Examples of Horizontal Challenges for Cybersecurity in Critical Infrastructure

Dr. Martin Wimmer

June 24th, 2021

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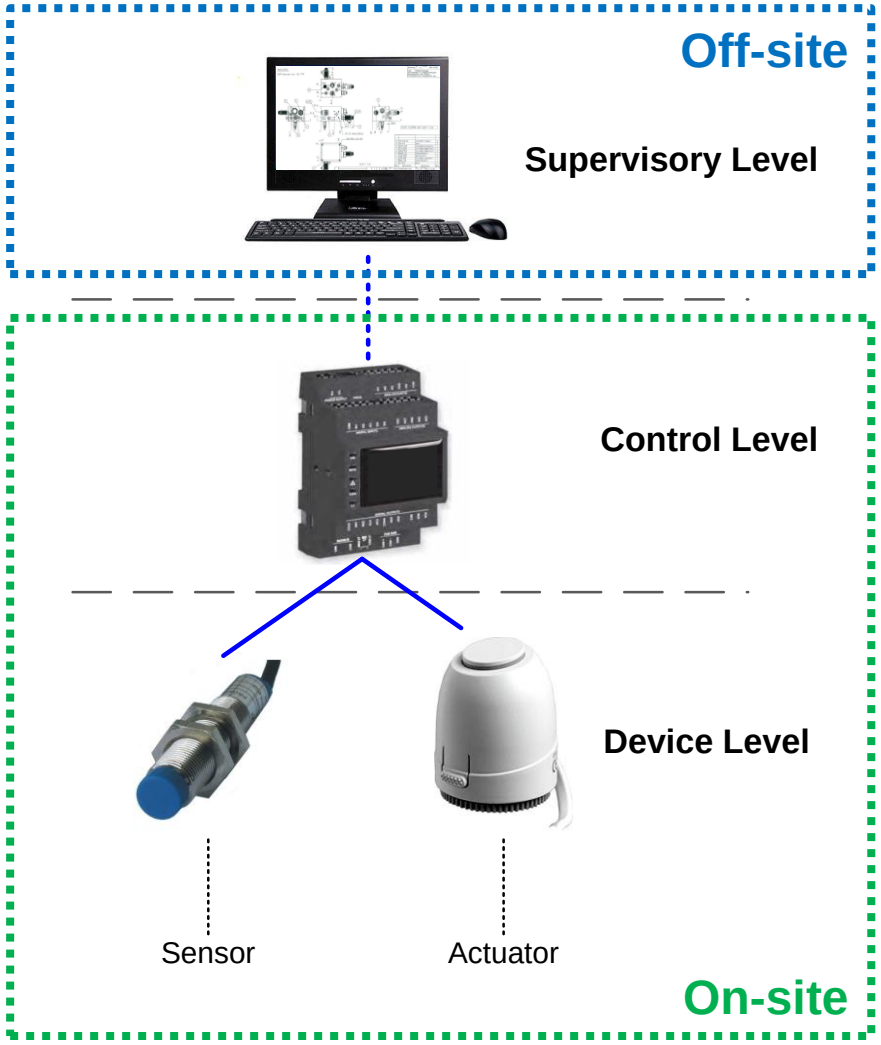
Starting Point: Operational Technology



- OT comprises *"…hardware and software that detects or causes a change through the direct monitoring and/or control of physical devices, processes and events…"*
  - Used in automation since the 70/80s
  - Originally not IP-based
- *"Secure island"* deployment model: system isolation, network segregation for the on-site components:
  - Controllers
  - Devices: sensors, actuators

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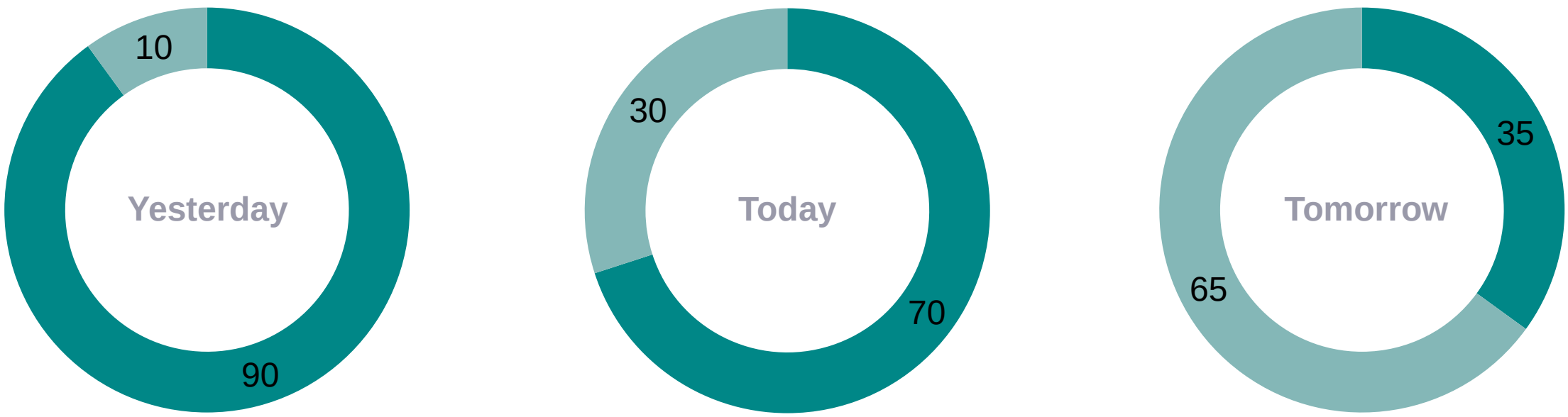
Paradigm Shift for OT Systems



Value proposition in OT products/systems

(indicative figures)

Hardware Software

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But are IT Security and OT the Same?

IT Security		OT Security
Confidentiality		**Availability**
3-5 years	**Asset lifecycle**	20-40 years
Forced migration (e.g. PCs, smart phone)	**Software lifecycle**	Usage as long as spare parts available
High (> 10 “agents” on office PCs)	**Options to add security SW**	Low (old systems w/o “free” performance)
Low (~2 generations, Windows 7 and 10)	**Heterogeneity**	High (from Windows 95 up to 10)
Standards based (agents & forced patching)	**Main protection concept**	Case and risk based

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Examples of What Can Go Wrong

U.S. Pipeline Attack - 2021
In May, Colonial, the operator of the biggest gasoline pipeline in the U.S. suffered from a ransomware attack and shut down operations. Colonial paid ransom of which the majority could be seized.

https://www.zdnet.com/article/colonial-pipeline-ransomware-attack-everything-you-need-to-know/
https://www.bloomberg.com/news/articles/2021-05-08/u-s-s-biggest-gasoline-and-pipeline-halted-after-cyberattack
https://www.nytimes.com/2021/06/07/us/politics/pipeline-attack.html

Cyberattack Targets Safety System of Saudi Arabian Petrochemical Plant - 2017
In 2017 the safety system of a petrochemical plant in Saudi Arabia was attacked. Parts of the plant were taken offline.

https://foreignpolicy.com/2017/12/21/cyber-attack-targets-safety-system-at-saudi-aramco

Ukrainian Power Grid - 2016
On December 23, 2015, the Ukrainian […] electricity distribution company, reported service outages to customers. […] outages that caused approximately 225,000 customers to lose power across various areas.

https://ics.sans.org/media/E-ISAC_SANS_Ukraine_DUC_5.pdf

German Steel Mill - 2015
… hackers had struck an unnamed steel mill in Germany. They did so by manipulating and disrupting control systems to such a degree that a blast furnace could not be properly shut down, resulting in "massive"—though unspecified—damage.

https://www.wired.com/2015/01/german-steel-mill-hack-destruction/
https://www.wired.com/wp-content/uploads/2015/01/Lagebericht2014.pdf

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Industroyer
"attacks ... [by] using industrial communication protocols which are standardised across a number of types of critical infrastructure" …

"The problem is that these protocols were designed decades ago, and back then industrial systems were meant to be isolated from the outside world,"

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Generic Attack Vectors

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Generic Attack Vectors … and the Need for Mitigations

Supply Chain Attacks

SCADA System Attacks

Communication/ Protocol Attacks

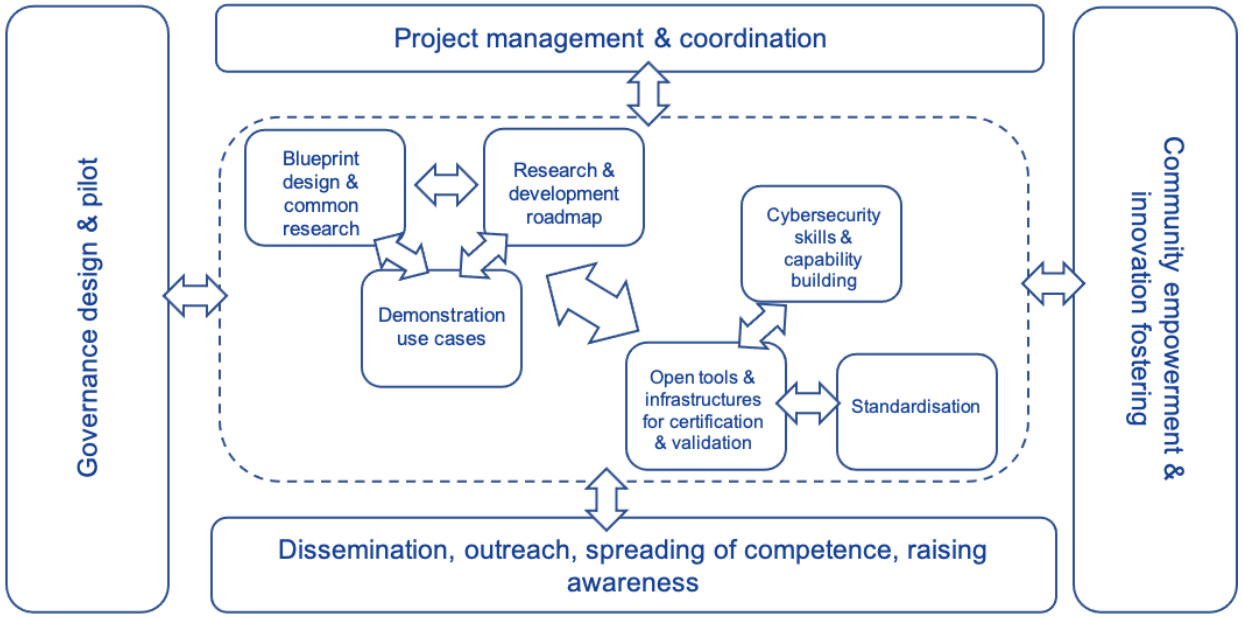
Phishing Attacks

Ransomwares

What Is CyberSec4Europe

CyberSec4Europe is funded by the European Union under the H2020 Programme Grant Agreement No. 830929

Cyber Security for Europe



- Ensure the adequacy and availability of cybersecurity education and training as well as common open standards
- Communicate widely and build communities

CyberSec4Europe is a research-based consortium working across four different but inter-related areas with a strong focus on openness and citizen-centricity in order to:

- Pilot a European Cybersecurity Competence Network
- Design, test and demonstrate potential governance structures for the network of competence centres
- Harmonise the journey from software componentry identified by a set of roadmaps leading to recommendations

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Supply Chain Security

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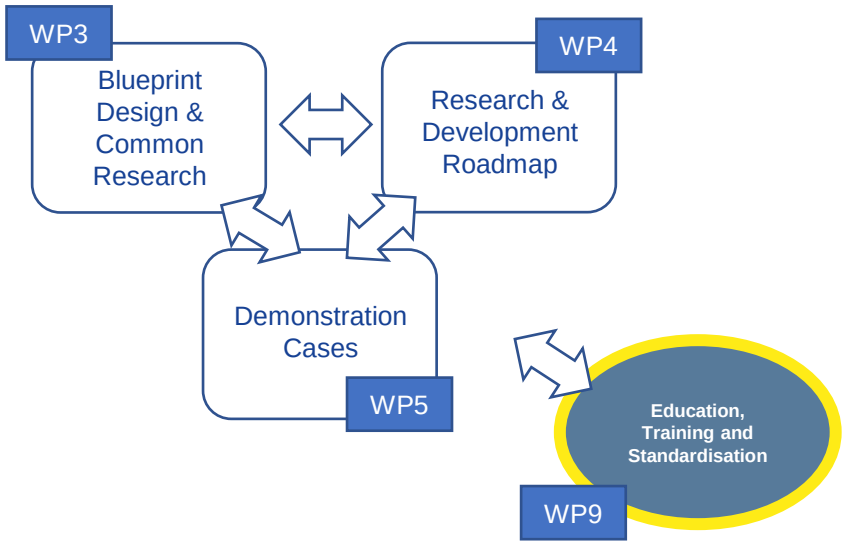
Cyber Security for Europe



Supply Chain Security is addressed by the programme through closely coordinated parallel streams

- WP3's research and integration on cybersecurity enablers and underlying technologies, e.g., blockchain
- WP4's definition and review of the research and development roadmap for industrial challenges, e.g., with focus on supply chain security
- WP5's demonstrator development, with two use cases for supply chain security
- WP9's cybersecurity awareness initiative, e.g., with regard to "Supply Chain Security Recommendations"

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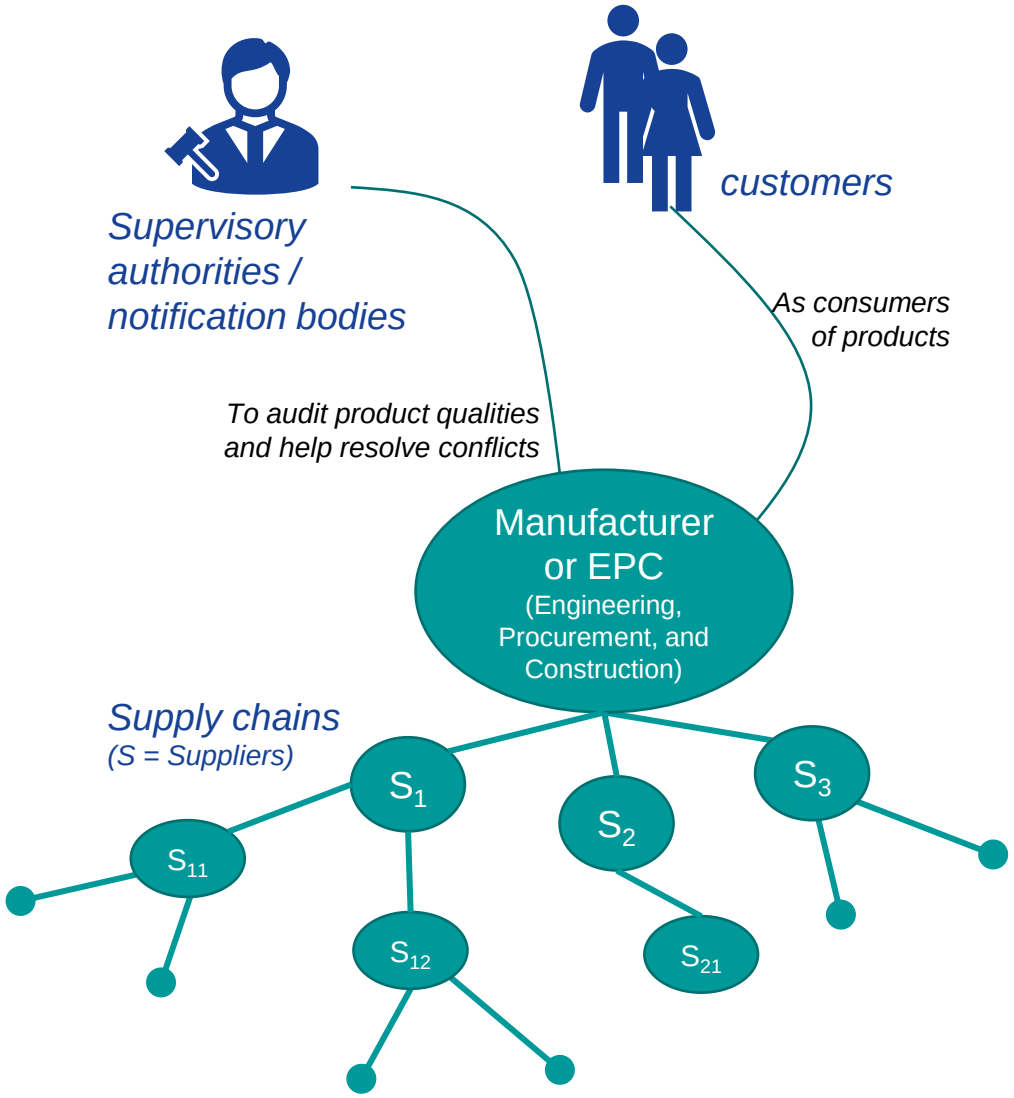
The Supply Chain Security Demonstrator is About

CyberSec4Europe is funded by the European Union under the H2020 Programme Grant Agreement No. 830929

Cyber Security for Europe



- … assessing the security requirements of highly distributed, cross-organizational business processes, e.g.,
  - guaranteeing non-repudiation and enforcing workflow compliance and
  - identifying and resolving disputes amongst business partners
- … demonstrating security architectures and processes that allow **building up trust** amongst business partners **without the need (and/or possibility) to rely on a trusted 3rd party**

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Secure Data Acquisition Through Unidirectional Connectivity

Firewall

Medium risk of remote attacks can disrupt operations

- SW can & has been hacked
- IT Lifecycle (5yrs)
- Patches, monitoring & audits $$

Data Diode

(DCU; siemens.com/dcu)

Very low risk of operational disruption due to remote attacks

- HW can't be hacked 0110110 1011101 0011011 0101010 1100101
- OT Lifecycle (+20yrs)
- No patches or audits needed $

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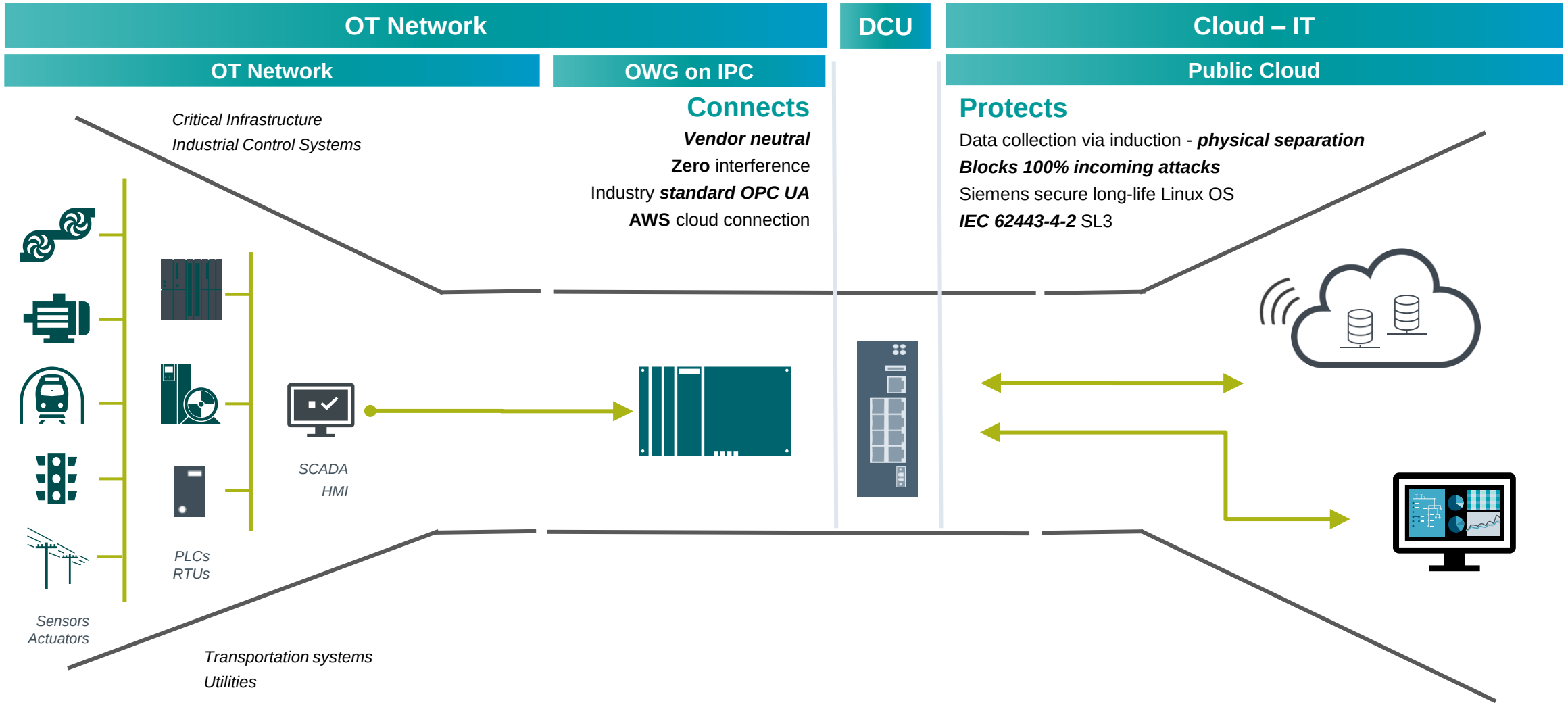
How Does It Work?



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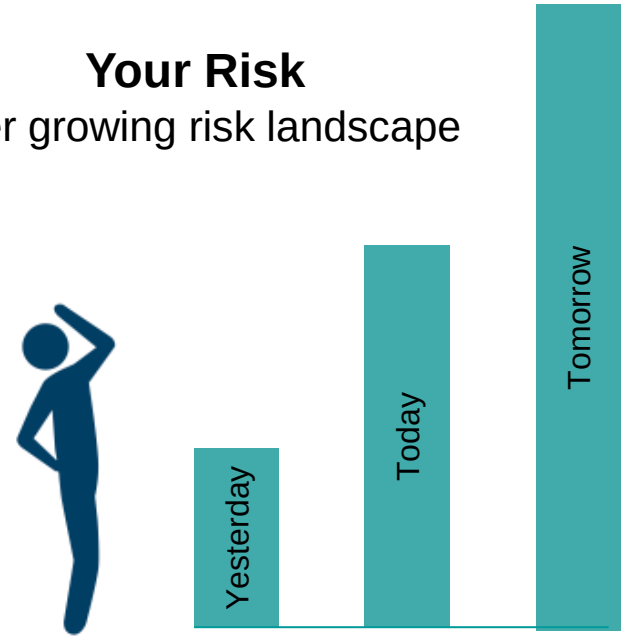
All Solved? How to Proceed?

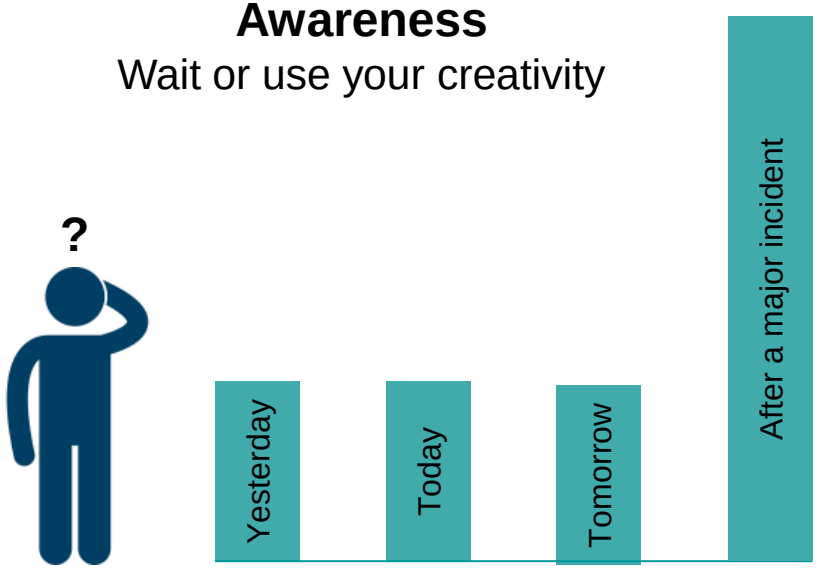
Your Risk

Ever growing risk landscape



Awareness

Wait or use your creativity



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