



Setting the Standard for Automation™

Security Assurance Levels: A Vector Approach

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Standards
Certification
Education & Training
Publishing
Conferences & Exhibits

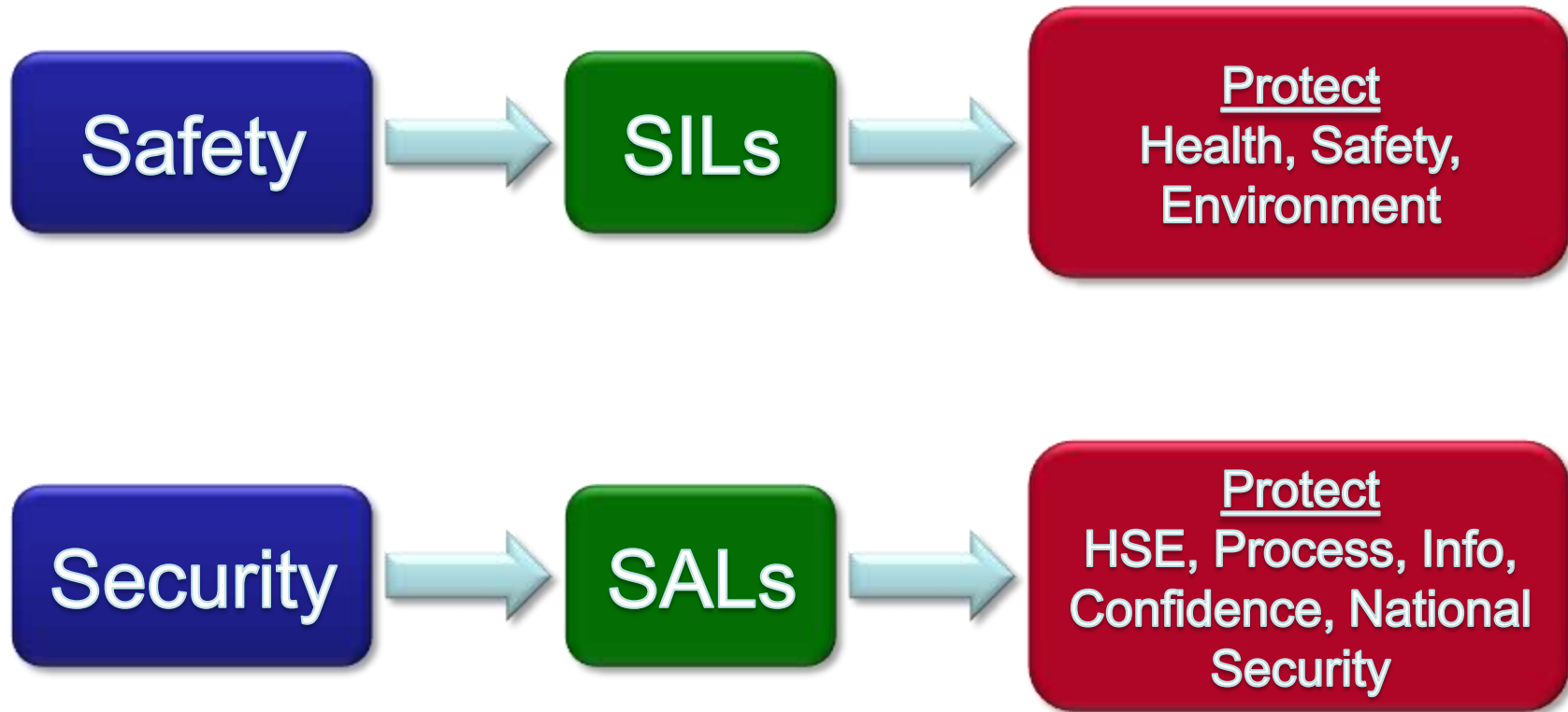
- Electronics Engineer with EL/NIST
- Started Career as IT Unix Administrator
- Industrial Control System Security
 - Managing Director, ISA-99 Committee
 - General editor, ISA-99 Committee
 - Lead editor, ISA-99 Working Group 2
- Industrial Ethernet Network Performance (IENetP)
- Education
 - Masters in EE Controls from Johns Hopkins University
 - Bachelors in EE Controls from Drexel University

NIST

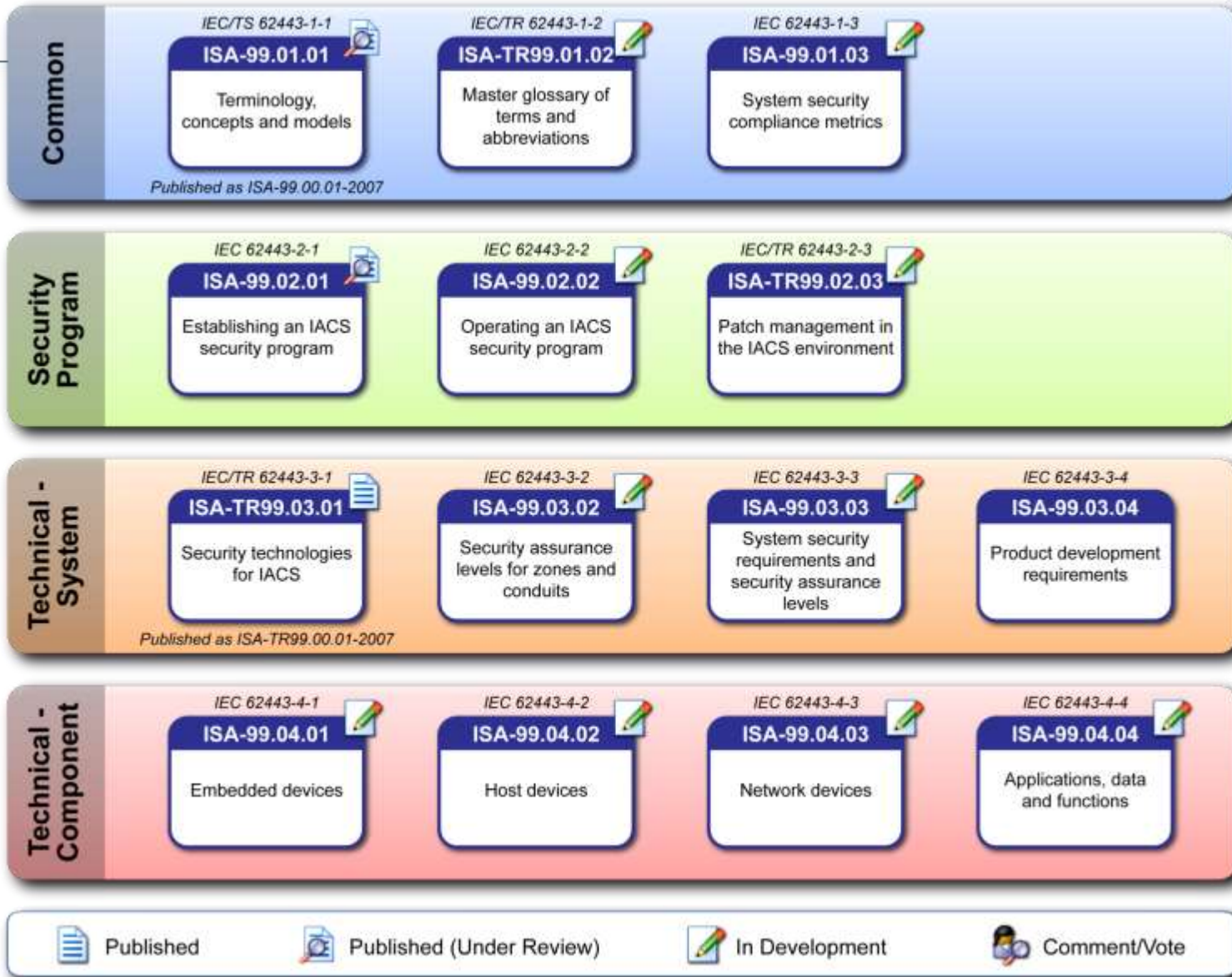
- Principal Scientist at ABB Corporate Research
 - Research Area Coordinator for Secure Remote Operations and Service Infrastructure in ABB's Industrial Software Systems research program
- Member of ISA-99
- Recognized Member of International ICS Security Community
- Education
 - PhD in Information Systems from the University of St. Gallen
 - Masters in Computer Science from Western Michigan University
 - Masters in Information Systems from the University of Paderborn



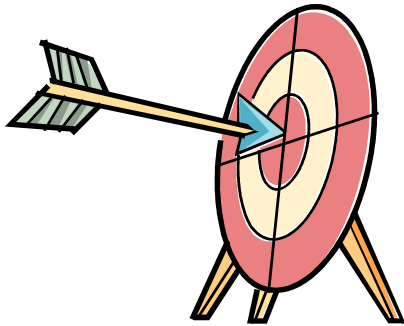
- Introduction
- ISA-99 Document Series
- Types of SALs
- Using SALs
- Level Definitions
- Foundational Requirements
- Vector Format
- Current Status & Comments
- Moving Forward
- Questions



ISA-99 Document Series



- Target SALs



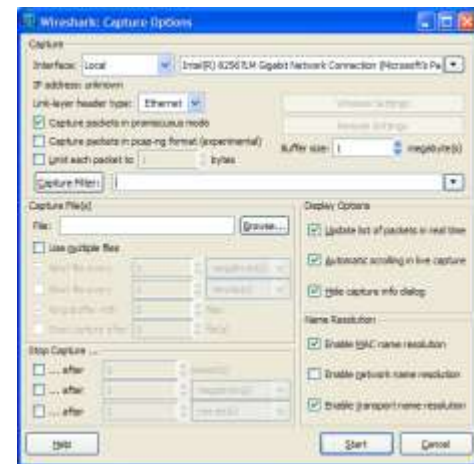
- Designed SALs



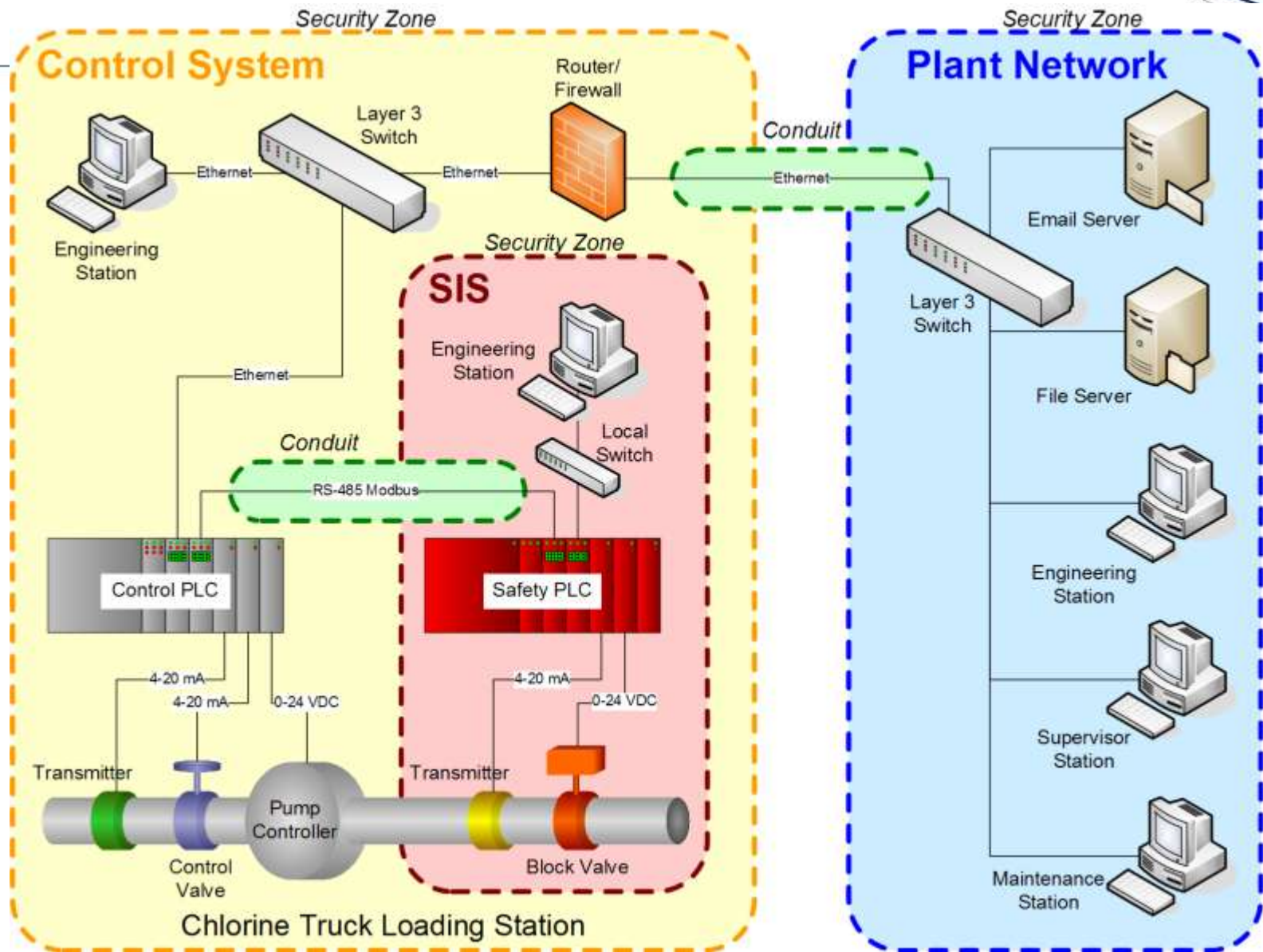
- Achieved SALs



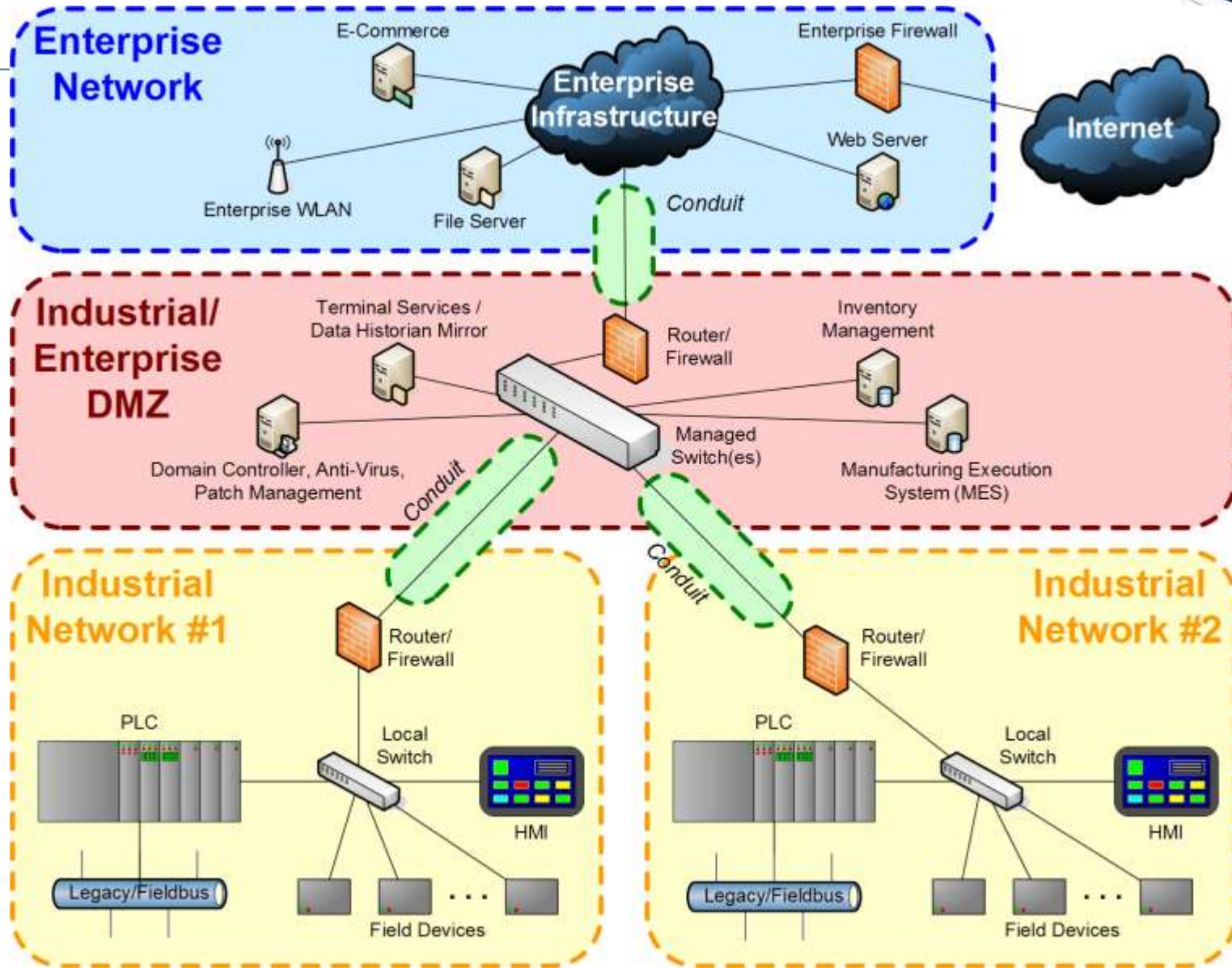
- Capability SALs



Using SALs: Process Example



Using SALs: Manufacturing Example



1

Casual or Coincidental Violation

2

Intentional Violation Using Simple Means

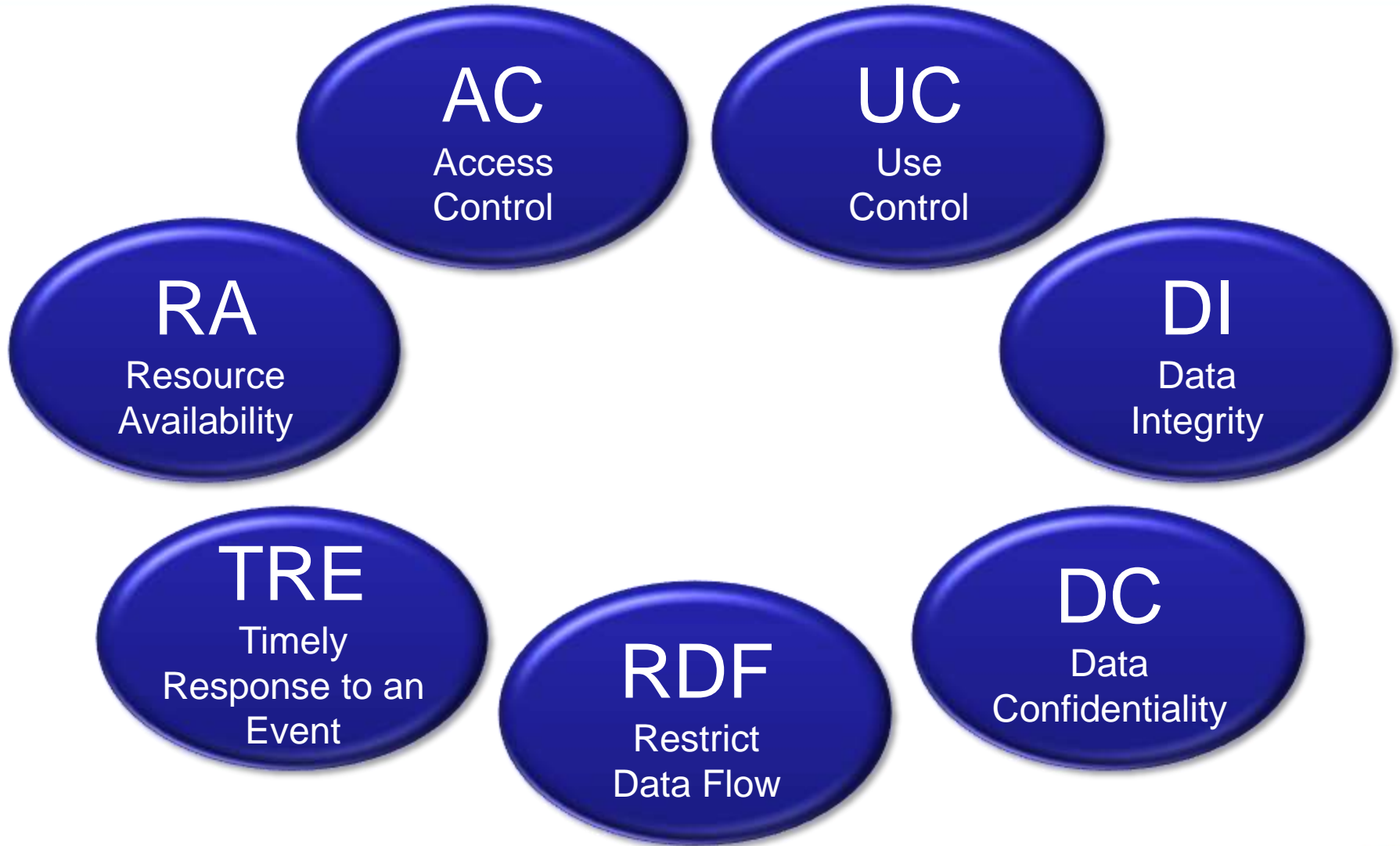
3

Intentional Violation Using Sophisticated
Means

4

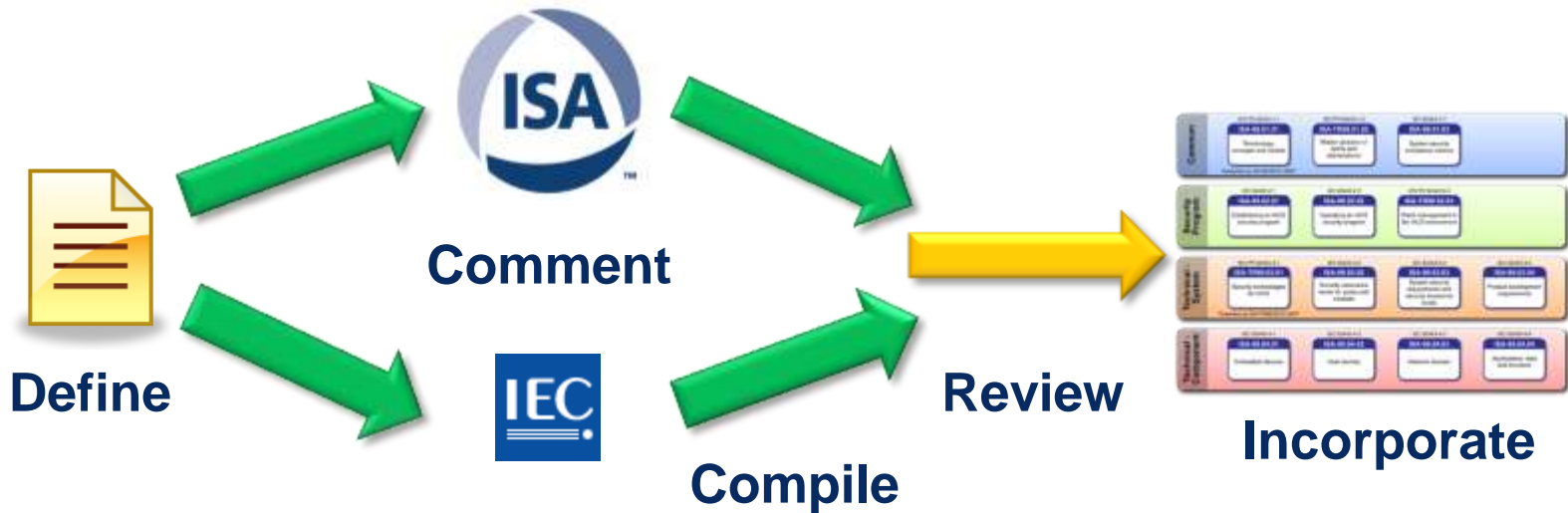
Intentional Violation Using Sophisticated
Means & Extended Resources

Foundational Requirements



$$SAL-?([FR,]domain) = \{AC \ UC \ DI \ DC \ RDF \ TRE \ RA\}$$

- Examples
 - SAL-T(Control System Zone) = {2 2 0 1 3 1 3}
 - SAL-C(Engineering Workstation) = {3 3 2 3 0 0 1}
 - SAL-C(RA, Safety PLC) = 4
- Definition & usage still under development



- General Comments
 - Good Concept
 - Some Misunderstanding of Use/Application
 - More Quantitative Details Needed

- Formally Define SAL Levels
- Incorporate SALs and Vector Concept at All Levels
- Determine SAL Aggregation Methodology
- Proof-of-Concept Application Desirable

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