Cybersecurity focused on Safety

Octubre 2022

Agustin Valencia Gil-Ortega

Operational Technology IBERIA

INTERNATIONAL RAILWAY SAFETY COUNCIL 2022

IRSC Spain

IRSC 2022

INTERNATIONAL RAILWAY
SAFETY COUNCIL

SEVILLA, OCTOBER 16-21, 2022

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Who am I? Agustin Valencia Gil-Ortega

Experience
OT Security Business Manager Fortinet (2021-)
Associated Professor MsC Cybersecurity Univ.Pontificia Comillas ICAI (2019-)
Head of Global OT Cybersecurity Iberdrola (2017-2021)
Head of I&C Engineering &+ Cybersecurity Director CN Cofrentes Iberdrola (2010-17)
O&M Manager CC Santurce Iberdrola (2006-2010)

Education
Industrial Engineer (Univ.Pontificia Comillas ICAI)
Msc Maintenance Management (US)
BWR Nuclear Technology Specialist (Tecnatom)
MsC Information Security (UPC-ViU), Director of Security (UDIMA)
CISM

Others:
Professor & collaborator Industrial Cybersecurity Centre (CCI)
Collaborator ISA 99 Committees & Co-chair ISA-Spain Cybersecurity WG
Collaborator Top 20 Secure PLC Coding Practices
Collaborator book “Ciberseguridad Industrial e Infraestructuras Críticas” Ed. Ra-Ma
Collaborator “Cyber Resilience in Electricity” Workgroup – World Economic Forum

ISA
Centro de Ciberseguridad Industrial
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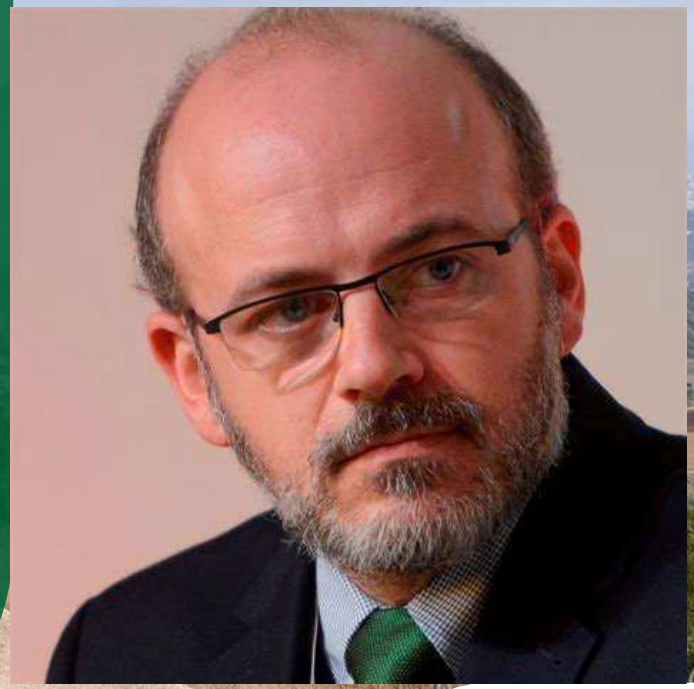


Who am I?

Agustín Valencia Gil-Ortega

Experiencia
Responsable Desarrollo Negocio OT Fortinet (2021-)
Profesor Máster Ciberseguridad Univ.Pontificia Comillas ICAI (2019-)
Responsable Ciberseguridad Global OT Iberdrola (2017-2021)
Jefe de Ingeniería I&C+Responsable Ciberseguridad CN Cofrentes (2010-17)
Jefe de O&M CC Santurce (2006-2010)

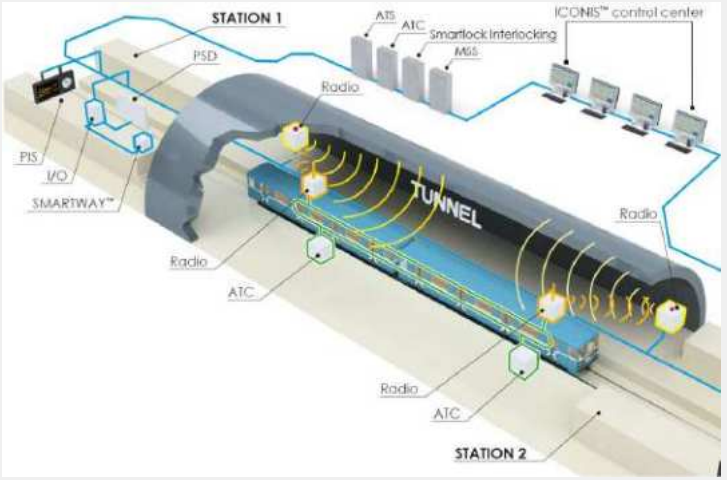
Formación
Ingeniero Industrial por Univ.Pontificia Comillas ICAI
Máster en Gestión de Mantenimiento (US)
Especialista Tecnología Nuclear BWR (Tecnatom)
Master de Seguridad Informática (UPC-ViU), Director de Seguridad (UDIMA)
CISM

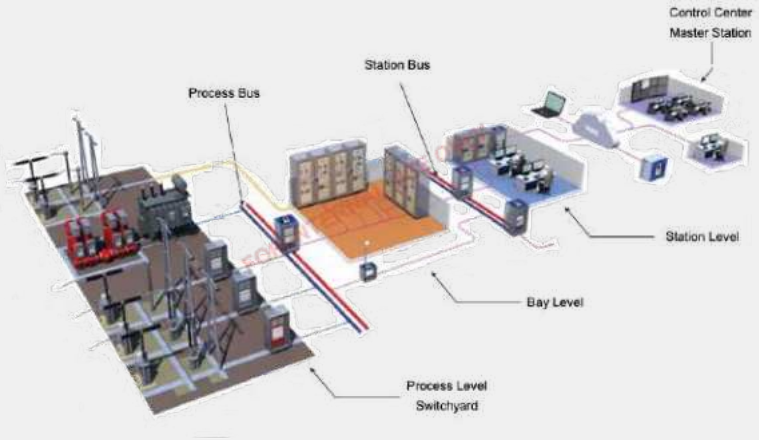
Otros:
Profesor y colaborador Centro de Ciberseguridad Industrial
Colaborador Comités ISA 99 y Co-líder Grupo Ciberseguridad ISA-España
Colaborador Top 20 Secure PLC Coding Practices
Colaborador del libro “Ciberseguridad Industrial e Infraestructuras Críticas” Ed. Ra-Ma
Colaborador “Cyber Resilience in Electricity” Workgroup – World Economic Forum

Railway Ecosystem

SD-Wan | Acceso Remoto Seguro | Segmentación | FortiNAC | FortiSIEM | Virtual Patching

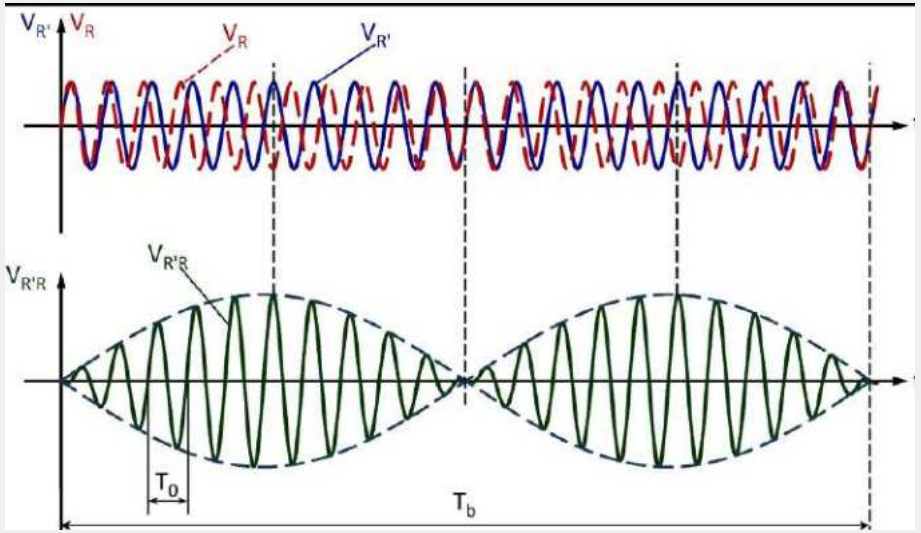
- Operations Control Centers
- *Substations*
- *Railway Stations*
- *Signalling*
- *Communications*
- *Rolling Stock*





Attacks against Safety

Aurora Project (2007)
Origin: Idaho National Laboratory
Objective: Demonstrate Emergency Diesel Generators vulnerabilities
Syncho coupling logic modified
Catastrophic coupling by changing conditions



Attacks against Safety

Crash Override (2016) - Ukraine

CRASHOVERRIDE: Reassessing the 2016 Ukraine Electric Power Event as a Protection-Focused Attack

- 2015 Vulnerability Exploitation leaving IED protections in “Test” mode
- Potentially destructive attack (discovered in 2018)
- Mitigated by personnel acting manually

CISA
CYBER+INFRASTRUCTURE

About Us | Alerts and Tips | Resources | Industrial Control Systems

ICS-CERT Landing > ICS-CERT Advisories > Siemens SIPROTEC Denial-of-Service Vulnerability

ICS Advisory (ICSA-15-202-01)

Siemens SIPROTEC Denial-of-Service Vulnerability

Original release date: July 21, 2015 | Last revised: August 27, 2018

Figure 5: CRASHOVERRIDE Attack Intentions

Attacks against Safety

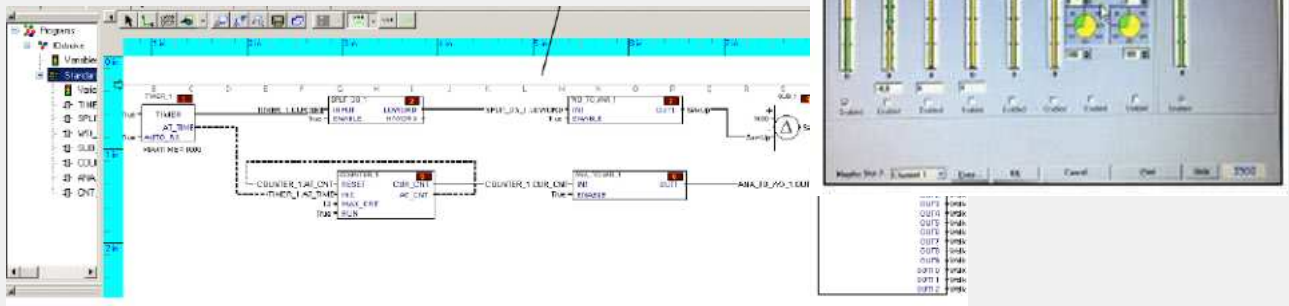
- **Triton** (2017) - Arabia: 1st Attack specifically focused on Safety Instrumented System –SIS- (Schneider Triconex) in Petrochemical plant
- Strong protections against program changes…por change management
- Malware became persistent in SCADA and Engineering Stations
  - Libraries modification in SCADA
  - Libraries modification in SIS
  - Became able to make changes bypassing change control protections
- Attackers also hire Safety experts
  - *(and they might work blind without knowing that is for an attack)*

Attacks against Safety

- Real failures in pitch angle control

- Alter Wind speed measure conversion
- Alter Protection Setpoints for high wind speed
  - Pitch
  - Brake

Stuxnet (2010)

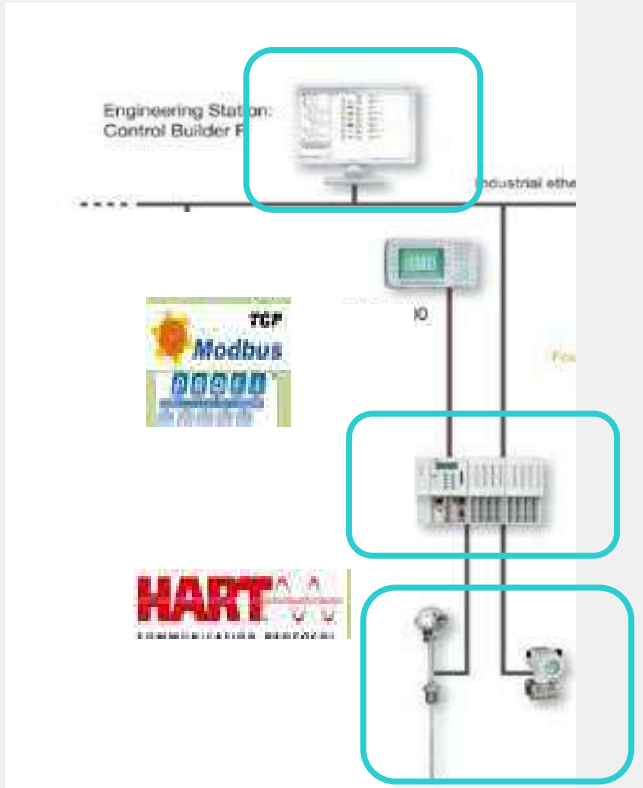


Attacks against Safety

Change in Measurements?
Change in Screen Values?
Change in Conversion Constants?
Change in Sensor type?

Stuxnet (2010)

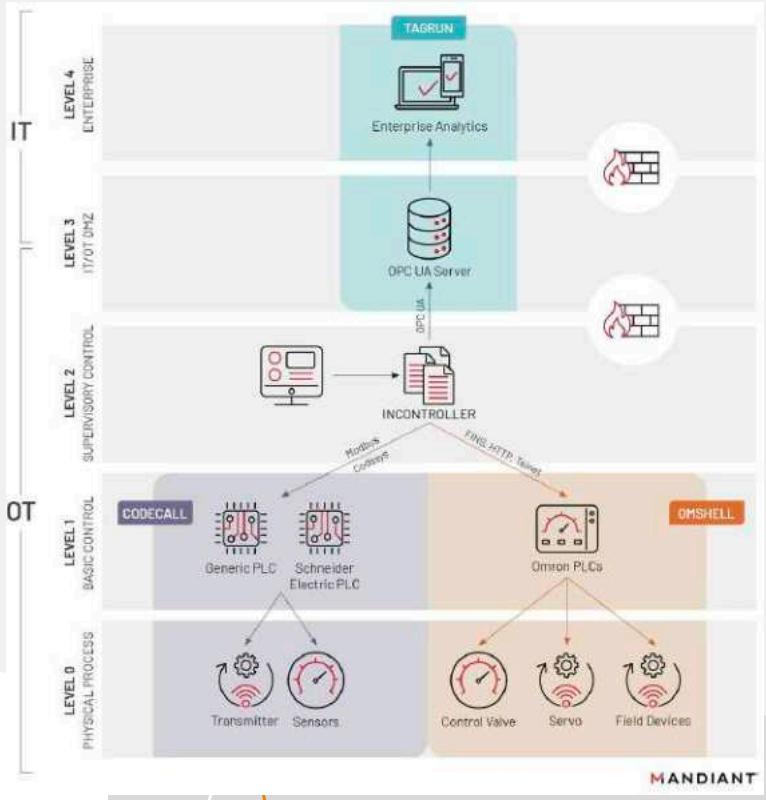
Operations driven to failure!!



New generation of attacks against ICS

Public exploits significantly lower the skill and effort needed to exploit a vulnerability.

Many ICS/OT systems are deployed on top of Windows, and exploits like ETERNALBLUE 15 (MS17-010) have been used to infiltrate ICS/OT networks on a number of occasions ➔ WindowsXP? Win7?



Dragos 2022

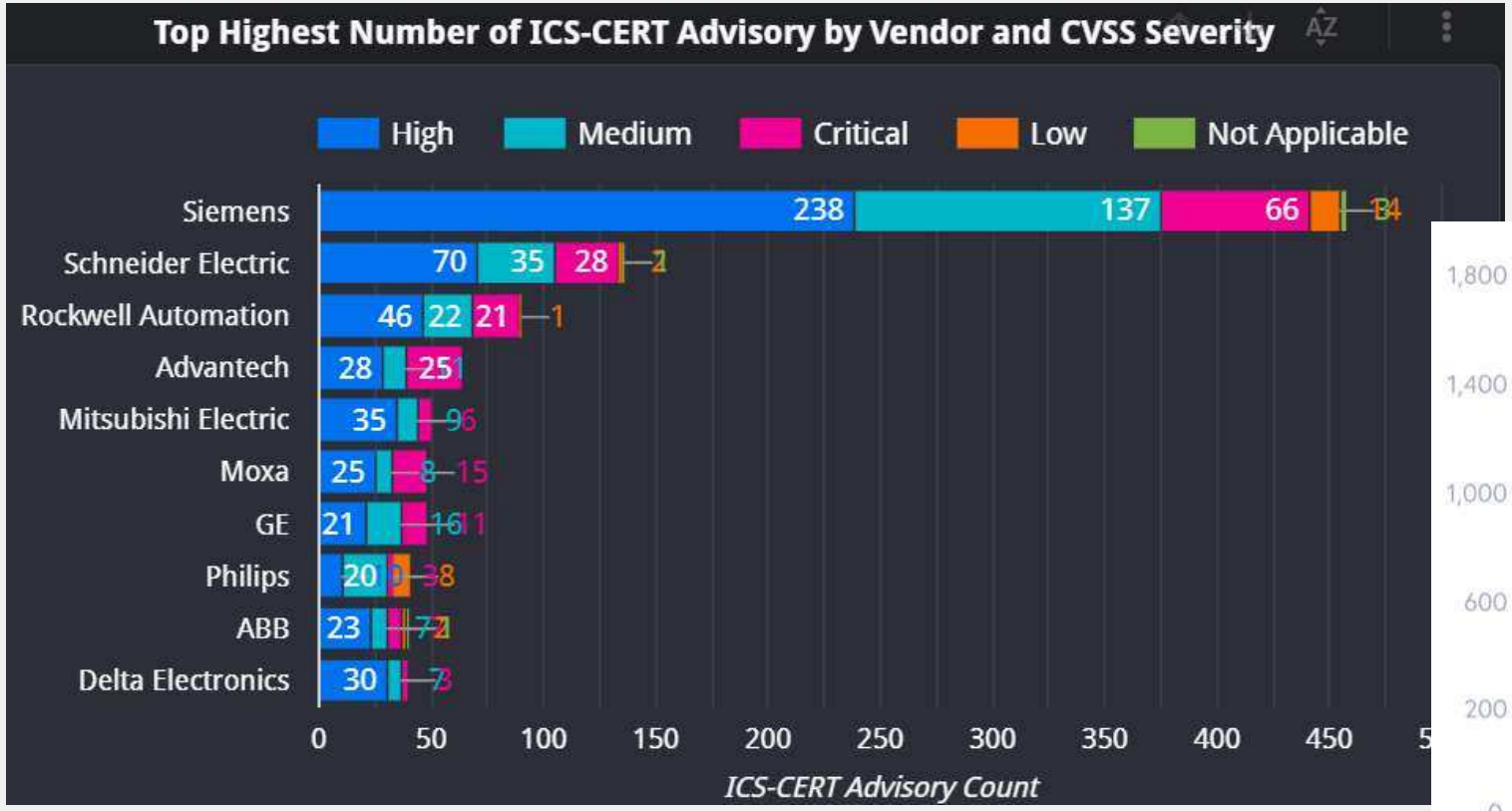
INCONTROLLER // PIPEDREAM ➔ Stuxnet+Triton+Industroyer

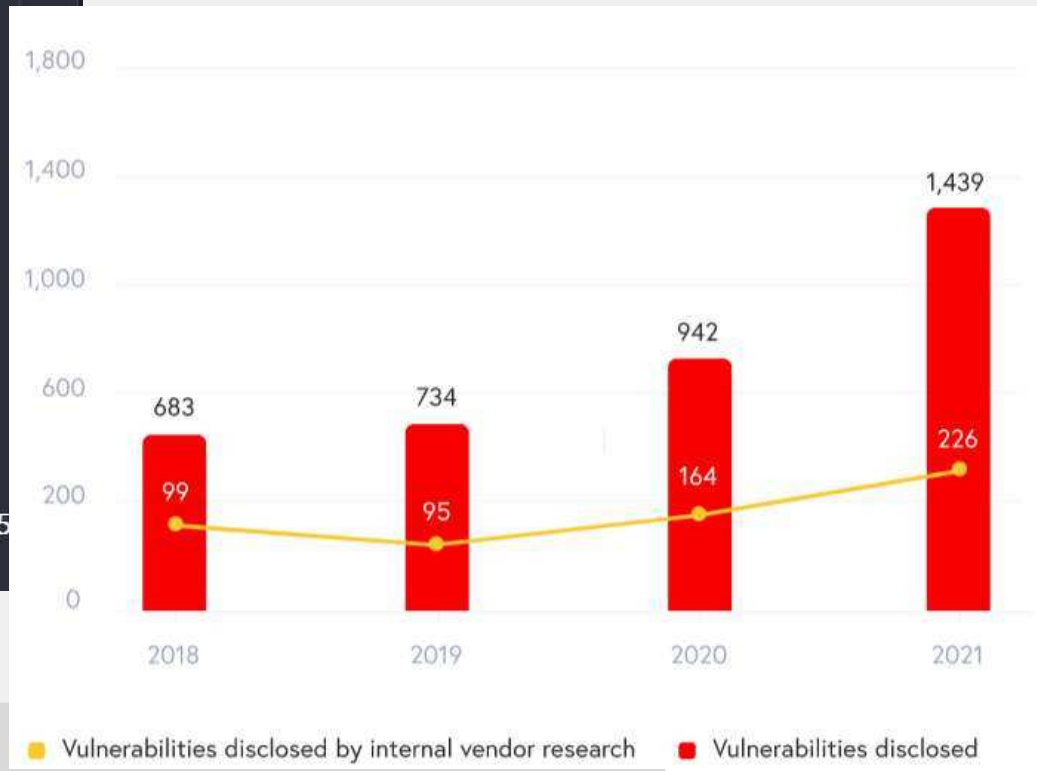
New malware targeting generic PLCs ➔ *Russia?*

Mandiant / Dragos 2022

ICS – vulnerabilities and obsolescence

ICS-CERT





Understand Industrial Protocols

(Much more than Port & IP address)

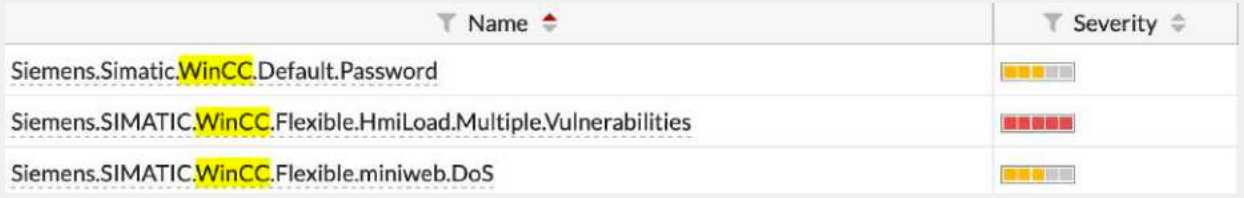
Protocols to be deeply understood

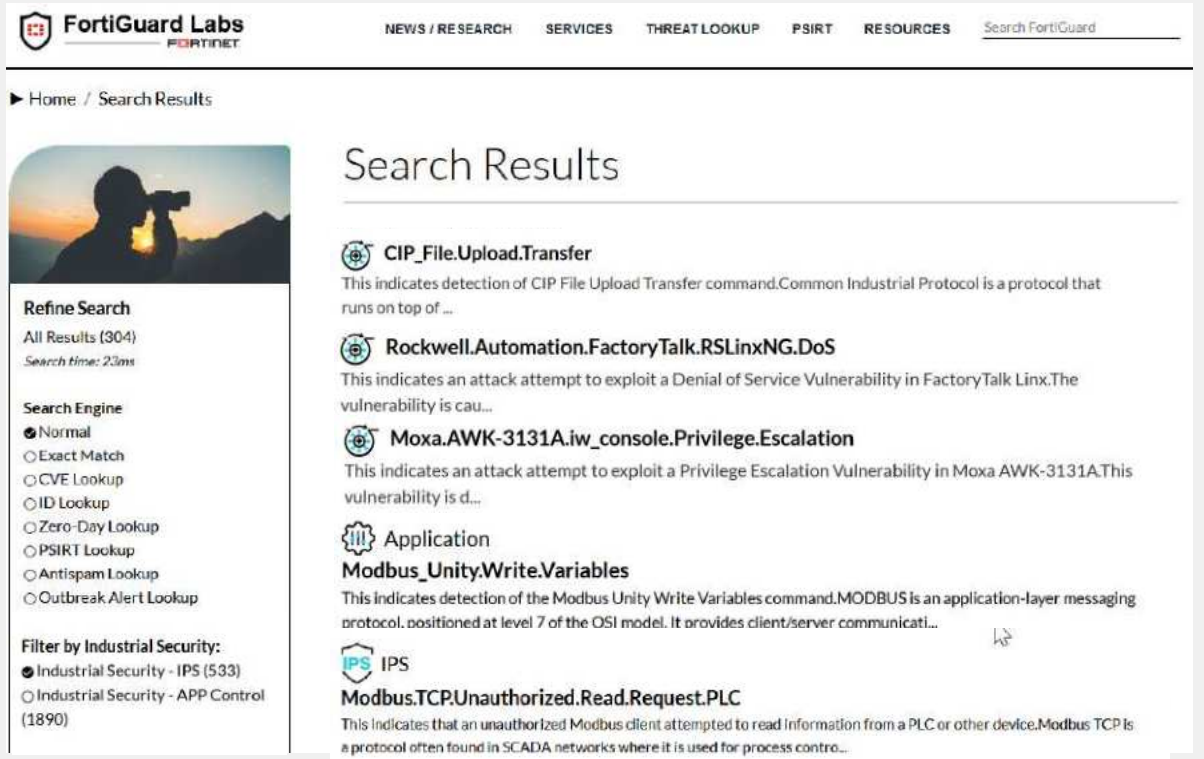
Commands!

- ➔ *Cannot forbid our whole protocol*
- ➔ ***Context** for security monitoring*
- ➔ *Granularity - actions allowed only to:*
  - ➔ *Operations, Engineering, Historian…*
  - ➔ *Achieved from SCADA, **needed from Network***
  - ➔ *Proper Virtual Patching!*

Applications!

- ➔ *Only Authorized applications reduce exposure*
- ➔ *Patching also over actions on apps*





Protocols & Rules available in https://www.fortiguard.com/services/is

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REPORT

2022 State of Operational Technology and Cybersecurity Report

People

33% of organizations entrust OT security to the VP/director of network engineering/ operations

67% of OT security leaders come from an OT engineering background

43% of respondents have security-incident response time as a top-three success measurement

Security Posture

56% of organizations report being at level 3 or level 4 of OT security maturity

50% say the OT security posture is a significant factor in the overall risk score

13% of organizations have centralized visibility of all OT activities

Security Practices

48% report security compromises to executive management

32% have deployed role-based network access control

52% say all OT activities are monitored and tracked by the SOC

Security Outcomes

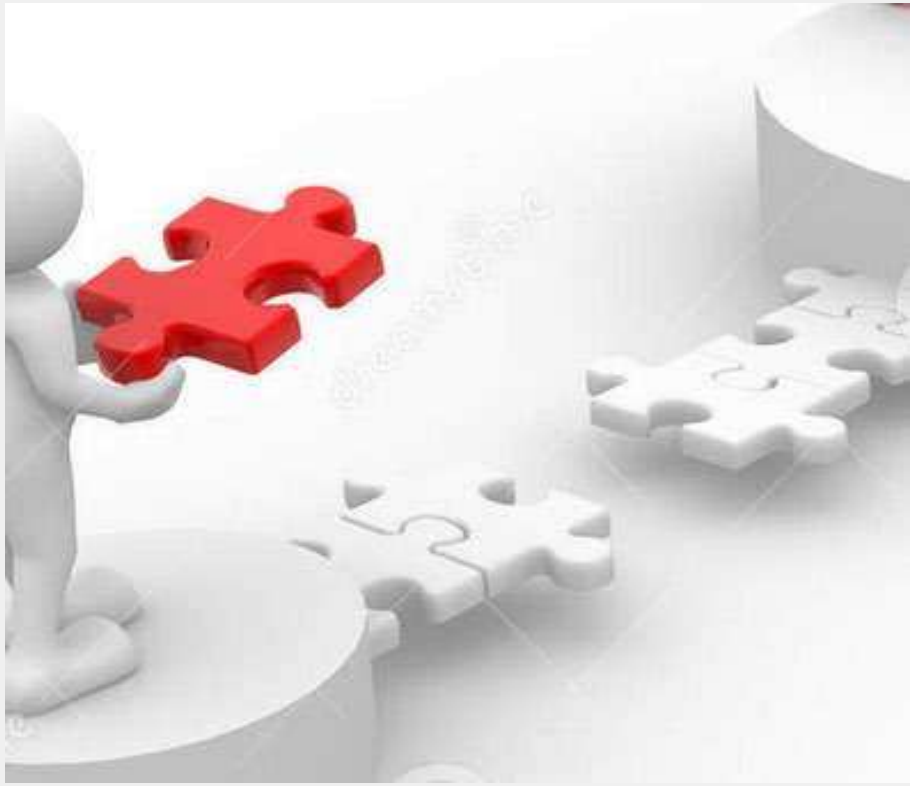
93% of organizations had 1+ intrusions in the past year; **78%** had 3+

61% of intrusions impacted OT systems

90% of intrusions required hours or longer to restore service

Lessons to Learn

- UX at station or Rolling stock is a cybersecurity challenge
- Attacks to Safety on the rise
- Attacks to Safety may have catastrophic consequences
- Most attack leverage vulnerabilities
- Patching is a must (think of virtual patching!)
- Safety & Cybersecurity need to coordinate and complement each other.
  - Data integrity is a must for Safety systems
  - Integrate monitorng and protection focused on industrial protocols
  - Cross change control and process analysis
  - Change control validation coordinating cyber+engineering

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