

Welcome

Inteligencia Artificial

Producto AXC F XT ML 1000

Ing. Antonio Gordillo / Infraestructura y Sistemas de Automatización / 7 SEP 2021

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INSPIRING INNOVATIONS



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PLCnext Technology Ecosystem

PLCnext Technology



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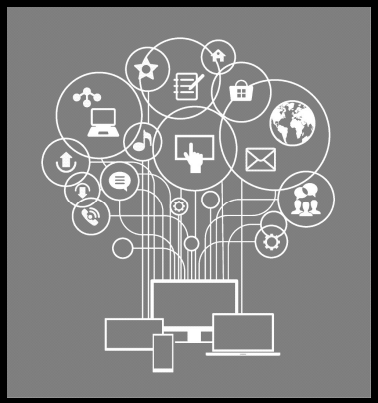
PLCnext Technology Ecosystem

Motivation



INDUSTRIAL
INTERNET
OF THINGS





Our solution for a
rapidly changing world

PLCnext Technology
Designed by PHOENIX CONTACT

The open ecosystem for
limitless automation

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PLCnext Control



PLCnext Engineer



PLCnext Store



PLCnext Community

Open Control Platform

Devices in various performance classes including PLCnext Runtime System and accessories

Engineering Software

Engineering tool for commissioning, configuring and programming PLCnext Control

Software Store

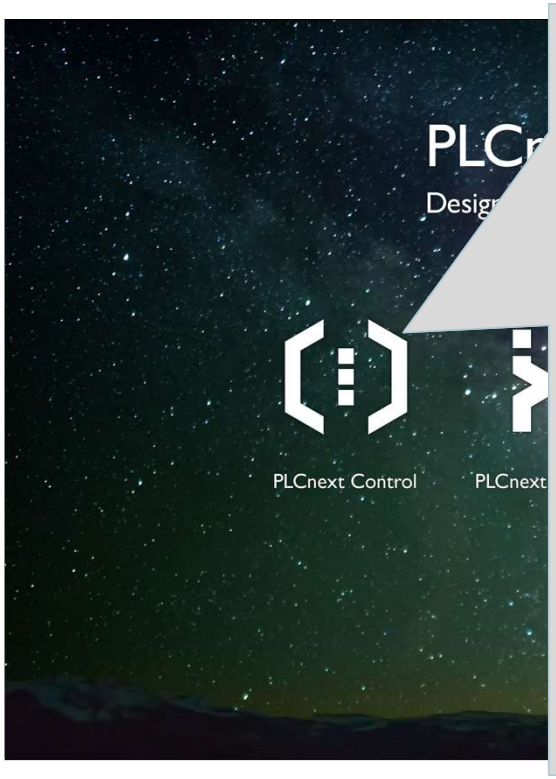
Apps for functional extension of PLCnext Control and PLCnext Engineer

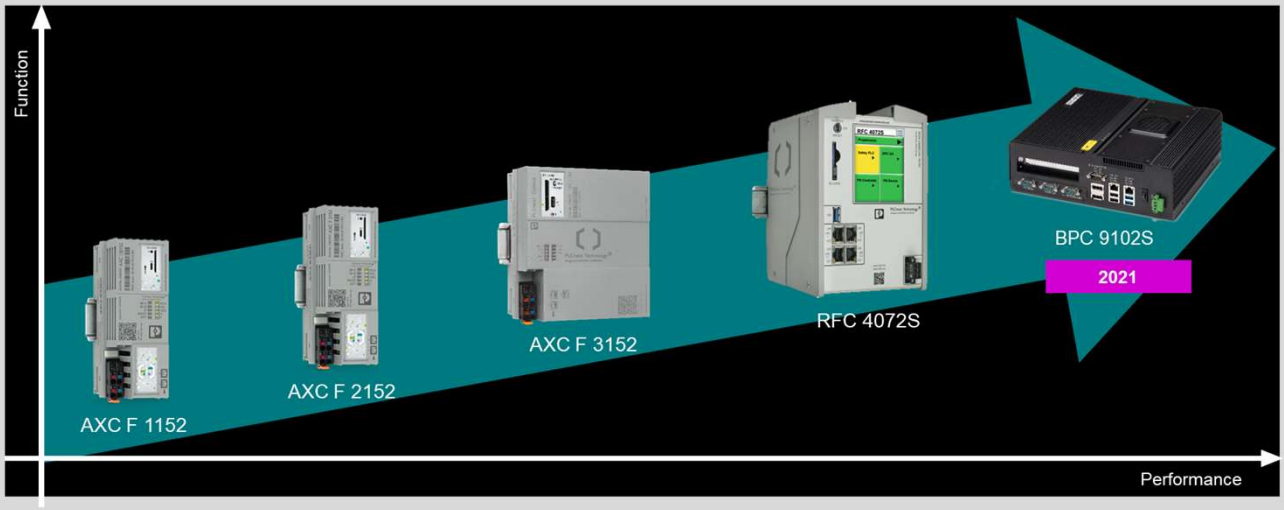
Collaboration & Resources

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

PLCnext Ecosystem

PLCnext Technology





Open Control Platform

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

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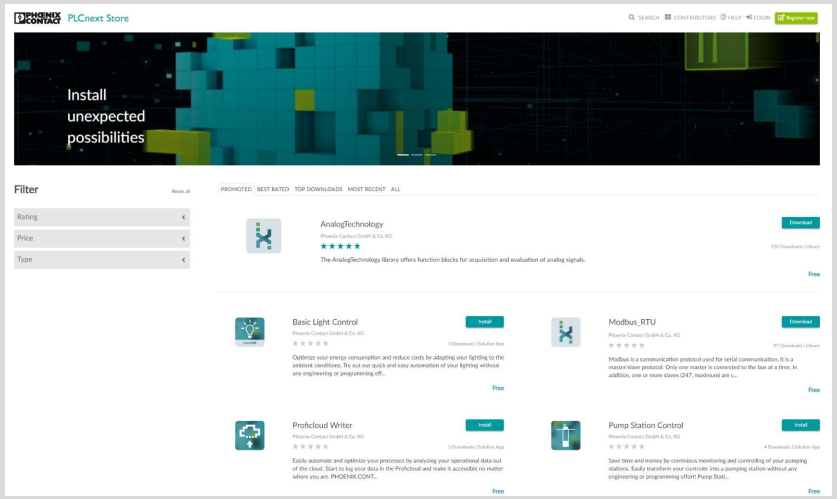
PLCnext Ecosystem

PLCnext Technology





Software Store for Automation

Apps for functional extension of
PLCnext Control and PLCnext Engineer

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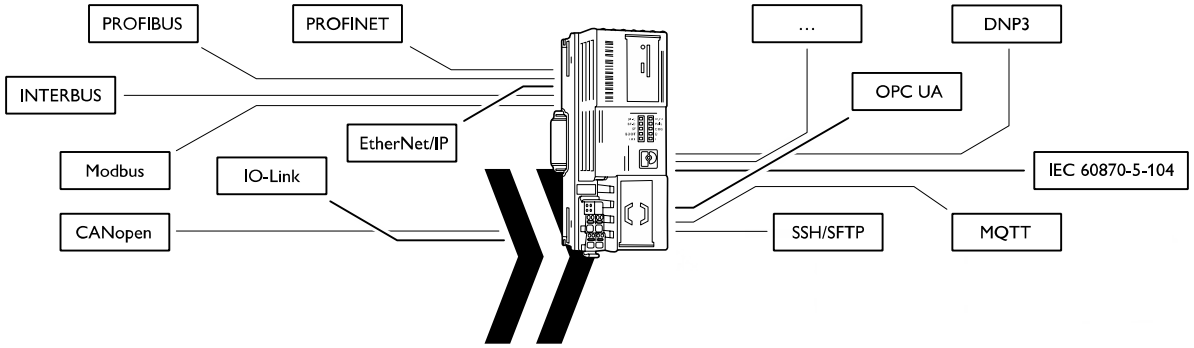
Future-proof Connectivity



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

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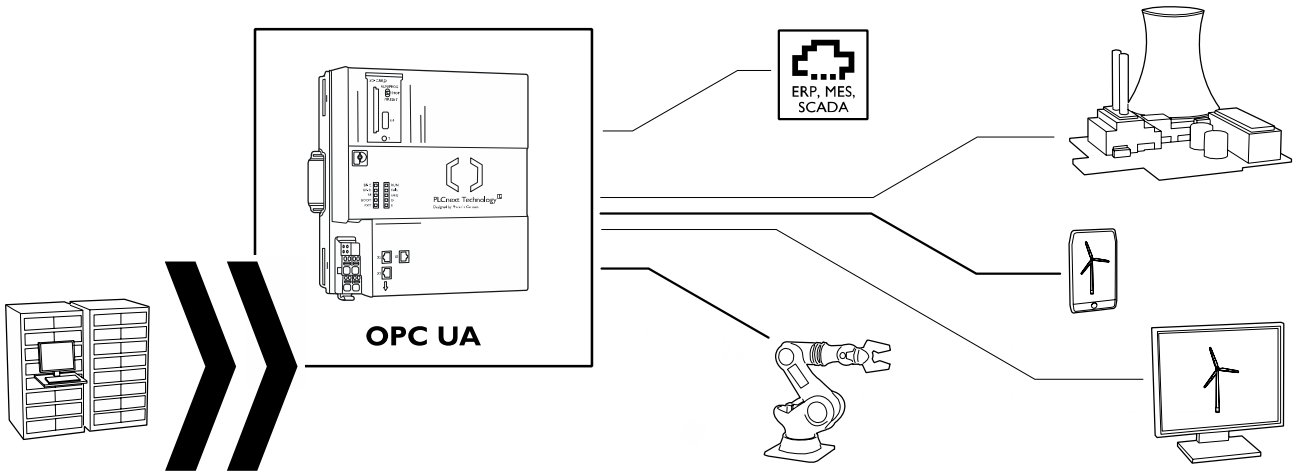
Integrated OPC UA Server



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

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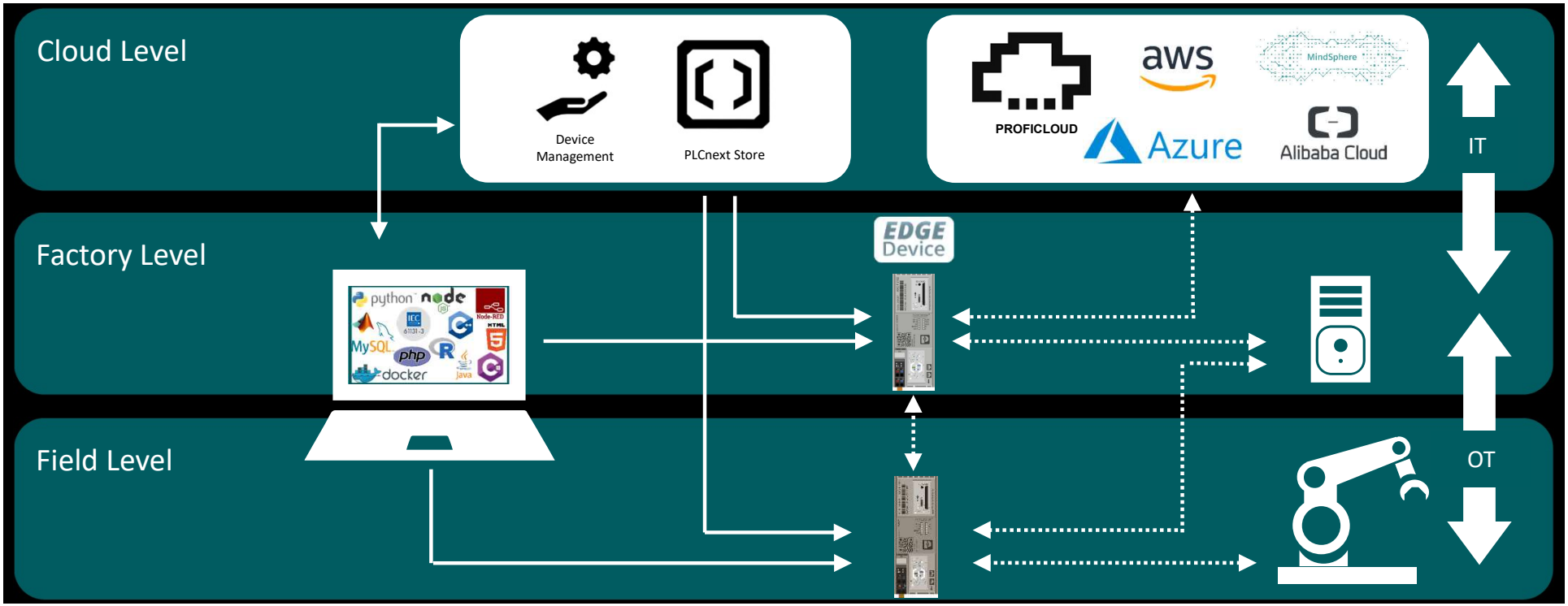
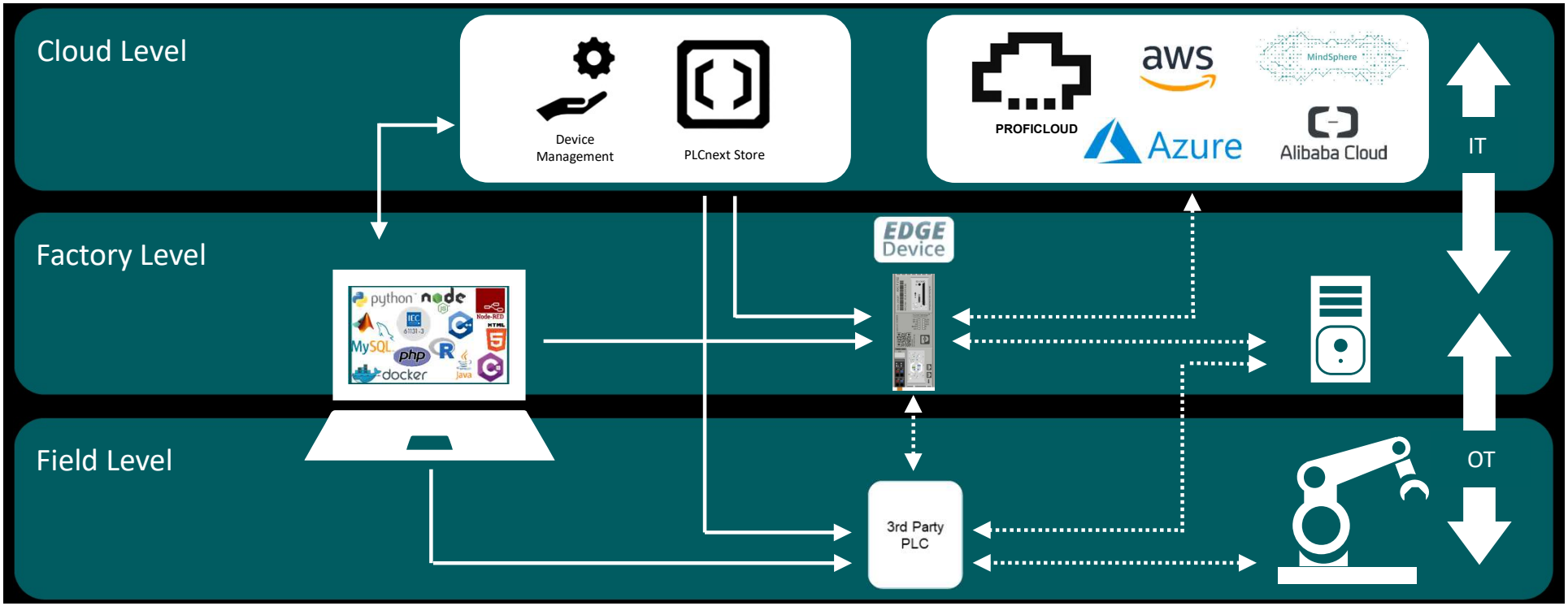
enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as PLC and Edge Device



enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as Edge Device



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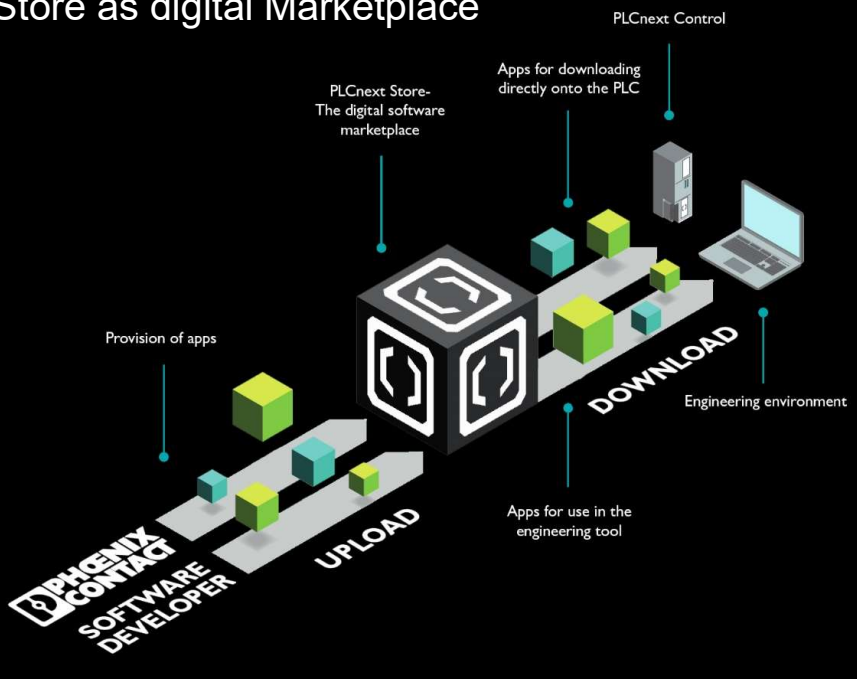
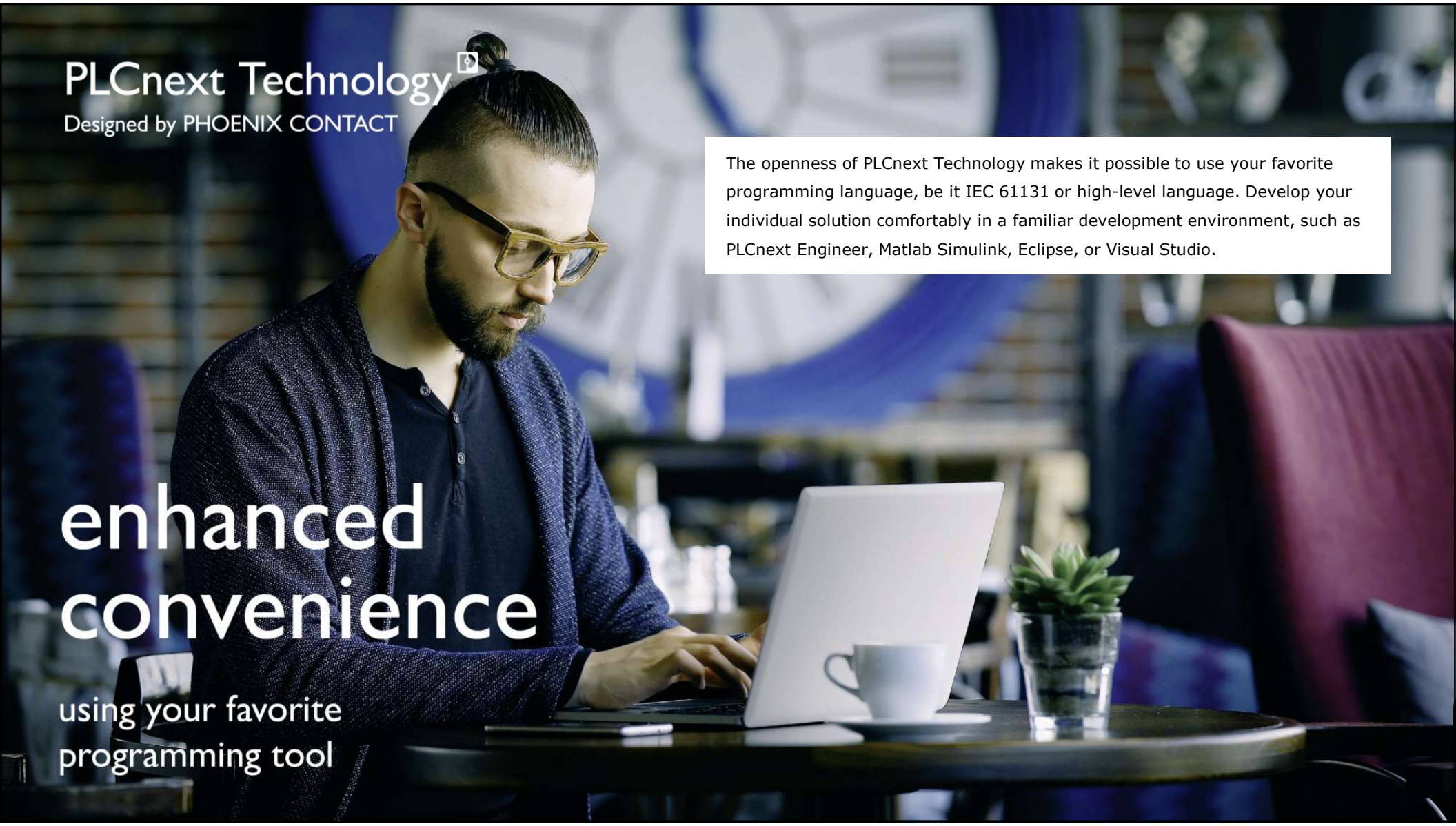
enhanced freedom

Limitless Adaption Capability

PLCnext Store as digital Marketplace



Open-Source Software



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.



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enhanced convenience

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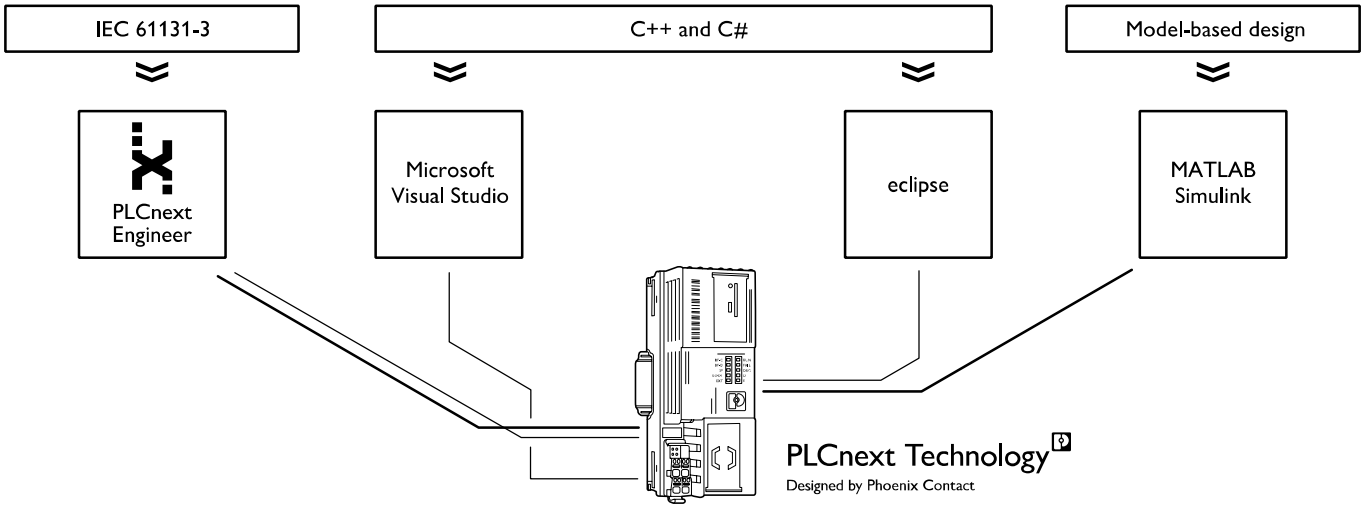
Engineering and Application Development



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.

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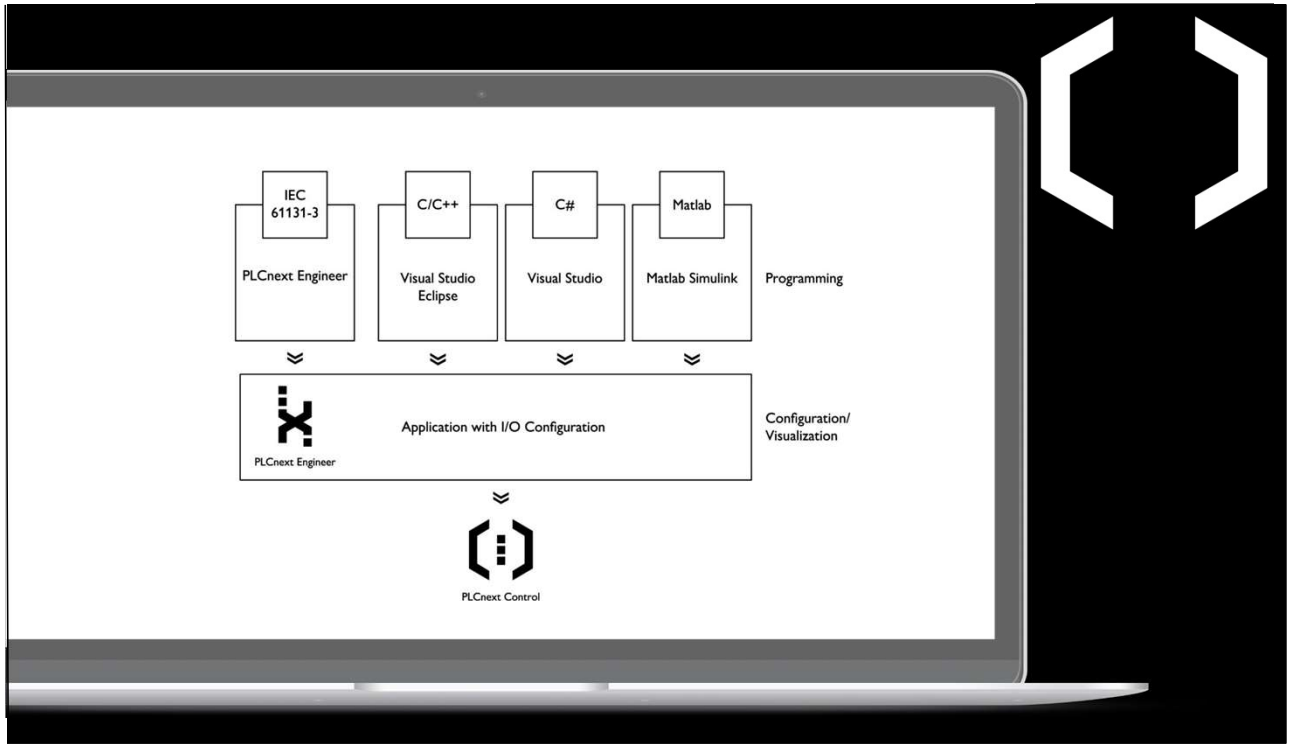
PLCnext Engineer





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enhanced development

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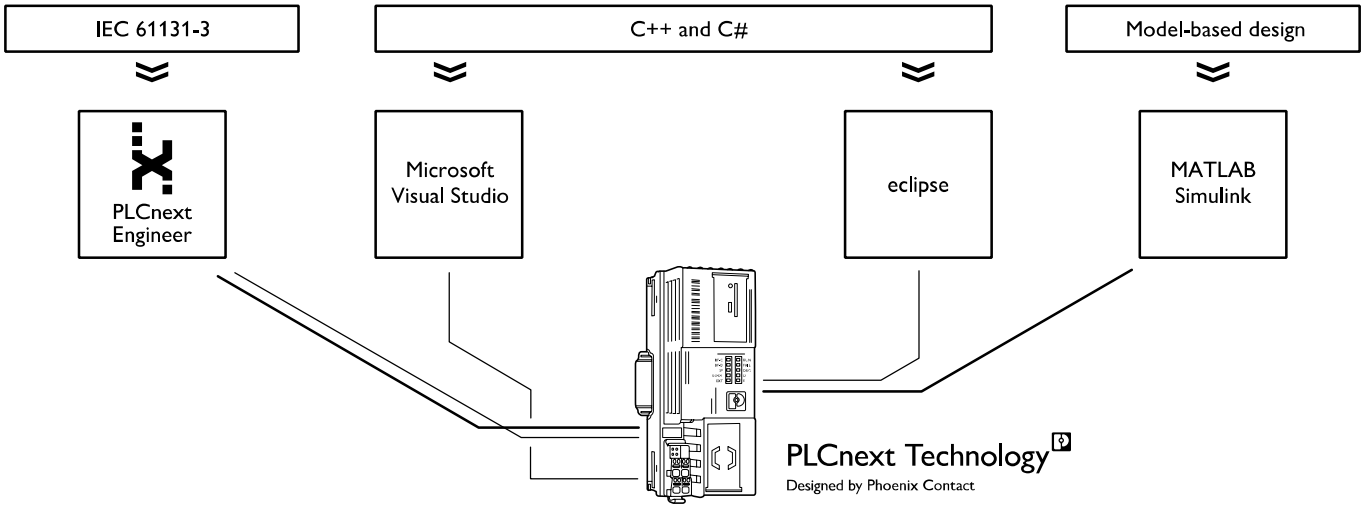
Engineering and Application Development



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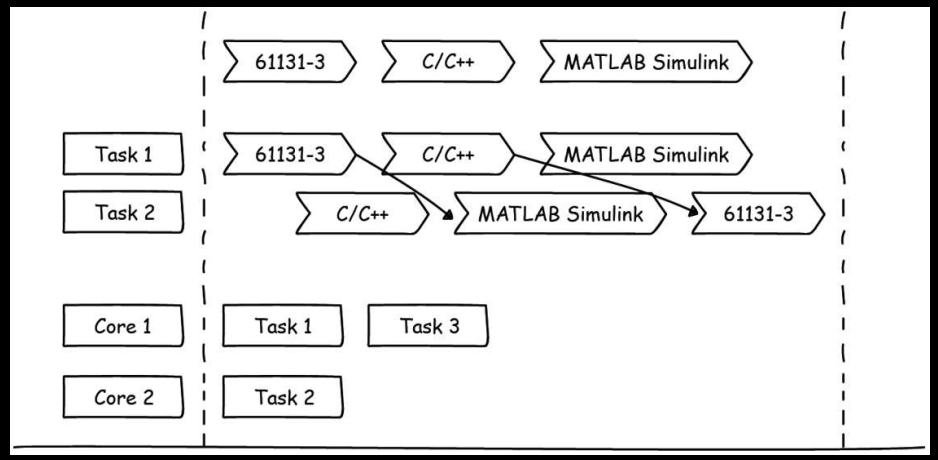
enhanced performance – PLC-typical Real-time Performance

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.

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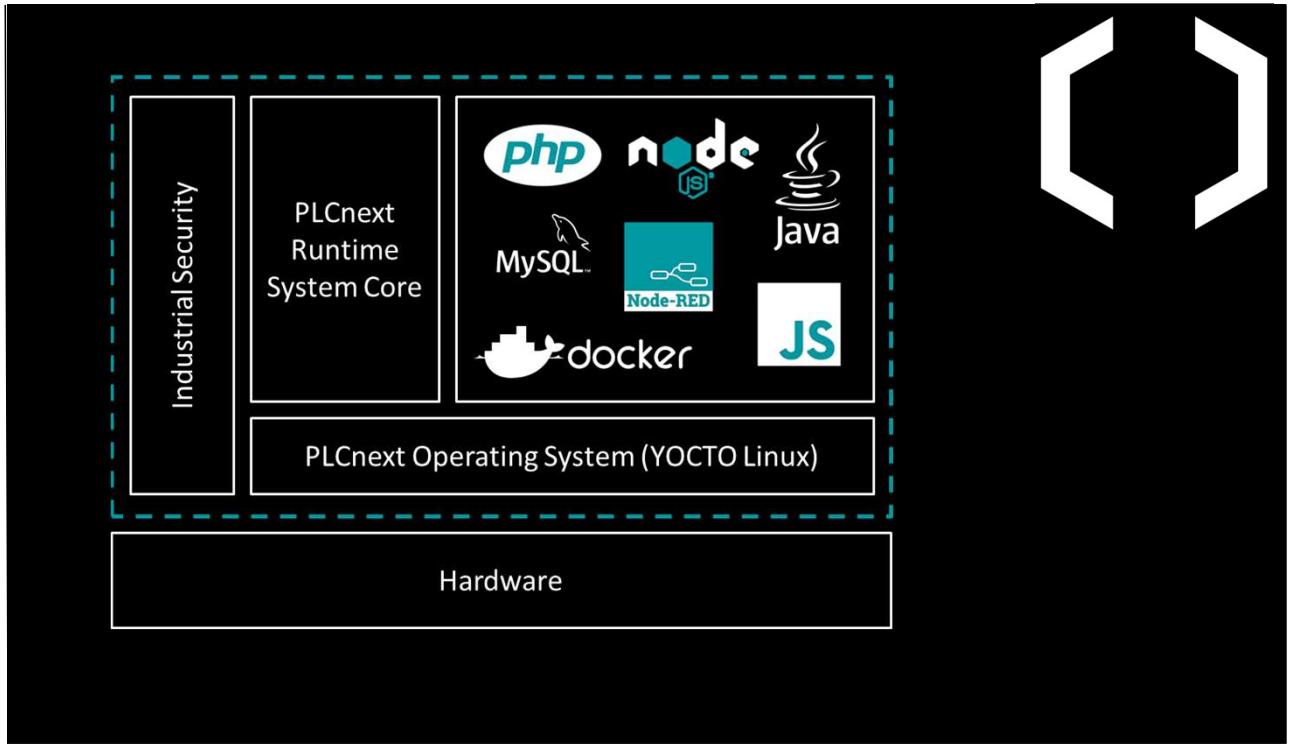
PLCnext Runtime System



- 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

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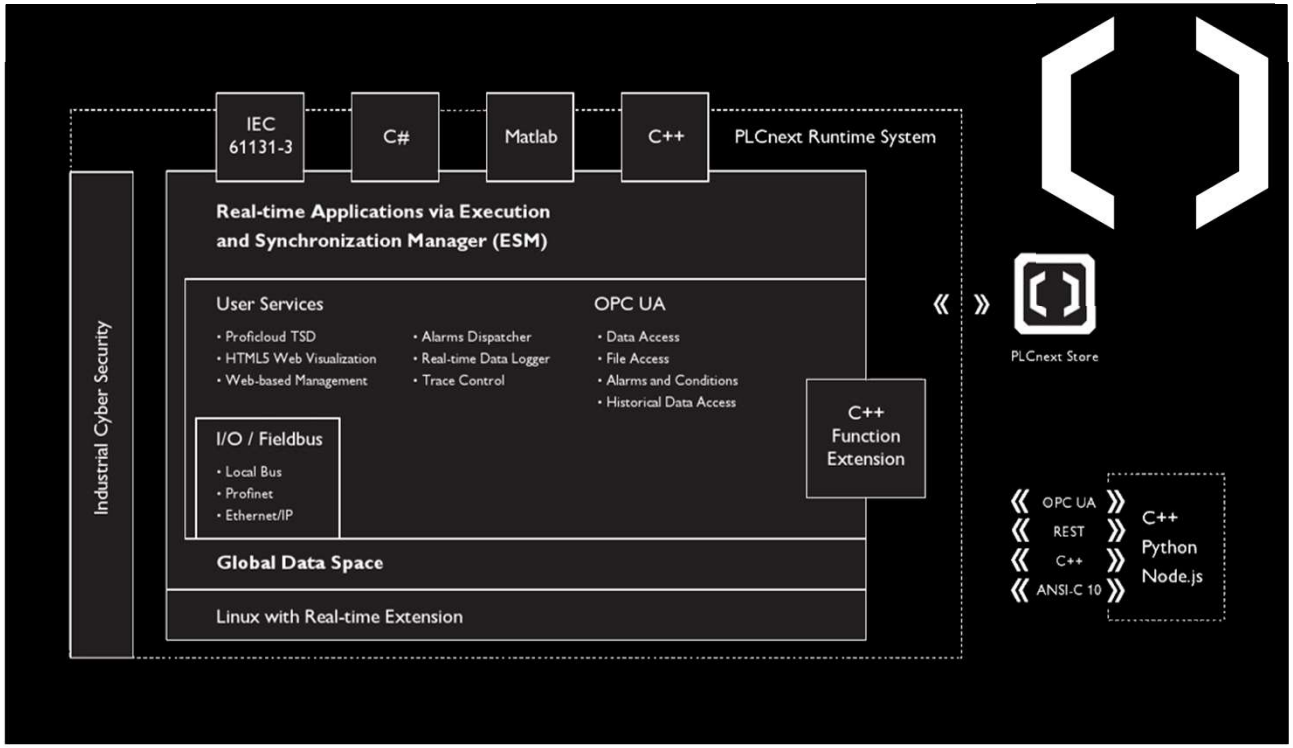
PLCnext Runtime System Architecture



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PLCnext Runtime System Architecture

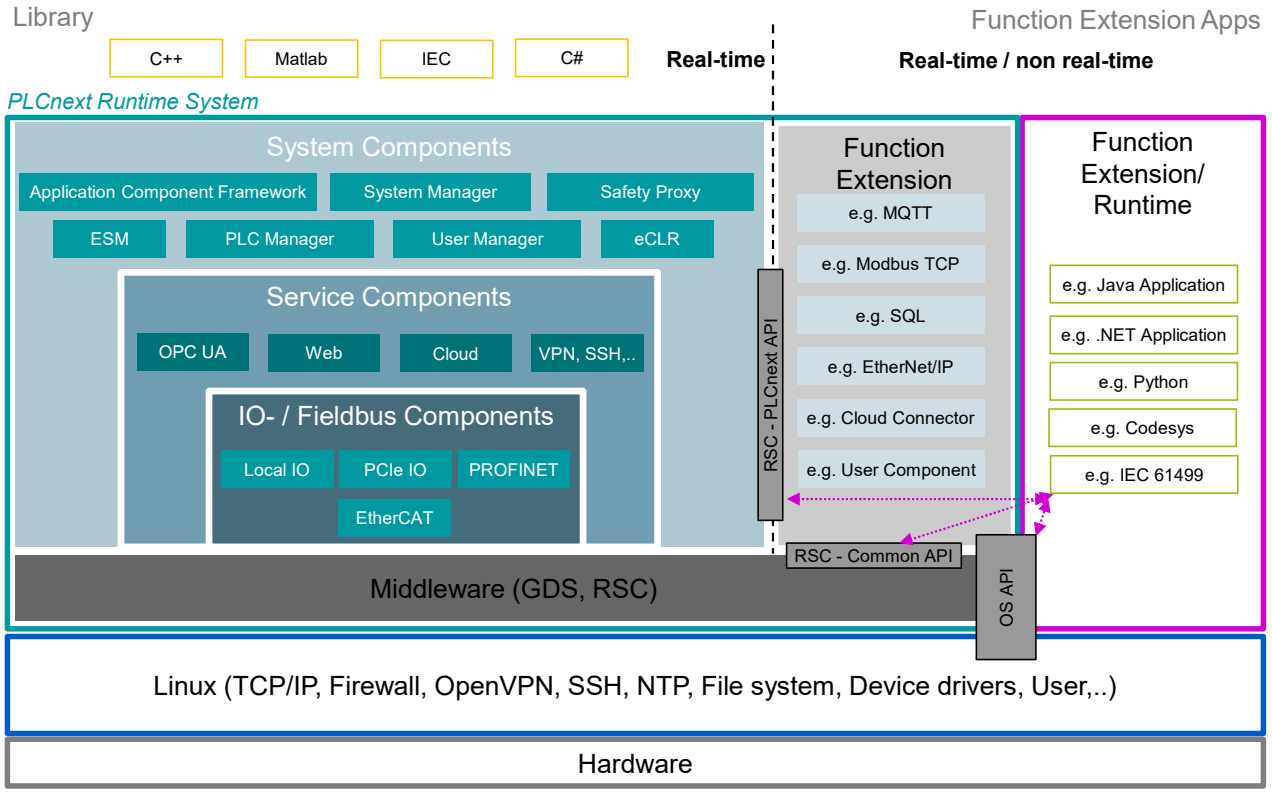
PLCnext Runtime System Core Components

System Components	Service Components

• Execution and Synchronization Manager (ESM)
• System Manager
• PLC Manager
• Device Interface
• User Manager
• Diagnostic Logger
• eCLR
• Application Component Framework
• Safety Proxy
• Event Manager
• …
	• OPC UA Server
	• PROFICLOUD Gateway
	• Web-based Management
	• PLCnext Engineer HMI
	• Data logger
	• Device HMI
	• Accessible via OS
	  • DHCP, DCP
	  • SFTP,VPN
	  • SSH, NTP
	  • Trace Controller

IO Components	**Middleware**

• Fieldbus Manager
  • PROFINET Controller
  • PROFINET Device
  • Axioline
  • …
	• Global Data Space (GDS)
	• Remote Service Calls (RSC)
	• Commons Layer (Common Classes)



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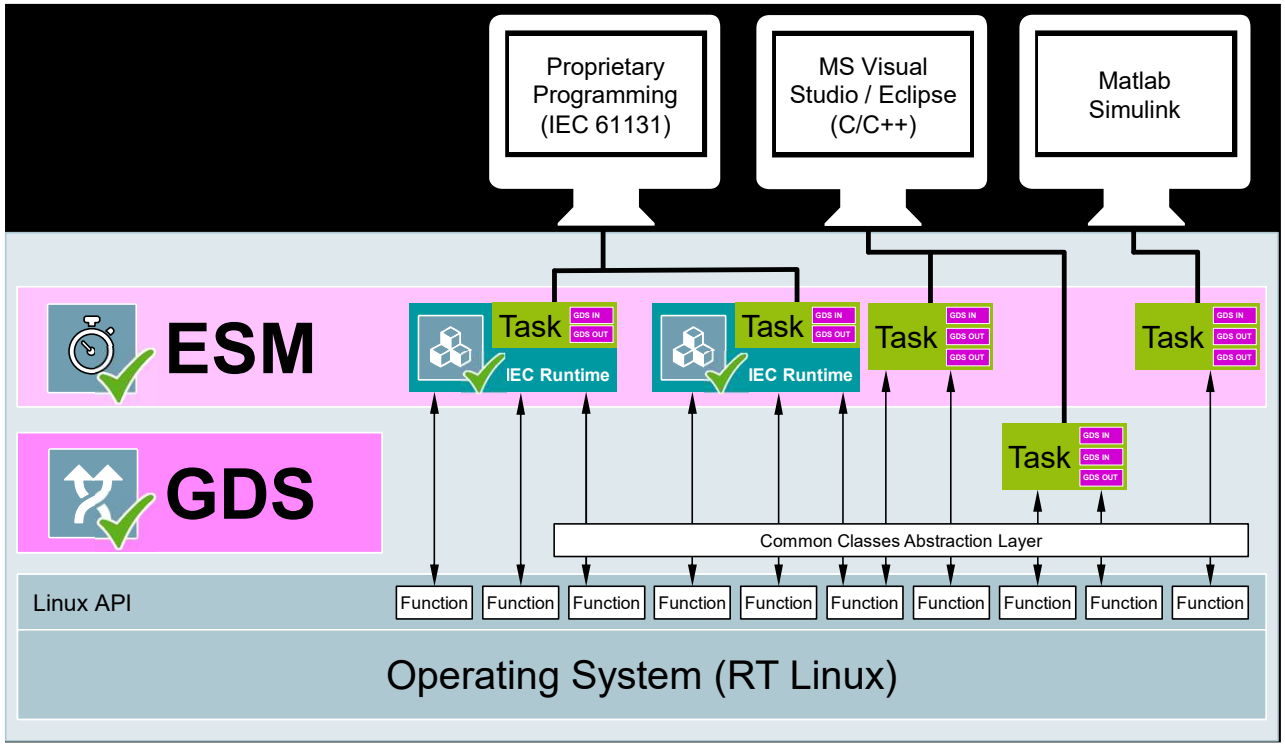
D: PLCnext Technology Architecture Advantages – Summary



- 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

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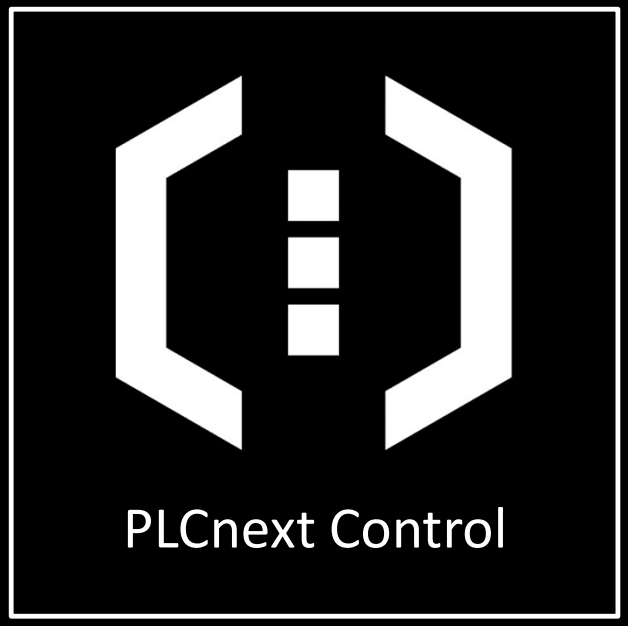
Open control platform for flexible automation



Discover flexible
automation

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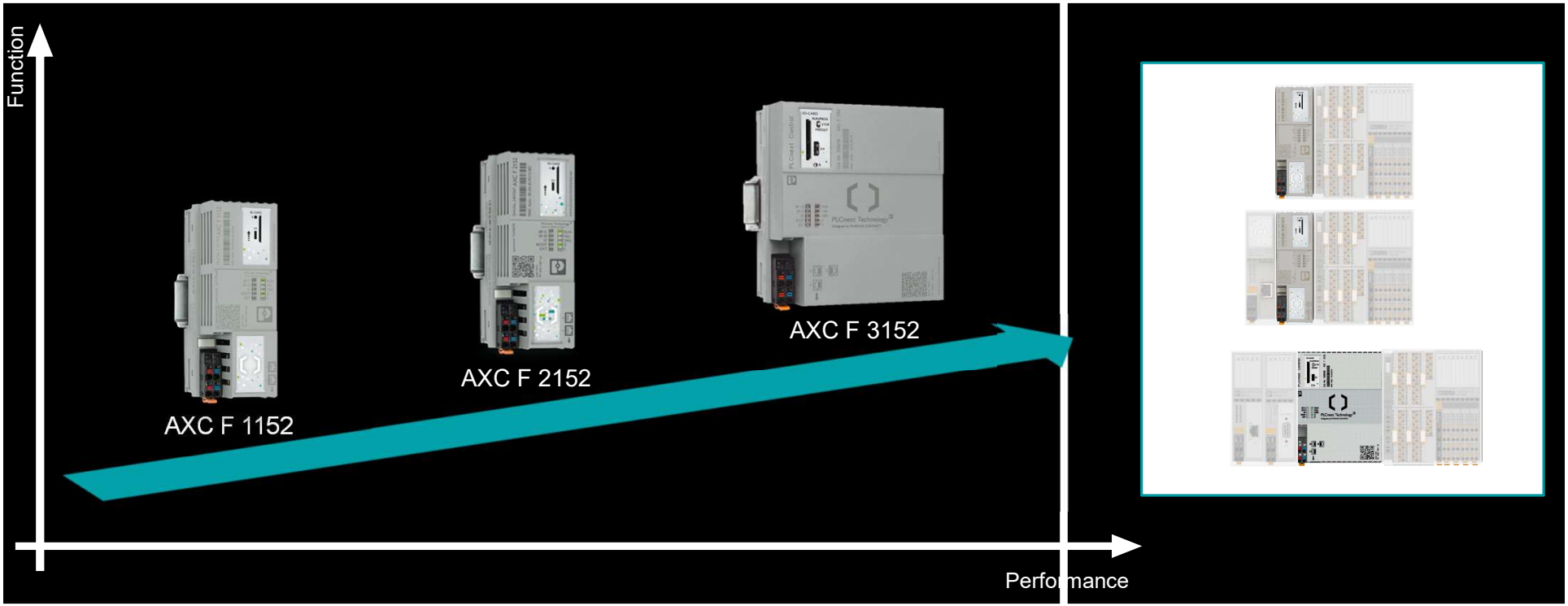
PLCnext Control for flexible automation with modular hardware platform



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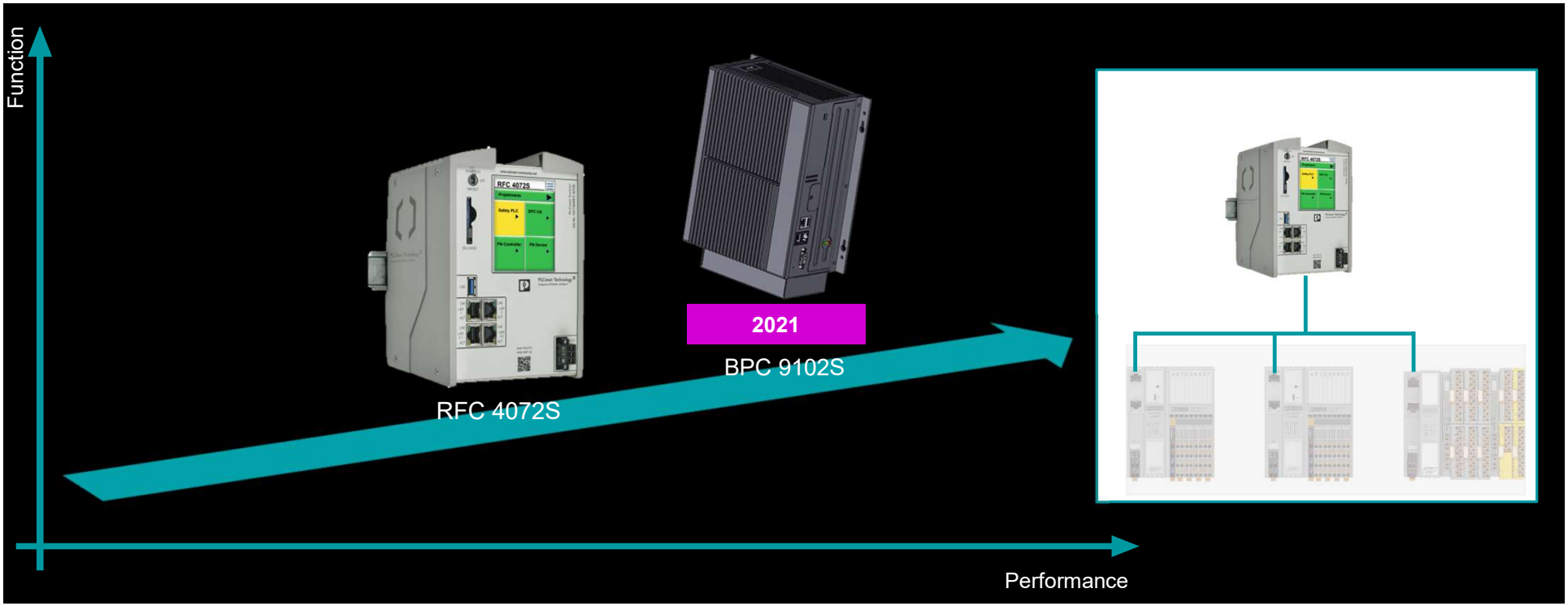
PLCnext Control for centralized applications with decentralized IOs



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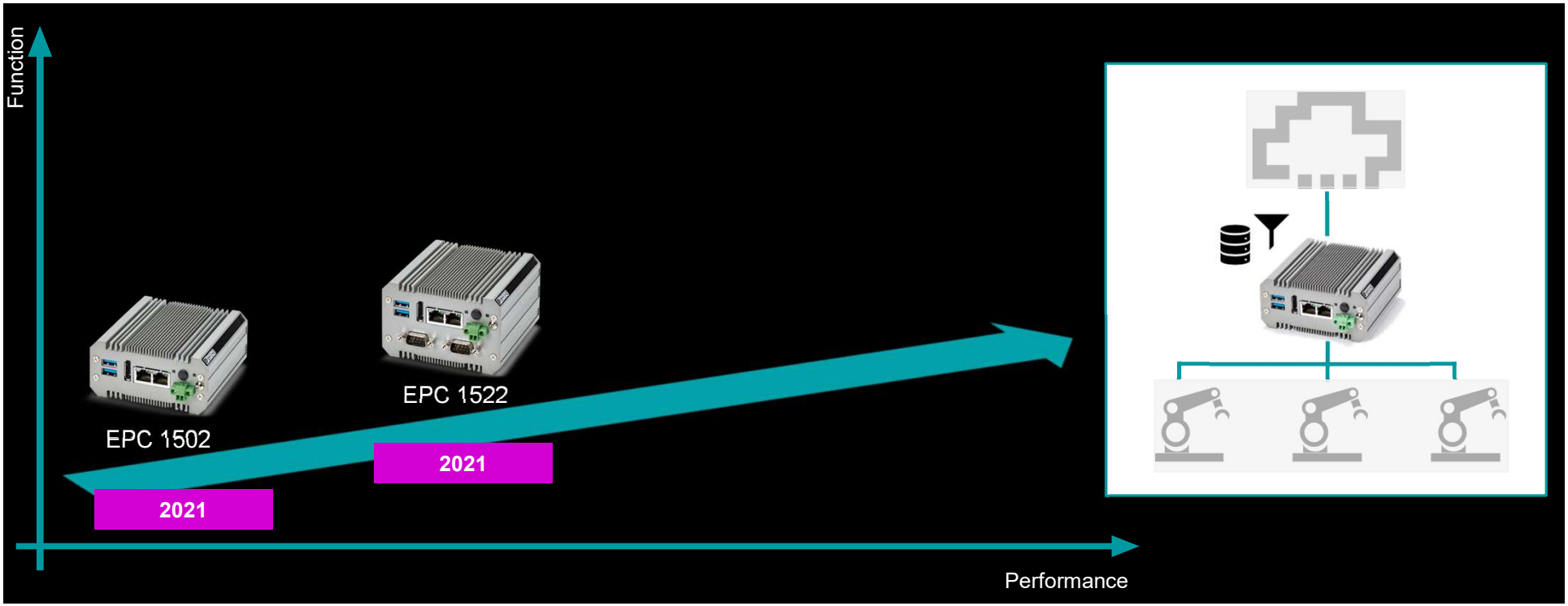
PLCnext Control for Edge Computing



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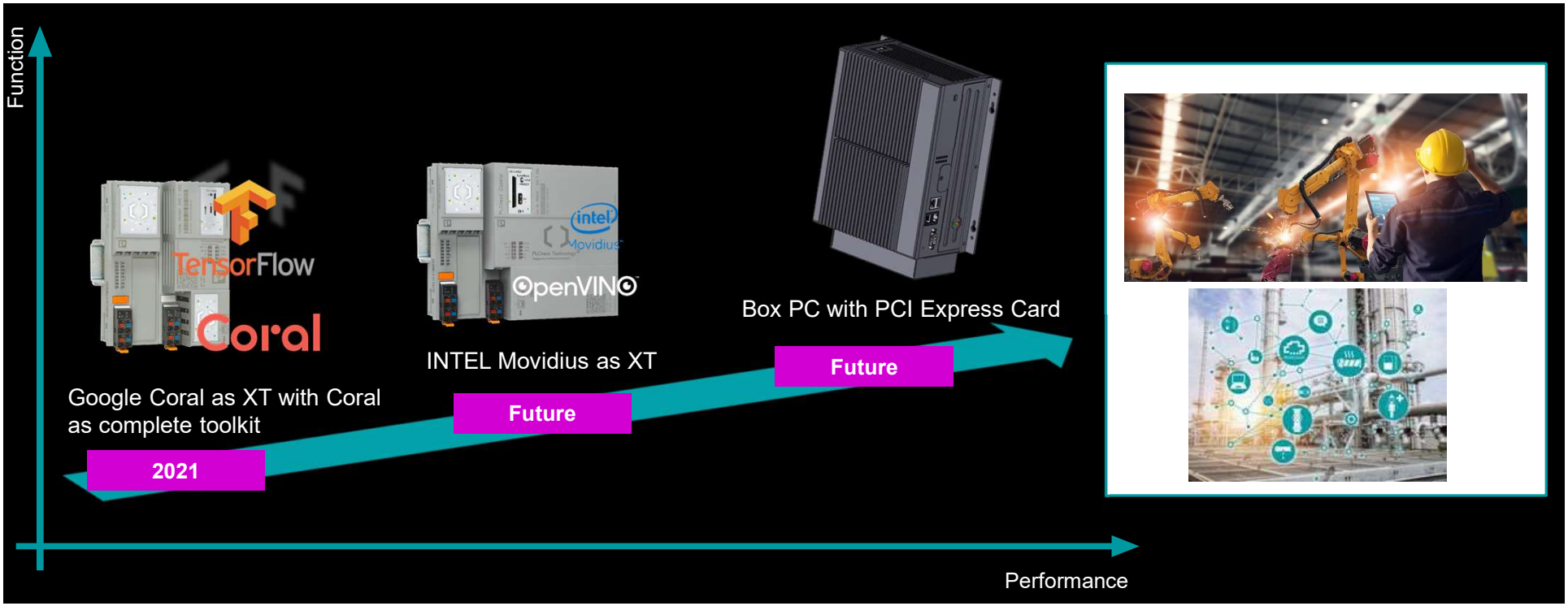
PLCnext Control for intelligent applications with Artificial Intelligence



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Coral: Expanding the edge AI landscape | Session

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PLCnext Controls Performance Benchmark



RFC 4072S

4362

Intel i5 – 6300U dual core



AXC F 3152

811

Intel E3930 1,3GHz dual core
Basic list price ~ 1599 EUR

~ 2.7 times faster than AXC F 2152



AXC F 2152

300

Cyclone 5 Cortex-A9 800 MHz dual core (Comparable with AXC 3050)
Basic list price 599 EUR



AXC F 1152

150

Cyclone 5 Cortex-A9 800 MHz single core (Comparable with ILC 390)
Basic list price 399 EUR

Confidential

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PLCnext Control AXC F 2152



Core	Working memory	Temperature
ARM Cortex-A9 (2x 800 MHz)	512 Mbytes RAM	-25°C-60°C

# control tasks (IEC 61131)	Min. cycle time (IEC 61131)	Security
32	1 ms	TPM integrated

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PLCnext Control AXC F 3152



Core	Working memory	Temperature
Intel ATOM x5-E3930 dual-core	2 GB DDR4 dual-channel RAM	-25°C-60°C

# control tasks (IEC 61131)	Min. cycle time (IEC 61131)	Security
32	500 µs	TPM integrated

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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



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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, …



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PLCnext Control

PLCnext Control RFC 4072S



Core

Intel i5 6300U 2 x 2,4 GHz processor

Working memory

4 GB DDR 4 dual channel RAM

Temperature

0°C up to 55°C with fan

control tasks (IEC 61131)

32

Min. cycle time (IEC 61131)

500 µs

Security

TPM integrated

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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 Control BPC 9102S



Core

Intel i7 CPU
8 cores

Random access memory

2GB RAM (min),
int. UPS

Temperature

-20°C-60°C

Storage

Removable
mass storage

Connections

2x RJ45,
1x TSN, 1x USB

PCIe

Safety board,
AI acceleration

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PLCnext Control BPC 9102S

- CPU: i7-10700TE (10th Gen 8-Core)
- RAM: 16GB
- Interfaces:
- 3 separate and independent Ethernet interfaces with 1 RJ45 port each
  - LAN1: PN Controller (I225), 1GBit
  - LAN2: PN Device (I225), 1GBit
  - LAN3: RAW user ethernet communication (I225), 1GBit
- 1 Serial Interface RS232
- 1 USB for FW/SW Update
- Reset button and power switch
- SD Card
- Internal Super-cap UPS module
- Fan (only on between 50-60°C) to expand MTBF



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Countless possibilities in hardware variance

PLCnext Control

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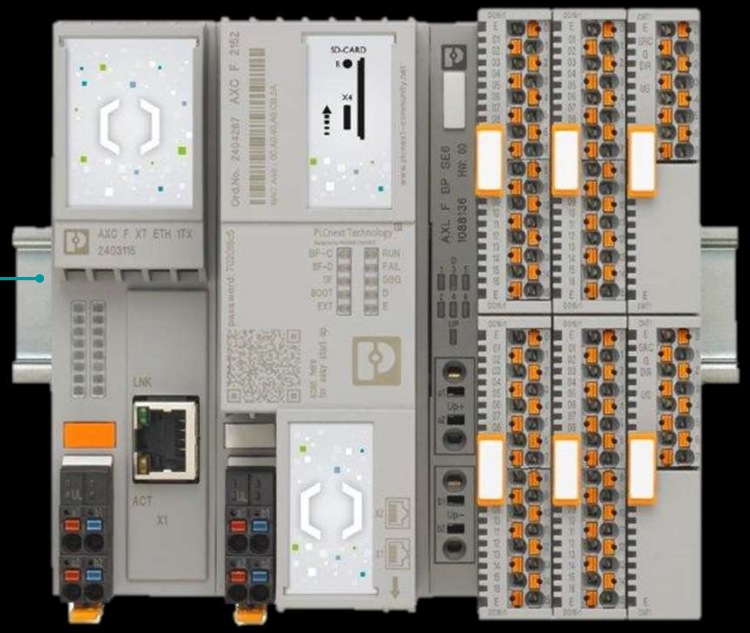
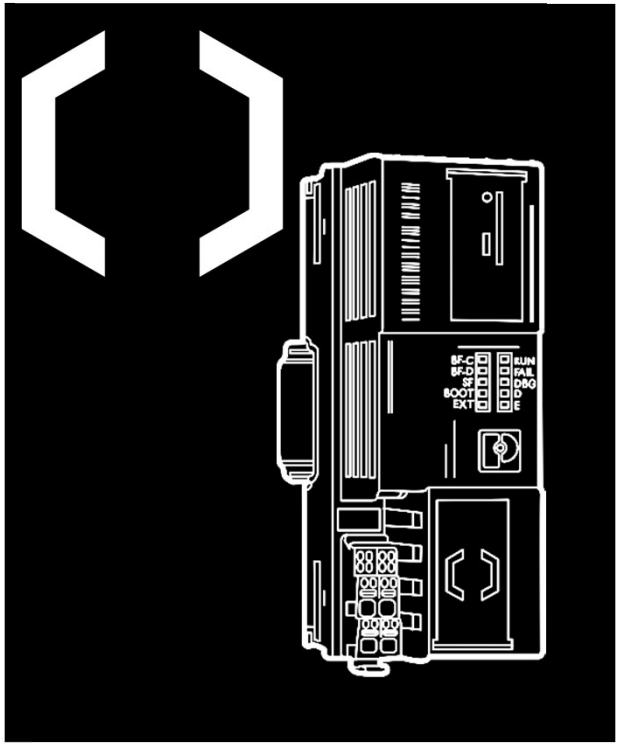
new

PLCnext Control Extension

Control functionality can be easily extended with left-handed modules





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PLCnext Ecosystem – PLCnext Control

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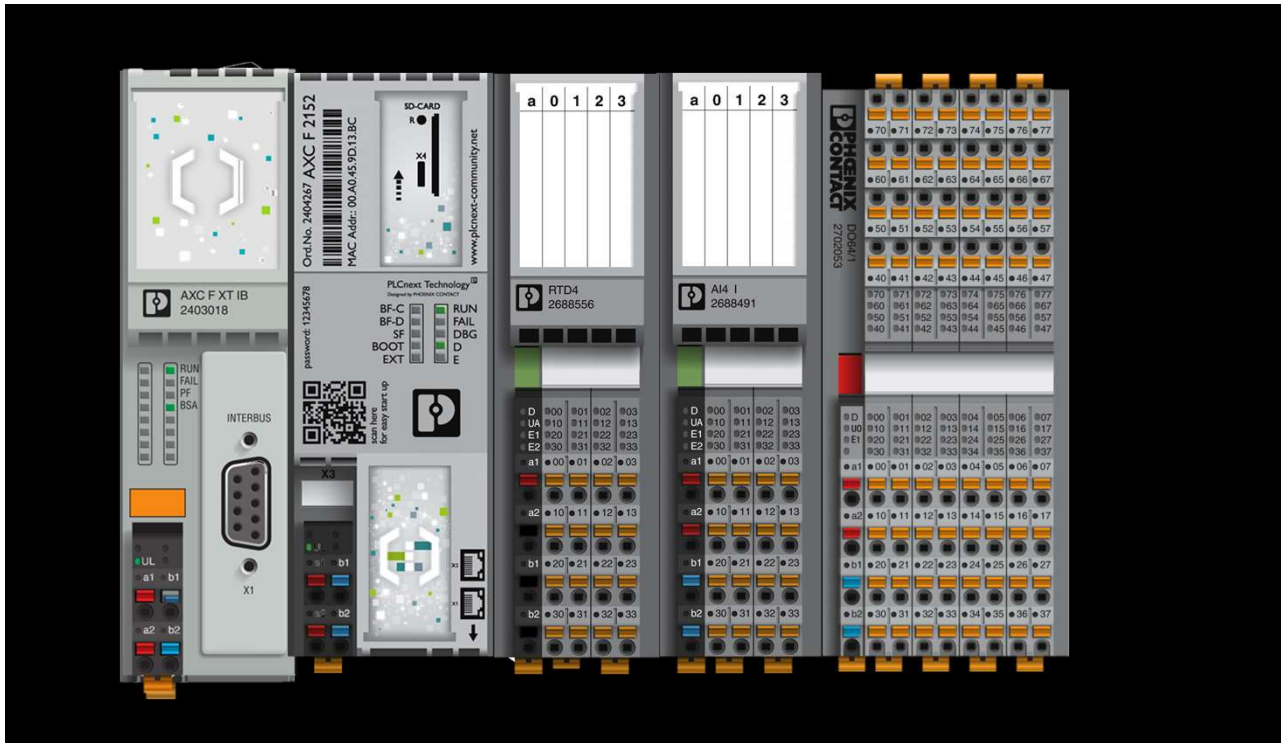
Left-hand side extension possibilities



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

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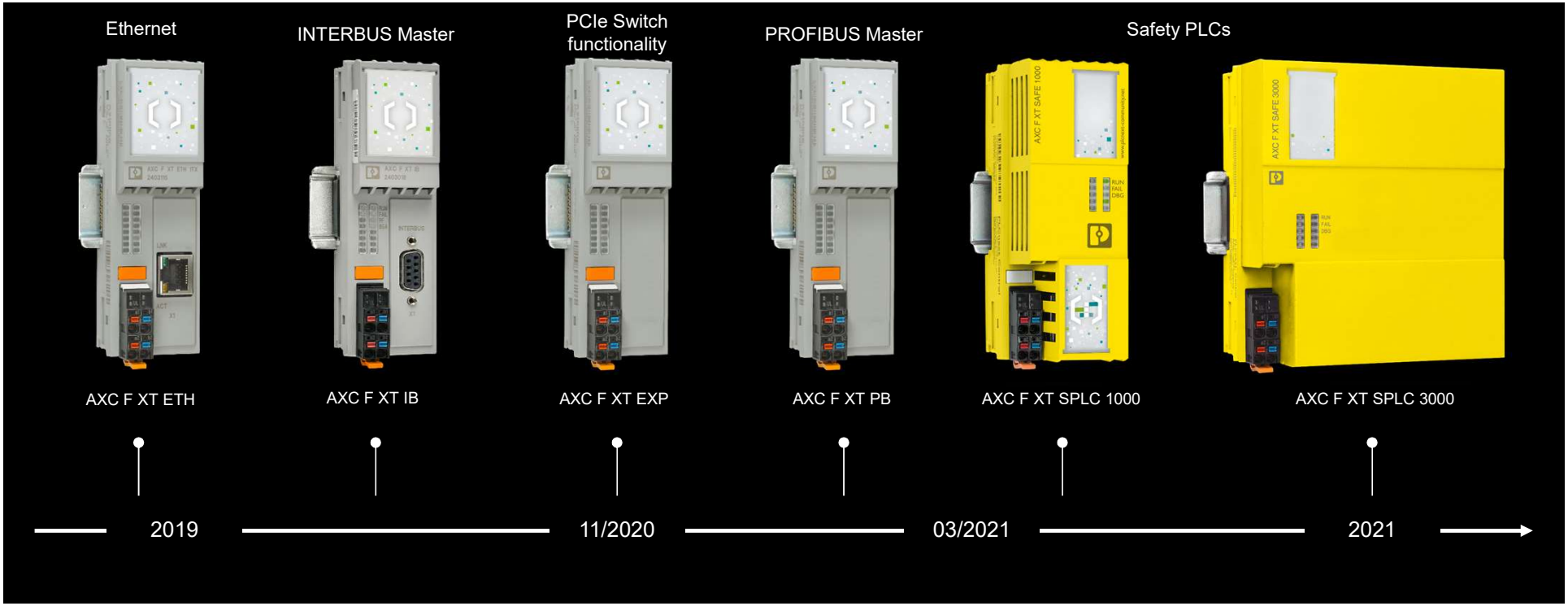
Portfolio PLCnext Control Extensions



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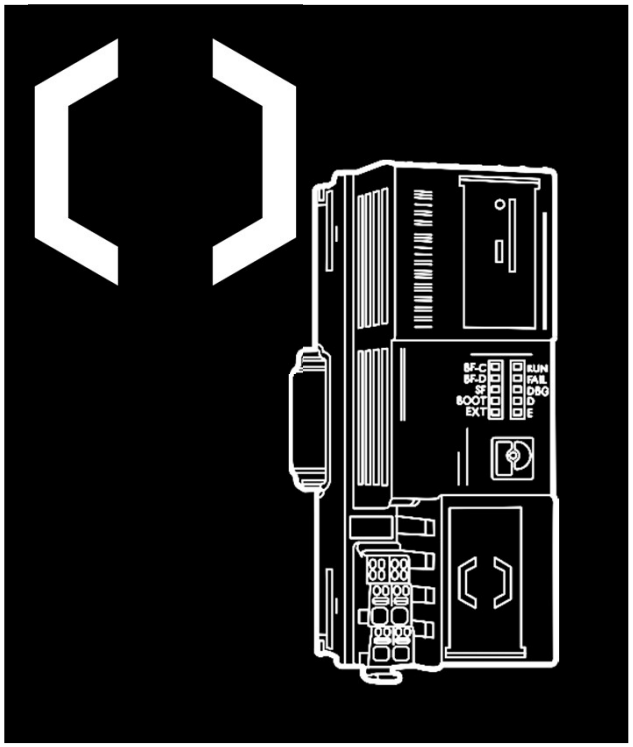
PLCnext Extension AXC F XT IB



- 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



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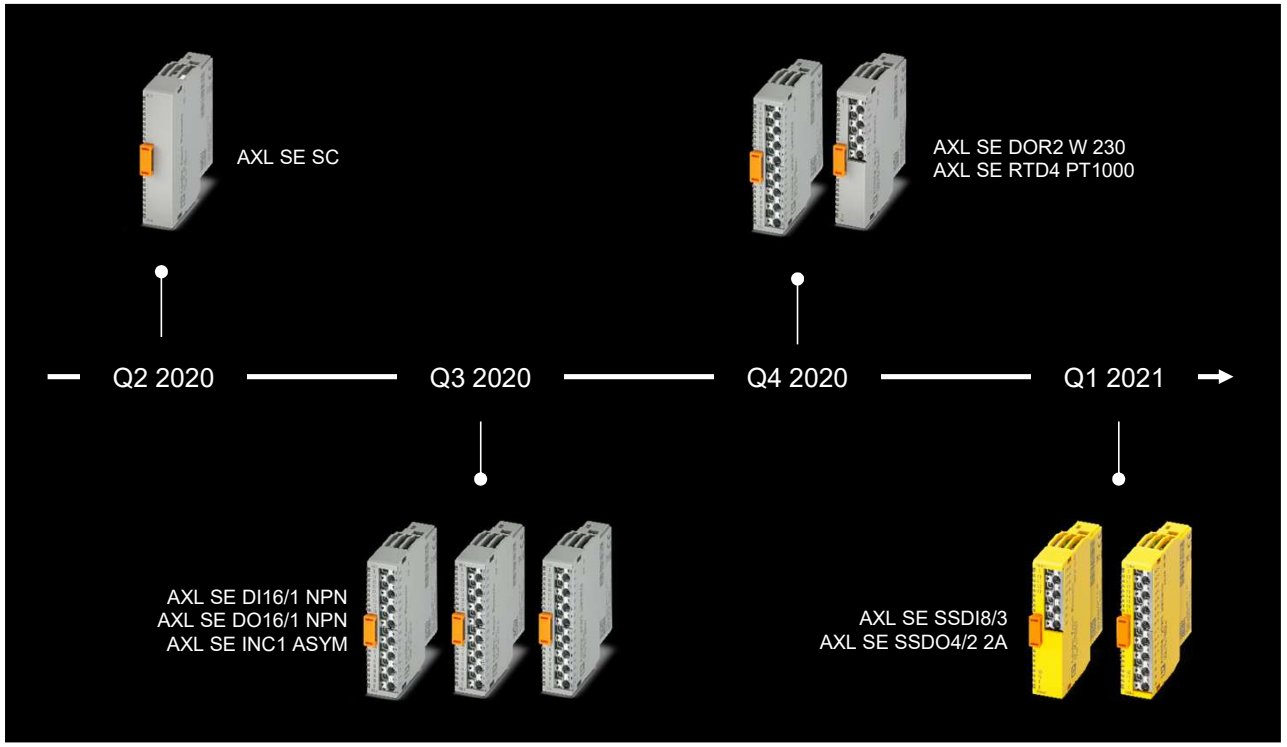
Axioline Smart Elements

More to come



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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

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COMPLETE line

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Overview – Axioline IP20 I/O systems



Axioline Smart Elements

- Flexible, modular and space saving I/O concept
- Machine building
- Field-level communication IO-Link



Axioline F XC

- Wide temperature range, process-relevant approvals
- Hybrid applications, process applications
- Field-level communication HART COMMUNICATION PROTOCOL

General requirements
Factory automation

Specific requirements
Process industry

Axioline F

- Robust and fast I/O solution, wide I/O portfolio
- Ship building, energy applications
- Field-level communication IO-Link



Axioline P

- Hot swap, PROFINET redundancy
- Process applications
- Field-level communication HART COMMUNICATION PROTOCOL



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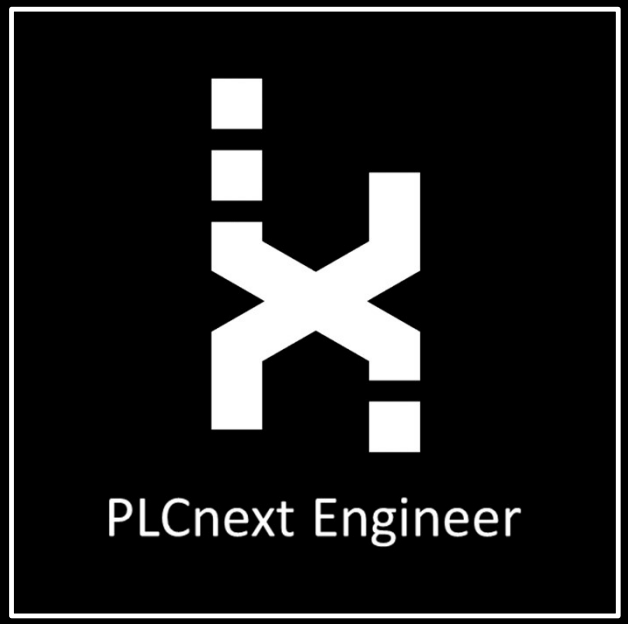
PLCnext Engineer modular software platform



Speed up your
application development

PLCnext Technology

Designed by PHOENIX CONTACT

Install limitless possibilities



Install limitless possibilities

PLCnext Ecosystem – PLCnext Store

PLCnext Store





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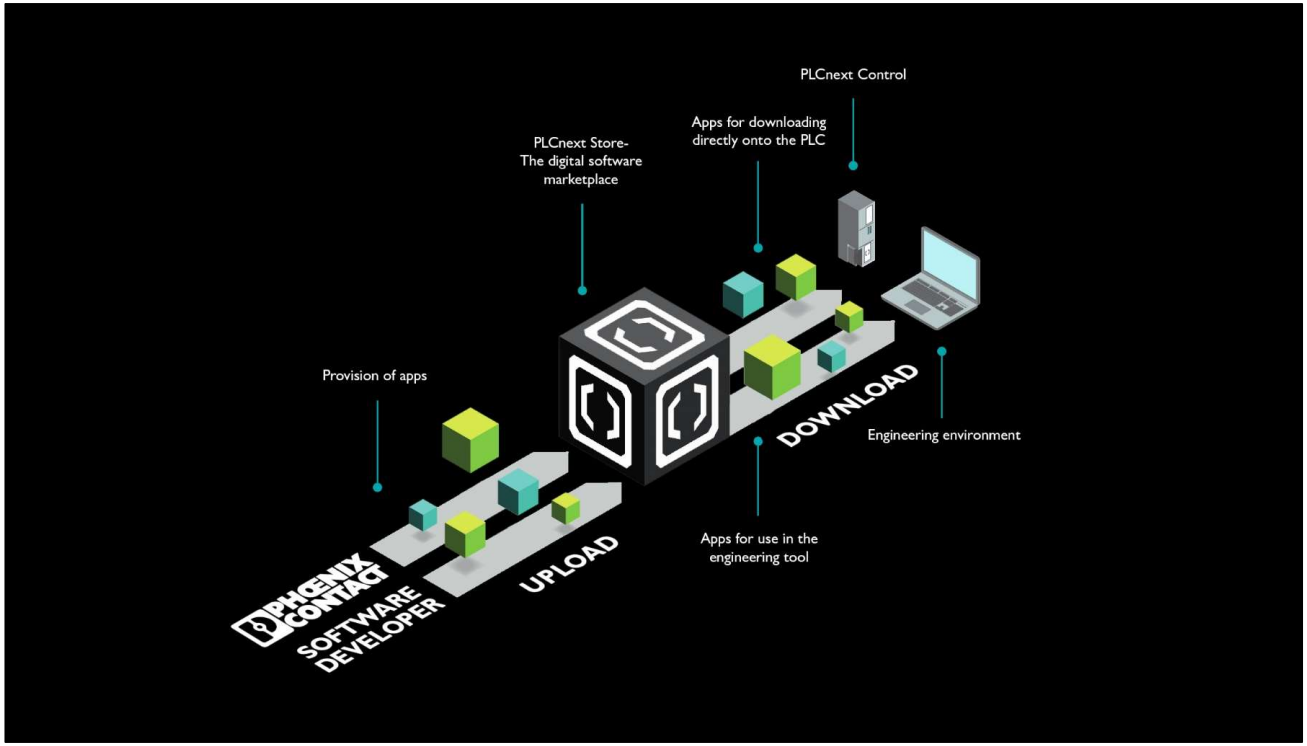
PLCnext Store





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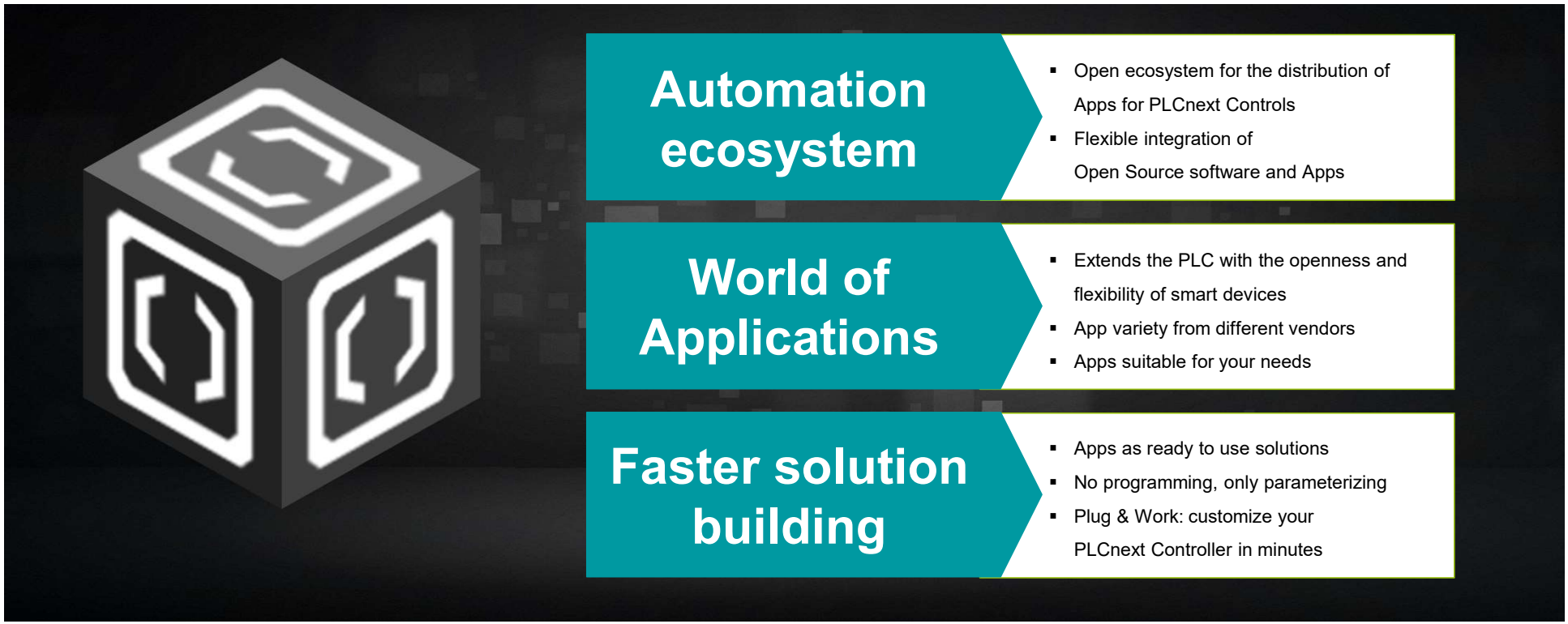
Benefits & Added Values



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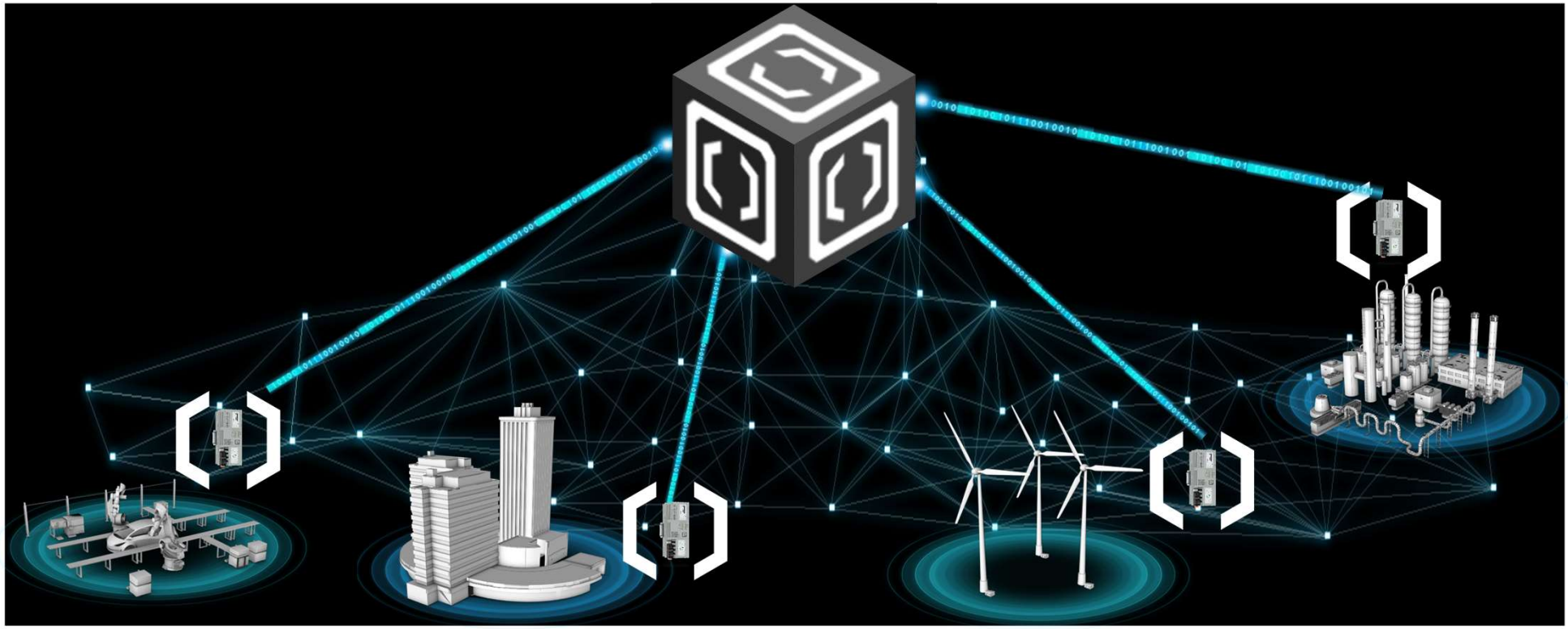
Ready-made Solutions



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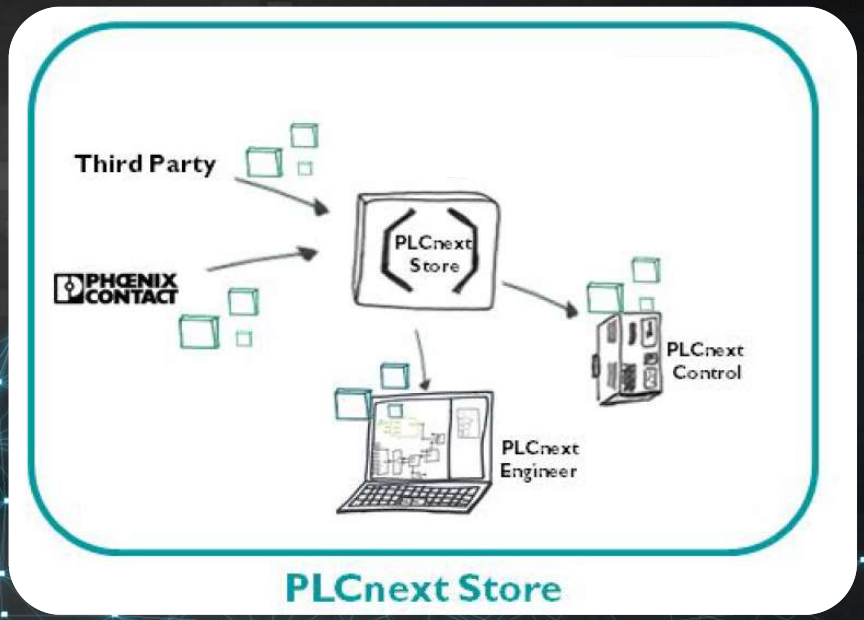
What is an App?

Application packages for industrial automation solutions



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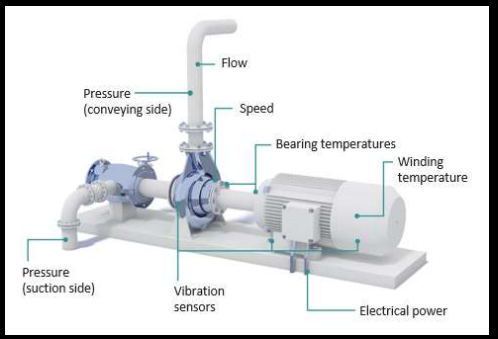
Pump Station Example: Water Supply Well and high-level Tank

- **Pump station App for Wastewater**
- Complete solution app incl. visualization
- Turns the PLCnext Device into a ready-to-use pump station

- **App for water supply well and high-level tank**
- This App is used with a high-level tanks or wells
- Both are communicating with each other
- 2 PLCnext Controls





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PLCnext Store – Digital Marketplace for Limitless Automation

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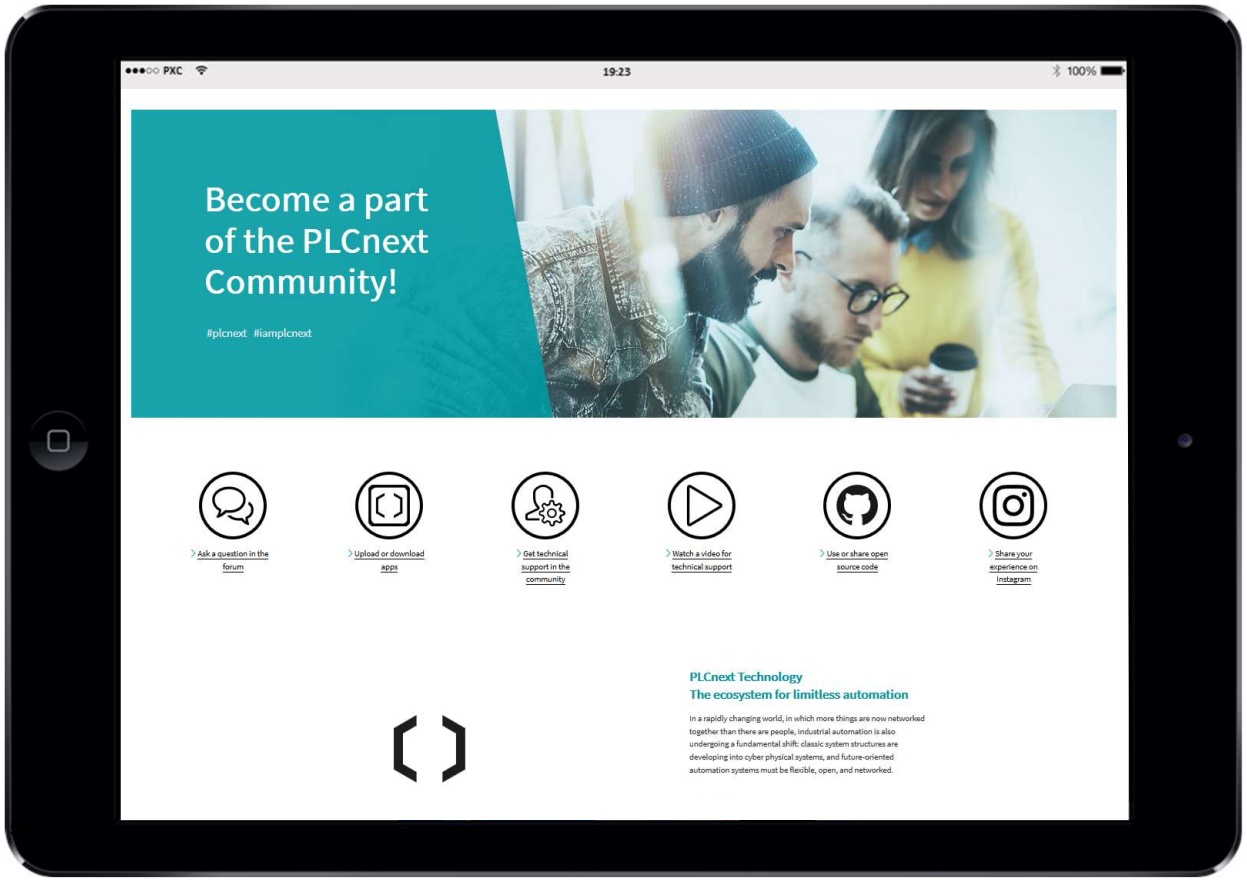
Pump Station Example: Navigate to the PLCnext Store





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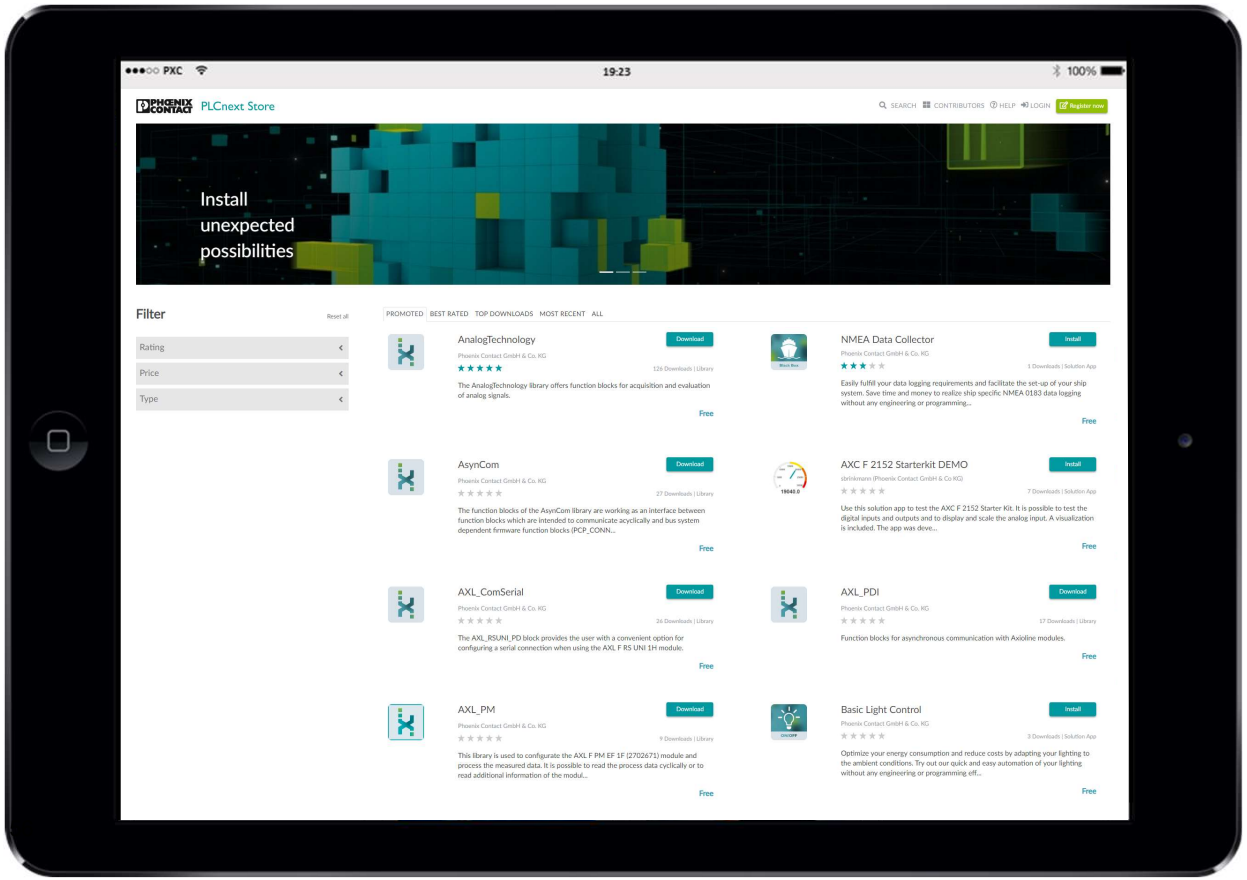
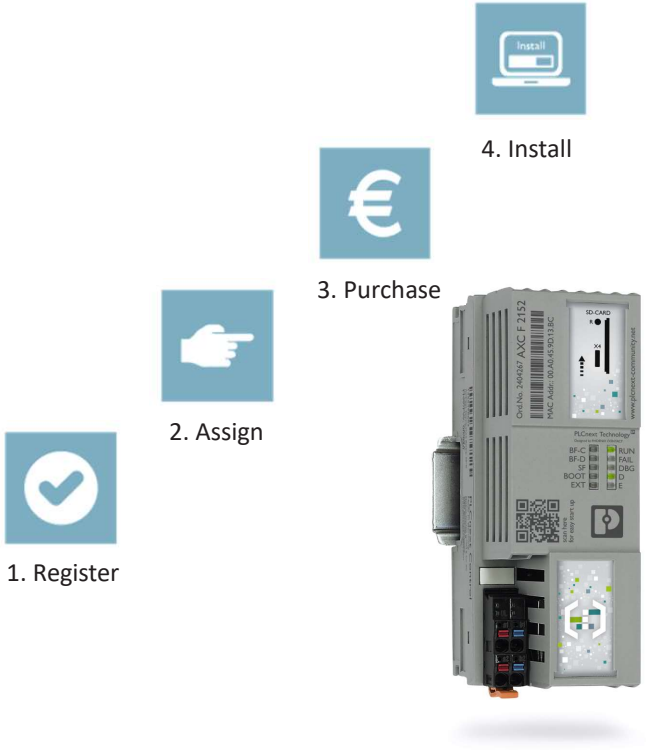
Pump Station Example: Register and browse PLCnext Store





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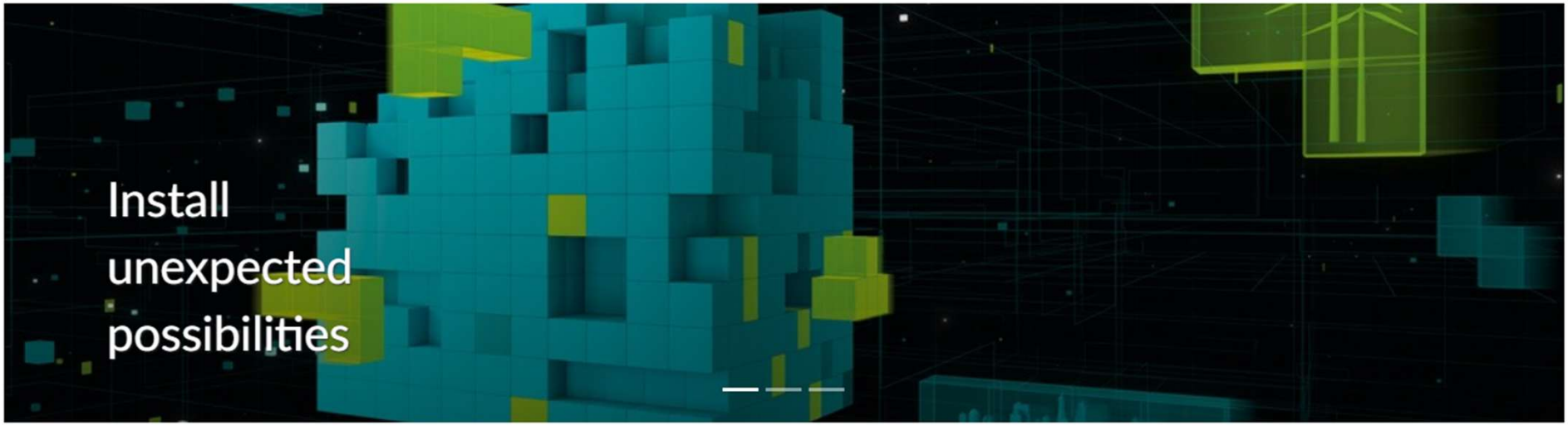

MLnext Framework Get it

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The MLnext Framework is an open-source framework for hardware independent execution of machine learning using Python and Docker. It also provides machine learning utilities for TensorFlow and Keras. T...

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MLnext Framework

by Phoenix Contact GmbH & Co. KG

Library | Version: 0.1.1

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Description

The MLnext Framework is an open-source framework for hardware independent execution of machine learning using Python and Docker. It also provides machine learning utilities for TensorFlow and Keras. The corresponding Python package is called mlnext.

The MLnext Framework consists out of 5 modules:
- For data loading and manipulation: import mlnext.data
- For loading and saving files: import mlnext.io
- For data preprocessing: mlnext.pipeline
- For data visualization: mlnext.plot
- For model evaluation: mlnext.score

It is part of the "Digital Factory now" campaign by Phoenix Contact Electronics to support the solution portfolio "Anomaly Detection".

Support

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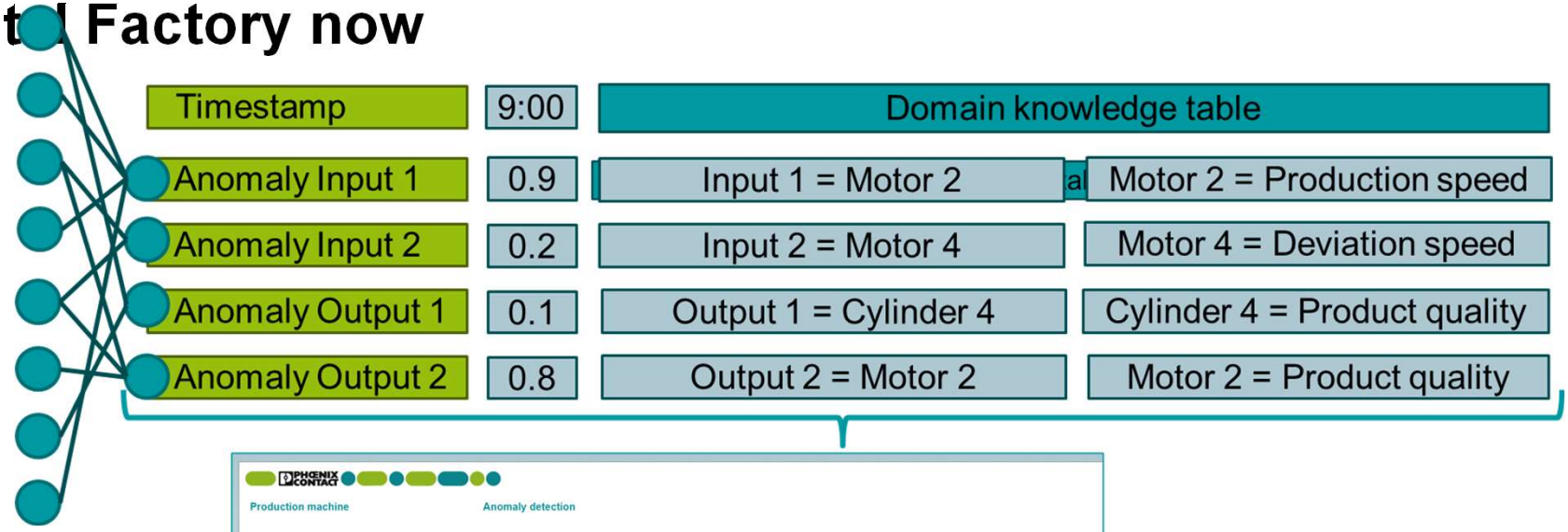
Anomaly Detection

Digital Factory now





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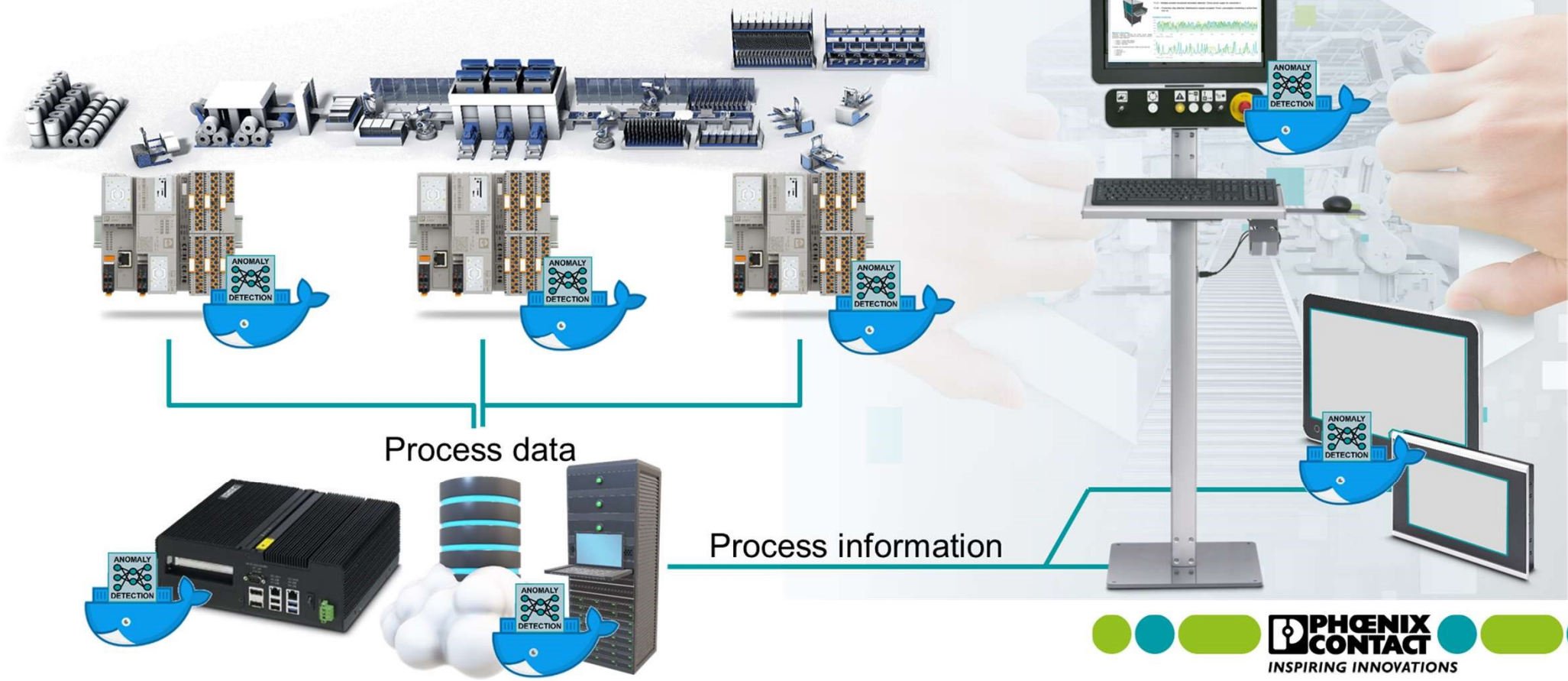
Scalable topology



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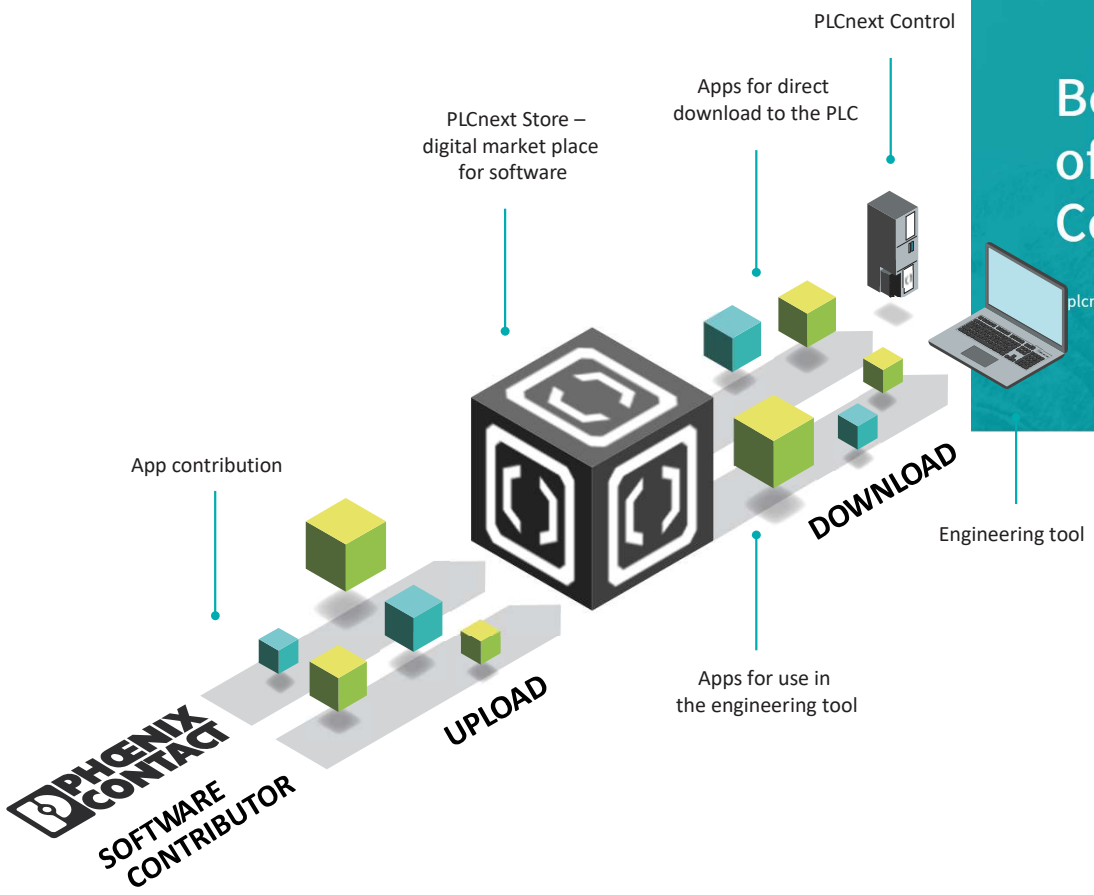



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Customer Journey for chargeable Apps

- The PLCnext Store provides various direct payment methods

- Customer journey for chargeable apps

1. **Click**
   Buy
2. **Choose payment method**
3. **Check license pool**
4. **Activate license on PLCnext Control**

Purchase option for chargeable Phoenix Contact App licenses via SAP under preparation (scheduled for Q4 2020)

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Ecosystem & PLCnext Store

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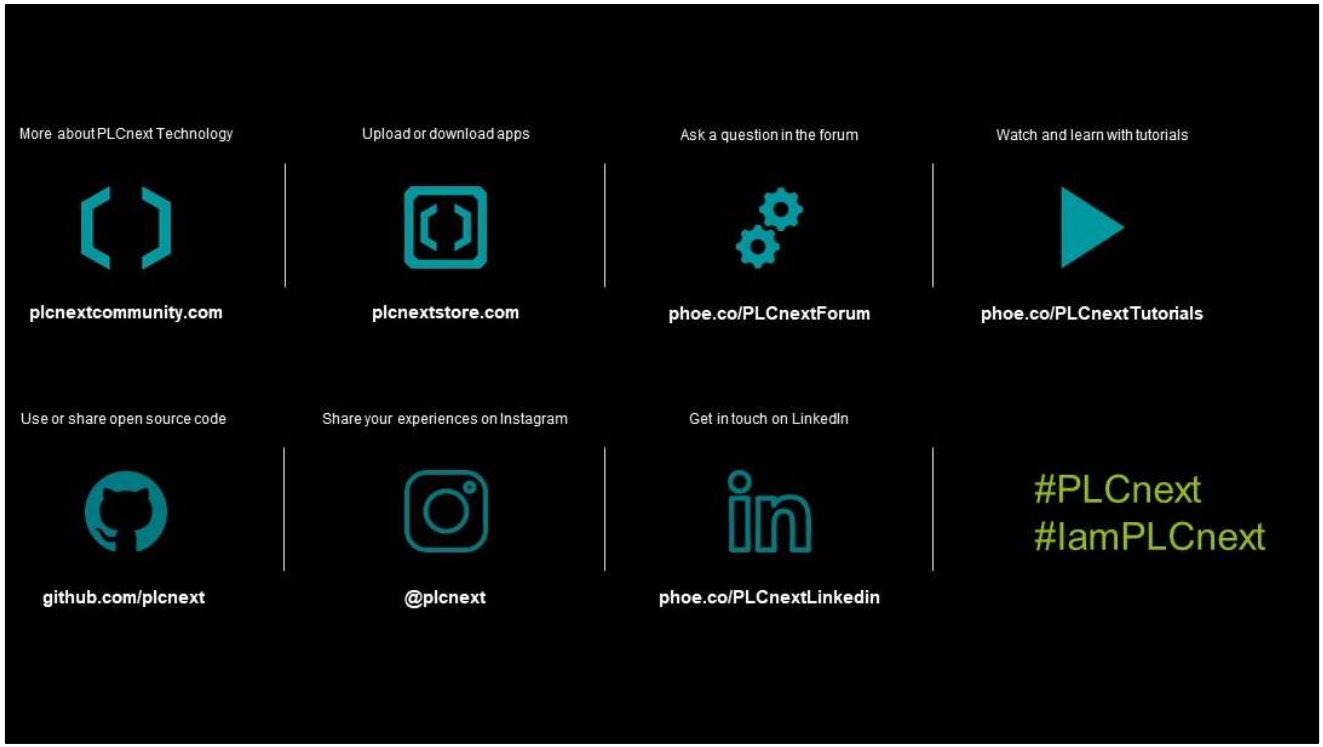
PLCnext Community – Global Exchange & Collaboration





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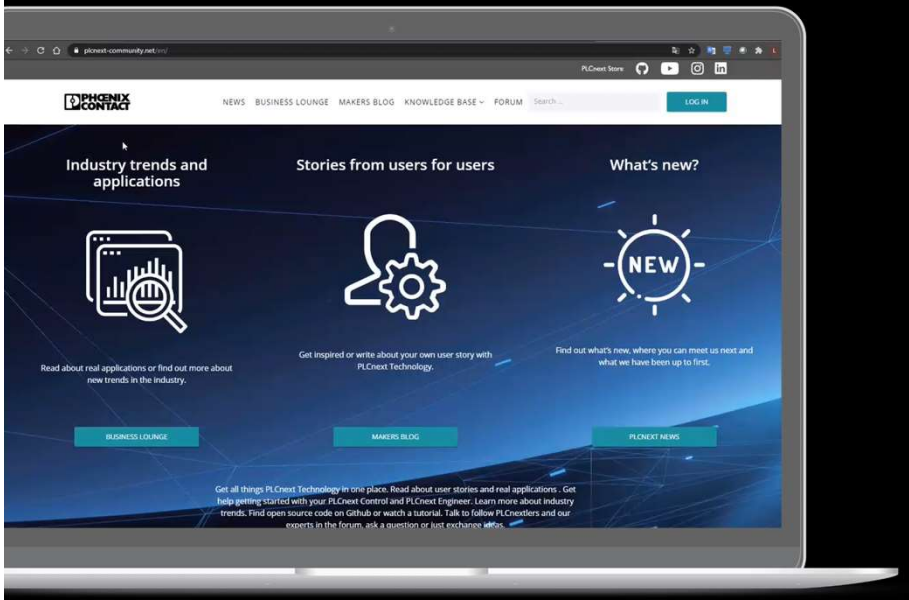
PLCnext Community website



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

- Forum
- FAQ
- Infocener
- MakersBlog
- Business Lounge

plcnext-community.net

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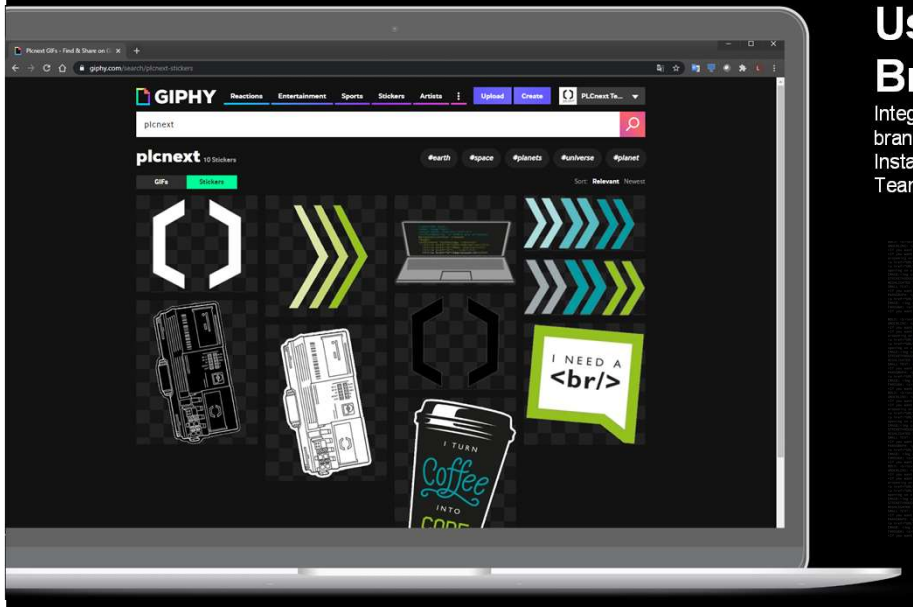

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PLCnext Ecosystem – PLCnext Community

Benefit from Crowd Knowledge



Specialists develop ideas and software solutions

Exchange of know-how with the aim of jointly advancing further developments. Profit from the ideas developed by others

Speed up your application developement or earn money with your developements

Market leadership requires speed

We need to make use of Crowed Knowledge

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Using AI in manufacturing for increased productivity by Google Cloud

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