Toward Securing the IIoT: Industrial Internet Security Framework
The Fourth Industrial Revolution

Industrial Internet of Things (IIoT)

1st
Mechanization, water power, steam power

2nd
Mass production, assembly line, electricity

3rd
Computer and automation

4th
Cyber Physical Systems

The 4 Industrial Revolutions (by Christoph Roser at AllAboutLean.com)
Repercussions of Industrial Revolution #4: Security Concerns

Along with the advances in industry come serious concerns over security.
Fallacy:
Industrial revolutions are driven by researchers, inventors, and designers of technology

Reality:
Investors, consumers, regulators, and citizens who adopt and employ the technologies in daily life.

Industrial revolutions driven by individual and collective choices of people.

Source: World Economic Forum
https://www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/

How can we enable the safe, reliable, and secure adoption of IIoT?
The IIC Library of Knowledge + Security

B0: Business Strategy & Solution Lifecycle

G0: IIS Overview

G0.1: IIS Overview

G0.2: Manifest of Documents

G1: Industrial Internet Reference Architecture (IIRA)

Architecture Concept & Framework

G2: Key System Characteristics and Crosscutting Concerns

G4: Industrial Internet Security Framework (IISF)

G5: Industrial Internet Connectivity Framework

G6: Interoperability

G7: Standards

G8: Vocabulary

Vertical & Thematic (Specific & Alternatives)

Topical (In-depth)

Horizontal & General (Foundational and Broad)

Vertical & Thematic (Specific & Alternatives)

Topical (In-depth)

Horizontal & General (Foundational and Broad)
Announcement:
The IIC has published the Industrial Internet Security Framework (IISF)

IISF contains:
• 174 pages
• 12 chapters
• 7 Annexes
• 18 pages of reference lists
• 177 individual references
• 142 individual acronyms
• 37 figures
• 7 tables

• All references hyperlinked (Description & Download)
• Fully Indexed
• Table of contents
• Table of figures
• All hi-rez (EPS) vector graphics
• 800+ comments over the lifetime of the document
• 15 version updates in one day (mid-July)
Security enables the other characteristics of IIoT Trustworthiness
IIoT Trustworthiness: OT/IT Convergence
Trustworthiness: Basis for Industry Adoption of IIoT

- Industrial Business Benefits from IIoT Trustworthiness

- Leverage Trustworthiness to Manage Risk:
  - increase likelihood of correct business decisions

- Permeation of Trust:
  Assure Trust across the entire Industrial System
  - Component Builders
  - System Builders
  - Operational Users

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Permeation of Trust

Trust flows down from the owner/operator to all parts of the IIoT system, but trust must be enabled from the bottom up.
Assurance of the Permeation of Trust

Trust in all of the system elements, how these elements are integrated and how they interact with each other.
International Collaboration

IIoT Though Leadership

• Industrial Internet Consortium
• Industrie 4.0
• National Institute of Standards and Technology (NIST)
IIoT Security Building Blocks and Techniques

- Security Configuration & Management
- Security Monitoring & Analysis
- Communications & Connectivity Protection
- Endpoint Protection
  *Edge – Cloud*
- Data Protection
- Security Model & Policy

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Security Deployment Models

Security Isolation Models

- Process Isolation
- Container Isolation
- Virtual Isolation
- Physical Isolation
Looking Ahead: The Future History of IIC Security

Topics intentionally not addressed in IISF.

- Decentralized Management
- Edge Autonomy
- Software Defined World
- Hardware Identity (PUF)
- Privacy Controls: Homomorphic Encryption
- Quantum Computing
- Fog Computing
- Blockchain

As these technologies evolve, IIC will apply them to IIoT
Industrial Internet Security Framework Summary

- Addresses Industrial Internet security issues
- Delivers the adoption model to apply IIoT security techniques
- Unifies Industrial characteristics in terms of trustworthiness
  - Security to enable: safety, reliability, resilience and privacy
- Provides system-wide, top-to-bottom assurance of Trustworthiness
- Applies techniques spanning: endpoints, communications, monitoring, and management
- Tracks future security trends to bring into Industrial Internet when mature
THANK YOU