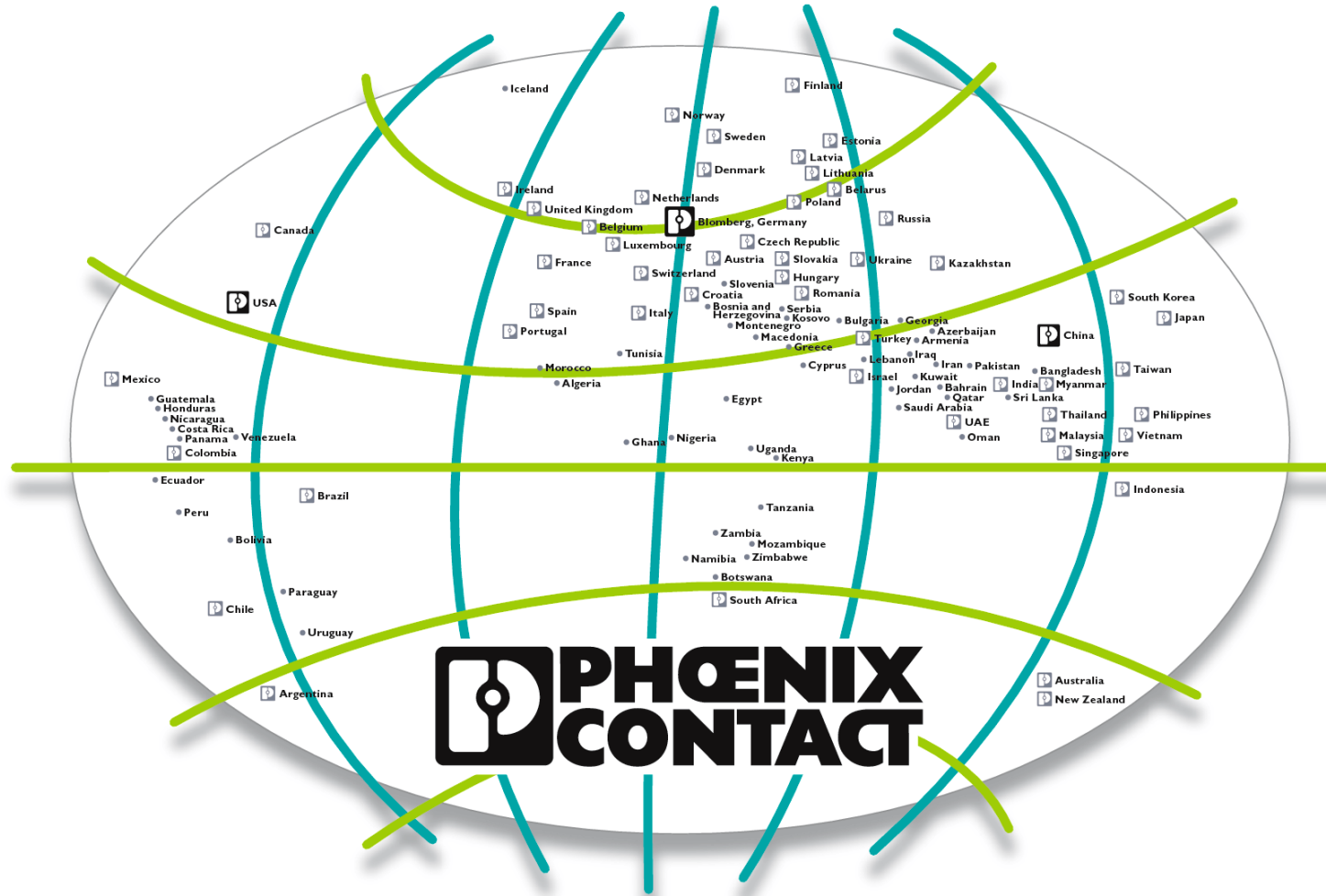


Grant Vandebrake – Industrial Security and Network Services

Next Generation Device Security at Purdue Level 1



Next Generation Device Security at Purdue Level 1

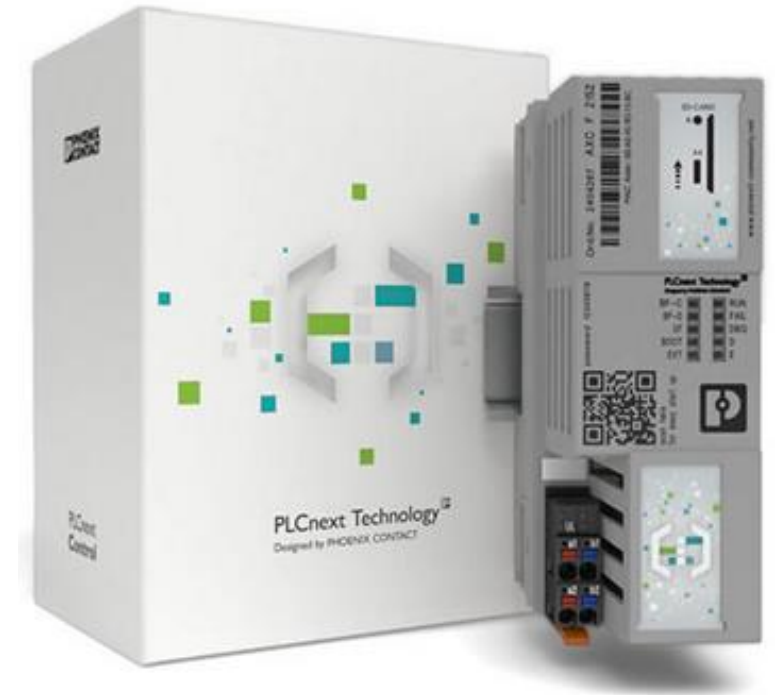
Industrial Security and Network Services



Lead Solutions Engineer –
Industrial Security and Network
Services

Agenda

- Brief Background on Level 1 Devices
 - What do you run into?
- Traditional Security Techniques
 - How Do I Secure it?
- Current Changes and Advancements
 - New Capabilities and Challenges?
- PLCnext Technology from Phoenix Contact
 - A New Toolbox at your Disposal!

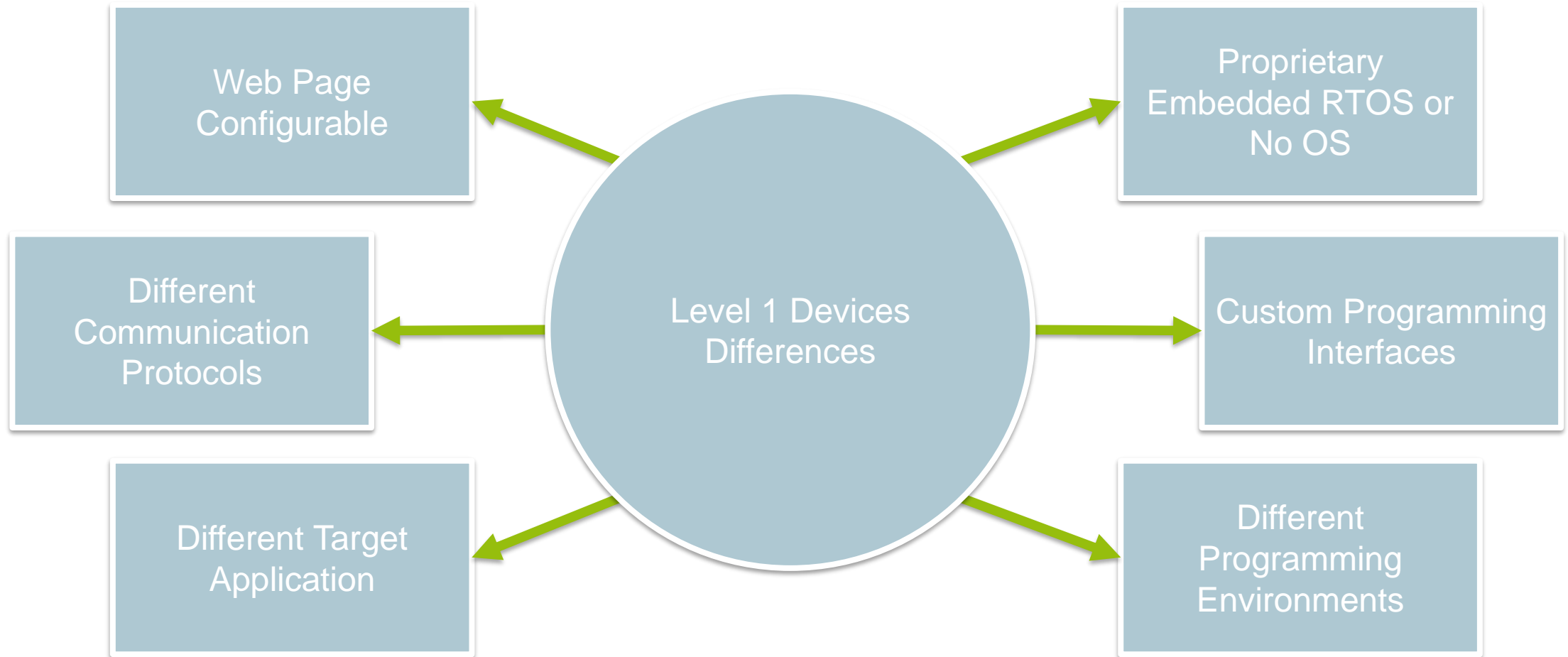


Brief Background on Level 1 Devices

A Crowded Space



The Difference is the Commonality



The Security Challenges

- Securing an RTOS that is proprietary
- Many different RTOS or OS depending on device
- Multiple physical communication interfaces
- Multiple communication protocols
- Valid inputs from sensors and I/O
- Protecting PLC code
- Updating the firmware in a running process
- Protecting web interfaces
- Physical Safety Considerations
- And many more....



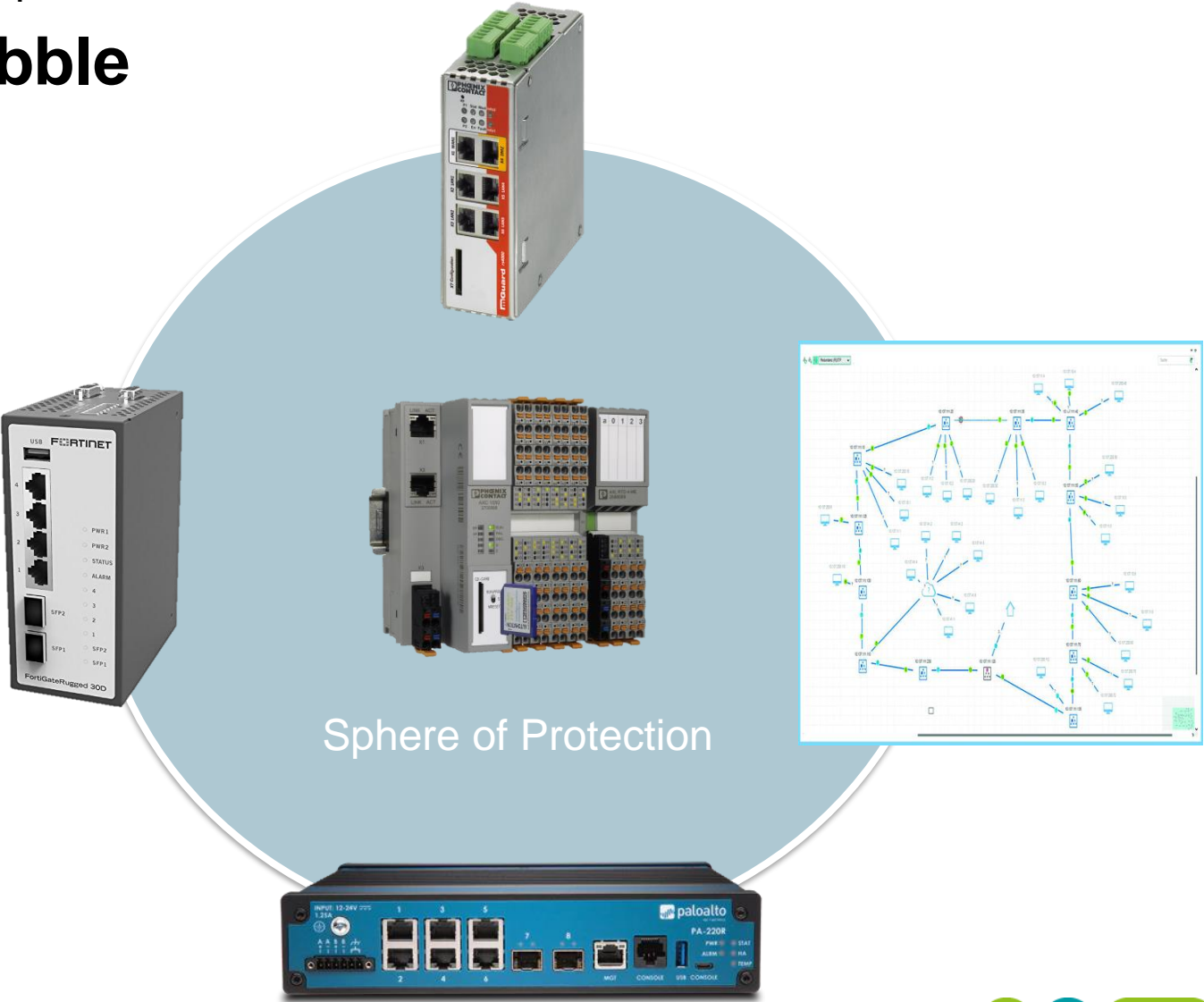
Traditional Security Techniques

What have we been doing?



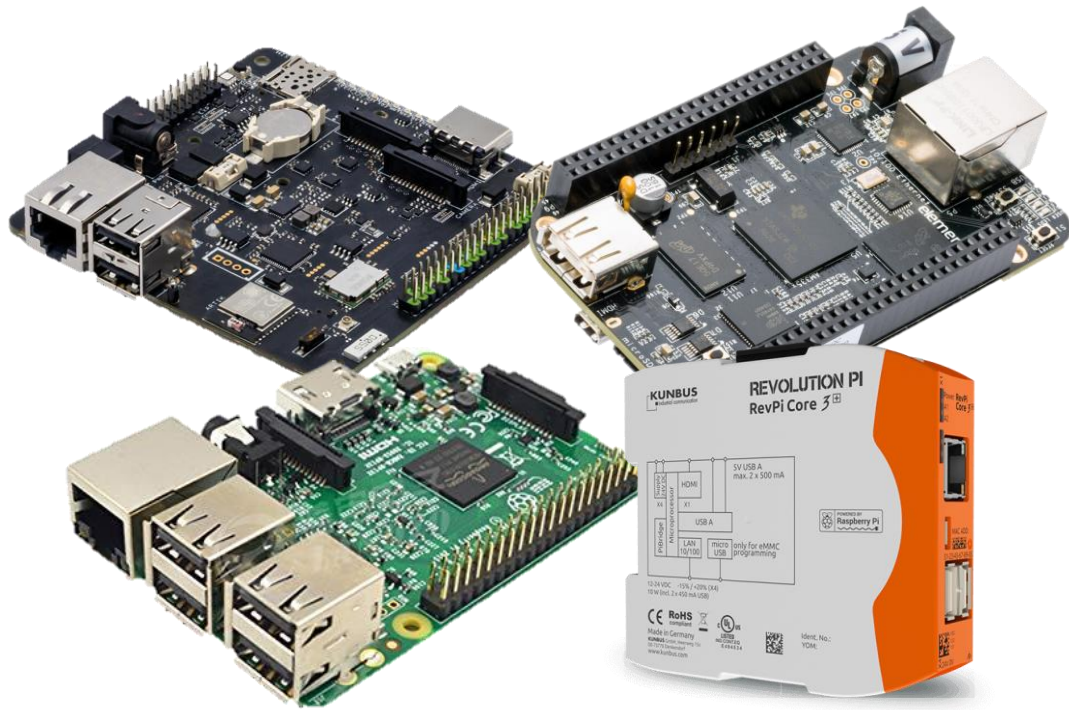
Traditional Security Techniques

Building the Bubble



Current Changes and Advancements

IoT adding capabilities and complexity



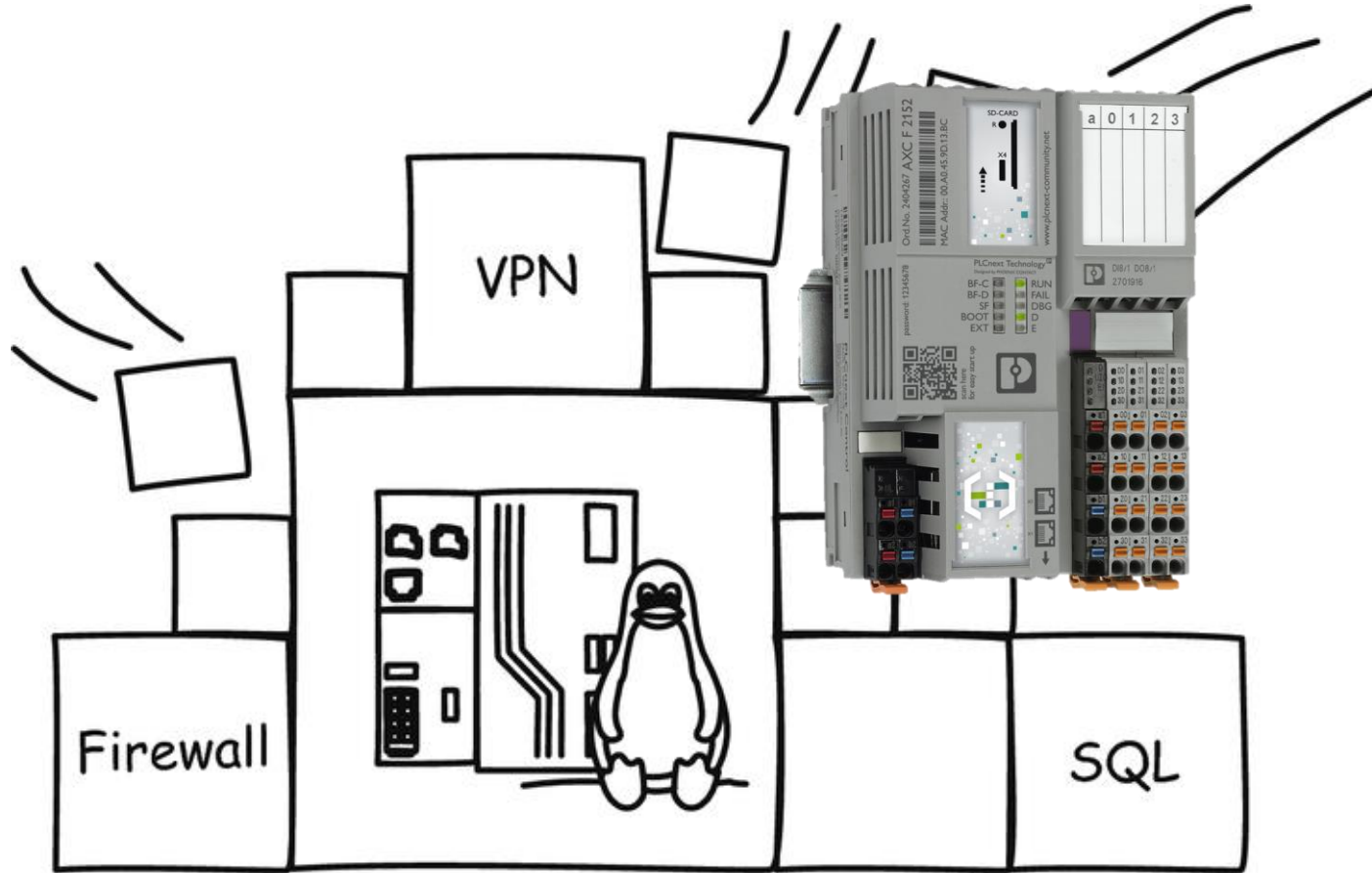
Capabilities

- Linux operating system
- Can utilize common utilities for security
- Pre-installed software for flexibility
- Ability to leverage open-source
- Common programming languages supported
- Large communities for support

Complexity

- Not designed for Realtime
- Application is built from ground up

What is PLCnext? – Combining The Worlds



PLCnext Technology is based on Linux...

- Utilize all standard Linux OS features

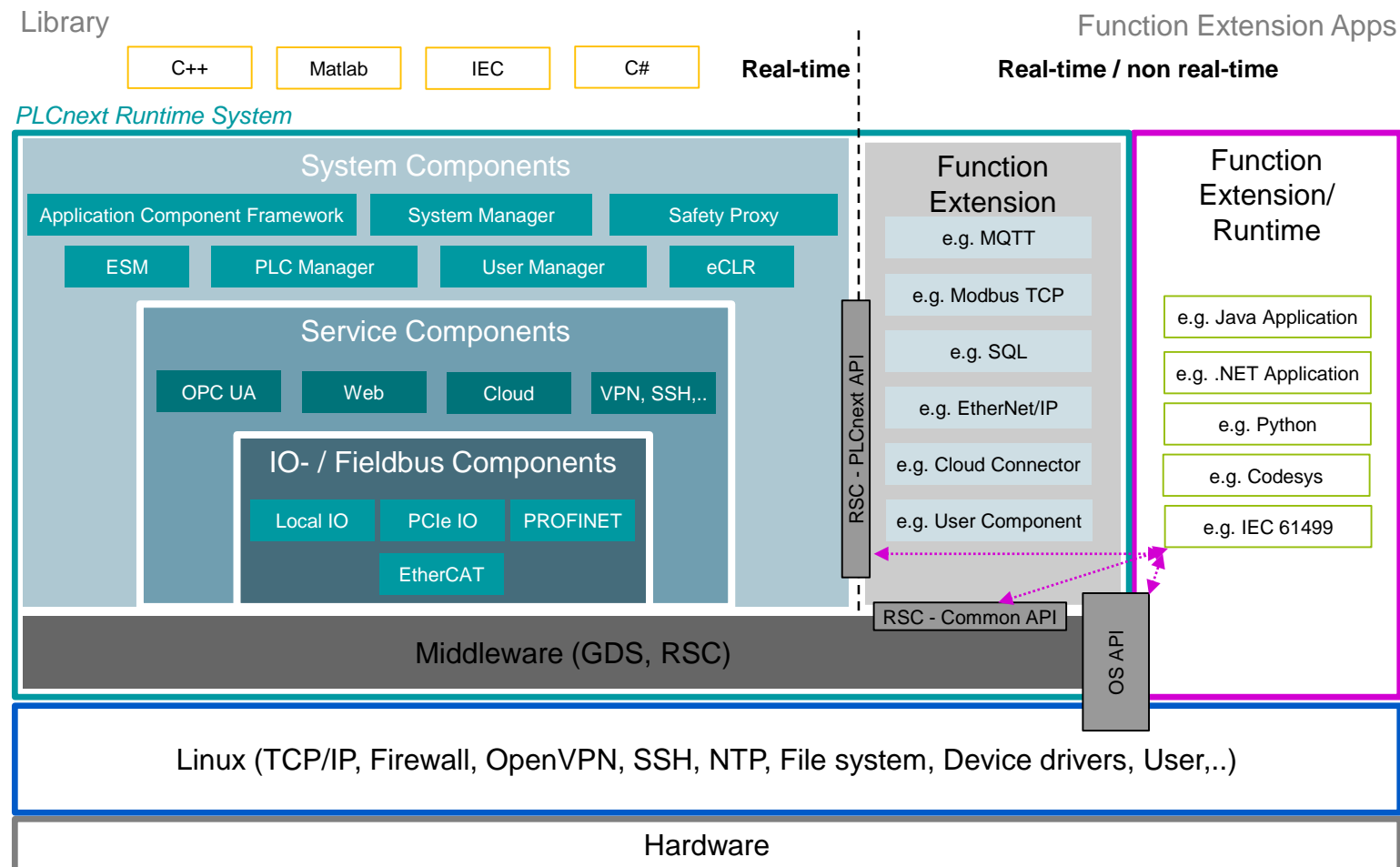
... but performs as a “classic” PLC!

- Easy task management
- Precise synchronization
- Cycle-consistent data exchange
- No Linux knowledge needed

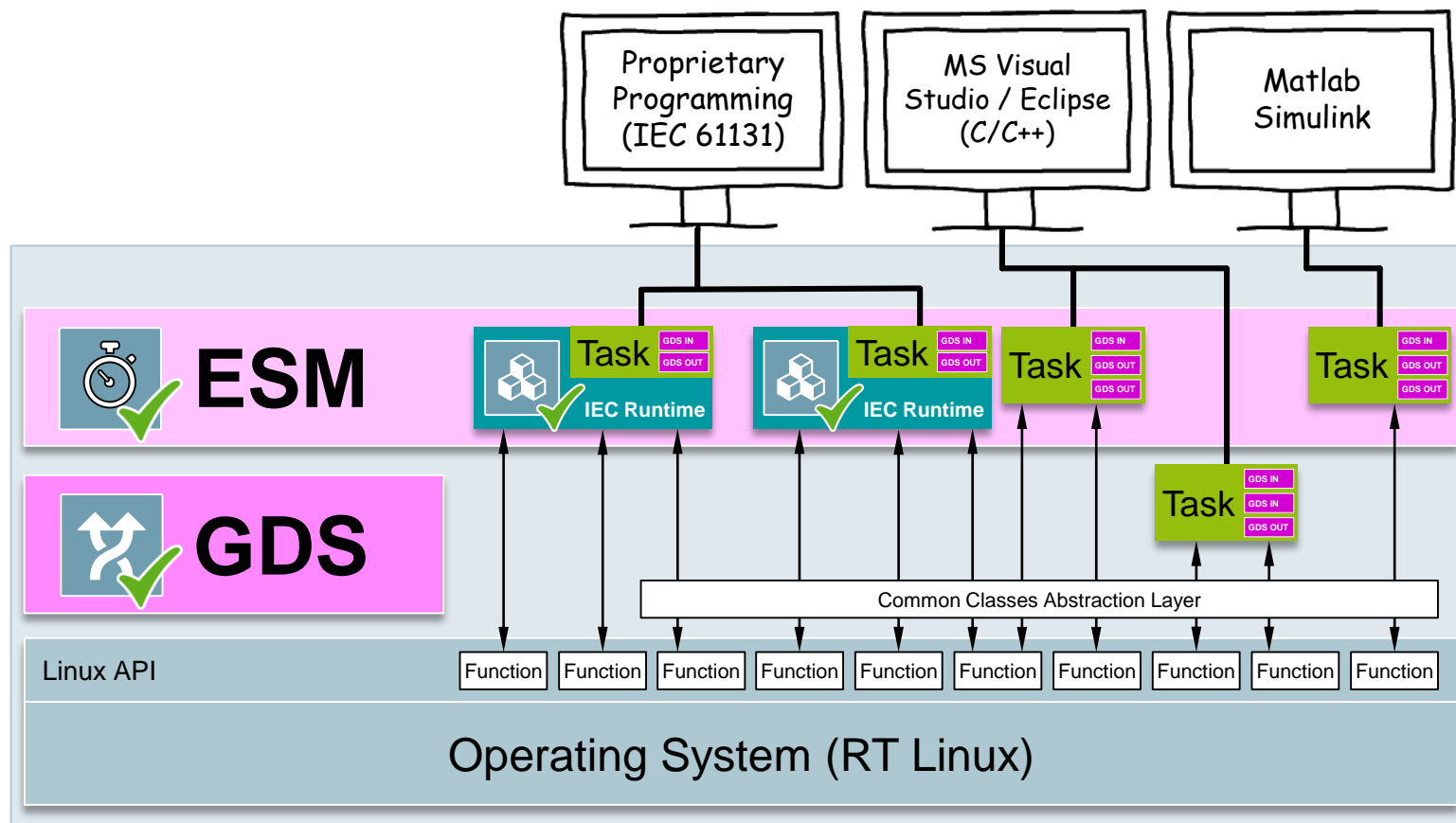
PLCnext Runtime System Architecture

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)



PLCnext Technology Architecture Advantages



- No vendor dependency
- Combined use of IEC 61131, standard languages, and model-based programs
- Built-in real-time and data consistency for IEC 61131 and standard languages
- OS API access

PLCnext Technology from Phoenix Contact

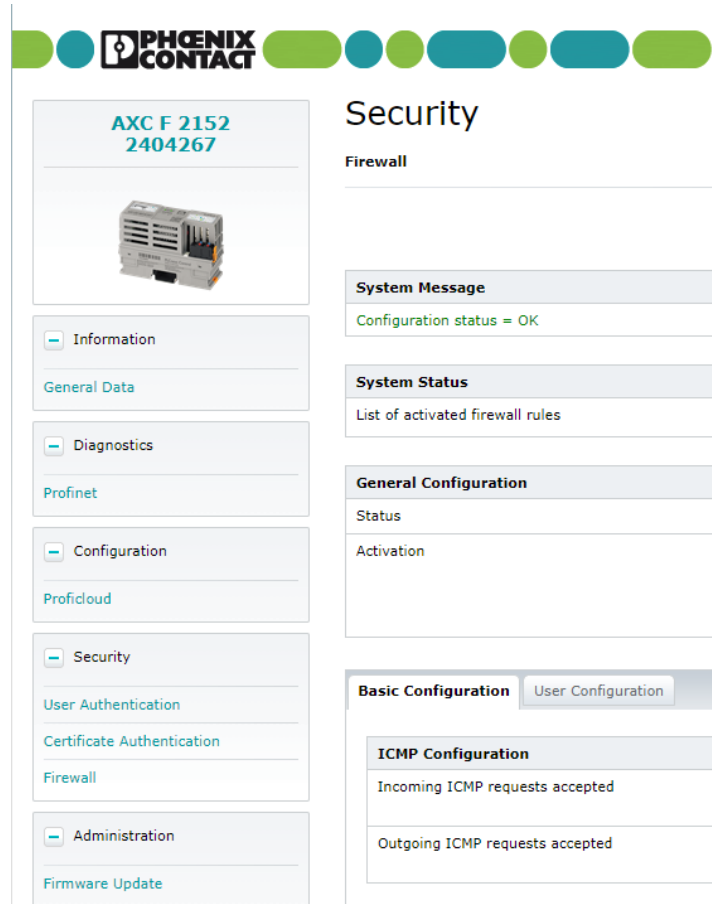
Bringing IT and OT Together

What does this provide to you?

- Use of Standard Programming Languages
- Realtime Scheduling of non IEC code
- Ability to Script via Bash or Python
- Integration of self-developed & open source software
- Open, nonproprietary control architectures / platforms
- Integrated security concepts
- ...



Security Features Summary – PLCnext Runtime System 2020.0



Communication

- Support for SFTP, IPsec / SSL VPN, HTTPS, SSH.....
- OPC UA with security support

Authentication

- Local role-based user management
- Certificate handling via crypto store
- Support for authentication via LDAP

Integrity

- Hardware design with TPM to store manufacturer's roots of trust
- Security architecture: configurable Linux using Yocto build system
- Configurable Firewall that utilizes nf-tables

IEC 62443-4-1 Secure Product Development Lifecycle Certificate

ZERTIFIKAT • CERTIFICATE • CERTIFICADO • CERTIFIKAT • 認證證書



CERTIFICATE
No. Q4B 029429 0007 Rev. 00

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

Factory(ies):
PHOENIX CONTACT Electronics GmbH
Industry Management and Automation
Business Unit Control Systems
Dringenauer 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.: 18CR01S007
Valid until: 2021-07-29
Date: 2018-08-01


Page 1 of 1
TÜV SÜD Product Service GmbH • Certification Body • Ridlerstraße 65 • 80339 Munich • Germany





ID	Requirement	Maturity Level
Practice 1 – Security Management		
SM-1	Development Process	3
SM-2	Identification of Responsibilities	2
SM-3	Identification of Applicability	2
SM-4	Security Expertise	2
SM-5	Process Scoping	2
SM-6	File Integrity	2
Practice 2 – Specification of Security Requirements		
SR-1	Product Security Context	2
SR-2	Threat Model	2
SR-3	Product Security Requirements	2
SR-4	Product Security Requirements Content	2
SR-5	Security Requirements Review	2
Practice 3 – Secure by Design		
SD-1	Secure Design Principles	2
SD-2	Defense In Depth Design	2
SD-3	Security Design Review	2



PLCnext Technology from Phoenix Contact

PLCnext Technology 
Designed by PHOENIX CONTACT

The Open Ecosystem for Limitless Automation

PLCnext Technology 
enhance your automation thinking

PLCnext Control



Open Control Platform

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

PLCnext Engineer



Engineering Software

Engineering tool for commissioning, configuring, and programming PLCnext Controls

PLCnext Store



Software Store for Automation

Apps for functional extension of PLCnext Control and PLCnext Engineer

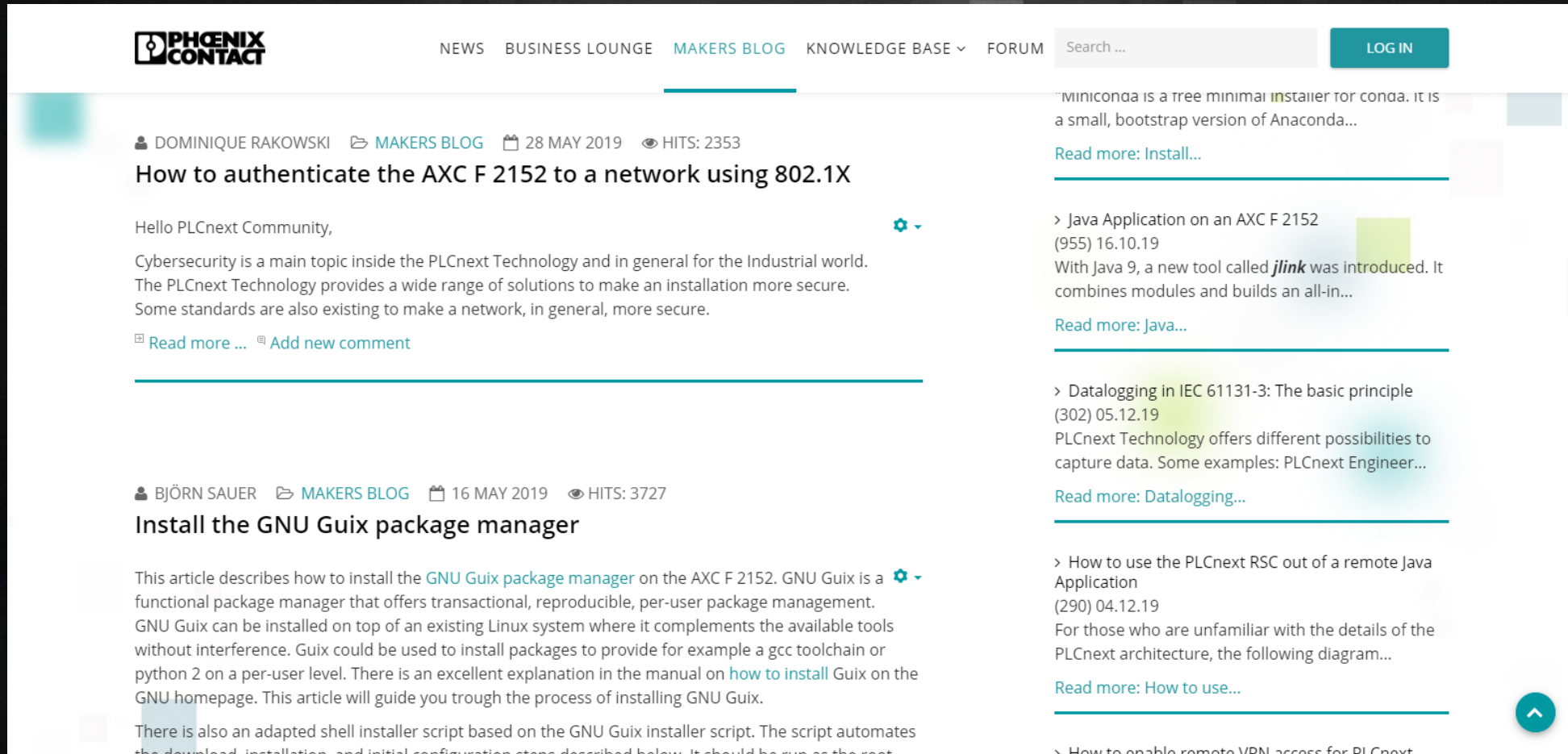
PLCnext Community



User Collaboration & Resources

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

The PLCnext Community



The screenshot shows the PLCnext Community website. The header includes the Phoenix Contact logo, navigation links (NEWS, BUSINESS LOUNGE, MAKERS BLOG, KNOWLEDGE BASE, FORUM), a search bar, and a LOG IN button. The main content area features two blog posts. The first post, by Dominique Rakowski, is titled 'How to authenticate the AXC F 2152 to a network using 802.1X' and includes a greeting and a paragraph about cybersecurity. The second post, by Björn Sauert, is titled 'Install the GNU Guix package manager' and describes how to install Guix on the AXC F 2152. A sidebar on the right lists additional articles, including one about Miniconda and another about Java applications. A 'Read more' link is visible at the bottom right of the sidebar.

PHOENIX CONTACT NEWS BUSINESS LOUNGE **MAKERS BLOG** KNOWLEDGE BASE ▾ FORUM Search ... LOG IN

DOMINIQUE RAKOWSKI **MAKERS BLOG** 28 MAY 2019 HITS: 2353

How to authenticate the AXC F 2152 to a network using 802.1X

Hello PLCnext Community,

Cybersecurity is a main topic inside the PLCnext Technology and in general for the Industrial world. The PLCnext Technology provides a wide range of solutions to make an installation more secure. Some standards are also existing to make a network, in general, more secure.

[Read more ...](#) [Add new comment](#)

BJÖRN SAUER **MAKERS BLOG** 16 MAY 2019 HITS: 3727

Install the GNU Guix package manager

This article describes how to install the [GNU Guix package manager](#) on the AXC F 2152. GNU Guix is a functional package manager that offers transactional, reproducible, per-user package management. GNU Guix can be installed on top of an existing Linux system where it complements the available tools without interference. Guix could be used to install packages to provide for example a gcc toolchain or python 2 on a per-user level. There is an excellent explanation in the manual on [how to install](#) Guix on the GNU homepage. This article will guide you through the process of installing GNU Guix.

There is also an adapted shell installer script based on the GNU Guix installer script. The script automates the download, installation, and initial configuration steps described below. It should be run as the root

Miniconda is a tree minimal installer for conda. It is a small, bootstrap version of Anaconda...

[Read more: Install...](#)

> Java Application on an AXC F 2152 (955) 16.10.19
With Java 9, a new tool called *jlink* was introduced. It combines modules and builds an all-in...

[Read more: Java...](#)

> Datalogging in IEC 61131-3: The basic principle (302) 05.12.19
PLCnext Technology offers different possibilities to capture data. Some examples: PLCnext Engineer...

[Read more: Datalogging...](#)

> How to use the PLCnext RSC out of a remote Java Application (290) 04.12.19
For those who are unfamiliar with the details of the PLCnext architecture, the following diagram...

[Read more: How to use...](#)

> How to enable remote VPN access for PLCnext

PLCnext Technology from Phoenix Contact

PLCnext Store – A Growing Number of Contributions



PLCnext Technology from Phoenix Contact

PLCnext Community

Join and get involved: www.plcnnext-community.net

Watch a tutorial on our [Technical Support Channel on YouTube](#)

Find open source code and start an exciting new project: www.github.com/plcnnext



More on
PLCnext Technology



Upload or
download apps



Support in the
community



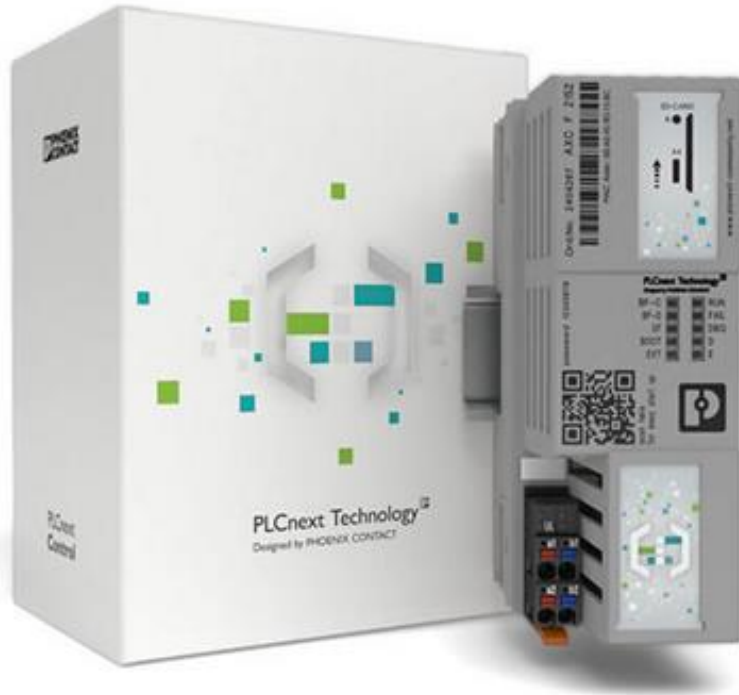
Tutorials for
technical support



Use or share open
source code

Grant Vandebrake – Industrial Security and Network Services

Next Generation Device Security at Purdue Level 1



Thank you