Security Level:

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Industry 4.0 from an IoT security standpoint

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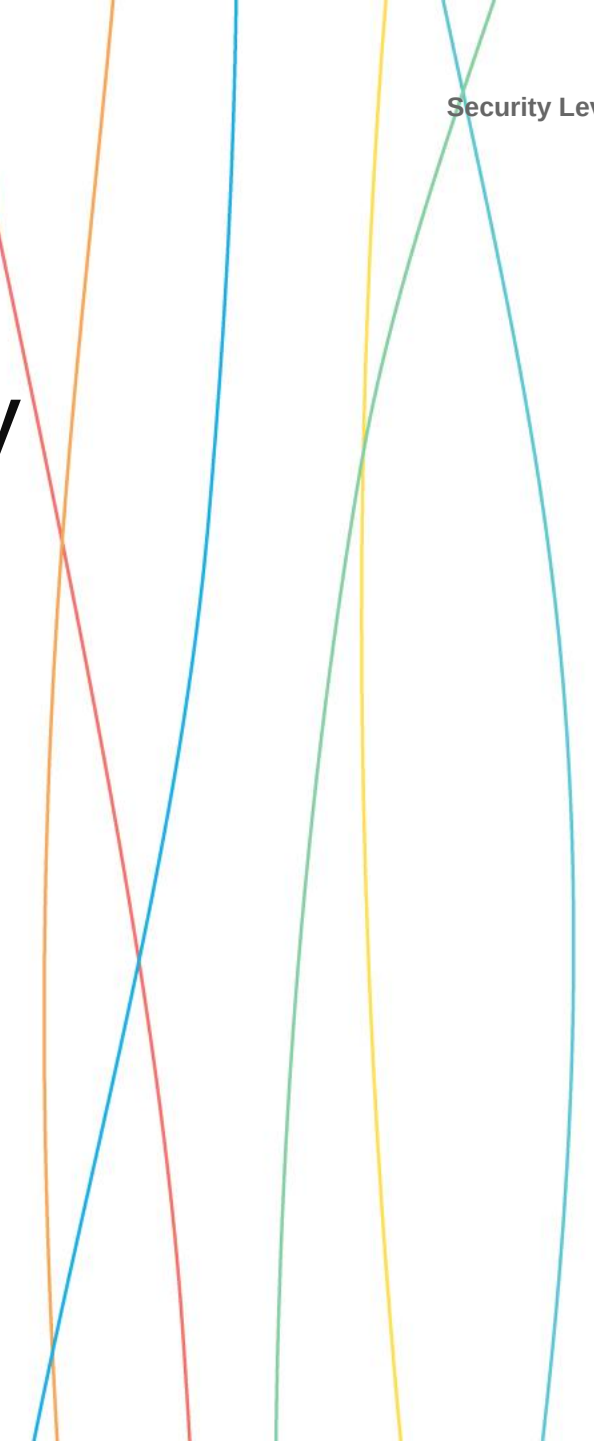


Key questions for today's session

Industrie 4.0 connects humans, machines, processes, and the flow of goods along value chains

- Which security requirements do we expect for this infrastructure and how can such an infrastructure be established?
- How can we assure a high trust level along the value creation network

Security by design has to be the superior principle

- How can security-by-design be accomplished for the complete life cycle?
- How does a road map for an Industrie 4.0 security ecosystem look like?

[1] ENISA Supply Chain Integrity: An overview of the ICT supply chain risks and challenges, and vision for the way forward (2015)

Is security really and issue for the value chain?

~ 80% of data breaches have a supply chain origin

~ 45% of data breaches leveraged components of a (current or past) partner

~ 70% of companies lack visibility in their supply chain

~ 60% of companies lack an appraisal process for the cybersecurity of its partners

~ 40% of companies surveyed suffered a data breach in the last 12 months

~ 40% of companies surveyed had financial losses 1-10 MUSD

[1] SANS Institute, “Combatting Cyber Risks in the Supply Chain”
[2] “Deloitte, “Cyber risk in Advanced Manufacturing”

Challenges and drivers to security in Industrial IoT

Challenges

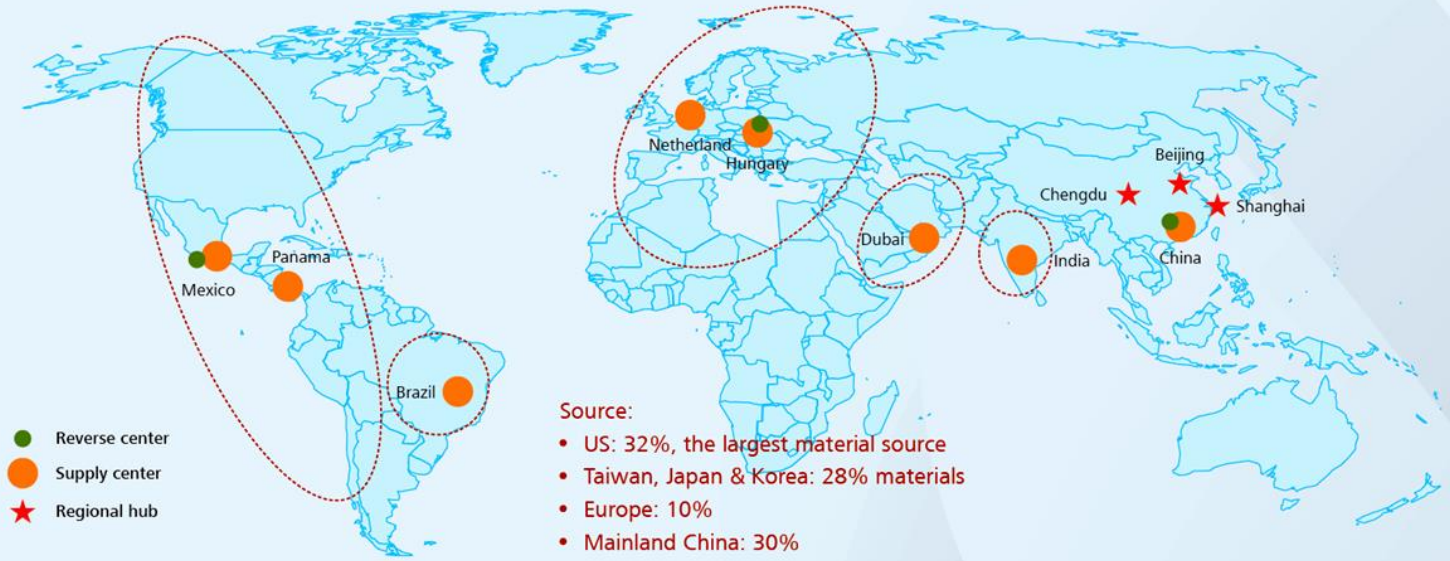
- Lack of visibility
- Lack of transparency
- Lack of alignment
- Lack of controls

Drivers

- Internet of Things (instrumentation and interconnection
- Digitization (code as the innovation engine)
- 3-D Printing (fine-grain embedment)

Huawei’s supply chain situation

Huawei Global Supply Network



Source:

- US: 32%, the largest material source
- Taiwan, Japan & Korea: 28% materials
- Europe: 10%
- Mainland China: 30%

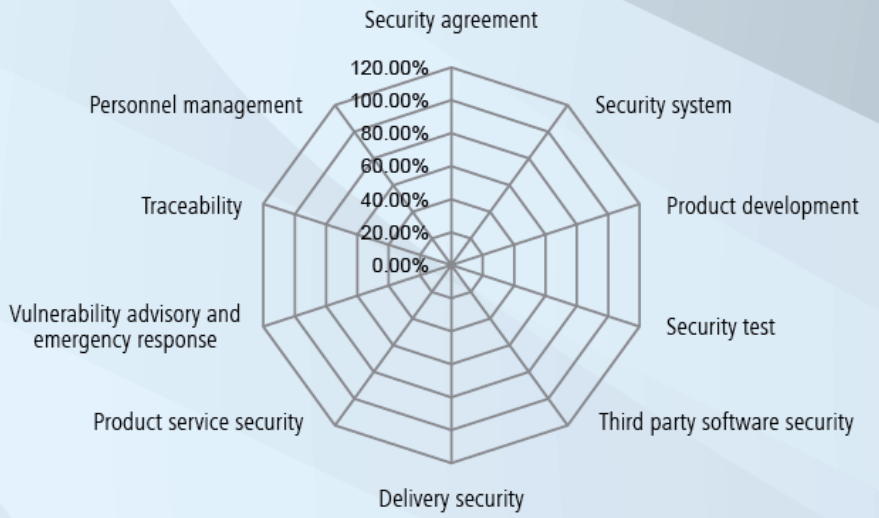
Supply Center	Reverse Center	Local EMS
• China (Delivery for the globe) • Europe (Delivery for West Europe & North Africa) • Latin America (Delivery for America, except Brazil) • Brazil (Delivery for Brazil) • India (Delivery for India) • Dubai (Delivery for Middle East)	• China • Mexico • Europe	• Brazil, Mexico, India and Hungary supply centers work with local partners to do manufacturing and make delivery

Huawei’s approach to supply chain security

Supplier Name		Audit Date	
Audited Location		Contact Person & Title	
Lead Auditor		Auditor	

No.	Item	Weight	Percentage	Weighted Score	Remarks
1	Security agreement	7%			
2	Security system	12%			
3	Product development	18%			
4	Security test	20%			
5	Third party software security	6%			
6	Delivery security	5%			
7	Product service security	5%			
8	Vulnerability advisory and emergency response	16%			
9	Traceability	5%			
10	Personnel management	6%			
Total					
Grade					

This audit checklist includes 10 items and 49 questions, each of which weights 5% to 15% of the total score. There are 1 to 10 questions in each item to evaluate the supplier's cyber security.



Weighted Score	Grade	Risk Level
< 70%	D Failed	High risk
≥ 70%	C Normal	Medium risk
≥ 80%	B Good	Low risk
≥ 90%	A Excellent	Benchmark

Key supply chain aspects of security

Risk management aspects

- Secure environment
- Secure development

Authenticity

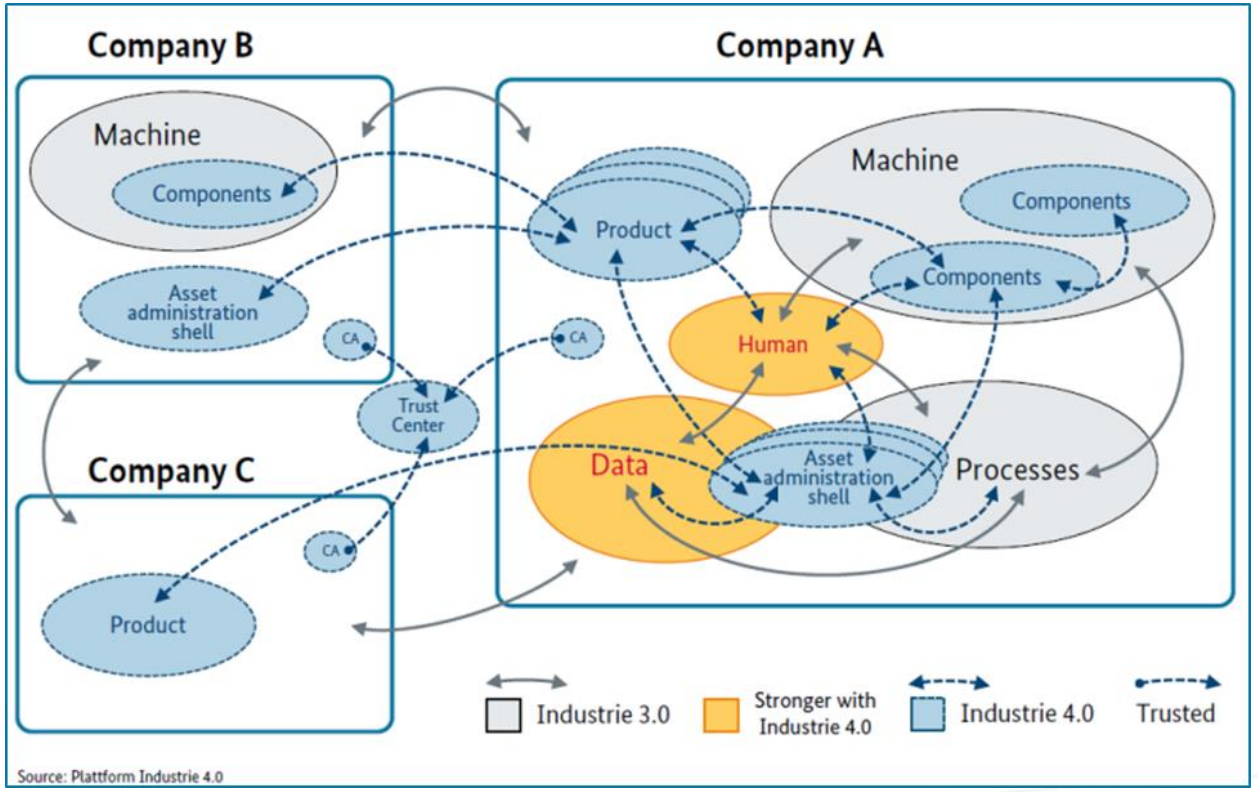
- Component (i.e. asset)
- Supplier (i.e. stakeholder)
- Interaction (i.e. trust in the supply chain)

[1] ENISA Supply Chain Integrity: An overview of the ICT supply chain risks and challenges, and vision for the way forward (2015)

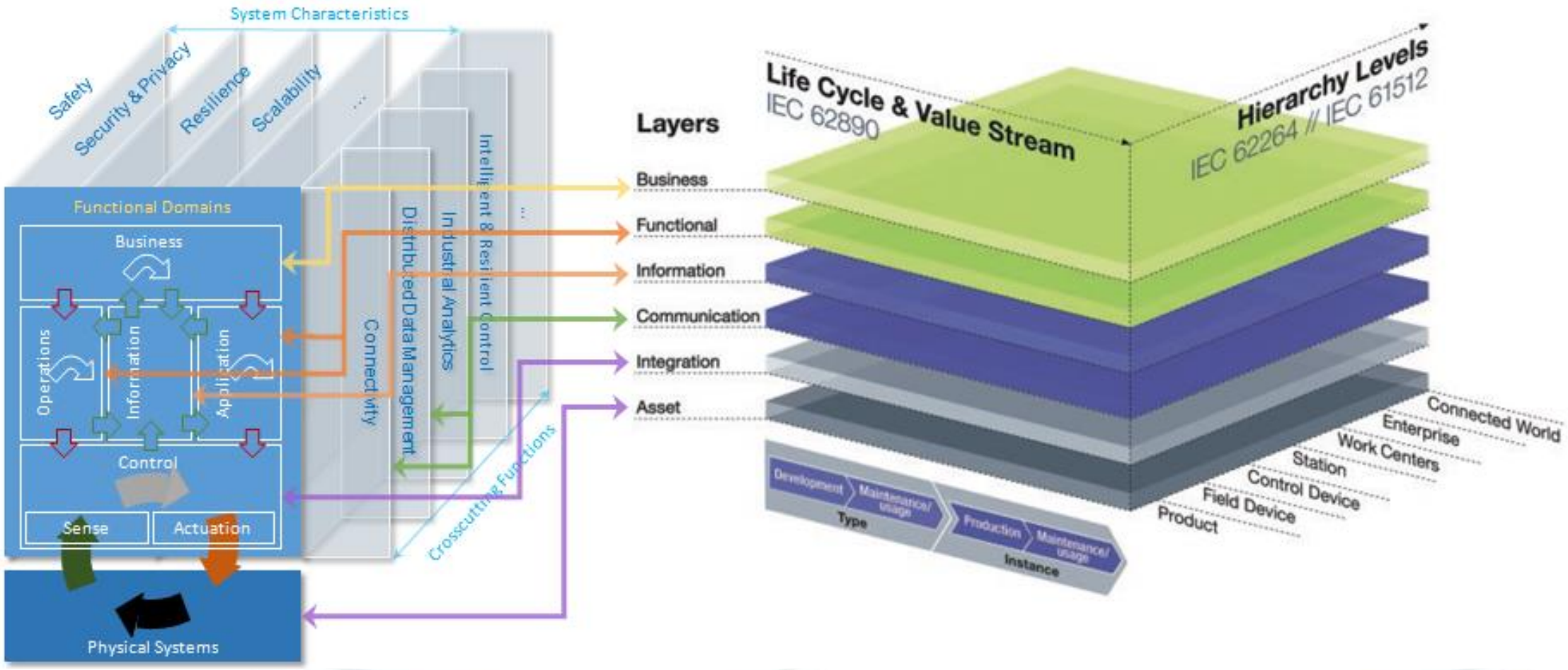
Industrie 4.0 vision

Dynamic online/semi-online system

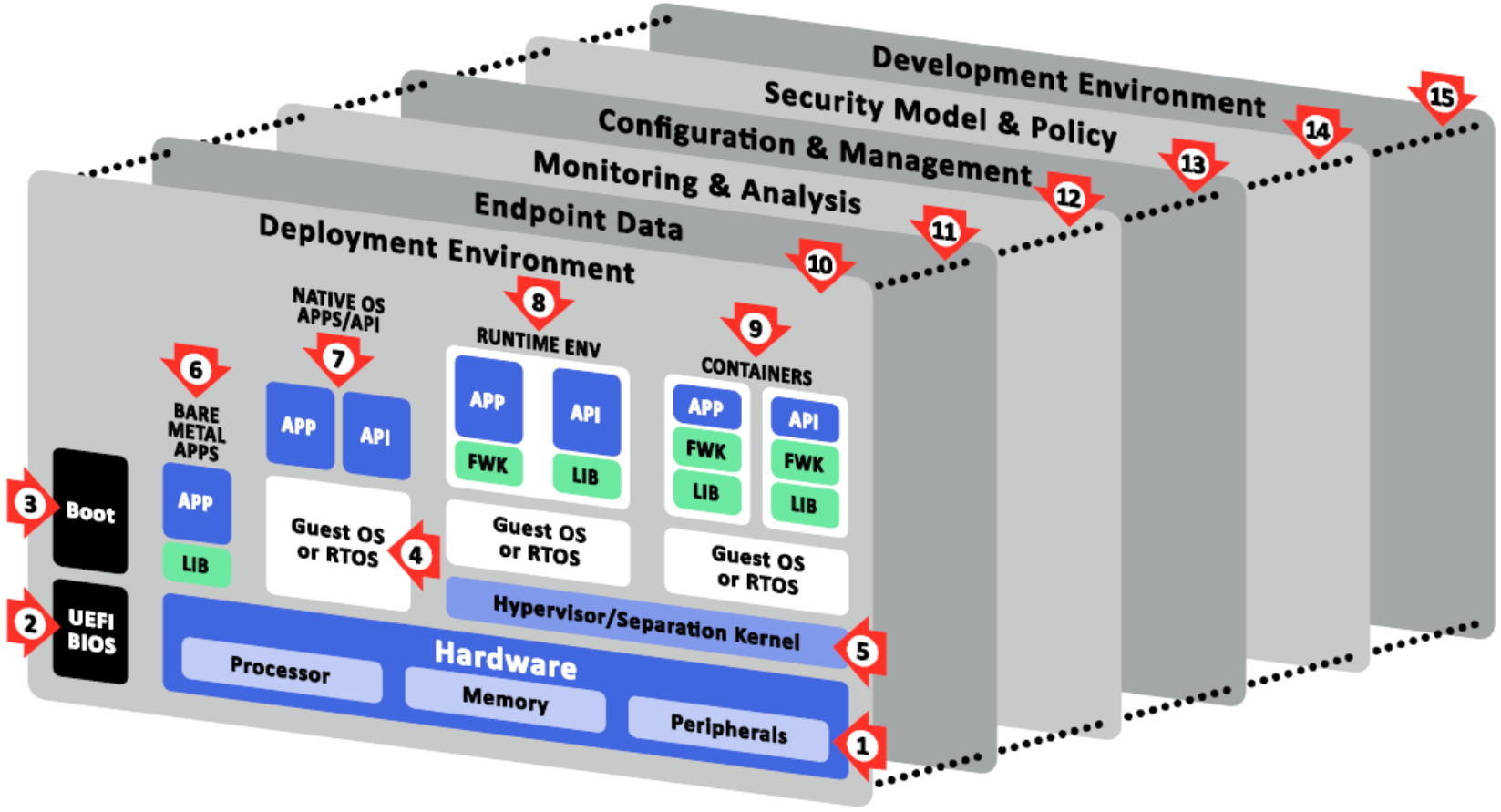
- Trust
  - Suppliers
  - Partners
- Trustworthiness
- Identification
  - Across organizations
- Interactions
  - Business purpose & relevance



Industrie 4.0 reference model



Industrial Internet Consortium threat model



Principles of security design for industrial IoT

Online trust management

- Identity management system
- Certificate management system
- Key management system

Online policy enforcement

- Policy provision (e.g. authentication, access control, etc.)
- Policy enforcement

Online intelligence management

- Knowledge management on threat and vulnerabilities

Online adaptation

- Statistical analysis at multiple levels
- Online model learning

Pillars of security architecture for industrial IoT

Security-by-design

- Security aspects MUST be integrated in requirements management

Secure defaults

- Consideration of secure defaults in system/process design

Reliable asset identification

- Tamper-proof identification framework
- Interoperable identity schemes

Compartmentalization of infrastructure

- Segregation and isolation

Policy enforcement

- Monitoring and analysis of asset interactions (e.g., DPI)
- Enforcement of policy (e.g. hardening, configuration templates, etc.)

Testing and validation

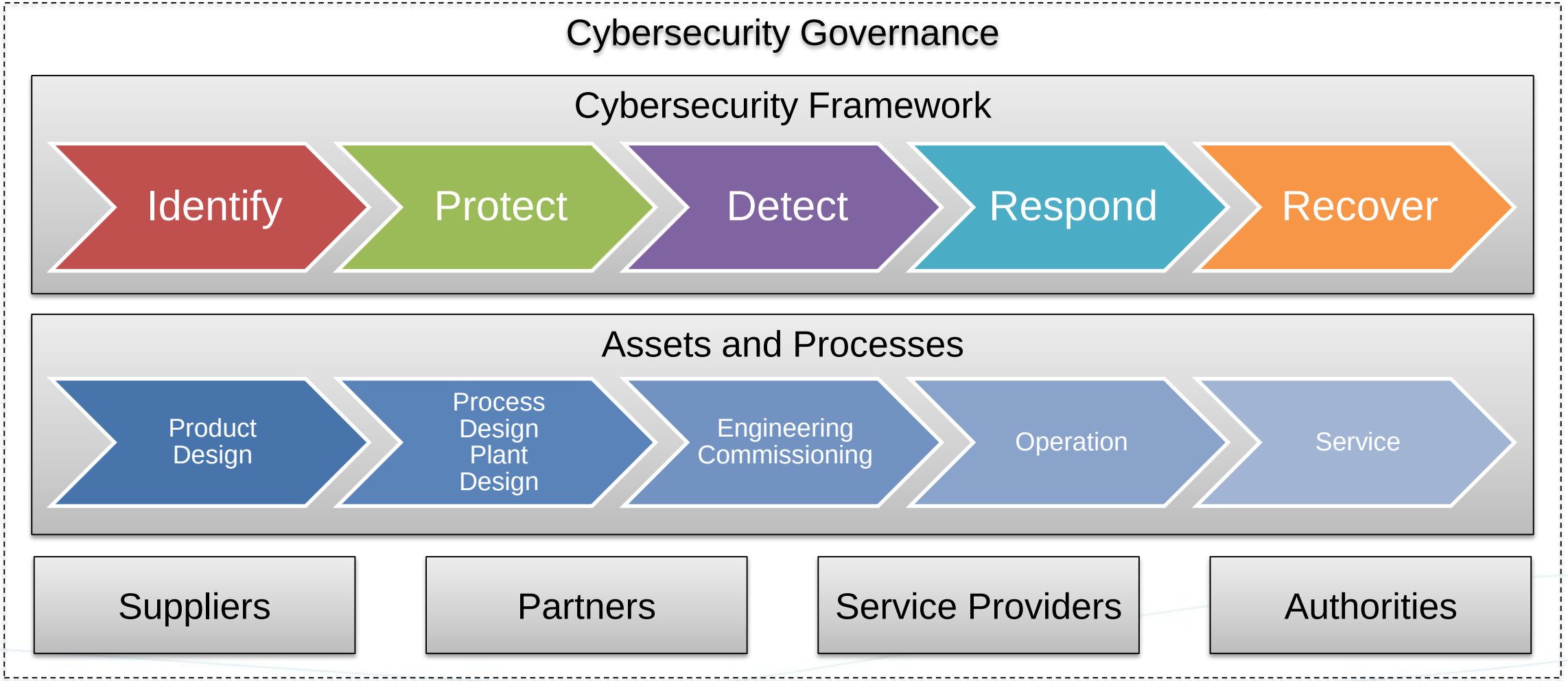
- Internal assessments (e.g. penetration tests, etc.)
- Independent assessments (e.g., reviews, audits, etc.)

Secure development throughout lifecycle processes

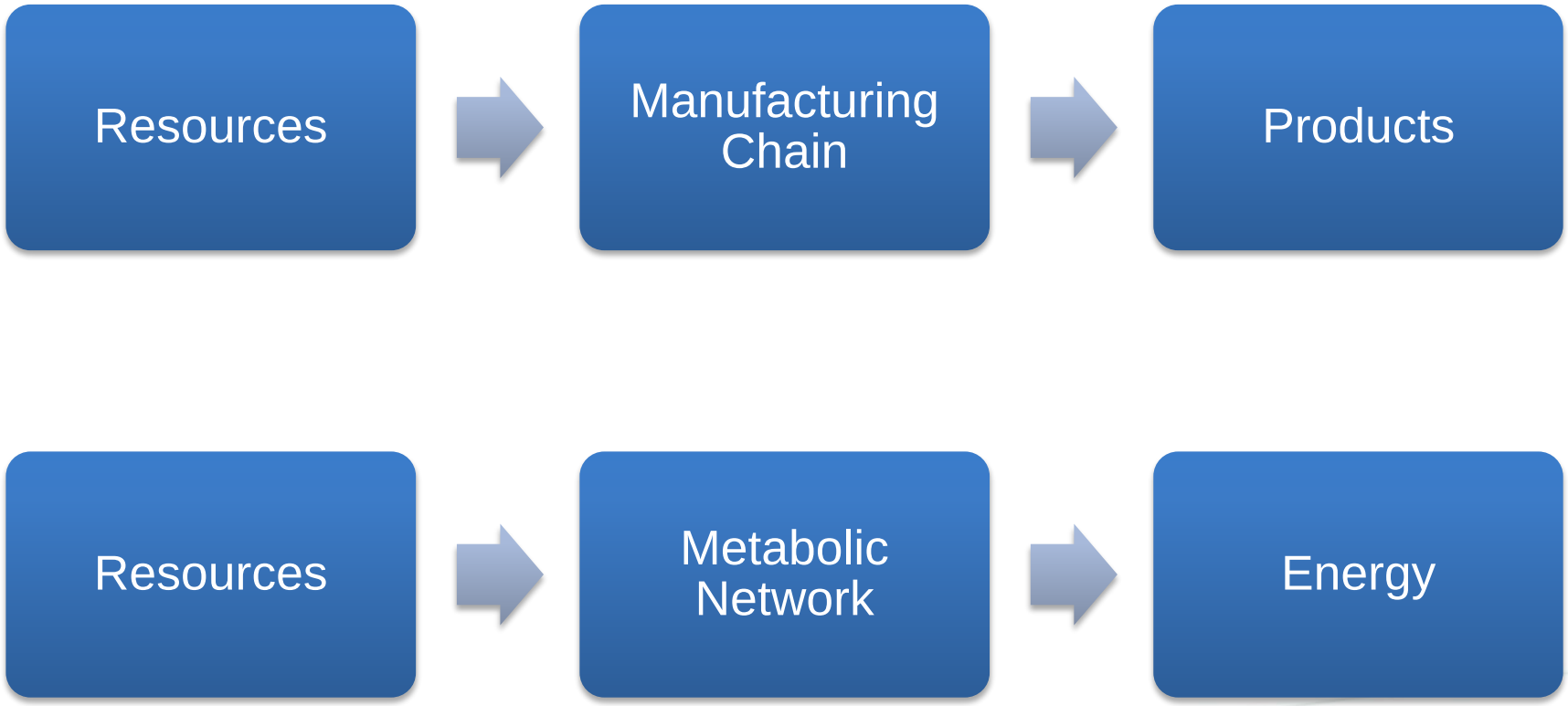
Primary Lifecycle	Supporting Lifecycle	Organizational
• Acquisition • Supply • Development • Operation • Maintenance	• Audit • Configuration Management • Joint Review • Documentation • Quality Assurance • Problem Solving • Verification • Validation	• Management • Infrastructure • Improvement • Training

[1] ENISA Supply Chain Integrity: An overview of the ICT supply chain risks and challenges, and vision for the way forward (2015)

Industrial value chain design vis-à-vis security design



From static chains to self-balancing networks of value



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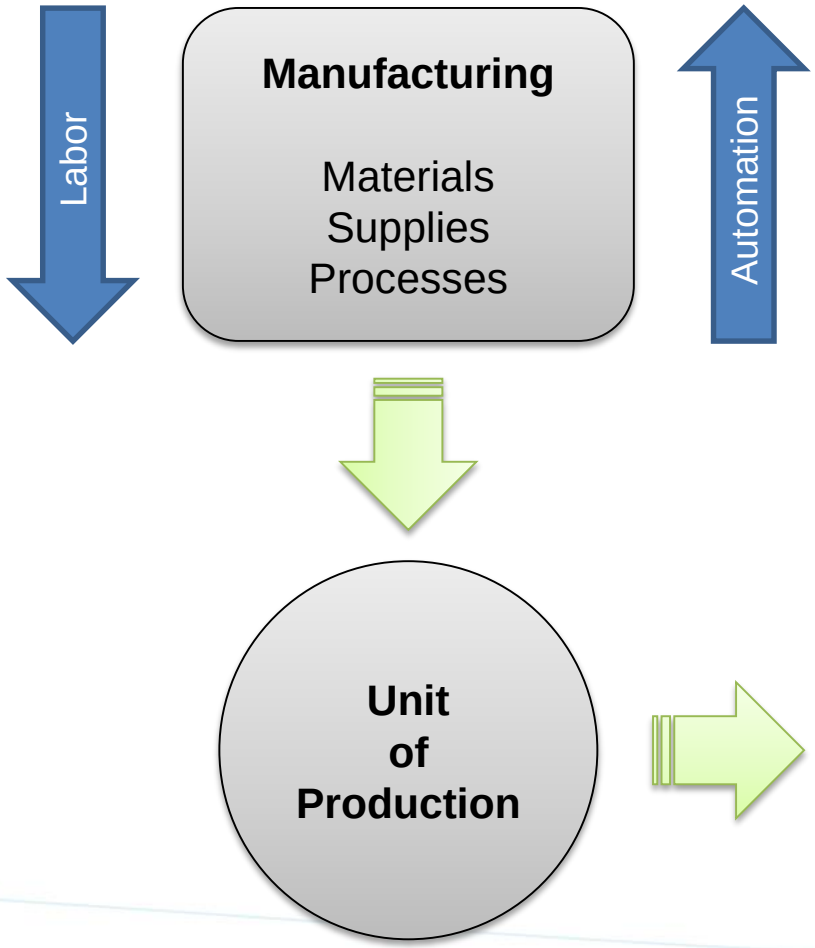
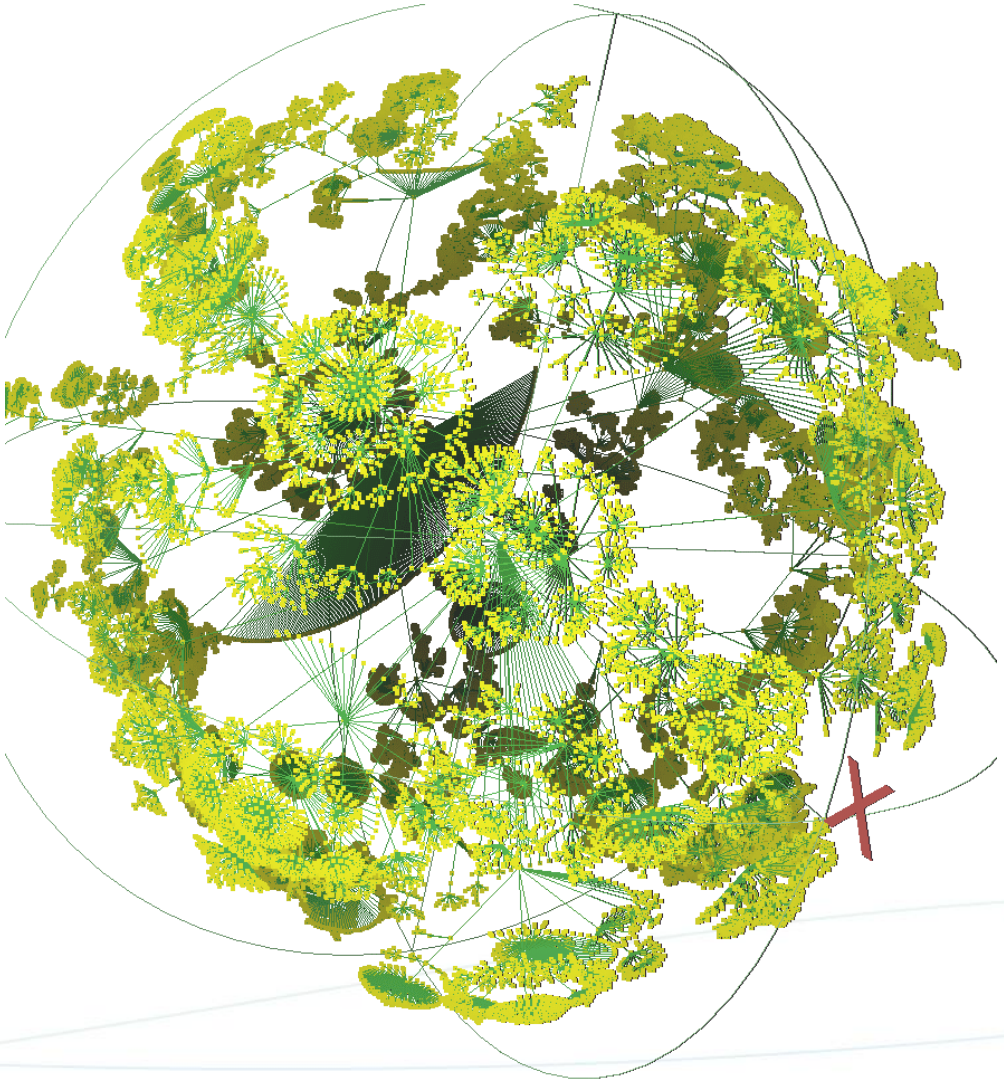
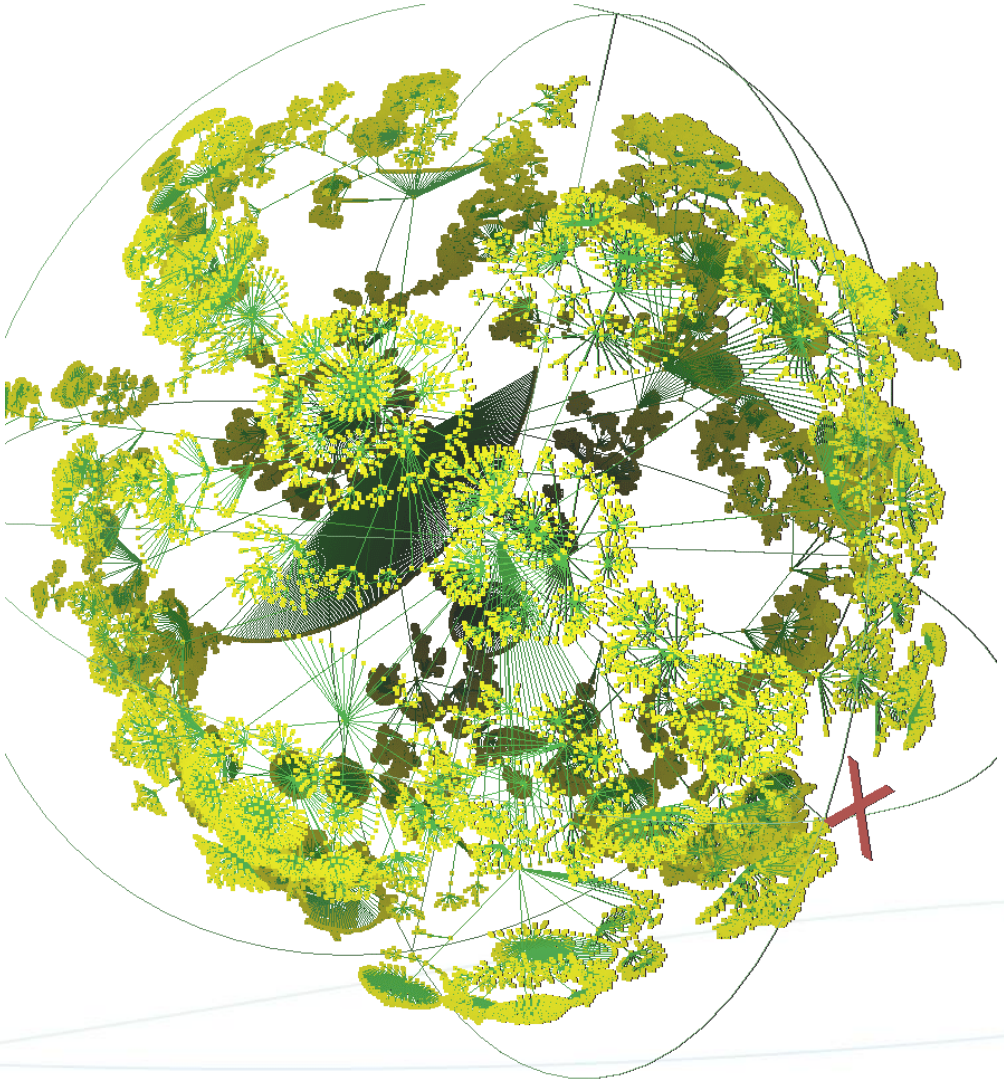




How do we securely get from here to there?



Possible roadmap for ecosystem security

Establish joint initiative vehicle to drive security

- Driven by participation across the value chain
- Business enablement for value-at-risk decisions

Establish governance framework

- Decision structures
- Collaboration enablers
- Operating processes

Deploy security integration architecture

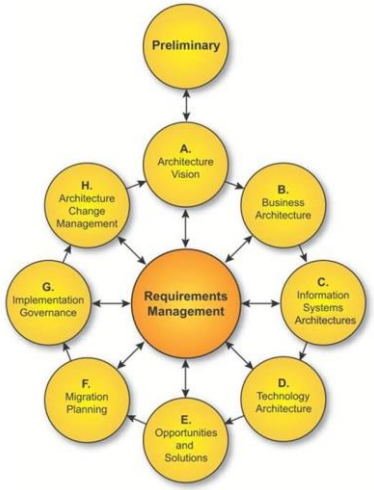
- Foundation and distribution of trust
- Standard and interoperable identity schemes
- Identity resolution and mapping services
- Services for online security management

Alignment and compliance framework

- Measures of adoption and alignment
- Acceleration of lighthouse innovation

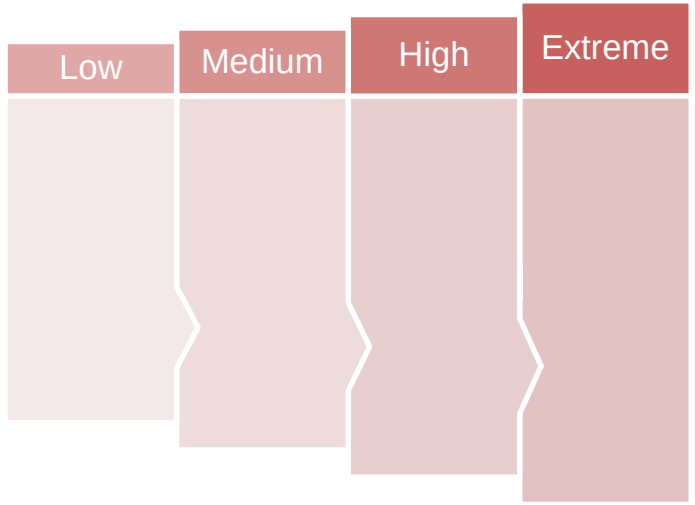
Iterative development of a security roadmap

Architecture Development Method



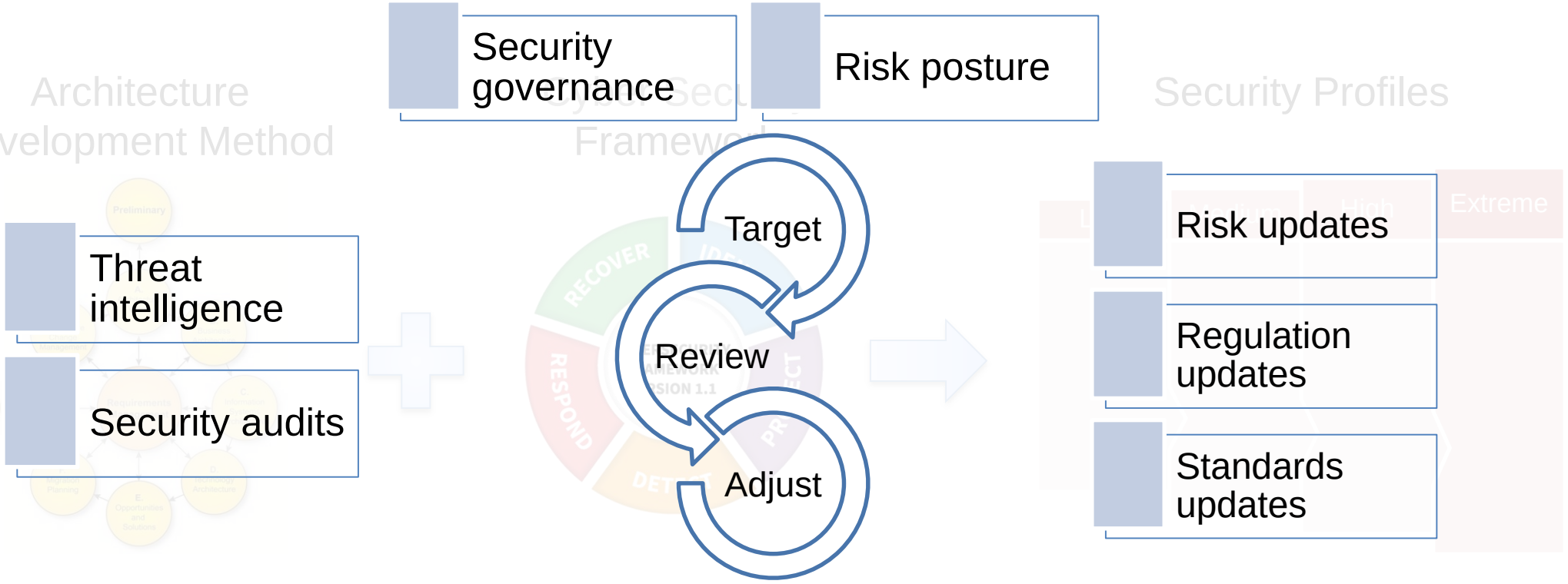
Cyber Security Framework

Security Profiles



Assets and Processes

Iterative development of a security roadmap



Assets and Processes

Product Design → Process Design Plant Design → Engineering Commissioning → Operation → Service

Thank You.