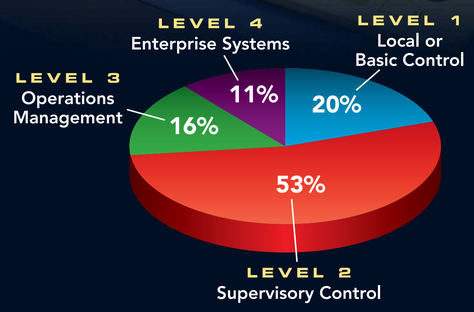
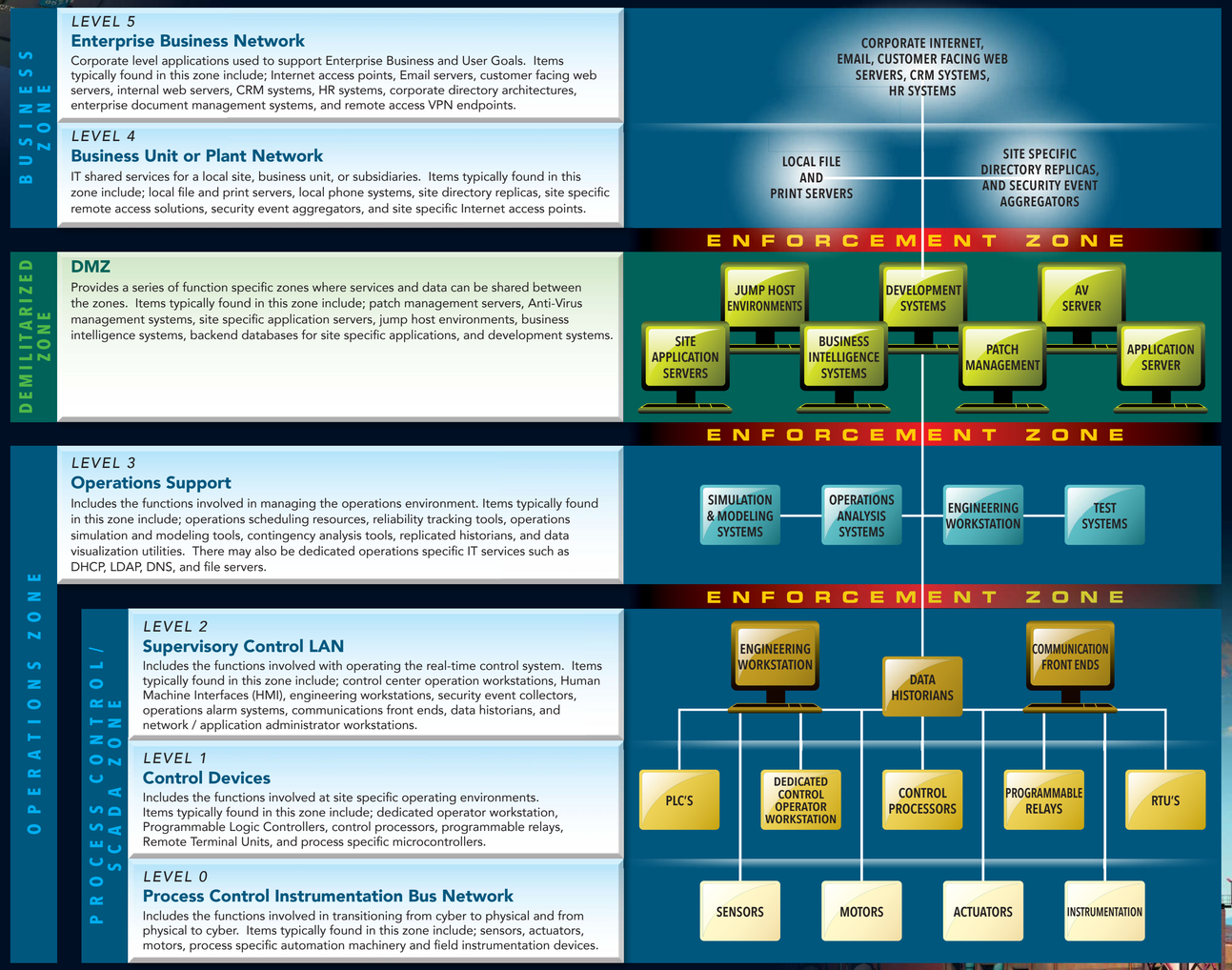
Industrial Control Systems (ICS) Security Resources

SANS, working with industry experts, is making a difference in the Industrial Control System (ICS) cyber security front. SANS has joined forces with industry leaders to, change the game, by equipping both security professionals and control system engineers with the security awareness, work specific knowledge, and hands-on technical skills they need to secure automation and control system technology. The SANS ICS team is working to provide ICS focused curriculum and certifications, as well as community resources including posters, white papers, and security practice application guidance. SANS has engaged the dedicated practitioner community that assembles during our global and regional ICS summits, and leverage leaders from enterprises, governments, and vendors from around the globe to tackle our common challenges and share working solutions.

DHS Common Cybersecurity Vulnerabilities in Industrial Control Systems





SANS ICS410: ICS/SCADA Security Essentials

Five-Day Program | Laptop Required | 30 CPEs

The SANS Industrial Control Systems Team is working to develop a curriculum of focused ICS courseware to equip both security professionals and control system engineers with the knowledge and skills they need to safeguard our critical infrastructures. The entry-level course in the SANS ICS Curriculum is ICS410: ICS/SCADA Security Essentials.

This course provides students with the essentials for conducting security work in Industrial Control System (ICS) environments. Students will learn the language, the underlying theory and the basic tools for ICS security in industrial settings across a diverse set of industry sectors and applications. This course will introduce students to ICS and provide the necessary information and learning to secure control systems while keeping the operational environment safe, reliable, and resilient.

Global ICS Professional Certification

GIAC, working with industry experts, has developed a vendor neutral, practitioner-focused Industrial Control System certification.

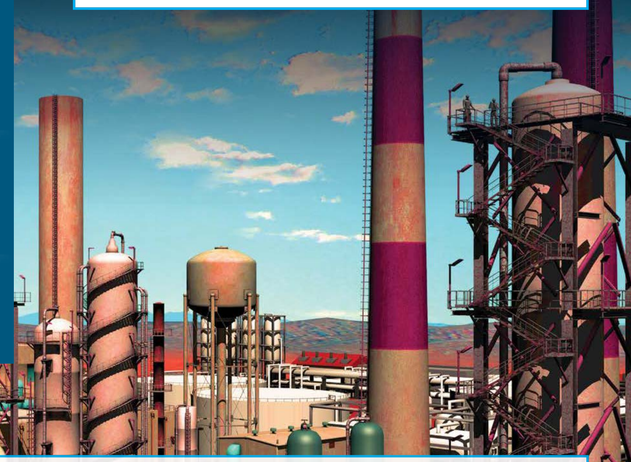
The Global Industrial Cyber Security Professional Certification (GICSP) assesses a base level of knowledge and understanding across a diverse set of professionals who engineer or support control systems and share responsibility for the security of these environments. This certification will be leveraged across industries to ensure a minimum set of knowledge and capabilities that an IT, engineer, and security professional should know if they are in a role that could impact the cybersecurity of an ICS environment.

Securing the Human

SANS has expanded the focus of the popular Securing the Human product into two ICS focused areas. First, **Securing the Human for Utilities** is a computer-based training program with specific focus on the NERC CIP Standards. This training consists of seven core modules that provide an overview of NERC and FERC, an Introduction to the NERC CIP Standards, and a series of topics on physical and electronic access controls, as well as information protection and incident response.

In addition, SANS has developed **Securing the Human for Engineers**, which focuses on security behaviors for individuals who interact with, operate, or support Industrial Control Systems. This training consists of 10 core modules and provides an ICS overview, an understanding of ICS attacks, and covers basic system and network defense approaches in an ICS environment, as well as governance and policy resources.

These programs were developed to not only assist your organization in meeting compliance requirements through continued training and standard reporting, but also change human behavior and reduce risk.



Resources

SANS ICS Homepage
http//www.sans.org/ics

DHS ICS-CERT
http://ics-cert.us-cert.gov

DHS Cybersecurity Evaluation Tool
http://ics-cert.us-cert.gov/Assessments

NERC ES-ISAC
http://www.esisac.com/SitePages/Home.aspx

ICS-ISAC
http://ics-isac.org

Cybersecurity Vulnerability NSTB Program
http://energy.gov/oe/downloads/common-cyber-security-vulnerabilities-observed-control-system-assessments-inl-nstb

Vulnerability Analysis of Energy Delivery Control Systems
http://energy.gov/oe/downloads/vulnerability-analysis-energy-delivery-control-systems

NIST SP 800-82 Guide to ICS Security
http://csrc.nist.gov/publications/nistpubs/800-82/SP800-82-final.pdf

ISA-99 Control System Security Committee
http://isa99.isa.org/ISA99%20Wiki/Home.aspx

NERC CIP Standards
http://www.nerc.com/pa/Stand/Pages/ReliabilityStandards.aspx

Industrial Control Systems Security Resources

POSTER

ICS-PSTR_26th EDITION_0617_v1

Control Systems Are a Target

www.sans.org/ics

www.securingthehuman.org

You may not realize it, but your organization's Industrial Control System (ICS) environments are a target for cyber attackers. The ICS automation, process control, access control devices, system accounts and asset information all have tremendous value to attackers. This poster demonstrates the many different ways attackers can gain access to an ICS environment and demonstrates the need for active security efforts and ICS engineer training that will enable informed engineering decisions and reenforce secure behaviors when interacting with an Industrial Control System.

In many cases these are not one-off attacks, but are planned for with reconnaissance, multiple attacks and adjustments. These are campaigns that happen over the course of months, and they require system owners and operators to be vigilant and recognize when something is not right.

ICS Security goal: Ensure the safe, reliable and secure operation of ICS environments from procurement to retirement

Abnormal activity or unexplained errors deserve a closer security look

Network Access

- *Internet accessible systems are being mapped by ERIPP or SHODAN, or are easily locatable through search engine queries*
- *Malware can spread vertically through the network by trusted system to system connections or VPN*
- *It is very easy to maneuver undetected throughout a control environment*
- *There is potential to leverage non-routable trusted communication paths*

Interconnects

- *ICS systems can be attacked by exploiting applications that communicate through network segmentation*
- *Connections to other organizations, plants or systems*
- *Many ICS environments are susceptible to network-based Man in the Middle Attacks*

Dial-Up

- *ICS assets can be remotely accessible through traditional dial-up modems that have little access control protections*
- *Numerous ICS assets at a location can be accessed through a single dial-up access point with a multiplex device that enables connections to many ICS assets*
- *Old attack vectors can still be successful in ICS environments*

System Management

- *Attackers can take advantage of long delays in patching and operating system upgrades*
- *Attackers can take advantage of systems with no anti-virus, or out-of-date signatures*
- *Attackers will leverage default usernames and passwords or weak authentication mechanisms*
- *Attacks will be difficult to detect due to minimal asset security logging capability*
- *Attackers will leverage file access techniques to move data in and out of the ICS environment through physical removable media or trusted communication paths utilized for system maintenance*

Supply Chain

- *Third party vendors, contractors or integrators can be attacked in an attempt to ultimately attack an ICS asset owner or multiple asset owners*
- *ICS hardware and software can be directly breached or impacted prior to arriving in the production ICS environment*

Governance

- *Attackers can leverage the lack of corporate security policies, procurement language, asset inventory and standardization that exist in many ICS environments*
- *Attackers can have greater impacts on ICS environments, as ICS assets are often not considered in the preparation phase of security incident response planning and containment approaches*
- *ICS risk and hazard assessment are not always evaluated with the loss of cyber integrity which, can lead to a loss of availability, impacts due to interdependencies and misuse of critical components or functions*
- *In some sectors ICS assets are often architected or assessed from a compliance perspective and not always assessed from a security perspective*

Social Engineering

- *Request for Proposals often contain a wealth of information regarding an ICS environment*
- *Vendors frequently post information about a project they are working on for an ICS customer*
- *Employee social media sites often contain technology architecture information and, possibly, images of ICS work environments*
- *Engineer professional bios can provide a helpful map of your ICS*
- *Publically available information regarding an ICS asset owners' vendor relationships, conference attendance, committee participation and domain registrations can all be leveraged against the organization*

Physical Security

- *Attackers can leverage the physical locations of numerous ICS assets that could be located in remote geographies or are unmonitored, even when little to no physical access controls ICS assets can be physically stolen or obtained*
- *ICS assets can be physically stolen or obtained secondhand with access to sensitive information that could be used in planning an attack*
- *Physical changes or alterations to ICS devices are often difficult to detect*

Cyber Actors

- *Nation States*
- *Insiders and other trusted parties (such as contractors / vendors / integrators)*
- *Criminal Hacker*
- *Politically motivated attackers (hacktivists)*
- *Script Kiddies*