Grant Vandebrake – Industrial Security and Network Services

Next Generation Device Security at Purdue Level 1

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Next Generation Device Security at Purdue Level 1

Industrial Security and Network Services

Lead Solutions Engineer – Industrial Security and Network Services

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Agenda

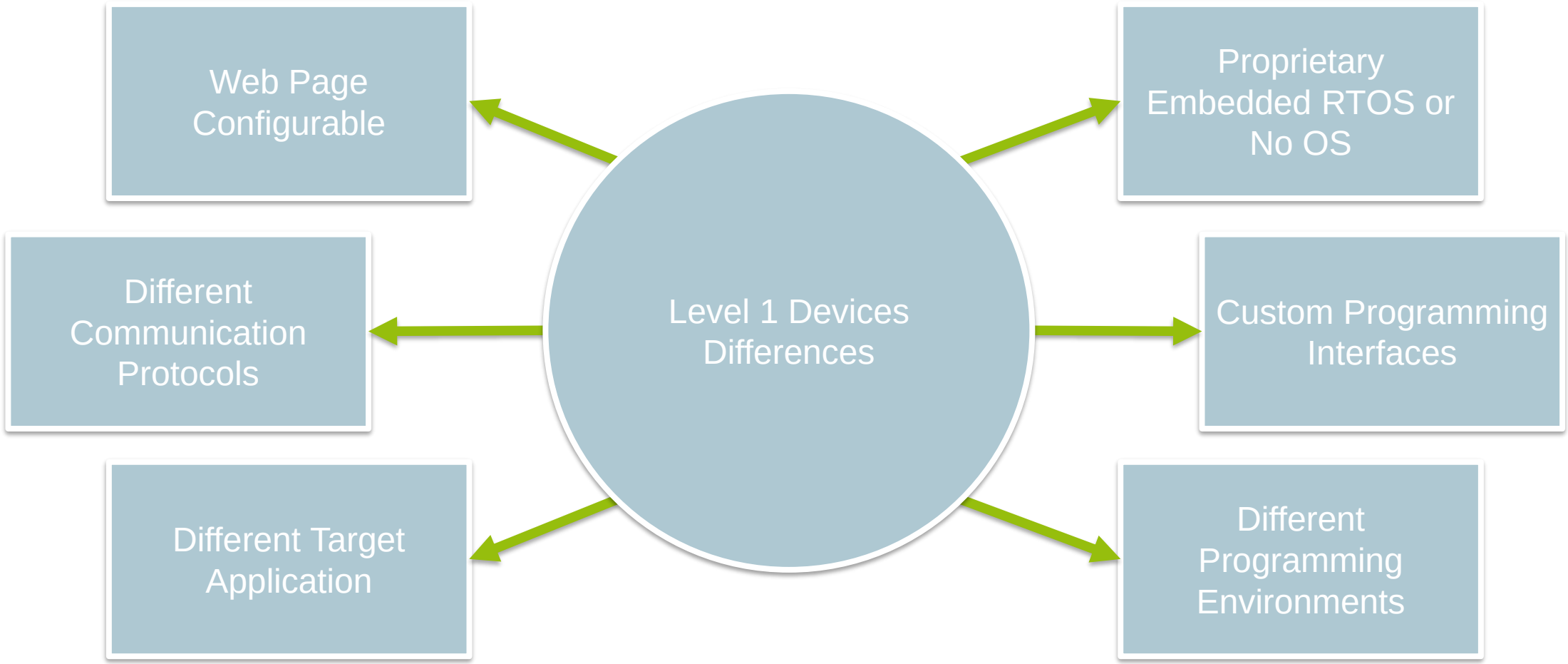
- Brief Background on Level 1 Devices
  - What do you run into?
- Traditional Security Techniques
  - How Do I Secure it?
- Current Changes and Advancements
  - New Capabilities and Challenges?
- PLCnext Technology from Phoenix Contact
  - A New Toolbox at your Disposal!

Brief Background on Level 1 Devices

A Crowded Space

Brief Background on Level 1 Devices

The Difference is the Commonality



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Brief Background on Level 1 Devices

The Security Challenges

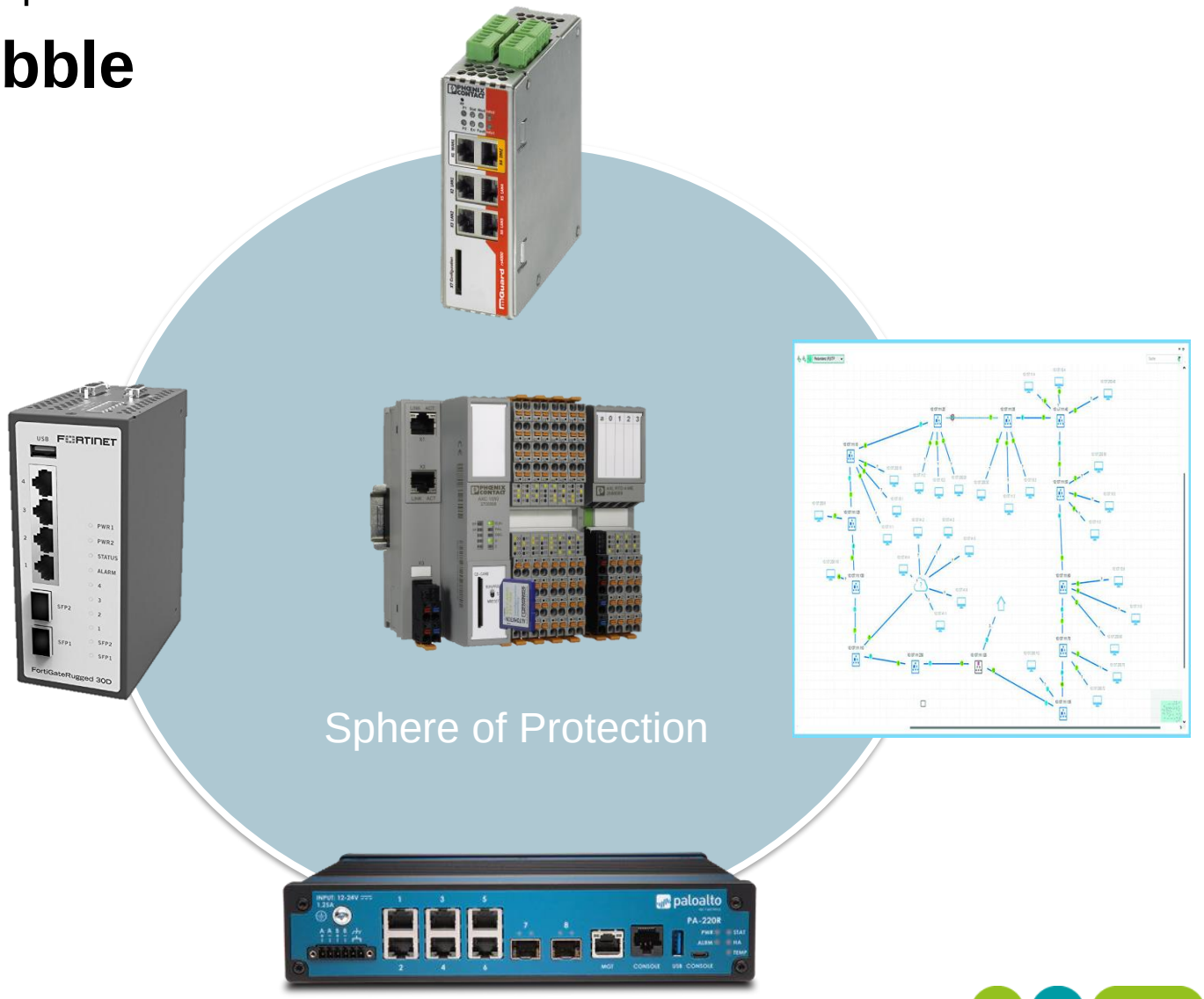
- Securing an RTOS that is proprietary
- Many different RTOS or OS depending on device
- Multiple physical communication interfaces
- Multiple communication protocols
- Valid inputs from sensors and I/O
- Protecting PLC code
- Updating the firmware in a running process
- Protecting web interfaces
- Physical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

Traditional Security Techniques

What have we been doing?

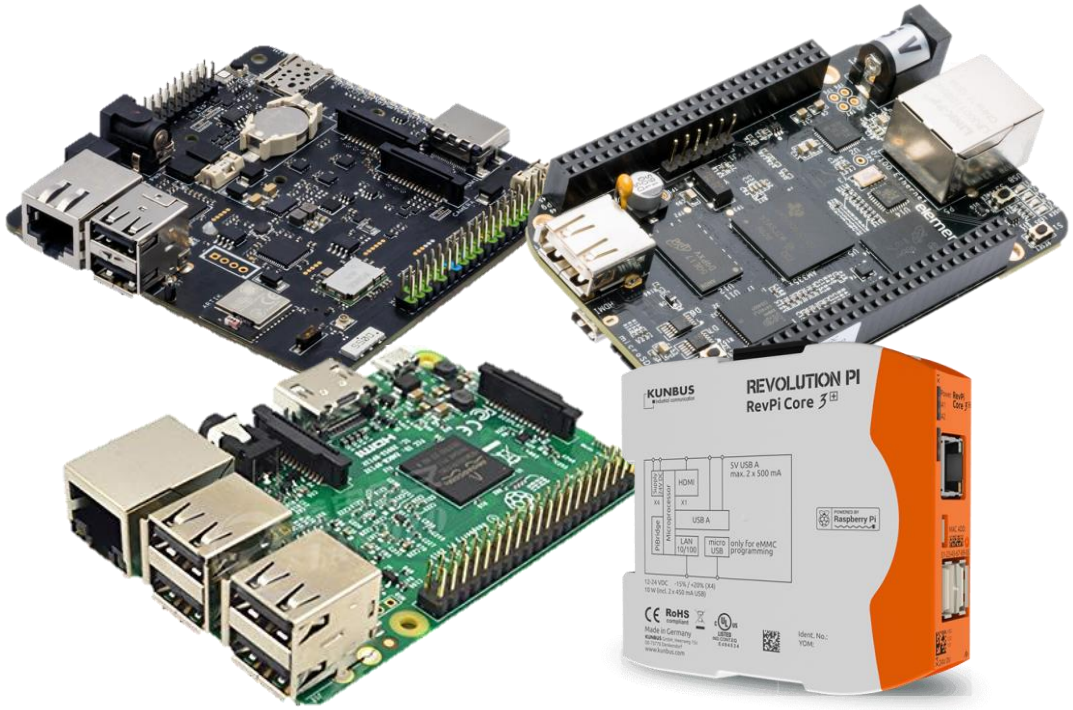
Traditional Security Techniques

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

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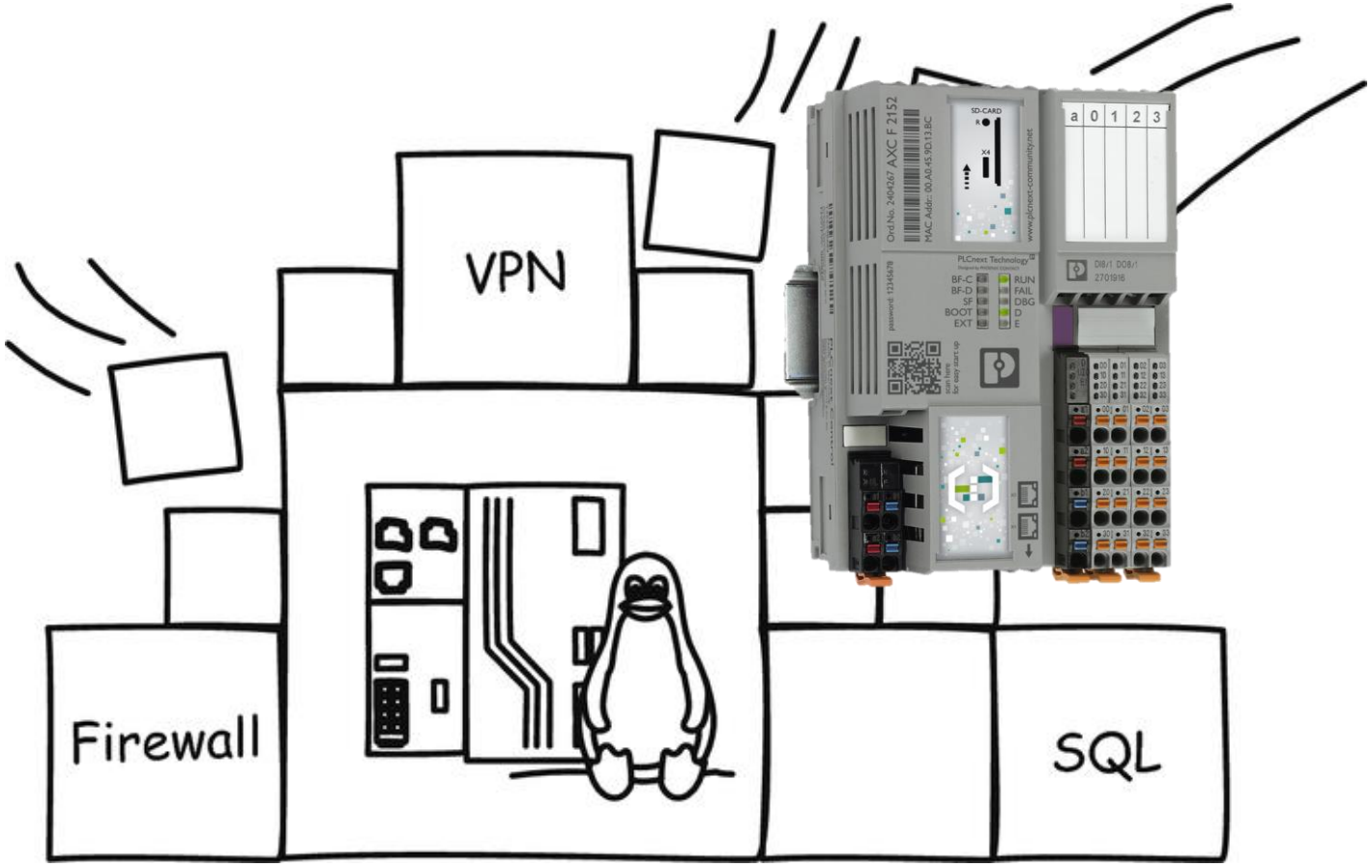
What is PLCnext? – Combining The Worlds



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

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PLCnext Runtime System Architecture

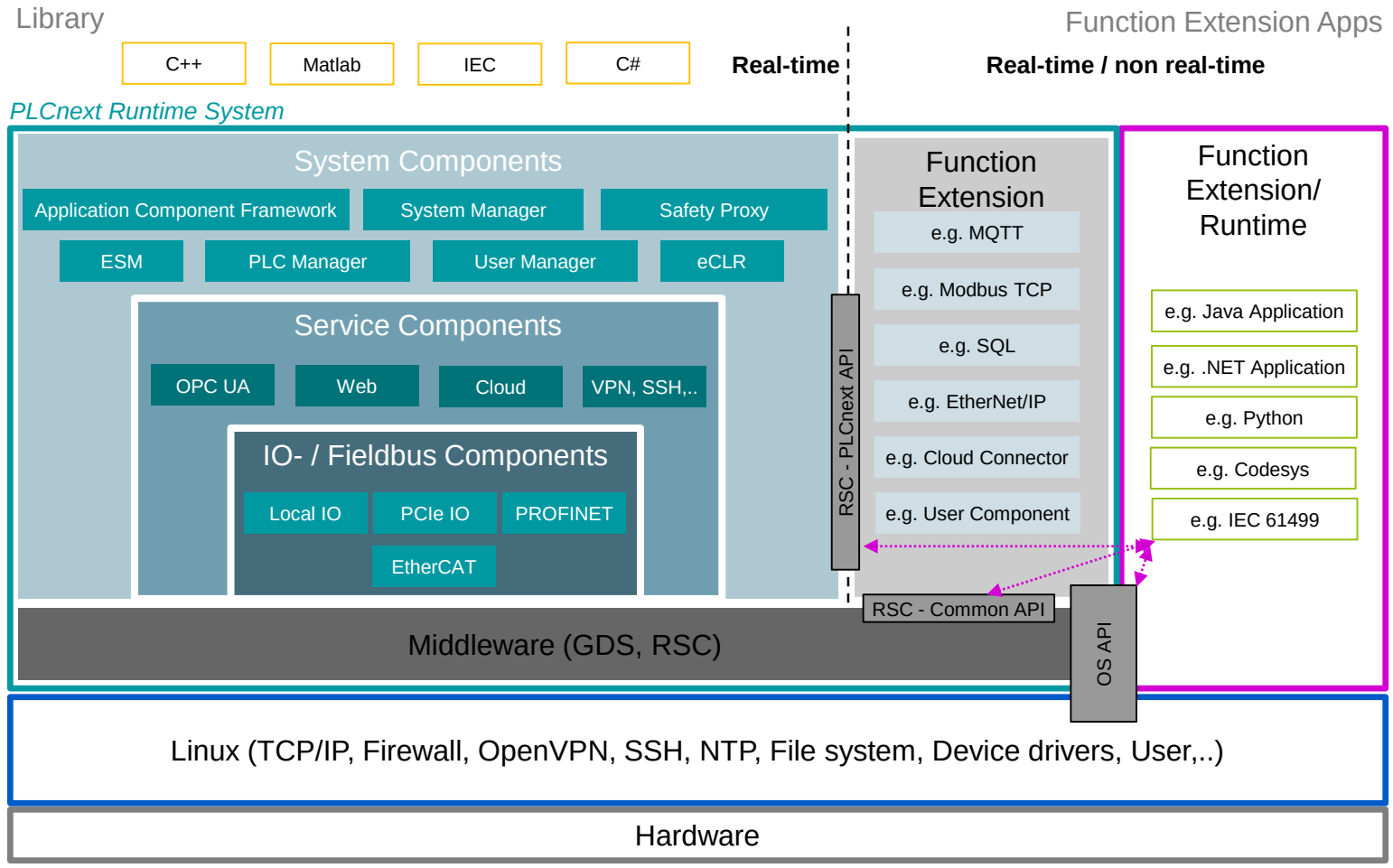
PLCnext Runtime System Core Components

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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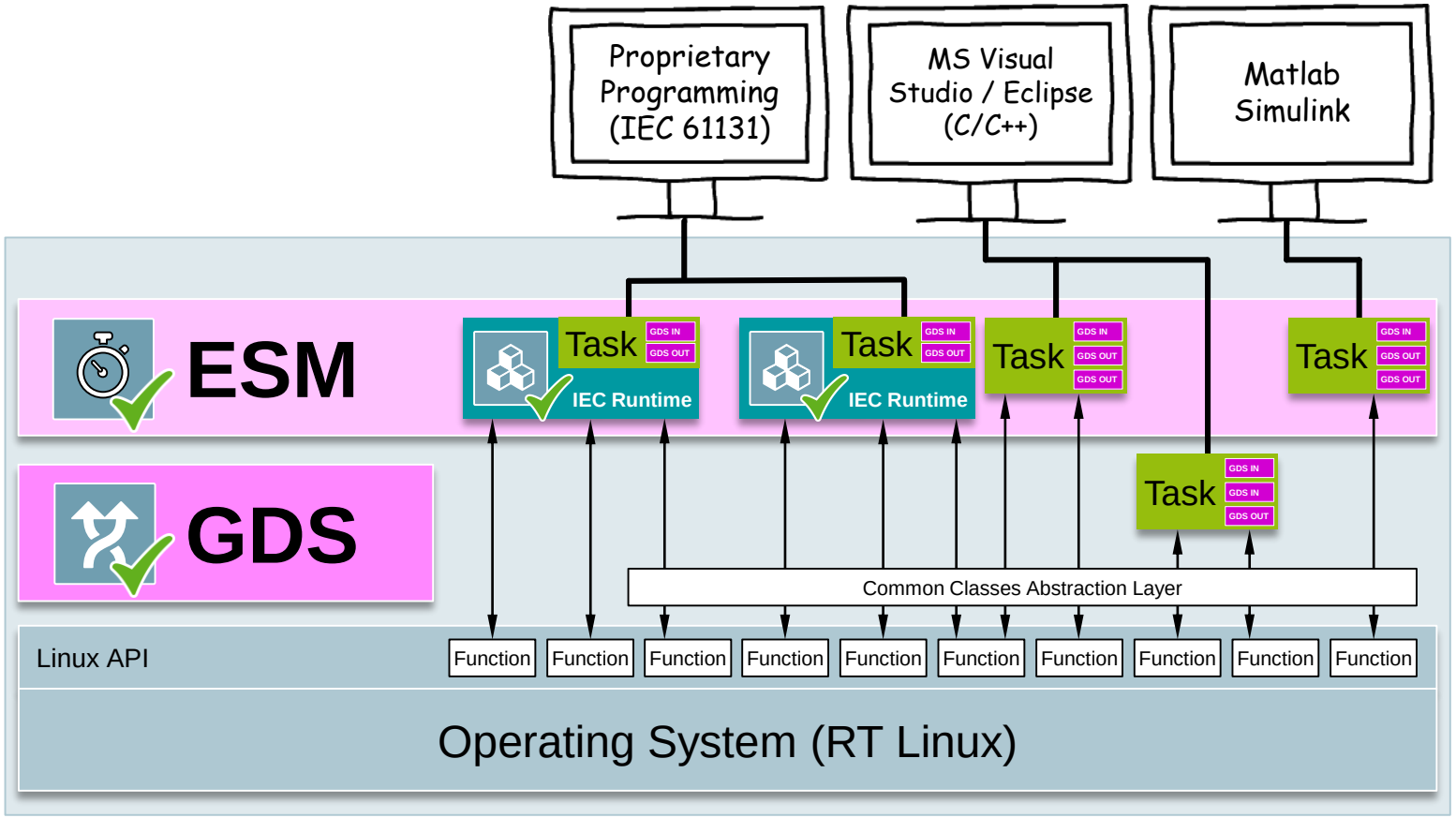
PLCnext Technology Architecture Advantages



- 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

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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
- …

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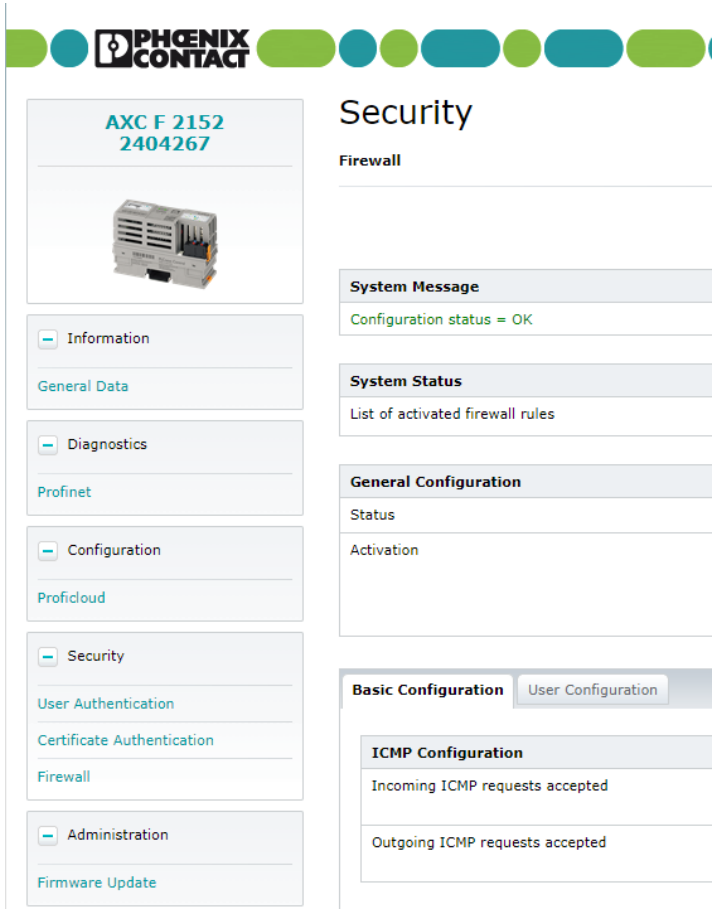
Security Features Summary – PLCnext Runtime System 2020.0



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

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IEC 62443-4-1 Secure Product Development Lifecycle Certificate

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 (Andreas Bärwald)

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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

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PLCnext Technology from Phoenix Contact

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The Open Ecosystem for Limitless Automation

PLCnext Technology
enhance your automation thinking

PLCnext Control

PLCnext Engineer

PLCnext Store

PLCnext Community

Open Control Platform

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

Engineering Software

Engineering tool for commissioning, configuring, and programming PLCnext Controls

Software Store for Automation

Apps for functional extension of PLCnext Control and PLCnext Engineer

User Collaboration & Resources

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

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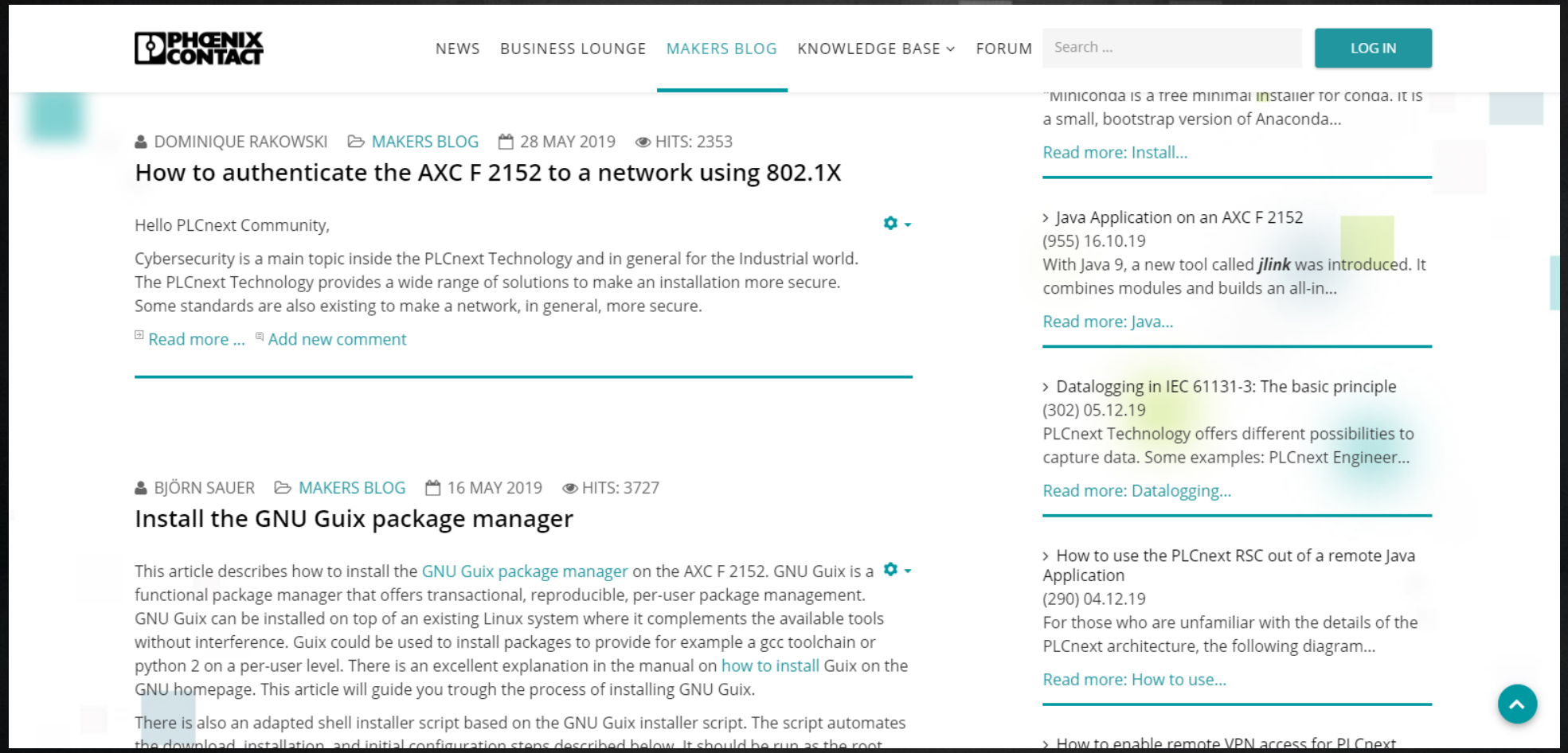
The PLCnext Community



PLCnext Store – A Growing Number of Contributions

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PLCnext Community

Join and get involved: www.plcnext-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/plcnext

More on
PLCnext Technology

Upload or
download apps

Support in the
community

Tutorials for
technical support

Use or share open
source code

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Thank you