Ollscoil Teicneolaíochta an Oirdheiscirt
South East Technological University

PROUD MEMBER OF CYBER | IRELAND

Cyber-security in Manufacturing

Dr Diarmuid Ó Briain

4 July 2024
10:00 – 11:00 hrs

IDEAM INDUSTRY CLUSTER

TUS IDEAM INDUSTRY CLUSTER

Digitalisation Leadership Bootcamp

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INSPIRING FUTURES

Topics

- What is Operational Technology?
- The Purdue Enterprise Reference Architecture
- NIST Cybersecurity Framework (CSF) v2
- CIS Critical Security Controls (CSC)
- NIST SP 800-82 Guide to Operational Technology Security
- ISA/IEC 62443 Securing Industrial Systems
- Network Information Systems 2 (NIS-2)
- Risk Management Measures (RMM) and CyFun

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What is
Operational Technology (OT)?

Information Technology —v— Operational Technology

- **IT**

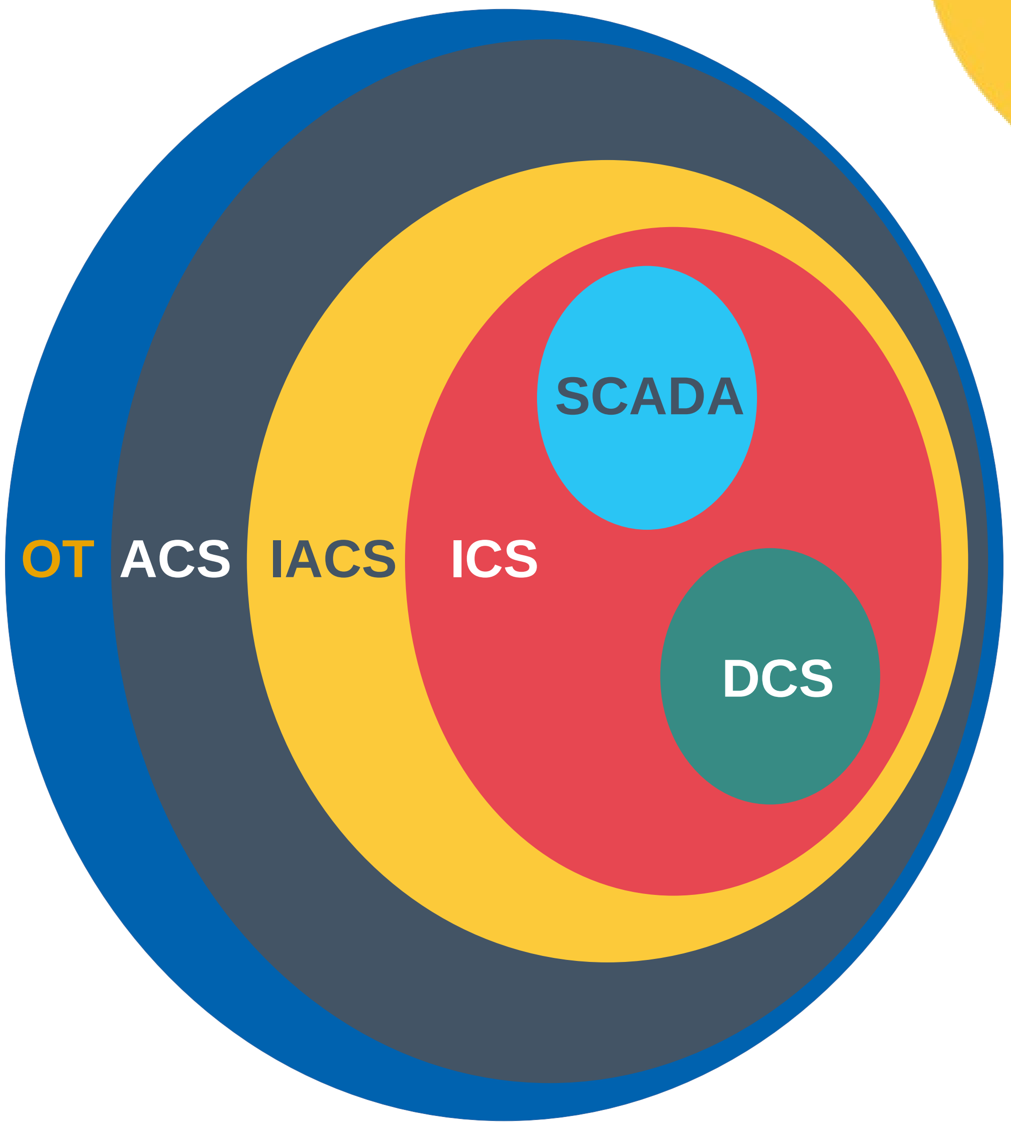
Any equipment or interconnected system used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by an organisation or by a 3rd party on the organisations behalf.

- **OT**

Programmable systems or devices that interact with the physical environment, or manage devices that interact with the physical environment. These systems/devices detect or cause a direct change through the monitoring and/or control of devices, processes, and events.

Some OT Terms

- Operational Technology (OT)
- Automation and Control Systems (ACS)
- Industrial Automation and Control Systems (IACS)
- Industrial Control Systems (ICS)
- Supervisory Control and Data Acquisition (SCADA)
- Distributed Control System (DCS)



Exercise #1

Exercise #1

- What is different about this power station and a typical office environment in terms of computing?

2

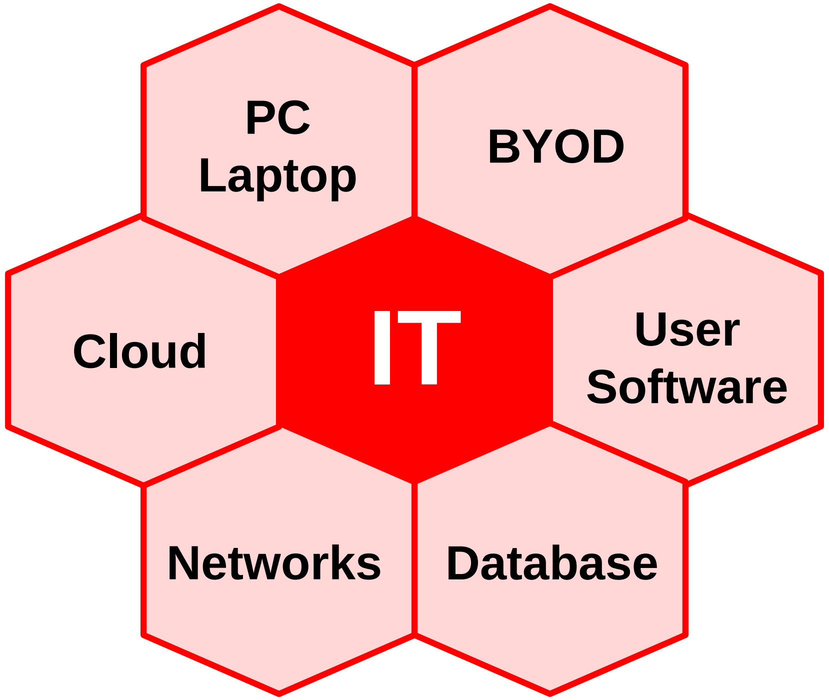
ESB Aghada,
Cork, Ireland

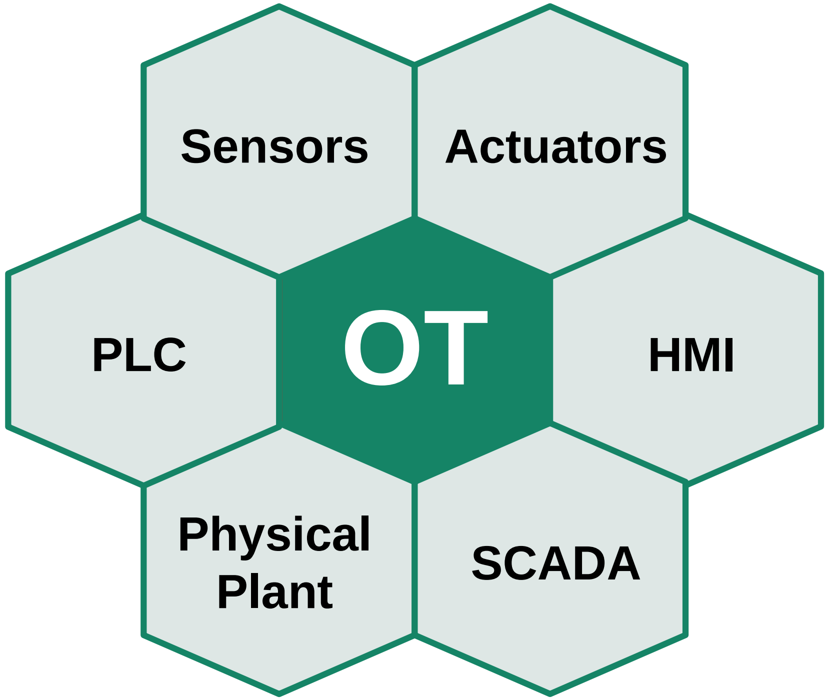
Exercise #1

- What is different about this power station and a typical office environment in terms of computing?
  - Computing interacts with physical processes.
  - There is the potential for physical damage.
  - The size of such facilities and the concerns for operations and security.
  - There is a real risk to human life.
  - Wider implications for society if the station is disrupted.

ESB Aghada,
Cork, Ireland

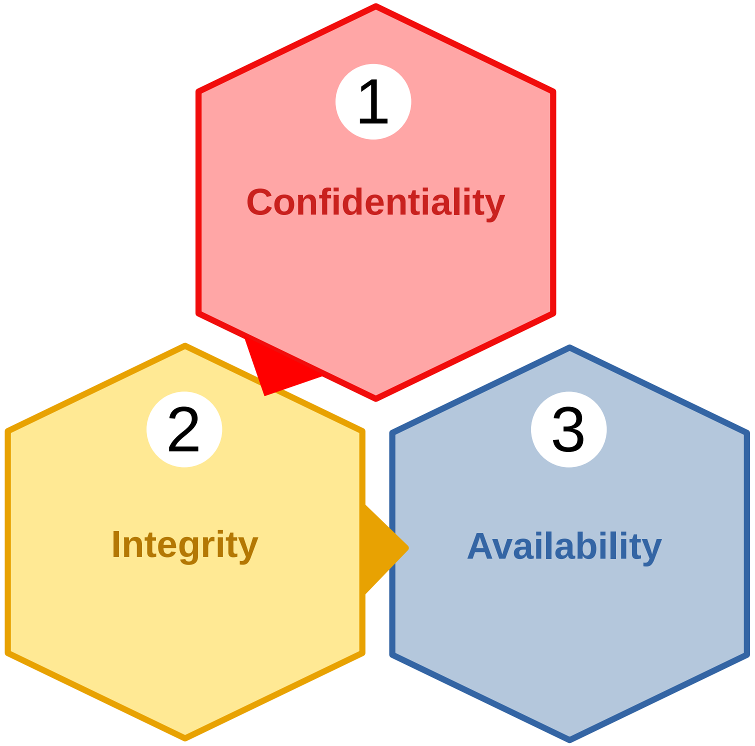
Information Technology -v- Operational Technology



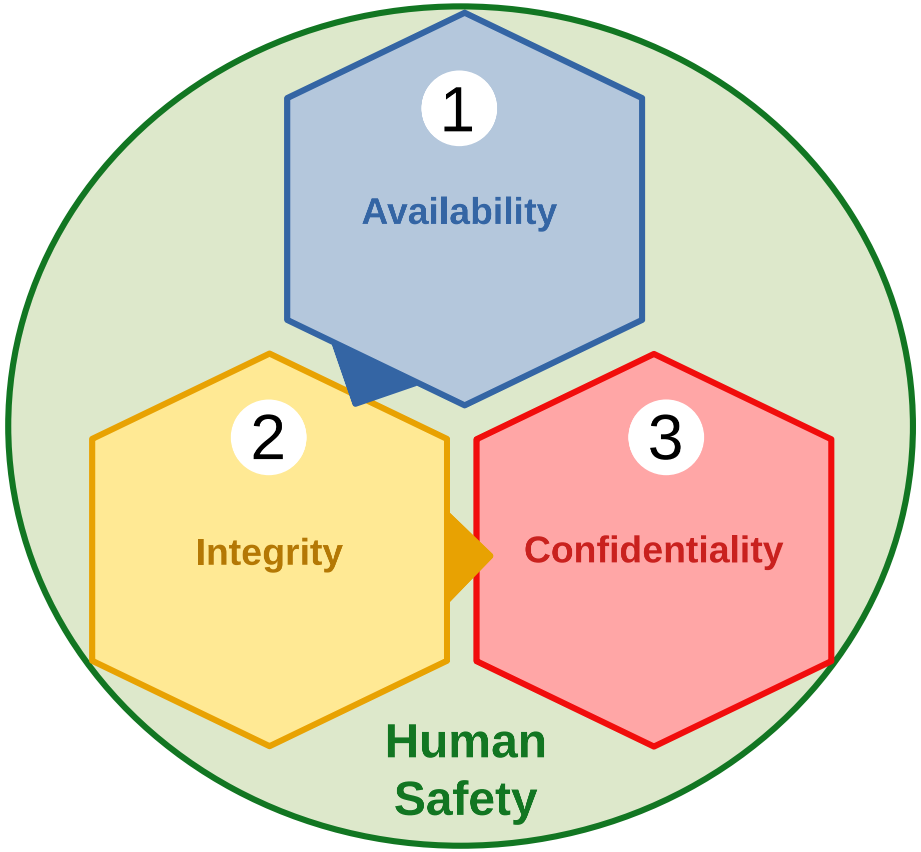


Core Principles IT/OT

IT (CIA Triad)

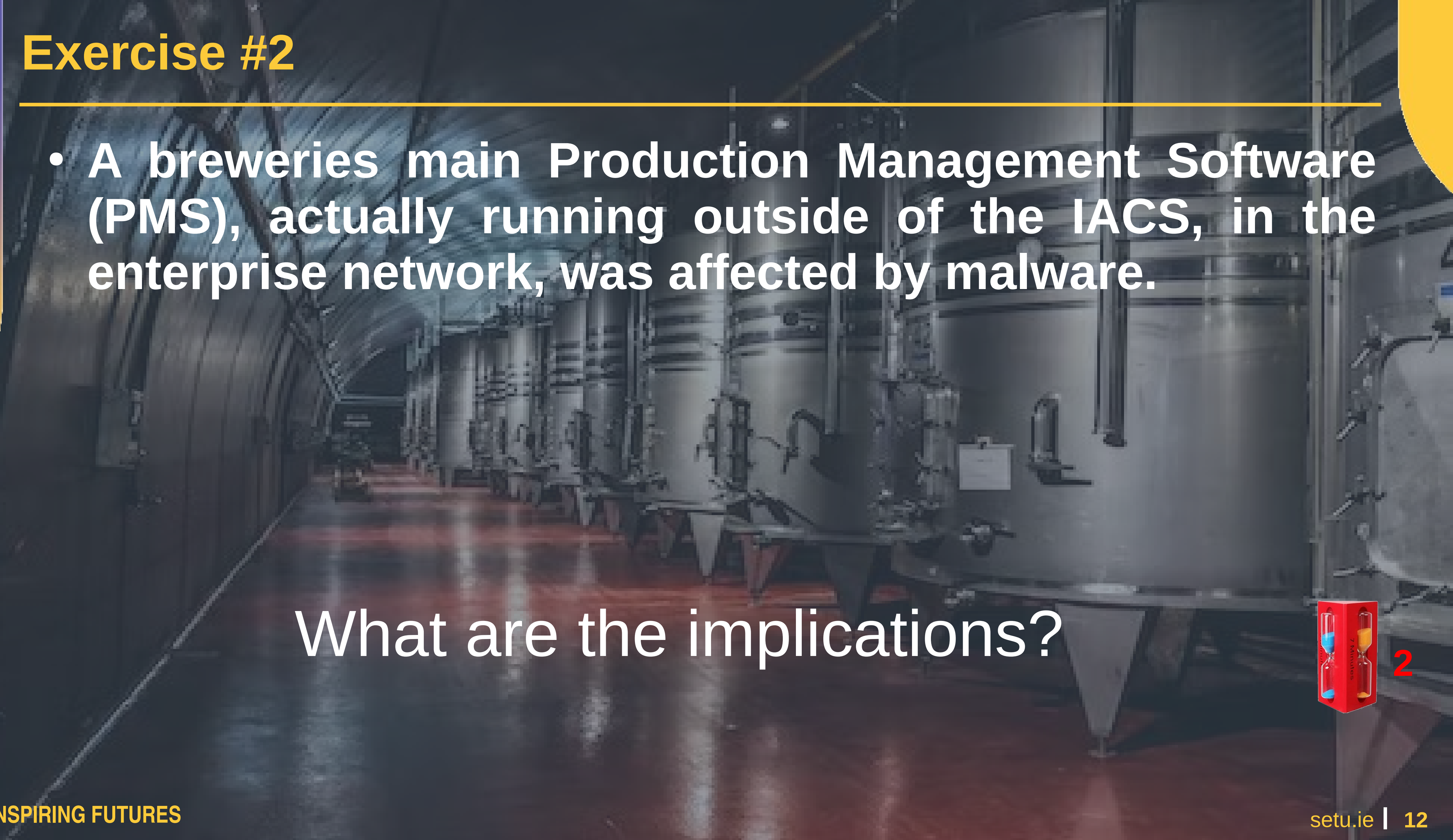


OT (SAIC)



Exercise #2

Exercise #2

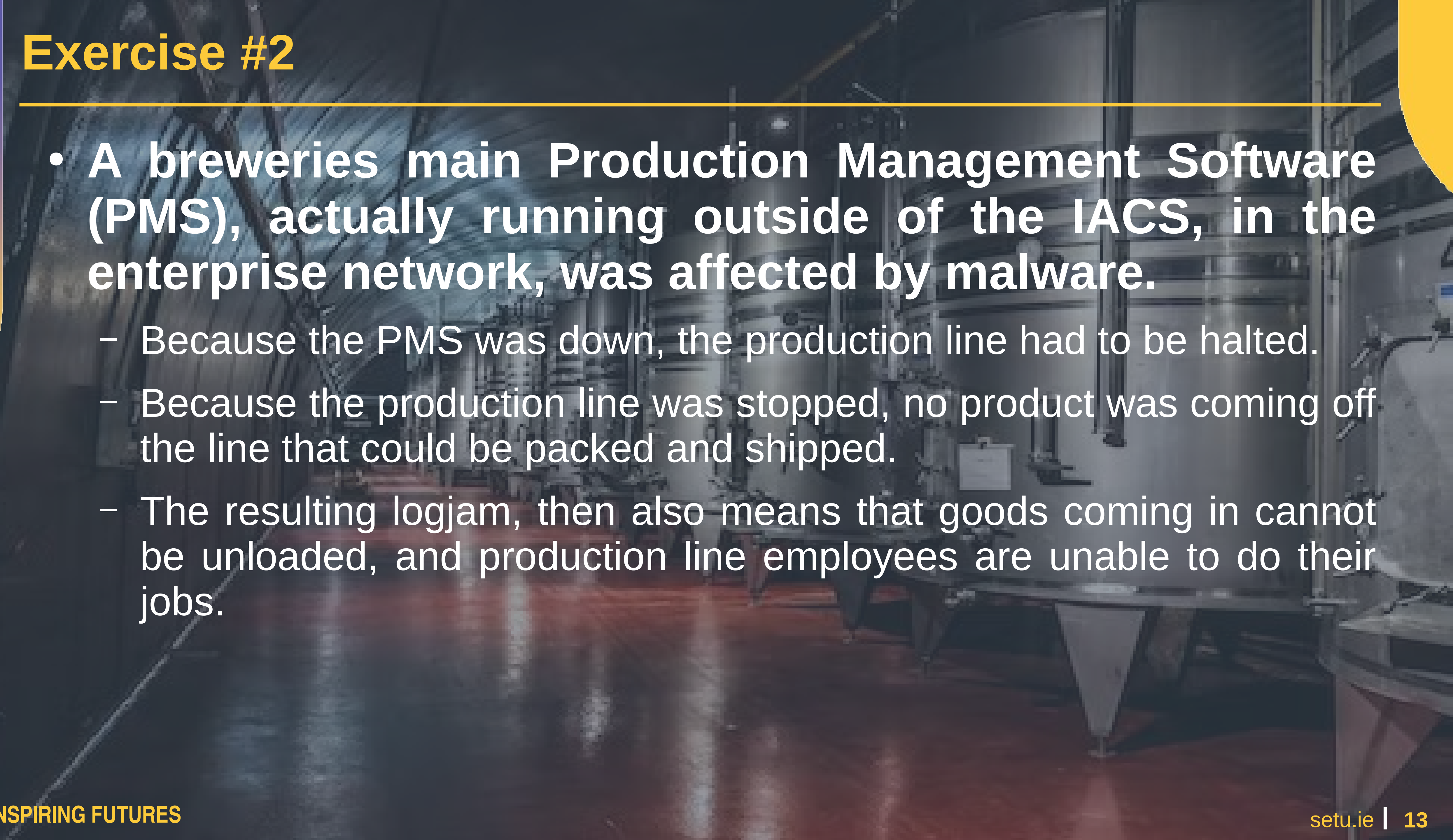


- A breweries main Production Management Software (PMS), actually running outside of the IACS, in the enterprise network, was affected by malware.

What are the implications?

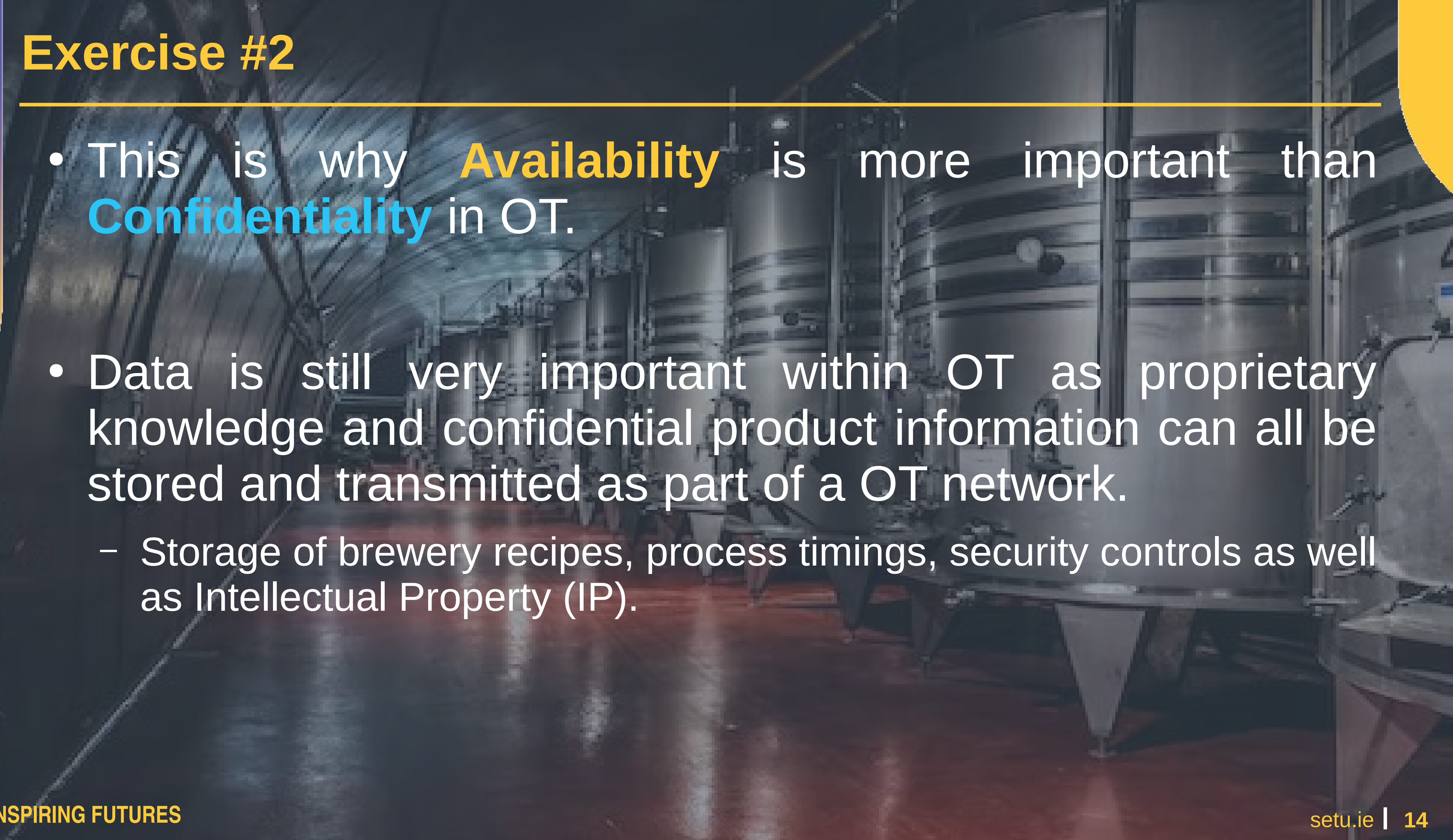
2

Exercise #2



- **A breweries main Production Management Software (PMS), actually running outside of the IACS, in the enterprise network, was affected by malware.**
  - Because the PMS was down, the production line had to be halted.
  - Because the production line was stopped, no product was coming off the line that could be packed and shipped.
  - The resulting logjam, then also means that goods coming in cannot be unloaded, and production line employees are unable to do their jobs.

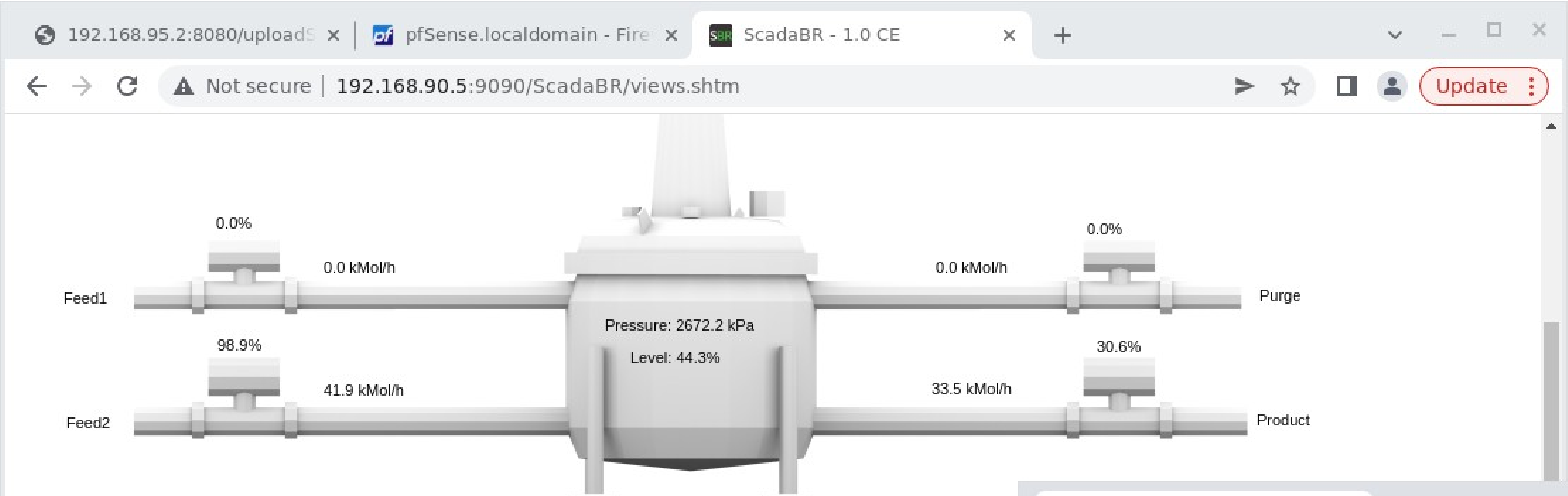
Exercise #2



- This is why **Availability** is more important than **Confidentiality** in OT.

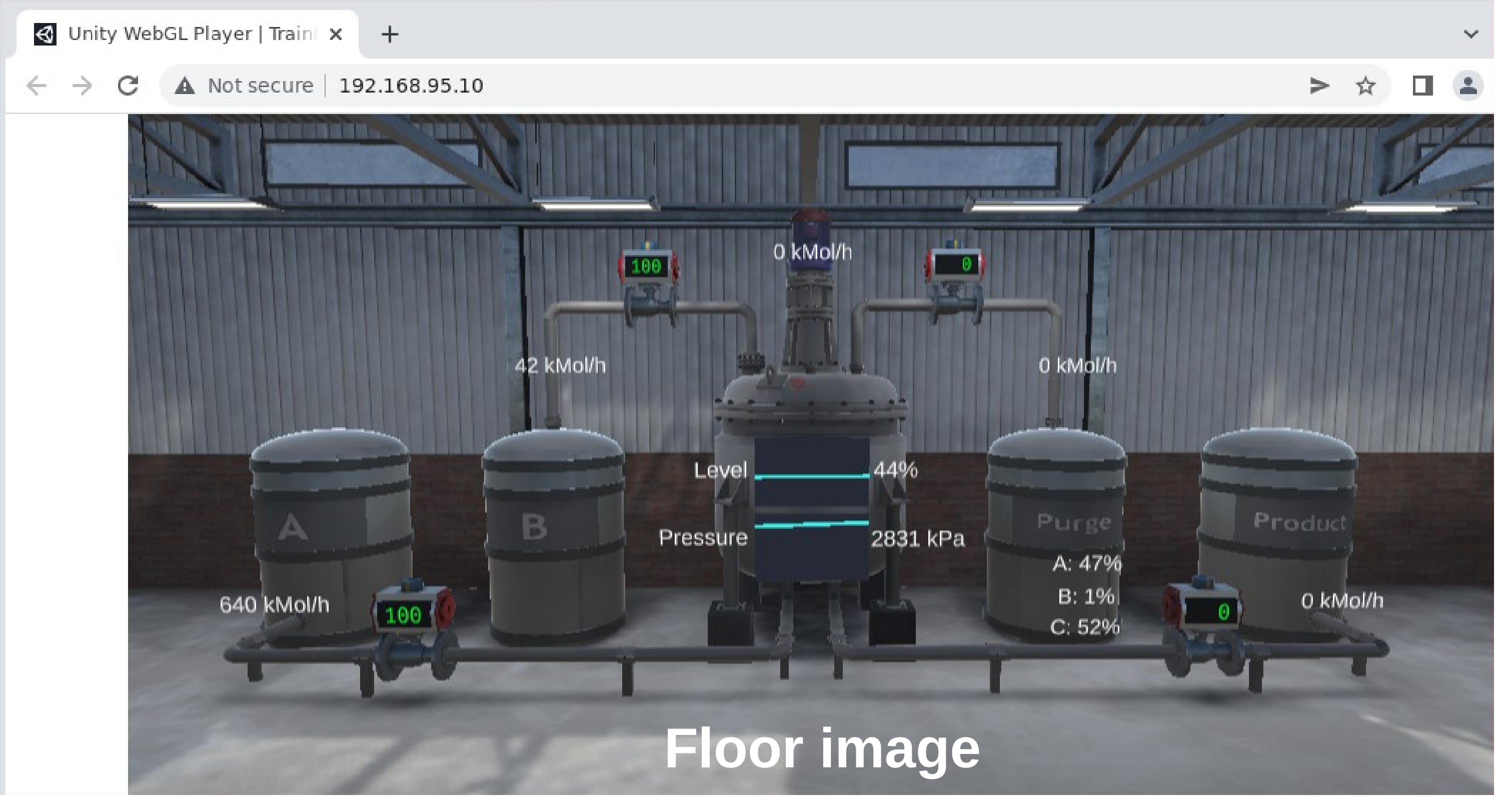
- Data is still very important within OT as proprietary knowledge and confidential product information can all be stored and transmitted as part of a OT network.
  - Storage of brewery recipes, process timings, security controls as well as Intellectual Property (IP).

Observe anything?



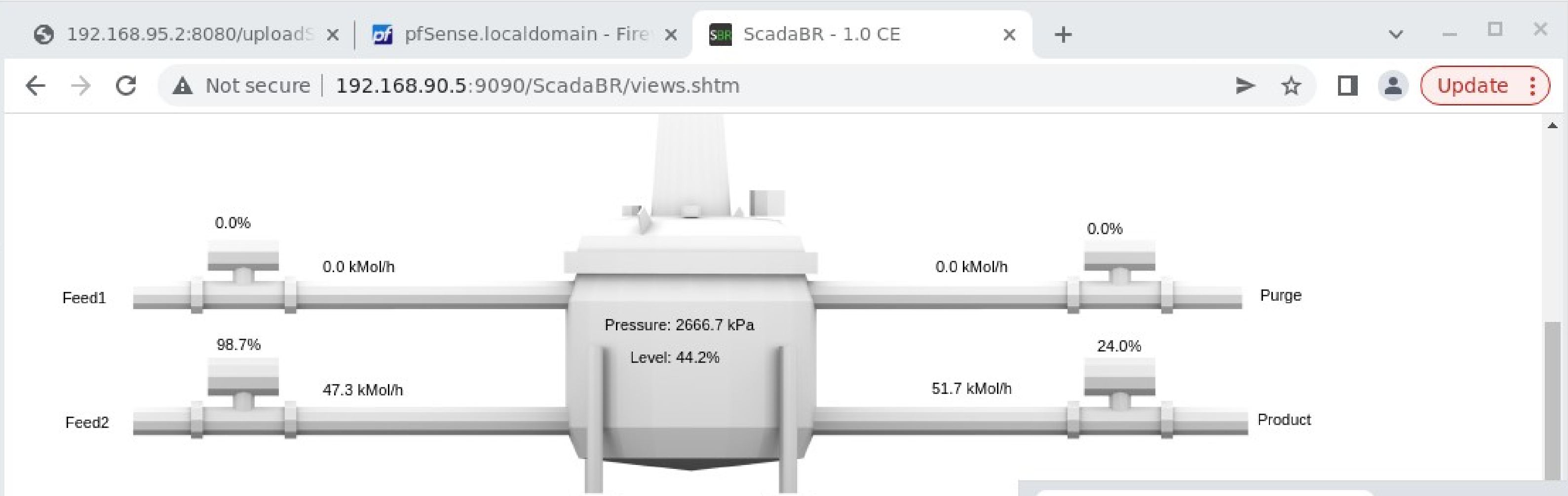
editor_files.zip

SCADA view

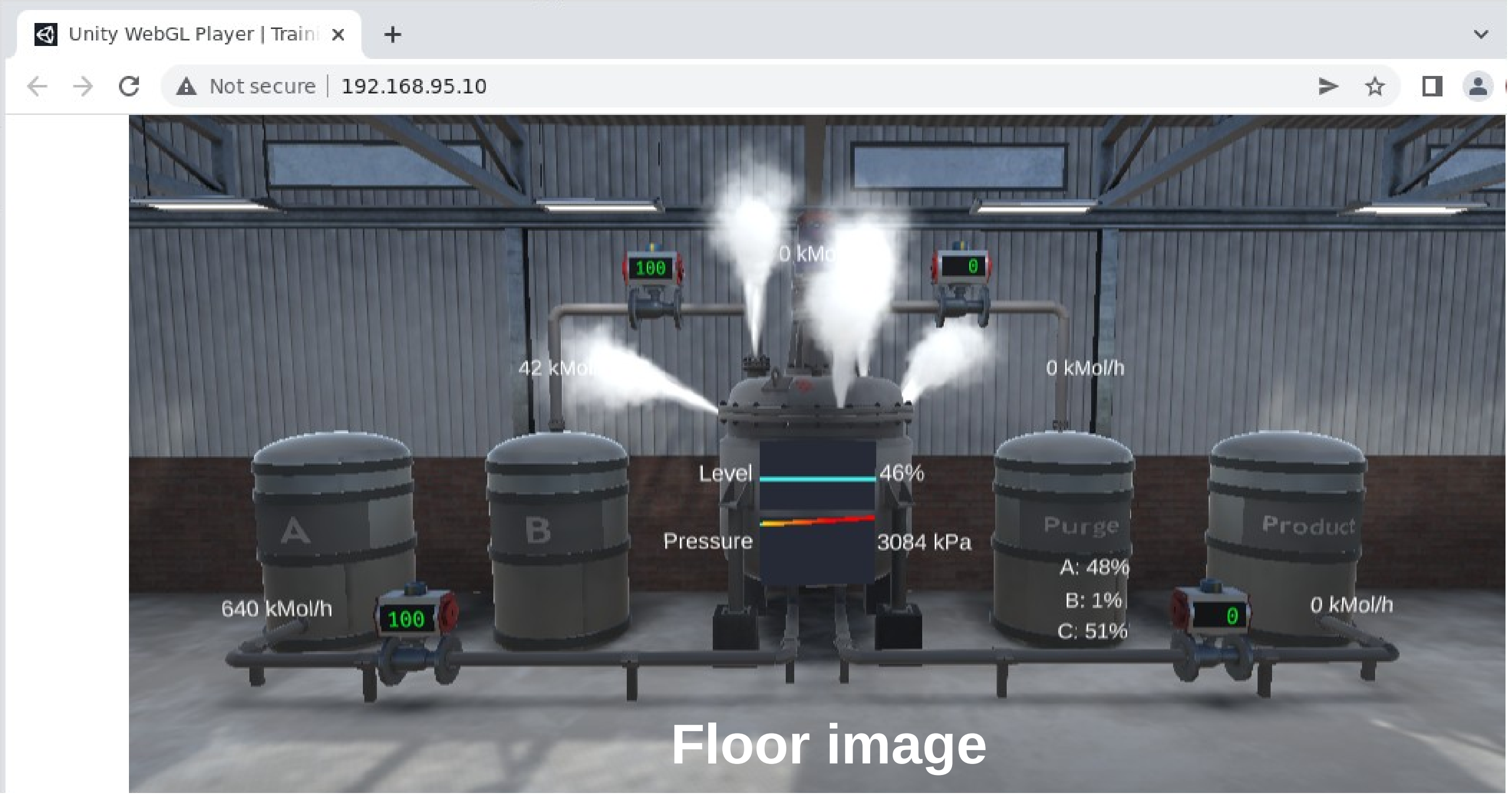


Floor image

1

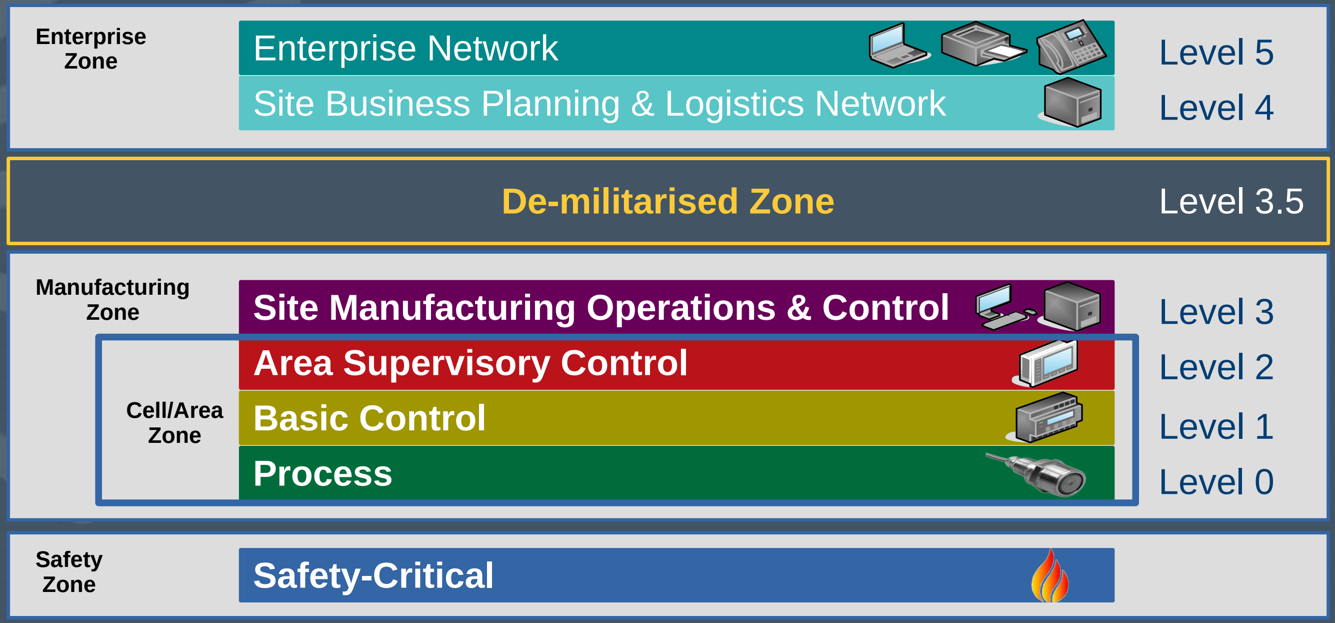


SCADA view



Floor image

Purdue Enterprise Reference Architecture (PERA)



Enterprise Zone

- Enterprise Network — Level 5
- Site Business Planning & Logistics Network — Level 4

De-militarised Zone — Level 3.5

Manufacturing Zone

- Site Manufacturing Operations & Control — Level 3

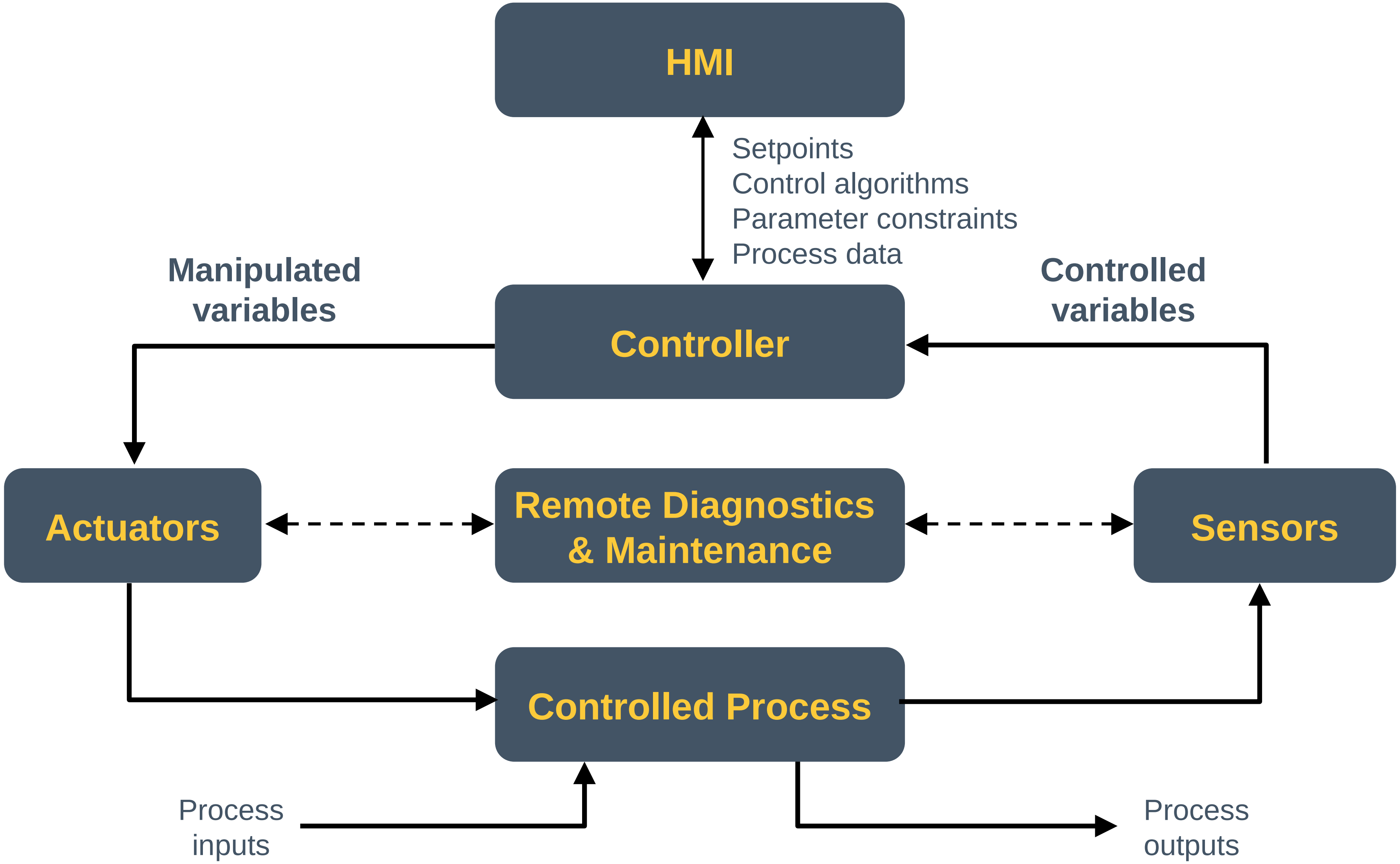
Cell/Area Zone

- Area Supervisory Control — Level 2
- Basic Control — Level 1
- Process — Level 0

Safety Zone

- Safety-Critical

Typical OT System


HMI

Setpoints
Control algorithms
Parameter constraints
Process data

Manipulated variables

Controlled variables

Controller

Actuators

Remote Diagnostics & Maintenance

Sensors

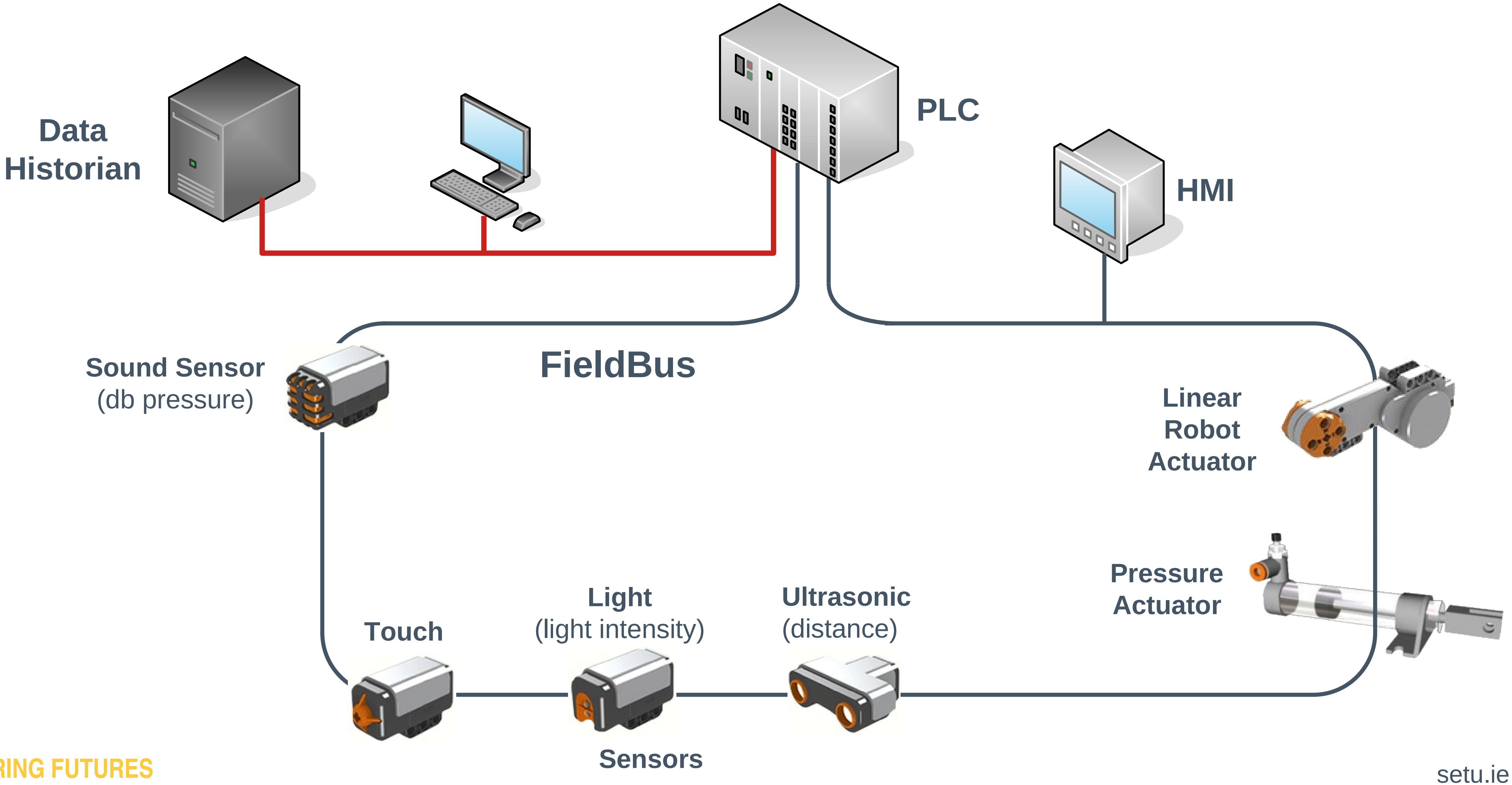
Controlled Process

Process inputs

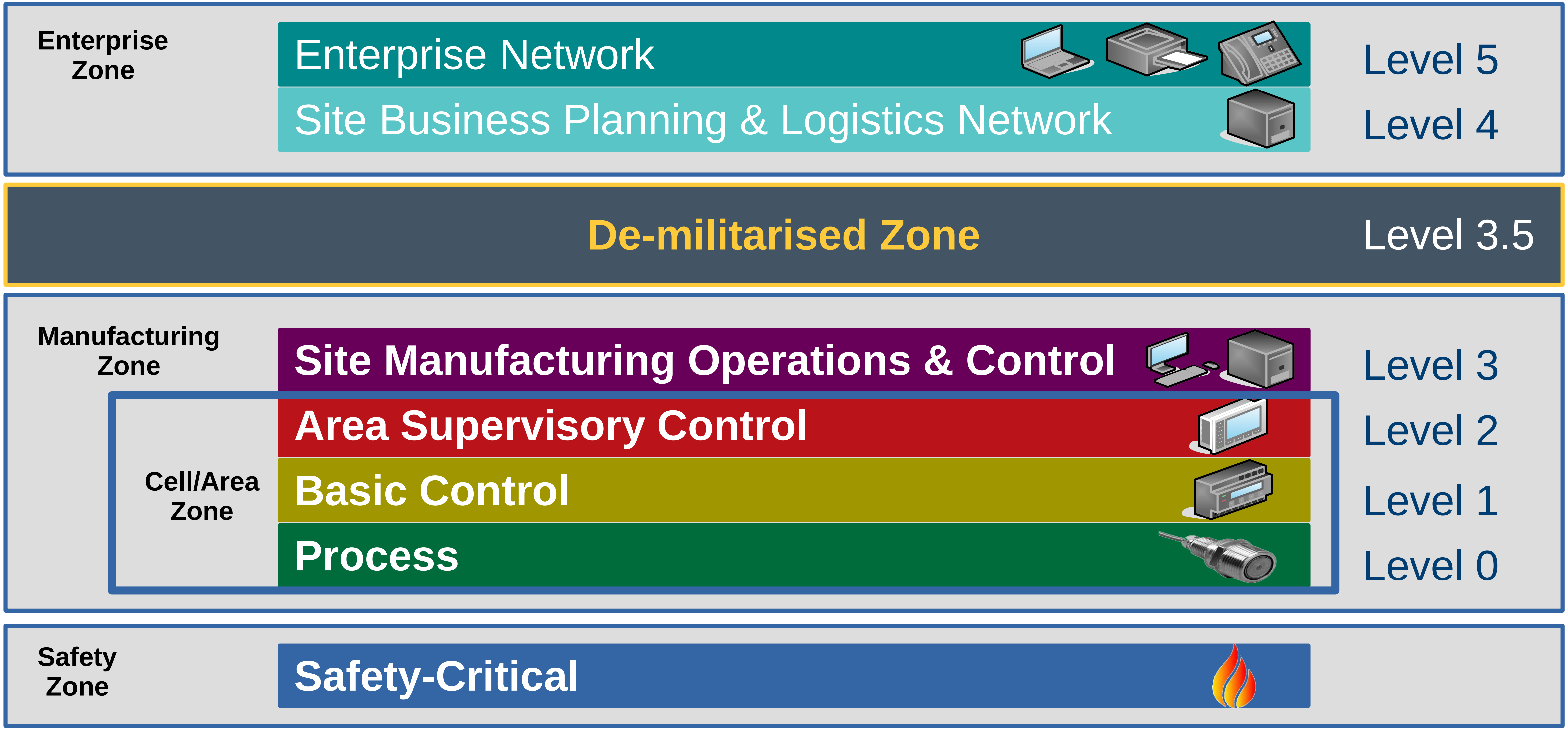
Process outputs

INSPIRING FUTURES

PLC Control in OT System



Functional manufacturing levels



Enterprise Zone

Enterprise Network — Level 5

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De-militarised Zone — Level 3.5

Manufacturing Zone

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Area Supervisory Control — Level 2

Basic Control — Level 1

Process — Level 0

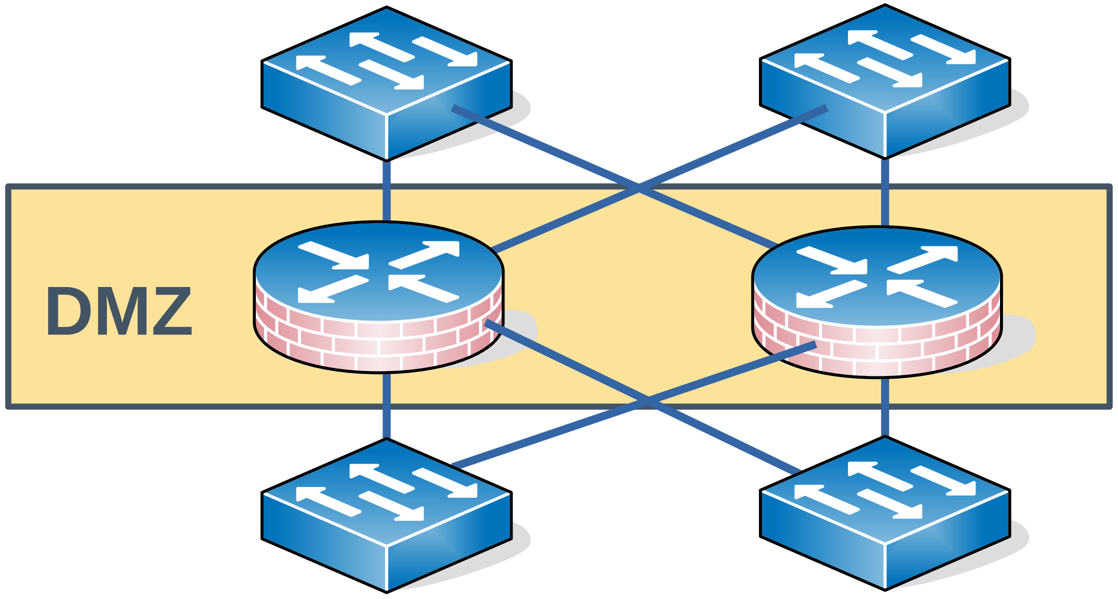
Safety Zone

Safety-Critical

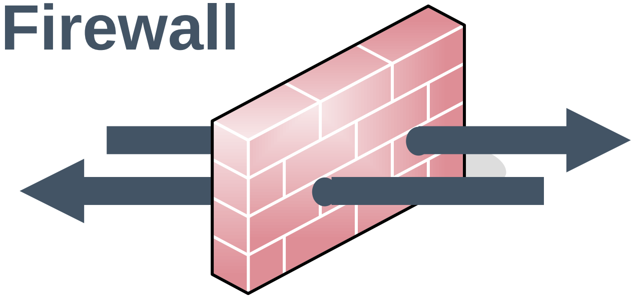
Ref: https://www.energy.gov/sites/default/files/2022-10/Infra_Topic_Paper_4-14_FINAL.pdf

Purdue Model

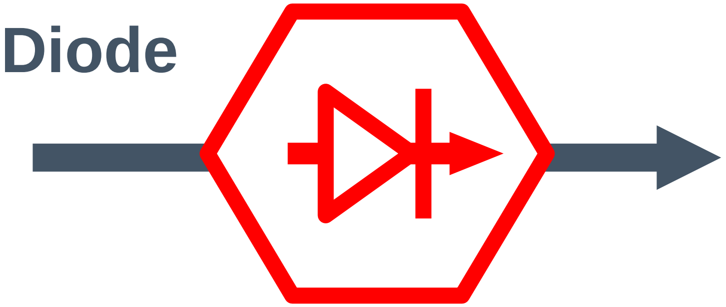
- **Industrial DMZ** (Level 3.5)
  - This first line of defence in isolating the IACS from IT network.



Firewall



Data Diode



Exercise #3

Exercise #3

- **Scenario**: Take a computer parts assembly line:
  - At the end of each line there is packer **robot #1** that takes flat-packed boxes and assembles them, bends the sides, closes the 4 bottom flaps, tapes the base.
  - Another packer **robot #2** packs parts off the assembly line into the boxes and when full allows the box to continue.
  - Packer **robot #3** that inserts the manual and warranty information closes the lid, tapes the lid and affixes the product specification sticker to the box.
  - The box passes on to a sorter robot who places it in a large box along with 99 others until the large box is full, seals it and it is moved to a distribution warehouse.

Exercise #3

- **Task**: Consider that a software patch was applied to packer **robot #1** that rendered it unworkable.
  - List the consequences that you can foresee for the business, the plant and the employees if this robot is offline for two to three hours as a result.

3

Exercise #3

- **Business**
  - Production Slowdown, missed deadlines, production quotas not being met, and potential loss of revenue.
- **Increased Costs**
  - Overtime
  - Expedited Shipping
  - Customer Dissatisfaction
- **Plant**
  - Production Line Inefficiency
  - Inventory Buildup
  - Equipment Wear and Tear

- **Employees**
  - Downtime
  - Frustration and boredom
  - Increased Workload
  - Safety Concerns

The impact can be lessened if there are **mitigation strategies** in place.

NIST Cybersecurity Framework (**CSF**) v2.0

NIST Cybersecurity Framework (CSF) v2.0

- CSF Functions

Govern (GV)

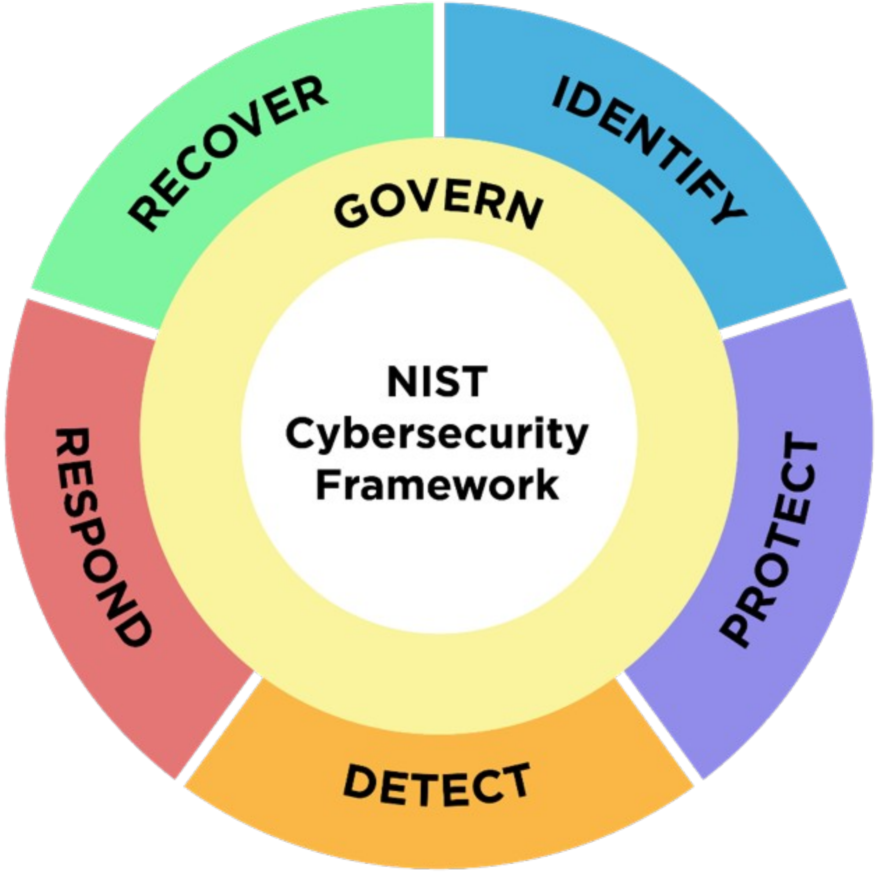
Identify (ID)

Protect (PR)

Detect (DE)

Respond (RS)

Recover (RC)



Ref: https://www.nist.gov/cyberframework

Categories and Sub-categories

Function	Category	Category ID
Govern (GV)	Organisational Context	GV.OC
	Risk Management Strategy	GV.RM
	Cybersecurity Supply Chain Risk Management	GV.SC
	Roles, Responsibilities, and Authorities	GV.RR
	Policies, Processes, and Procedures	GV.PO
	Oversight	GV.OV
Identify (ID)	Asset Management	ID.AM
	Risk Assessment	ID.RA
	Improvement	ID.IM
Protect (PR)	Identity Management, Authentication, and Access Control	PR.AA
	Awareness and Training	PR.AT
	Data Security	PR.DS
	Platform Security	PR.PS
	Technology Infrastructure Resilience	PR.IR
Detect (DE)	Continuous Monitoring	DE.CM
	Adverse Event Analysis	DE.AE
Respond (RS)	Incident Management	RS.MA
	Incident Analysis	RS.AN
	Incident Response Reporting and Communication	RS.CO
	Incident Mitigation	RS.MI
Recover (RC)	Incident Recovery Plan Execution	RC.RP
	Incident Recovery Communication	RC.CO

CIS

Center for
Internet Security

CIS
Controls

Center for Internet Security (CIS)

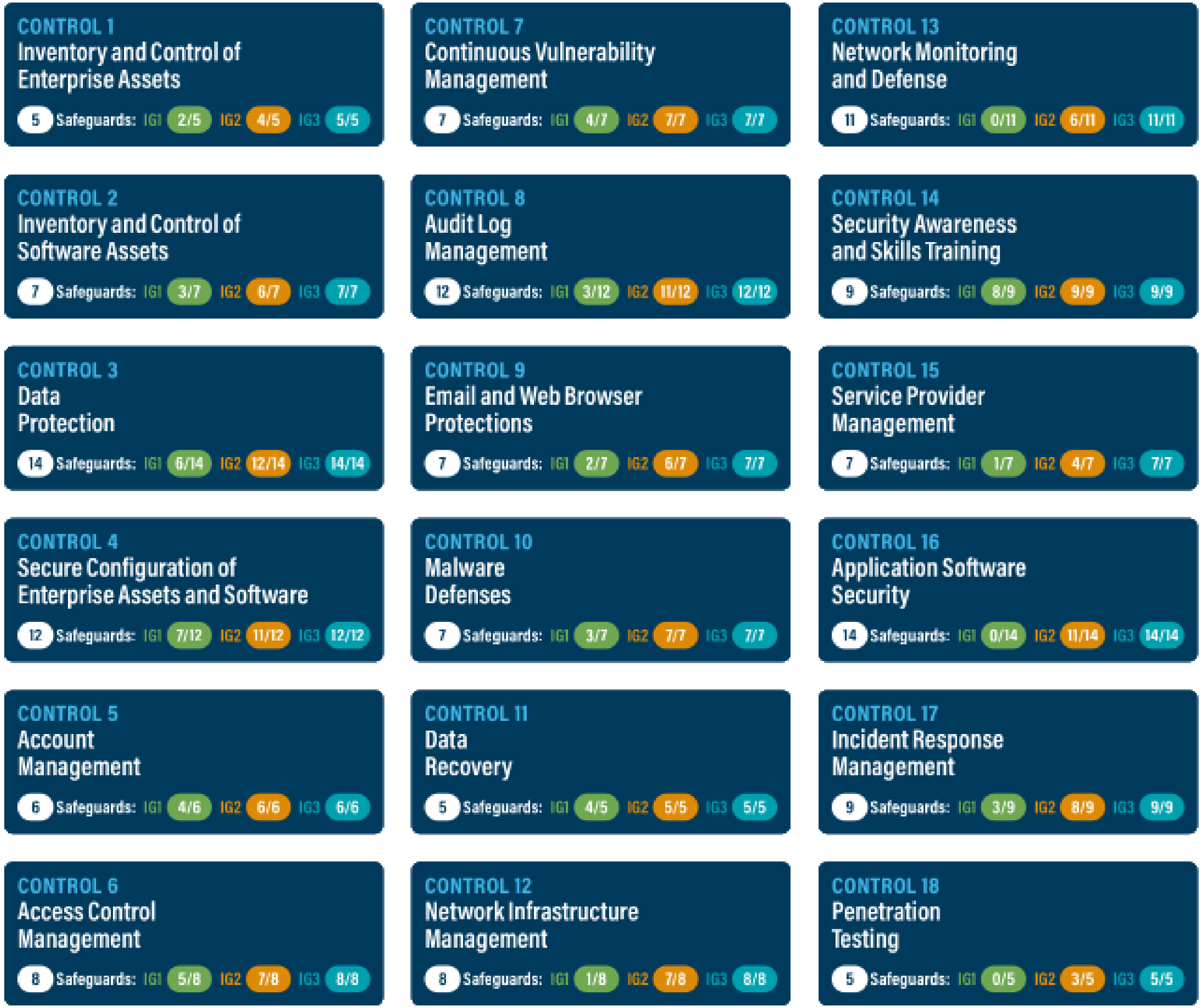
- 2008 - collaboration between representatives from the U.S. government and private sector security research organisations.
- Current version 8.1 – Released June 2024
- Prioritised set of safeguards to mitigate the most prevalent cyber-attacks against systems and networks.
- They are considered the gold standard for cybersecurity best practices and are widely used by organisations of all sizes to improve their security posture.

https://www.cisecurity.org/controls

Implementation Groups

- **IG1** - Safeguards selected for IG1 should be implementable with limited cybersecurity expertise and aimed to thwart general, non-targeted attacks.
- **IG2** (Includes IG1) - An IG2 enterprise employs individuals responsible for managing and protecting IT infrastructure. These enterprises support multiple departments with differing risk profiles based on job function and mission.
- **IG3** (Includes IG1 and IG2) - An IG3 enterprise employs security experts that specialise in the different facets of cybersecurity. IG3 assets and data contain sensitive information or functions that are subject to regulatory and compliance oversight.

Critical Security Controls (CSC)



CONTROL 1
Inventory and Control of Enterprise Assets
5 Safeguards: IG1 2/5 IG2 4/5 IG3 5/5

CONTROL 2
Inventory and Control of Software Assets
7 Safeguards: IG1 3/7 IG2 6/7 IG3 7/7

CONTROL 3
Data Protection
14 Safeguards: IG1 6/14 IG2 12/14 IG3 14/14

CONTROL 4
Secure Configuration of Enterprise Assets and Software
12 Safeguards: IG1 7/12 IG2 11/12 IG3 12/12

CONTROL 5
Account Management
6 Safeguards: IG1 4/6 IG2 6/6 IG3 6/6

CONTROL 6
Access Control Management
8 Safeguards: IG1 5/8 IG2 7/8 IG3 8/8

CONTROL 7
Continuous Vulnerability Management
7 Safeguards: IG1 4/7 IG2 7/7 IG3 7/7

CONTROL 8
Audit Log Management
12 Safeguards: IG1 3/12 IG2 11/12 IG3 12/12

CONTROL 9
Email and Web Browser Protections
7 Safeguards: IG1 2/7 IG2 6/7 IG3 7/7

CONTROL 10
Malware Defenses
7 Safeguards: IG1 3/7 IG2 7/7 IG3 7/7

CONTROL 11
Data Recovery
5 Safeguards: IG1 4/5 IG2 5/5 IG3 5/5

CONTROL 12
Network Infrastructure Management
8 Safeguards: IG1 1/8 IG2 7/8 IG3 8/8

CONTROL 13
Network Monitoring and Defense
11 Safeguards: IG1 0/11 IG2 6/11 IG3 11/11

CONTROL 14
Security Awareness and Skills Training
9 Safeguards: IG1 8/9 IG2 9/9 IG3 9/9

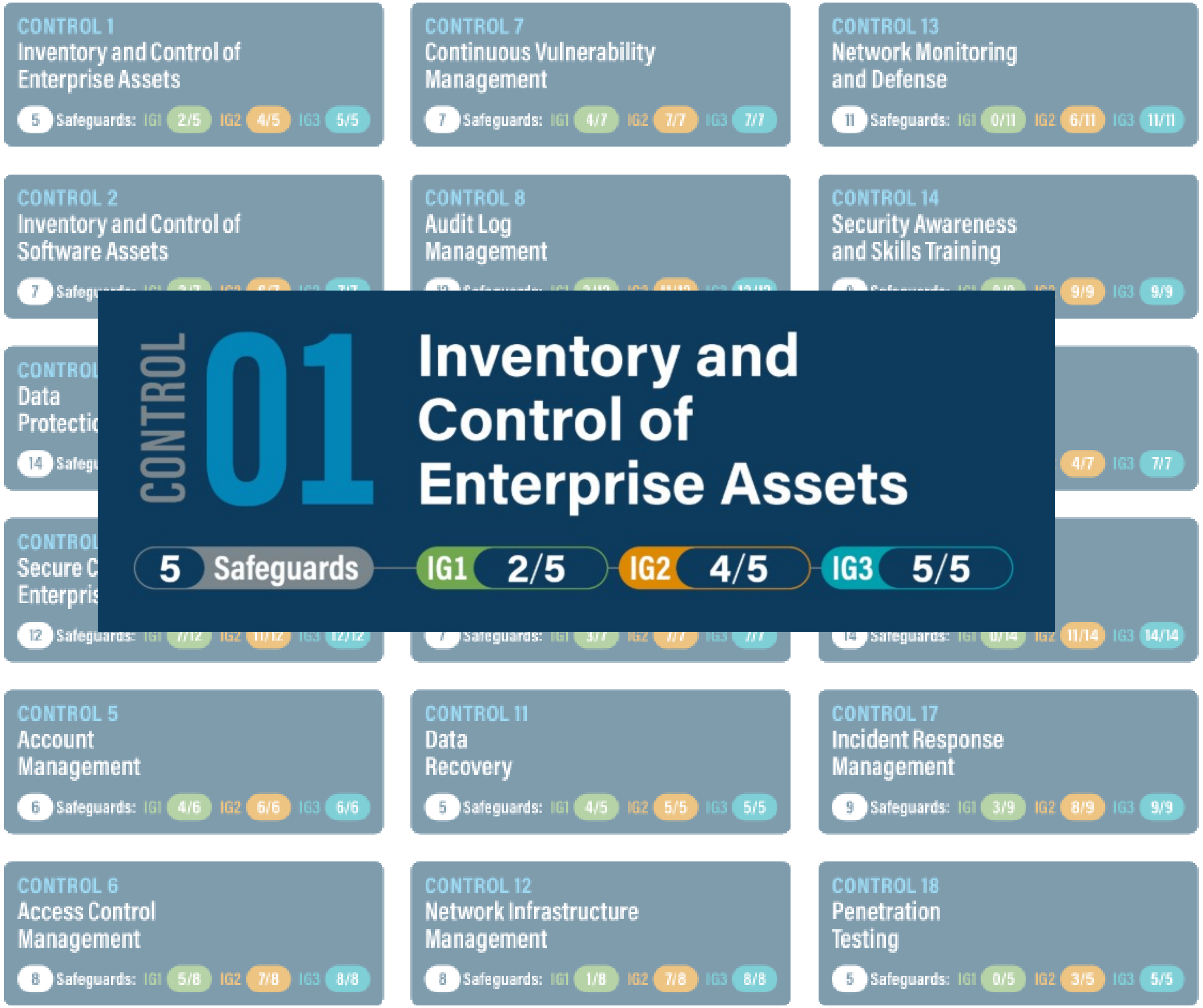
CONTROL 15
Service Provider Management
7 Safeguards: IG1 1/7 IG2 4/7 IG3 7/7

CONTROL 16
Application Software Security
14 Safeguards: IG1 0/14 IG2 11/14 IG3 14/14

CONTROL 17
Incident Response Management
9 Safeguards: IG1 3/9 IG2 8/9 IG3 9/9

CONTROL 18
Penetration Testing
5 Safeguards: IG1 0/5 IG2 3/5 IG3 5/5

Critical Security Controls (CSC)



CONTROL 1
Inventory and Control of Enterprise Assets
5 Safeguards: IG1 2/5 IG2 4/5 IG3 5/5

CONTROL 2
Inventory and Control of Software Assets
7 Safeg

CONTROL
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CONTROL
Secure C
Enterpris
12 Safeguards: IG1 7/12 IG2 11/12 IG3 12/12

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Account Management
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Audit Log Management

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IG2 9/9 IG3 9/9

4/7 IG3 7/7

14 Safeguards: IG1 0/14 IG2 11/14 IG3 14/14

CONTROL 17
Incident Response Management
9 Safeguards: IG1 3/9 IG2 8/9 IG3 9/9

CONTROL 18
Penetration Testing
5 Safeguards: IG1 0/5 IG2 3/5 IG3 5/5

CONTROL 01
Inventory and Control of Enterprise Assets
5 Safeguards IG1 2/5 IG2 4/5 IG3 5/5

CSC Safeguards example

- CSC 1 - Inventory and Control of Enterprise Assets

ESSENTIAL CYBER HYGIENE IG1 IG2 IG3 Safeguard 1.1 - Establish and Maintain Detailed Enterprise Asset Inventory

- Security function: Identify

ESSENTIAL CYBER HYGIENE IG1 IG2 IG3 Safeguard 1.2 - Address Unauthorised Assets

- Security function: Respond

IG2 IG3 Safeguard 1.3 - Utilise an Active Discovery Tool

- Security function: Detect

IG2 IG3 Safeguard 1.4 - Use DHCP Logging to Update Enterprise Asset Inventory

- Security function: Identify

IG3 Safeguard 1.5 - Use a Passive Asset Discovery Tool

- Security function: Detect

ISO 27001 ISMS

ISO/IEC 27001 – Management Requirement

- ISO/IEC 27001 provides and ISMS that allows the organisation to:
  - Systematically **identify security risks**, considering threats, vulnerabilities, and impacts.
  - Design and deploy comprehensive **security controls** or other risk treatments.
  - Maintain an ongoing process to ensure **controls remain effective**.
  - Use a coherent, **all-encompassing suite of controls**.
  - **Continuously monitor and adjust** security measures.

Ref: https://www.iso.org/standard/27001

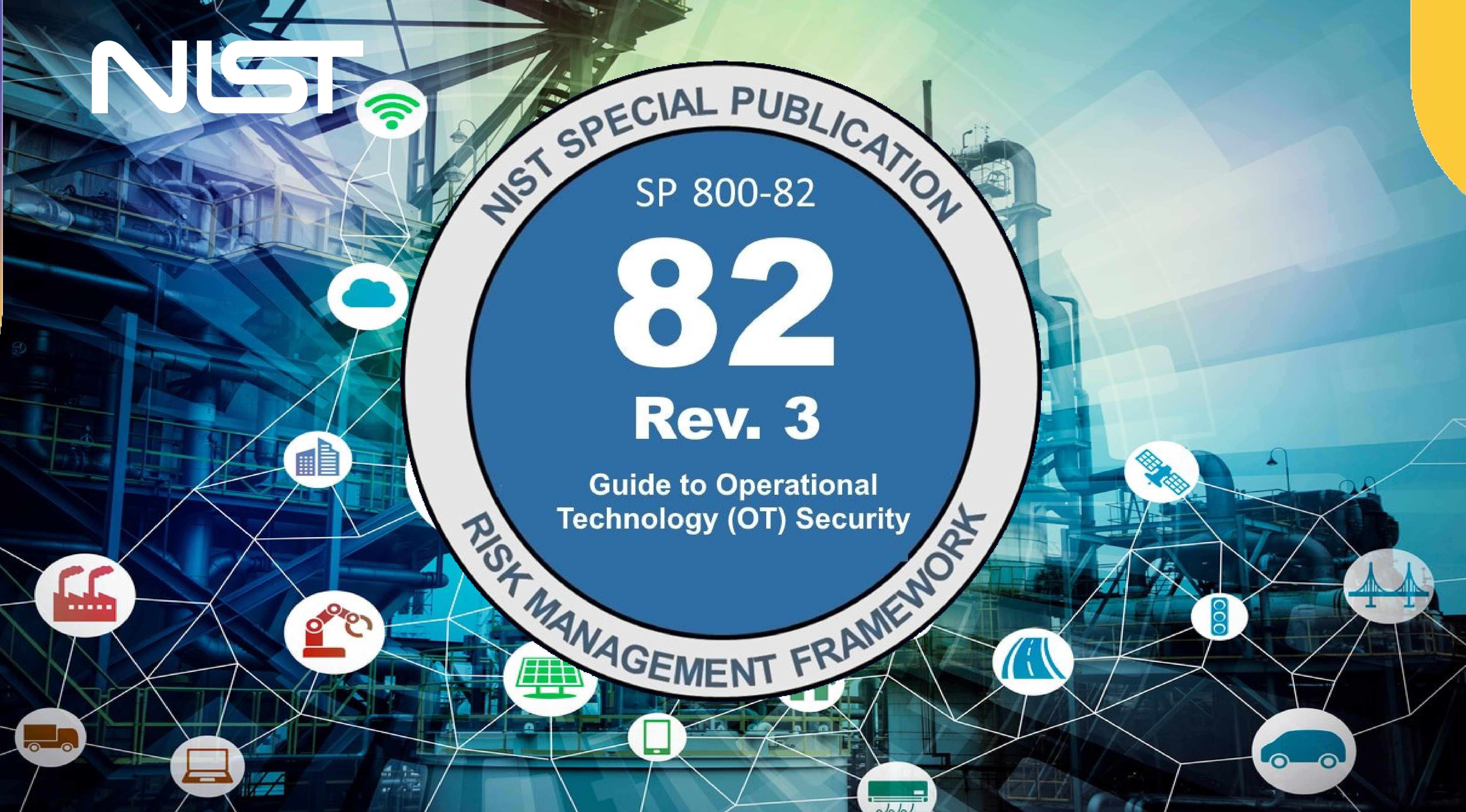
ISO 27001

Control Points (CP) in ISO27001:2022

Technical	• Firewalls • Intrusion detection systems • Data encryption • Password management
Organisational	• Information security policies and procedures • Training for employees • Incident response plan • Risk Assessment • Access Control • Data Security • Business Continuity
Change Management	• Offsite backup • Asset management

Systematic approach to implementation of ISMS

- Get top management **commitment and support**.
- **Involve all stakeholders** in the implementation process.
- Use a **risk-based approach** to identify and mitigate risks.
- Choose the **right tools and technologies** to support the ISMS.
- **Monitor and review** the ISMS on an ongoing basis.
- Make **continuous improvement** a part of the ISMS.



NIST

NIST SPECIAL PUBLICATION

SP 800-82

82

Rev. 3

Guide to Operational Technology (OT) Security

RISK MANAGEMENT FRAMEWORK

NIST SP 800-82 Rev. 3

- Guidance on how to secure OT while addressing their unique performance, reliability, and safety requirements.
- Identifies common threats and vulnerabilities to OT.
- Recommends security countermeasures to mitigate associated risks.
- Provides OT-tailored security control overlay that customises controls for the unique characteristics of the OT domain.

https://csrc.nist.gov/pubs/sp/800/82/r3/final

NIST SP 800-82 Rev. 3

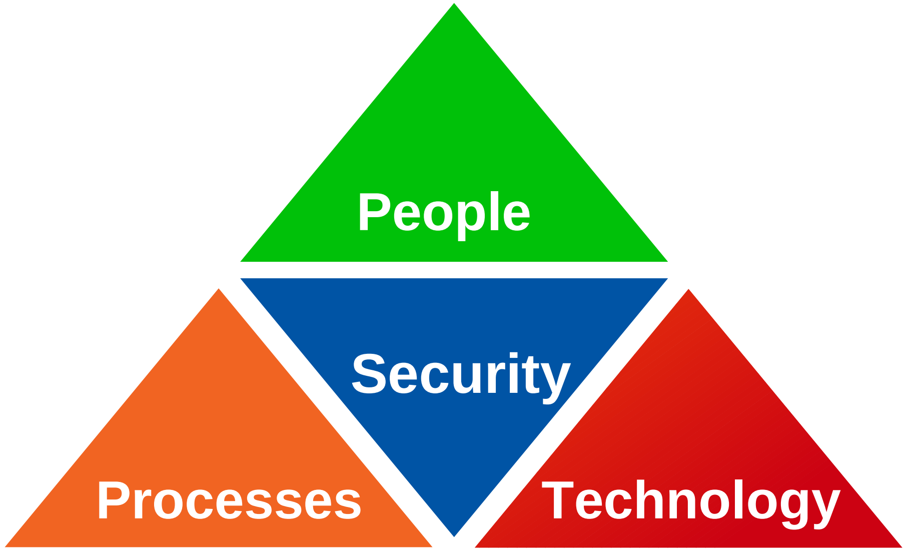
- Establish OTSec governance.
- Build and train a cross-functional team to implement an OTSec programme.
- Define the OTSec strategy.
- Define OT-specific policies and procedures.
- Establish a OT specific cybersecurity awareness training programme.
- Implement a Risk Management Framework for OT.
- Develop a maintenance tracking capability.
- Develop an incident response capability.
- Develop a recovery and restoration capability.

ISA/IEC 62443

Cybersecurity for operational technology in automation and control systems

ISA/IEC 62443 Series of Standards

- A series of standards is a comprehensive and internationally recognised framework for securing IACS.
- It provides a holistic approach to cybersecurity, addressing all aspects of IACS security throughout their lifecycle, from design and development to operation and maintenance.

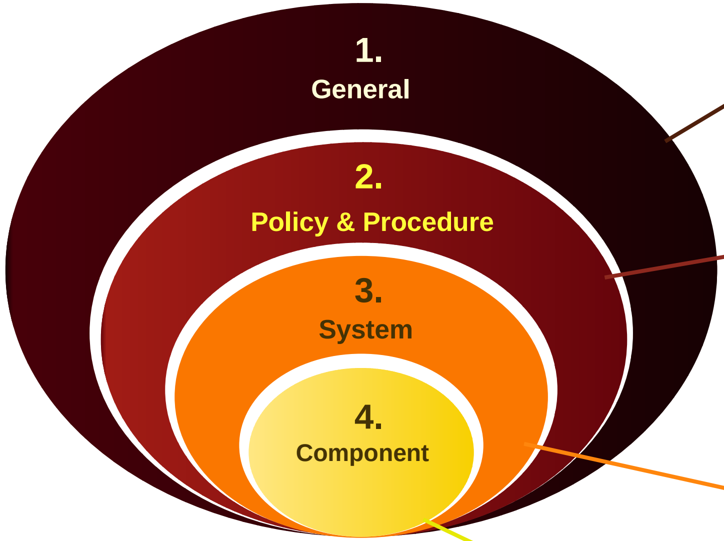


- **Core Principles**
  - Security by design
  - Security by default
  - Security throughout the lifecycle
  - Security risk management

Ref: https://www.isa.org/standards-and-publications/isa-standards/isa-iec-62443-series-of-standards

ISA/IEC 62443 Series of Standards

Industrial Automation and Control System (IACS)



Asset owner responsibility:

Part 1-1: Terminology, concepts and models
Part 1-2: Master glossary of terms and conditions
Part 1-3: System security conformance metrics
Part 1-4: ICAS security lifecycle and use cases

Part 2-1: Security programme requirements for IACS asset owners
Part 2-2: ICAS Security programme ratings
Part 2-3: Patch management in the IACS environment
Part 2-4: Security programme requirements for IACS service providers
Part 2-5: Implementation guidance for ICAS asset owners

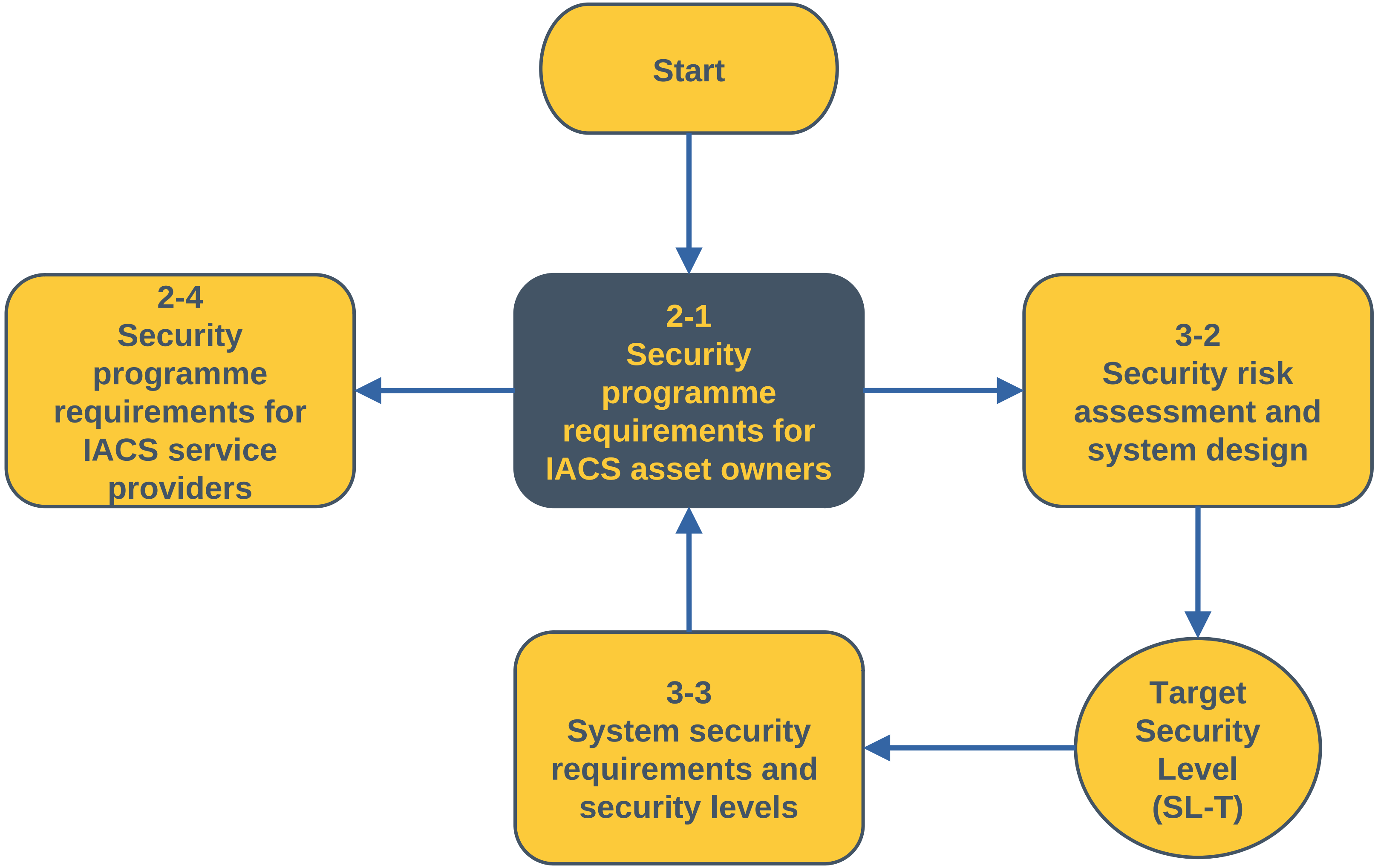
Systems Integrator responsibility:

Part 3-1: Security technologies for ICAS
Part 3-2: Security risk assessment for system design
Part 3-3: System security requirements and security levels

Component Supplier responsibility:

Part 4-1: Secure product development lifecycle requirements
Part 4-2: Technical security requirements for IACS components

ISA/IEC 62443 Relationship Between Parts


Start
2-1
Security programme requirements for IACS asset owners
2-4
Security programme requirements for IACS service providers
3-2
Security risk assessment and system design
Target Security Level (SL-T)
3-3
System security requirements and security levels

NIS-2

EU and Cybersecurity

- Common market, different OT Cybersecurity approaches.
- Critical National Infrastructure (CNI) risks, an incident in one member state may impact a service in another state.
- Network Information Security (NIS) Directive 2016/1148
  - Common level of security for all member states.
- Network Information Security 2 Directive 2022/2555
  - Broadened the scope of the original directive.
  - Identifies 10 sectors of high criticality and 7 other critical services.

Ref: https://eur-lex.europa.eu/eli/dir/2022/2555/2022-12-27/eng

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Essential and Important entities must take appropriate and proportional technical, operational and organisational measures to manage the risks posed to the systems.

Three main pillars of NIS2

Member State Responsibilities

- Competent Authorities
- National Strategies
- CVD Frameworks
- Crisis Management
- Frameworks

Company Responsibilities

Risk Management

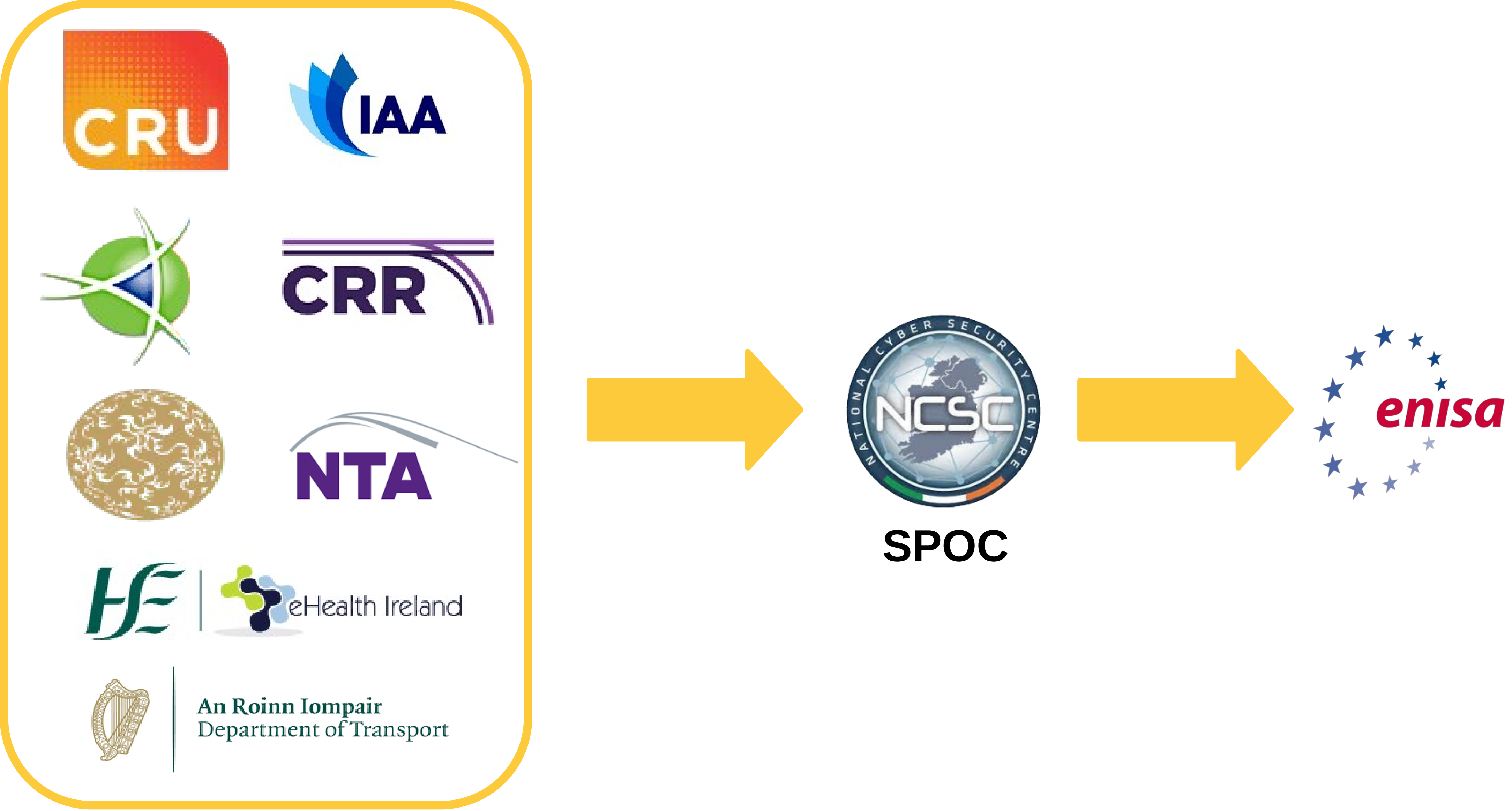
- Accountability for top management for non-compliance
- Essential and important companies are required to take security measures
- Companies are required to notify incidents within a given time frame

Co-operation and Information Exchange

- Cooperation Group
- CSIRTs Network
- CyCLONe
- CVD and European Vulnerability registry
- Peer-reviews
- Biennial ENISA cybersecurity report

Coordinated Vulnerability Disclosure (CVD)
European Cyber Crisis Liaison Organisation Network (EU-CyCLONe)
European Network Information Security Agency (ENISA)

Irish Competent Authorities



SPOC

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*Entities may be designated as “**Essential**” or “**Important**” depending on factors such as size, sector and criticality.*

Entities

Large Enterprise

- >= 250 employees, or
- > €50m revenue

Medium Enterprise

- 50-249 employees, or
- > €10m revenue

Small & Micro Enterprise

- < 50 employees

NIS2 Sectors of high criticality

Energy

Transport

Banking

Financial Markets

Digital Infrastructure

- IXPs
- CSPs
- Data Centres
- CDNs

Essential Entities

Important Entities

(EU) 2024/2690:
Implementing Regulation

Drinking Water

Waste Water

Health

Space

NIS2 Sectors of high criticality

Digital Infrastructure

- **Qualified Trust Service Provider**
- **DNS Service Provider**
- **TLD registries**

Essential Entities

- **Providers of public electronic communications networks**

Essential Entities

Important Entities

(EU) 2024/2690: Implementing Regulation

- **Central Government**

Essential Entities

- **Regional Government**

Important Entities

Public Administration

https://eur-lex.europa.eu/eli/reg_impl/2024/2690/oj/eng

NIS2 Other critical sectors

Postal & Courier

Waste Management

Chemicals

Food

Important Entities

Manufacturing

Digital Providers

Research Organisations

Supervision of Entities by NCAs

Essential Entities	Important Entities
Ex Ante & Ex Post	**Ex Post**
On-site inspections and off-site supervision	On-site inspections and off-site, ex post, supervision
Regular & Targeted Security Audits	Targeted Security Security Audits
Security Scans	Security Scans
Information Requests	Information Requests
Requests for information necessary to assess the cybersecurity risk-management measures adopted by the entity concerned	Requests for information necessary to assess, ex post, the cybersecurity risk-management measures adopted by the entity concerned
Ad hoc audits, for example after a significant incident	

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NIS2 provides NCAs with a ***minimum*** *list of enforcement powers for non-compliance.*

NIS2 Penalties

- Strict penalties for non-compliance by entities.
- There are particularly high penalties for infringements of:
  - **Article 21 Cybersecurity risk-management measures**
  - **Article 23 Reporting obligations**
- **Essential entities** can be fined up to **€10,000,000** or at least **2%** of the total annual worldwide turnover in the previous fiscal year, whichever amount is higher.
- **Important entities** can be penalised by fines of up to **€7,000,000** or at least **1.4%** of the total annual worldwide turnover, whichever amount is higher.

NIST SP 800-82 || ISA/IEC 62443

NIS2 Requirement Category	NIST SP 800-82r3	ISA/IEC 62443 Series
Risk Management	Direct	Direct & Comprehensive
Incident Handling	Direct	Direct & Foundational
Business Continuity & Crisis Management	Direct	Direct & Integrated
Supply Chain Security	Indirect/Focus on Components	Direct & Comprehensive
Security in System Acquisition, Development, & Maintenance	Direct	Direct & Strong
Awareness Training & Hygiene	Direct	Direct
Access Control	Direct	Direct & Detailed
MFA & Encryption	Direct	Direct
Assessment of Effectiveness	Direct	Direct

NATIONAL CYBER SECURITY CENTRE

NCSC

RMM

CyFun

Risk Management Measures (RMM)

RMM001
Registration

RMM002
Governance – Management board commitment and accountability

RMM003
Network and Information Security Policy

RMM004
Risk Management Policy

RMM005
CI/assess effectiveness & improve cybersecurity RMM

RMM006
Basic Cyber Hygiene Practises & Security Training

RMM007
Asset Management

RMM008
Human Resource Security

RMM009
Access Control

RMM010
Environmental and physical security

RMM011
Cryptography, Encryption and Authentication

RMM012
Supply chain policy

RMM013
Security in network and information systems acquisition

RMM014
Incident Handling

RMM015
Incident Reporting

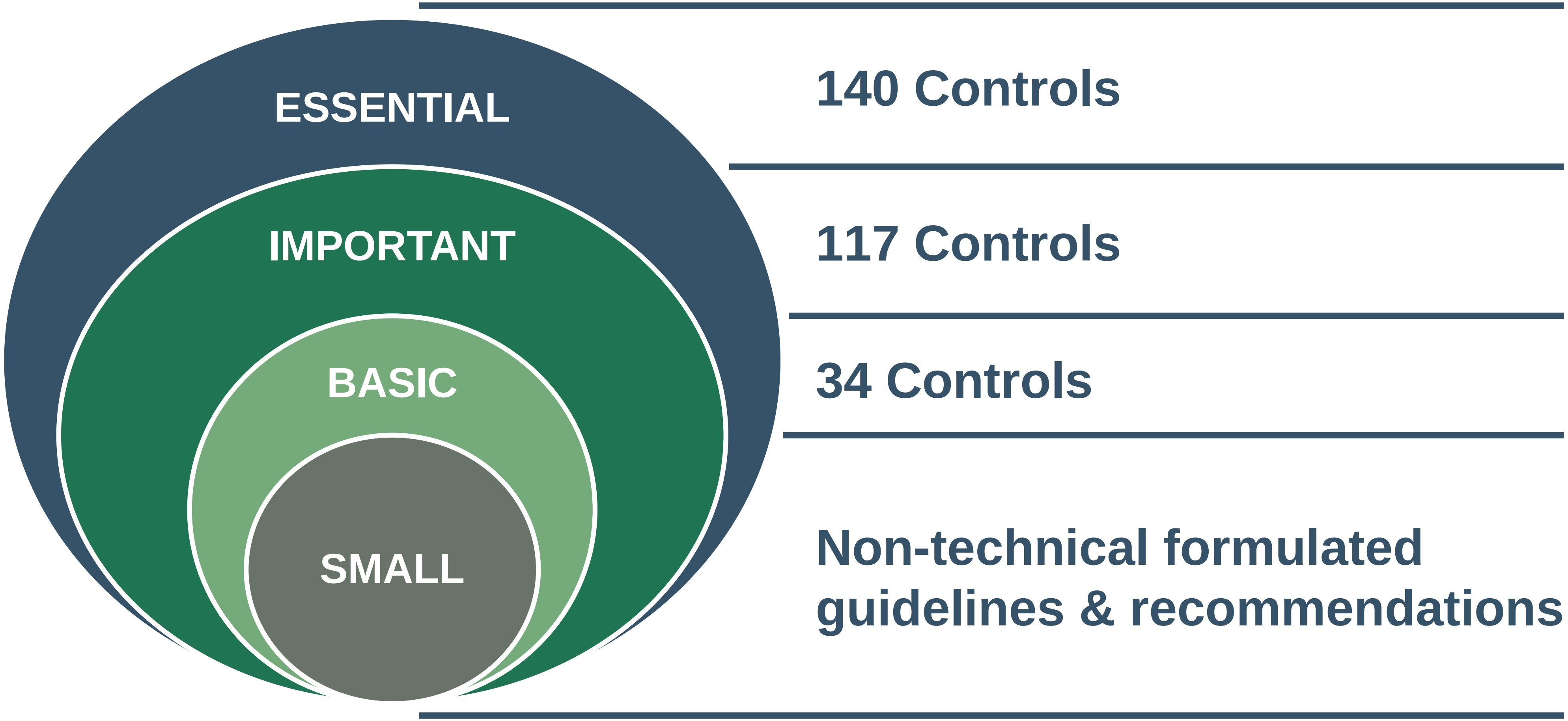
RMM016
Business Continuity and Crisis Management

Foundational Actions

Supporting Actions

Ref: https://www.ncsc.gov.ie/pdfs/NIS2_Draft_Risk_Management_Measures_Guidance.pdf

CyberFundamentals Framework (CyFun)



140 Controls

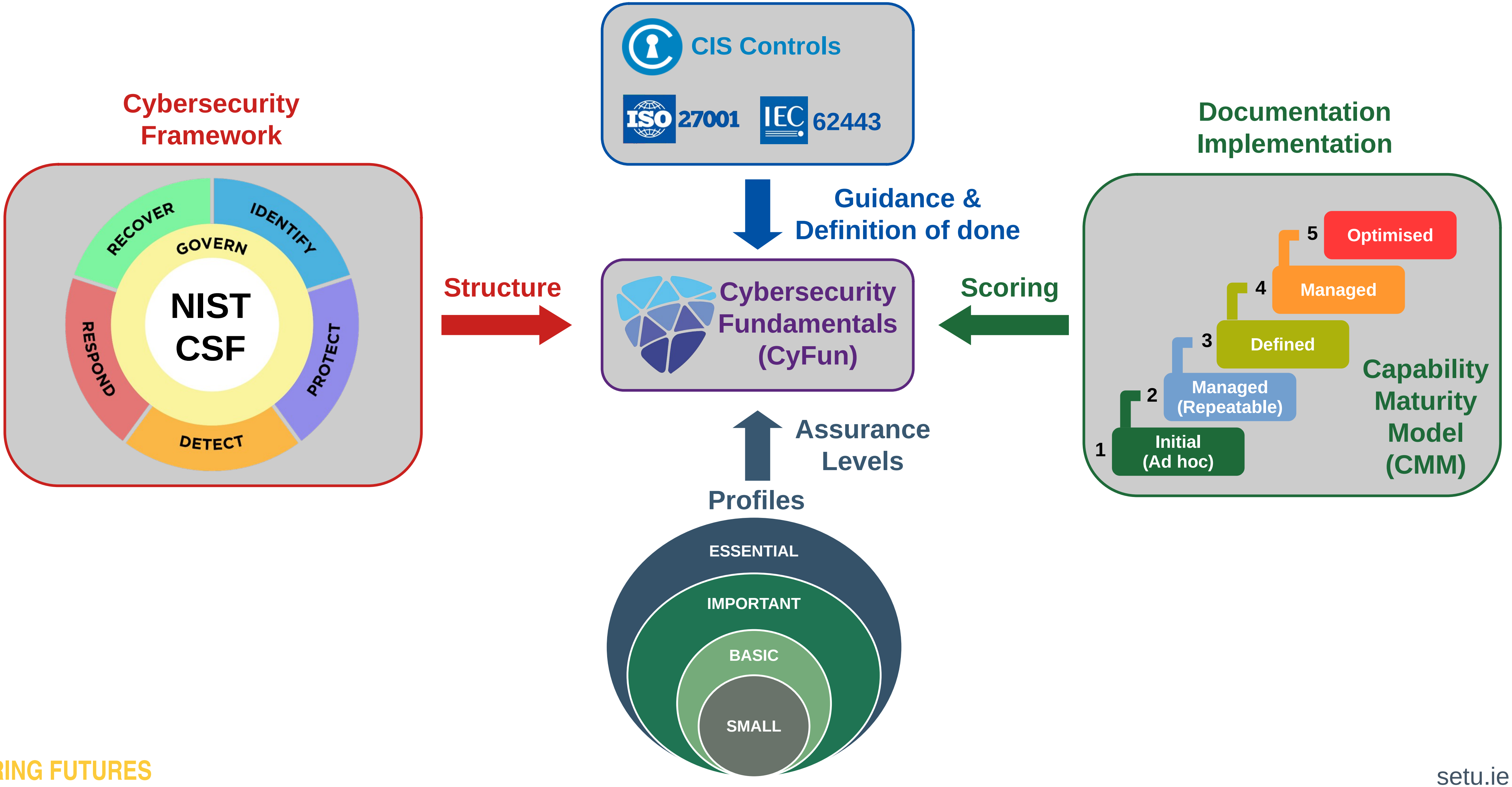
117 Controls

34 Controls

Non-technical formulated guidelines & recommendations

Ref: https://atwork.safeonweb.be/tools-resources/cyberfundamentals-framework

CyFun Framework



Exercise #4
Limerick Cheeses Limited

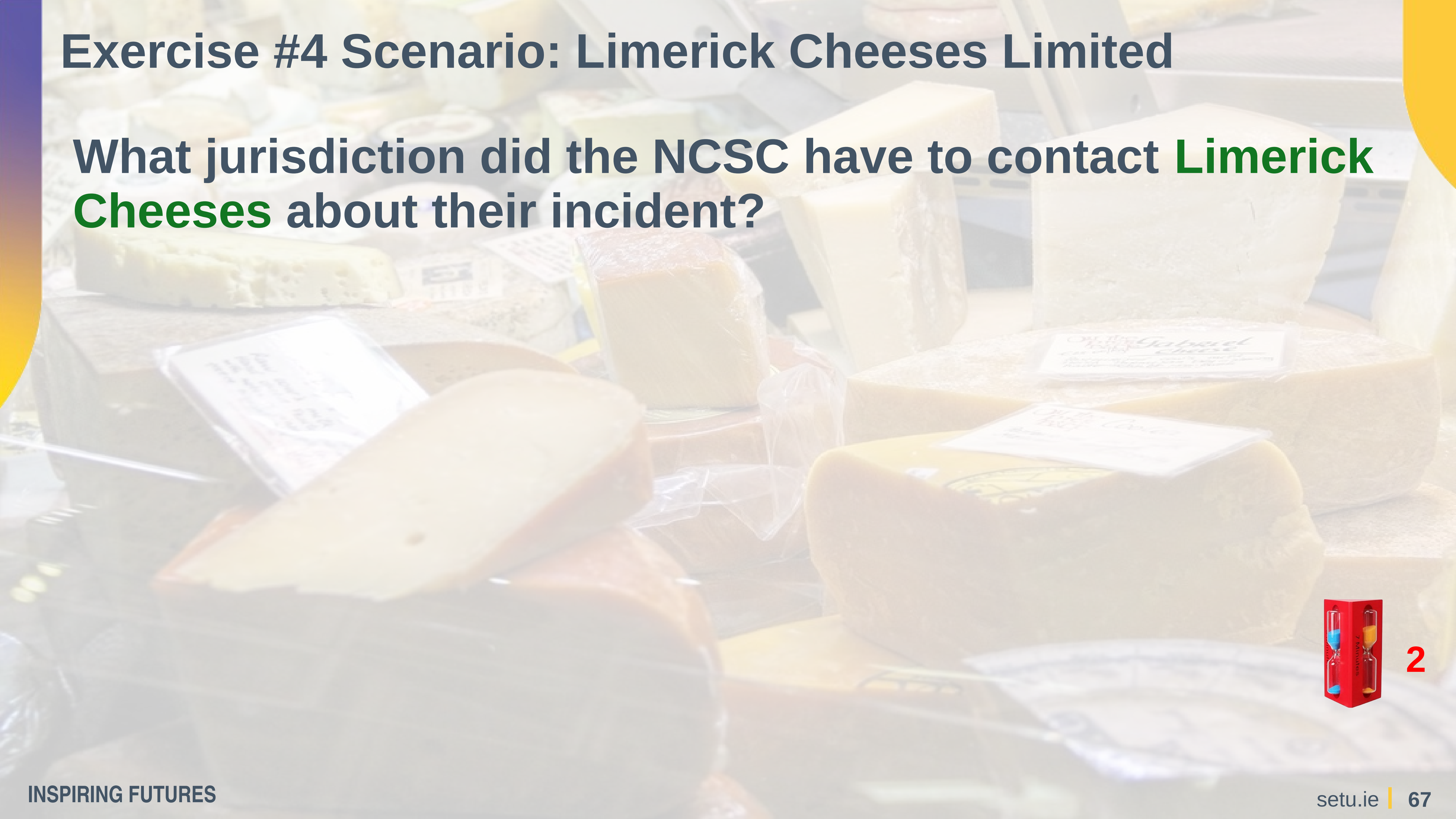
Exercise #4 Scenario: Limerick Cheeses Limited

- Saint Patrick’s Day **Limerick Cheeses** was hit with a ransomware attack.
- The attack crippled its operations in Patrickswell.
- On the 1 April **Limerick Cheeses** was contacted by an officer of the NCSC who stated that **Mótar Transport** reported that they had suffered an attack and reported it on the 18 March.
- In the report the CTO of **Mótar Transport** stated that they believe the attack came through a VPN they had with **Limerick Cheeses** logistics system for processing movement orders.

Exercise #4 Scenario: Limerick Cheeses Limited

- Additionally, on the 19 March, **Mótar Transport** reported that they had to rebuild each computer on their network and restore data to their business management system from backups.
- **Limerick Cheeses** responded by stating that they did have a minor issue and that they restored their systems after working to get the systems back up as quickly as possible as the attack was disrupting their production and shipping.
- Further questioning of the IT manager at **Limerick Cheeses** revealed that they had employed the services of **Echo Cyber**, a cybersecurity firm, and the incident cost them €175,000 to get everything restored to pre-incident state.

Exercise #4 Scenario: Limerick Cheeses Limited



What jurisdiction did the NCSC have to contact Limerick Cheeses about their incident?

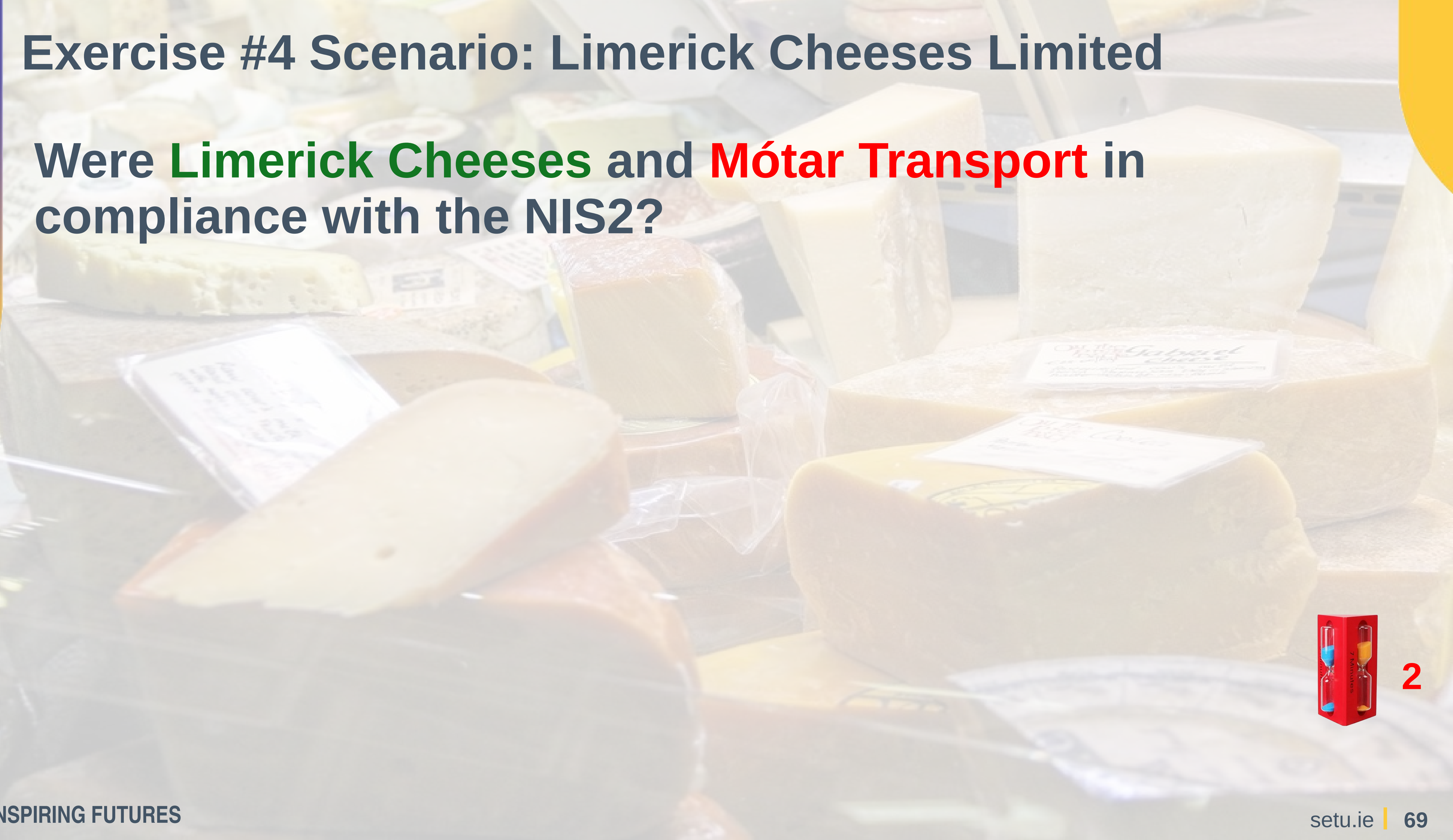
2

Exercise #4 Scenario: Limerick Cheeses Limited

What jurisdiction did the NCSC have to contact Limerick Cheeses about their incident?

- As a food producer ***Limerick Cheeses*** is part of a ***other critical sectors*** and they are therefore an ***important entity***.
- They are subject to ex-post supervision, meaning that as the CSIRT-IE received potential evidence of non-compliance they had the right to take action.

Exercise #4 Scenario: Limerick Cheeses Limited



Were Limerick Cheeses and Mótar Transport in compliance with the NIS2?

2

Exercise #4 Scenario: Limerick Cheeses Limited

Were Limerick Cheeses and Mótar Transport in compliance with the NIS2?

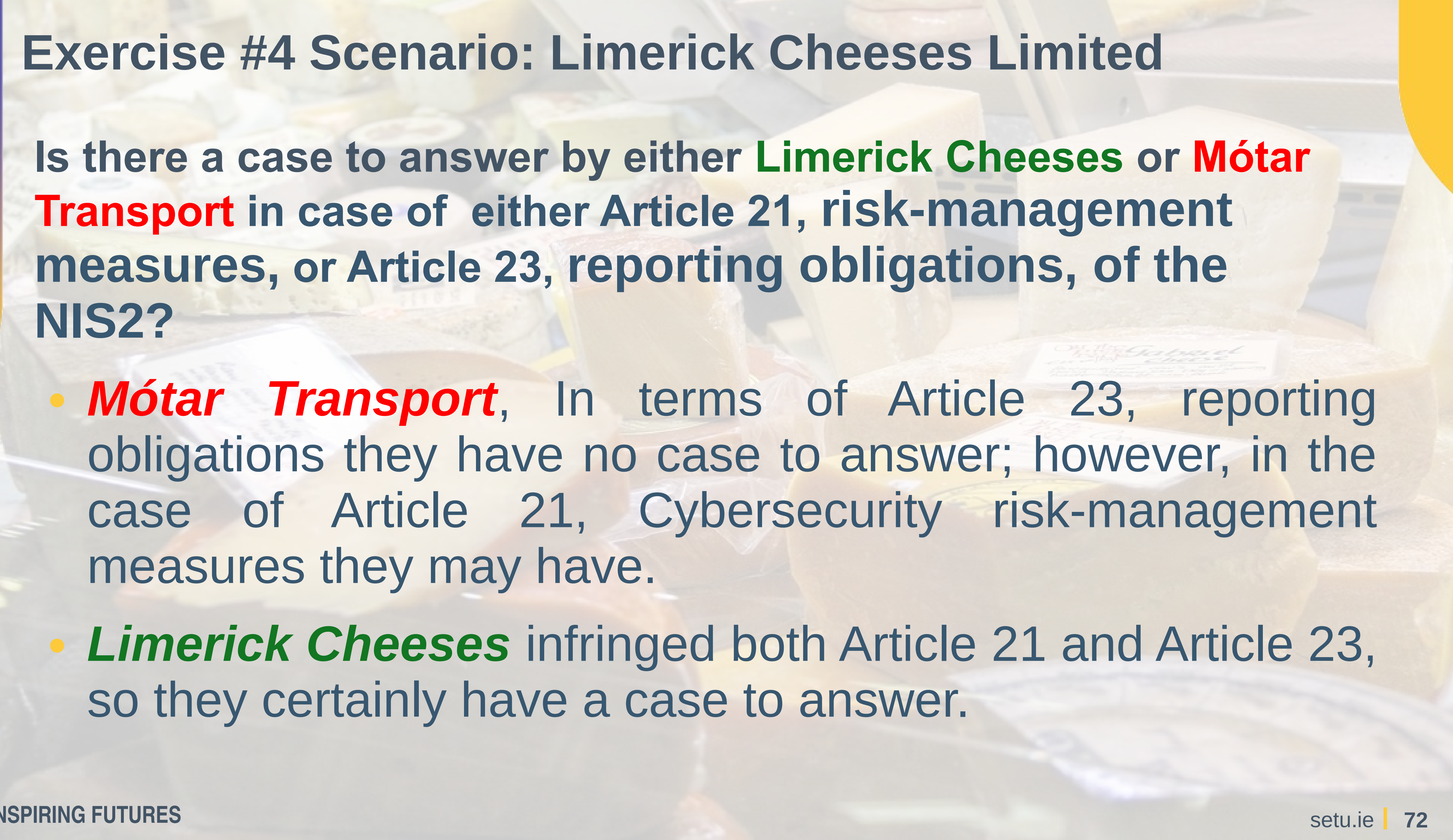
- ***Mótar Transport***, from a high criticality sector, is an essential entity, they reported the incident within 24 hours and followed up within 72 hours so they were in compliance.

- ***Limerick Cheeses*** did not report the incident, they were solicited by the NCSC because of information received from ***Mótar Transport***, so they were not in compliance.

Exercise #4 Scenario: Limerick Cheeses Limited

Is there a case to answer by either Limerick Cheeses or Mótar Transport in case of either Article 21, risk-management measures, or Article 23, reporting obligations, of the NIS2?

2



Exercise #4 Scenario: Limerick Cheeses Limited

Is there a case to answer by either Limerick Cheeses or Mótar Transport in case of either Article 21, risk-management measures, or Article 23, reporting obligations, of the NIS2?

- ***Mótar Transport***, In terms of Article 23, reporting obligations they have no case to answer; however, in the case of Article 21, Cybersecurity risk-management measures they may have.
- ***Limerick Cheeses*** infringed both Article 21 and Article 23, so they certainly have a case to answer.

Topics

- What is Operational Technology? ✓
- The Purdue Enterprise Reference Architecture ✓
- NIST Cybersecurity Framework (CSF) v2 ✓
- CIS Critical Security Controls (CSC) ✓
- NIST SP 800-82 Guide to Operational Technology Security ✓
- ISA/IEC 62443 Securing Industrial Systems ✓
- Network Information Systems 2 (NIS-2) ✓
- Risk Management Measures (RMM) and CyFun ✓

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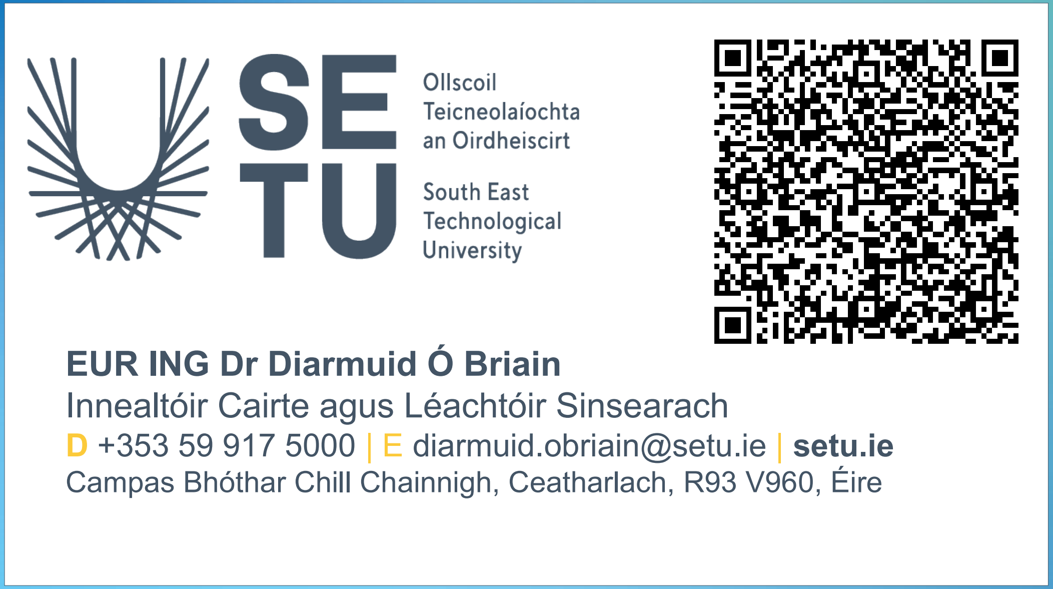

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Technological
University

EUR ING Dr Diarmuid Ó Briain
Innealtóir Cairte agus Léachtóir Sinsearach
D +353 59 917 5000 | E diarmuid.obriain@setu.ie | **setu.ie**
Campas Bhóthar Chill Chainnigh, Ceatharlach, R93 V960, Éire

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