Industrial Systems Security

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Proposed Topics

- Introduction
- What are S99 & IEC 62443
- What other standards groups are relevant
- Summary ?

Introduction – Gary Rathwell

- President, Enterprise Consultants, Inc (ECI)
- Long experience in Industrial Controls & Telecom
  - Fluor - Functional Leader of Controls and Automation
  - H.A. Simons – Director, Mill Wide Systems
  - ICI and Texaco Manager process control and optimization
- Proponent of PERA (Purdue Enterprise Reference Architecture) Architecture and Master Planning
  - Lead more than 12 master planning studies for multi-billion $ enterprises
  - Contributed to many more plans & studies for major corporations
- Member of S95, S99 and IEC TC184 Standards Teams.
- Author of many engineering tools and standards. See www.engwb.com, www.pera.net, and www.entercon.biz

What are ISA S99 and IEC 62443 ?

- ISA S99 – guidance documents and standards on IT security to existing industrial control and automation Systems
  - Part 1 – defines terms and models used in automation security
  - Part 2 – establishing Cyber Security Management Systems
- IEC 62443 – mainly addresses technical aspects of system security architecture,

What is the Threat ?

- Terrorists, Hackers and Organized Crime Threats
- Must defend against both internal and external threats
  - For small companies most threats are external
  - For large companies most threats are internal

What kind of Attacks Have Occurred?

- Nuclear Plant shutdown (virus)
- Massive release of human sewage (malicious employee)
- Shutdown of major US airport (technical and contract failure)
- Many banking system breaches (many more not publicized e.g. Russia in 1999)
- Tests of North American Power grid showed many openings.

What has changed?

- Hackers, Terrorists and Organized Crime are becoming more sophisticated.
- Increased use of Standardized LAN and Operating Systems in ICD mean many more people know how to attack them
- Wireless technologies present major new challenges
- 911 and increased terrorist activity

Why is a Security Standard Needed ?

- Need to have a standard to audit against
- Need standards to train next generation of engineers.
- Need standards so security products can work compatibly together.

What Sort of Security Policies Does my Company Need ?

- Every manufacturing organization needs ICD (Industrial Control Domain) policies and effective implementation
- Need a well documented and managed Corporate Control and Information Systems architecture, particularly for the ICD
- If processes are critical or dangerous, need a regular audit of ICD security
- The Firewalls between MES & ICD and MES and IT must be very carefully designed, managed and regularly audited.
- If any ICD links traverse external networks, require secure VLAN and monitoring.
- Most medium to large companies will require a secured Industrial Data Center where MES and SCADA (Supervisory Control and Data Acquisition) systems reside.

What Sort of Security Policies Does my Company Need ?

- No non-critical applications in ICD
- Eliminate unstructured applications
  - e.g. email
- Eliminate communication access points
  - e.g. maintenance dial-ins
- Single point control
  - every application adds vulnerabilities
  - Must be auditable

Why not use existing IS standards for ICD Security ?

- Authentication and Authorization Technologies
  - Operator's ability to recall and enter a password may be impacted by the urgency of the situation
- Filtering/Blocking/Access Control Technologies
  - Adds delay to control system communications
  - Lack of firewall products for non-IP based protocols
- Encryption Technologies
  - Slows down communication as additional time is required to encrypt, decrypt, and authenticate message
- Auditing Tools
  - Many legacy process control devices do not have the capability to provide logs

S99 - Standard

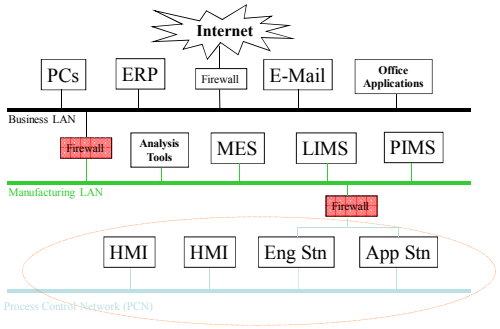
Part 1 - Models & Terminology

- Theme
  - Establish the scope and define terminology
- Typical Questions Addressed
  - What is a control system?
  - How is it different from a typical business system?
  - What are the different levels of data confidentiality for control systems applications?
  - How can these levels be established?
  - What are the key security terms and concepts and how are they defined in this context?

Part 1 - Models & Terminology

- References
  - Purdue CIM Reference Model
  - ISA S84 – Safety Instrumented Systems
  - ISA S88 – Batch Control
  - ISA S95 – Enterprise- Control Systems Integration
- Models
  - Identify threats and vulnerabilities
  - Classify assets
  - Define boundaries and information flows
  - Define security policy

Part 1 Application Example



Part 2 - Establishing a Security Program

- Theme
  - Give practical guidance and direction on how to establish business case for a security program and how to design the program to meet business needs.
- Typical Questions Addressed
  - How to make a business case for security in M&CS environment?
  - What is the step-by-step process of building such a program?
  - What skills and organizations need to be involved?
- Proposed Timeline
  - First committee vote expected in July 2005

Part 3 - Operating a Security Program

- Theme
  - Details of how a program is run after it is designed and implemented
- Typical Questions Addressed
  - What should the short-term and long-term responsible organization look like?
  - What do I do when the project team goes away?
  - How do I keep a program relevant and effective in the face of changing technology and business needs?
  - How do I work effectively with my IT and audit organizations?
- Proposed Timeline
  - First Draft December 2005

Part 4 – Specific Security Requirements for M&CS

- Theme
  - Focus on those operational and design requirements that set apart manufacturing and control systems from IT systems
- Typical Questions Addressed
  - What is so special about the Manufacturing and Controls Environment that it requires a different response and design?
- Timeline
  - First Draft March 2006

What other Groups are Working in this Area ?

- The National Strategy to Secure Cyberspace published in Feb. 2003
- DHS Initiatives (Fact Sheet – Published Feb. 2005)
  - Established the US Computer Emergency Readiness Team (CERT) Control Systems Center
  - Established, the Control Systems Security and Test Center (CSSTC) in conjunction with Idaho National Environmental and Engineering Laboratory
  - Launched a new Process Control Systems Forum as a joint effort between National Cyber Security Division (NCSD) and Science & Technology (S&T) Directorate
- Other Standards Organizations
  - IEC, NERC, NIST, CIDX and several other organizations

What other Groups are Working in this Area ?

- Working Group 7
  - Proactively seeks partnerships and coordinate activities with pertinent outside groups
  - Participate in meetings of these outside organizations, as well as monitor progress and review published documents
  - Report back to ISA areas of overlap and viewpoints that are either cooperative or conflicting
- Organizations
  - DHS (Department of Homeland Security)
  - IEC (International Electrotechnical Commission)
  - NIST PCSRF (Process Control Security Requirements Forum)
  - CIDX (Chemical Industry Data eXchange)
  - NERC (North American Electric Reliability Council)
  - Other standards organizations

Summary

- Rapidly increasing industrial systems integration market
- Complexity and risks are also increasing
- S95 represents the ONLY efficient way to implement links between automation, MES and ERP (e.g. SAP etc.)
- S99 and Security architectures are essential at all enterprise levels.
- Failures have legal implications if best technology was not applied