Electronic Systems Supply Chain Traceability and Security
Chips, Packaging, PCBs

Brett Attaway

November 30, 2023

Agenda

- Siemens Overview
- Need for Electronics Security
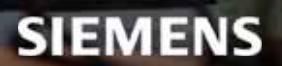- Parts of the Solution
- Summary & Next Steps

SIEMENS

As a focused technology company, we empower our customers to transform their industries and markets, helping them to transform the everyday

320,000
employees[1]

$85.5 B
in revenue[2]

$9.3 B
in net income[3]

1 Approximate in 2023 | 2 For fiscal 2023 (77.8 Euro) | 3 Fiscal 2023 (8.5 Euro)

SIEMENS

Trusted partner
for the future of
Aerospace & Defense

SIERRA SPACE

GENERAL ATOMICS
AERONAUTICAL

BOMBARDIER

NORTHROP GRUMMAN

BYE AEROSPACE

L3HARRIS

U.S. AIR FORCE

Raytheon Technologies

NASA

AIRBUS

GE

ULA

Honeywell

BOEING

SPACEX

RR

GENERAL DYNAMICS

Gulfstream

LOCKHEED MARTIN

SIEMENS

Trusted partner for the future of Aerospace & Defense – Public Announcements

BOMBARDIER

U.S. AIR FORCE

NORTHROP GRUMMAN

LOCKHEED MARTIN

SIERRA SPACE

GENERAL ATOMICS AERONAUTICAL

A&D Recent Public Commitments to Siemens Xcelerator Portfolio

Northrop Grumman
July 2021

"The company uses Xcelerator to integrate repositories of program data and seamlessly share product performance details […] and will leverage Siemens' Xcelerator portfolio as part of its technology stack to help manage its digital engineering design process and product data in an integrated single-source environment."

https://news.northropgrumman.com/news/releases/northrop-grumman-selects-siemens-xcelerator-portfolio

Lockheed Martin
January 2022

"The company plans to leverage Xcelerator to achieve its goals for mission-driven digital transformation—accelerating program lifecycles, driving cost savings and fostering greater innovation."

https://www.plm.automation.siemens.com/global/en/our-story/newsroom/siemens-lockheed-xcelerator-aerospace/104633

US Air Force
January 2021

"Leveraging an enterprise-wide system to produce a digital thread throughout the product lifecycle will change the way we field capability. The DAF has decided to use Siemens' Teamcenter as its Product Lifecycle Management (PLM) data management platform"

- Dr. William B. Roper Jr., Assistant Secretary of the Air Force (Acquisition, Technology, & Logistics)

Memorandum for All Department of the Air Force Program Executive Officers

Airbus
January 2022

"This is a game-changer in an industry looking to recover quickly from unprecedented challenges. By realizing the benefits of a model-based development process, Capital helps world-class companies like Airbus reduce complexity, lower risk and boost overall productivity."

https://press.siemens.com/global/en/pressrelease/siemens-capital-software-xcelerator-portfolio-selected-airbus-next-generation

Sierra Space
March 2022

"Siemens' solutions will significantly accelerate development of our unique space platform - the first to combine all aspects of space transportation, space destinations and space applications in a holistic ecosystem."

- Tom Vice, CEO, Sierra Space

https://sierraspace.com/newsroom/press-releases/sierra-space-to-revolutionize-space-exploration-with-siemens-xcelerator/

General Atomics Aeronautical Systems
April 2022

"The customer support and responsiveness we get from Siemens is like no other vendor I have worked before". "The engagements Siemens has with the aerospace and defense industry are top notch."

- Dee Wilson, Vice President of Engineering, General Atomics Aeronautical Systems, Inc

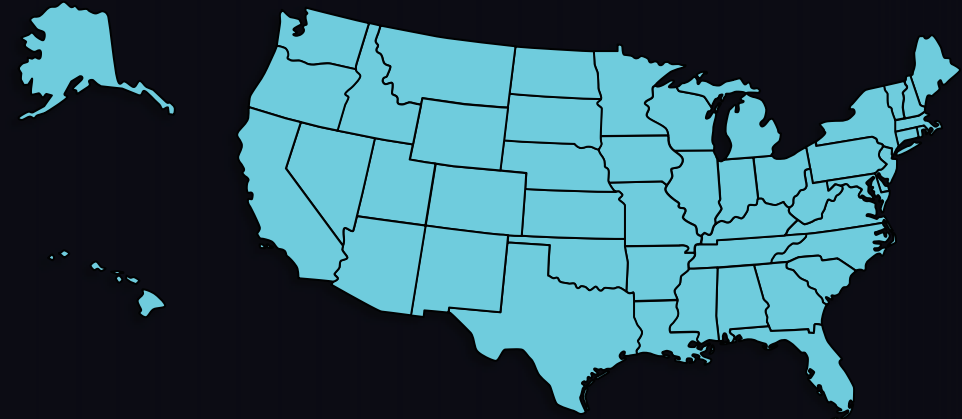**SIEMENS**

About Siemens Government
Siemens Government Technologies, Inc.

Global Support

- Multi-billion dollar, decades-long support for the U.S. Government

- Integrator for Siemens products, services, solutions to DoD/Mil & Federal customers, CONUS & OCONUS

- Sponsored by the DCSA and maintains a TS Facilities clearance; CMMC Ready

U.S. HQ

- HQ for Siemens Government Technologies, Inc. in Crystal City, VA

- >200 employees in multiple locations across the U.S. and internationally

- Onsite with DoD/Federal customers across CONUS and OCONUS

- Serve every U.S. Federal Cabinet-Level Agency

Siemens Digital Industry Software (DISW)
Includes Siemens EDA

Siemens Digital Industries Software

Business Unit of Siemens Digital Industries
Workforce: 22,000+
Locations: 250 in 36 countries
Organization Customers: 170,000+

| Electronic Design | Mechanical Product Engineering | Electronic Board & Interconnect | Mechanical Simulation and Test Solutions |
| Manufacturing Engineering | Manufacturing Execution System | Lifecycle Collaboration | Cloud Application Services |

Microelectronics Supply Chain Visibility

Securing Defense-Critical Supply Chains

An action plan developed in response to
President Biden's Executive Order 14017

February 2022

"Supply Chain Visibility: DoD is still building visibility into the sub-tiers of the microelectronics supply chain; until there is greater visibility, it will be difficult to identify certain supply chain threats, vulnerabilities, and risks. Visibility is further eroded by system-level (next-level assembly comprised of multiple microelectronics components) manufacturers who simply seek the lowest cost producers and are source agnostic."

How President Biden's 100-Day Supply Chain Review Sets the Stage for New American Supply Chain
Only by adopting a whole-of-government approach to supply chain resilience – and by leveraging **cutting-edge visibility tools** – can we hope to tackle today's multifaceted supply chain challenges. [source]

The Big Hack: How China Used a Tiny Chip to Infiltrate U.S. Companies
The attack by Chinese spies reached almost 30 U.S. companies, including Amazon and Apple, by compromising America's technology supply chain, according to extensive interviews with government and corporate sources. [source]

Counterfeit Chinese Parts Slipping Into U.S. Military Aircraft: Report
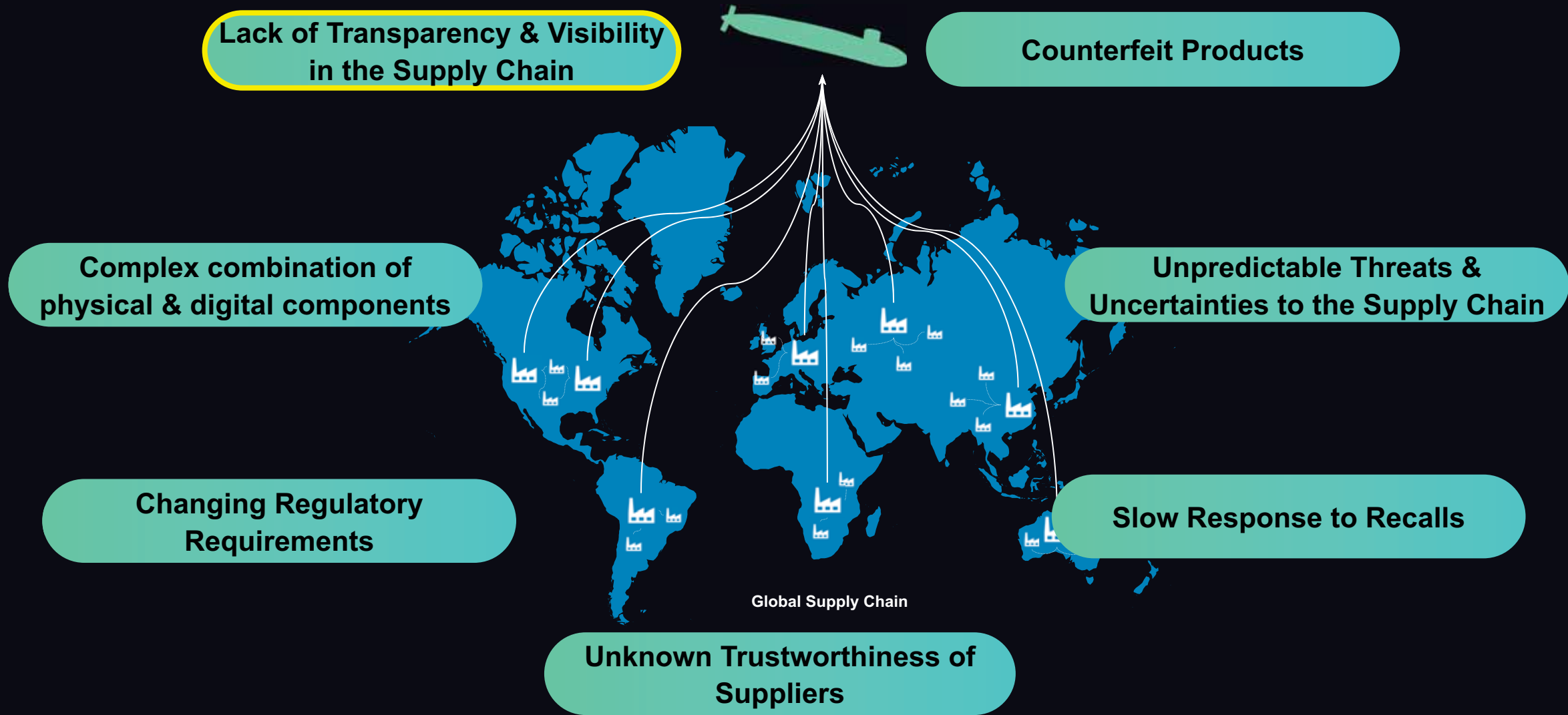A year-long investigation conducted by the Senate Armed Services Committee found more than one million suspected counterfeit parts made their way into the Department of Defense's supply chain and were bound for use by "critical" military systems. [source]

Chinese Alloy in F-35 Parts Not Likely Security, Safety Risk, Says Pentagon Acquisition Chief
"The contractor **self-reported** that an alloy that goes into a magnet was made in China…" [source]

The US Needs A Strategy To Secure Microelectronics – Not Just Funding
Instead of throwing subsidies around indiscriminately, the authors argue, the US government needs to invest only in crucial new technologies while crafting policy incentives to shift industry behavior. [source]

SIEMENS

Lack of Transparency & Visibility in the Supply Chain

Counterfeit Products

Complex combination of physical & digital components

Unpredictable Threats & Uncertainties to the Supply Chain

Changing Regulatory Requirements

Slow Response to Recalls

Global Supply Chain

Unknown Trustworthiness of Suppliers
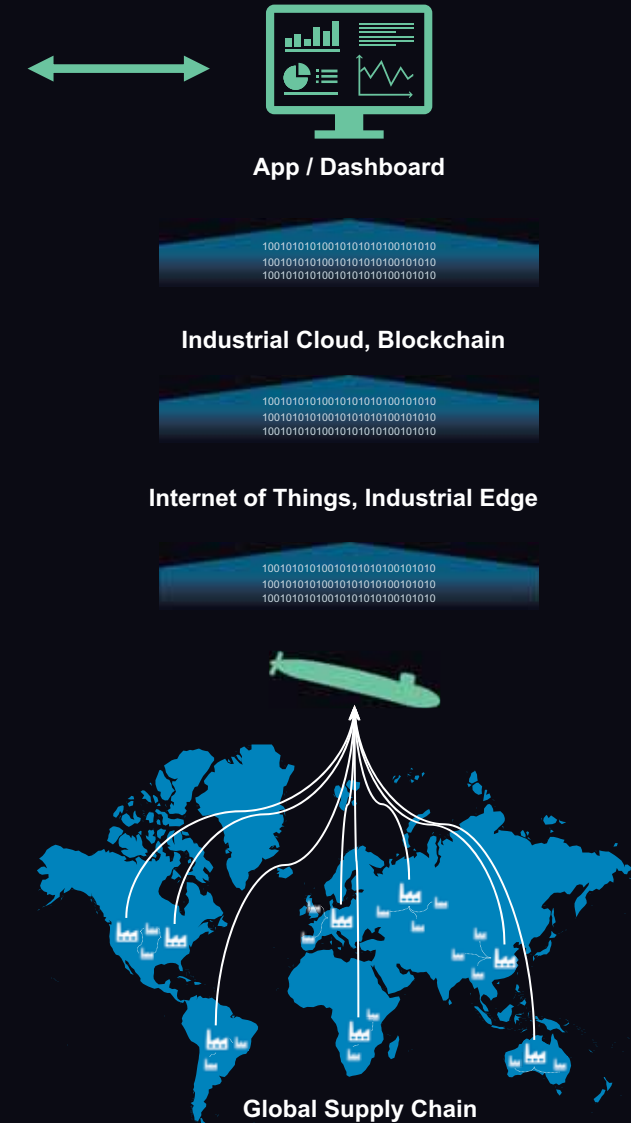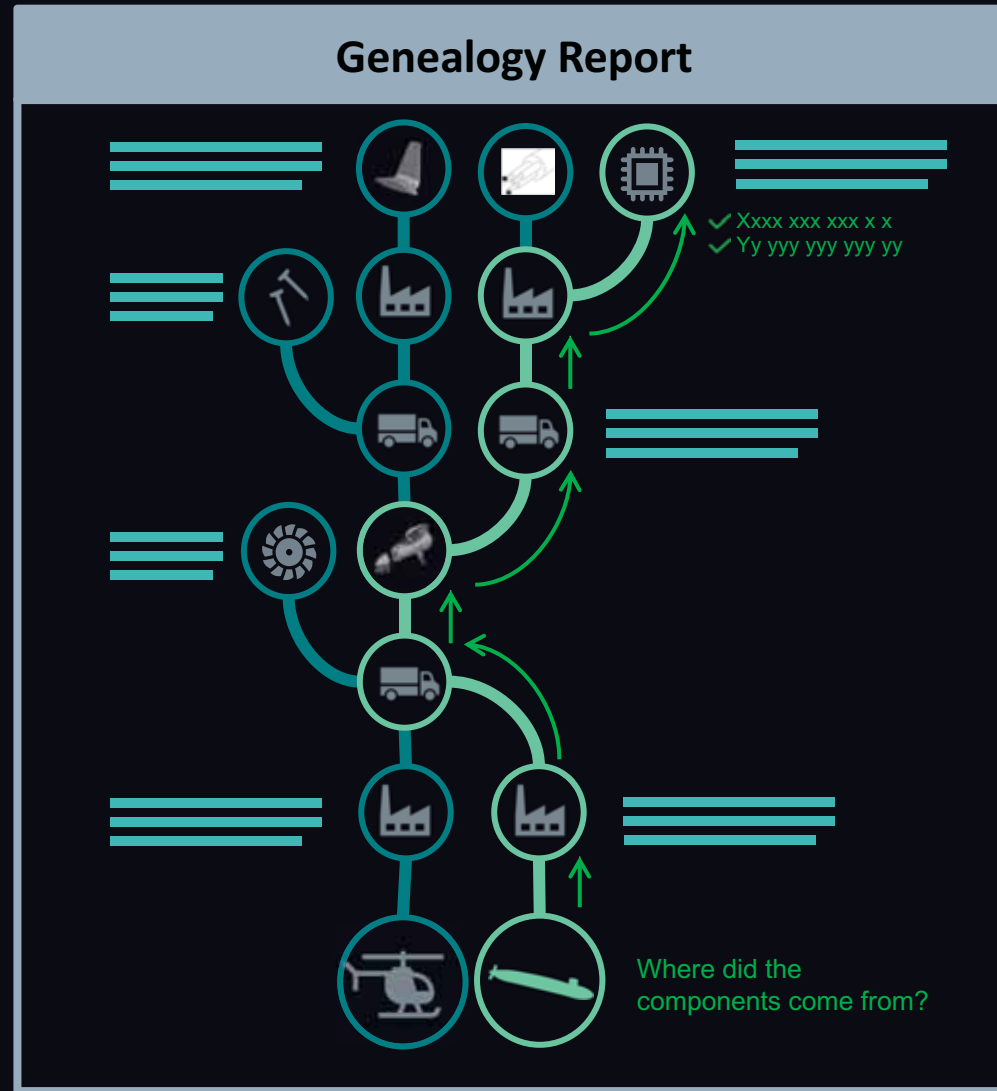
SIEMENS

Xcelerator Trusted Supply Chain makes the genealogy of your product visible along the whole value chain.

Speeds up recalls, enables you to proof claims (origin, sustainable, quality, …). Links meta-data from your production and the whole value chain and makes it accessible through the built-up genealogy. De-centralized, based on distributed ledger and other trust technology and works across business partners.
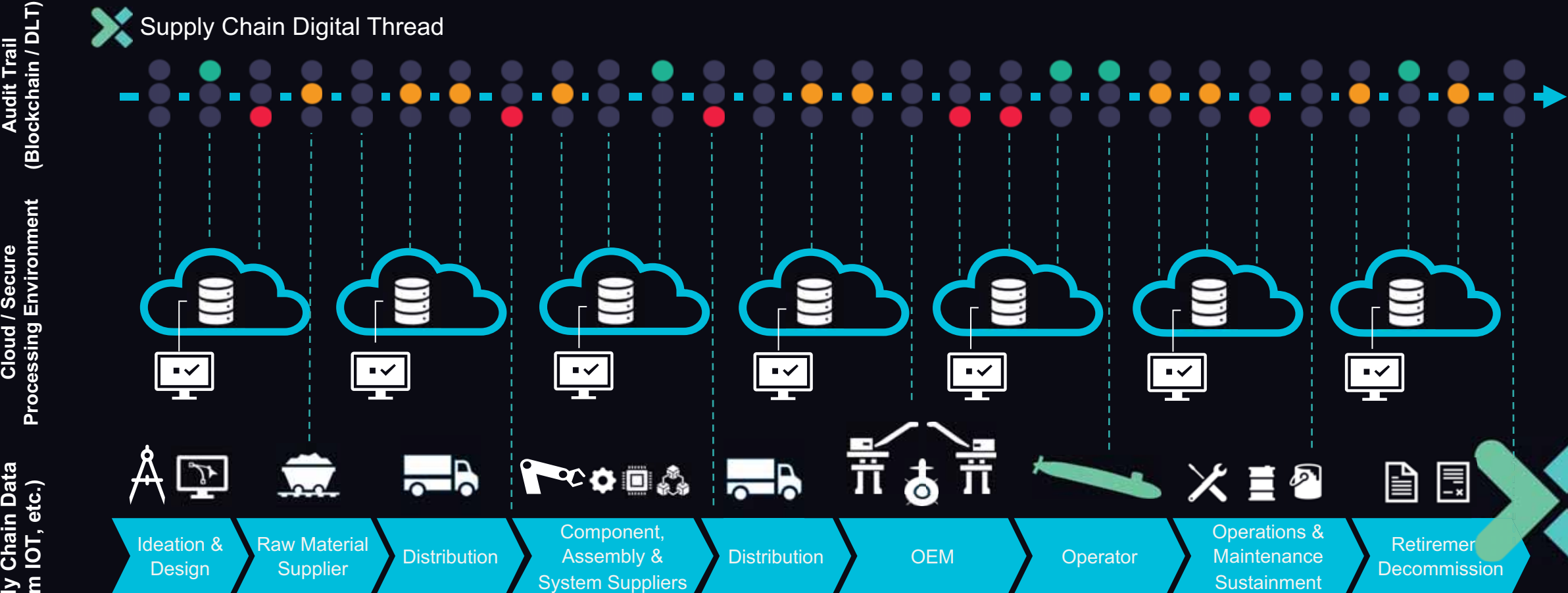
Collect, store and link data from any system along a value chain so that you can retrieve information concerning your product in seconds.

Unlike existing solutions, data available is not controlled by a central authority, is immutable and even complex information retrieval is done within seconds.
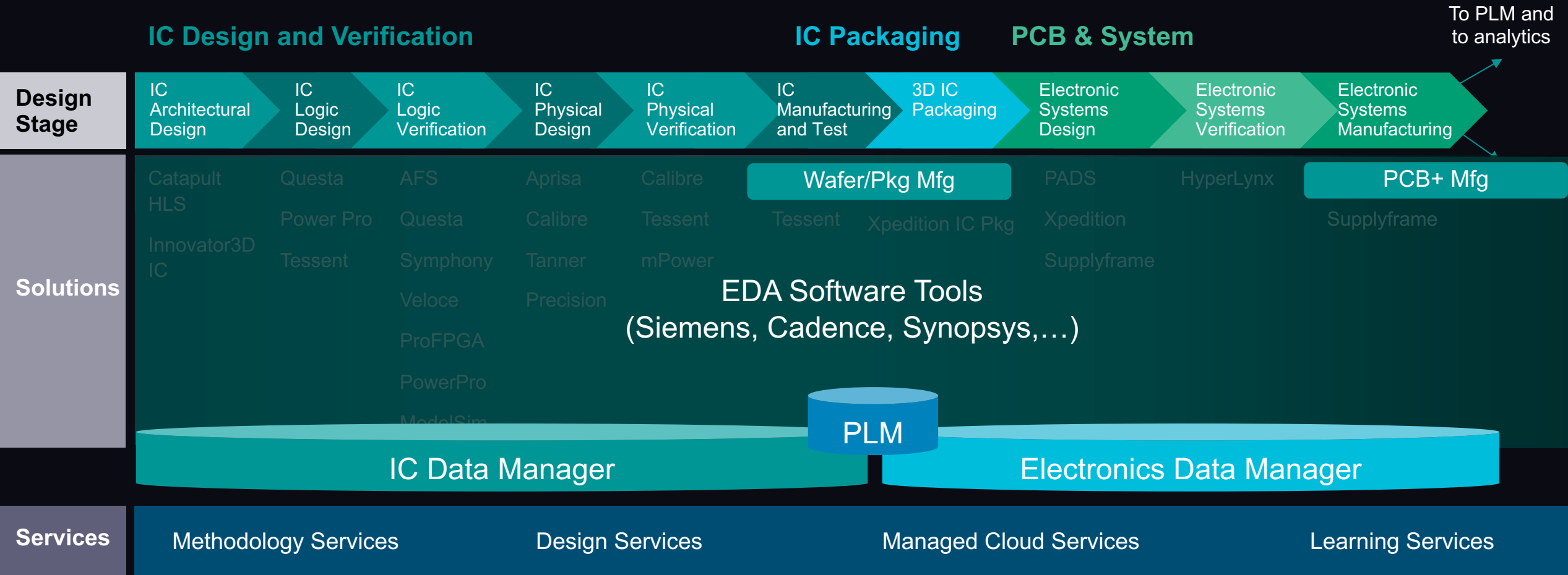
Genealogy Report
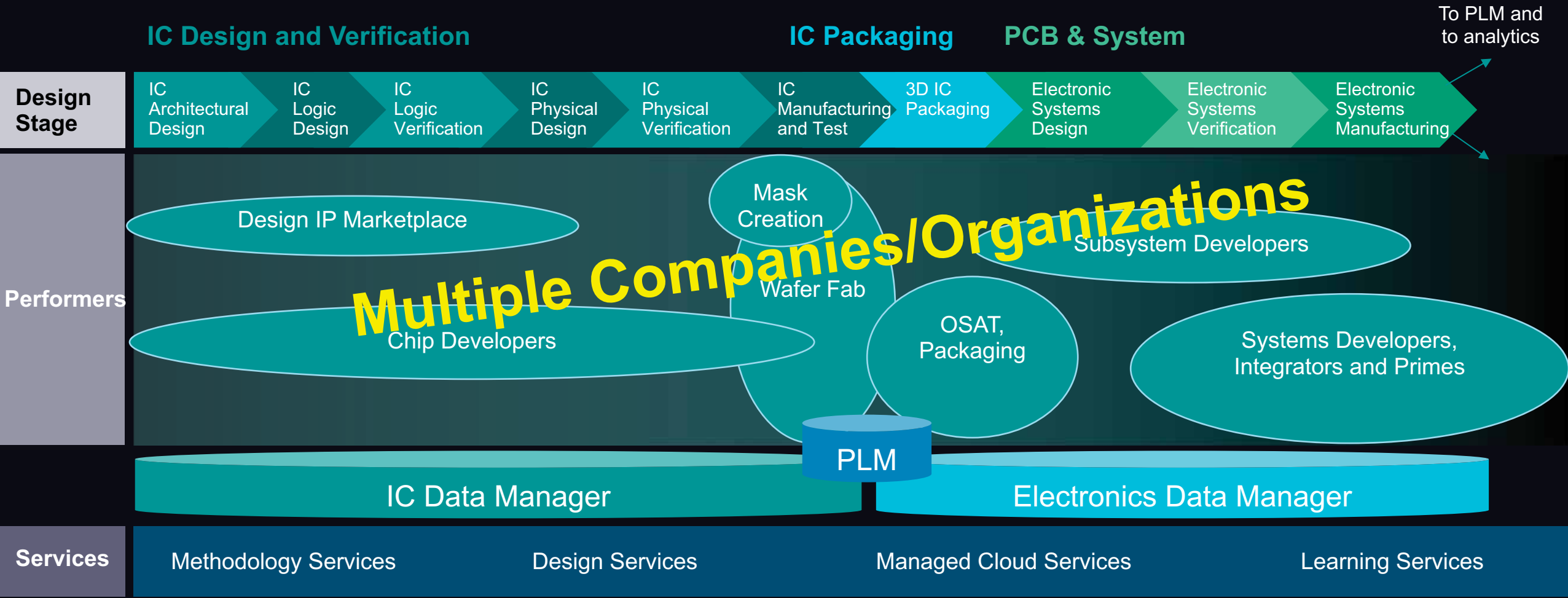
✓ Xxxx xxx xxx x x
✓ Yy yyy yyy yyy yy

Where did the components come from?

App / Dashboard

Industrial Cloud, Blockchain

Internet of Things, Industrial Edge

Global Supply Chain

SIEMENS

Siemens & Supply Chain

Supply Chain Digital Thread

Audit Trail (Blockchain / DLT)

Cloud / Secure Processing Environment

Supply Chain Data (from IOT, etc.)

Ideation & Design → Raw Material Supplier → Distribution → Component, Assembly & System Suppliers → Distribution → OEM → Operator → Operations & Maintenance Sustainment → Retirement Decommission

● = No Visibility ● = Trusted ● = Moderate Risk ● = High Risk

SIEMENS

Chip, Packaging and PCB Flows

IC Design and Verification **IC Packaging** **PCB & System**

To PLM and to analytics

Design Stage	IC Architectural Design	IC Logic Design	IC Logic Verification	IC Physical Design	IC Physical Verification	IC Manufacturing and Test	3D IC Packaging	Electronic Systems Design	Electronic Systems Verification	Electronic Systems Manufacturing

Solutions

Catapult HLS	Questa	AFS	Aprisa	Calibre		Wafer/Pkg Mfg		PADS	HyperLynx	PCB+ Mfg
Innovator3D IC	Power Pro	Questa	Calibre	Tessent	Tessent		Xpedition IC Pkg	Xpedition	Supplyframe	
	Tessent	Symphony	Tanner	mPower				Supplyframe		
		Veloce	Precision							
		ProFPGA								
		PowerPro								
		ModelSim								

EDA Software Tools
(Siemens, Cadence, Synopsys,…)

PLM

IC Data Manager Electronics Data Manager

Services

Methodology Services	Design Services	Managed Cloud Services	Learning Services

SIEMENS

Chip, Packaging and PCB Flows

Restricted | © Siemens 2023 | 2023-11-30 | Brett Attaway | Dir, Strategic Microelectronics Programs | Siemens Digital Industries Software | Where today meets tomorrow.
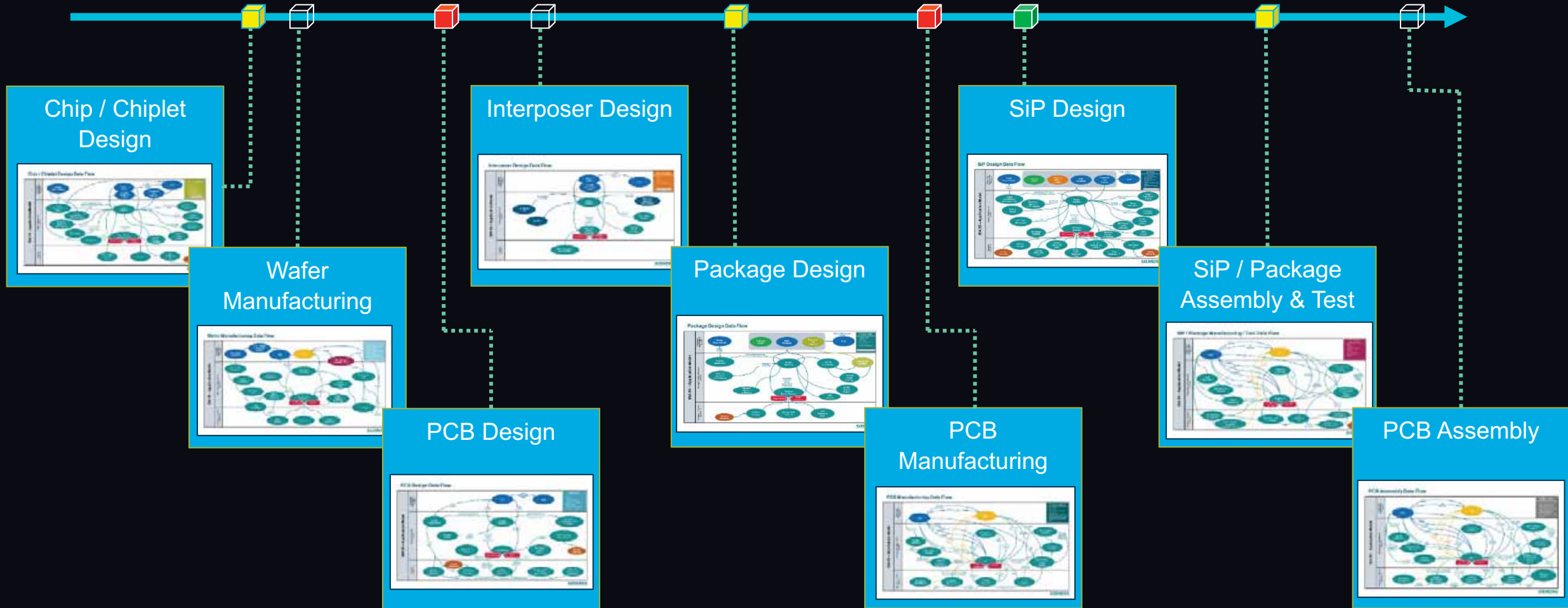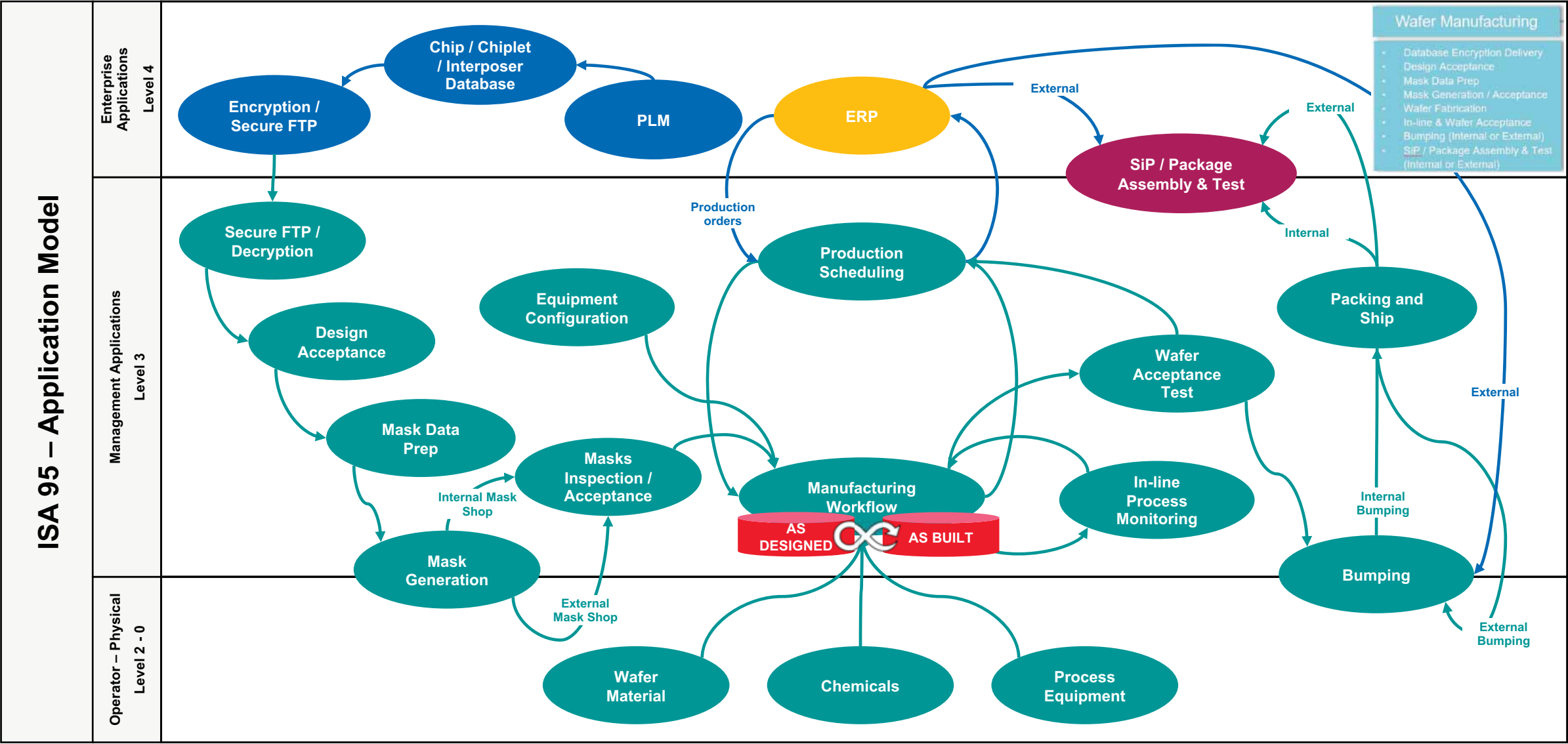
SIEMENS

Trusted Supply Chain Overview
Microelectronics Provenance – Domain Dataflows

Supply Chain Security (SCS)
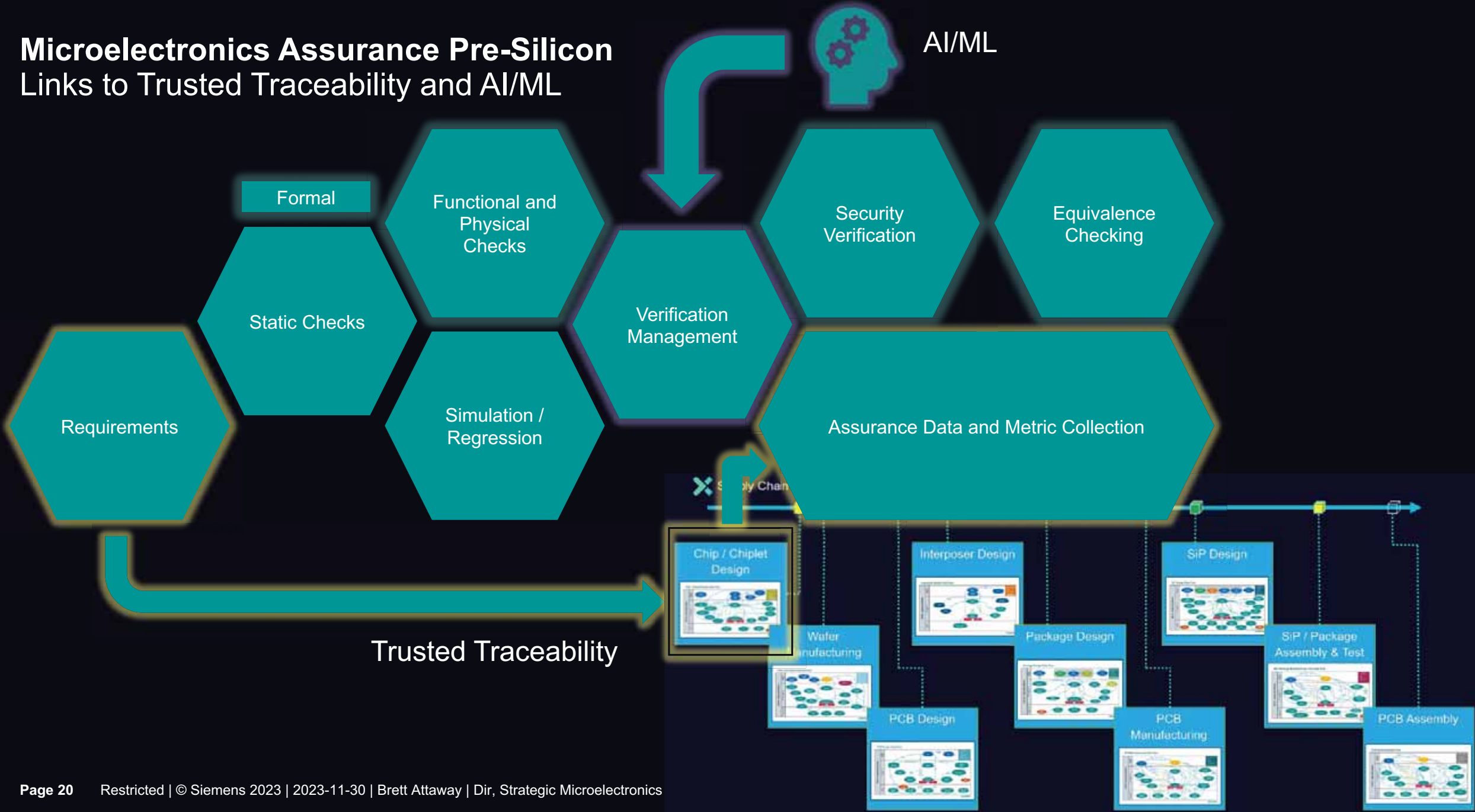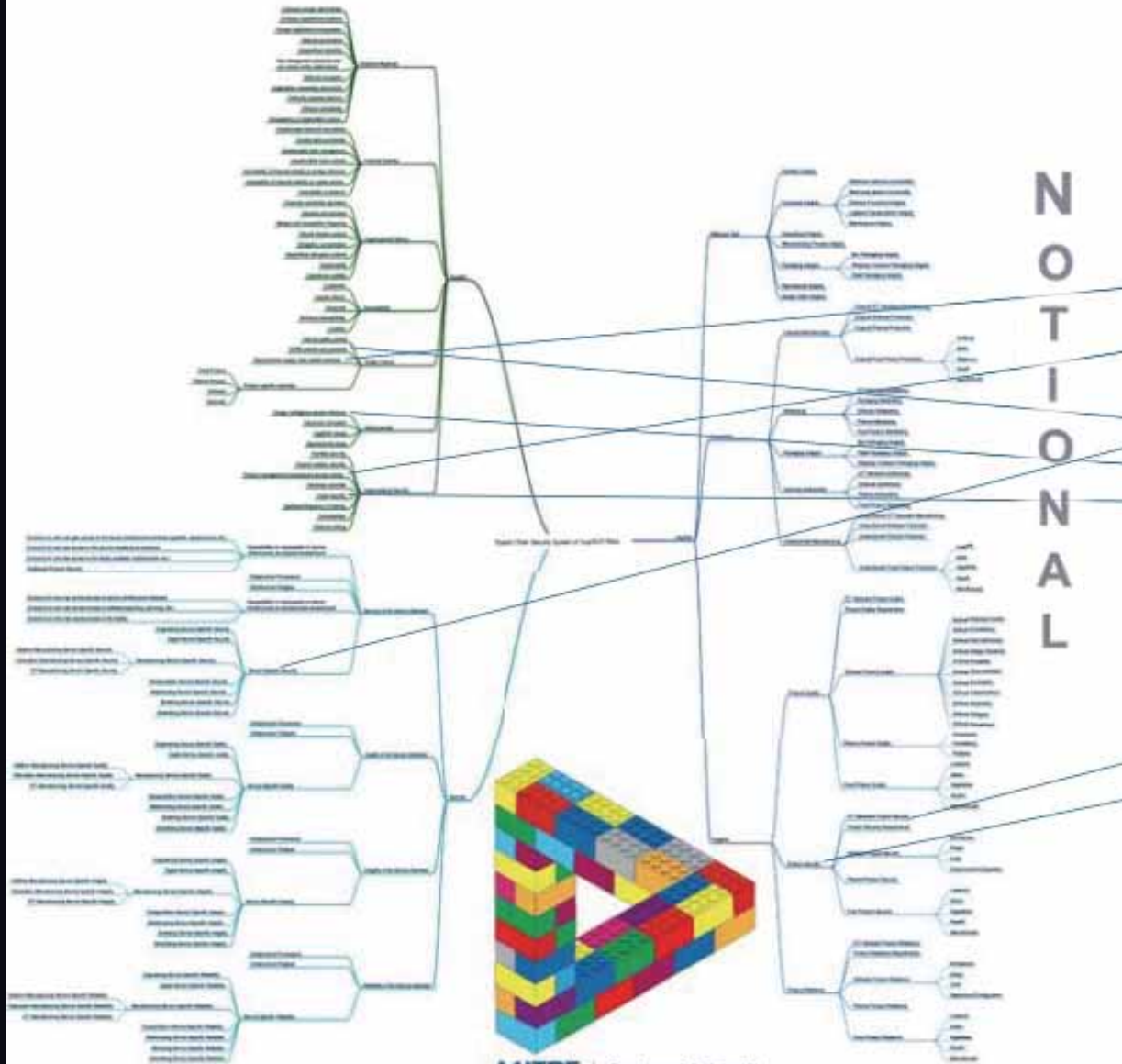System of Trust (SOT)

Supply Chain Digital Thread

Chip / Chiplet Design

Wafer Manufacturing

Interposer Design

PCB Design

Package Design

PCB Manufacturing

SiP Design

SiP / Package Assembly & Test

PCB Assembly

SIEMENS

Chip / Chiplet Design Data Flow

SIEMENS

Wafer Manufacturing Data Flow

SIEMENS

Microelectronics Assurance Pre-Silicon
Links to Trusted Traceability and AI/ML

AI/ML

Formal

Functional and Physical Checks

Static Checks

Verification Management

Security Verification

Equivalence Checking

Simulation / Regression

Requirements

Assurance Data and Metric Collection

Trusted Traceability

Supply Chain

Chip / Chiplet Design

Interposer Design

SiP Design

Wafer Manufacturing

Package Design

SiP / Package Assembly & Test

PCB Design

PCB Manufacturing

PCB Assembly

Mapping SoT Risks to Assessment Information Sources / Standards
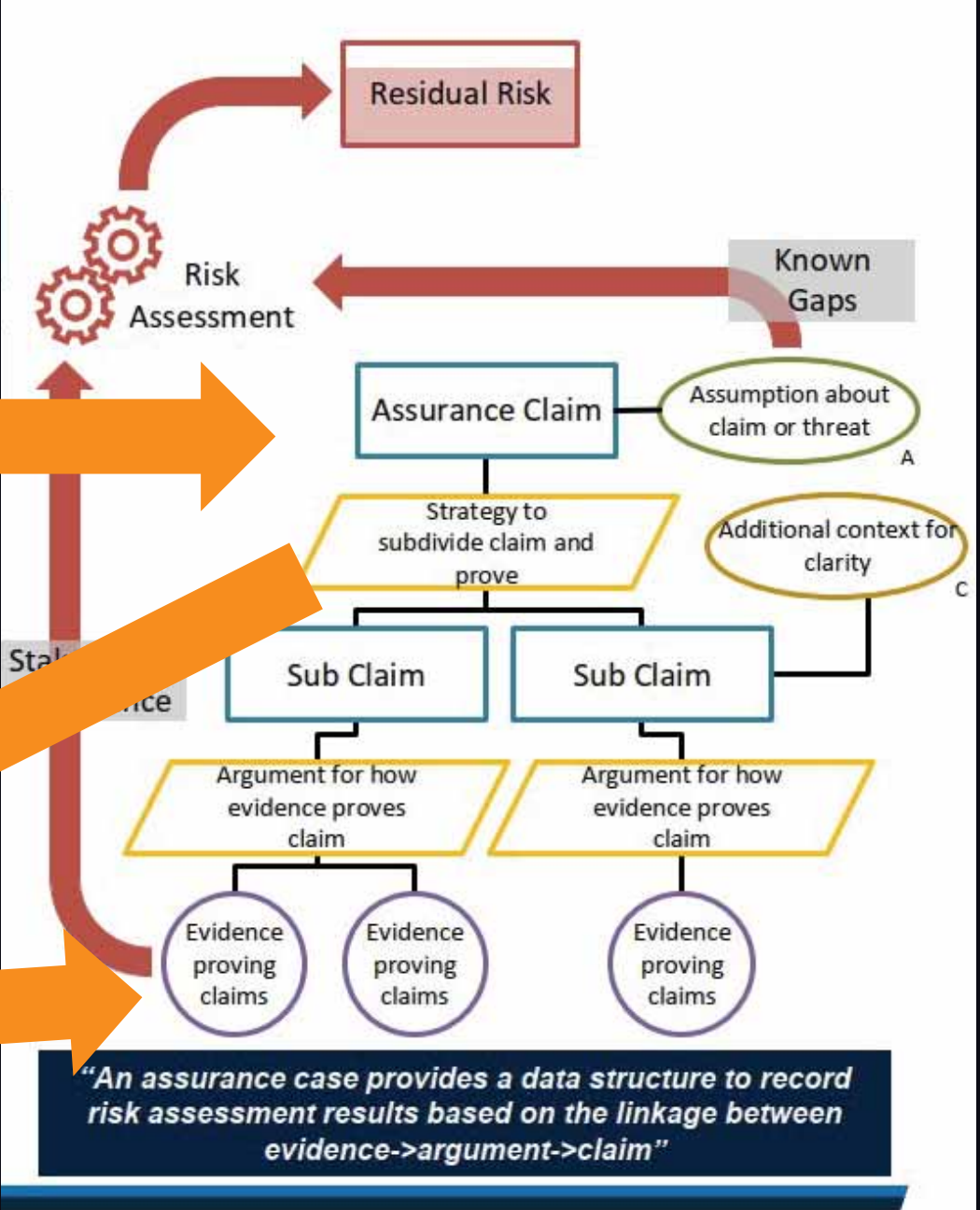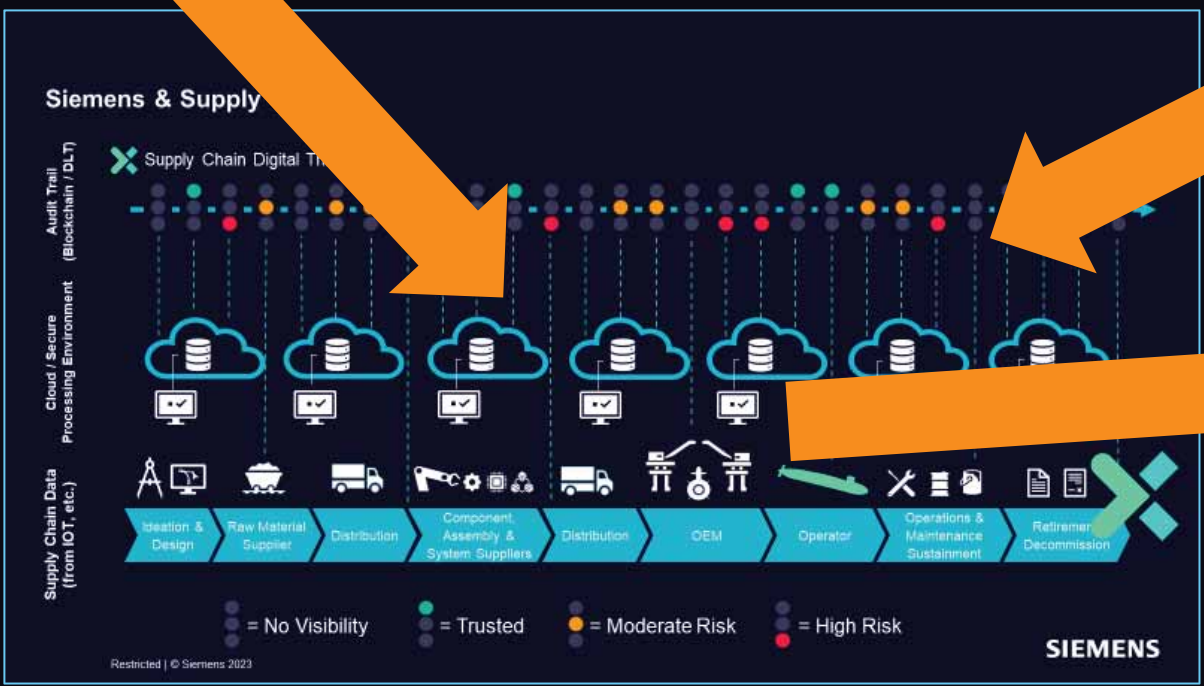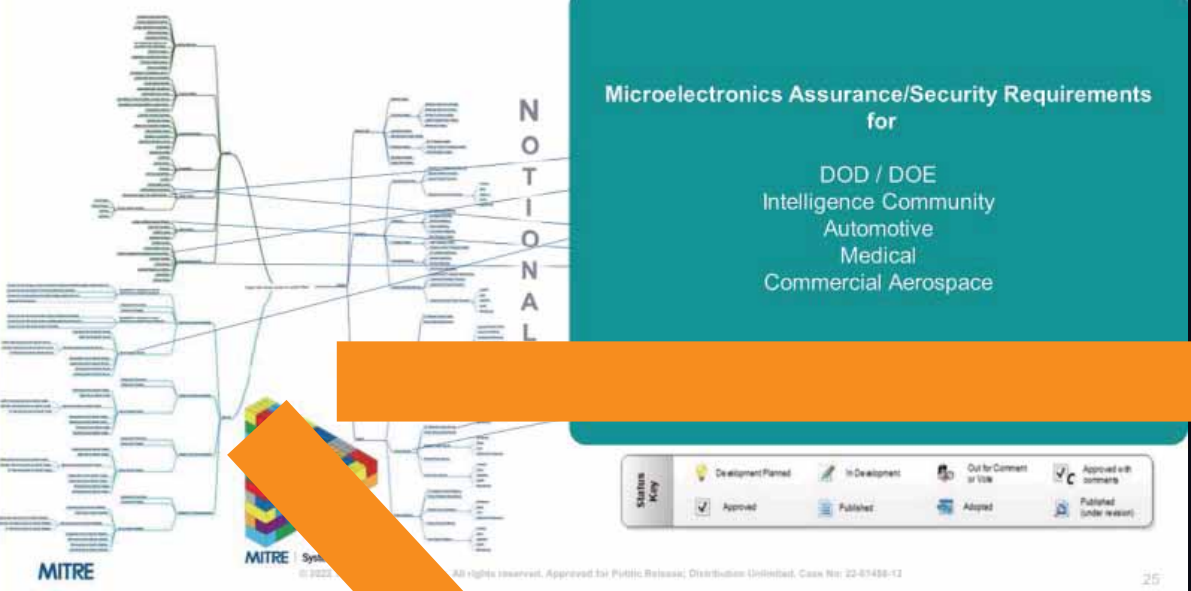
Microelectronics Assurance/Security Requirements for

DOD / DOE
Intelligence Community
Automotive
Medical
Commercial Aerospace

Summary

- Complete solution for Evidence–based Assurance requires:
  - Detailed risk and mitigation identification and management
  - Supply chain infrastructure for capturing relevant data
    (e.g., unique IDs on everything, digital certificate methods,…)
  - Analysis tools to assess risk based on supply chain data
  - Address the details of chips, packaging, and PCBs with a scalable architecture extensible to the top of complex products
  - Enables the supply chain multiple companies to participate
- *Need to start merging the "pieces" of solutions in the ecosystem*

Xcelerator
Trusted Supply Chain

SIEMENS

Microelectronics Demo for the DoD

SIEMENS

Xcelerator Trusted Supply Chain
End-to-End visibility of digital & physical assets across the supply chain

Customer

Component Mfg 1

Component Mfg 2

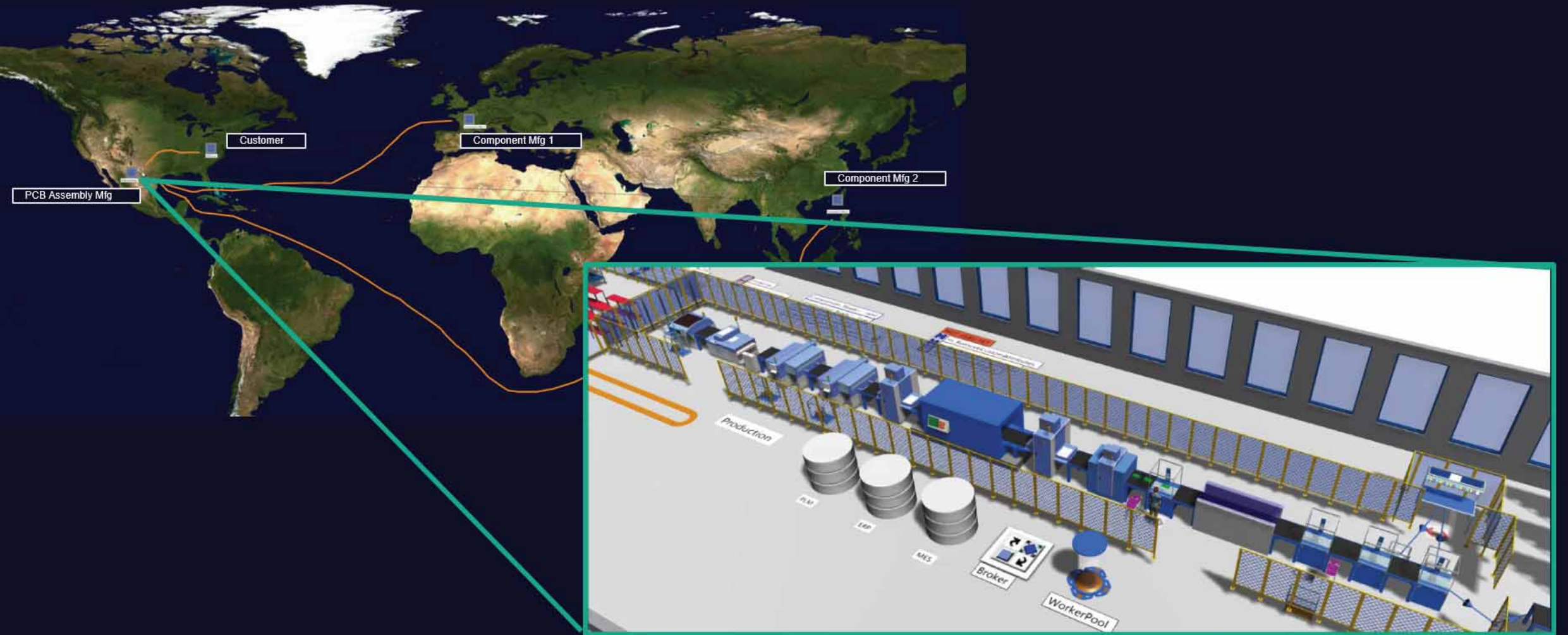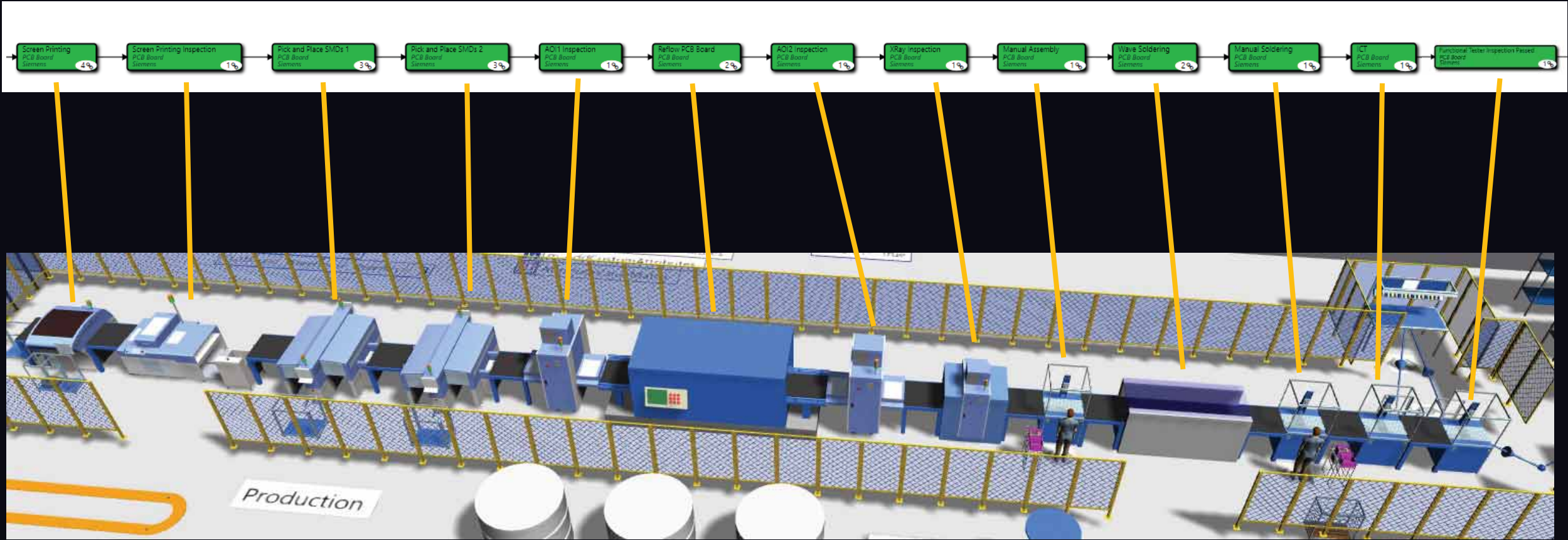PCB Assembly Mfg

Xcelerator
Trusted Supply Chain

SIEMENS

Xcelerator Trusted Supply Chain
End-to-End visibility of digital & physical assets across the supply chain
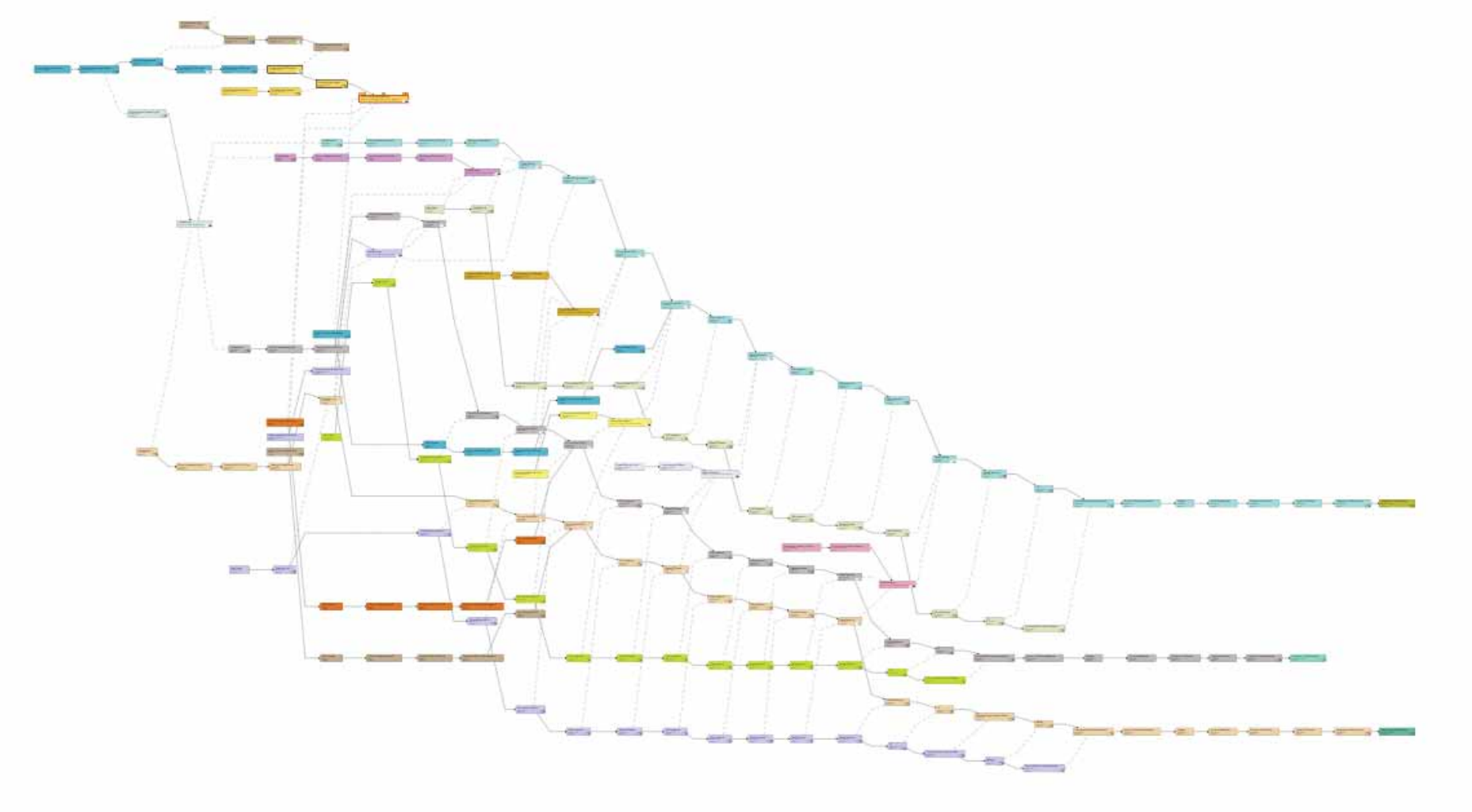
Xcelerator
Trusted Supply Chain

SIEMENS

Xcelerator Trusted Supply Chain
Visibility & transparency to the lowest supply chain Levels

Xcelerator
Trusted Supply Chain

SIEMENS

Contacts

SGT Microelectronics

Brett Attaway
Sr Director, Strategic Microelectronics
Programs
Washington DC & Orlando, FL

Siemens Government Technologies, Inc.

407-579-0969

brett.attaway@siemensgovt.com

SGT Cross-Industry

Justin Brisco
Director, Strategic Supply Chain
Solutions
Dallas, TX

Siemens Government Technologies, Inc.

832-425-9200

justin.brisco@siemensgovt.com

EDA Contact

John Hallman
DVT Solutions Manager
Melbourne, FL, US

Phone +1 321-536-8250

E-mail hallman.john@siemens.com

SIEMENS