Accelerating the IoT* Digital Economy With Trusted Value Chains Driven by Collaboration with International Allies

Leveraging US & EU CHIPS Acts and new production capacity worldwide for supply chain digitalization initiatives that strengthen resiliency and trust and fuel economic growth.

*Internet of Things

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Strengthening National and Economic Security

- *Can we create a resilient electronics supply chain that fuels growth of IoT digital economy?*
- *Can we ensure chips are trusted, secure, traceable and enable trillions of economic value?*
- *Can we use a small investment from CHIPS Acts to speed adoption with international allies?*

- **The USG can leverage the US & EU CHIPS Acts to lead global collaboration for supply chain security**
  - Orchestrate ecosystem strategy for digitalization and traceability of the electronics value chain
  - Drive multi stakeholder initiatives on supply chain provenance from chip design & manufacturing

- **The DOC & TTC can lead global ecosystem orchestration since no one enterprise can do this alone**
  - Support low-cost pilot programs to prove value of supply chain digitalization for economic growth
  - Expand collaboration across values chain with international allies and standards organizations

- **Speed adoption across value chains programs like Digital Product Passport and Cyber Trust Mark**
  - Support creation of a “digital paper trail” for chips and IoT electronics assets and their data
  - Fuel economic growth by incentivizing IoT digital marketplaces of data producers and consumers

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Global Electronics and IoT Landscape

- **IoT will explode in ways that are transformative for our environment and new digital economies***
  - 100B+ devices 500ZB+ of data by 2030 will fuel IoT services and AI applications
  - Potential value for the global economy will be from $5.5 to $12.6 trillion by 2030

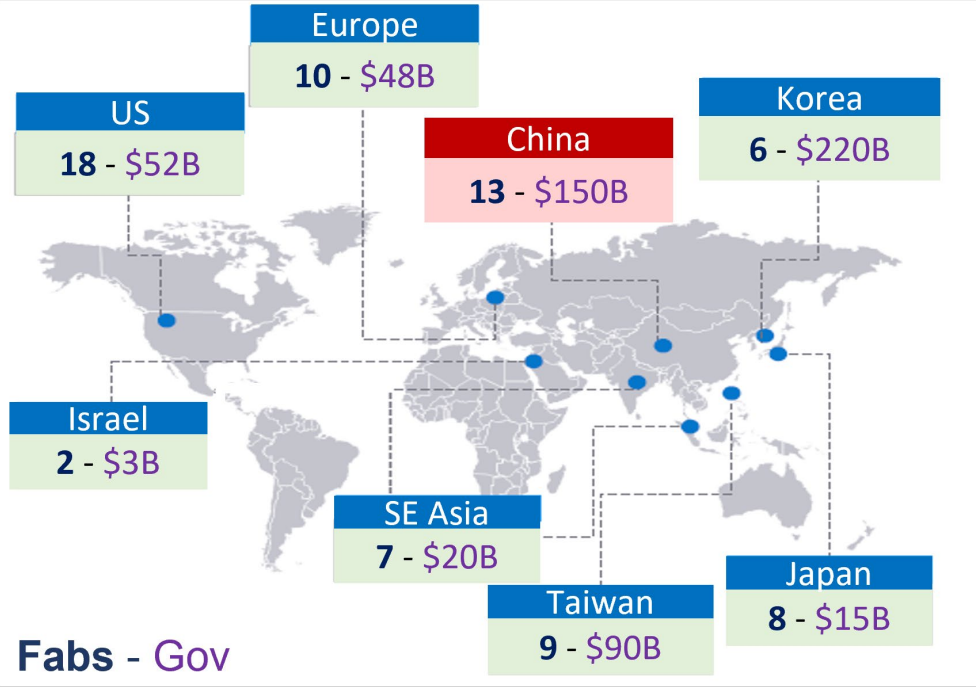
- **Economic growth is hindered by supply chain disaggregation, geopolitics and cybersecurity risks**
  - Huge barriers on value chain fragmentation, unregulated distribution channels, organization silos
  - No one company can address supply chain security and monetization across IoT value chains

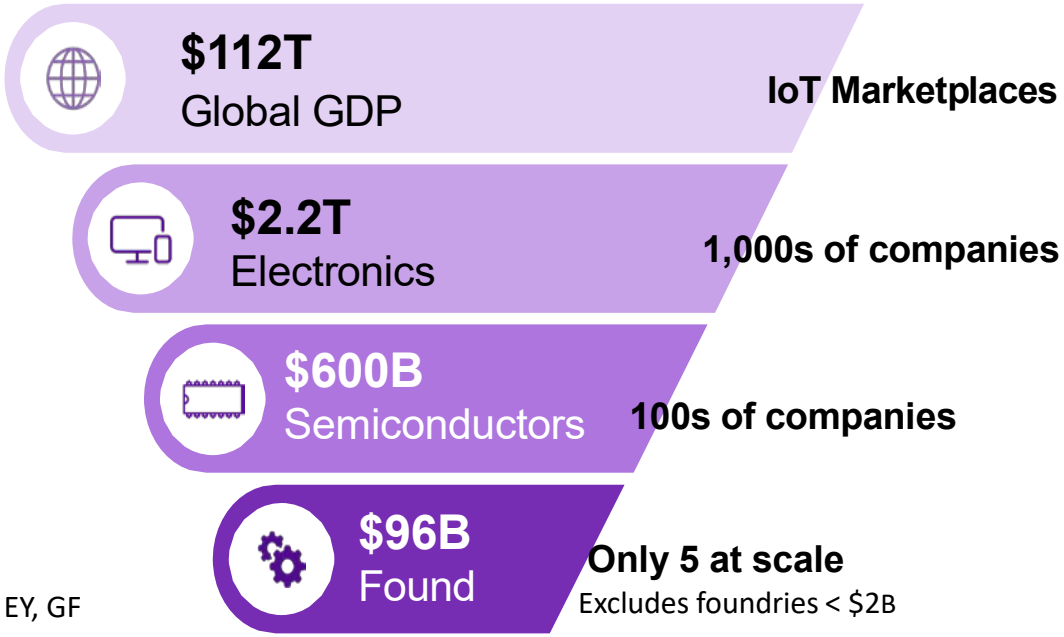
- **A trusted digital thread from chips to IoT edge is critical for national security and economic growth**
  - Digital flow of data that connects business processes, products, and assets across value chains
  - Drives operating efficiency, supply chain resilience & security, risk management and business growth

- **Data is the "new oil" requiring infrastructure and standards to pump it out and extract value**
  - Chip manufacturing produces huge volumes of data used to improve quality, reliability, assurance
  - Trusted traceability of assets & data will enable digital marketplaces and new revenue streams

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

Supply Chain Provenance Starts From Trusted Chips





Sources: SEMI, EY, GF

- **~71 new fabs are being built worldwide in 2022-2024 driven by >$600 Billion* in government incentives**
- **Over 80% of the global fab capacity that fuels IoT is controlled by a handful of allied nations (incl. Taiwan)**
- **Investment in traceability infrastructure is small compared to many chips producing over a fab lifecycle**

Short geopolitical market window to start a digital thread from chip design and manufacturing

* Over $2 trillion with private investments

Examples - Trusted Digital Thread Use Cases and Benefits

- **Chip suppliers** trace and authenticate ICs in the field, remotely configure SKUs to enable pay-as-you-go business models, analyze chip data and offer hardware/software updates
- **Foundries** reduce field failures by collecting test data across the value chain to increase reliability, and save chip buyers' resources for validating that chips function as intended
- **Device makers** license test data from suppliers instead of relying on data sheets, thus saving time to design systems and shorten time to market with digital twin prototypes
- **System OEMs** securely configure devices to offer IoT services remotely and use trusted digital threads to pass data to their suppliers that create digital twins of chips & devices
- **Fleet Operators** analyze trusted data from IoT systems and chips to manage ecosystems, and develop ML/AI applications for failure prediction, vulnerability management, etc.
- **Chip suppliers and System OEMs** track and trace allied chips when they power-up inside enemy weapons and disable them remotely to prevent cybersecurity or physical attacks

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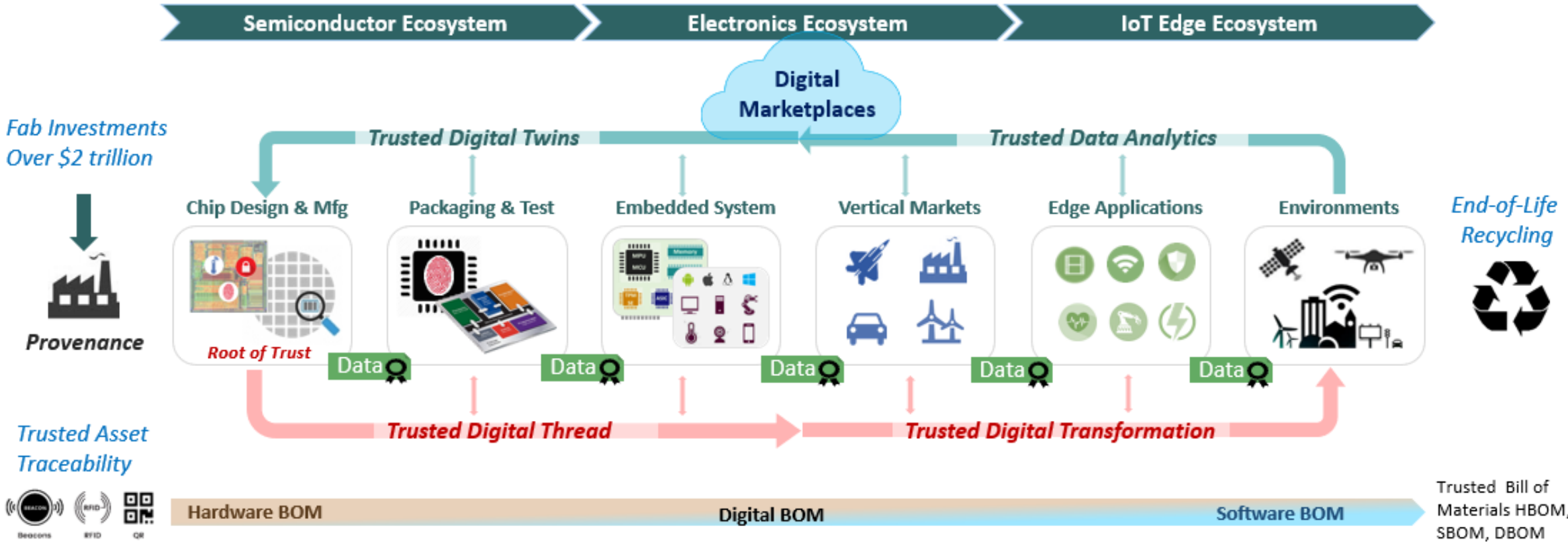
Digitalization Across the Electronics and IoT Value Chain



- **Establish a trusted digital thread of provenance and traceability starting from chip design & manufacturing**
- **Use IoT technology and ML/AI to track, monitor, manage assets across the electronics and IoT value chain**
- **Incentivize enterprises to digitalize operations* and join digital marketplace of data producers & consumers**

*Receivables, workflows, deliverables

Digital Thread Enables Data Monetization

	Data Producers	Data Consumers	Monetization
Electronic Design Simulation	EDA tools generate data from circuit design, optimization and performance.	Product designers, and device makers can use this data to improve products	Offer data-driven insights and add-on services to EDA simulation tools.
Semiconductor Manufacturing	Produce vast amounts of data on quality, performance, functionality, integrity, etc.	Chip or equipment suppliers, device makers use data to improve design	Fabs license data to consumers who use it to increase product differentiation
Supply Chain Procurement	Create data for shipping, inventory levels, demand forecasting, etc.	Manufacturers, logistics companies, retailers can increase forecast accuracy	Sell data access for customers to reduce, costs, and enhance customer service.
IoT Device Deployment	Generate data related to device operation, sensors and environment	Businesses, researchers, insurance companies, use data to offer services.	OEMs get Insights on product value, RMA root causes, and predictive maintenance
Electronic Part Lifecyle	Generate data related to specifications, availability, quality, and environment	Device makers, repair services, and environmental sustainability orgs.	Test of recycling data can be licensed to designers for eco-friendly organizations

Incentivize digital marketplaces and business ecosystems to sell "Everything-as-a-service (XaaS)"

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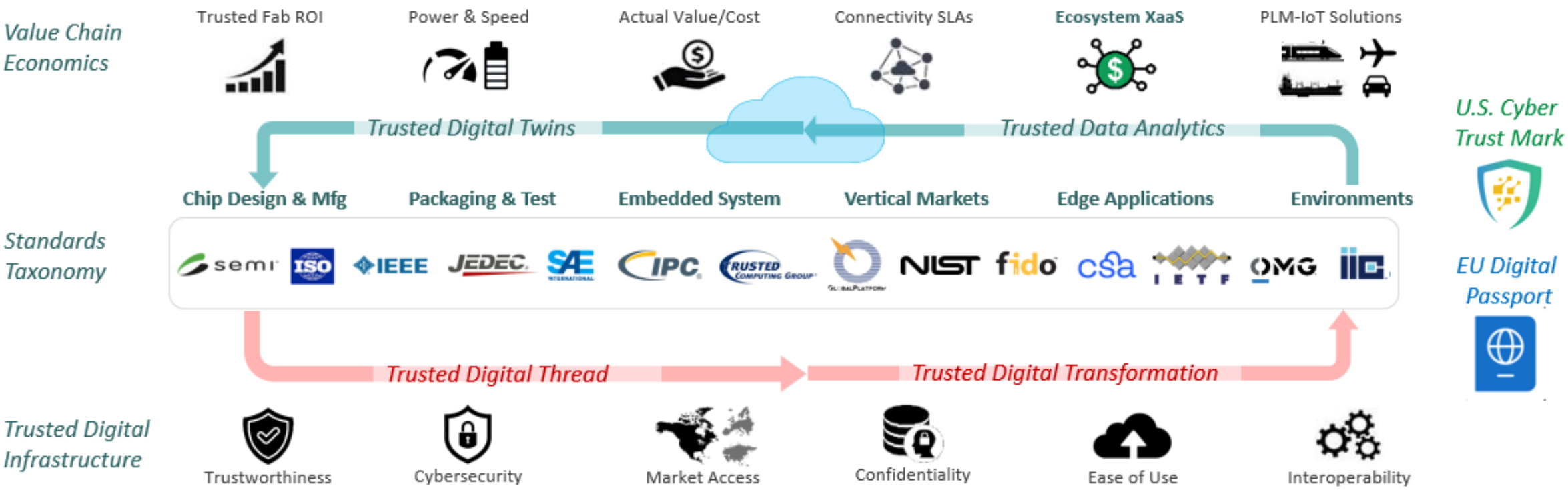
Accelerating Supply Chain Resilience and Economic Value



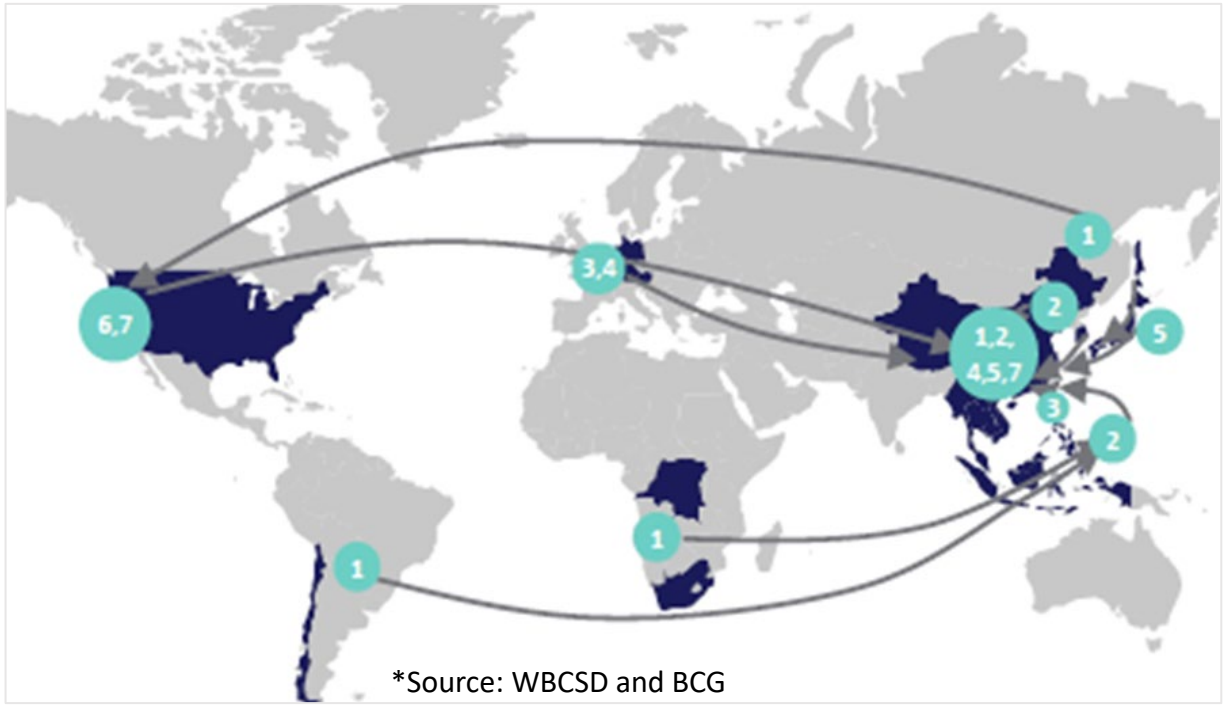
- **Trusted infrastructure:** Facilitate market preference and regulate market access and use of chips & electronics
- **Standards Taxonomy:** Align SDOs* and national standards strategy for assurance, provenance, and traceability
- **Value Chain Economics:** Support trusted business ecosystems and marketplaces with traceable transactions

*Standards Development Organizations

Expanding Digital Thread Global Impact Beyond Borders

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

1. **China** Rear 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: WBCSD and BCG

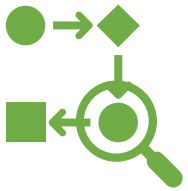
EU Digital Product Passport can have global impact as regulation is applied to imported electronics parts and may inspire cross border collaboration

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

Global interoperability and identifier standards will help unify the approach* to supply chain transparency, traceability and monetization

*https://www.cbp.gov/newsroom/national-media-release/cbp-launches-global-business-identifier-pilot-increase-supply-chain

Recommendations to Accelerate Adoption



Physical Supply Chain Traceability

- **Promote use of standards** for supply chain logistics, assurance provenance, and traceability
- **Support Root of Trust** based Architectures for Provenance & Traceability of chips assets
- **Use IoT Technology to Track asset** chain of custody (with trusted certs, blockchain, AI)

Trusted Digitalization Solutions

- **Create infrastructure for digital thread** toward supply chain risk management & monetization
- **Promote digitalization of enterprise** receivables, workflows, deliverables across value chains
- **Incentivize digital marketplace** enablement of data producers, consumers, and IoT services.

Policy and Market Behavior

- **Drive demand** tied to assurance to increase chip production capacity and incentives for market access
- **Promote orchestrated PPPs*** to reduce risk of supply disruption and drive XaaS revenue streams
- **Facilitate creation of digital thread driven** business ecosystems and platforms for monetization

*Private-Public Partnerships

Summary - Call to Action

- **The USG can leverage the US & EU CHIPS Acts to lead global collaboration for supply chain security**
  - Orchestrate ecosystem* for digitalization and trusted traceability of the electronics value chain
  - Drive multi stakeholder initiatives on supply chain provenance starting in chip manufacturing

- **The DOC & TTC should lead allied nation orchestration and support for collaboration on standards**
  - Lead by controlling root of trust based digital thread for market preference and chip access/use
  - Promote collaboration on trusted traceability with international allies and standards organizations

- **Speed adoption across value chains programs like Digital Product Passport and Cyber Trust Mark**
  - Support creation of a “digital paper trail” for chips and IoT electronics assets and their data
  - Fuel economic growth by incentivizing digital marketplaces and XaaS business ecosystems

Create a resilient global supply chain with allied nations that will drive trillions in IoT economic value

*Pilot project was proven to be viable with GSA Trusted IoT Ecosystem Security (TIES)

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