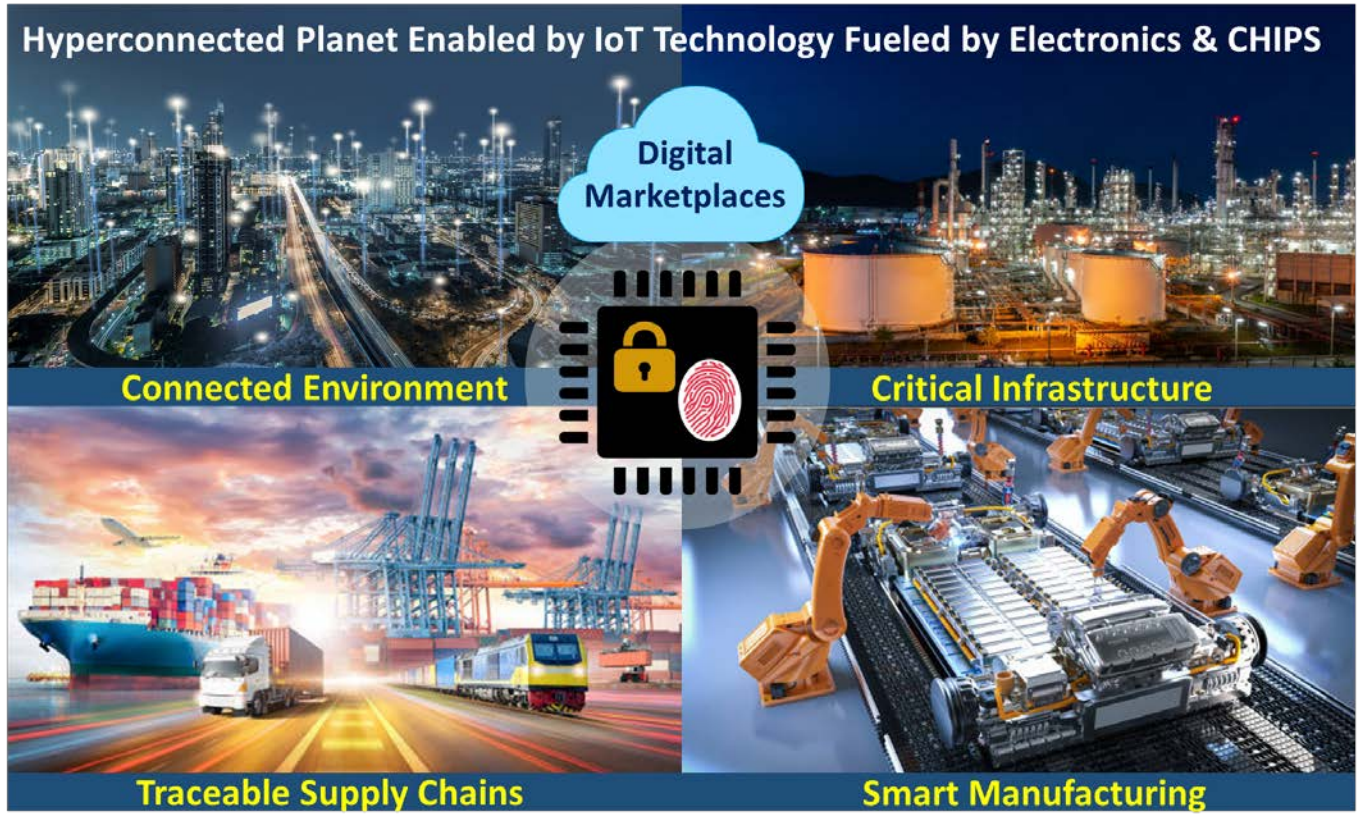
Leveraging chip supply chain traceability to navigate the geopolitical risks and fuel the IoT Digital Economy



IoT Tech Expo
June 5, 2024

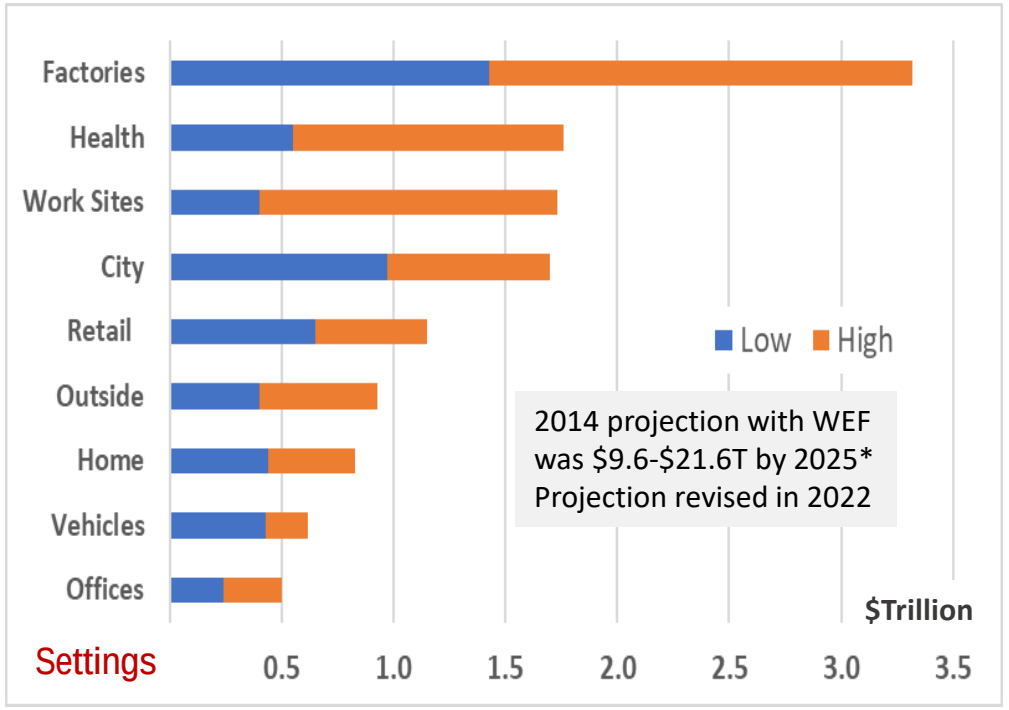
Tom Katsioulas
President & CEO
Archon Design Solutions
tomkat@archon-ds.com

*Views expressed in this document are personal and do not represent the views of the IoT Advisory Board, NIST, the Department of Commerce, or the U.S. Government

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IoT Opportunity and Global Economic Value

Global IoT Economic Value $5.5-$12.6 Trillion by 2030



*Sources: 2014 World Economic Forum, 2021 McKinsey & Company

- **IoT will grow in ways that are transformative for our environment and new digital economies**
- **Economic growth is hindered by IoT supply chain disaggregation, geopolitics and cybersecurity risks**
- **Convergence of physical & digital worlds will drive growth of IoT digital marketplaces and ecosystems**
- **A trusted digital thread starting from chip* design and manufacturing can drive new IoT value chains**

*Provenance and traceability applies to any good or asset, not only chips

*Sources: McKinsey & Company (IoT), GlobalDots, ABI Research, Semiconductor Digest, McKinsey & Co (Security)

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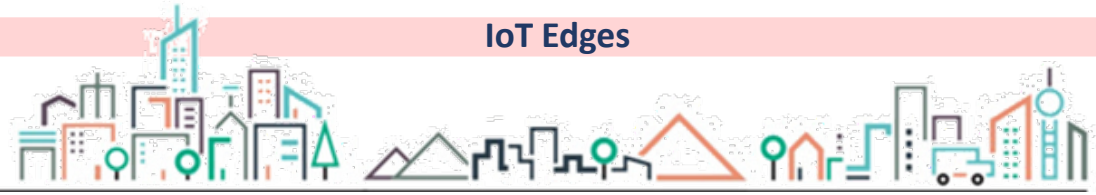
IoT Connectivity Changes Business Economics

Industrial | Aerospace | Automotive | Consumer | Communications | Healthcare | Data Centers

*OT Edges — IoT Edges — *IT Edges

*Operational Technology

*Information Technology



Billions of Connected Devices

Powered by trillions of chips

Smart Cities, Supply Chains, and Critical Infrastructure Environments

Smart Connected Product Supplier

Secure & Trusted IoT Device

Field Use Analytics

Fragmented Supply Chain

Product as a Service

Digital Marketplaces

IoT Edge Devices

- Better visibility on product field use
- Remote lifecycle management (OTA)
- Reduced support costs and RMAs
- Lower OPEX, higher differentiation
- Growth of XaaS* revenue streams
- Security, trust and data sharing

Sources: HBR, TechTarget

*XaaS – Anything as a Service

Trusted IoT ecosystems are fueled by trusted AI, trusted data, trusted devices and trusted chips

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Cross-Border Chip Supply Chain Traceability Is at the Core IoT

Forbes — Securing The IoT From The Threat China Poses To US Infrastructure

REUTERS — Two US lawmakers raise security concerns about Chinese cellular modules

REUTERS — Focus: The chip challenge: Keeping Western semiconductors out of Russian weapons

Bloomberg — Chips From Texas Instruments and Other US Makers Flow Into Russia Despite Ban

FINANCIAL TIMES — The shadowy network smuggling European microchips into Russia

tom's HARDWARE — US sanctions transform China into legacy chip production juggernaut

CNN — Chip supply chains will shape geopolitics more than oil over the next 50 years

FORTUNE — Commerce Secretary Raimondo says more funding needed for AI export controls

tom's HARDWARE — Intel Officially Introduces Pay-As-You-Go Chip Licensing

imedia — Samsung Electronics plans to launch high-end memory chip rental service

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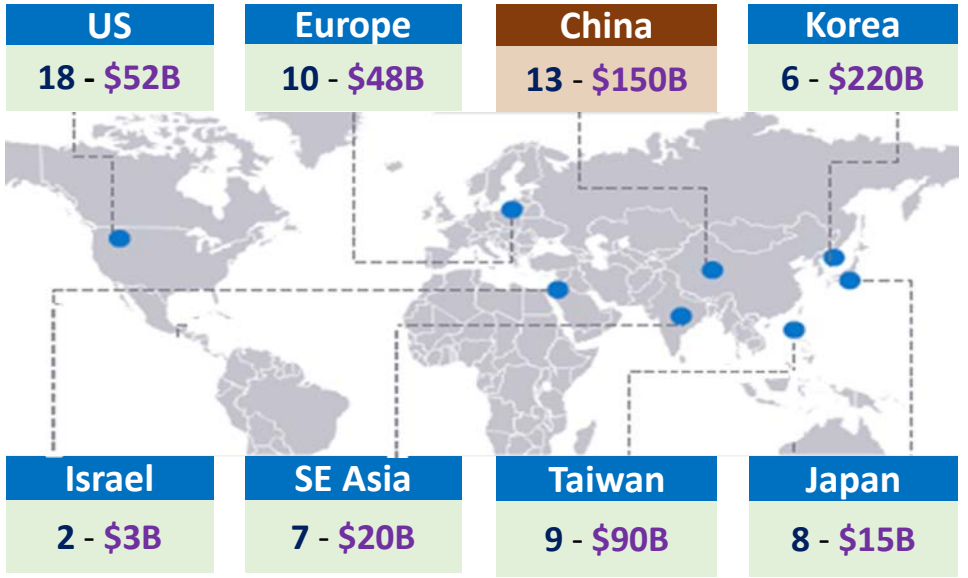
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Chip Supply Chain Provenance Starts in Manufacturing

2023 Market Sizes

- **$112T** Global GDP — **IoT Marketplaces**
- **$2.2T** Electronics — **1,000s of companies**
- **$602B** Semiconductors — **100s of companies**
- **$127B** Foundry — **Only 5 at scale**
  Excludes fabs < $2B

2023-2025: Fabs Built & Government Subsidies



*Potential for $2 trillion with Public Private Partnerships

- **Over 80% of the global fab capacity that fuels IoT is controlled by a handful of allied nations (incl. Taiwan)**
- **~71 new fabs are being built worldwide in 2022-2025 funded by ~$600 Billion* in government subsidies**
- **Investment in trusted traceability** is small compared to volume of chips produced during fab's lifecycle**

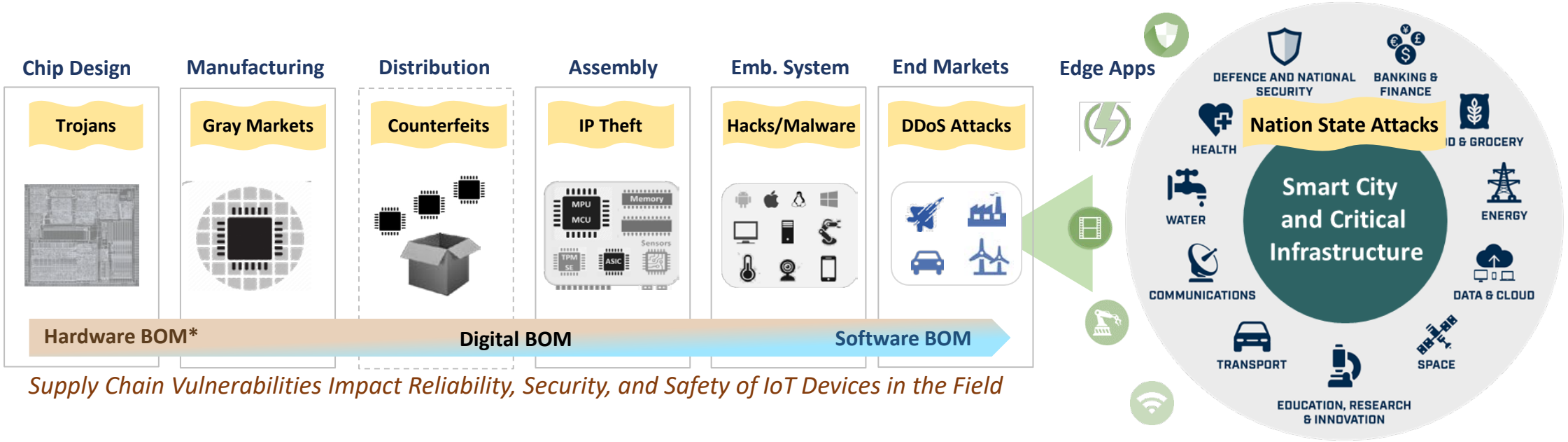
Unique opportunity to invest into a trusted digital thread starting from chip design & manufacturing

*Sources: GlobalFoundries, SEMI.org, EY.com, DARPA.mil

**Source: NDAA Sec. 5949 - Microelectronics traceability and diversification initiative

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Supply Chain Vulnerabilities Create IoT Opportunities



Supply Chain Vulnerabilities Impact Reliability, Security, and Safety of IoT Devices in the Field

- Lack of visibility in fragmented supply chain
- Over 65% of electronics assembled in Asia
- Ineffective sanctions and customs controls
- Costly support, liabilities, and loss of value

US & EU CHIPS Acts Allied Collaboration

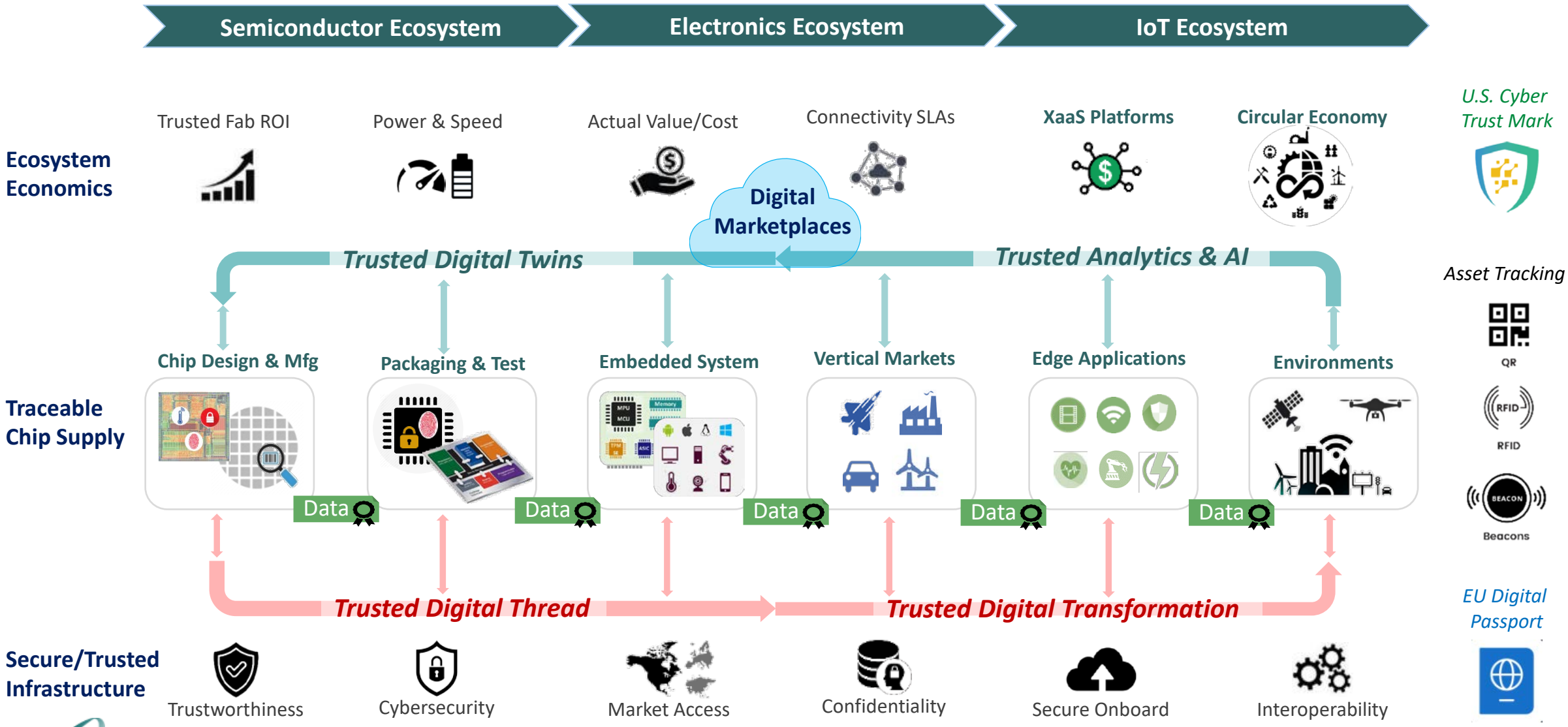
- No security in IIoT Systems & Process Sensors
- Silos and no visibility affects IT/OT convergence
- Nation state attacks start from supply chains
- Compromised equipment and human safety

Chip supply chain provenance and traceability are essential for industry 4.0 and critical infrastructure

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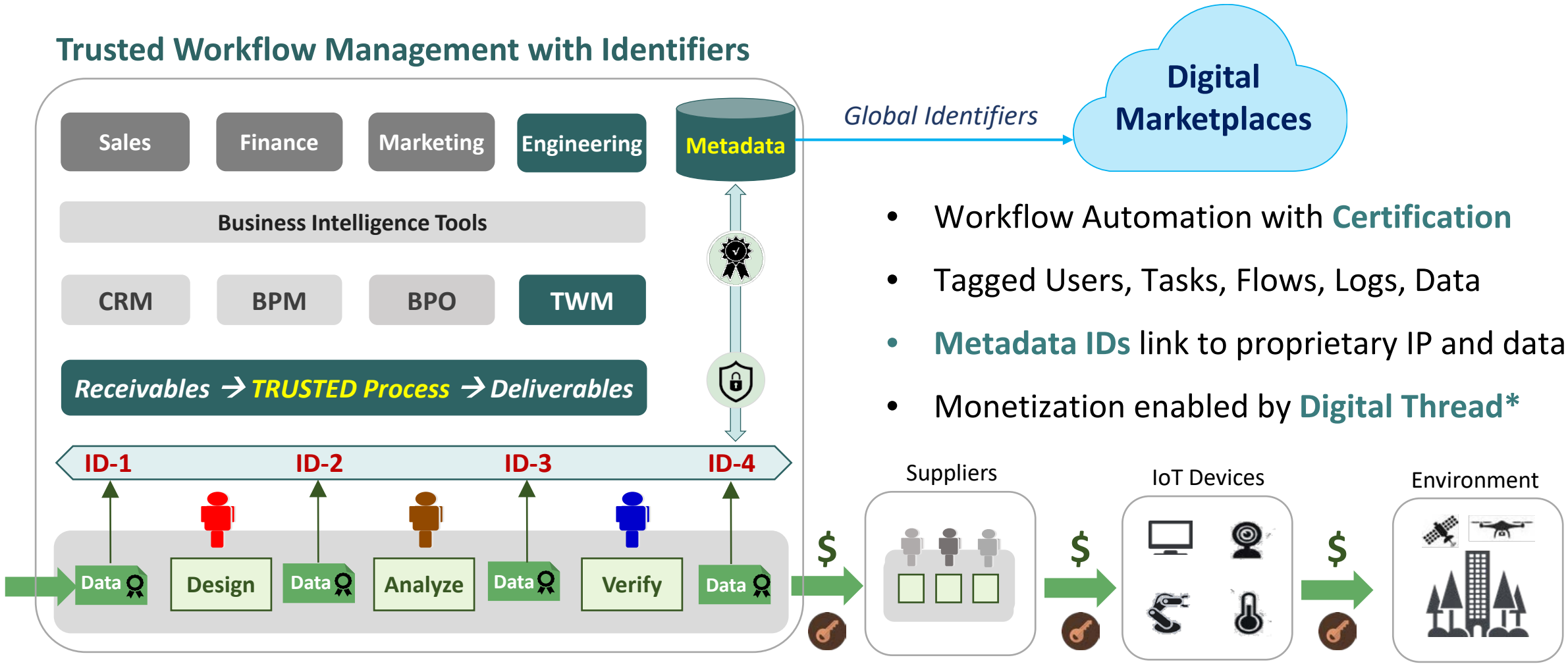
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Supply Chain Digitalization Drives Economic Value



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Trusted Enterprise Digitalization Accelerates IoT Markets



- Workflow Automation with **Certification**
- Tagged Users, Tasks, Flows, Logs, Data
- **Metadata IDs** link to proprietary IP and data
- Monetization enabled by **Digital Thread***

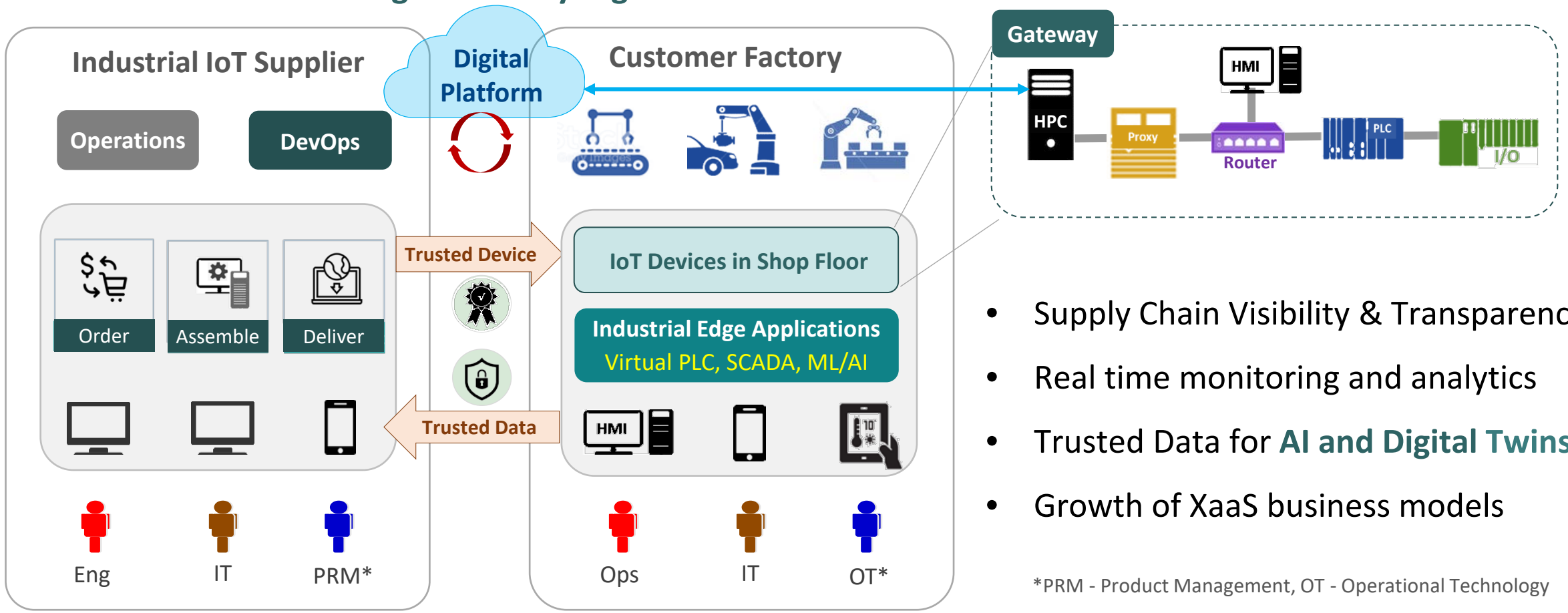
*Source: NIST - Digitalization Strategy by GSA Trusted IoT Ecosystem Security (TIES)

*Digital flow of data connecting business processes, products, and assets in supply chains

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Trusted Digital Transformation Enables New IoT Services

Business Process change driven by Digitalization and IoT



- Supply Chain Visibility & Transparency
- Real time monitoring and analytics
- Trusted Data for **AI and Digital Twins**
- Growth of XaaS business models

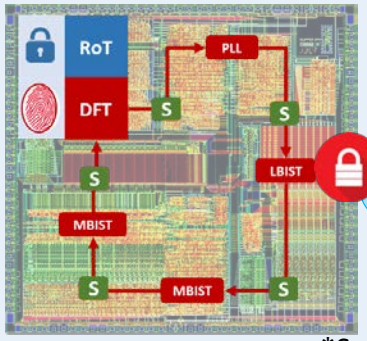
*PRM - Product Management, OT - Operational Technology

Sources: Deloitte - XaaS creating value beyond the device McKinsey & Co - Implementing Digital Transformation Deloitte - Digital Industrial Transformation 4.0 Collection

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Connected Chips Enable New Apps and Business Models

Automotive - Silicon Lifecycle Management (SLM)



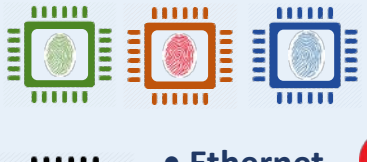
Functional Safety

Fleet Monitoring



*Source: Semiconductor Eng

Industrial - Chip Licensing and Multi Market Product XaaS



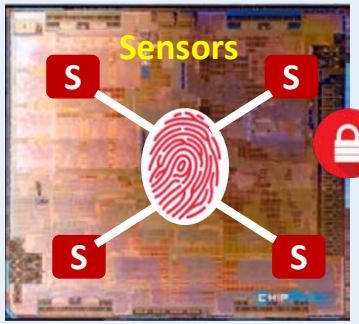
- Ethernet
- Profinet
- BACnet

HW + SW Provisioning



*Sources: Intel - Pay-as-you-go Chip Licensing, Samsung - Memory Chip Rental Service

Aerospace & Defense - Manufacturing Integrity

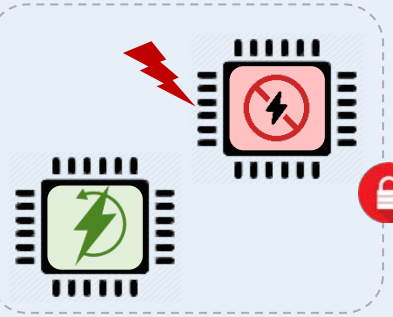


Failure Prevention



Source: ERI Summit 2020

Supply Chain - Monitoring & Regulating Field Use



Disable Adversary



Sources: Reuters - Western chips in Russian drones, WSJ - Cheap drones in battlefields

**Source: Deloitte and GSA - Semiconductor Industry Transformation Study 2.0

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Creating Market Awareness and “Digital Asset Trail”

U.S. Cyber Trust Mark

Consumer → Industrial IoT



Security & Privacy Overview

Smart Device Co.

Smart Video Doorbell NS200
Firmware version: 2.5.1 - updated on: 11/12/2020
The device was manufactured in: China

Security Mechanisms

Security updates	Automatic - Available until at least 1/1/2022
Access control	Password - Factory default - User changeable, Multi-factor authentication, Multiple user accounts are allowed

Data Practices

	Visual	Audio	Physiological	Location
Sensor type	Camera	Microphone		
Purpose	Providing device functions	Providing device functions, Research		
Data stored on device	Identified	No device storage		
Data stored on cloud	Identified	Identified - Option to delete		
Shared with	Manufacturer, Government	Manufacturer		
Sold to	Not disclosed	Not sold		

Other collected data	Motion, Account info, Payment info, Contact info, Device setup info, Device tech info, Device usage info
Privacy policy	www.NS200.smartdeviceco.com/policy

More Information

Detailed Security & Privacy Label:
www.iotsecurityprivacy.org/featured/external/manufacturer/Smart/Video-Doorbell

CMU IoT Security and Privacy Label **CISPL 1.0** iotsecurityprivacy.org PUBLIC DOMAIN

Sources: White House, Carnegie Mellon University

EU Digital Product Passport for Digital Traceability

Considerations for Data Policies Across Value Chain

1	Product Groups	Product by Product	Industry by Industry			
2	Company Size	All Sizes	Large First	Large Only		
3	Application Level	Item	Batch	Product Model		
4	Data Storage	EU Federated	Company	Centralized	Decentralized	
5	Data Carrier **IDs**	**Root of Trust**	**QR Code**	**Barcode**	**RFID**	**NFC**	**Marker**
6	Access Security	Full	Minimum	Differentiated		
7	Requirements	Standardization	Product Spec	Combination		
8	Governance	No Assurance	Limited	Reasonable		

Sources: The EU Digital Passport WBCSD-BCG, Catena-X Automotive, Gaia-X Platform

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Expanding Chip & Device Traceability Beyond Borders

Journey of chips though untrusted environments assembled with other chips into electronics and IoT products

1. **China** Rare Earth Metals
2. **S. Korea** Flash Memory
3. **Germany** Accelerometer
4. **Netherlands** NFC Controller
5. **Japan** Camera, LCD Screen
6. **USA** Wi-Fi & Audio Chips
7. **Taiwan** CPU/GPU Manufacturing
8. **China** Final Assembly & Test

Source: BCG and World Business Council for Sustainable Development (WBCSD)



Digital Product Passport can have global impact as regulation applied to imported electronics and IoT parts will inspire cross border collaboration

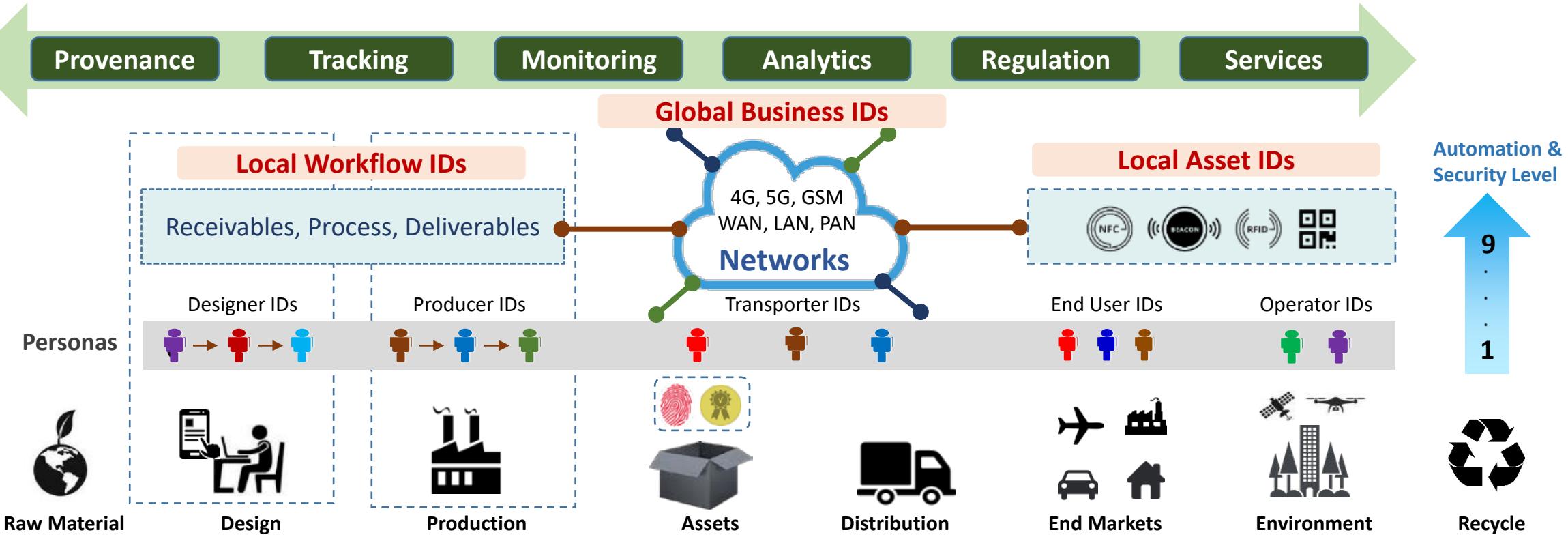
U.S. Cyber Trust Mark will empower businesses, governments, and users to make informed decisions about IoT device security, privacy, etc.

Global identifiers* linked to local identifiers will enable trusted best practices for supply chain transparency, traceability and monetization

*Source - U.S. Customs and Border Protection CBP Launches Global Business Identifier Pilot to Increase Supply Chain Visibility

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Leveraging IoT and IDs for Any Supply Chain Traceability

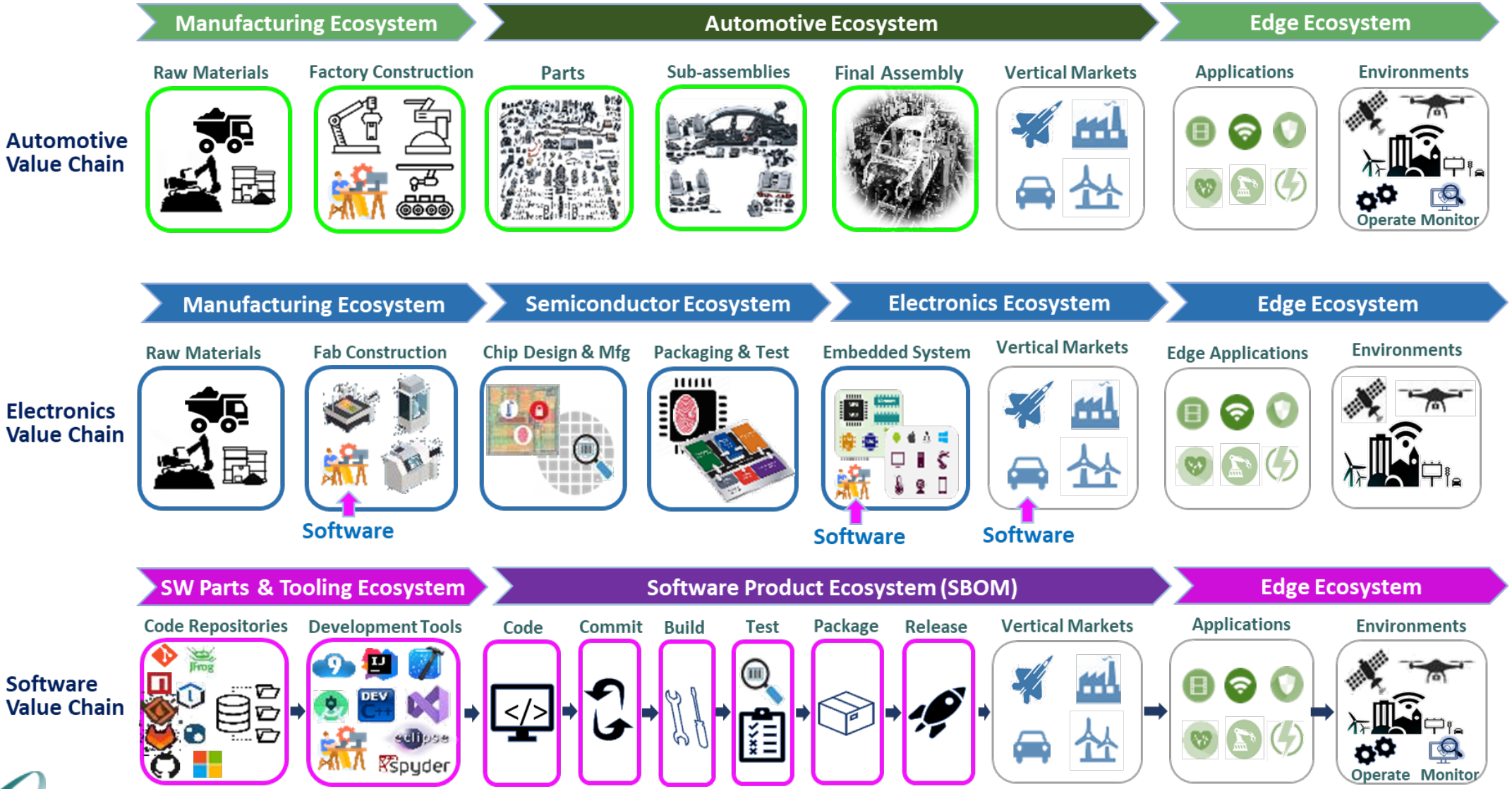


- **Current Local Unique IDs (LIDs) are often proprietary tied to physical assets, security subsystems and RoTs**
- **A Global Unique ID (GID) cryptographically linked to proprietary LIDs this will speed adoption of traceability**
- **A GID must be globally unique, electronically verifiable, cryptographically secure, traceable to a root of trust***

*Draft recommendation to the IoT Advisory Board

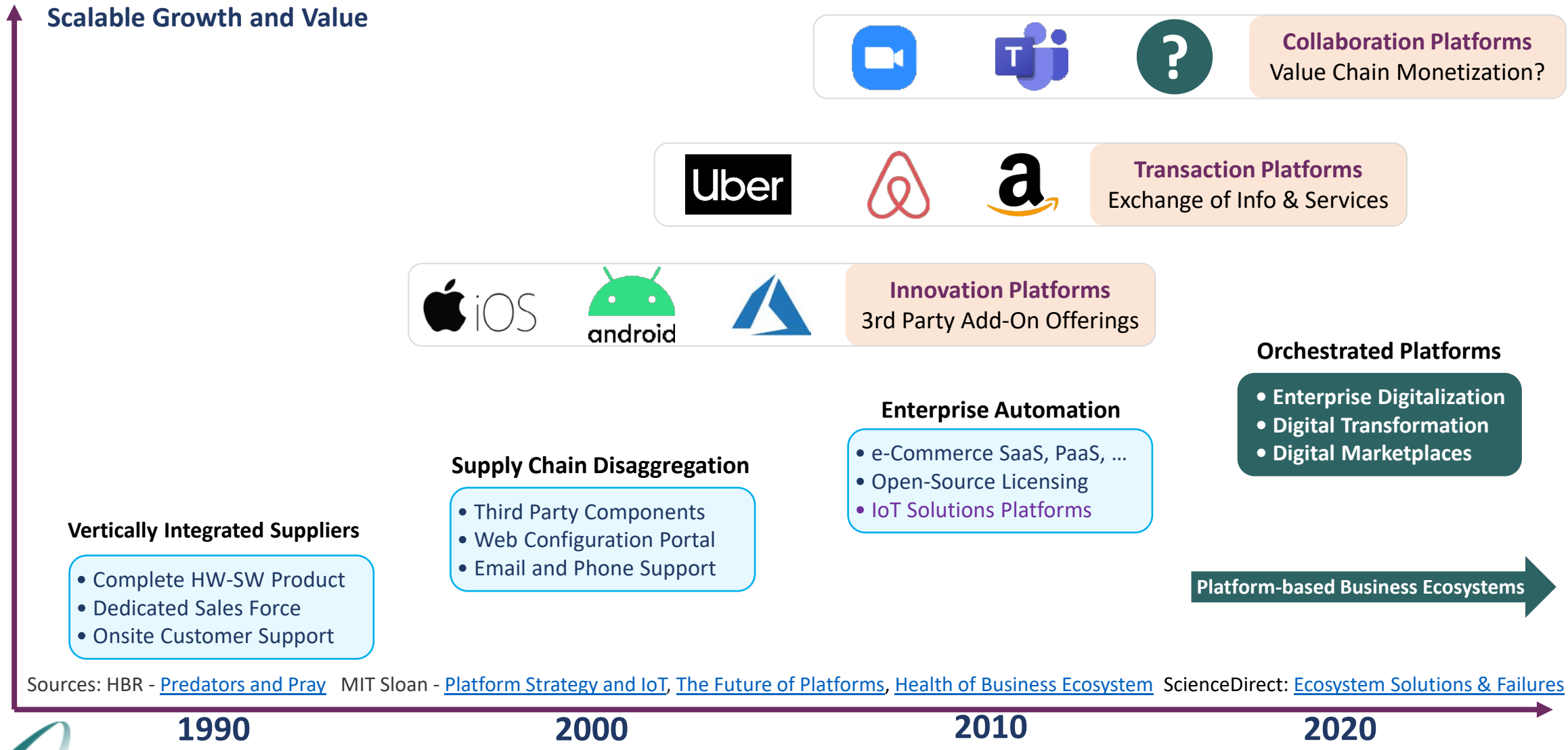
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Supply Chain Traceability Varies by Vertical Market



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Platforms Needed for Multi-Stakeholder Collaboration



Sources: HBR - Predators and Pray MIT Sloan - Platform Strategy and IoT, The Future of Platforms, Health of Business Ecosystem ScienceDirect: Ecosystem Solutions & Failures

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Orchestrated Ecosystem Partnerships Fuel IoT Solutions

Smart-Connected Cities
IoT systems collecting data on traffic, pollution, etc. to improve city lifestyle



- Cisco
- Qualcomm
- AWS
- Siemens
- UrbanData
- City Planners

Smart-Connected Manufacturing
Factories using sensor data to improve efficiency, automation and quality



- Schneider
- NVIDIA
- Azure
- PTC, GE
- QualitySense
- IT/OT Experts

Smart-Connected Transportation
Connected EVs becoming Autonomous and integrated with city infrastructure



- Tesla, Rivian
- Siemens
- AMD, Infineon
- Azure, AWS
- AutonomyTech
- Urban Planners

- Minimize market failures (e.g., fragmented supply chain) or organizational failures (e.g. silos)
- Use governance to mitigate stakeholder self-interests and avoid undermining the value structure
- Facilitate network effects and innovation with PoC digital twins before investing to deploy at scale

Platform-based business ecosystems of large companies, innovative startups, domain experts

*Sources: BCG - Orchestrating the Value in IoT Platform-Based Business Models EDA - Regional Innovation Tech Hubs McKinsey & Co - Building Innovation Ecosystems

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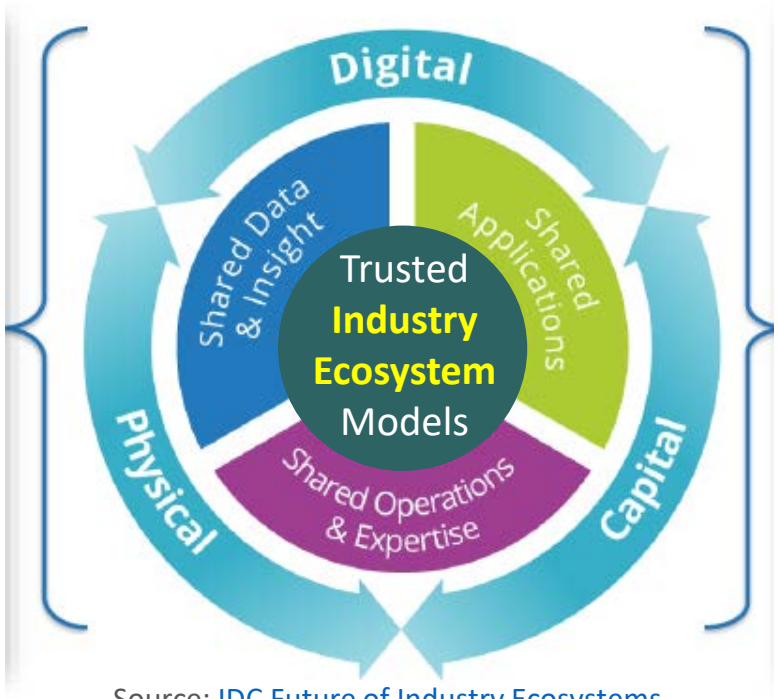
Scaling the Growth & Value of IoT with Industry Ecosystems

DX 1.0 The Digital Transformation (DX) Era **DX 2.0** The Digital Business Era **Digital-first**

Testing Digital Use Cases → **Transform Business and ROI** → **Sustainable Digital Business**

Resources & Data

- Business Networks
- Alliances and Consortia
- Gov Organizations
- Trusted Supply Chains
- Cloud Services
- Producers / Consumers
- Digital Marketplaces



Source: IDC Future of Industry Ecosystems

Methodology & Technology

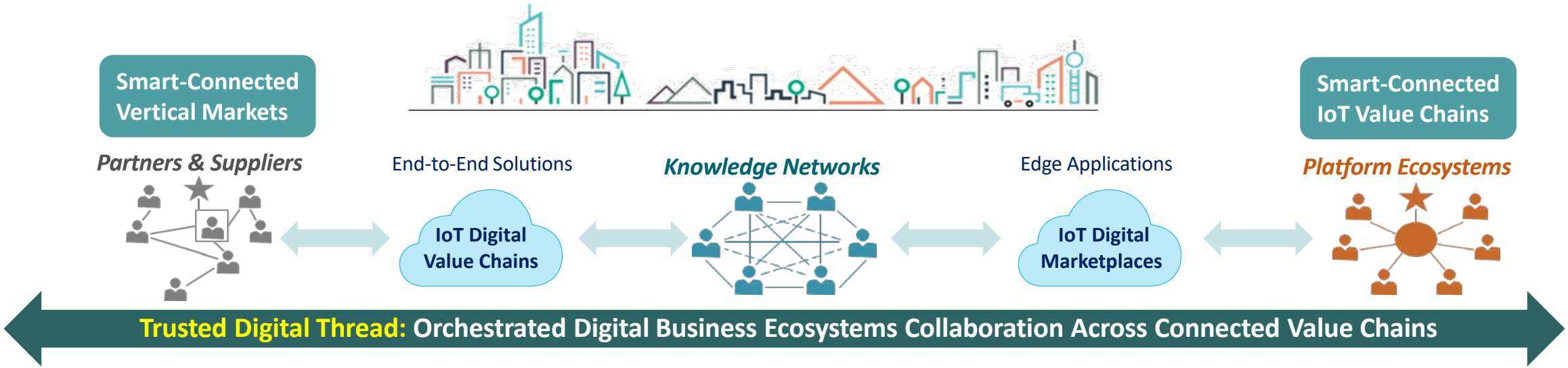
- Value Chain Orchestration
- Team Collaboration
- Enterprise Data Sharing
- Cybersecurity & Trust
- Blockchain, ML, AI
- Simulation Analytics
- Trusted Digital Twins

Orchestrated business ecosystems and network effects across IoT value chains drive exponential growth

*Sources: BCG - How IoT Data Ecosystems Will Transform B2B Competition McKinsey & Co - Digital Ecosystems 2.0 McKinsey & Co - Data Ecosystems Made Simple

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Accelerating the Future of IoT Digital Economies



- Hyperscalers may lead in creating orchestrated business ecosystems across IoT value chains
- Partnerships will evolve to knowledge networks, business ecosystems and digital marketplaces
- Massive data created across value chains will fuel new services, digital twins and AI applications
- Circular value chains will accelerate convergence of physical-digital worlds and fuel sustainability

Orchestrated business ecosystems and network effects in IoT value chains drive exponential growth

*Source: October 2023 U.S.-EU Summit Joint Statement

**Source: McKinsey & Co - 2023 Technology Trends Outlook

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