U.S. Department of Homeland Security

CYBERSECURITY AND INFRASTRUCTURE SECURITY AGENCY

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Presented at IEEE Consultants' Network of Silicon Valley (IEEE-CNSV)

CYBERSECURITY &
INFRASTRUCTURE
SECURITY AGENCY

Cybersecurity and Infrastructure Security Agency (CISA)

VISION

Secure and resilient infrastructure for the American people.

MISSION

CISA partners with industry and government to understand and manage risk to our Nation's critical infrastructure.

OVERALL GOALS

GOAL 1

DEFEND TODAY

Defend against urgent threats and hazards

seconds | days | weeks

GOAL 2

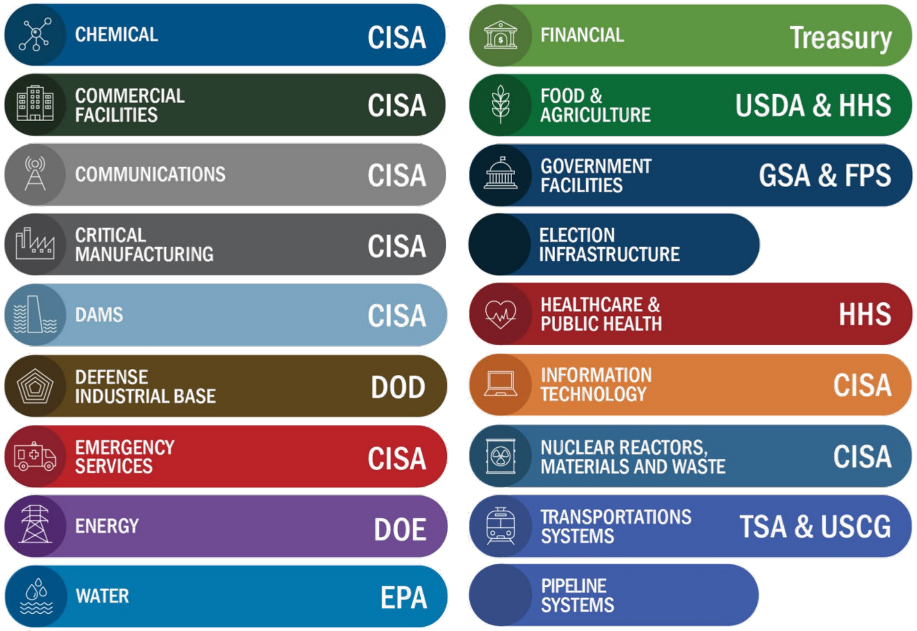
SECURE TOMORROW

Strengthen critical infrastructure and address long-term risks

months | years | decades

Critical Infrastructure Sectors

16 Critical Infrastructure Sectors & Corresponding Sector Risk Management Agencies



CHEMICAL	CISA
COMMERCIAL FACILITIES	CISA
COMMUNICATIONS	CISA
CRITICAL MANUFACTURING	CISA
DAMS	CISA
DEFENSE INDUSTRIAL BASE	DOD
EMERGENCY SERVICES	CISA
ENERGY	DOE
WATER	EPA
FINANCIAL	Treasury
FOOD & AGRICULTURE	USDA & HHS
GOVERNMENT FACILITIES	GSA & FPS
ELECTION INFRASTRUCTURE	
HEALTHCARE & PUBLIC HEALTH	HHS
INFORMATION TECHNOLOGY	CISA
NUCLEAR REACTORS, MATERIALS AND WASTE	CISA
TRANSPORTATIONS SYSTEMS	TSA & USCG
PIPELINE SYSTEMS	

CISA Integrated Operations Division (IOD)

CYBERSECURITY

PROTECTIVE SECURITY

CHEMICAL SECURITY

EMERGENCY COMMUNICATIONS

OPERATIONS & OUTREACH

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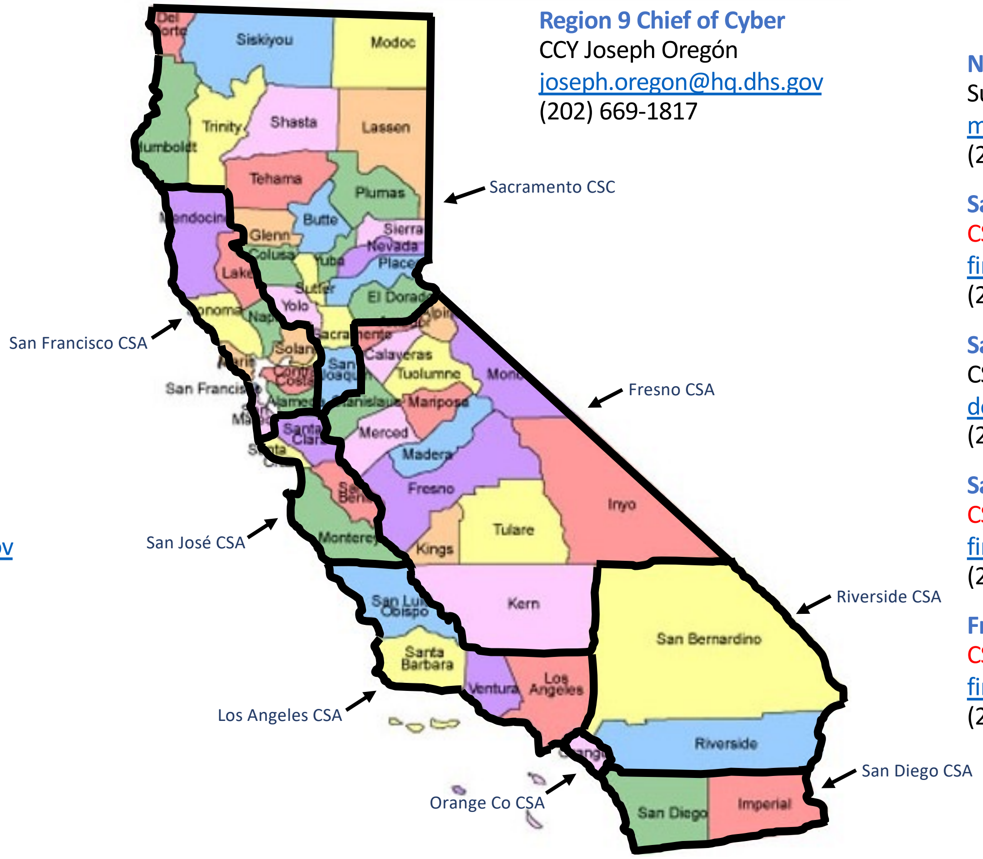

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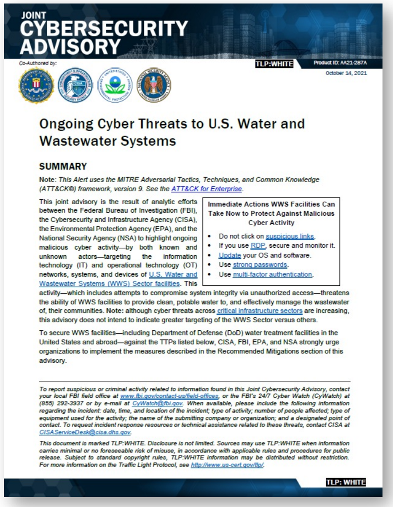
Rev 1.2 6/7/2023

ICS & OT Incidents

- Colonial Pipeline Attack – 2021
- NotPetya – 2017
- Stuxnet – 2010

https://www.cisa.gov/shields-up



JOINT CYBERSECURITY ADVISORY

Co-Authored by:

TLP:WHITE

Product ID: AA21-287A

October 14, 2021

Ongoing Cyber Threats to U.S. Water and Wastewater Systems

SUMMARY

Note: *This Alert uses the MITRE Adversarial Tactics, Techniques, and Common Knowledge (ATT&CK®) framework, version 9. See the ATT&CK for Enterprise.*

Immediate Actions WWS Facilities Can Take Now to Protect Against Malicious Cyber Activity

- Do not click on suspicious links.
- If you use RDP, secure and monitor it.
- Update your OS and software.
- Use strong passwords.
- Use multi-factor authentication.

This joint advisory is the result of analytic efforts between the Federal Bureau of Investigation (FBI), the Cybersecurity and Infrastructure Agency (CISA), the Environmental Protection Agency (EPA), and the National Security Agency (NSA) to highlight ongoing malicious cyber activity—by both known and unknown actors—targeting the information technology (IT) and operational technology (OT) networks, systems, and devices of U.S. Water and Wastewater Systems (WWS) Sector facilities. This activity—which includes attempts to compromise system integrity via unauthorized access—threatens the ability of WWS facilities to provide clean, potable water to, and effectively manage the wastewater of, their communities. **Note:** although cyber threats across critical infrastructure sectors are increasing, this advisory does not intend to indicate greater targeting of the WWS Sector versus others.

To secure WWS facilities—including Department of Defense (DoD) water treatment facilities in the United States and abroad—against the TTPs listed below, CISA, FBI, EPA, and NSA strongly urge organizations to implement the measures described in the Recommended Mitigations section of this advisory.

To report suspicious or criminal activity related to information found in this Joint Cybersecurity Advisory, contact your local FBI field office at www.fbi.gov/contact-us/field-offices, or the FBI's 24/7 Cyber Watch (CyWatch) at (855) 292-3937 or by e-mail at CyWatch@fbi.gov. When available, please include the following information regarding the incident: date, time, and location of the incident; type of activity; number of people affected; type of equipment used for the activity; the name of the submitting company or organization; and a designated point of contact. To request incident response resources or technical assistance related to these threats, contact CISA at CISAServiceDesk@cisa.dhs.gov.

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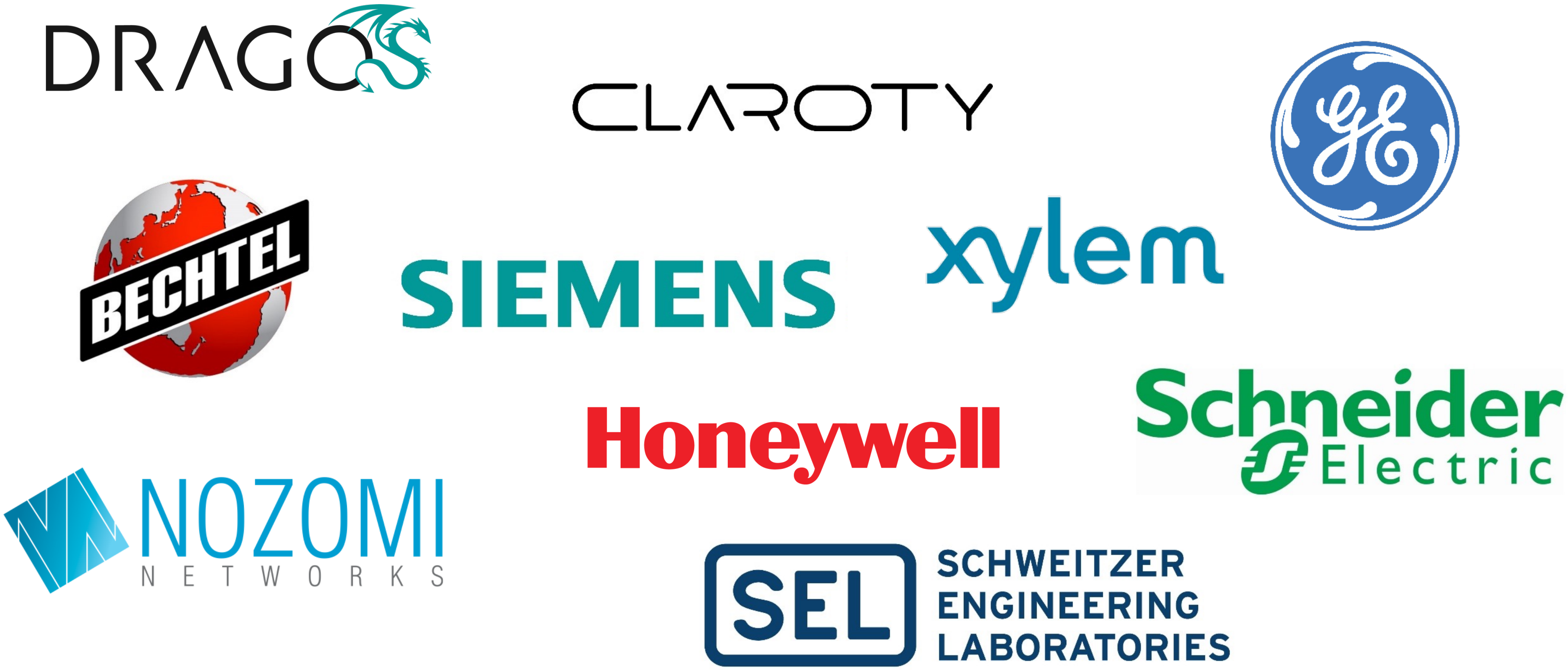
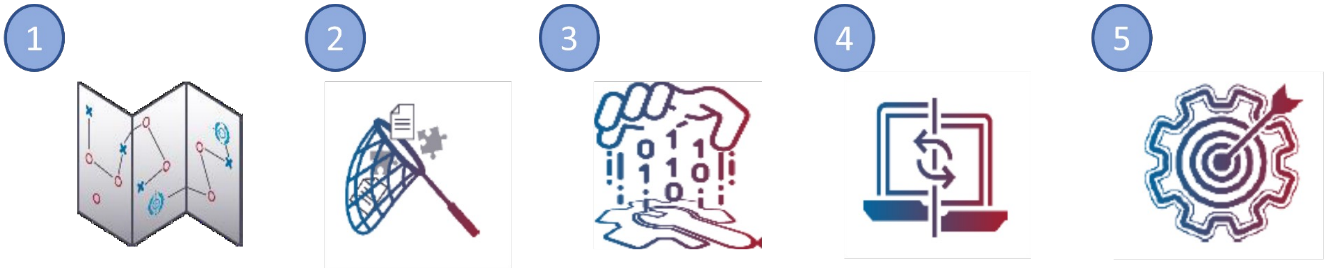
TLP: WHITE

Joint Cyber Defense Collaborative (JCDC-ICS)



Defend Against Malicious Actors’ Game Plan

“Control System Defense: Know the Opponent.” This NSA and CISA advisory breaks down the **steps malicious cyber actors take to compromise critical infrastructure control systems** so that you can better defend against them.



1. Establish intended effect and select a target
2. Collect intelligence about the target system
3. Develop techniques and tools to navigate and manipulate the system
4. Gain initial access to the system
5. Execute techniques and tools to create the intended effect

Reduce Exposure Across OT and CS

1. Have a Resilience Plan for OT
2. Exercise your Incident Response Plan
3. Harden Your Network
4. Create an Accurate “As-operated” OT Network Map Immediately
5. Understand and Evaluate Cyber-risk on “As-operated” OT Assets
6. Implement a Continuous and Vigilant System Monitoring Program

CISA ICS Offerings

Assessments
Operational resilience evaluations

Cyber Hunt
Aid ICS partners with adversary presence search in absence of known threat

Exercises
Testing and readiness for ICS incidents

Information Exchange
Sharing of threat and best practice guidance with partners

Partnerships and Engagement
Collaborate and coordinate with ICS partners

Products and Tools
Access to hands-on tools for the ICS community

Response
Provide expertise and advanced tooling to aid ICS cyber victims

Strategic Risk Analysis
Provide ICS risk information pertaining to National Critical Functions (NCFs)

Technical Analysis
ICS malware analysis support

Training
Technical and non-technical ICS instruction for all skill levels

Vulnerability Coordination
Coordinated, public disclosure of ICS vulnerabilities + mitigation recommendations

Sign up for Cyber Hygiene Services

CISA offers free cybersecurity services to Critical Infrastructure entities:

- **Vulnerability Scanning:** Persistent scanning of internet-accessible systems for vulnerabilities, configuration errors, and suboptimal security practices.
- **Web Application Scanning:** Assesses the "health" of publicly accessible web applications by checking for known vulnerabilities and weak configurations.
- **Phishing Campaign Assessment:** measures a workforce's tendency to click on email phishing lures commonly used by cyber actors to collect sensitive information or to obtain initial access to a network.
- CISA Assessments: Agency cybersecurity assessments provide actionable and risk-informed recommendations. Email vulnerability@cisa.dhs.gov for more information and to sign up.

STATE AND LOCAL

CYBERSECURITY GRANT PROGRAM

- First of its kind cybersecurity grant program for state, local territorial and tribal governments across the country
- $ 1 Billion over four years (2022 – 2025)
- To help SLTT government leaders identify their cybersecurity needs, DHS created a Toolkit: https://cisa.gov/cybergrants

Parting Thoughts …

- **Integrate** cybersecurity in your earliest designs and planning, and within each phase
  - Include IT <u>and</u> Cybersecurity Staff in your planning; they are <u>not</u> interchangeable
  - Consider your four types of assets: People, Information, Technology, Facilities
- Identify your critical service(s) and protect them and their dependencies
- Train for manual operation (Just because you have a calculator doesn't mean you don't have to know math!)
- Implement cybersecurity best practices (https://cisa.gov)
- Transnational Studies and Engagements
  - Keep sensitive information close to the vest
  - Know your international partners, consider vetting
  - Sharing should not be a one-way street

Everyone counts on IT to lead the response, but Incident Response is a shared and leadership driven event!

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888-282-0870

Report incidents:
Report@cisa.gov

Additional information:
Central@cisa.dhs.gov

CYBERSECURITY & INFRASTRUCTURE SECURITY AGENCY

CISA

IEEE-CNSV

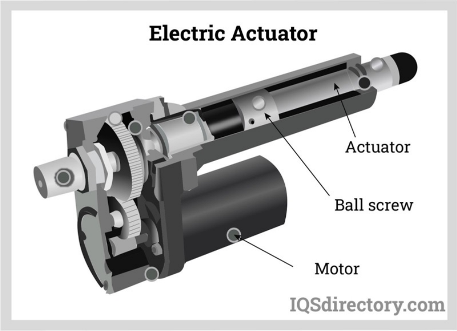
Consultants' Network of Silicon Valley

Cybersecurity for Industrial Control Systems

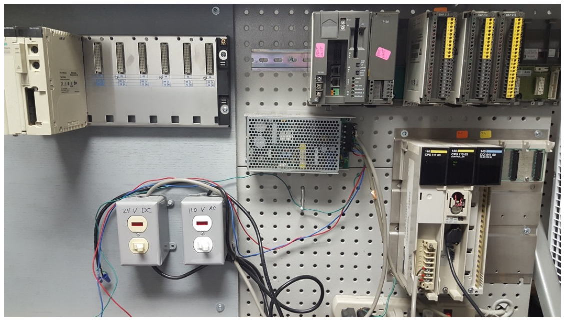
David Snyder, MBA, PE, CISSP, CCSP

IEEE Consultants Network of Silicon Valley

June 13, 2023



42TEK



- Trained as a Civil Engineer
- Respiratory Therapy in hospital ICUs
- 20 years of environmental engineering, including electric power and petroleum industries and hazardous waste cleanup
- Switched to credit card systems 25 years ago
- E-commerce led to cybersecurity
- Currently a contractor at Apple in Public Key Infrastructure
- 42TEK LLC is my consulting practice

- Critical Infrastructure & Industrial Control
- Vulnerabilities & Attacks
- What We Can Do

Critical Infrastructure Sectors

1. Chemical
2. Commercial Facilities
3. Communications
4. Critical Manufacturing
5. Dams
6. Defense Industrial Base
7. Emergency Services
8. Energy
9. Financial Services
10. Food and Agriculture
11. Government Facilities
12. Healthcare and Public Health
13. Information Technology
14. Nuclear Reactors, Materials, and Waste
15. Transportation Systems
16. Water and Wastewater Systems

* Space Systems?

Industrial Control Systems

- The term "**industrial control systems**" or "ICS" refers to a broad set of control systems, which include:
  - SCADA (Supervisory Control and Data Acquisition)
  - DCS (Distributed Control System)
  - PCS (Process Control System)
  - EMS (Energy Management System)
  - AS (Automation System)
  - SIS (Safety Instrumented System)
  - Any other automated control system

Different Types of Industrial Control

- Process control, both continuous and batch – typically a Distributed Control System (DCS)
- Discrete control, sequence control – typically a Programmable Logic Controller (PLC)
- Remote monitoring and dispatch – typically a Supervisory Control and Data Acquisition System (SCADA)
- Life Safety or Personnel Protection – typically a Safety Instrumented System (SIS)

- *All Industrial Control Systems are designed for one primary purpose – and that is to* ***automate a physical process****. They accomplish this through* ***sensors*** *to measure physical properties and* ***actuators*** *to manipulate those properties*

- **Operational Technology (OT)** – is often used to describe Industrial Control Systems (ICS) and other “cyber physical systems” – but is also used to describe automation systems that aren’t industrial in nature but use similar technology
    - Building Automation Systems
    - Transportation (Avionics, Positive Train Control, etc.)
    - Medical Devices and systems (many CAT scan / MRI use PLC technology)

Many of these systems have developed independently from ICS system development, but they look remarkably similar and have many of the same vulnerable sub-systems!

Cybersecurity Differences

- IT
  - Data at rest
  - Data in transit
  - Confidentiality
  - Integrity
  - Availability

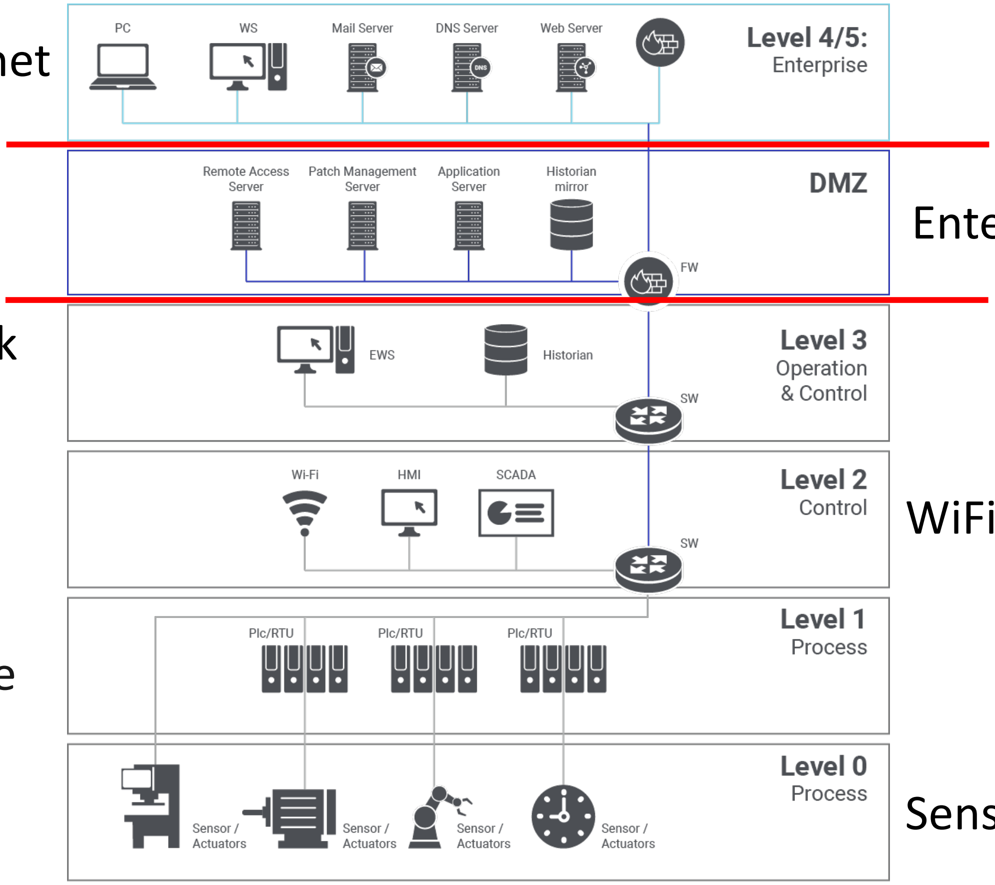
“computer science”

- ICS/OT
  - Things
  - Actions
  - Safety
  - Reliability

“controls engineering”

Purdue Model

Work Stations, Internet



Enterprise IT

Engineering Work Stations

WiFi, SCADA & HMI

Programmable Logic Controllers & Remote Terminal Units

Sensors & Actuators

Remote Terminal Unit

A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA (supervisory control and data acquisition) system by transmitting telemetry data to a master system, and by using messages from the master supervisory system to control connected objects.

https://en.wikipedia.org/wiki/Remote_terminal_unit

Programmable Logic Controller

A programmable logic controller (PLC) or programmable controller is an industrial computer that has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, machines, robotic devices, or any activity that requires high reliability, ease of programming, and process fault diagnosis.

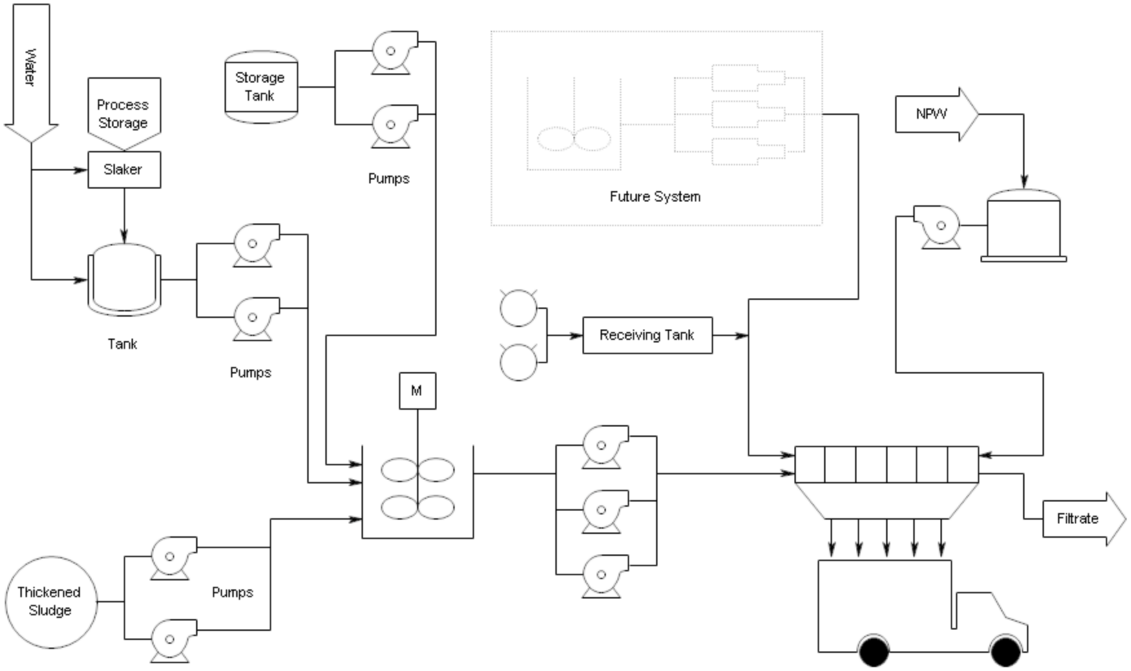
IEC 61131-3:2013 (Programming languages)
https://en.wikipedia.org/wiki/IEC_61131-3

https://en.wikipedia.org/wiki/Programmable_logic_controller

Threat Modeling

- What do we have? Asset inventory; process flow; network diagram
- What can go wrong? Risk assessment
- What are we going to do about it? Controls; mitigation measures
- Did we do a good job? Assessments; audits

Asset Inventories, Process Flows, and Piping & Instrument Diagrams



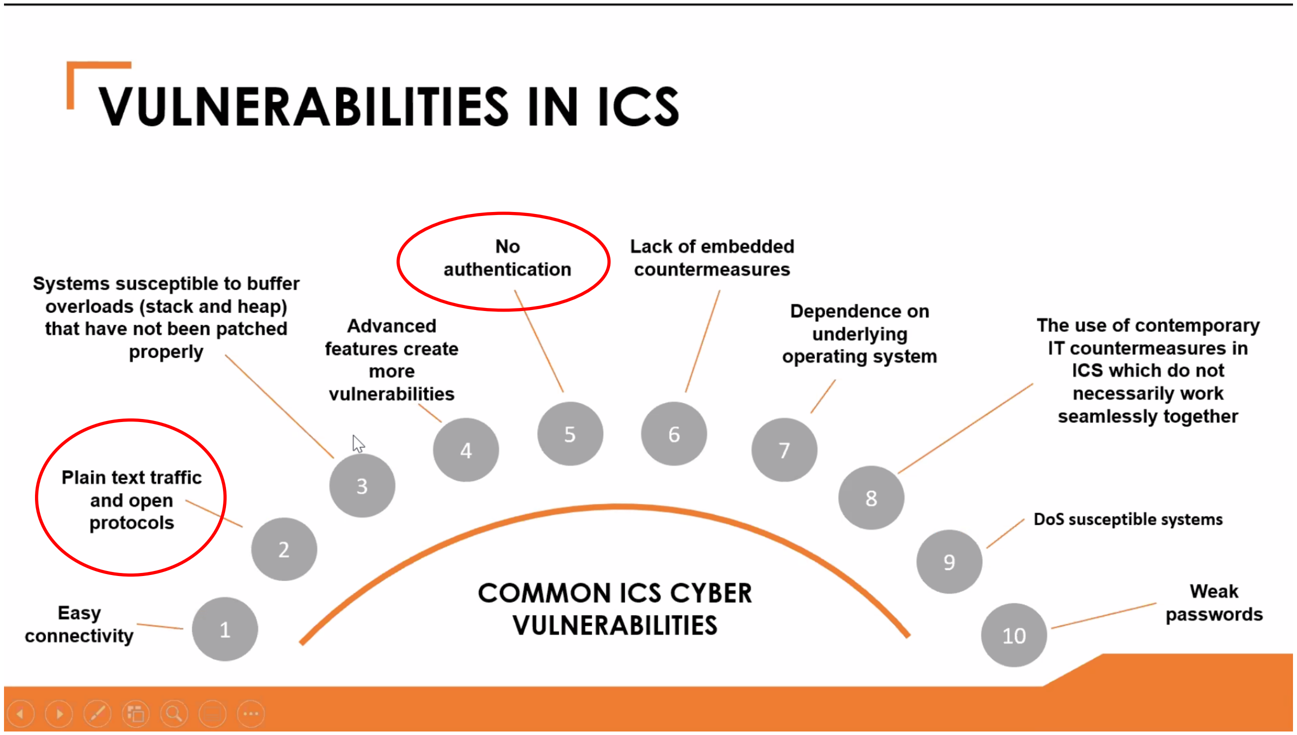
What Can Go Wrong?

Possible incidents an ICS may face

- Blocked or delayed flow of information through ICS networks, which could disrupt ICS operation.
- Unauthorized changes to instructions, commands, or alarm thresholds, which could damage, disable, or shut down equipment, create environmental impacts, and/or endanger human life.
- Inaccurate information sent to system operators, either to disguise unauthorized changes, or to cause the operators to initiate inappropriate actions, which could have various negative effects.

NIST Special Publication 800-82 Revision 2, Guide to Industrial Control Systems (ICS) Security

- ICS software or configuration settings modified, or ICS software infected with malware, which could have various negative effects.
- Interference with the operation of equipment protection systems, which could endanger costly and difficult-to-replace equipment.
- Interference with the operation of safety systems, which could endanger human life.



VULNERABILITIES IN ICS

COMMON ICS CYBER VULNERABILITIES

1 Easy connectivity

2 Plain text traffic and open protocols

3 Systems susceptible to buffer overloads (stack and heap) that have not been patched properly

4 Advanced features create more vulnerabilities

5 No authentication

6 Lack of embedded countermeasures

7 Dependence on underlying operating system

8 The use of contemporary IT countermeasures in ICS which do not necessarily work seamlessly together

9 DoS susceptible systems

10 Weak passwords

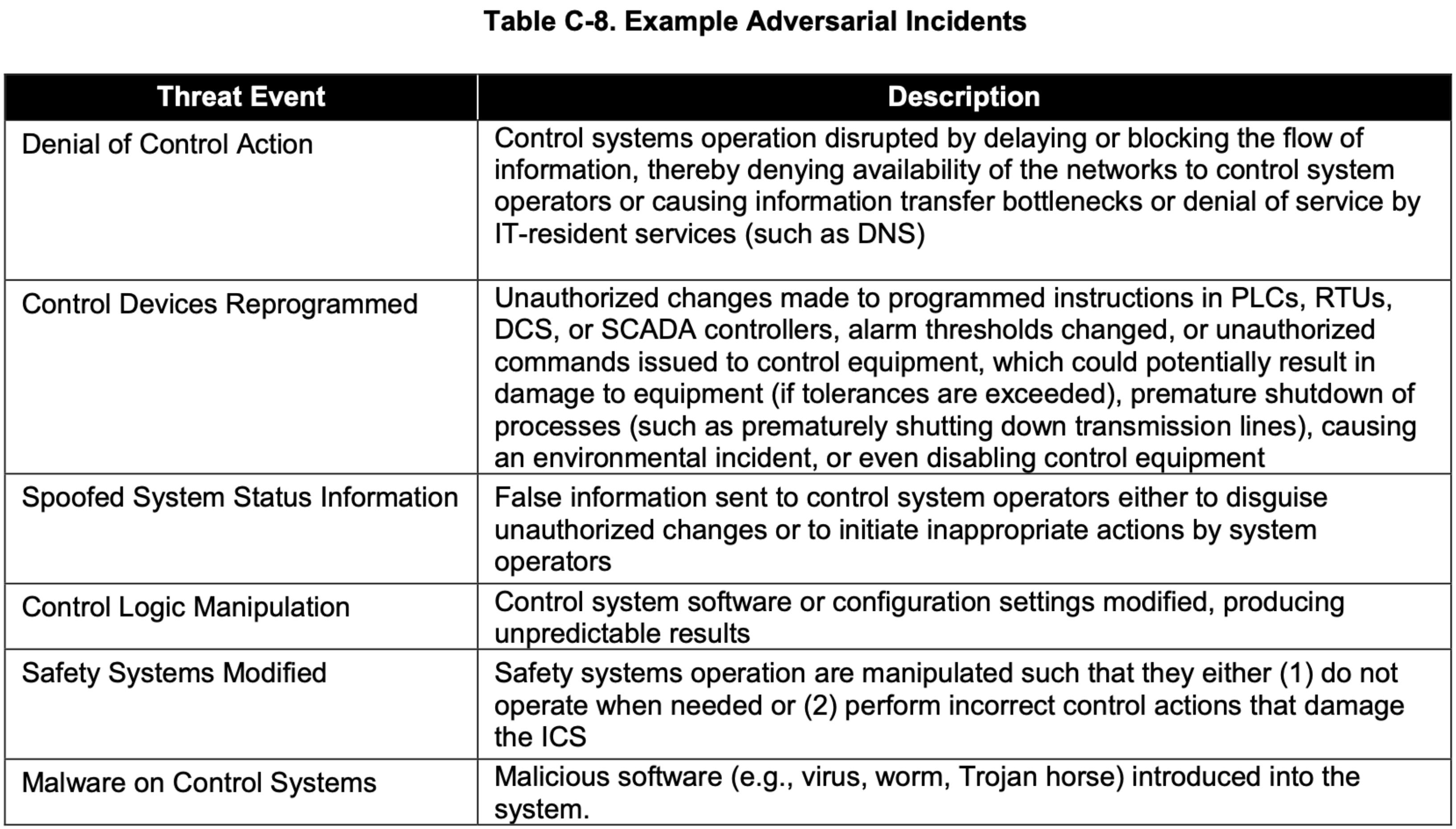


Table C-8. Example Adversarial Incidents

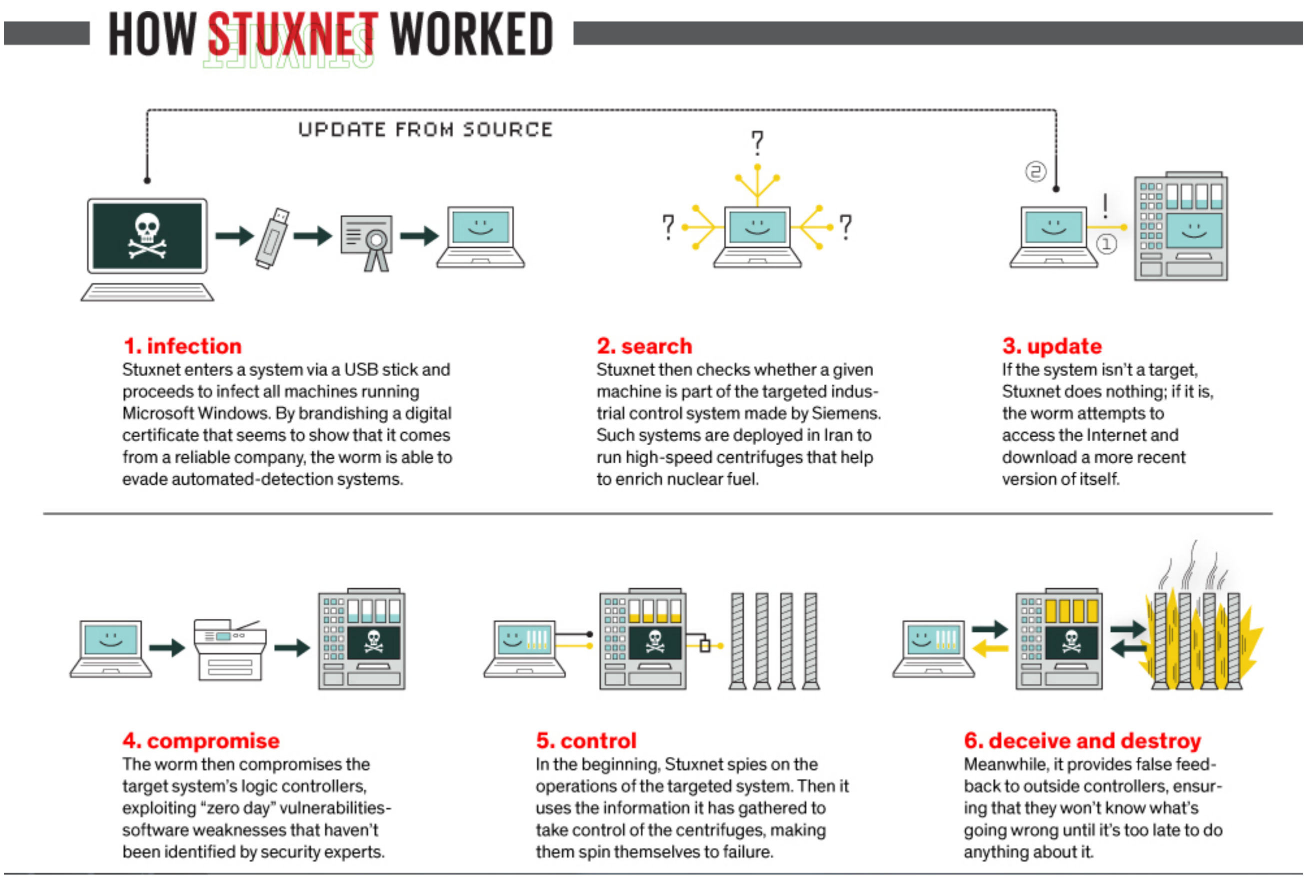
Threat Event	Description
Denial of Control Action	Control systems operation disrupted by delaying or blocking the flow of information, thereby denying availability of the networks to control system operators or causing information transfer bottlenecks or denial of service by IT-resident services (such as DNS)
Control Devices Reprogrammed	Unauthorized changes made to programmed instructions in PLCs, RTUs, DCS, or SCADA controllers, alarm thresholds changed, or unauthorized commands issued to control equipment, which could potentially result in damage to equipment (if tolerances are exceeded), premature shutdown of processes (such as prematurely shutting down transmission lines), causing an environmental incident, or even disabling control equipment
Spoofed System Status Information	False information sent to control system operators either to disguise unauthorized changes or to initiate inappropriate actions by system operators
Control Logic Manipulation	Control system software or configuration settings modified, producing unpredictable results
Safety Systems Modified	Safety systems operation are manipulated such that they either (1) do not operate when needed or (2) perform incorrect control actions that damage the ICS
Malware on Control Systems	Malicious software (e.g., virus, worm, Trojan horse) introduced into the system.

NIST Special Publication 800-82 Revision 2, Guide to Industrial Control Systems (ICS) Security

Attacks

- Stuxnet
- Sandworm
- TRITON
- CrashOveride
- COSMICENERGY
- PIPEDREAM
- and others

- USB stick
- Siemens control system
- Attacks logic controllers
- Makes centrifuges spin out of control to failure



HOW STUXNET WORKED

1. infection
Stuxnet enters a system via a USB stick and proceeds to infect all machines running Microsoft Windows. By brandishing a digital certificate that seems to show that it comes from a reliable company, the worm is able to evade automated-detection systems.

2. search
Stuxnet then checks whether a given machine is part of the targeted industrial control system made by Siemens. Such systems are deployed in Iran to run high-speed centrifuges that help to enrich nuclear fuel.

3. update
If the system isn't a target, Stuxnet does nothing; if it is, the worm attempts to access the Internet and download a more recent version of itself.

4. compromise
The worm then compromises the target system's logic controllers, exploiting "zero day" vulnerabilities-software weaknesses that haven't been identified by security experts.

5. control
In the beginning, Stuxnet spies on the operations of the targeted system. Then it uses the information it has gathered to take control of the centrifuges, making them spin themselves to failure.

6. deceive and destroy
Meanwhile, it provides false feedback to outside controllers, ensuring that they won't know what's going wrong until it's too late to do anything about it.

Sandworm

- …hacking unit known widely as “Sandworm,” a group in the Russian Main Intelligence Directorate, or GRU…
- …BlackEnergy for access and reconnaissance, then KillDisk for destruction…
- BlackEnergy, its first version shortened as BE1, started as a crimeware being sold in the Russian cyber underground as early as 2007. Initially, it was designed as a toolkit for creating botnets for conducting DDoS attacks
- On 23 December 2015, attackers behind the BlackEnergy malware successfully caused power outages for several hours in different regions of Ukraine.

TRITON

- Triton is malware first discovered at a Saudi Arabian petrochemical plant in 2017. It can disable safety instrumented systems, which can then contribute to a plant disaster.
- In December 2017, it was reported that the safety systems of an unidentified power station, believed to be in Saudi Arabia, were compromised when the Triconex industrial safety technology made by Schneider Electric SE was targeted in what is believed to have been a state sponsored attack. The computer security company Symantec claimed that the malware, known as "Triton", exploited a vulnerability in computers running the Microsoft Windows operating system.
- In 2018, FireEye, a company that researches cyber-security, reported that the malware most likely came from the Central Scientific Research Institute of Chemistry and Mechanics (CNIIHM), a research entity in Russia.

https://en.wikipedia.org/wiki/Triton_(malware)

CrashOveride

- The U.S. Government attributes this activity to Russian nation-state cyber actors and assess that Russian nation-state cyber actors deployed CrashOverRide malware to conduct a cyberattack against Ukrainian critical infrastructure.
- The modules and capabilities publicly reported appear to focus on organizations using ICS protocols IEC101, IEC104, and IEC61850, which are more commonly used outside the United States in electric power control systems.
- Issues valid commands directly to remote terminal units (RTUs) over ICS protocols. (…and more)

PIPEDREAM

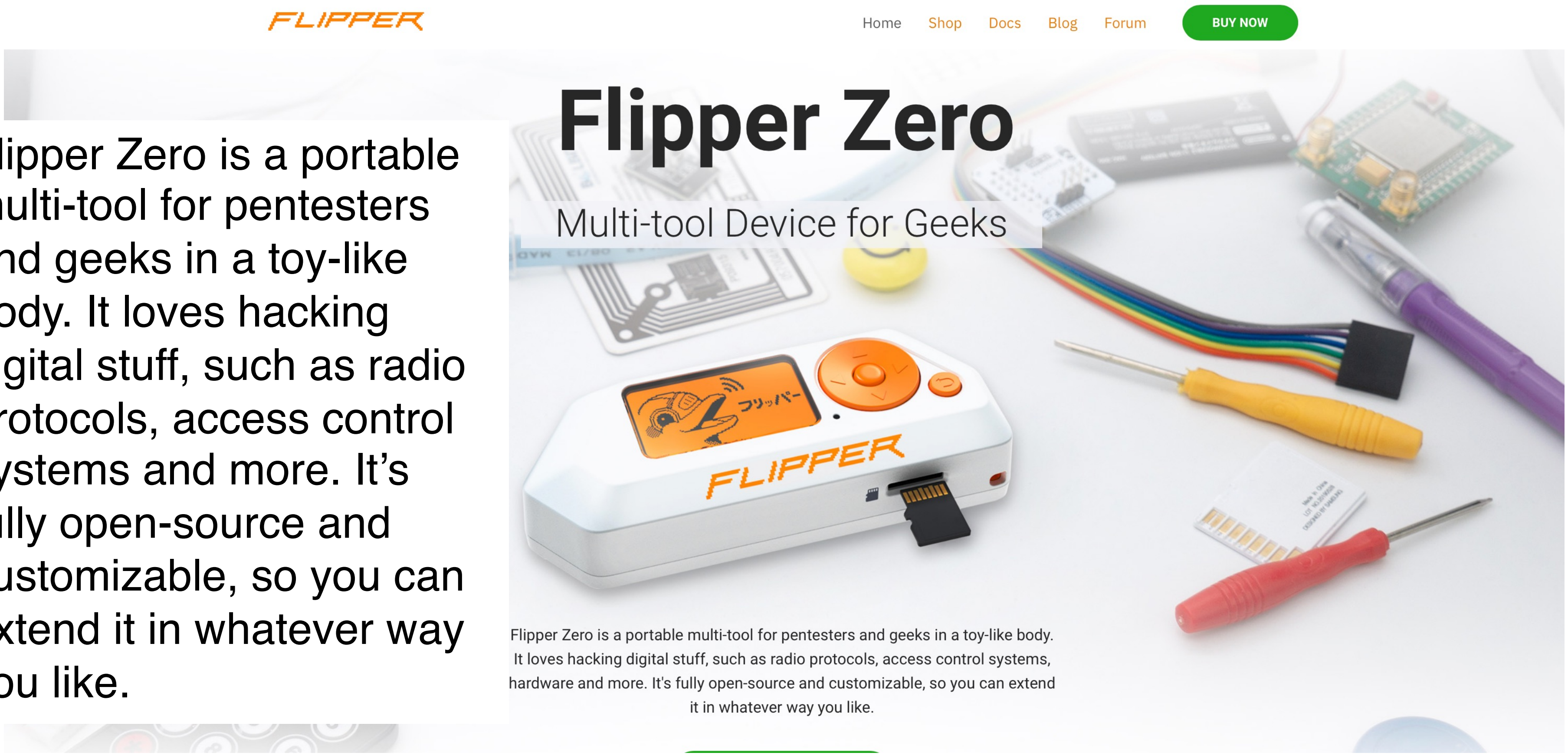
- … is a modular ICS attack framework that an adversary could leverage to cause disruption, degradation, and possibly even destruction depending on targets and the environment.
- … can manipulate a wide variety of industrial control programmable logic controllers (PLC) and industrial software, including Omron and Schneider Electric controllers, and can attack ubiquitous industrial technologies including CODESYS, Modbus, and Open Platform Communications Unified Architecture (OPC UA).
- …components…to enumerate an industrial environment, infiltrate engineering workstations, exploit process controllers, cross security and process zones, fundamentally disable controllers, and manipulate executed logic and programming.

https://www.dragos.com/blog/industry-news/chernovite-pipedream-malware-targeting-industrial-control-systems/

COSMICENERGY

- …designed to disrupt electric power by interacting with IEC 60870-5-104 (IEC-104) standard devices, such as remote terminal units. These devices are commonly used in electric transmission and distribution operations in Europe the Middle East and Asia.
- …similarities to malware used in previous attacks targeting electricity grids, including the ‘Industroyer’ incident that took down power in Kiev, Ukraine in 2016.
- …in the Industroyer attack in 2016, believed to have been perpetrated by Russian APT group Sandworm, the malware issued IEC-104 ON/OFF commands to interact with RTUs, and may have made use of an MSSQL server as a conduit system to access OT. This enabled attackers to send remote commands to affect the actuation of power line switches and circuit breakers, thereby causing power disruption.

Flipper Zero is a portable multi-tool for pentesters and geeks in a toy-like body. It loves hacking digital stuff, such as radio protocols, access control systems and more. It’s fully open-source and customizable, so you can extend it in whatever way you like.



Flipper Zero

Multi-tool Device for Geeks

Flipper Zero is a portable multi-tool for pentesters and geeks in a toy-like body. It loves hacking digital stuff, such as radio protocols, access control systems, hardware and more. It's fully open-source and customizable, so you can extend it in whatever way you like.

https://flipperzero.one

So What Can We Do?

Accounting Controls Example

In accounting, Internal Control is comprised of the policies and procedures adopted by the management of an entity to assist in achieving the following objectives:

(a) Orderly and efficient conduct of business.

(b) Adherence to management policies

(c) Safeguarding of assets

(d) Prevention and detection of fraud and errors

(e) Accuracy and completeness of accounting records

(f) Timely preparation of financial statements

Security Controls

Cybersecurity controls are the processes an organization has in place to protect itself from computer system vulnerabilities and data hacks.

IT-oriented examples include:

- Establish and Maintain Detailed Asset Inventory
- Ensure Network Infrastructure is Up-to-Date
- Establish and Maintain a Security Awareness Program
- Establish and Maintain a Secure Application Development Process

ICS/OT Controls

- Fail-safe design
- Physical security
- Logical separation
- Monitoring
- Secure remote access

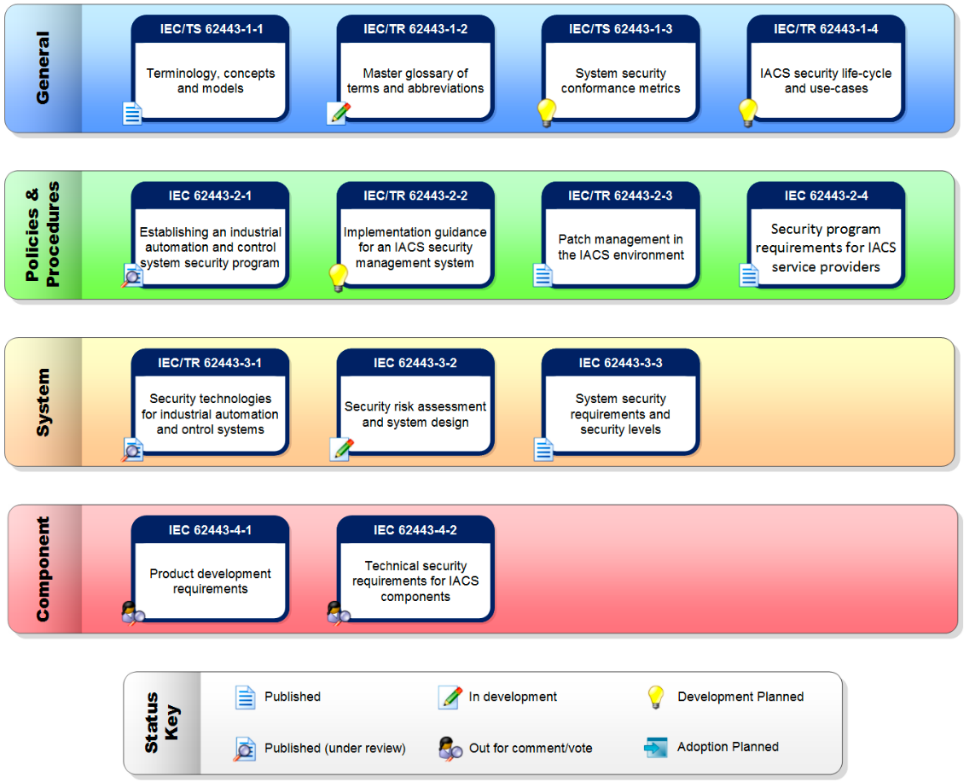
5 Reasons Why IT Security Tools Don't Work For OT

- Reason 1: OT prioritizes availability over confidentiality
- Reason 2: OT systems run on always-up legacy systems
- Reason 3: IT tools almost always require a connection
- Reason 4: OT systems are highly variable
- Reason 5: OT systems are delicate

https://thehackernews.com/2023/06/5-reasons-why-it-security-tools-dont.html

IEC 62443 Standards

International
Electrotechnical
Commission



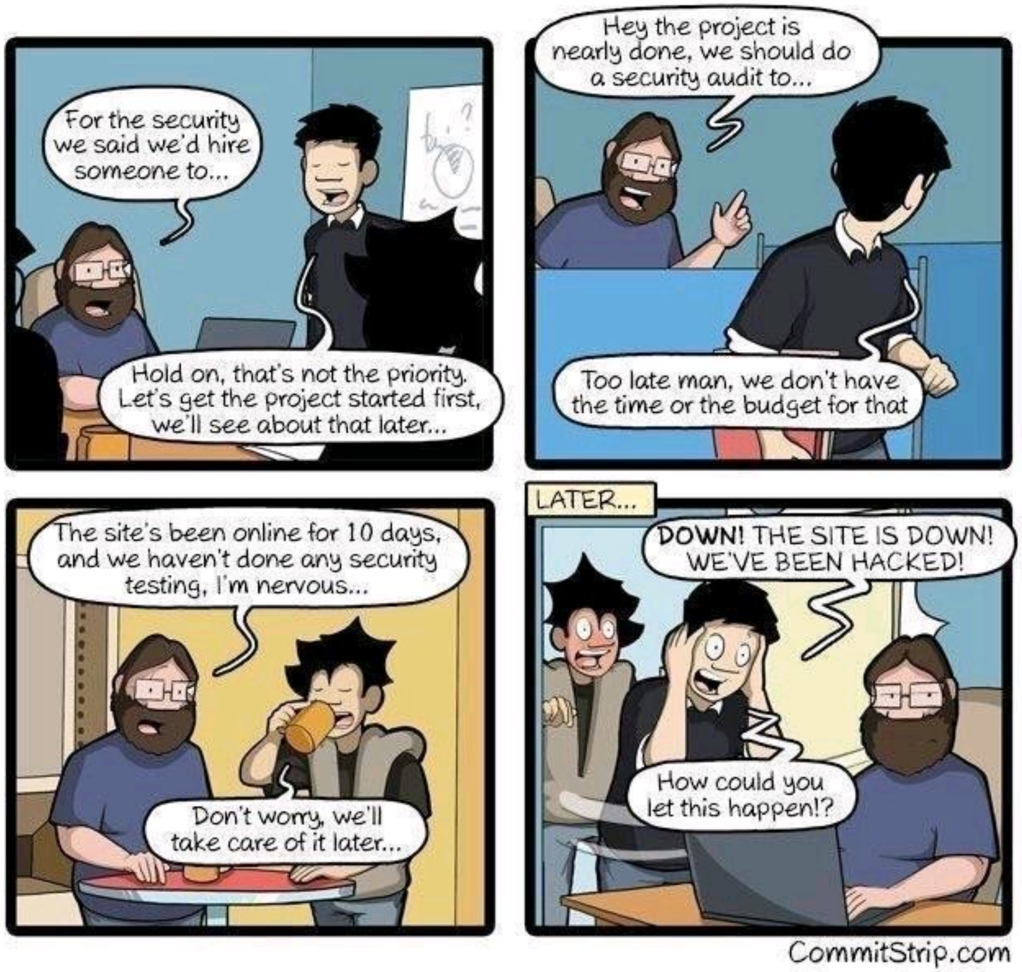
General	IEC/TS 62443-1-1 Terminology, concepts and models	IEC/TR 62443-1-2 Master glossary of terms and abbreviations	IEC/TS 62443-1-3 System security conformance metrics	IEC/TR 62443-1-4 IACS security life-cycle and use-cases
Policies & Procedures	IEC 62443-2-1 Establishing an industrial automation and control system security program	IEC/TR 62443-2-2 Implementation guidance for an IACS security management system	IEC/TR 62443-2-3 Patch management in the IACS environment	IEC 62443-2-4 Security program requirements for IACS service providers
System	IEC/TR 62443-3-1 Security technologies for industrial automation and ontrol systems	IEC 62443-3-2 Security risk assessment and system design	IEC 62443-3-3 System security requirements and security levels	
Component	IEC 62443-4-1 Product development requirements	IEC 62443-4-2 Technical security requirements for IACS components		

Status Key

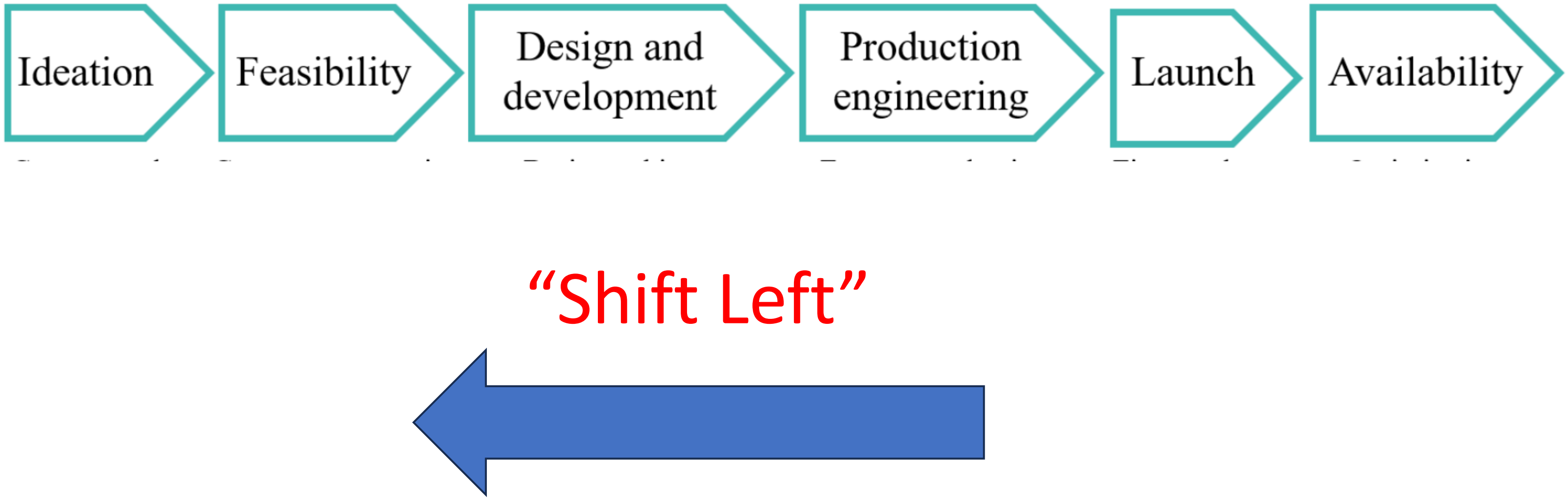
Published	In development	Development Planned
Published (under review)	Out for comment/vote	Adoption Planned

Industrial
Automation and
Control

As opposed to
IEC/ISO 27000
for Information
Technology


For the security we said we'd hire someone to...
Hold on, that's not the priority. Let's get the project started first, we'll see about that later...
Hey the project is nearly done, we should do a security audit to...
Too late man, we don't have the time or the budget for that
The site's been online for 10 days, and we haven't done any security testing, I'm nervous...
Don't worry, we'll take care of it later...
LATER...
DOWN! THE SITE IS DOWN! WE'VE BEEN HACKED!
How could you let this happen!?
CommitStrip.com

Secure by Design



Ideation

Feasibility

Design and development

Production engineering

Launch

Availability

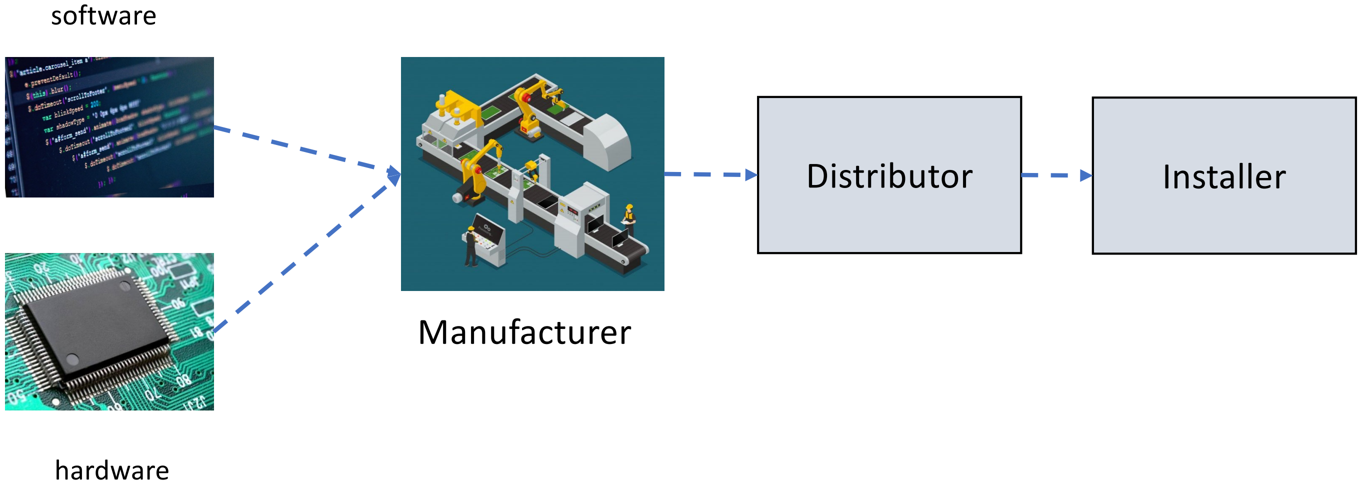
“Shift Left”

“A few examples of … cybersecurity deficiencies in the transmitters include lack of device cyber forensics (no ability to determine what has been changed and by whom); lack of cyber logging (no ability for long-term storage of information as data is overwritten); no capability for implementing antivirus software; lack of patching capabilities; and the use of insecure communication protocols, such as FTP, Modbus, and Bluetooth.”

Weiss, Joseph, “Challenges in Federal Facility Control System Cyber Security, Including Level 0 and 1 Devices,” 2023

Supply Chain Security

- How can you be sure that the components used in control systems can be trusted?



software

Manufacturer

Distributor

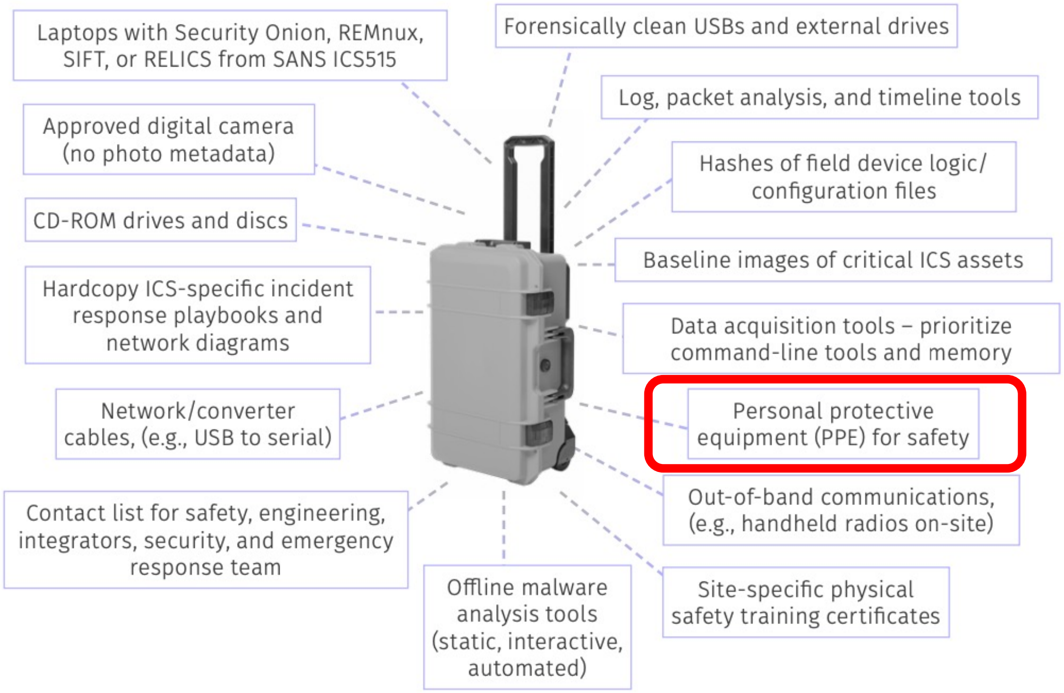
Installer

hardware

Ecosystems

- Business partners
  - Contracts
  - Business associate agreements
  - Service level agreements
  - Monitoring
  - Auditing

ICS Incident Response Jump Bag



Laptops with Security Onion, REMnux, SIFT, or RELICS from SANS ICS515

Forensically clean USBs and external drives

Approved digital camera (no photo metadata)

Log, packet analysis, and timeline tools

Hashes of field device logic/ configuration files

CD-ROM drives and discs

Baseline images of critical ICS assets

Hardcopy ICS-specific incident response playbooks and network diagrams

Data acquisition tools – prioritize command-line tools and memory

Network/converter cables, (e.g., USB to serial)

Personal protective equipment (PPE) for safety

Contact list for safety, engineering, integrators, security, and emergency response team

Out-of-band communications, (e.g., handheld radios on-site)

Offline malware analysis tools (static, interactive, automated)

Site-specific physical safety training certificates

https://www.sans.org/mlp/ics-resources/?msc=is_ICS%20Field%20Manual%20V3#download-volume3

Hackers only need to get it right once…

…we need to get it right every time

Selected References

- NIST guidance
  - Guide to Industrial Control Systems (ICS) Security
    - https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-82r2.pdf
  - Special Publication NIST SP 800-82r3 ipd, Guide to Operational Technology (OT) Security, Initial Public Draft
    - https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-82r3.ipd.pdf
  - Securing the Industrial Internet of Things: Cybersecurity for Distributed Energy Resources
    - https://www.nccoe.nist.gov/sites/default/files/2021-09/es-iiot-nist-sp1800-32-draft.pdf

- CISA guidance
  - Securing Industrial Control systems: A Unified Initiative
    - https://www.cisa.gov/sites/default/files/publications/Securing_Industrial_Control_Systems_S508C.pdf
  - Shifting the Balance of Cybersecurity Risk: Principles and Approaches for Security-by-Design and –Default
    - https://www.cisa.gov/sites/default/files/2023-04/principles_approaches_for_security-by-design-default_508_0.pdf

Selected References (continued)

- SANS guidance
  - ICS Cybersecurity Field Manual series
    - https://www.sans.org/mlp/ics-resources/
- "Challenges in Federal Facility Control System Cyber Security, Including Level 0 and 1 Devices," Joseph Weiss, PE, CISM, CRISC Managing Partner, Applied Control Solutions, LLC https://nap.nationalacademies.org/catalog/26511/challenges-in-federal-facility-control-system-cyber-security-including-level-0-and-1-devices
- "Unfettered Blog," Control Global https://www.controlglobal.com/blogs/unfettered
- ISA/IEC 62443 Series of Standards, https://www.isa.org/standards-and-publications/isa-standards/isa-iec-62443-series-of-standards

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