Industrial Security for Pharma

IEC 62443 - den altomfavnende Industrial Security standard, der ændrer hele industrien

siemens.com/industrial-security

The

Threat Landscape

Cybersecurity – an increasingly critical factor for the success of the digital economy

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1950s – 1960s
Military, governments and other organizations implement computer systems

1980s
Computers make their way into schools, homes, business and industry

1999
The globe is connected by the internet

2010s
Cloud computing enters the mainstream

2020s
Internet of Things, Smart and autonomous systems, Artificial Intelligence, Big Data

Digital Information Processing

Digital Connectivity

Digital Automation and Intelligence

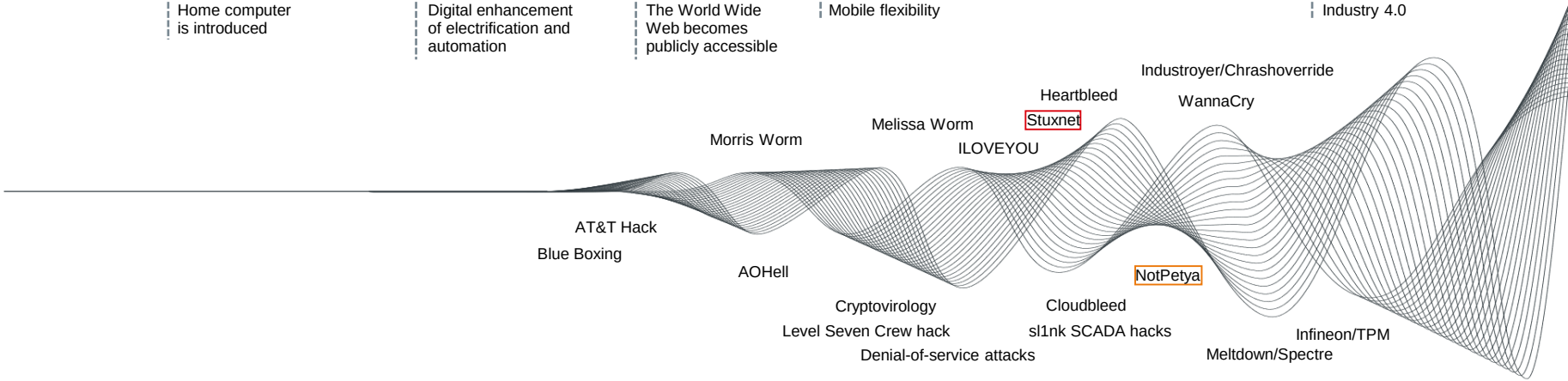
1970s
Home computer is introduced

1990s
Digital enhancement of electrification and automation

1991
The World Wide Web becomes publicly accessible

2000s
Mobile flexibility

2020s
Industry 4.0



The typical threat
Ransomware

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Deploy malware on a PC via mail, USB, etc.

Lock the system with the malware

Claim money from PC owner for unlocking

Deliver key to unlock system

NIS – direktivet

Formålet med NIS-direktivet

- EU's første horisontale lovgivning om håndtering af cybersikkerhedsudfordringer
- Målsætningen med NIS-direktivet › At sikre et højt sikkerhedsniveau for net- og informationssystemer i hele Unionen.

"Operatører af væsentlige tjenester"

- Inden for sektorerne: Energi, transport, bank, finansielle markedsinfrastrukturer, sundhed, vand samt digital infrastruktur
- Skal opfylde kriterierne i direktivet, herunder *væsentlig for opretholdelsen af kritiske samfundsmæssige og/eller økonomiske aktiviteter*
- Operatører af væsentlige tjenester udpeges senest **9. november 2018**

Who are we?

What do we do?

Who are we? And… what do we do?
Our reality

"Security is a top priority for Siemens as the world's leading automation provider with **30 million automated systems**, **75 million contracted smart meters** and **one million Cloud connected products** in the field"

Who are we? And… what do we do?
Charter of Trust

More info: www.charter-of-trust.com

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Charter of Trust
For a secure digital world

Key principles

01 **Ownership of cyber and IT security**
02 **Responsibility throughout the digital supply chain**
03 **Security by default**
04 **User-centricity**
05 **Innovation and co-creation**
06 **Education**
07 **Certification for critical infrastructure and solutions**
08 **Transparency and response**
09 **Regulatory framework**
10 **Joint initiatives**

Video: https://www.siemens.com/global/en/home/company/topic-areas/digitalization/cybersecurity.html

charter-of-trust.com

Who are we? And… what do we do?

NATO Cooperative Cyber Defense Centre of Excellence

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LOCKED SHIELDS

Tallinn, Estonia (April 23rd to 27th 2018)

More info: ccdcoe.org/nato...ields-2018.html

So…

how do we start?

Caught between regulation, requirements, and standards

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The all encompassing Industrial Security Standard

Provides greater clarity by clearly defining the roles and responsibilities

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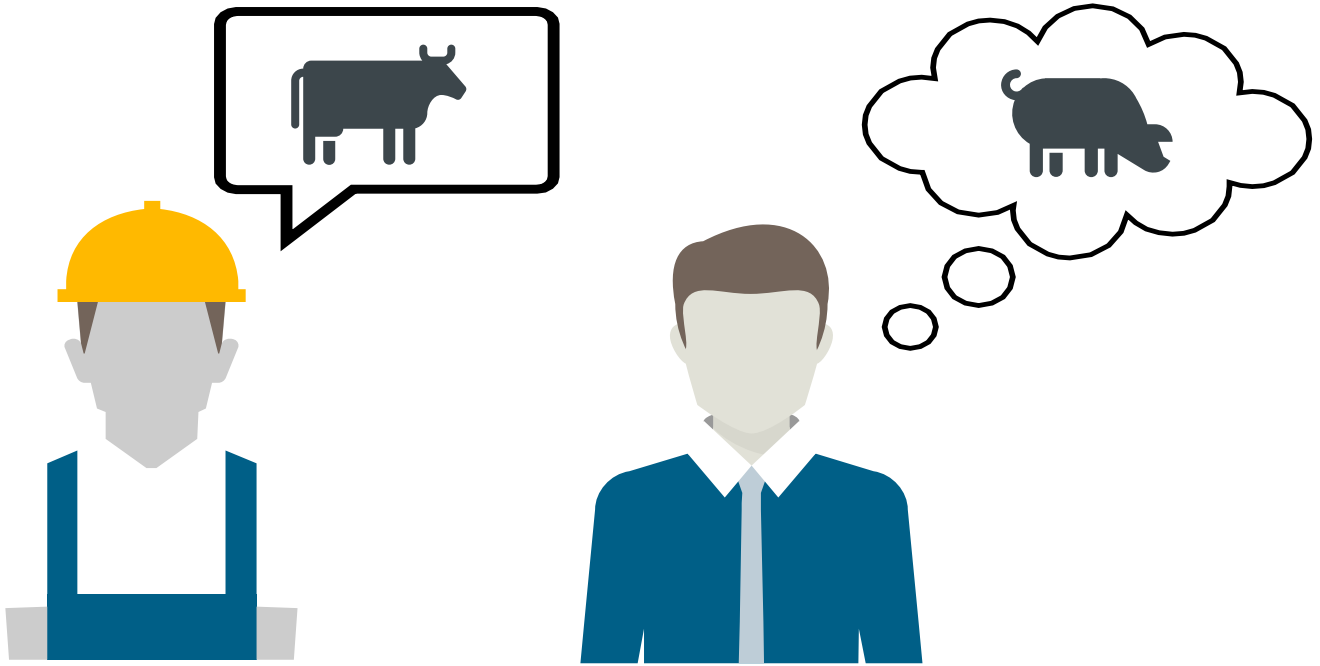
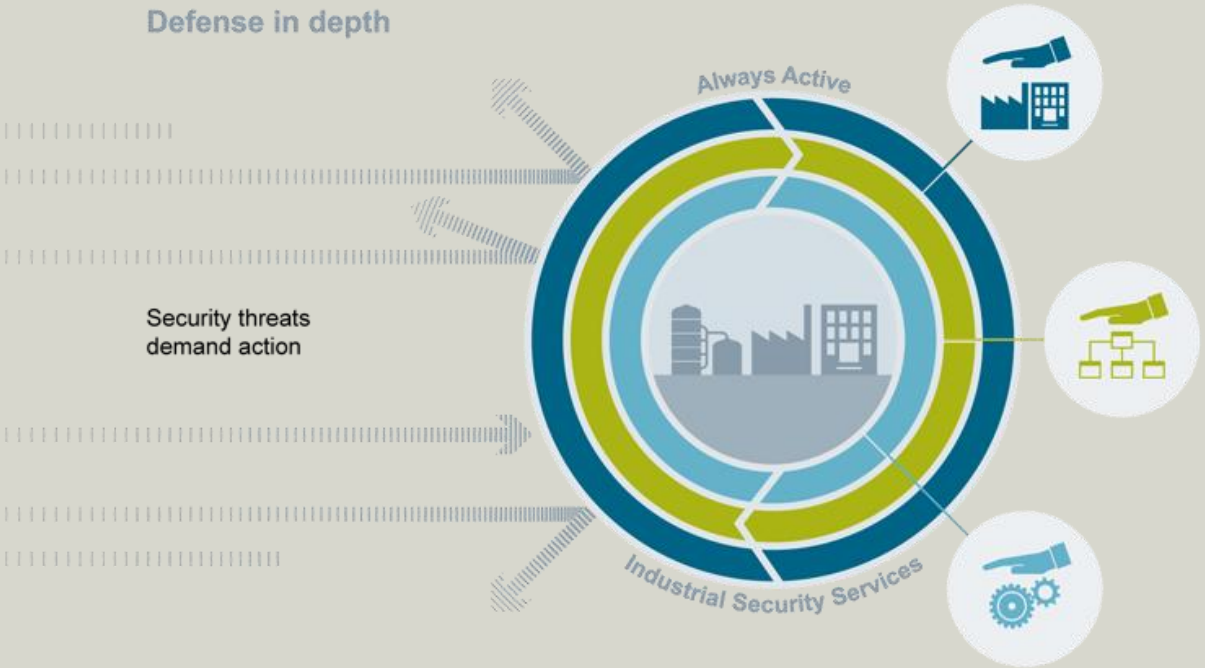
IEC 62443

From IEC62443

IEC 62443 gives us the ability to communicate
In an unambiguous way



IEC 62443 addresses the Defense in Depth concept



Plant Security

- Physical access protection
- Processes and guidelines
- Security service protecting production plants

Network Security

- Cell protection, DMZ and remote maintenance
- Firewall and VPN
- Segmentation
- Asset and Network Management

System integrity

- System hardening
- Authentication and user administration
- Patch management
- Logging and Monitoring
- Detection of attacks

IEC 62443 focus on the interfaces between all stakeholders

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Asset Owners, **Integrators**, and **Manufacturers**

IEC 62443 from machines to corporates

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It is **scalable**

IEC 62443 provides system design guidelines

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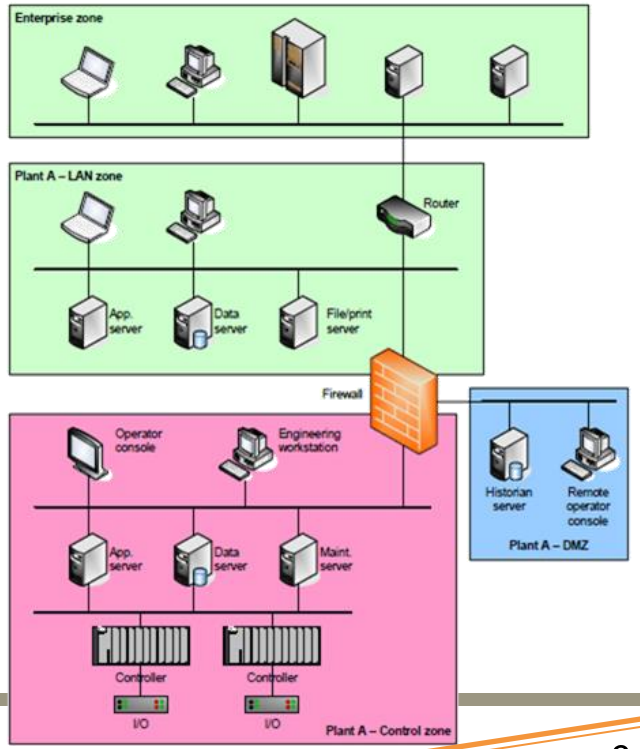
Generic network blueprints

That covers:

How to **connect IT** with **OT**

How to develop a **segmentation** concept



From IEC62443-3-2

IEC 62443 provides a complete Cyber Security Management System

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Risk based approach

That covers the setup of:

Risk analysis

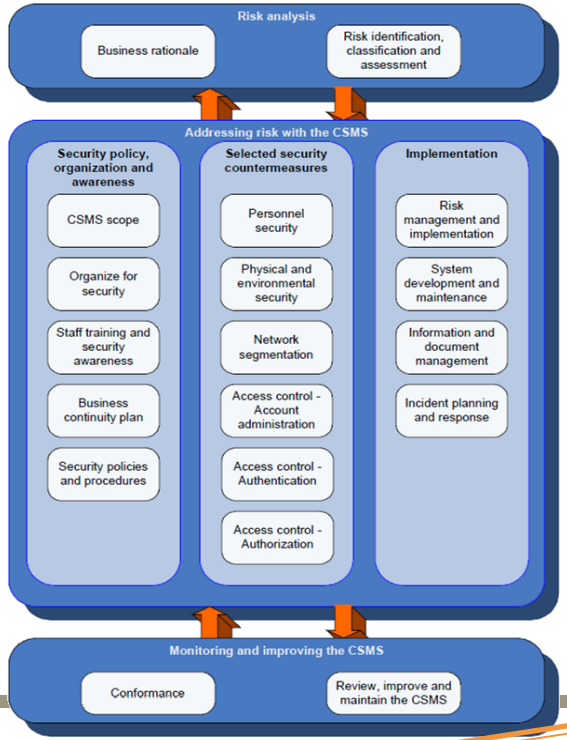
Addressing risk

security organization and **security processes**

security countermeasures

and **Implementation**

Monitoring and improving



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Risk methods and frameworks

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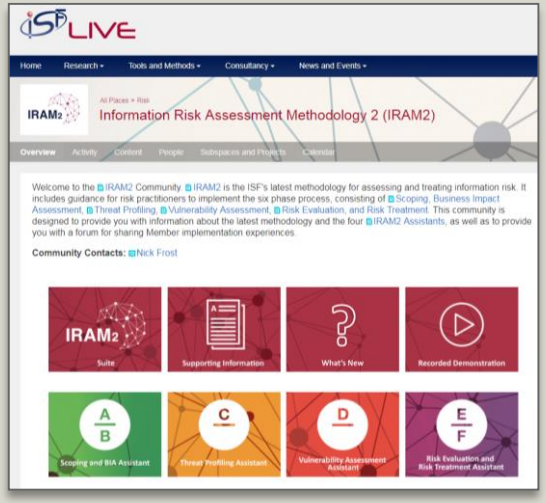
National Cyber Security Centre
a part of GCHQ

A good overview

The Information Security Forum (ISF)



National Institute of Standards and Technology (NIST) and…

More info: https://www.ncsc.gov.uk/guidance/summary-risk-methods-and-frameworks

What is the structure of IEC 62443?

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1-1 General
Terminology, concepts and models

1-2 General
Master glossary of terms and abbreviations

1-3 General
System security compliance metrics

1-4 General
IACS sec. life cycle and use case

1-5 General
IACS protection levels

2-1 Policies and procedures
Establishing an IACS security program

2-2 Policies and procedures
Operating an IACS security program

2-3 Policies and procedures
Patch management in the IACS environment

2-4 Policies and procedures
Certification of IACS supplier security policies

3-1 System
Security technologies for IACS

3-2 System
Security assurance levels for zones and conduits

3-3 System
System sec. requirements and security assurance levels

4-1 Component
Product development requirements

4-2 Component
Technical sec. requirements for IACS products

Definition and metrics
Processes / procedures
Functional requirements

From IEC62443

IEC 62443 from the beginning to the end

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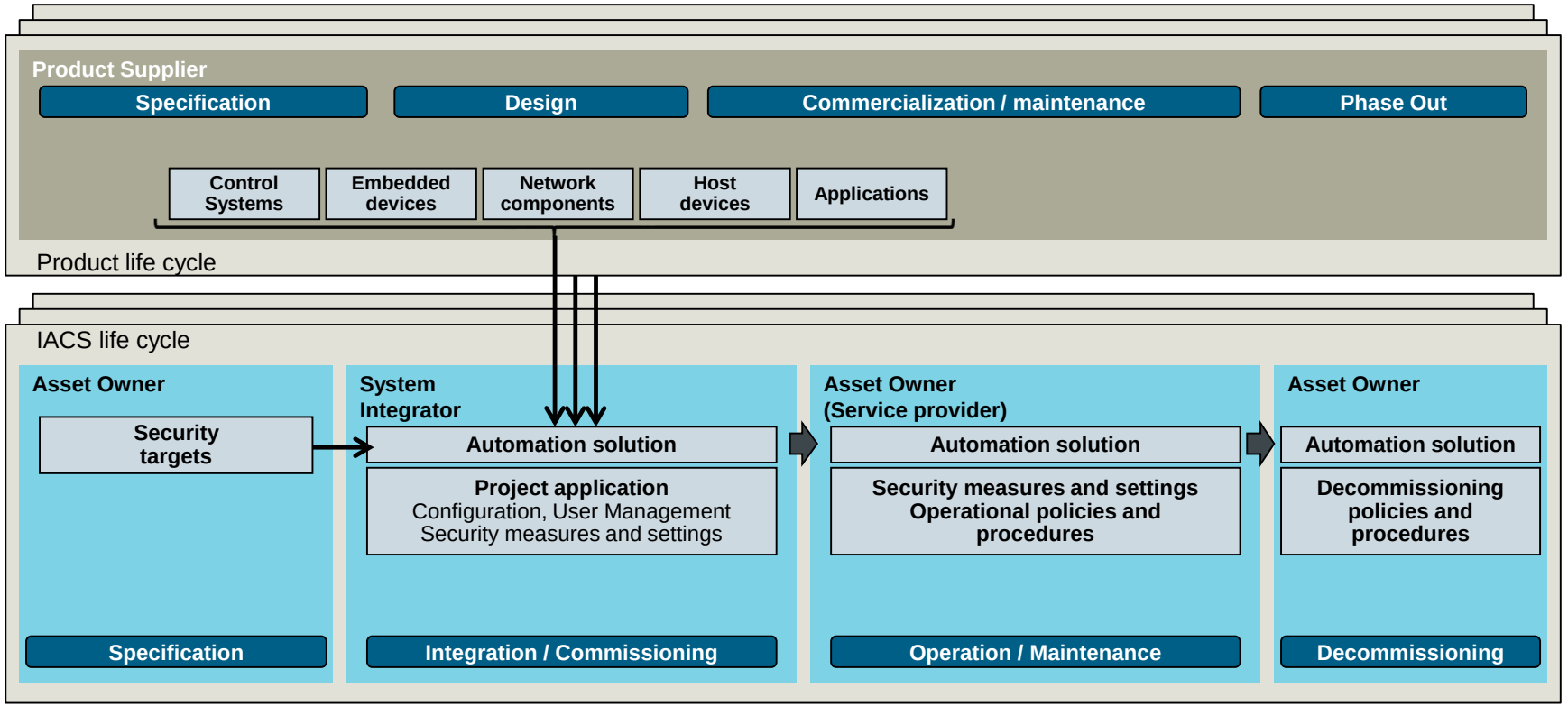
It addresses the entire **life cycle**

Phases in product and IACS life cycles



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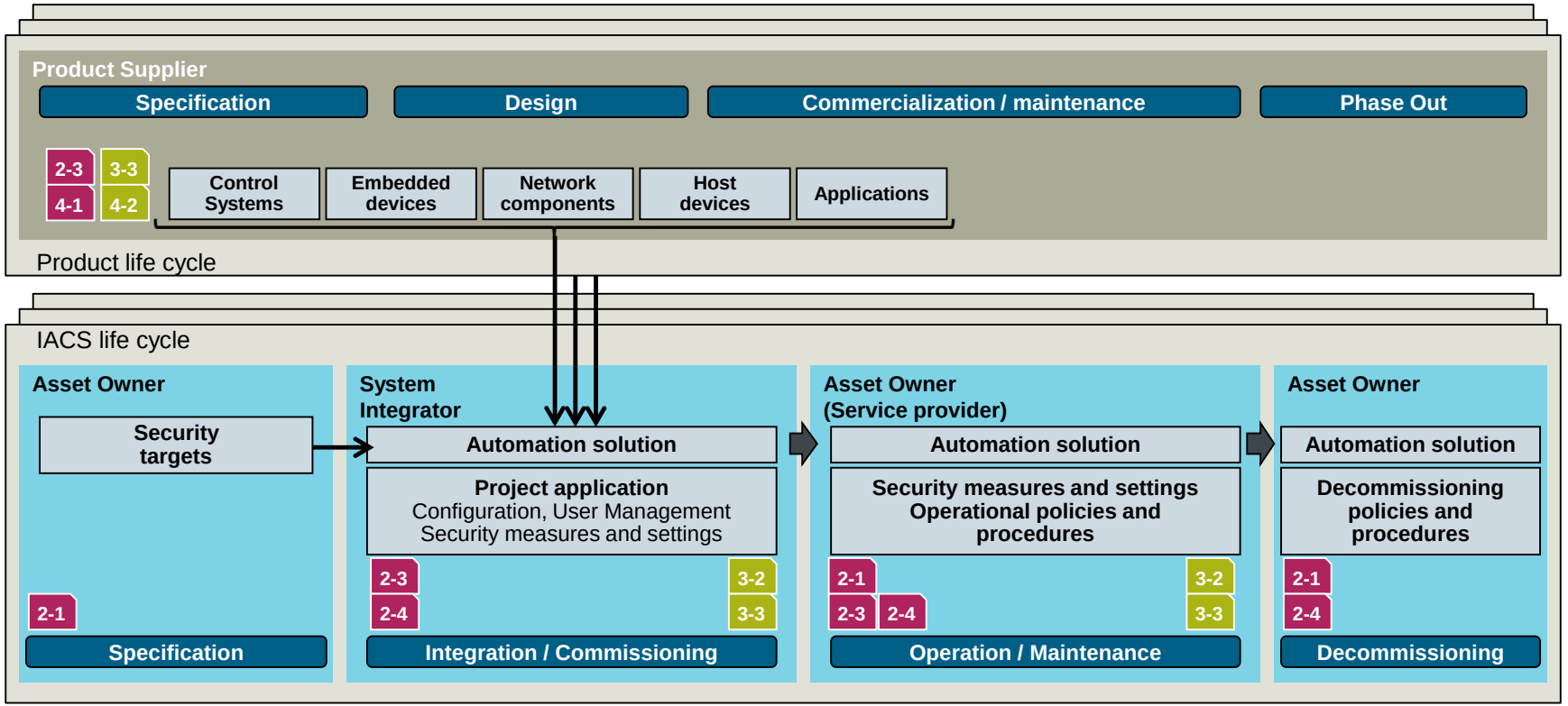

Risk based development of security levels
Getting started

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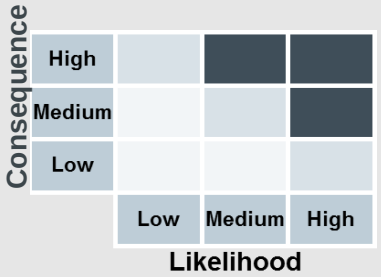
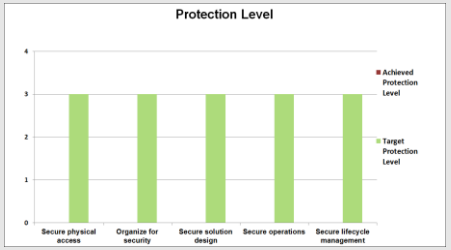
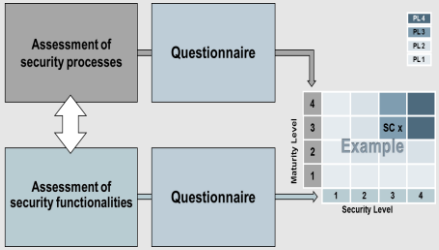
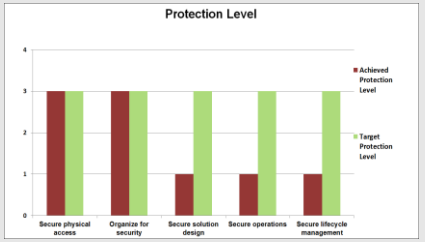
Evaluate Business Risk to determine Criticality → **Assign Target Protection Levels** → **Evaluate Protection Levels** → **Achieved Protection Levels**









Security Assessment

Cybersecurity Life Cycle
Getting started

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Assess phase

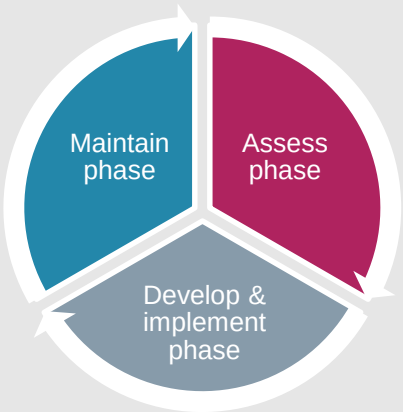
1. High-level Cyber Risk Assessment
2. Allocation of IACS Assets to Zones or Conduits
3. Detailed Cyber Risk Assessment

Develop & implement phase

4. Cybersecurity Requirements Specification
5. Design and Engineering of countermeasures or other means of risk reduction
6. Installation, commissioning and validation of countermeasures

Maintain phase

7. Maintenance, Monitoring and Management of change
8. Incident Response and Recovery



From IEC62443-3-2

Protection Levels
Cover security functionalities and processes

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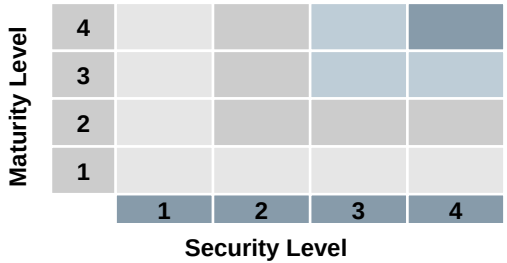
Security functionalities

SL 1	Capability to protect against casual or coincidental violation
SL 2	Capability to protect against intentional violation using simple means with low resources, generic skills and low motivation
SL 3	Capability to protect against intentional violation using sophisticated means with moderate resources, IACS specific skills and moderate motivation
SL 4	Capability to protect against intentional violation using sophisticated means with extended resources, IACS specific skills and high motivation

Security processes

ML 1	**Initial** - Process unpredictable, poorly controlled and reactive.
ML 2	**Managed** - Process characterized , reactive
ML 3	**Defined** - Process characterized, proactive deployment
ML 4	**Optimized** - Process measured, controlled and continuously improved

Protection Levels



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From IEC62443

Protection Levels
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Consequences
Some randomly selected points

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PL 1	Use of VLAN is mandatory Network Hardening is mandatory Managed Switches is mandatory Capability to backup …
PL 2	Unique identification and authentication A distributed Firewalls concept has to be implemented Inventory and Network Management are mandatory Capability to automate the backup …
PL 3	Even more….

IEC 62443-3-3

Defines security requirements for industrial control systems

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7 Foundational Requirements

- FR 1 – Identification and authentication control
- FR 2 – Use control
- FR 3 – System integrity
- FR 4 – Data confidentiality
- FR 5 – Restricted data flow
- FR 6 – Timely response to events
- FR 7 – Resource availability

From IEC62443-3-3

FR 1 – Identification and authentication control
System Requirement Overview (Part 1)

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 1.1 – **Human user** identification and authentication	✔	✔	✔	✔
SR 1.1 RE 1 – Unique identification and authentication		✔	✔	✔
SR 1.1 RE 2 – Multifactor authentication for untrusted networks			✔	✔
SR 1.1 RE 3 – Multifactor authentication for all networks				✔
SR 1.2 – **Software process and device** identification and authentication		✔	✔	✔
SR 1.2 RE 1 – Unique identification and authentication			✔	✔
SR 1.3 – Account management	✔	✔	✔	✔
SR 1.3 RE 1 – Unified account management			✔	✔
SR 1.4 – Identifier management	✔	✔	✔	✔
SR 1.5 – Authenticator management	✔	✔	✔	✔
SR 1.5 RE 1 – **Hardware security** for software process identity credentials			✔	✔
SR 1.6 – Wireless access management	✔	✔	✔	✔
SR 1.6 RE 1 – Unique identification and authentication		✔	✔	✔

From IEC62443-3-3

FR 1 – Identification and authentication control
System Requirement Overview (Part 2)

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 1.7 – **Strength of password-based authentication**	✔	✔	✔	✔
SR 1.7 RE 1 – Password generation and lifetime restrictions for human users			✔	✔
SR 1.7 RE 2 – Password lifetime restrictions for all users				✔
SR 1.8 – **Public key infrastructure certificates**		✔	✔	✔
SR 1.9 – **Strength of public key authentication**		✔	✔	✔
SR 1.9 RE 1 – Hardware security for public key authentication			✔	✔
SR 1.10 – **Authenticator feedback**	✔	✔	✔	✔
SR 1.11 – **Unsuccessful login attempts**	✔	✔	✔	✔
SR 1.12 – **System use notification**	✔	✔	✔	✔
SR 1.13 – Access via untrusted networks	✔	✔	✔	✔
SR 1.13 RE 1 – Explicit access request approval		✔	✔	✔

From IEC62443-3-3

FR 2 – Use control
System Requirement Overview (Part 1)

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 2.1 – Authorization enforcement	✔	✔	✔	✔
SR 2.1 RE 1 – Authorization enforcement for **all users**		✔	✔	✔
SR 2.1 RE 2 – Permission mapping to roles		✔	✔	✔
SR 2.1 RE 3 – Supervisor override			✔	✔
SR 2.1 RE 4 – Dual approval				✔
SR 2.2 – **Wireless use** control	✔	✔	✔	✔
SR 2.2 RE 1 – Identify and report unauthorized wireless devices			✔	✔
SR 2.3 – Use control for **portable and mobile devices**	✔	✔	✔	✔
SR 2.3 RE 1 – Enforcement of security status of portable and mobile devices			✔	✔
SR 2.4 – Mobile code	✔	✔	✔	✔
SR 2.4 RE 1 – Mobile code integrity check			✔	✔
SR 2.5 – **Session lock**	✔	✔	✔	✔

From IEC62443-3-3

FR 2 – Use control
System Requirement Overview (Part 2)

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 2.6 – **Remote session termination**		✔	✔	✔
SR 2.7 – **Concurrent session control**			✔	✔
SR 2.8 – **Auditable events**	✔	✔	✔	✔
SR 2.8 RE 1 – Centrally managed, system-wide audit trail			✔	✔
SR 2.9 – **Audit storage capacity**	✔	✔	✔	✔
SR 2.9 RE 1 – Warn when audit record storage capacity threshold reached			✔	✔
SR 2.10 – **Response to audit processing failures**	✔	✔	✔	✔
SR 2.11 – **Timestamps**		✔	✔	✔
SR 2.11 RE 1 – Internal time synchronization			✔	✔
SR 2.11 RE 2 – Protection of time source integrity				✔
SR 2.12 – **Non-repudiation**			✔	✔
SR 2.12 RE 1 – Non-repudiation for all users				✔

From IEC62443-3-3

FR 3 – System integrity
System Requirement Overview

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 3.1 – **Communication integrity**	✔	✔	✔	✔
SR 3.1 RE 1 – Cryptographic integrity protection			✔	✔
SR 3.2 – **Malicious code protection**	✔	✔	✔	✔
SR 3.2 RE 1 – Malicious code protection on entry and exit points		✔	✔	✔
SR 3.2 RE 2 – Central management and reporting for malicious code protection			✔	✔
SR 3.3 – Security functionality verification	✔	✔	✔	✔
SR 3.3 RE 1 – Automated mechanisms for security functionality verification			✔	✔
SR 3.3 RE 2 – Security functionality verification during normal operation				✔
SR 3.4 – **Software and information integrity**		✔	✔	✔
SR 3.4 RE 1 – Automated notification about integrity violations			✔	✔
SR 3.5 – **Input validation**	✔	✔	✔	✔
SR 3.6 – Deterministic output	✔	✔	✔	✔
SR 3.7 – **Error handling**		✔	✔	✔
SR 3.8 – **Session integrity**		✔	✔	✔
SR 3.8 RE 1 – Invalidation of session IDs after session termination			✔	✔
SR 3.8 RE 2 – Unique session ID generation			✔	✔
SR 3.8 RE 3 – Randomness of session IDs				✔
SR 3.9 – **Protection of audit information**		✔	✔	✔
SR 3.9 RE 1 – Audit records on write-once media				✔

From IEC62443-3-3

FR 4 – Data confidentiality
System Requirement Overview

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 4.1 – **Information confidentiality**	✔	✔	✔	✔
SR 4.1 RE 1 – Protection of confidentiality at rest or in transit via untrusted networks		✔	✔	✔
SR 4.1 RE 2 – Protection of confidentiality across zone boundaries				✔
SR 4.2 – **Information persistence**		✔	✔	✔
SR 4.2 RE 1 – Purging of shared memory resources			✔	✔
SR 4.3 – **Use of cryptography**	✔	✔	✔	✔

From IEC62443-3-3

FR 5 – Restricted data flow
System Requirement Overview

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 5.1 – **Network segmentation**	✓	✓	✓	✓
SR 5.1 RE 1 – Physical network segmentation		✓	✓	✓
SR 5.1 RE 2 – Independence from non-control system networks			✓	✓
SR 5.1 RE 3 – Logical and physical isolation of critical networks				✓
SR 5.2 – **Zone boundary protection**	✓	✓	✓	✓
SR 5.2 RE 1 – Deny by default, allow by exception		✓	✓	✓
SR 5.2 RE 2 – Island mode			✓	✓
SR 5.2 RE 3 – Fail close			✓	✓
SR 5.3 – General purpose person-to-person communication restrictions	✓	✓	✓	✓
SR 5.3 RE 1 – Prohibit all general purpose person-to-person communications			✓	✓
SR 5.4 – **Application partitioning**	✓	✓	✓	✓

From IEC62443-3-3

FR 6 – Timely response to events
System Requirement Overview

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 6.1 – **Audit log accessibility**	✔	✔	✔	✔
SR 6.1 RE 1 – Programmatic access to audit logs			✔	✔
SR 6.2 – **Continuous monitoring**		✔	✔	✔

From IEC62443-3-3

FR 7 – Resource availability
System Requirement Overview

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SRs und REs	SL 1	SL 2	SL 3	SL 4
SR 7.1 – **Denial of service protection**	✔	✔	✔	✔
SR 7.1 RE 1 – Manage communication loads		✔	✔	✔
SR 7.1 RE 2 – Limit DoS effects to other systems or networks			✔	✔
SR 7.2 – Resource management	✔	✔	✔	✔
SR 7.3 – **Control system backup**	✔	✔	✔	✔
SR 7.3 RE 1 – Backup verification		✔	✔	✔
SR 7.3 RE 2 – Backup automation			✔	✔
SR 7.4 – **Control system recovery and reconstitution**	✔	✔	✔	✔
SR 7.5 – **Emergency power**	✔	✔	✔	✔
SR 7.6 – **Network and security configuration settings**	✔	✔	✔	✔
SR 7.6 RE 1 – Machine-readable reporting of current security settings			✔	✔
SR 7.7 – Least functionality	✔	✔	✔	✔
SR 7.8 – **Control system component inventory**		✔	✔	✔

From IEC62443-3-3

A piece of a bigger picture

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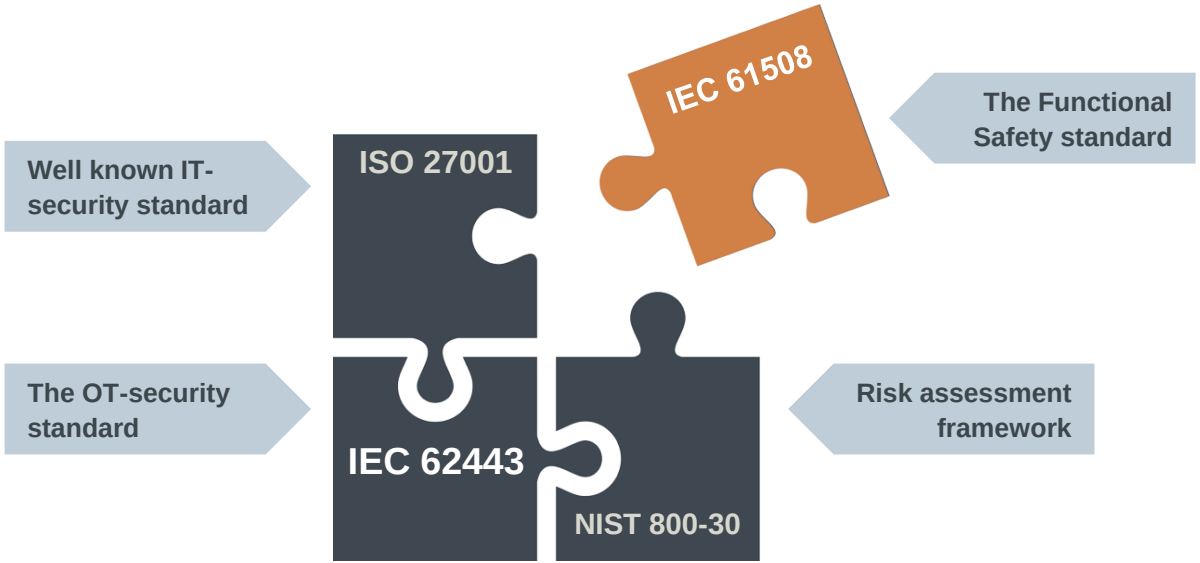

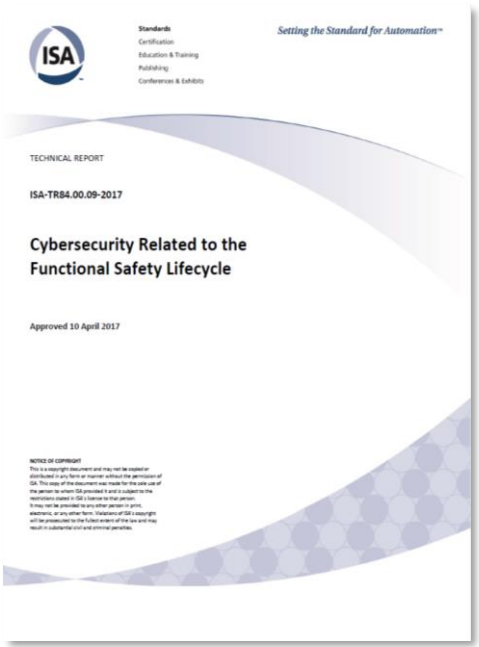

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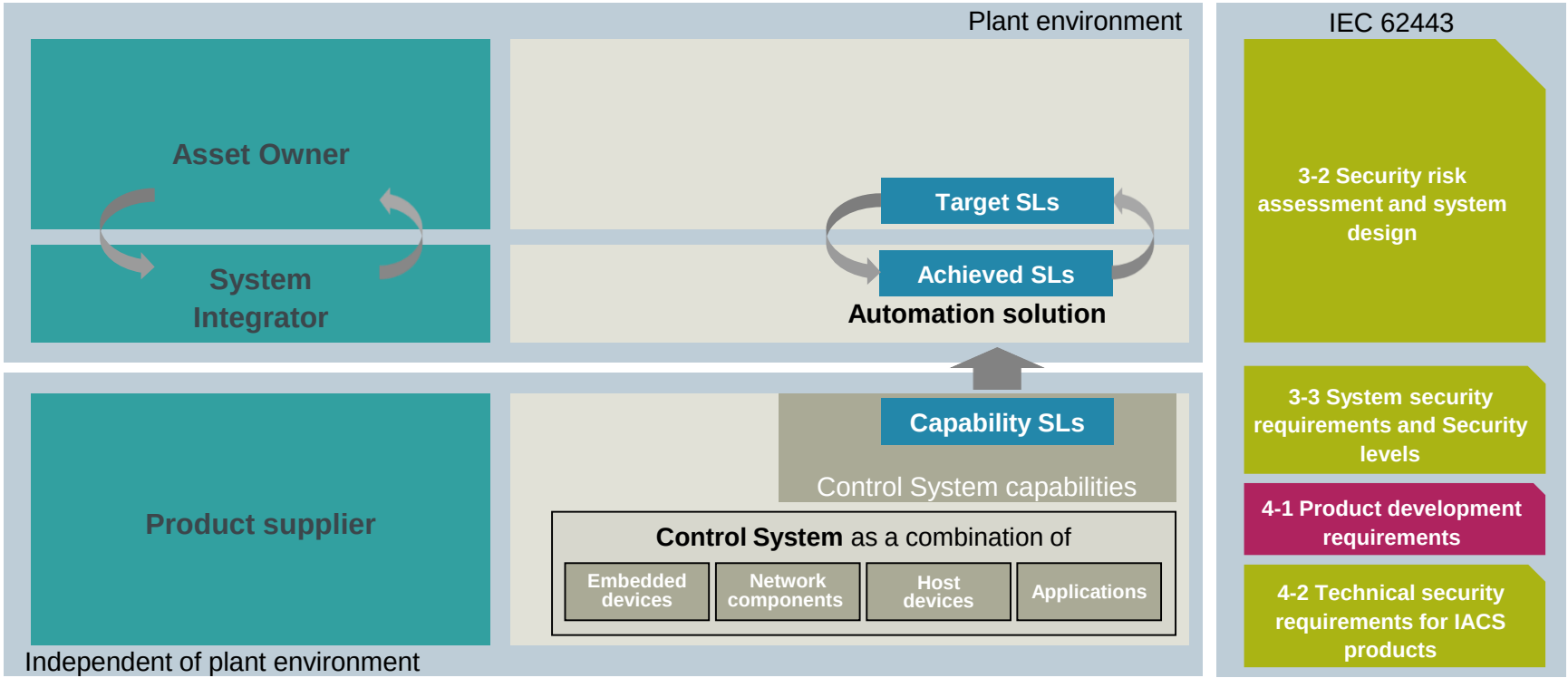
Recap - System Security Levels
Contributions of the stakeholders



We are Certified !

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Products & Solutions	Assessments	Design & consulting

http://isaeurope.com/apply/

Our offering…

We have the **Industrial DNA**

It's a **System**

Asset and **Network Management**

Segmentation – **Secure Cells**

Industrial **Firewalls**, **Anormaly Detection**

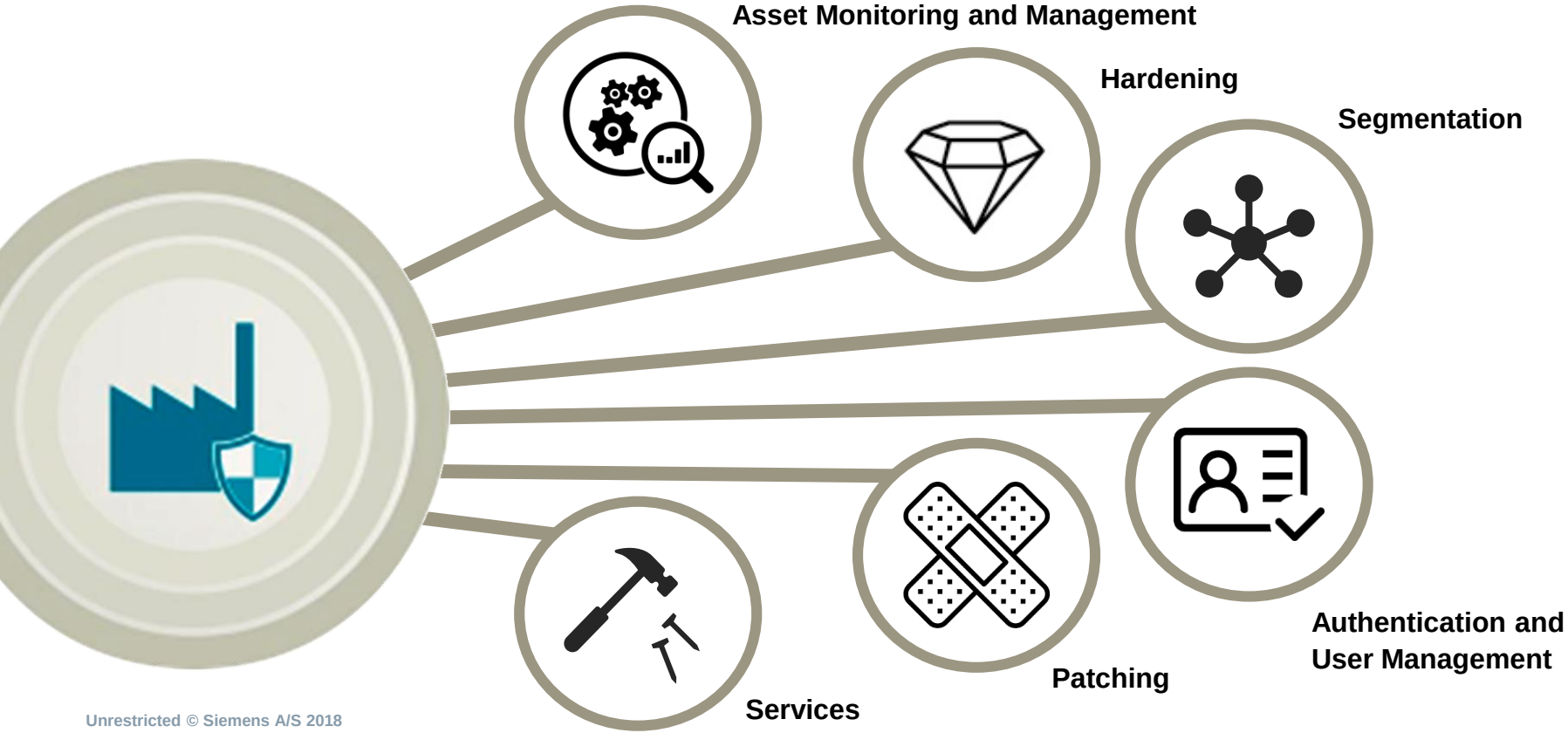
AD integration on the **factory floor**

Cloud based **Vulnerability Management**

Consulting, **design** and **services**

Security **Assessments**

Our offering…



Asset Monitoring and Management
SINEC NMS

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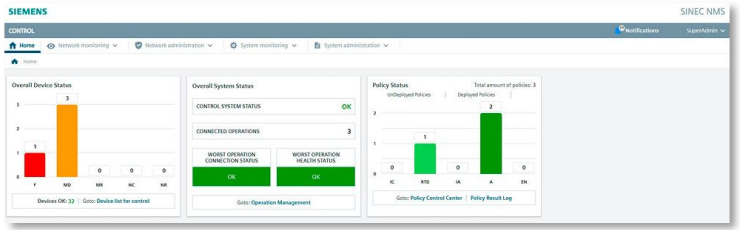
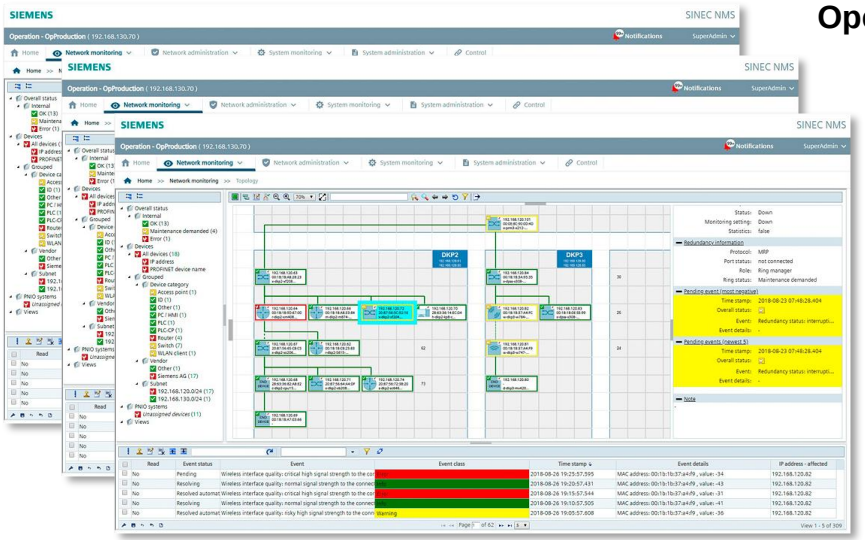
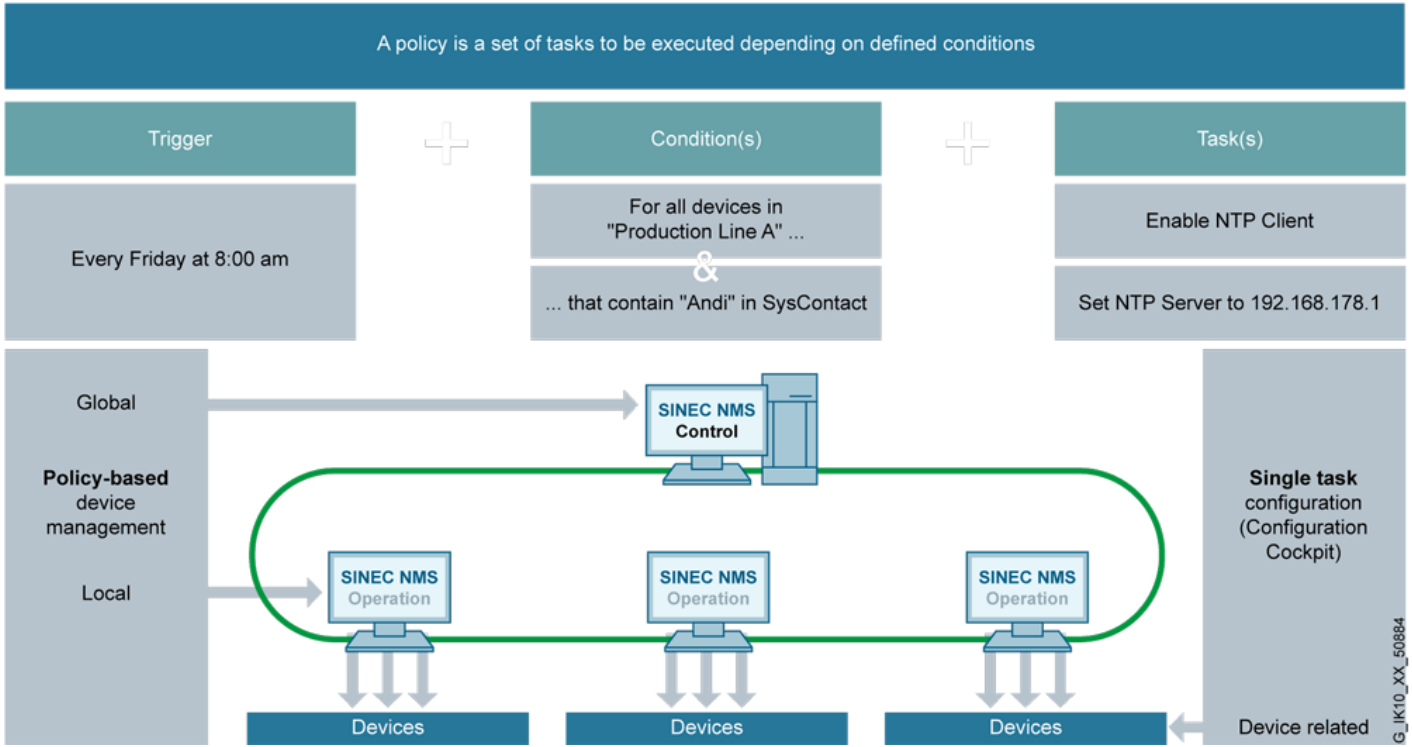


Control

Operation



Asset Monitoring and Management
SINEC NMS



Patching and Vulnerability Management
Industrial Vulnerability Manager

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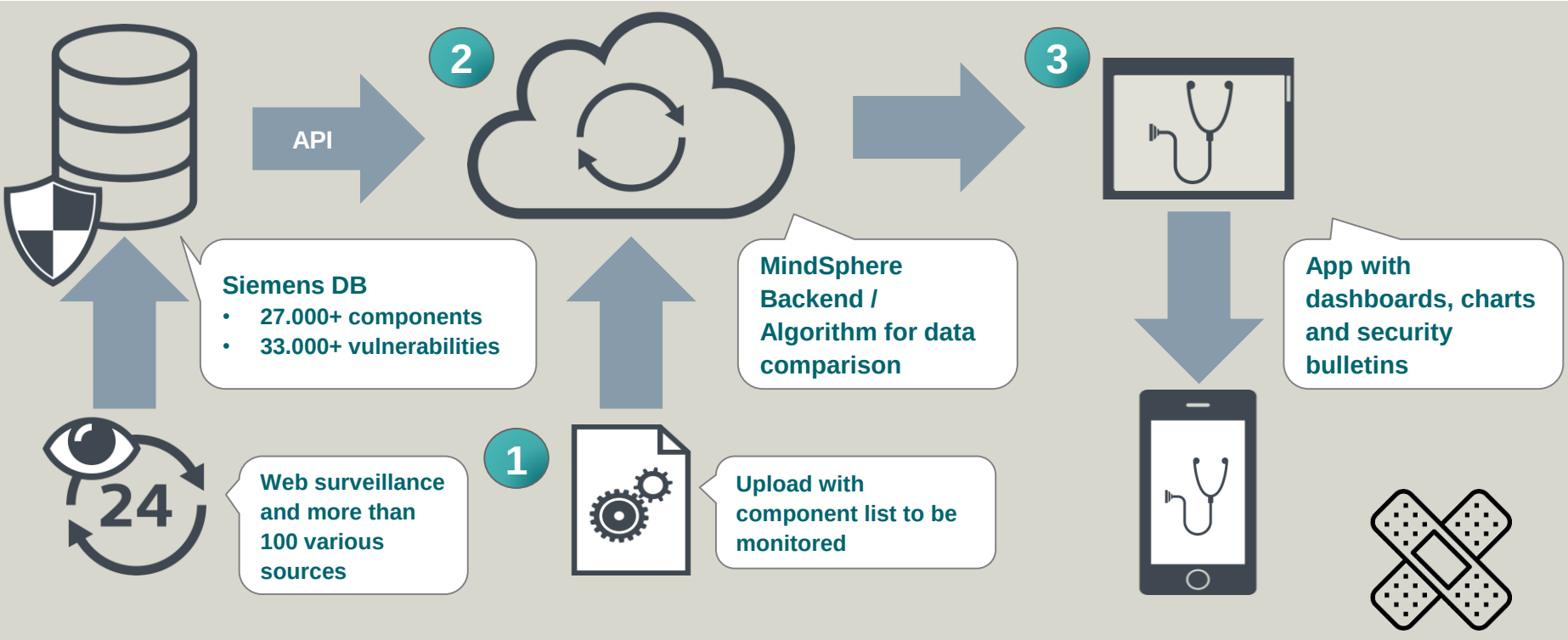
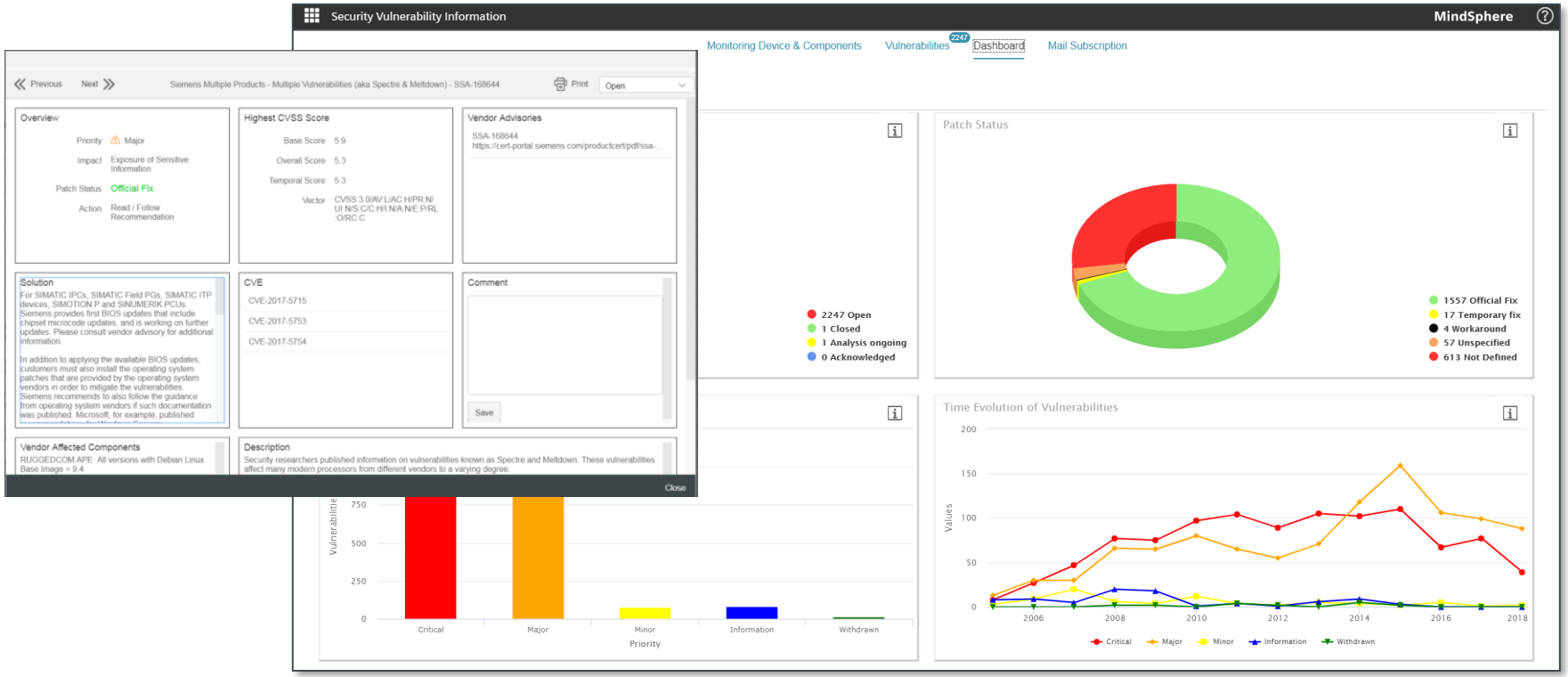


Patching and Vulnerability Management

Industrial Vulnerability Manager - The Dashboard



Thank You

for your attention

Thank you for your attention ☺

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Security information

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