

# Counterintelligence Webinar Series:

## Microelectronics and Supply Chain: 2022

DEFENSE COUNTERINTELLIGENCE AND SECURITY AGENCY



# TODAY'S SESSION



## Hosts:

- Ed Kobeski, CDSE Counterintelligence (CI)
- Carl E. McCants, Ph. D., Special Assistant, Electronics Resurgence Initiative (ERI), Defense Advanced Research Projects Agency (DARPA)

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Q & A



# ATTENDEE PARTICIPATION & FEEDBACK



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# FORTIFY THE CHAIN

THE NATIONAL COUNTERINTELLIGENCE AND SECURITY CENTER

## APRIL IS NATIONAL SUPPLY CHAIN INTEGRITY MONTH



# FORTIFY THE CHAIN

# Microelectronics Supply Chain Resilience

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Special Assistant, ERI

Briefing Prepared for CDSE

28 April 2022





# Outline

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- Introduction
- Semiconductor Manufacturing Process Overview
- Semiconductor Ecosystem
- Semiconductor Supply Chain Overview
- Types of Microelectronics Supply Chain Attacks
- Semiconductor Supply Chain Resilience Overview
- Semiconductor Supply Chain Resilience Recommendations





# Introduction – Supply Chain Risk

- Supply chain risk is a function of threat, vulnerability, and consequence
  - Threat is specific and credible information that a component, system, or service might be targeted by adversaries or unauthorized personnel
  - Vulnerability is a weakness which is either inherent to the component, system or service, or has been introduced by an outside agent
  - Consequence is the ability of an adversary or unauthorized person to surveil, deny, disrupt, or otherwise degrade a component, system, or service
- A supply chain risk exists when the capability and intention of an adversary or unauthorized person aligns with the opportunity to exploit a vulnerability.
  - These actions would allow the adversary or unauthorized person to extract Intellectual Property (IP), sensitive government data, and sensitive information
  - These actions may compromise the integrity, trustworthiness, and authenticity of critical components, systems, or services

$$\text{Risk} = f(\text{Threat, Vulnerability, Consequence})$$



## Introduction – Supply Chain Resilience

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- Resilience – ***the capacity to absorb stress, recover critical functionality, and thrive in altered circumstances*** – has become a key element in a company’s overall health. Resilient companies enjoy better outcomes than their peers in three ways: the immediate impact of an external shock on their performance can be lower, the speed of their recovery can be faster, and the extent of their recovery can be higher.
- Six pillars of supply chain resilience – three that increase the ability to absorb shocks, and three that allow faster reaction when disruption occurs
  - Redesigning the global network
  - Setting new parameters for supply chain buffers
  - Proactively managing suppliers
  - Managing the multienterprise supply chain
  - Actively managing end-to-end risk
  - Planning based on anticipation, simulation, and scenarios

Source: <https://www.bcg.com/publications/2021/building-resilience-strategies-to-improve-supply-chain-resilience>

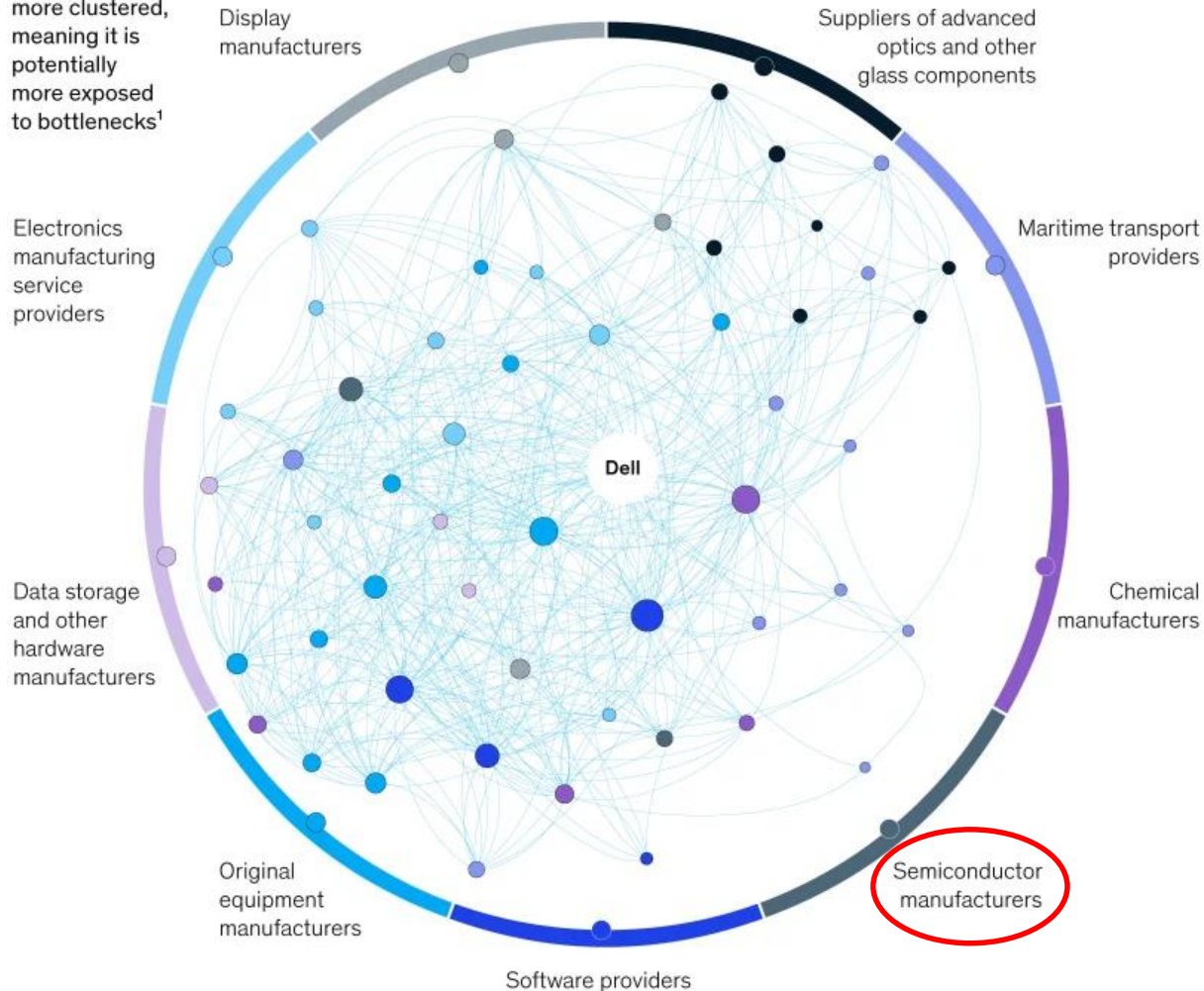


# Introduction – Dell Technologies Supply Network\*

## Dell network example

(semiconductors, computers and electronics, and communication equipment)

Dell's supplier ecosystem is more clustered, meaning it is potentially more exposed to bottlenecks<sup>1</sup>

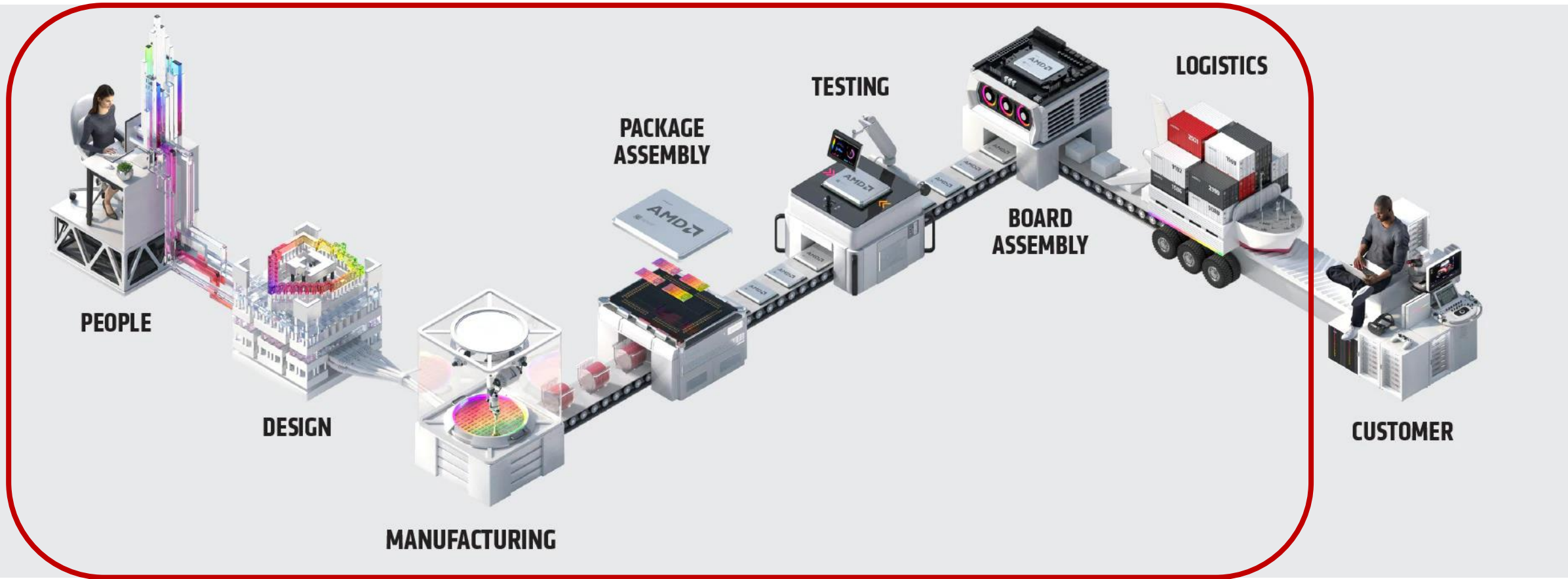


\*Based on publicly available data from first and second tier suppliers

Source: <https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains>



# Semiconductor Manufacturing Process



Source: <https://www.amd.com/en/technologies/introduction-to-semiconductors>

Focus of discussion

Threats, Vulnerabilities, and Consequences must be addressed in each phase of the manufacturing process



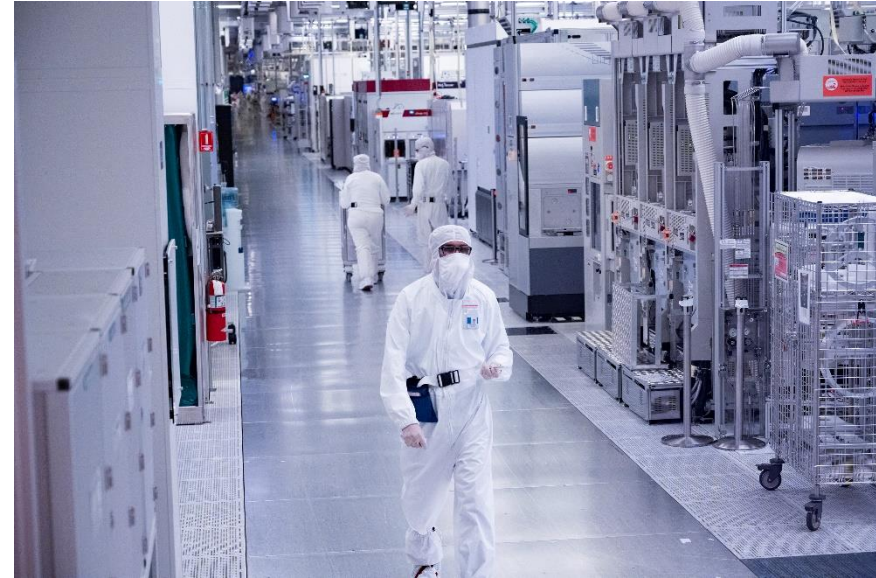
# Semiconductor Manufacturing Process



Source: <https://www.youtube.com/watch?v=dJLvT-TDavU&list=PLMNf0uzWVIZn3Gd9F22a2rWUGY76bHRgz&index=1>



# Semiconductor Manufacturing Process



Source: Intel Corporation

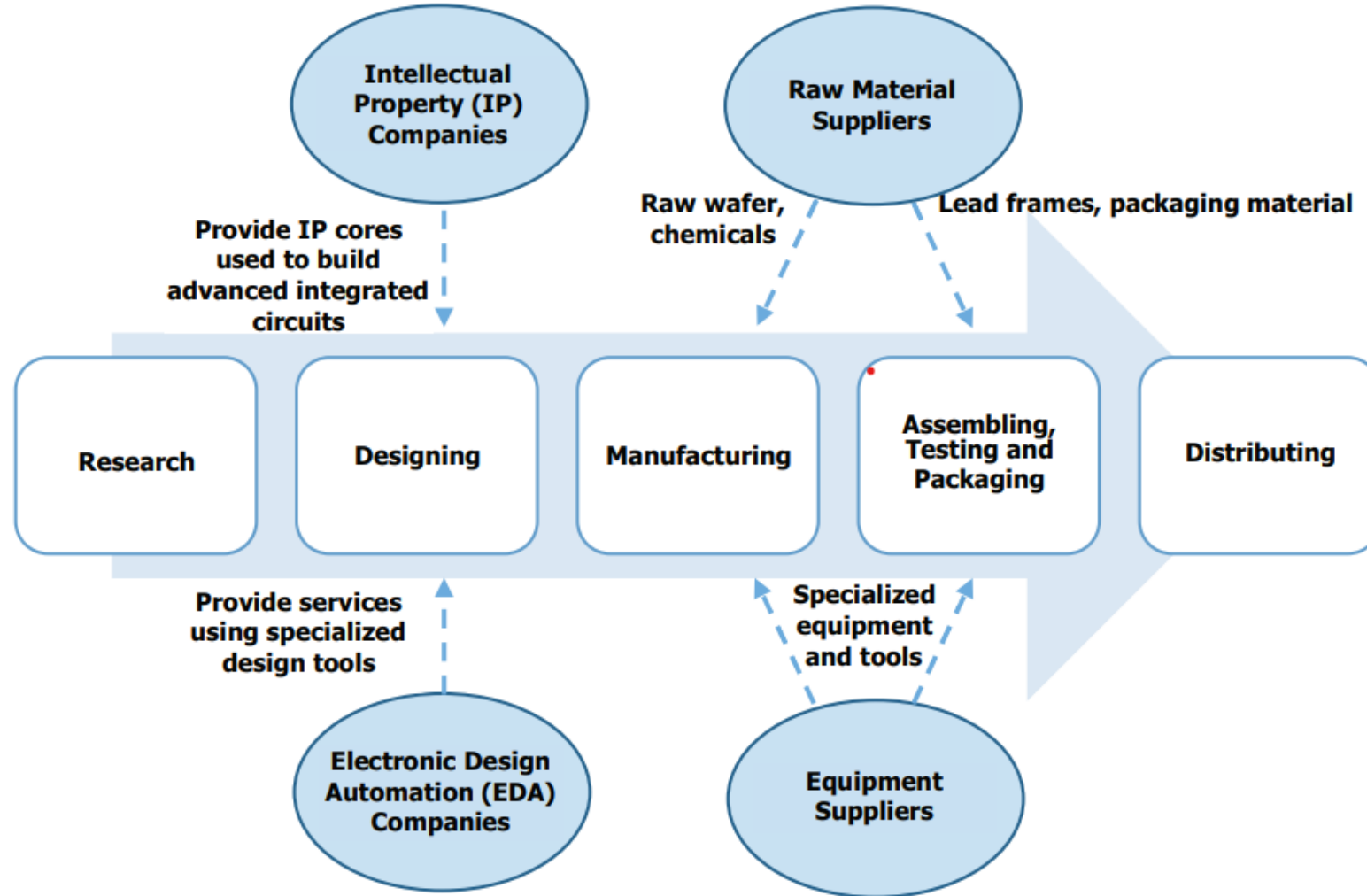


# Semiconductor Package, Assembly, and Testing





# Semiconductor Ecosystem

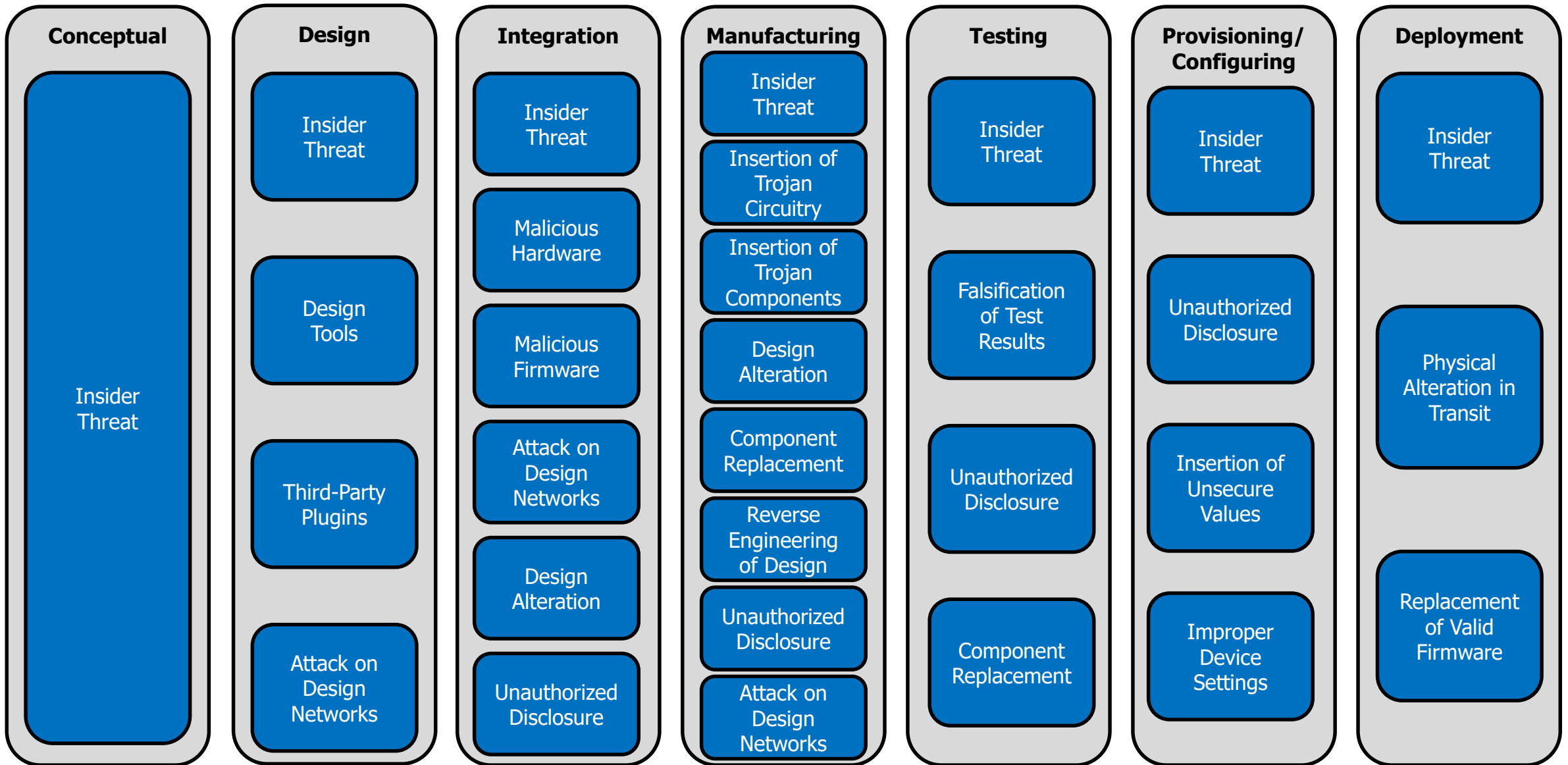


Source: <https://www.semiconductors.org/wp-content/uploads/2018/06/SIA-Beyond-Borders-Report-FINAL-June-7.pdf>





# Supply Chain Threat Vectors by Lifecycle Stage



Source: <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/supply-chain-threats-v1.pdf>, p8.

## Beyond Borders: Semiconductors are a Uniquely Global Industry

Typical semiconductor production process spans multiple countries: 4+ Countries, 4+ States, 3+ trips around the world, 25,000 miles travelled, 100 days TPT, 12 days in transit



**\$1,340 Billion** in Global Trade

### Top Participants in Global Trade: Semiconductor Goods

China	USA	Mexico
Hong Kong	Malaysia	Thailand
Singapore	Japan	France
Taiwan	Germany	Viet Nam
Korea	Philippines	Netherlands

**\$36.8 Billion** in Global Trade

### Top Participants in Global Trade: Fabrication Material Goods

China	Taiwan	Norway
USA	UAE	Mexico
Japan	Singapore	Netherlands
Germany	UK	France
Korea	Italy	Brazil

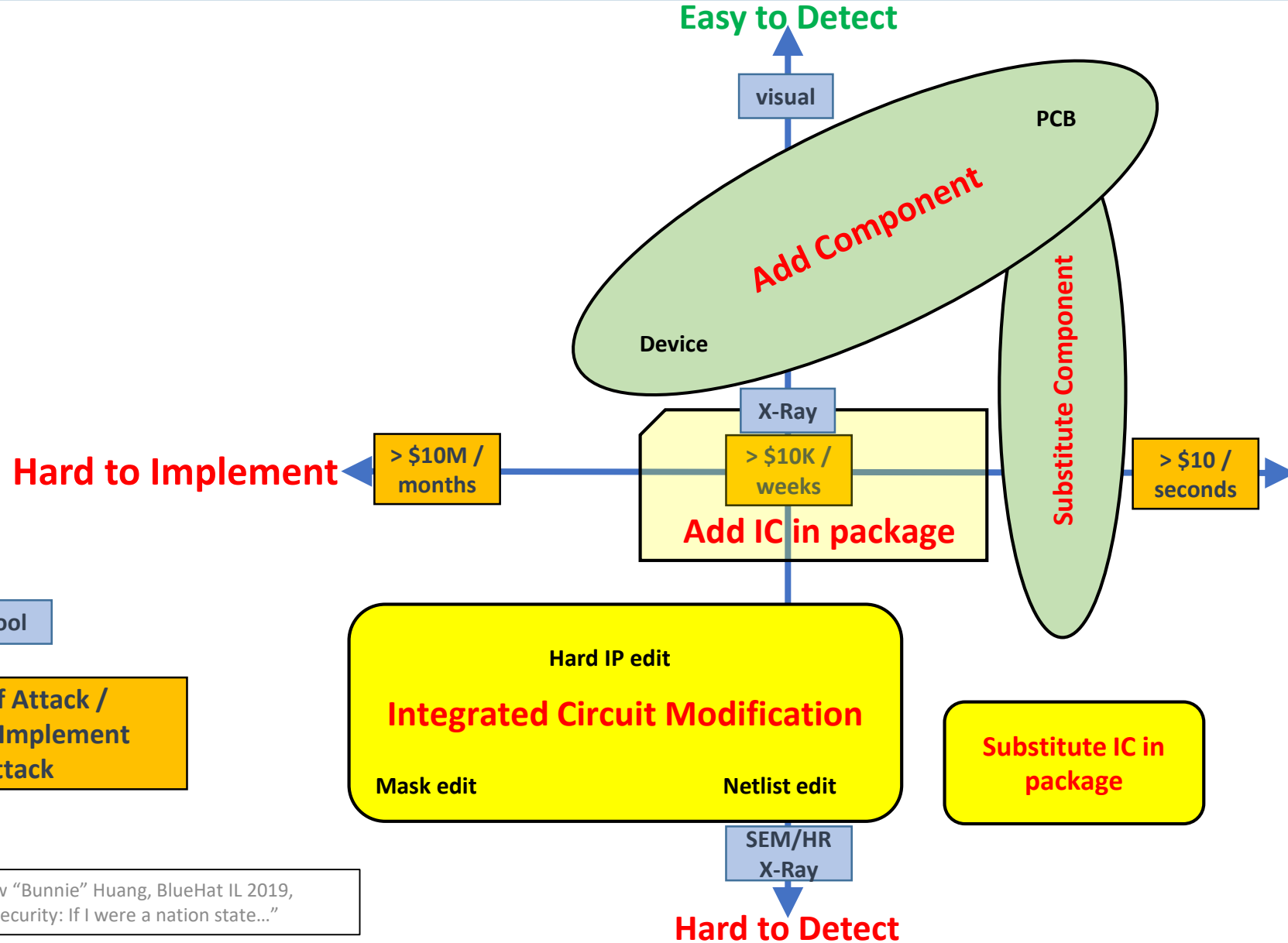
**\$23.7 Billion** in Global Trade

### Top Participants in Global Trade: Assembly, Test, Packaging Goods

China	France	Mexico
Germany	Korea	Netherlands
USA	Hong Kong	Poland
Japan	Italy	Canada
Taiwan	UK	Belgium



# Types of Microelectronics Supply Chain Attacks



Source: Andrew "Bunnie" Huang, BlueHat IL 2019, "Supply Chain Security: If I were a nation state..."



## **12 April 2021 White House CEO Summit on Semiconductor and Supply Chain Resilience**

The semiconductor shortage, which is impacting American workers and families right now, is a top and immediate priority for the President and his senior most advisors on economic and national security. The White House heard directly from industry leaders on the impact of the chip shortage and discussed short and long-term approaches to address it. Participants emphasized the importance of improving transparency in the semiconductor supply chain to help mitigate current shortages and improving demand forecasting across the supply chain to help mitigate future challenges. They also discussed the importance of encouraging additional semiconductor manufacturing capacity in the United States to make sure we never again face shortages. Finally, they discussed how the President's infrastructure investments in the American Jobs Plan strengthen America's competitiveness and national security by building the infrastructure of tomorrow and strengthening supply chain resilience — ensuring that the United States remains a global leader in critical technologies and the transition to a clean energy future.

Source: <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/12/readout-of-white-house-ceo-summit-on-semiconductor-and-supply-chain-resilience/>



## **23 September 2021 White House Semiconductor Convening**

WASHINGTON (SBG) — The White House is taking new steps to alleviate a semiconductor shortage that has disrupted global supply chains and delayed shipments of goods for over a year, but experts say the problem is still likely to persist well into 2022 or longer.

Commerce Secretary Gina Raimondo and National Economic Council Director Brian Deese met with industry representatives Thursday to discuss efforts to address supply chain bottlenecks and increase communication and transparency.

In a report this week, consulting firm AlixPartners estimated the computer chip shortage would cost the auto industry alone \$210 billion this year. Even though demand for new vehicles is high, manufacturers have been forced to slash production because of delays obtaining semiconductors from companies in Asia. In addition, the White House called on Congress to bolster domestic semiconductor design, research, and production and create a new supply chain resiliency program at the Commerce Department.



## Carl M's Recommendations by Area

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- Research and Development
- Design
- Fabrication (Manufacturing)
- Package, Assembly, & Testing
- Board Assembly
- Logistics



[www.darpa.mil](http://www.darpa.mil)



# RESOURCES



[eLearn: DOD Supply Chain Fundamentals](#)

[eLearn: Contracting for the Rest of Us](#)

[eLearn: Thwarting the Enemy: Providing Counterintelligence & Threat Awareness to the Defense Industrial Base](#)

[eLearn: Supply Chain Risk Management for Information and Communications Technology](#)

[eLearn: Introduction to Risk Management](#)

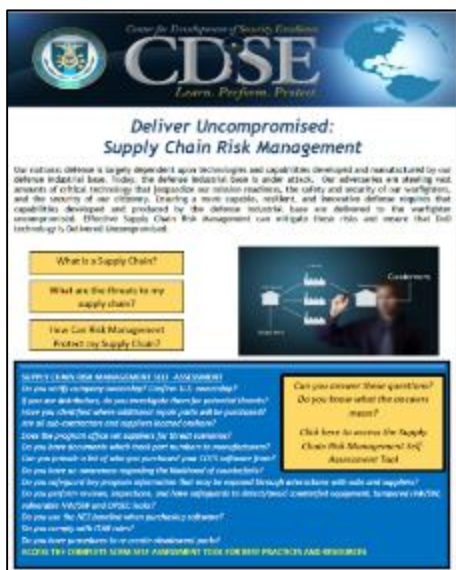
[Job Aid: Supply Chain Risk Management](#)

[Job Aid: Software Supply Chain Attacks](#)

[Job Aid: Baker's Dozen: 13 Elements of an Effective SCRM Program](#)

[Job Aid: Framework for Assessing Risks](#)

[Director of National Intelligence Supply Chain Toolkit](#)



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<https://www.cdse.edu/Training/Toolkits/Counterintelligence-Awareness-Toolkit/>





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Date	Title
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## CDSE Counterintelligence Awareness

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