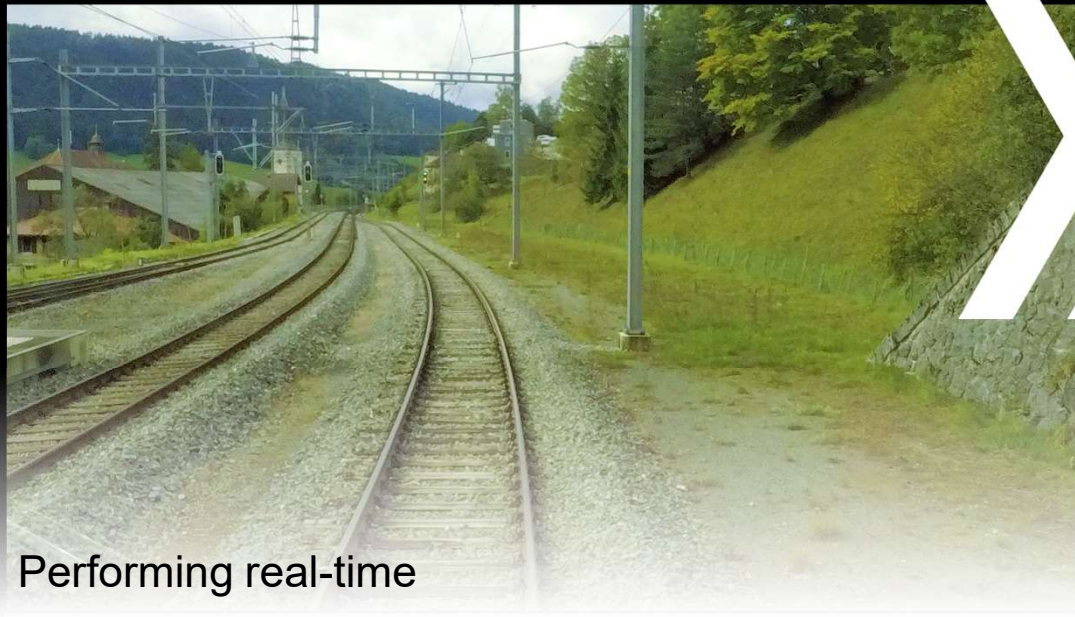


- » High level language integration
- » Integration of Matlab Simulink models
- » NOA compliant solution

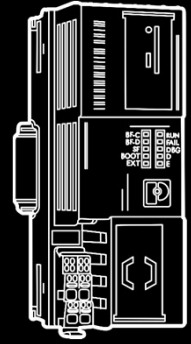
Made with PLCnext Technology

Schweizerische Bundesbahnen

PLCnext Technology ¹²
Designed by PHOENIX CONTACT



Performing real-time

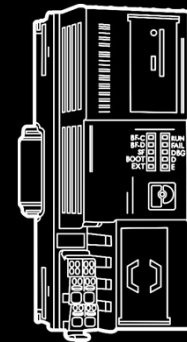


- » Real-time performance
- » Cloud connection
- » Connection to existing IT infrastructures

Made with PLCnext Technology

Power station Huntendorf

PLCnext Technology ¹²
Designed by PHOENIX CONTACT



- » Extension of existing plants
- » Data security
- » Futureproof

What else is worth mentioning ...

Visitors can experience PLCnext: We live and think digitalization

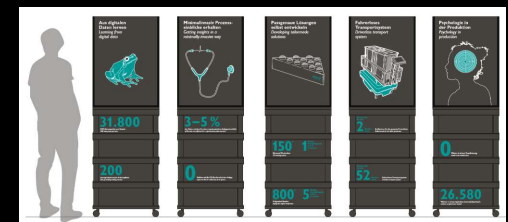
PLCnext Factory –
 PLCnext Technology becomes a tangible experience

VISION:

In a rapidly changing world, we have to rethink our production processes every day. Digitalization is the key to this. Every day, we move borders, are flexible and open to new ways of working together. So are our products.



Tour for visitors with 5 stations on digitization topics



PLCnext Technology™

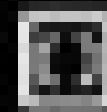
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PLCnext Control



PLCnext Engineer



PLCnext Edge



PLCnext Technology

Ecosystem for limitless automation
PHOENIX CONTACT