



Digitalization

Industrie 4.0

Smart Production

E-Mobility

Smart Energy

Energy Efficiency

Smart Infrastructure

Smart Buildings

Renewables

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

Welcome

Inteligencia Artificial

Producto AXC F XT ML 1000





Be part of our smart future
PHOENIX CONTACT

PLCnext Technology Ecosystem

PLCnext Technology

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



PLCnext Technology[®]
Designed by PHOENIX CONTACT



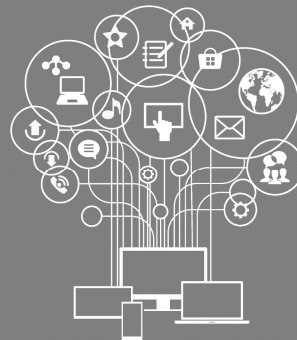
PLCnext Technology Ecosystem

Motivation

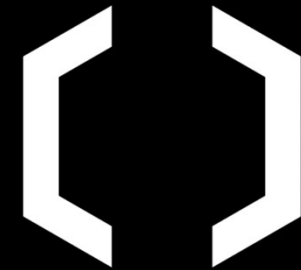
All Electric Society



INDUSTRIAL
INTERNET
OF THINGS



Our solution for a
rapidly changing world



PLCnext Technology[®]
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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



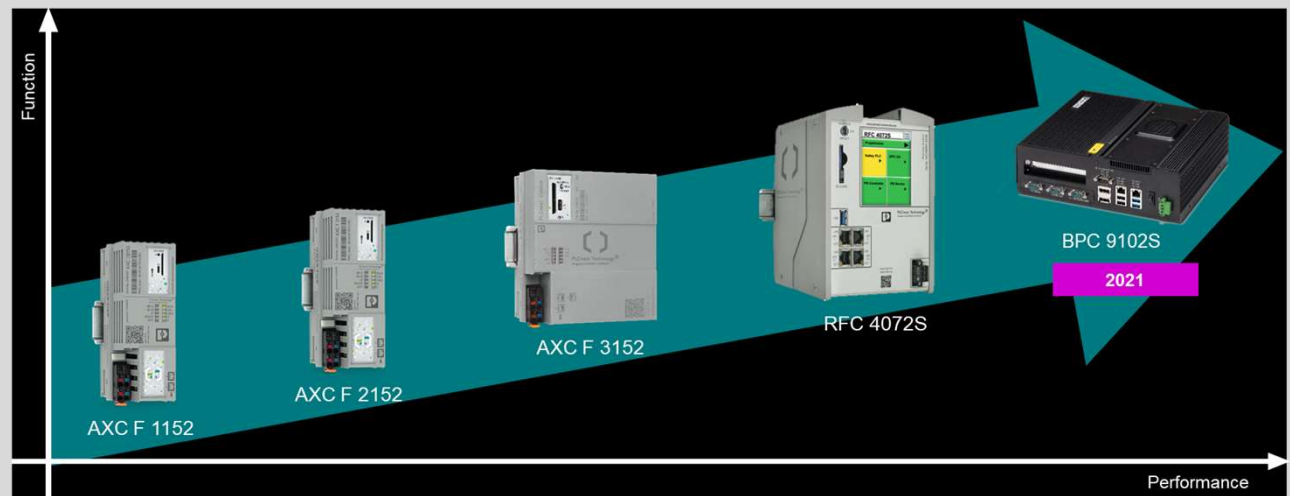
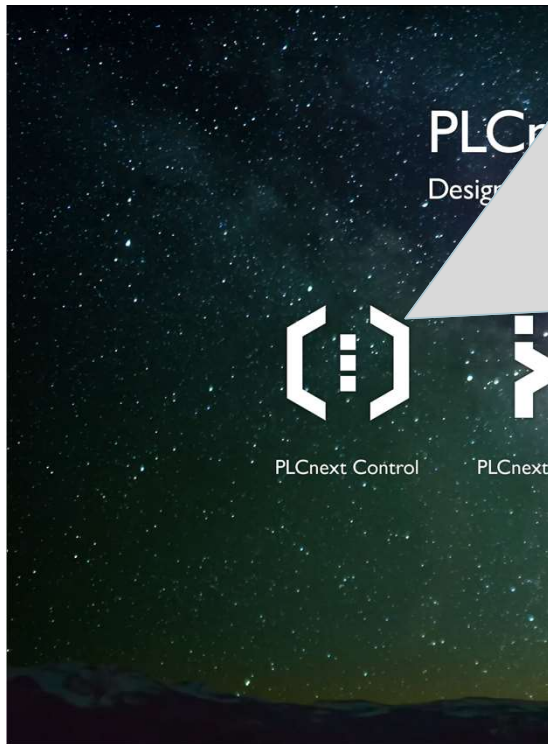
PLCnext Community

Collaboration & Resources

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

PLCnext Ecosystem

PLCnext Technology

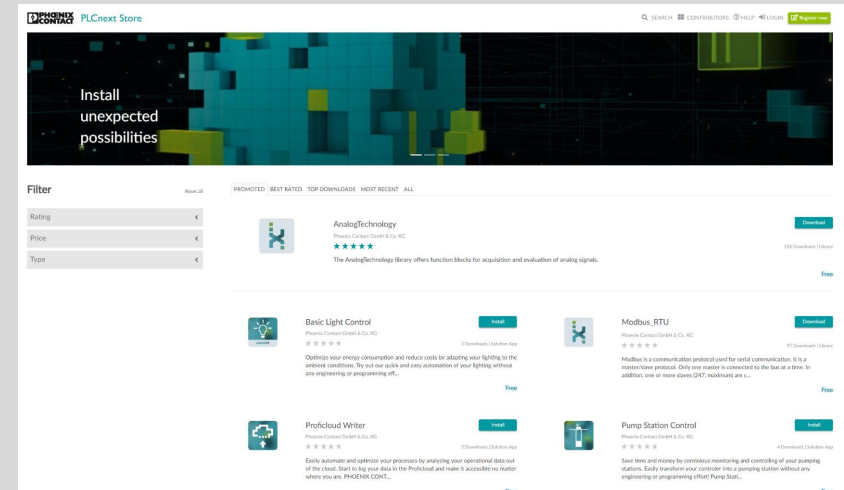


Open Control Platform

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

PLCnext Ecosystem

PLCnext Technology

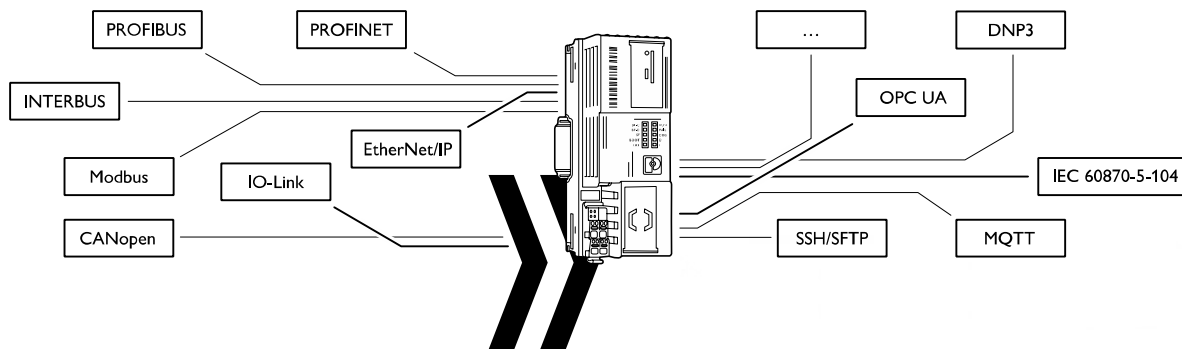


Software Store for Automation

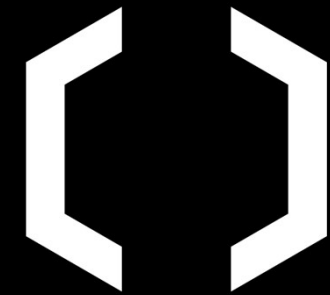
Apps for functional extension of
PLCnext Control and PLCnext Engineer

enhanced connectivity – Intelligent Networking

Future-proof Connectivity



PLCnext Technology 
Designed by PHOENIX CONTACT

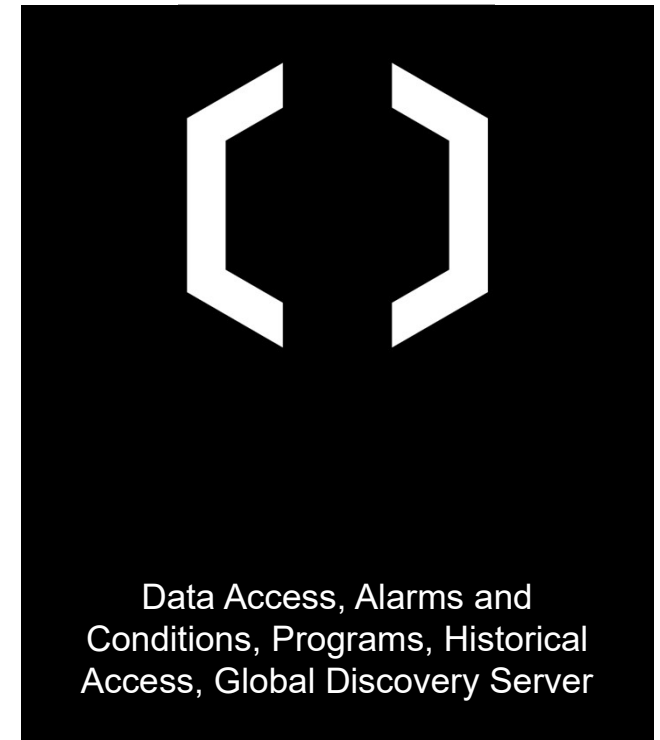
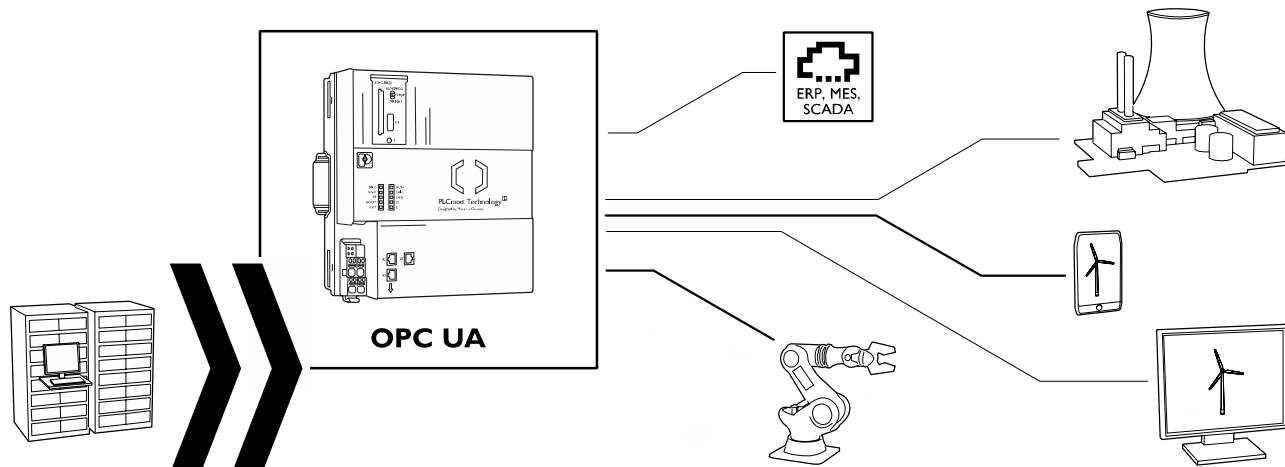


PLCnext Technology enables the integration of current and future interfaces and protocols for open communication in highly networked automation systems.

enhanced connectivity – Intelligent Networking

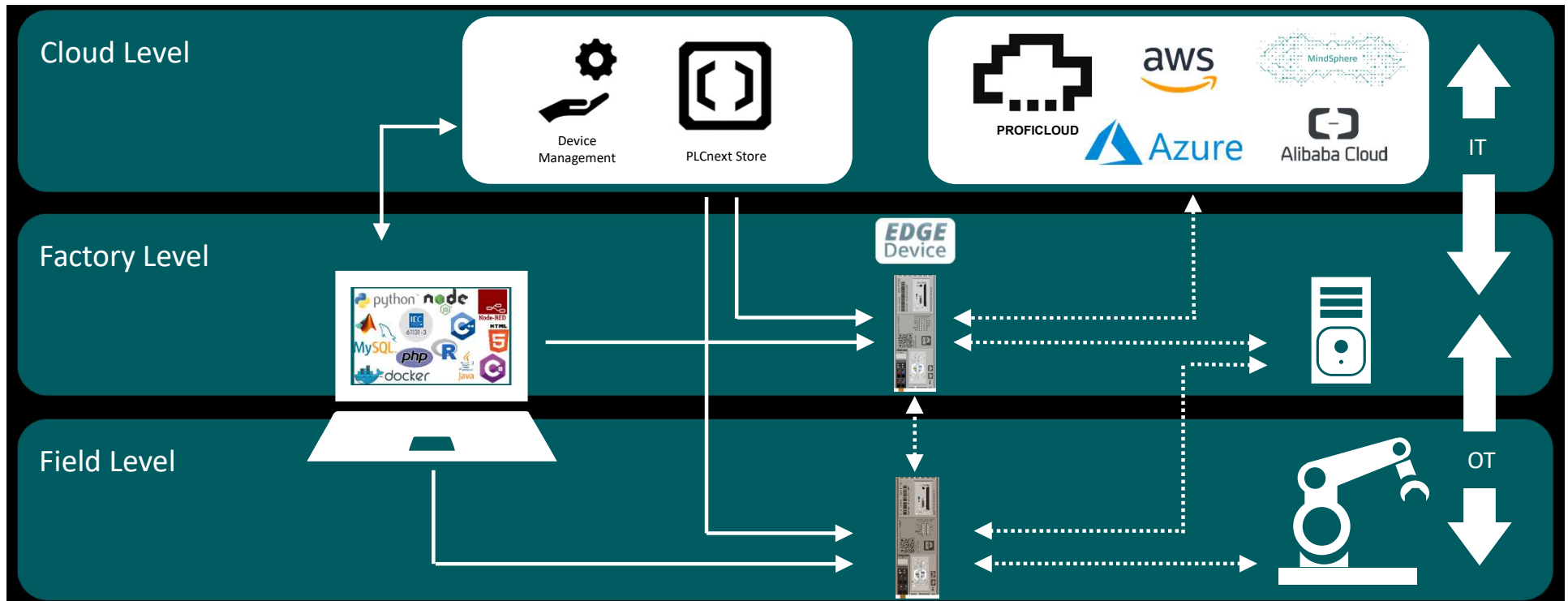
Integrated OPC UA Server

PLCnext Technology 
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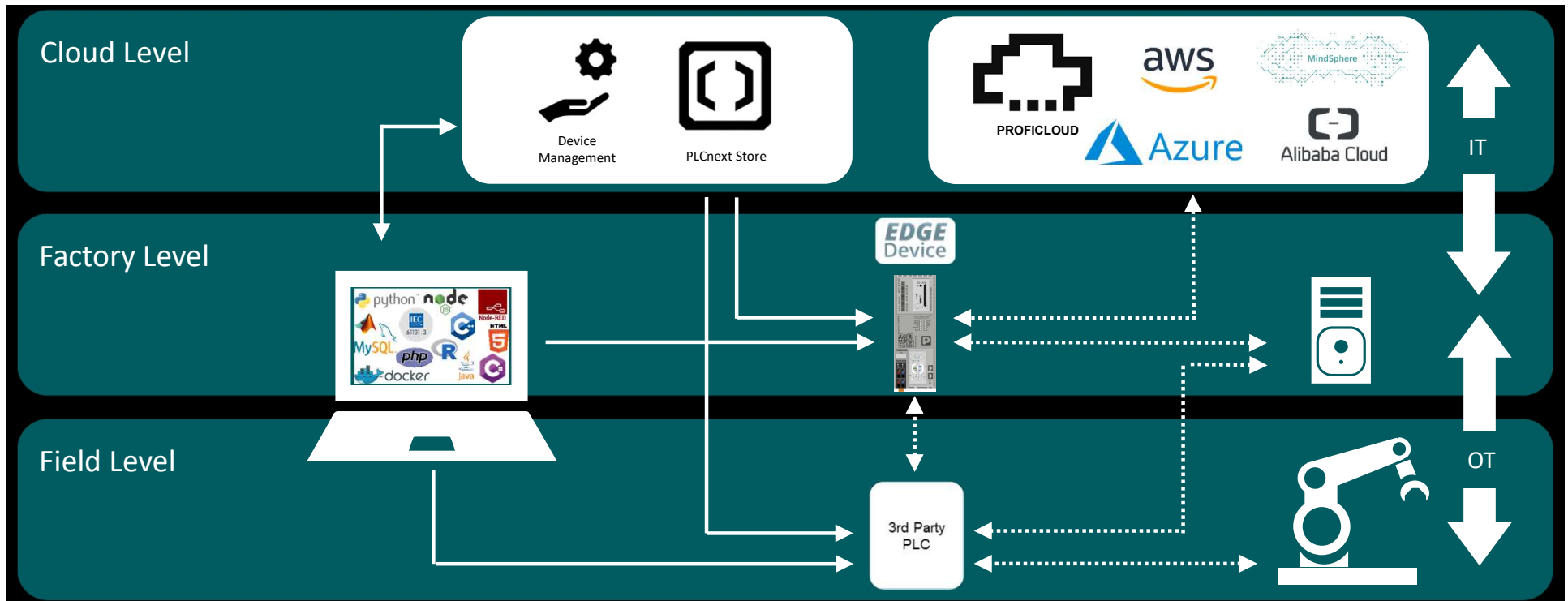
enhanced connectivity – Edge Device or PLC connecting all Levels

PLCnext Control as PLC and Edge Device



enhanced connectivity – Edge Device or PLC connecting all Levels

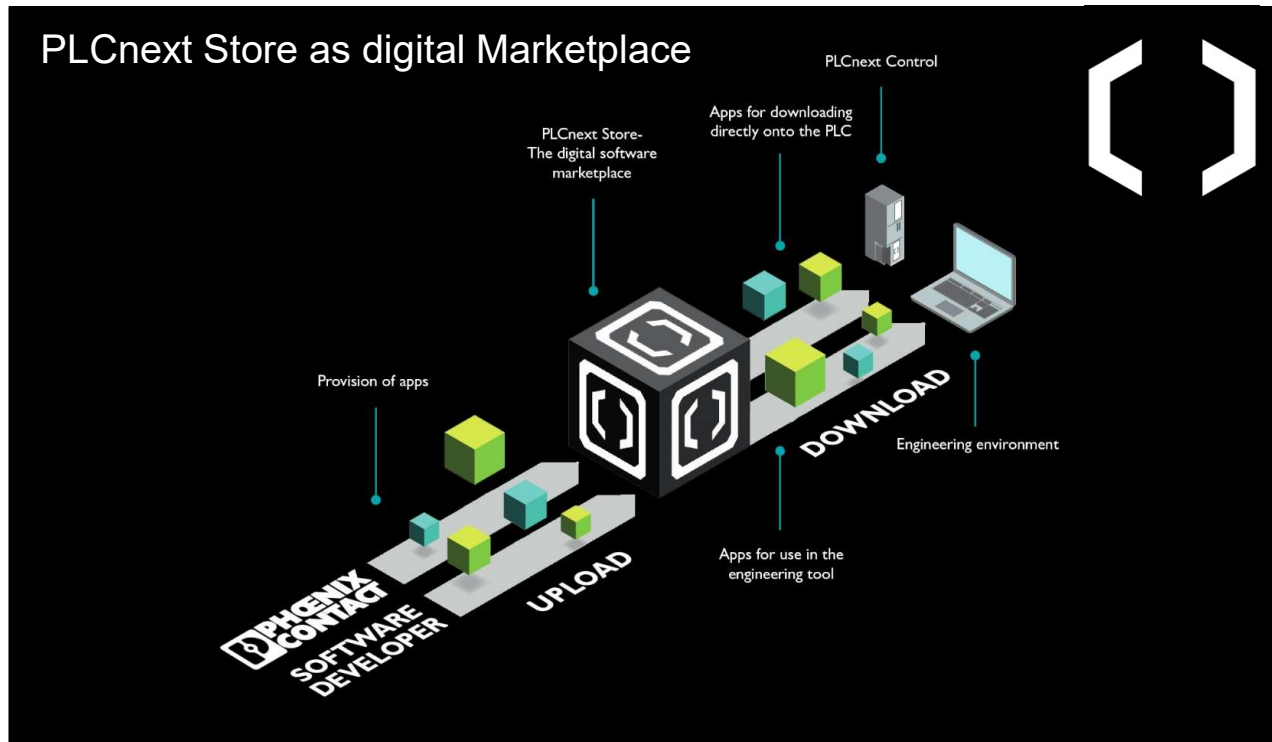
PLCnext Control as Edge Device



enhanced freedom

Limitless Adaption Capability

PLCnext Technology 
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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

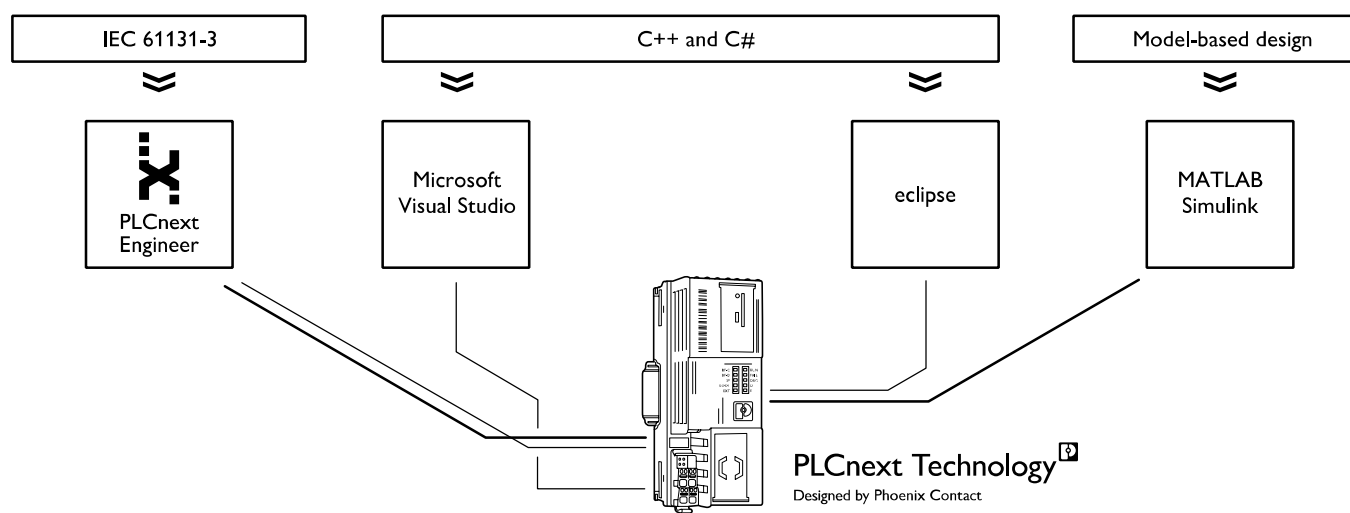


Artificial Intelligence In 10 Minutes | What Is Artificial Intelligence?| AI Explained | Simplilearn

enhanced convenience

Engineering and Application Development

PLCnext Technology[®]
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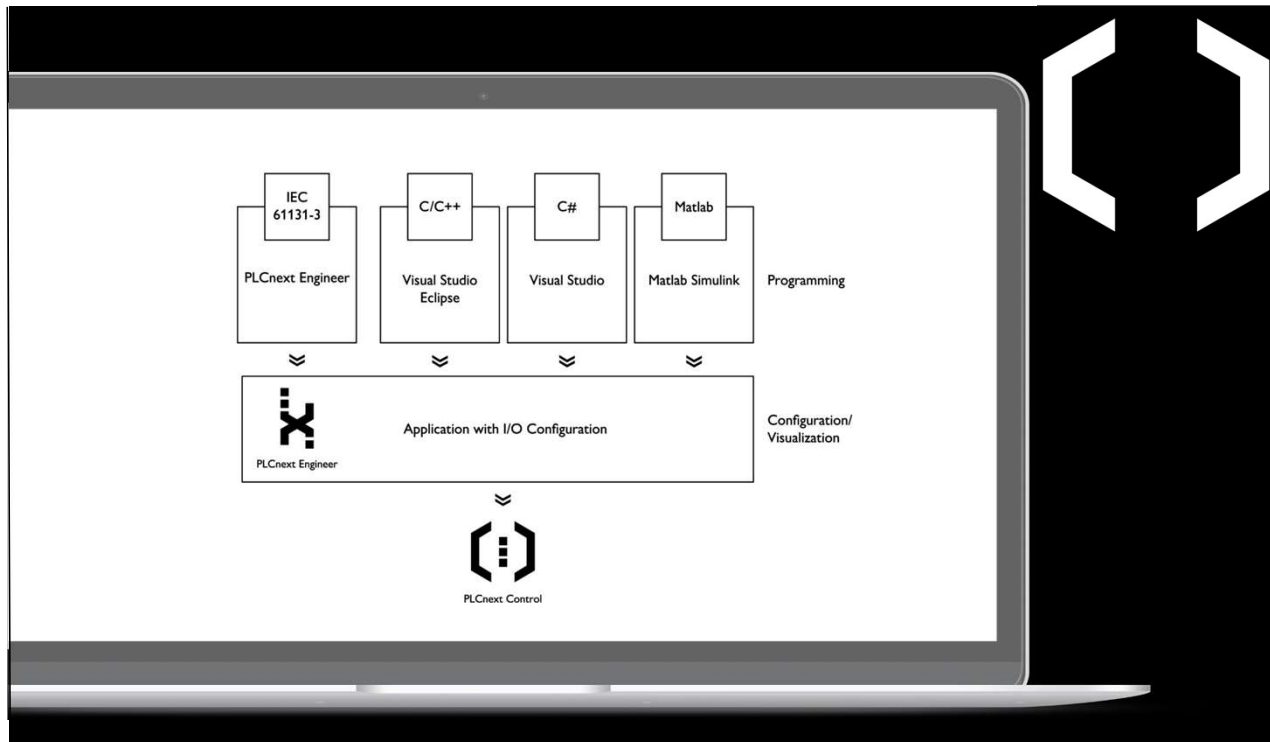


With PLCnext Technology, several developers from different generations, with different skill sets and expertise can work on one controller program, in parallel and yet independently, using different programming languages.

PLCnext Technology – Limitless engineering options

PLCnext Engineer

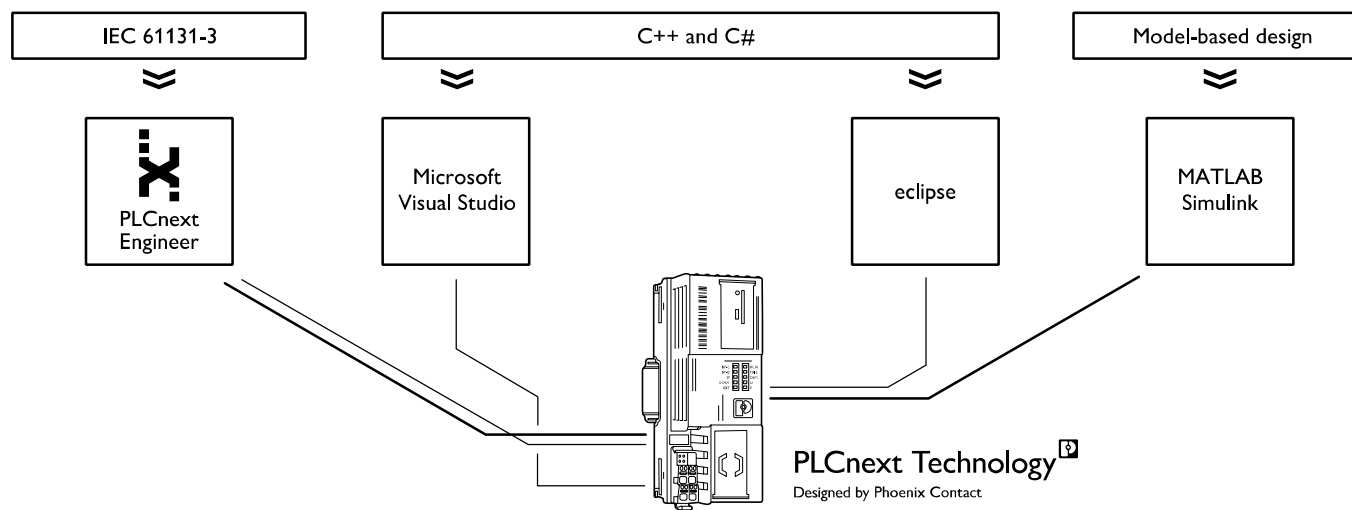
PLCnext Technology 
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enhanced development

Engineering and Application Development

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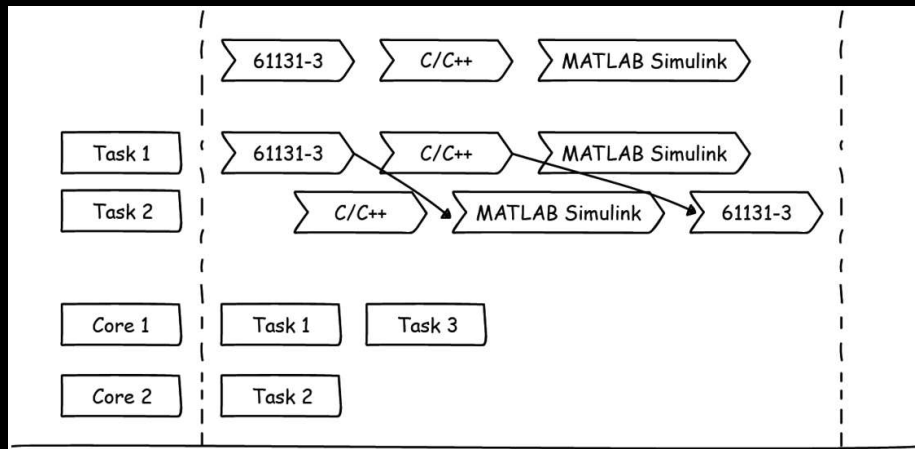


With PLCnext Technology, several developers from different generations, with different skill sets and expertise can work on one controller program, in parallel and yet independently, using different programming languages.

enhanced performance – PLC-typical Real-time Performance

Execution & Synchronization Manager

PLCnext Technology 
Designed by PHOENIX CONTACT

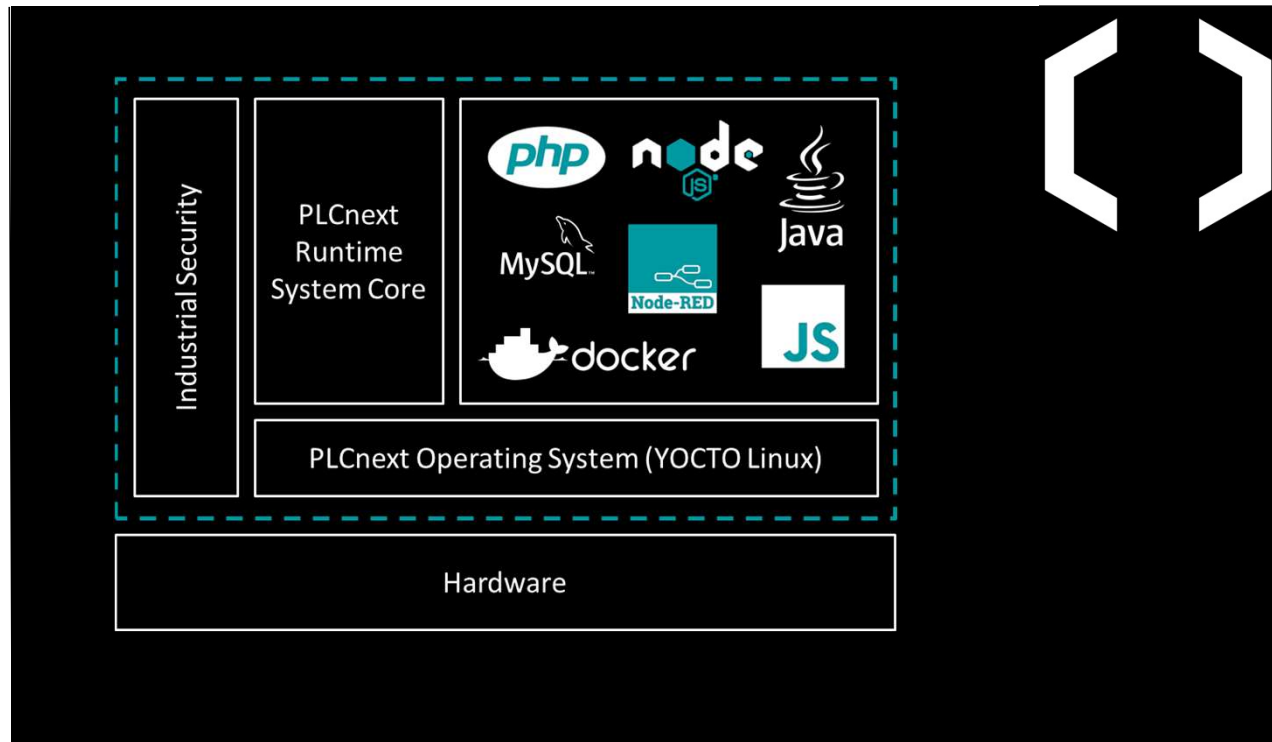


The patent-applied-for task handling of PLCnext Technology lets program routines of different origin run like classical IEC 61131 PLC code. Your high-level language programs become automatically deterministic.

PLCnext Technology – Limitless engineering options

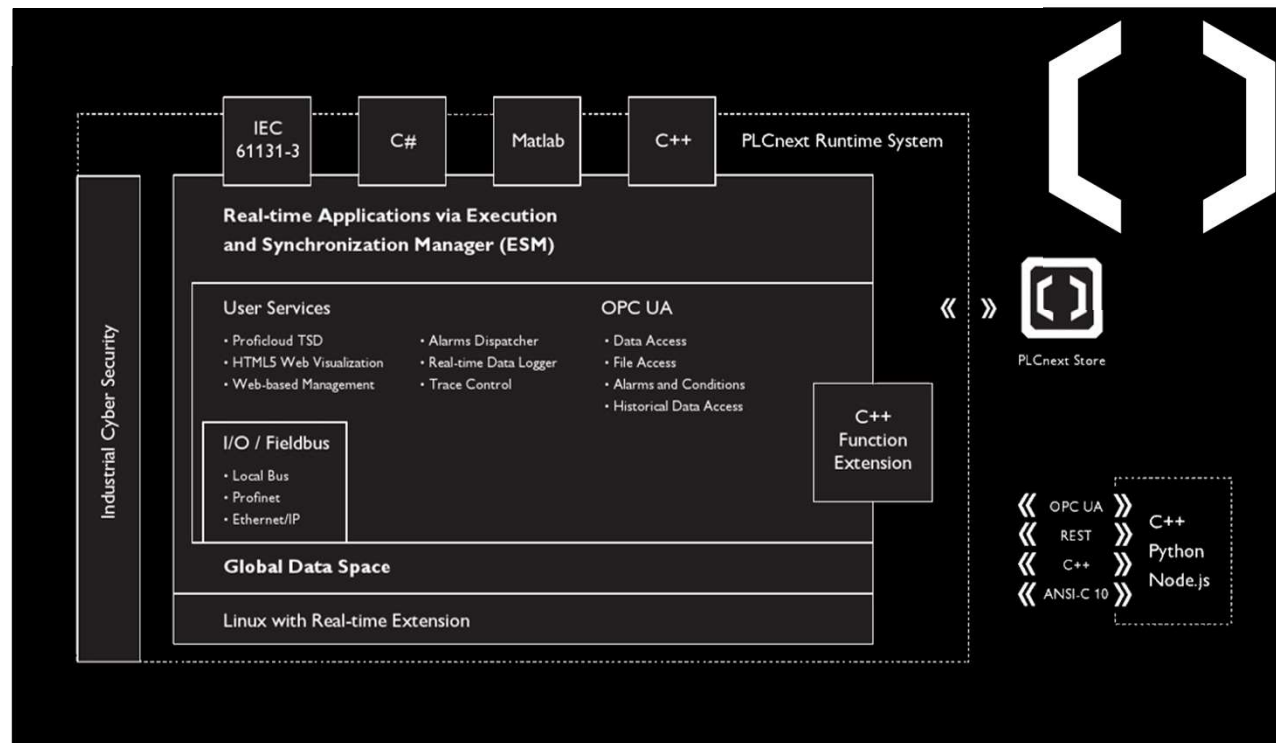
PLCnext Runtime System

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

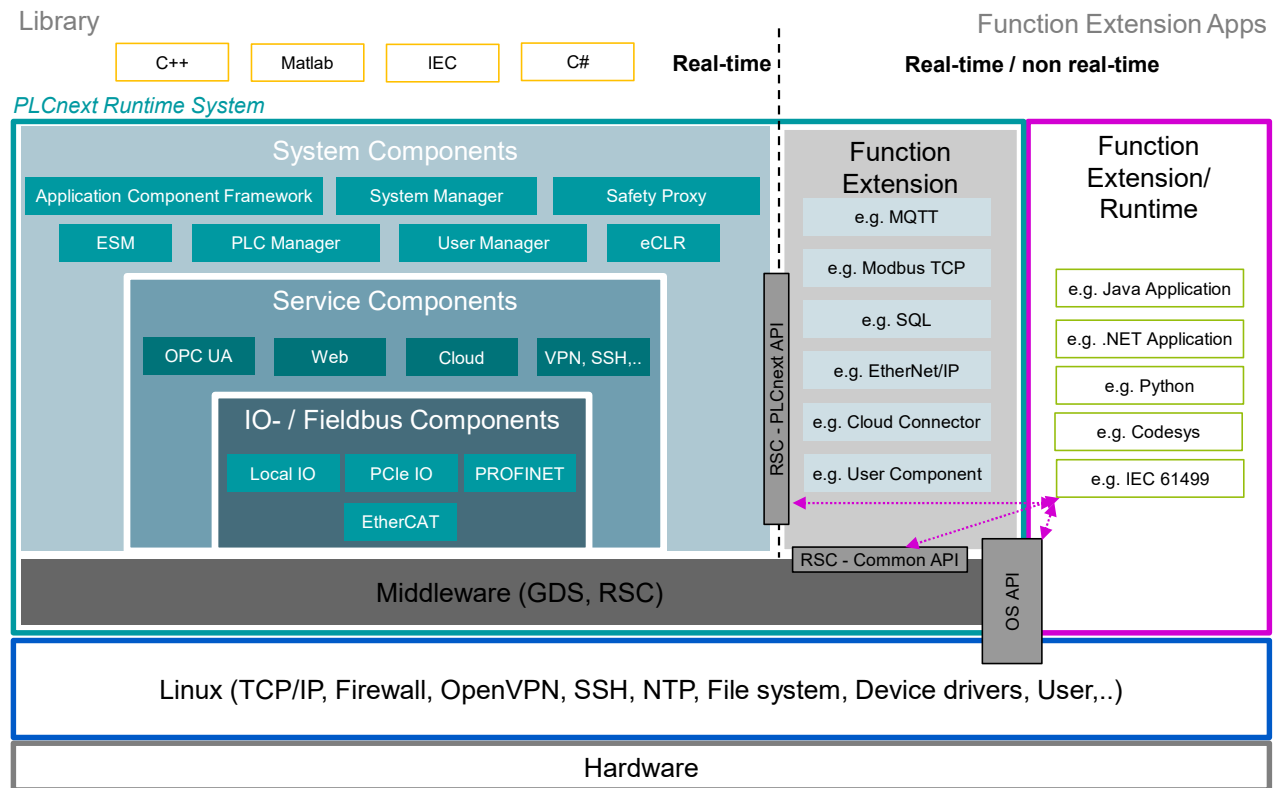


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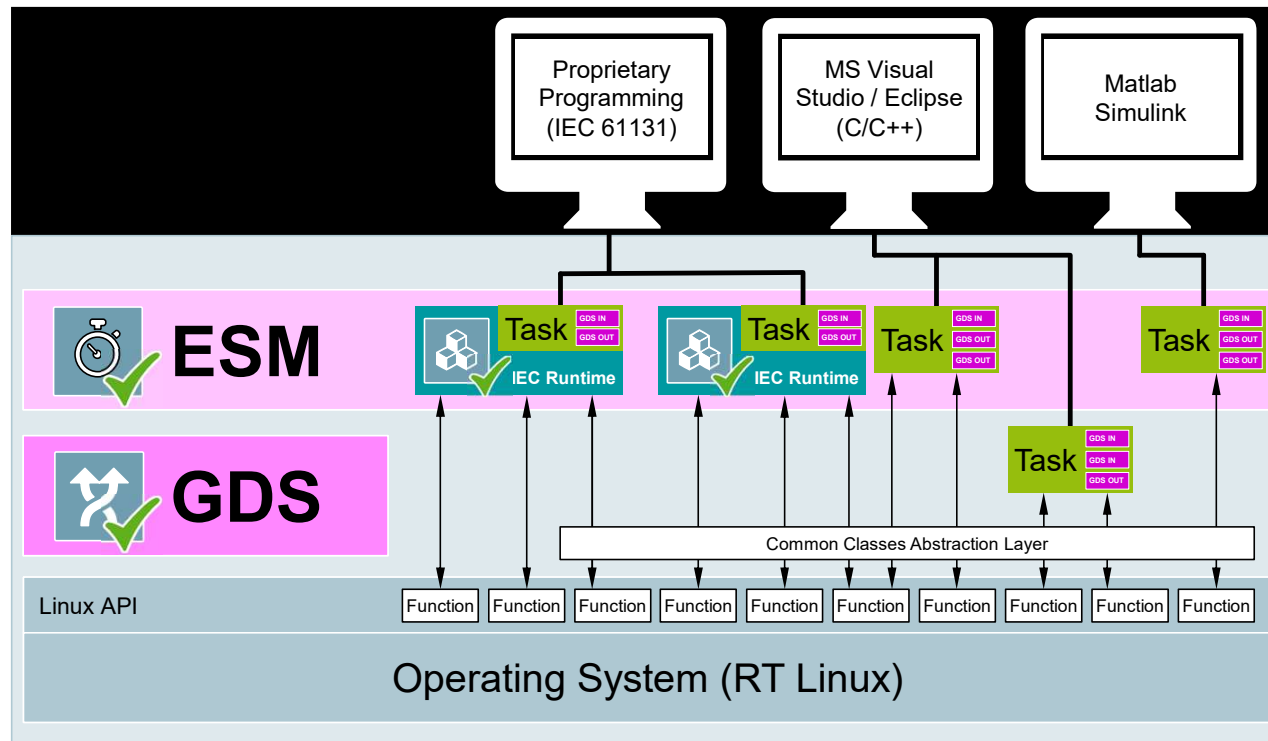
PLCnext Runtime System Architecture

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)



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

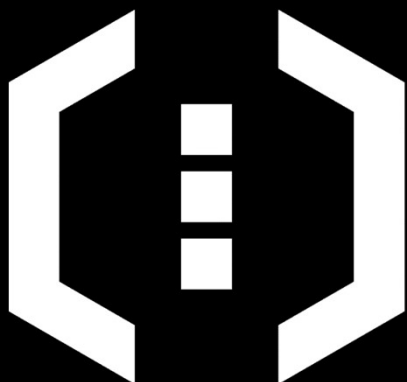


Confidential

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Open control platform for flexible automation



PLCnext Control

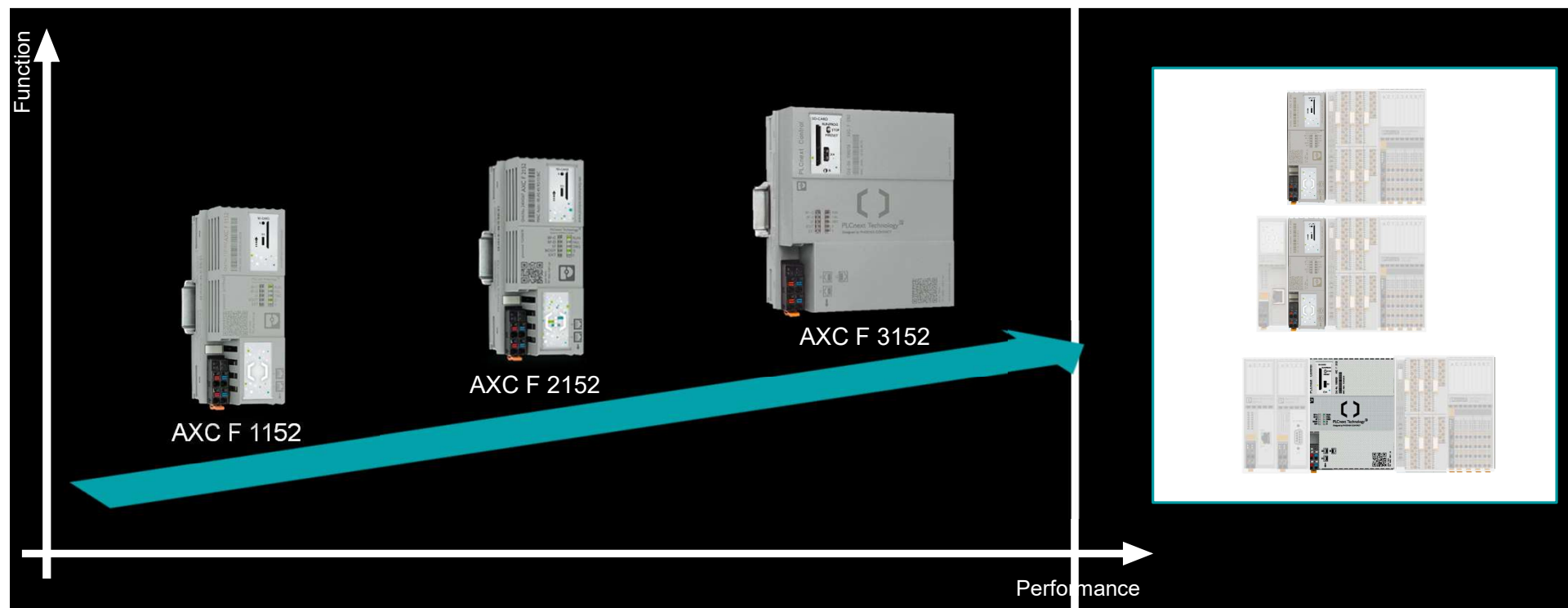
Discover flexible
automation



PLCnext Control

PLCnext Technology 
Designed by PHOENIX CONTACT

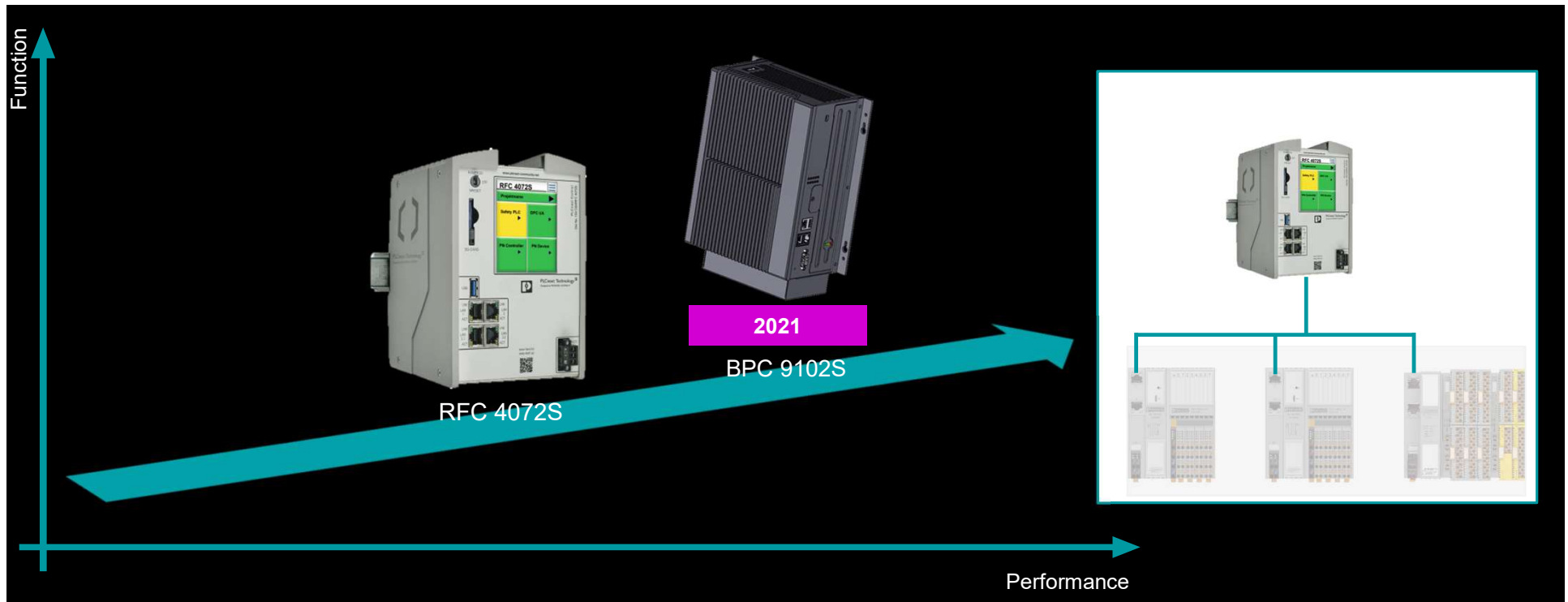
PLCnext Control for flexible automation with modular hardware platform



PLCnext Control

PLCnext Technology 
Designed by PHOENIX CONTACT

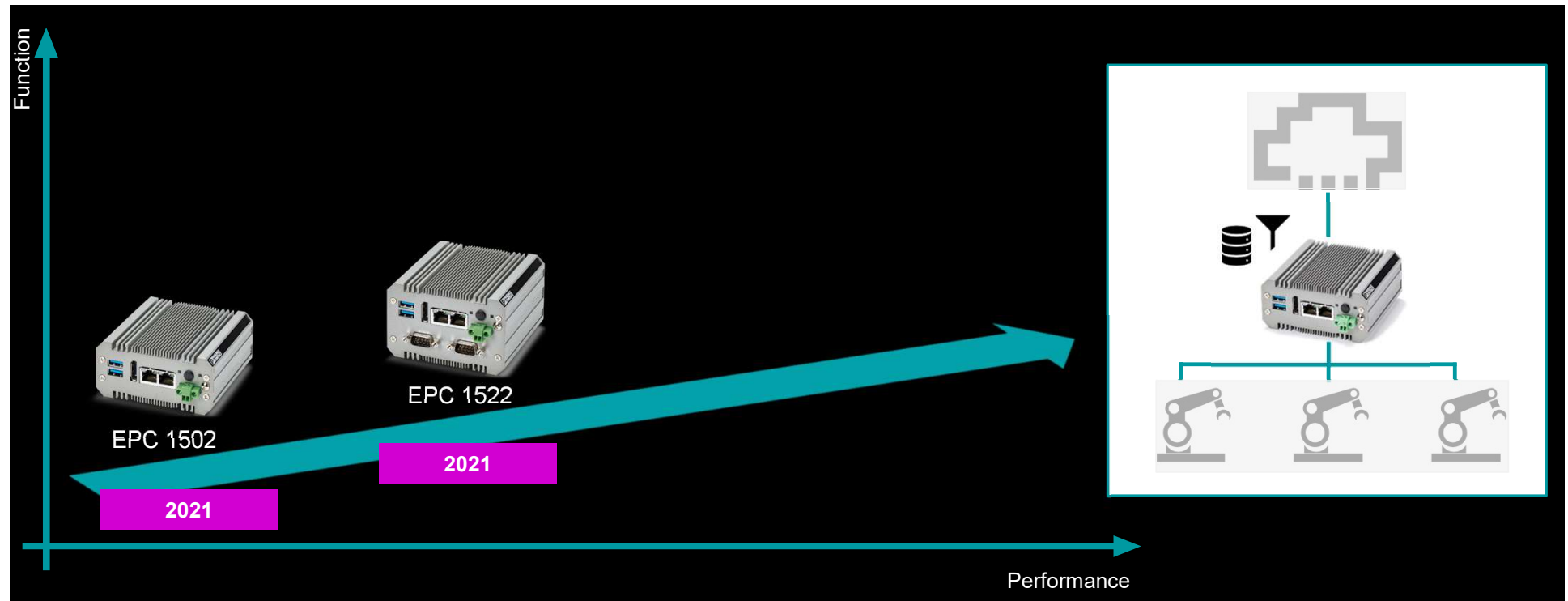
PLCnext Control for centralized applications with decentralized IOs



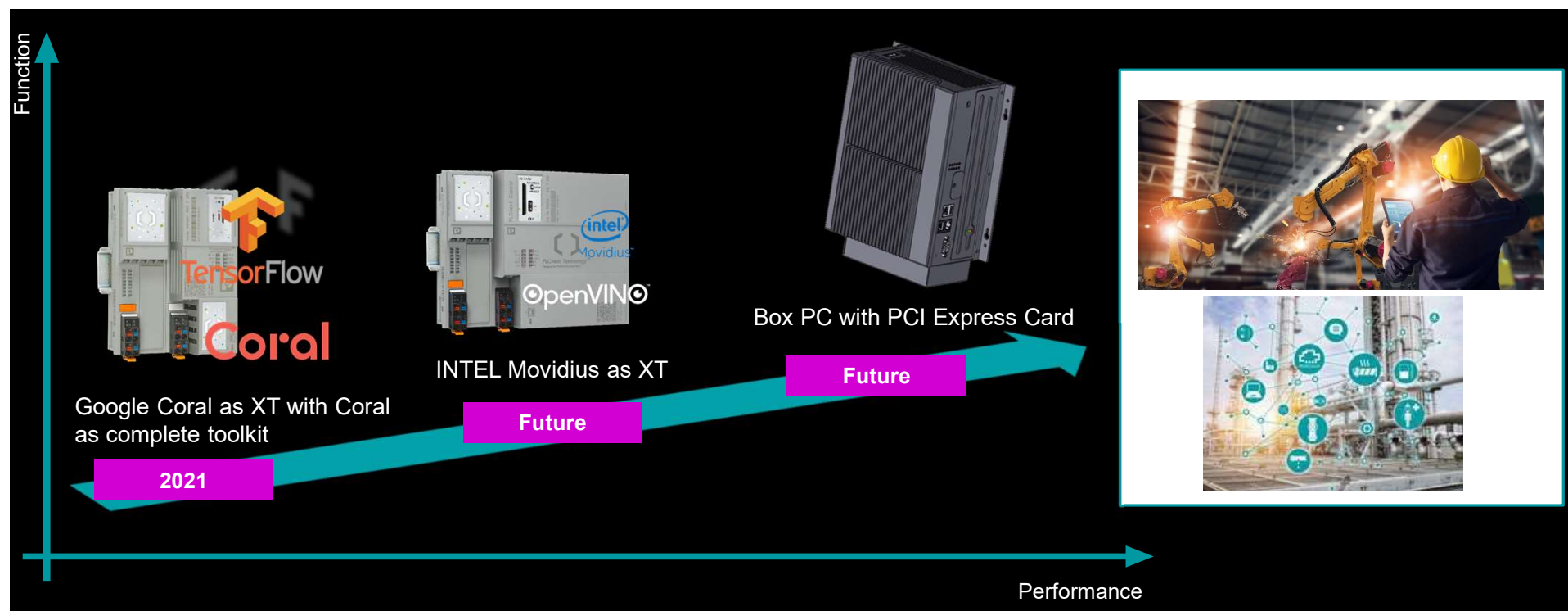
PLCnext Control

PLCnext Technology 
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PLCnext Control for Edge Computing



PLCnext Control for intelligent applications with Artificial Intelligence





Coral: Expanding the edge AI landscape | Session


PLCnext Controls Performance Benchmark









Confidential

PLCnext Control

PLCnext Control AXC F 2152




The image shows the PLCnext Control AXC F 2152 unit, a compact industrial PLC. It features a grey front panel with a display screen showing 'AXC F 2152' and 'MAC Address: 02:00:43:00:13:0C'. Below the screen are status LEDs for RUN, FAIL, DBG, and E, along with buttons for BF-C, BF-D, SF, BOOT, and EXT. A QR code and the PLCnext Technology logo are also visible.







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 Control AXC F 3152



The image shows the PLCnext Control AXC F 3152 unit, a compact industrial PLC. It features a grey front panel with a control interface including a RUN/STOP button, a RESET button, and a status indicator. The unit is labeled with 'PLCnext Control', 'AXC F 3152', and 'Designed by PHOENIX CONTACT'. It also has a QR code and various technical specifications printed on it.

Core	Working memory	Temperature
 Intel ATOM x5-E3930 dual-core	 2 GB DDR4 dual-channel RAM	 -25°C-60°C
 32	 500 µs	 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 (Hazardous Location), CUL, IEC Ex, ATEX
 - DNV/GL, LR, BV, ABS, ...



PLCnext Control

PLCnext Control RFC 4072S

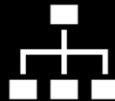


Core



**Intel i5 6300U 2
x 2,4 GHz
processor**

control tasks
(IEC 61131)



32

Working memory



**4 GB DDR 4 dual
channel RAM**

Min. cycle time
(IEC 61131)



500 µs

Temperature



**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






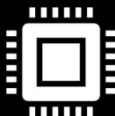
PLCnext Technology 
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PLCnext Control

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

PLCnext Control

PLCnext Control BPC 9102S

PLCnext Technology 
Designed by PHOENIX CONTACT

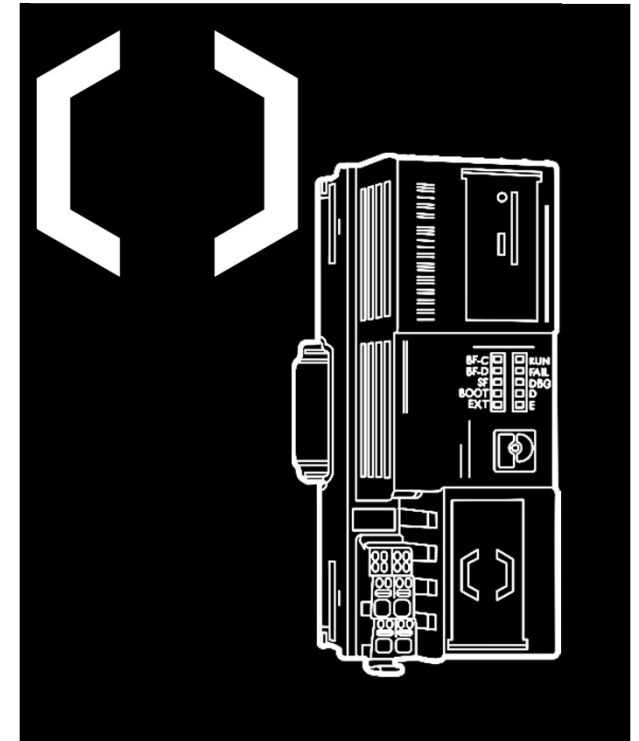
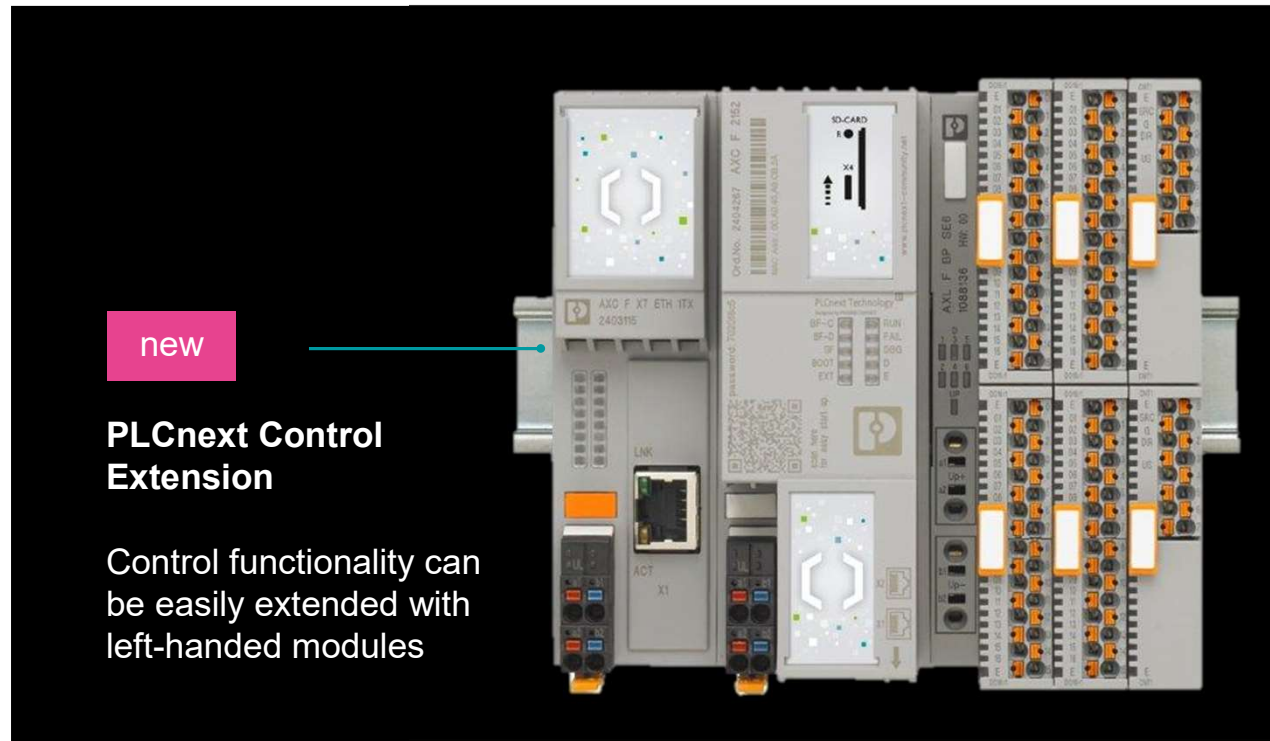
- CPU: i7-10700TE (10th Gen 8-Core)
- RAM: 16GB
- Interfaces:
- 3 separate and independent Ethernet interfaces with 1 RJ45 port each
 - LAN1: PN Controller (I225), 1GBit
 - LAN2: PN Device (I225), 1GBit
 - LAN3: RAW user ethernet communication (I225), 1GBit
- 1 Serial Interface RS232
- 1 USB for FW/SW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



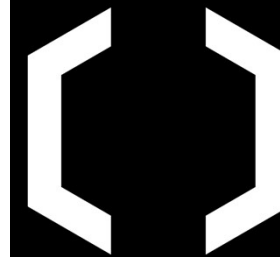
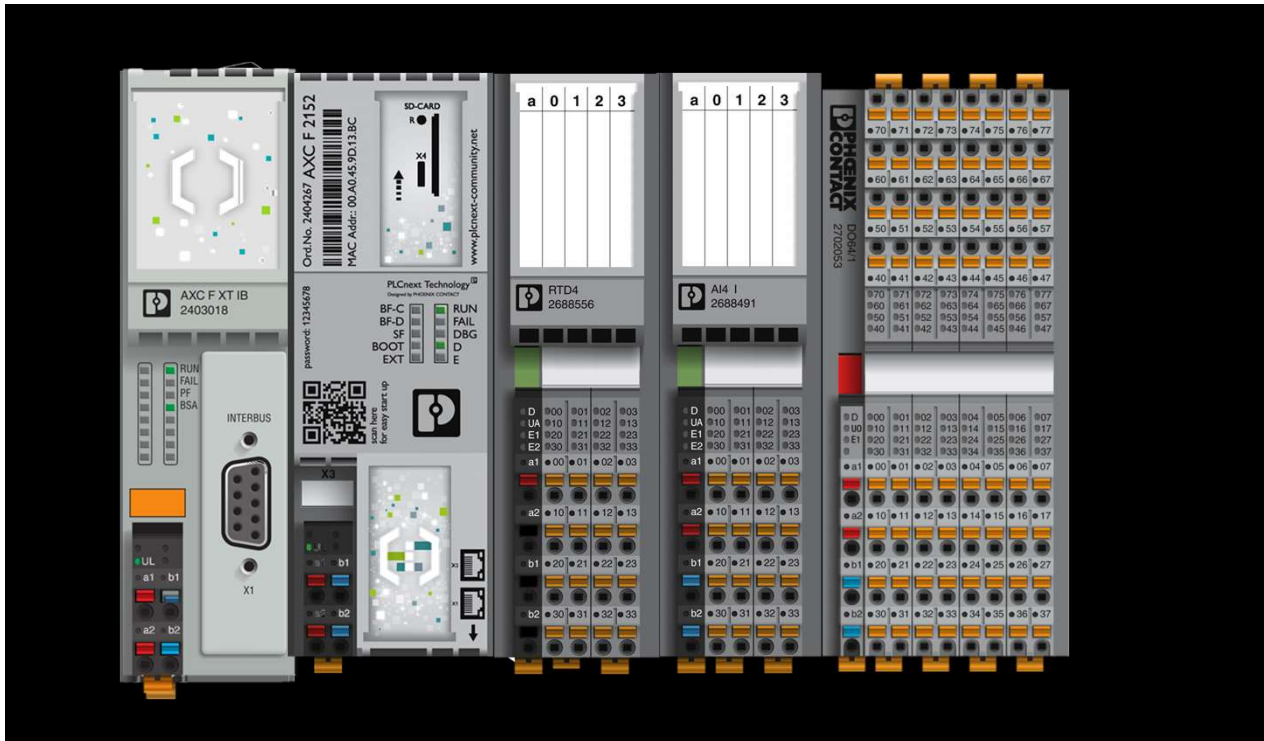
Countless possibilities in hardware variance

PLCnext Control

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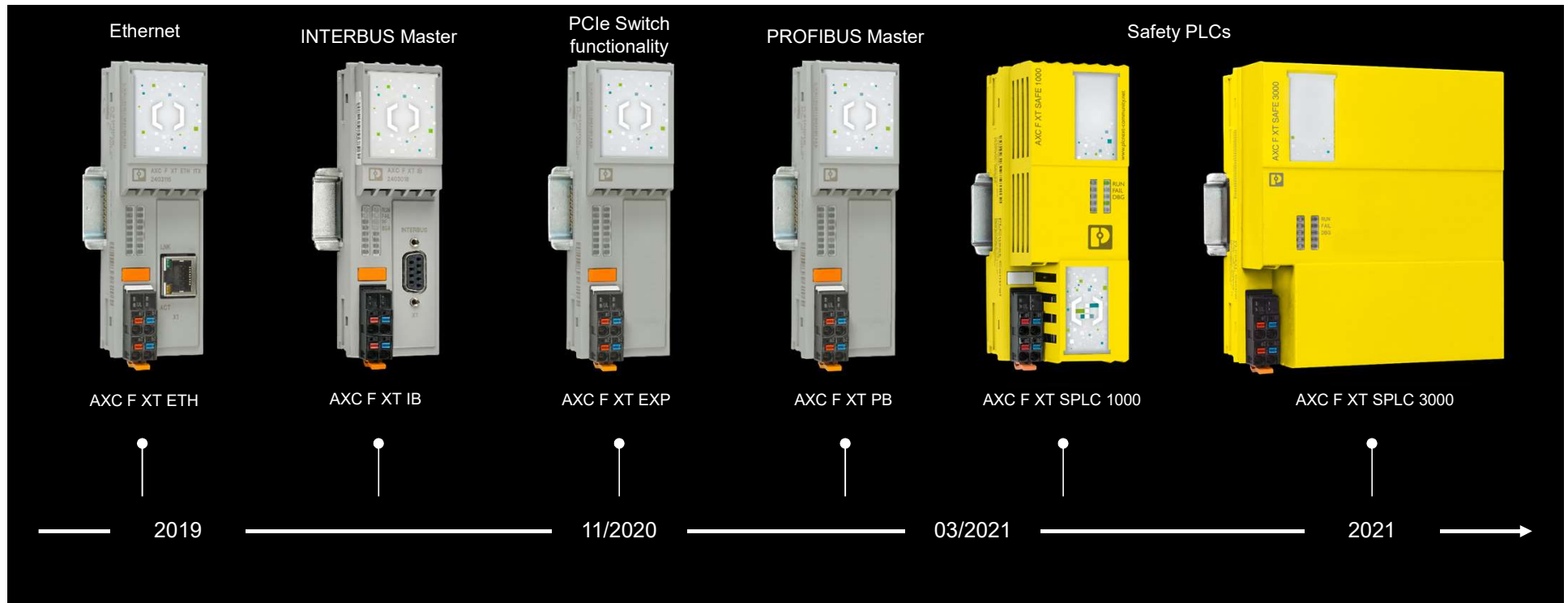
Left-hand side extension possibilities



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

PLCnext Ecosystem – PLCnext Control

Portfolio PLCnext Control Extensions



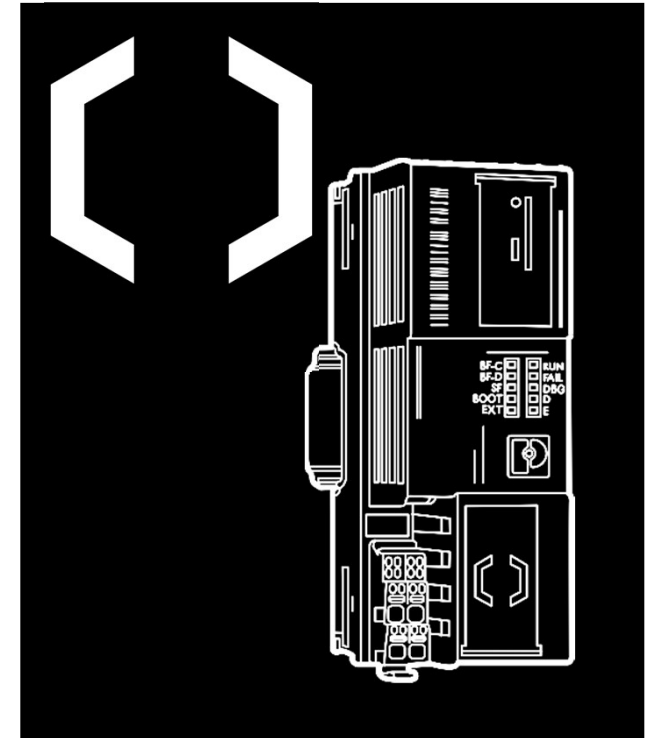
PLCnext Control

PLCnext Extension AXC F XT IB

PLCnext Technology 
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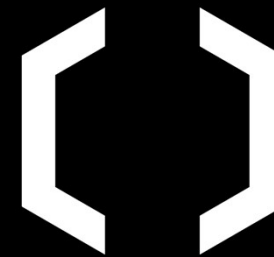
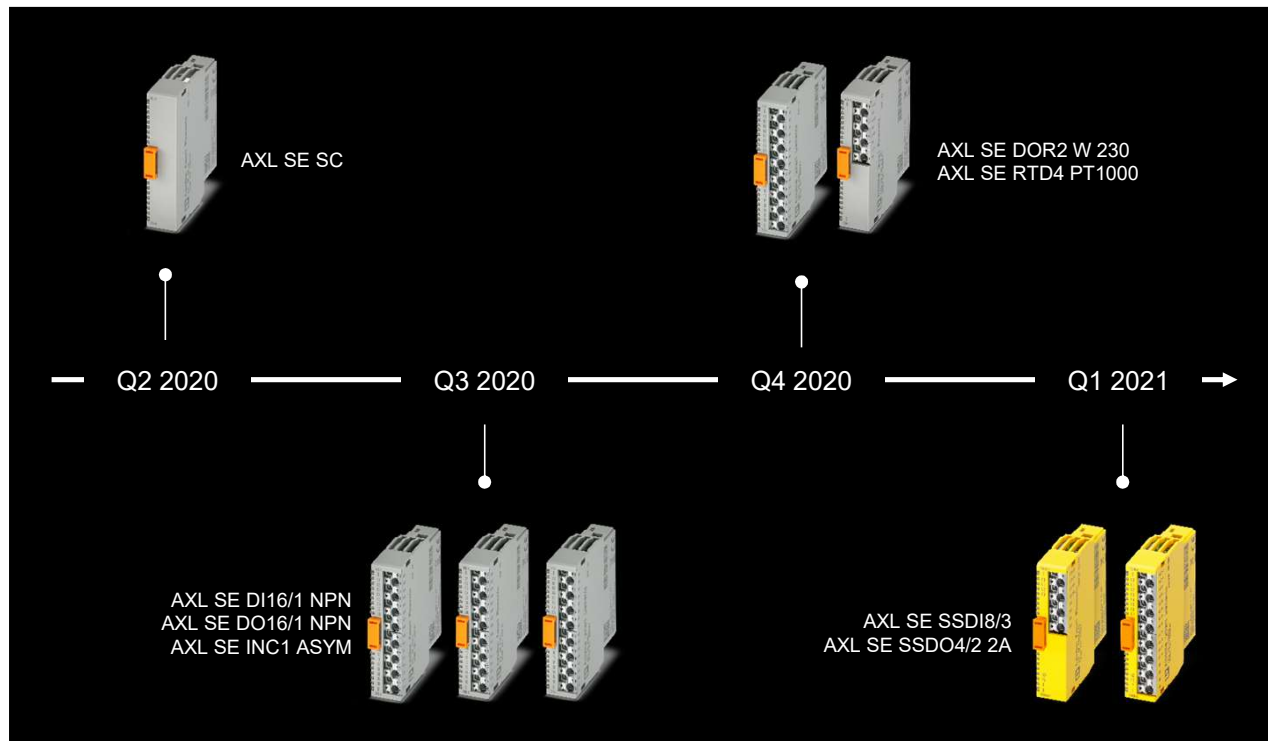


- Additional INTERBUS Master
- Up to 512 Devices, up to 255 Remote Devices
- Up to 126 PCP Devices
- Up to 16 Remote Bus Level
- 4096 Bit Process data
- 500kBit und 2 Mbit
- Ideal for Retrofit applications
- Approvals
 - UL (Hazloc), CUL, IEC Ex, ATEX
 - DNV/GL, LR, BV, ABS, ...
- Temperature range: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



Axioline Smart Elements

More to come

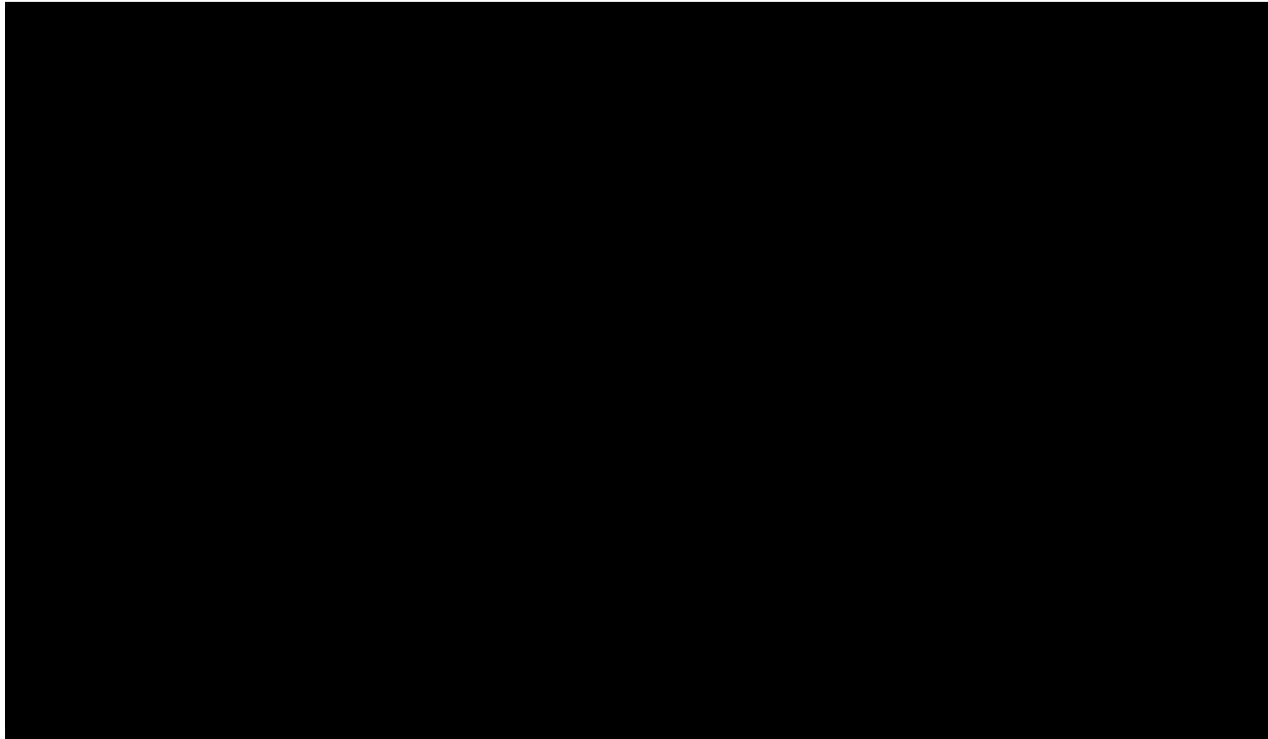


Be always up to date with the
[I/O systems & light community](#)
at the PC World.

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

PLCnext & Axioline Smart Elements

Modular automation system

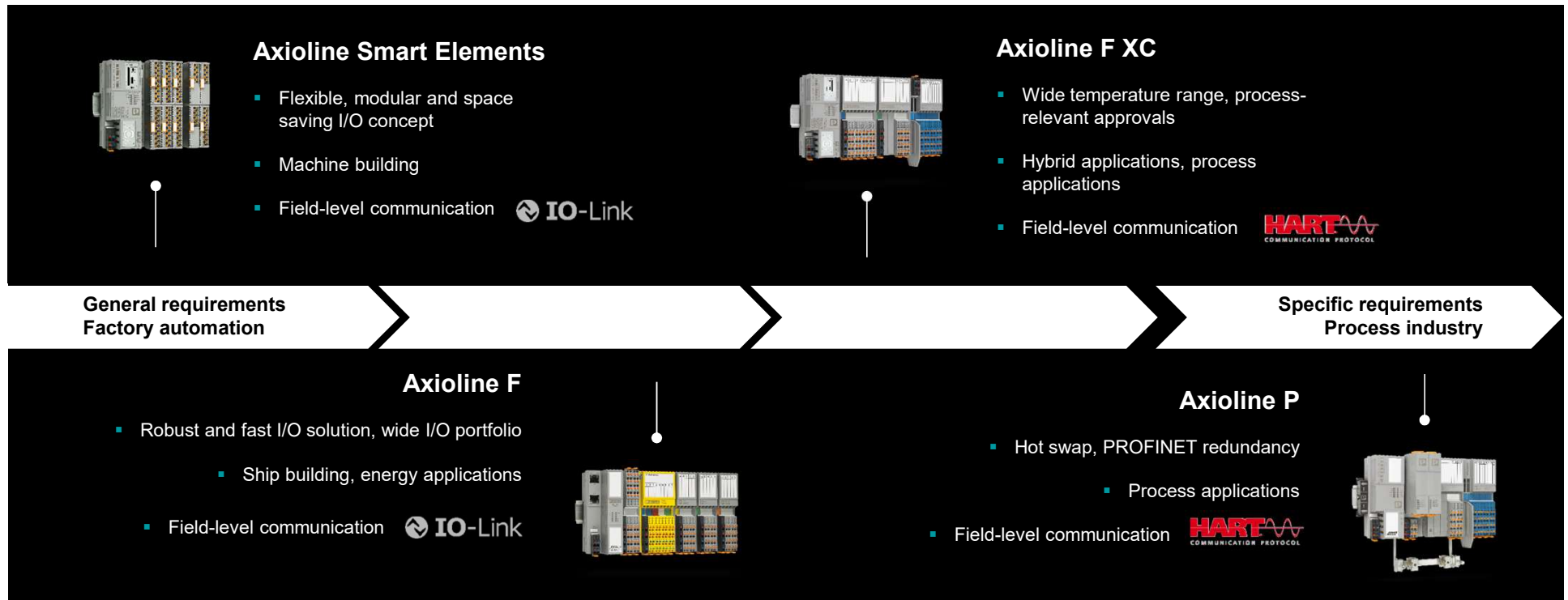


- Scalable automation system for simple to complex assignments
- Large selection of modules according to the modular system principle
- Optimal complement to PLCnext Control
- All components are part of the COMPLETE line system

PLCnext Technology[®]
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COMPLETE line

Overview – Axioline IP20 I/O systems



PLCnext Technology[®]

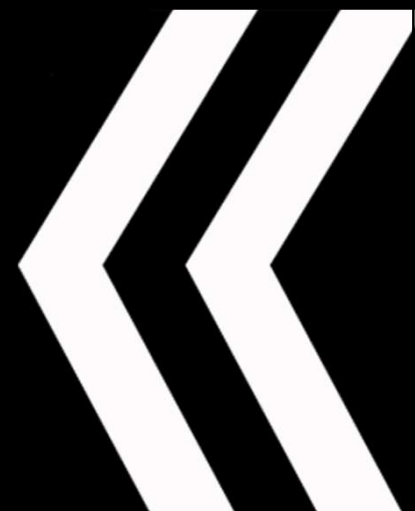
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PLCnext Engineer modular software platform



PLCnext Engineer

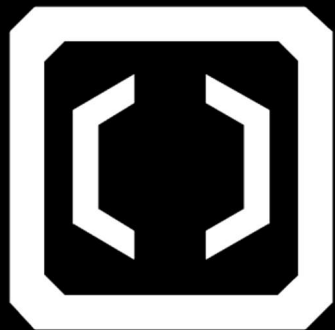
Speed up your
application development



PLCnext Technology[®]

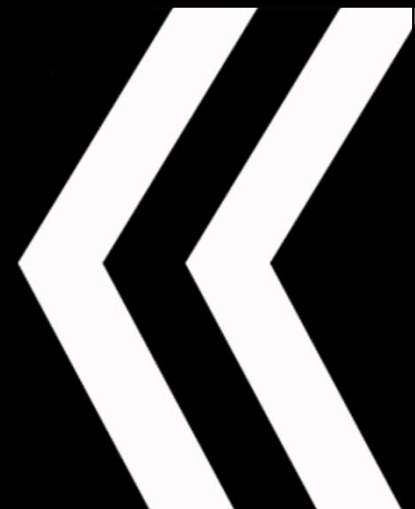
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Install limitless possibilities



PLCnext Store

Install limitless possibilities



PLCnext Ecosystem – PLCnext Store

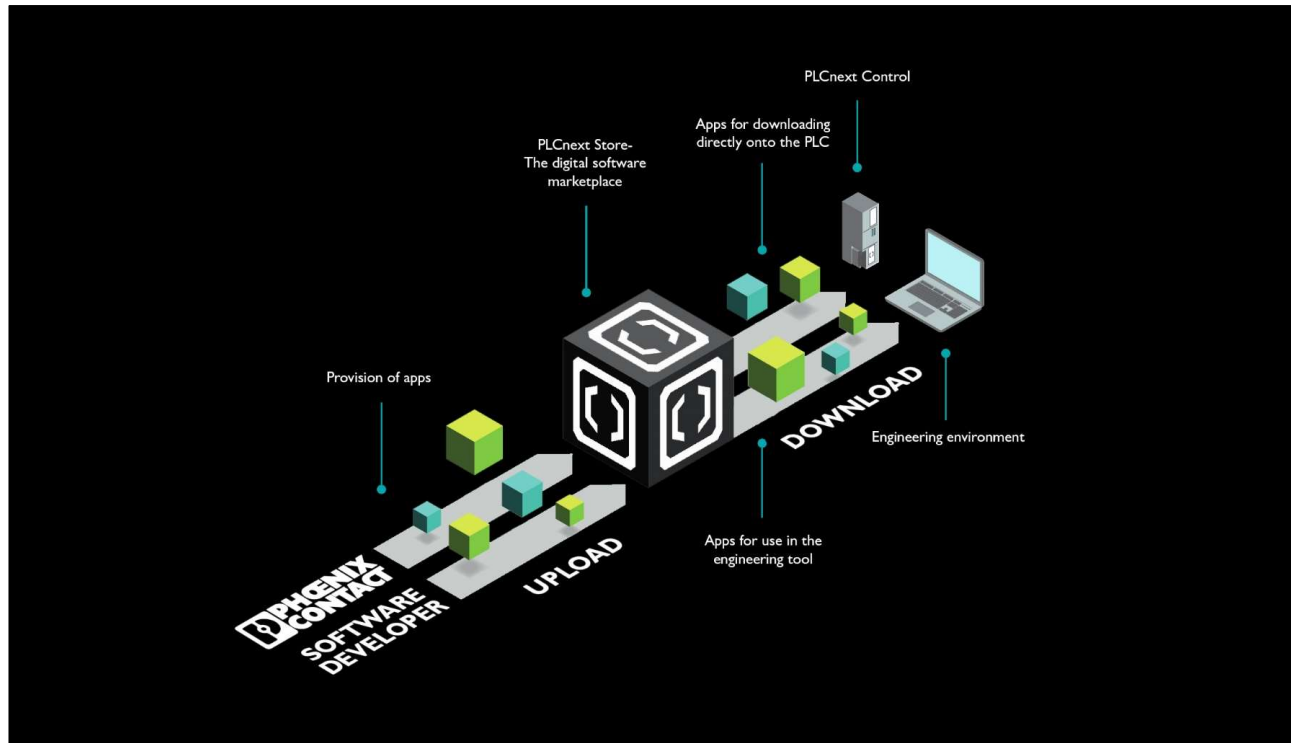
PLCnext Store



PLCnext Ecosystem – PLCnext Store

PLCnext Store

PLCnext Technology 
Designed by PHOENIX CONTACT



Benefits & Added Values



Automation ecosystem

- Open ecosystem for the distribution of Apps for PLCnext Controls
- Flexible integration of Open Source software and Apps

World of Applications

- Extends the PLC with the openness and flexibility of smart devices
- App variety from different vendors
- Apps suitable for your needs

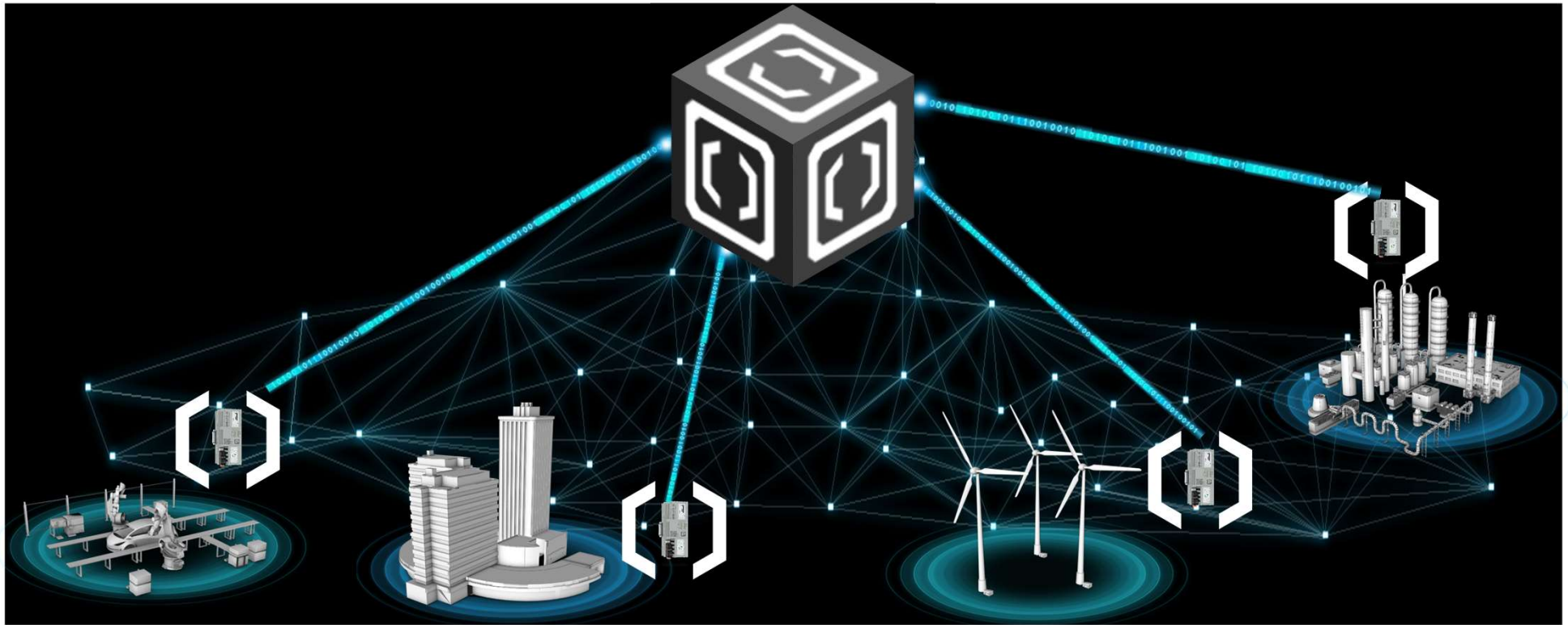
Faster solution building

- Apps as ready to use solutions
- No programming, only parameterizing
- Plug & Work: customize your PLCnext Controller in minutes

PLCnext Store – Digital Marketplace for Limitless Automation

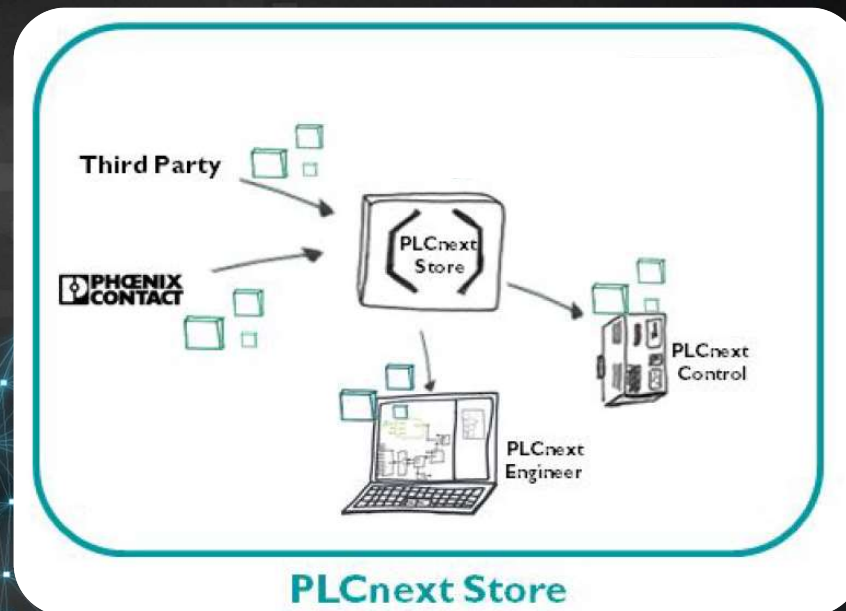
PLCnext Technology 
Designed by PHOENIX CONTACT

Ready-made Solutions



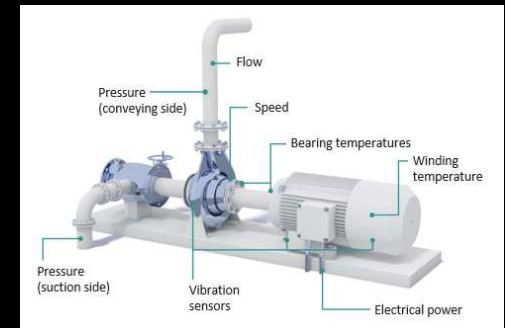
What is an App?

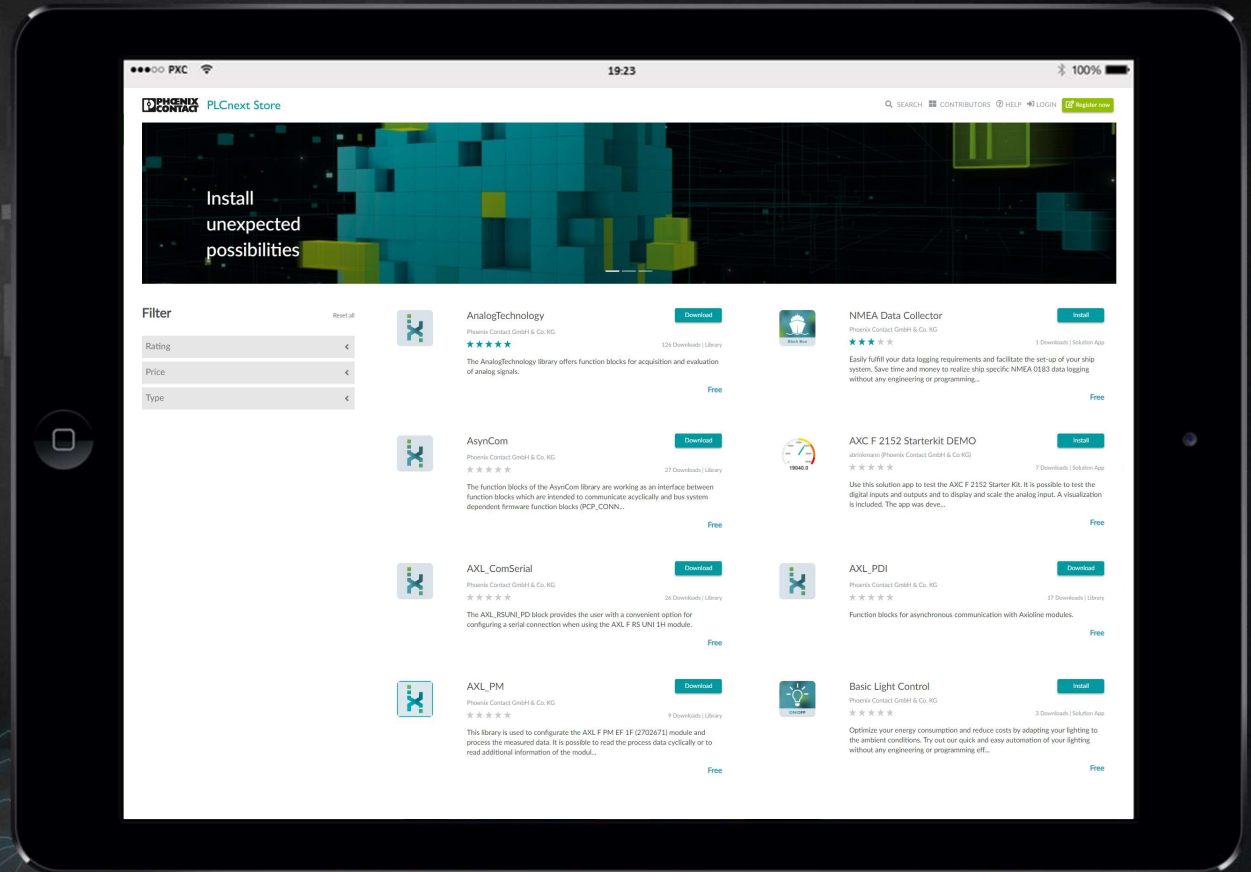
Application packages for
industrial automation solutions



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

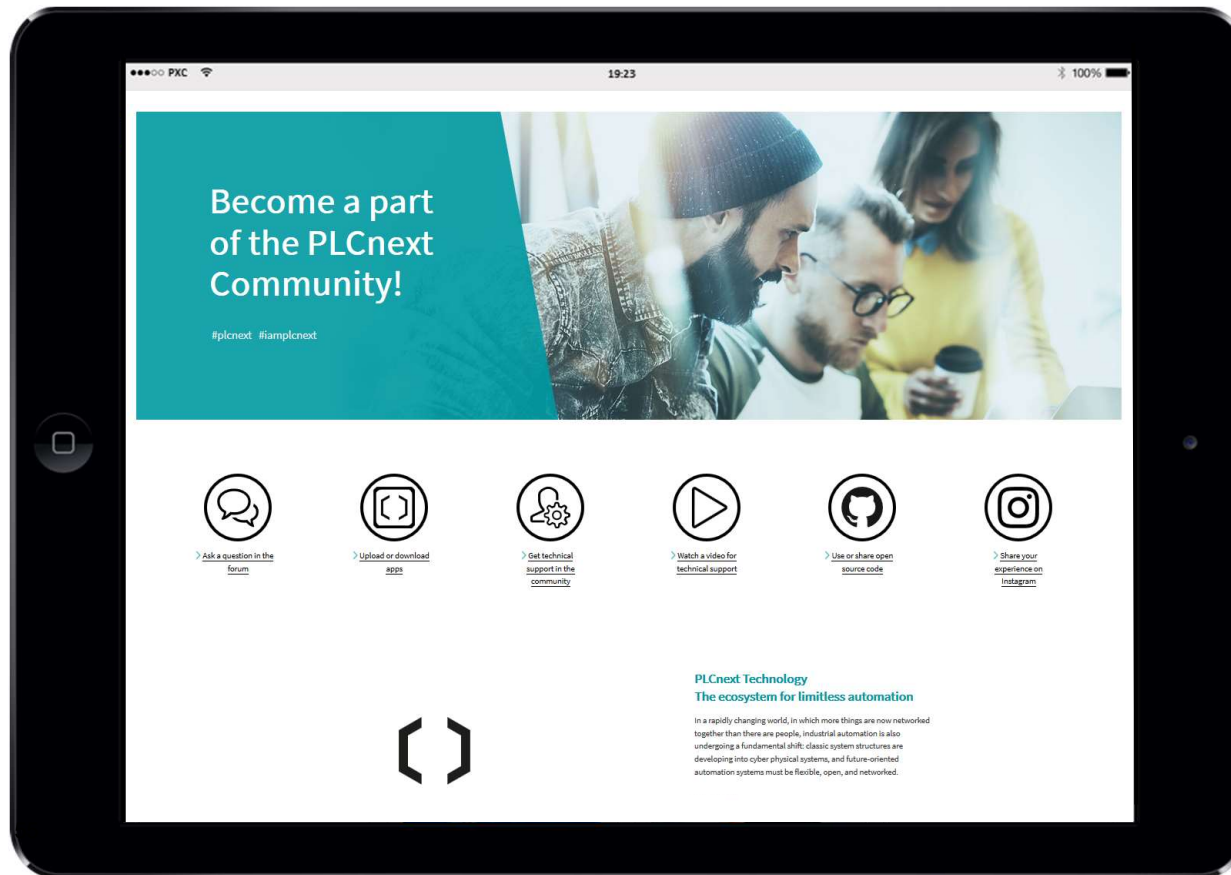




PLCnext Store – Digital Marketplace for Limitless Automation

PLCnext Technology 
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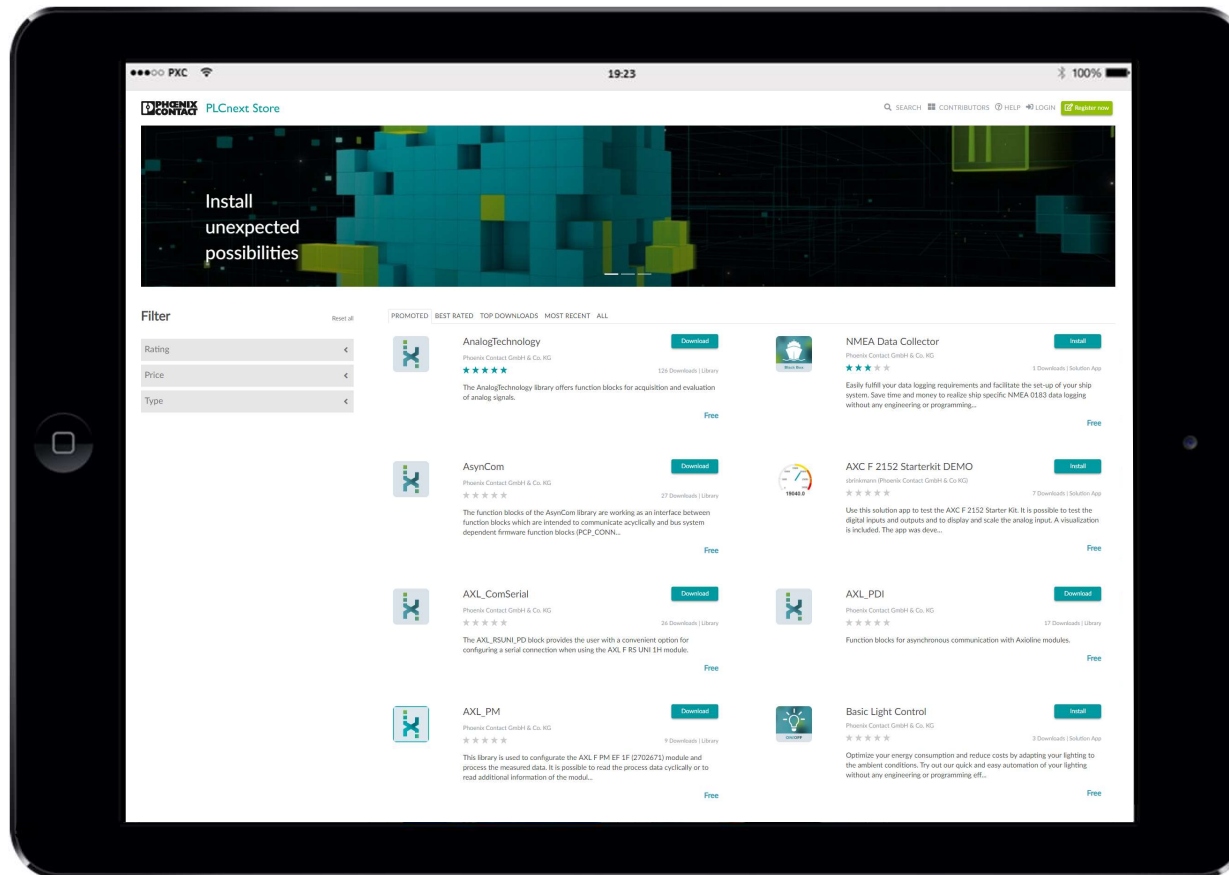
Pump Station Example: Navigate to the PLCnext Store



PLCnext Store – Digital Marketplace for Limitless Automation

PLCnext Technology 
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Pump Station Example: Register and browse PLCnext Store



4. Install



3. Purchase

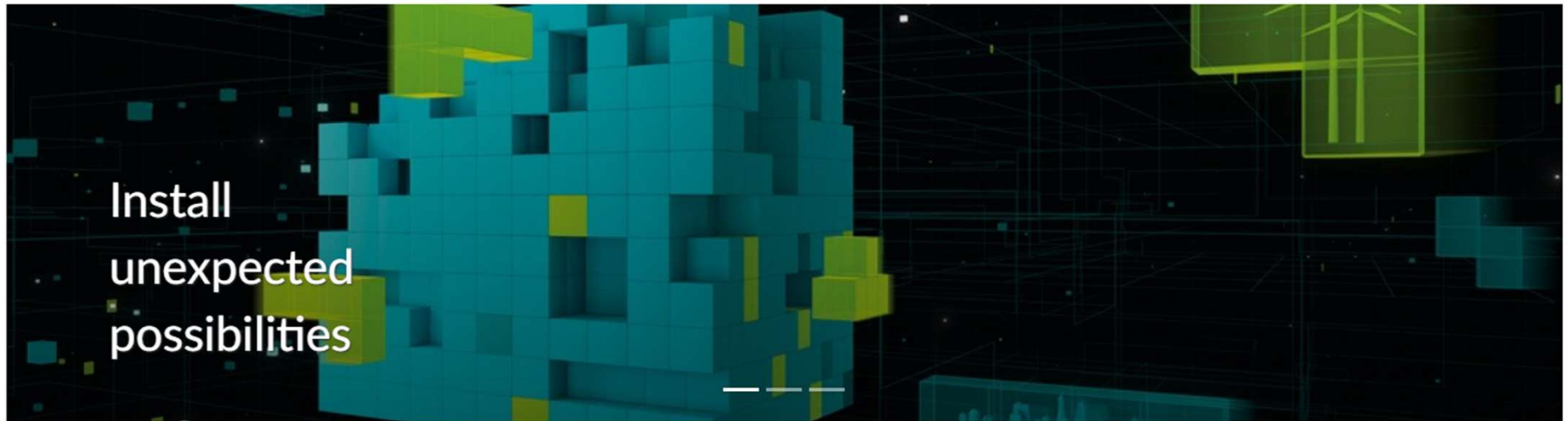


2. Assign



1. Register





MLnext Framework

Get it

Phoenix Contact GmbH & Co. KG

NEW | Library

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...

Free



MLnext Framework

by Phoenix Contact GmbH & Co. KG

Library | Version: 0.1.1



Install

no license required



Download

import in PLCnext Engineer



Contact

the app developer

Price per License

Free - 0.00€

Download this PLCnext Engineer library and import it to use in as many projects as you like. No license required.

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:

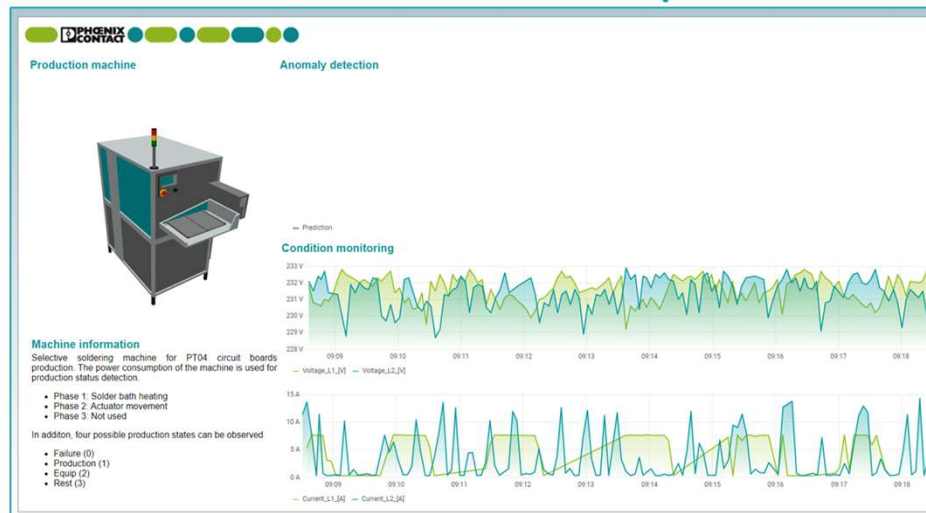
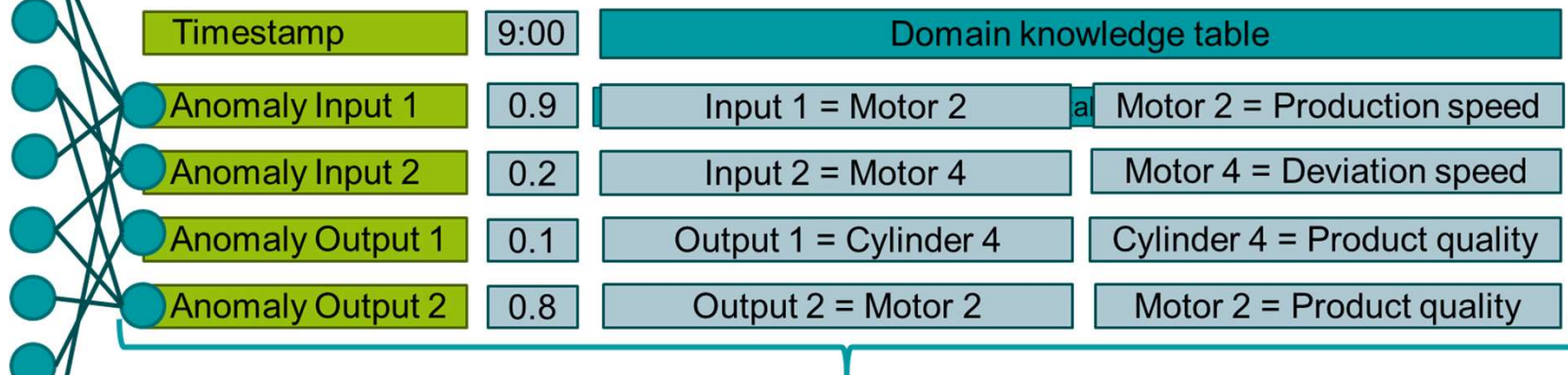
- For data loading and manipulation: `import mlnext.data`
- For loading and saving files: `import mlnext.io`
- For data preprocessing: `mlnext.pipeline`
- For data visualization: `mlnext.plot`
- For model evaluation: `mlnext.score`

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

? Support

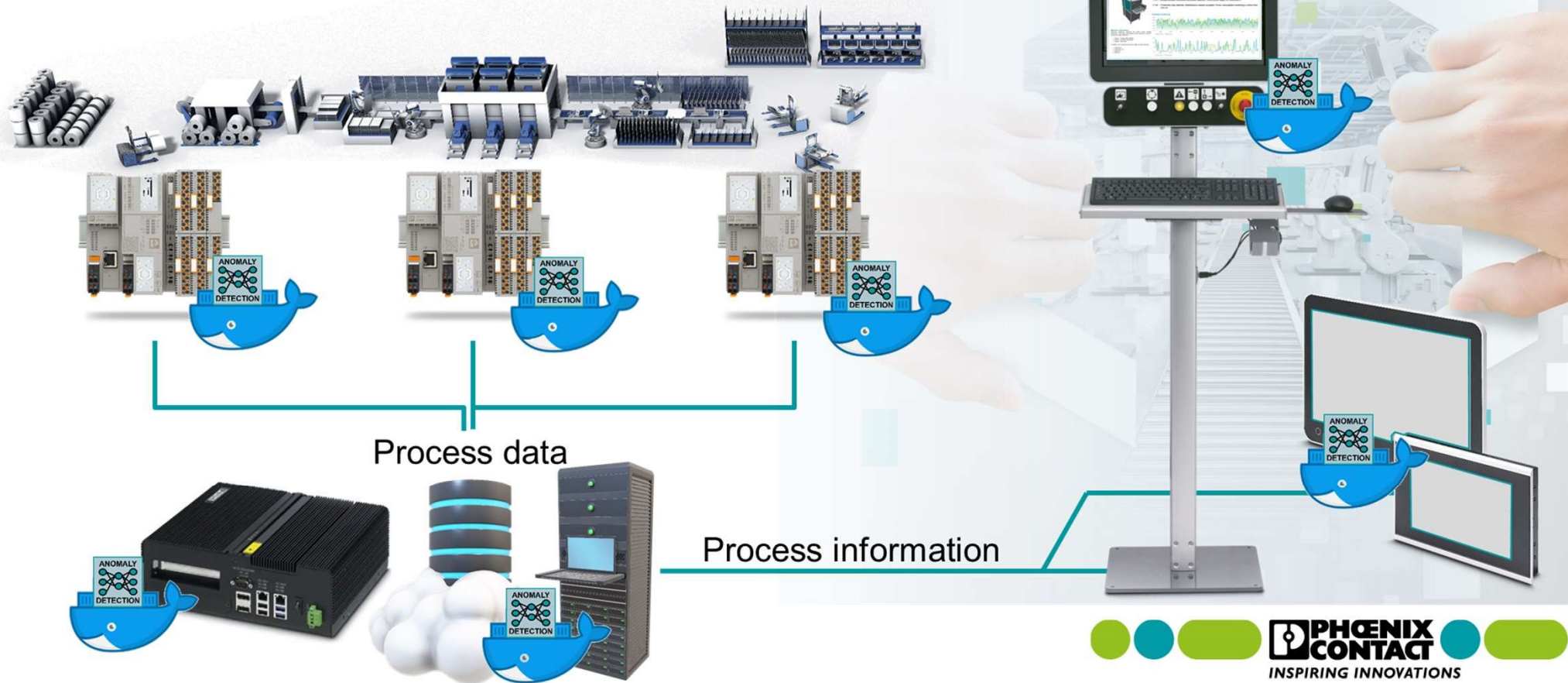
Anomaly Detection

Digital Factory now



Data collection, storage and evaluation | Basic training

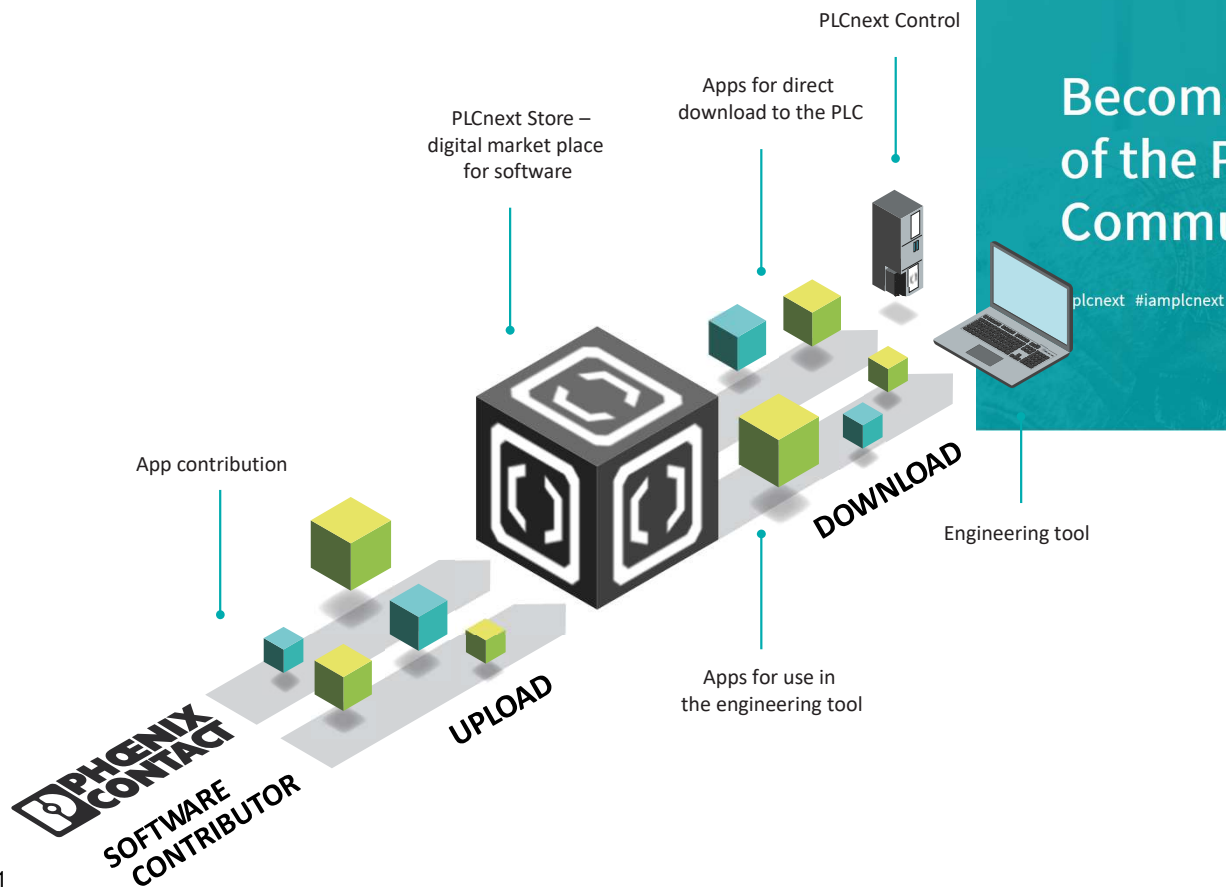
Scalable topology



PLCnext Store – Digital Marketplace for Limitless Automation

PLCnext Community

PLCnext Technology 
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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



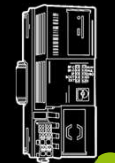
3

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)

PLCnext Ecosystem – PLCnext Store

PLCnext Store








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Ecosystem & PLCnext Store

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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>



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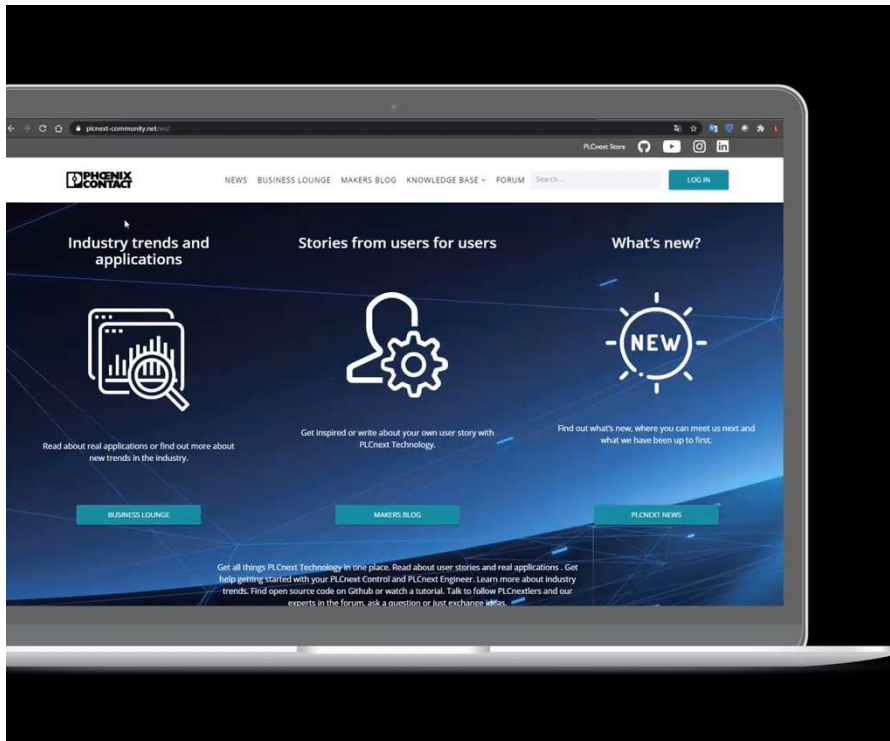
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PLCnext Community website

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

- Forum
- FAQ
- Infocener
- MakersBlog
- Business Lounge

plcnext-community.net

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Use GIPHY Brand Channel

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



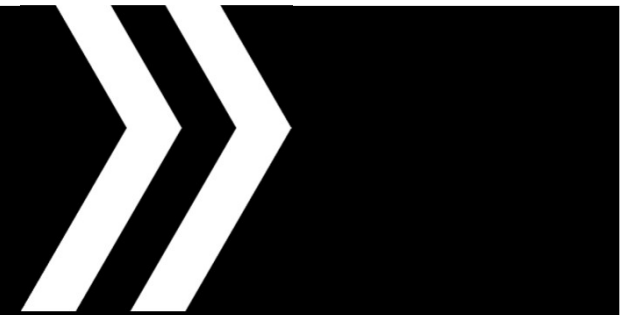
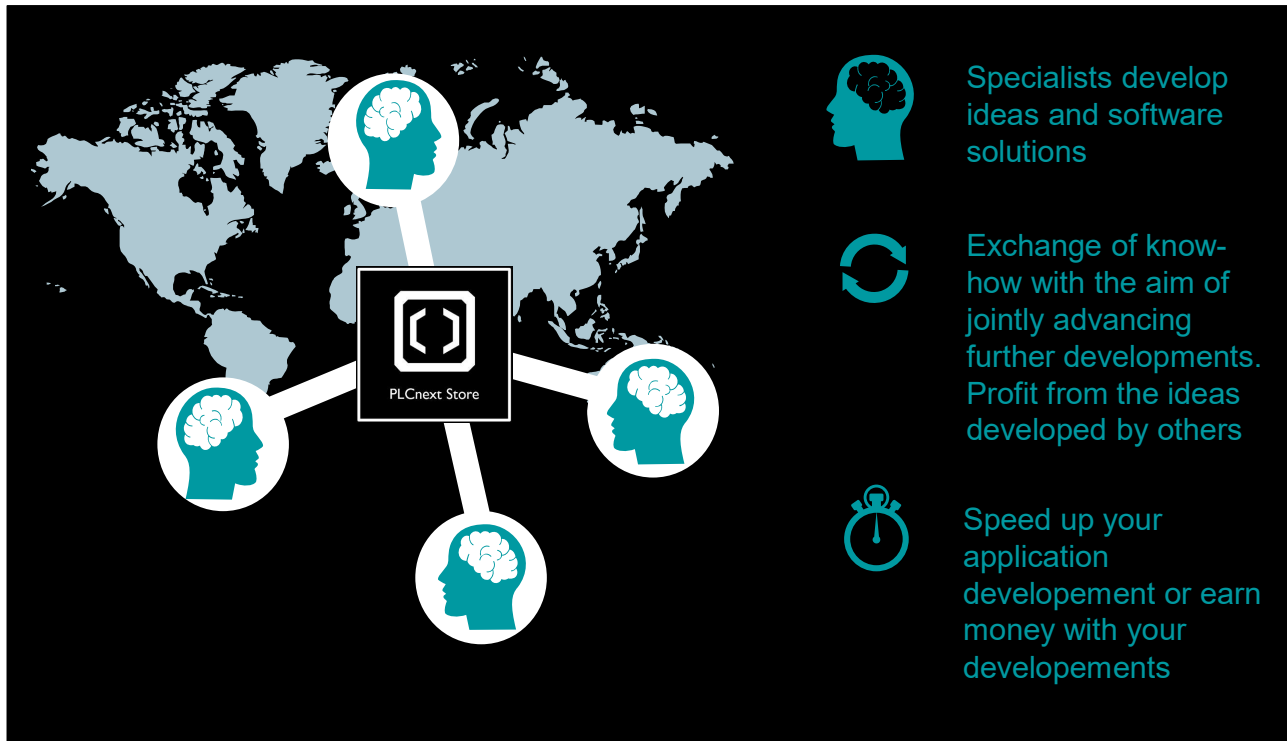
Join Live Q&As

eg. on Instagram

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Benefit from Crowd Knowledge

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Market leadership requires speed

We need to make use of Crowd Knowledge



Use AI in Manufacturing for Increased Productivity

Yuhang Gao

Google Cloud Evangelist

Using AI in manufacturing for increased productivity by Google Cloud