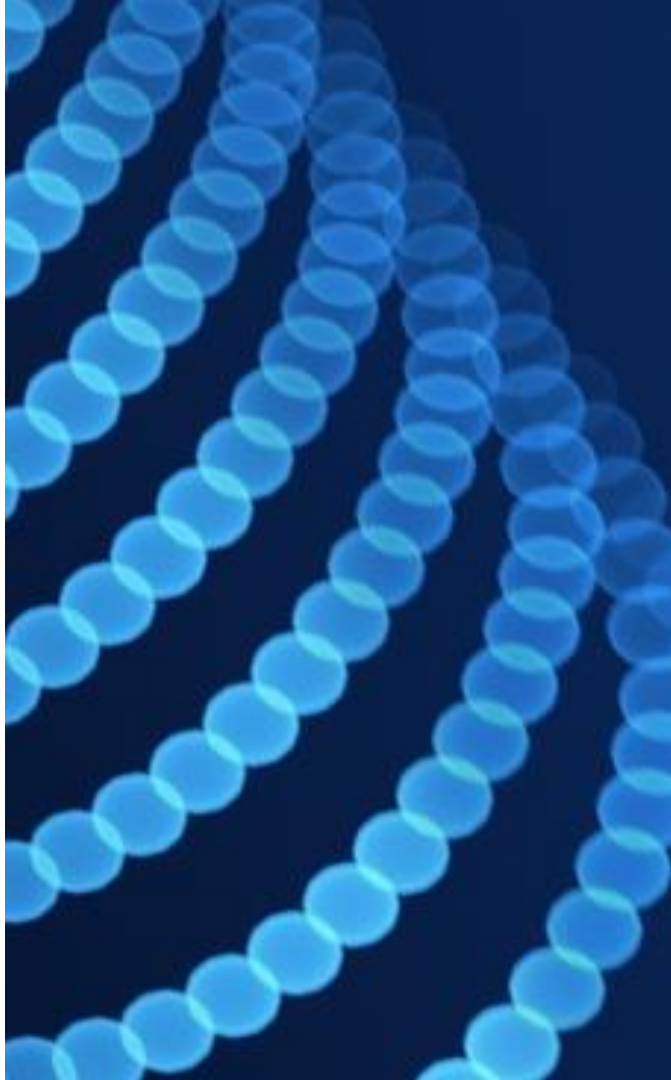
Supply Chain Security – an Evolution

Uptane Workshop
3/31/2023

Discussion

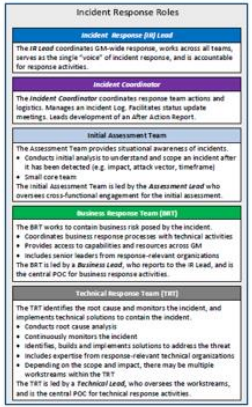
- IR example
- GM supply chain security viewpoints
- New approach

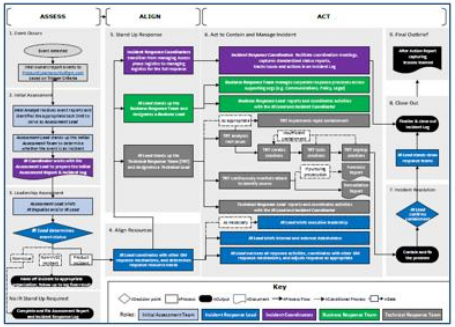


History: Incident Response Circa 2015

IR Program Creation (2015)

- Build ***resources*** for role familiarity
  - Who does what?
- Develop ***plans*** for consistent execution
  - How do I do it?
- Conduct ***exercises***
  - Enhance role familiarity
  - Enhance IR enterprise awareness
  - Stress-test plans





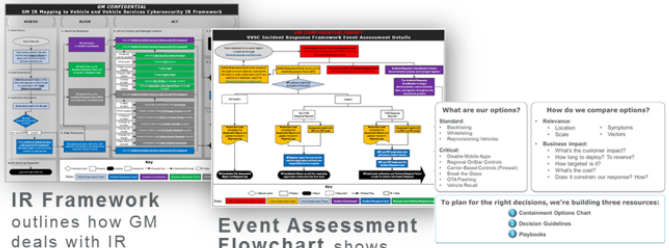
History: Incident Response Circa 2015

PROCESS MAKES PERFECT…OR DOES IT?

IR Plan defines and documents GM approach to incident response

Capability Roadmap and **Exercise Program Plan** provides plan to mature GM IR capabilities

Resources



IR Framework outlines how GM deals with IR across the enterprise

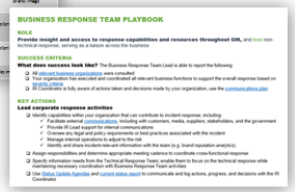
Event Assessment Flowchart shows how to determine if an issue is a cyber event

Containment Options Chart details options for rapid response

Incident Response Log used by team to report actions

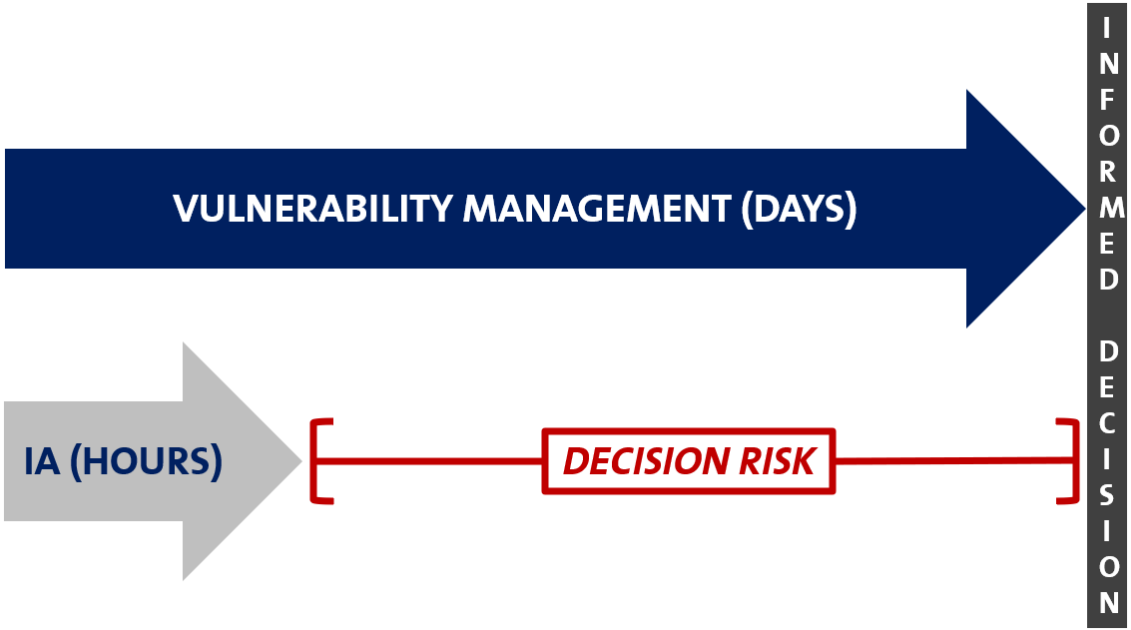
Incident Response Report used by team to consistently report status

Severity Criteria provides guidance on how response should be tailored to scale and potential impact of incidents

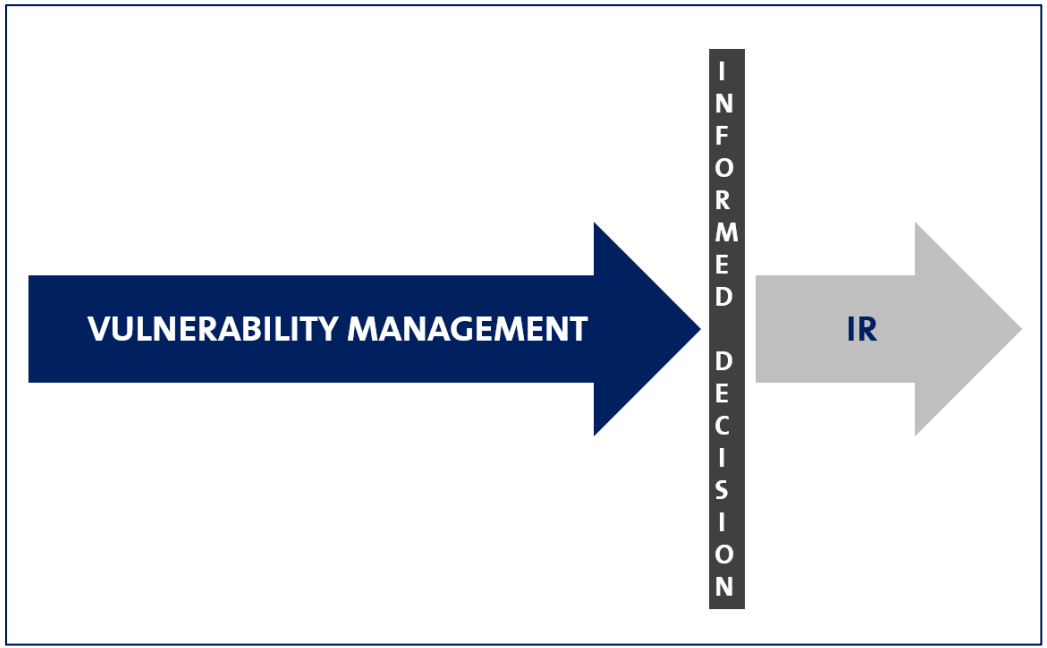


Playbooks provides details on how to respond by role

VM and IR Viewed Separately Circa 2015

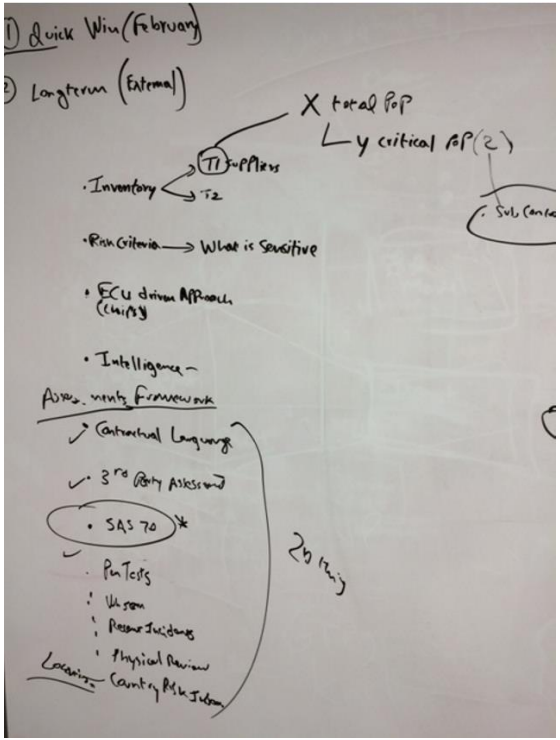


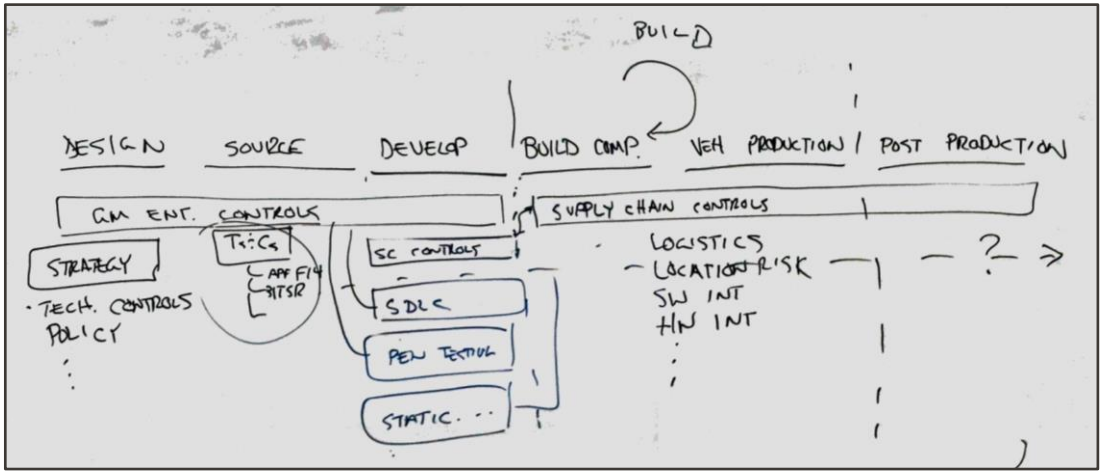
Holistic VM View



IR IS INSEPARABLE FROM VM

C-SCRM Focus Circa 2015





3rd Party Audit Focus Circa 2015

SOC 2 Reports cover controls relevant to a system's…
- Security (physical and logical)
- Confidentiality
- Processing Integrity
- Availability
- Privacy

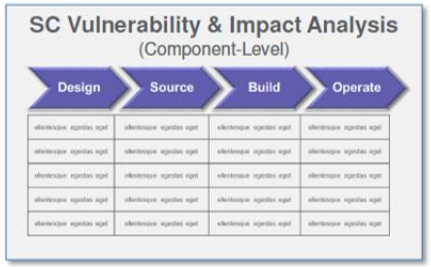
…and attest to a service org's ability to maintain controls (vs. snapshot in time)

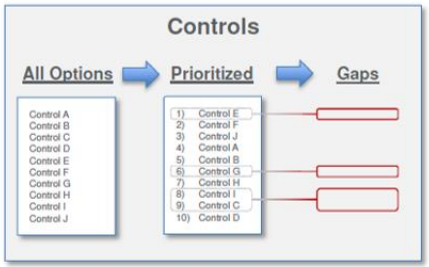
Goal: achieve specific business objectives (e.g., delivery of services, production of goods) in accordance with ***management-specified requirements***.
- Components
  - *Infrastructure*. The physical structures, IT, and other hardware (e.g., facilities, computers, equipment, mobile devices, and telecommunications networks).
  - *Software*.
  - *People*.
  - *Processes*.
  - *Data*.

3rd Party Compliance Focus Circa 2015

INITIAL STRATEGY

Today





Early Fall 2015

- Repeatable method for SC risk assessment
- Ideal questions to ask of the data lake (e.g., who owns source code for Part X?)
- Optimized control plan
  - Will look at end-of-line flashing as one of many options
  - Analyzed by cost/benefit
  - Recommendation plan for foundational SC controls; advanced controls to follow

Circa 2015: Hardware Integrity Attestation - DARPA SHIELD

SHIELD: The DARPA Supply Chain Solution

- Full AES encryption engine with on-dielet key storage
- Passive sensors to detect dielet tamper attempts
- Physical fragility designed in to thwart removal
- Unique serial ID

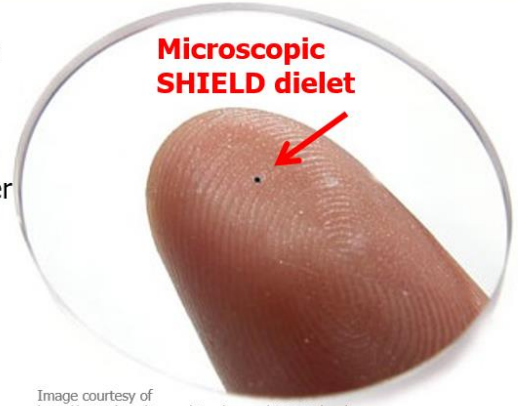


Image courtesy of
http://www.hitachi.com/New/cnews/030902.html

- 100µm x 100µm
- 50µW total power
- Less than $0.01 per-dielet cost
- Wireless power and communication (connection made through external probe)

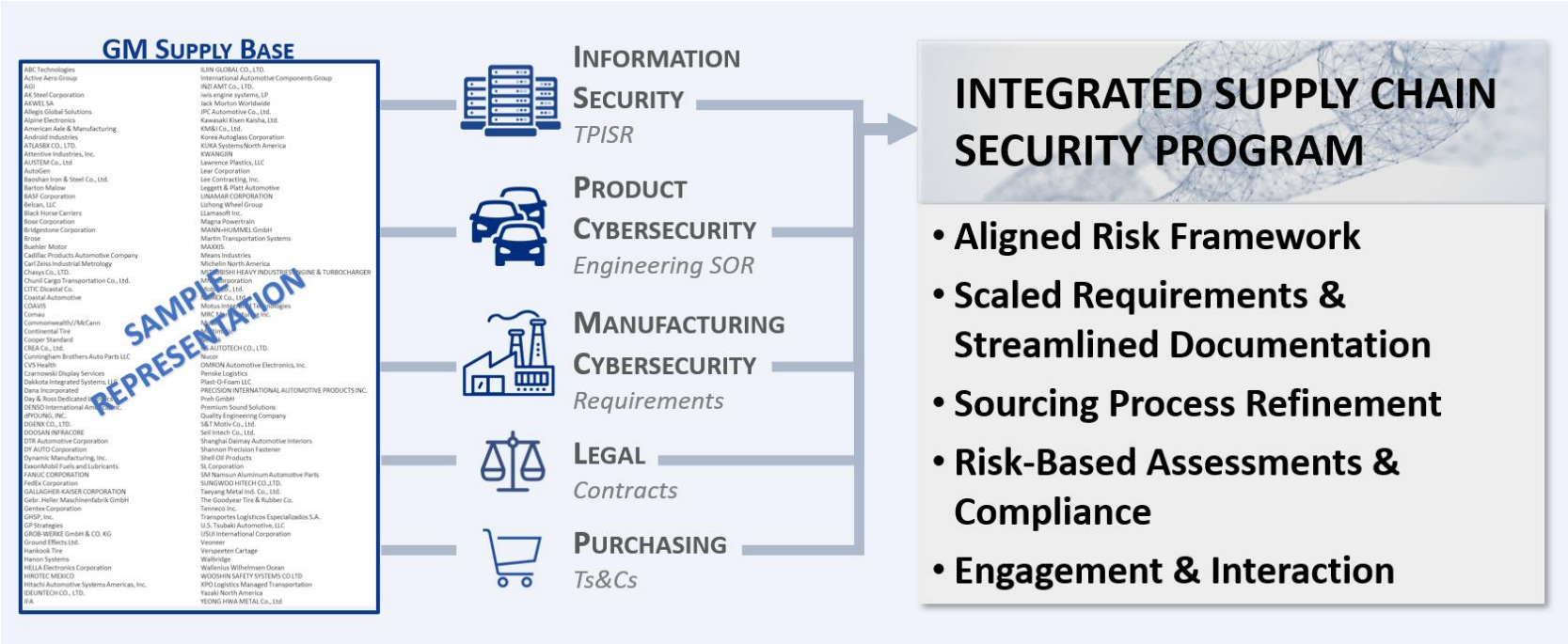
The SHIELD dielet, installed in the package of the integrated circuit, will provide 100% assurance against many common supply chain threats. Physically fragile with on-board industry standard encryption, SHIELD will be highly resistant to cloning and spoofing attempts.

SHIELD makes counterfeiting too expensive and too hard to do.

2015 Software Supply Chain Security Assurance Activities

- Suppliers write majority of the code
  - Performed binary SCA analysis
  - Required static code analysis
- OSS SBOM submission requirement for license compliance (OSS team moved to PCYS team in 2017)
  - Manual CVE mapping not ideal, but possible
- Internal and 3rd-party pentests
- Explored sub-tier hardware attestation requirements
  - Industry-wide adoption prospects were dim

2019 focus: Cross-functional Cyber Domain C-SCRM



Recent: NIST CSF, log4j, NHTSA, EO 14028, SSDF, NCS …

ID.AM-1: Physical devices and systems within the organization are inventoried

ID.AM-2: Software platforms and applications within the organization are inventoried

4.2.6 Inventory and Management of Software Assets on Vehicles

[G.10] Manufacturers should maintain a database of operational software components[19,20] used in each automotive ECU, each assembled vehicle, and a history log of version updates applied over the vehicle's lifetime.

[G.11] Manufacturers should track sufficient details related to software components,[21] such that when a newly identified vulnerability is identified related to an open source or off-the-shelf software,[22] manufacturers can quickly identify what ECUs and specific vehicles would be affected by it.

THE CYBERSECURITY 202

An 'ingredients list' for software could help prevent the next log4j

CISA warns 'most serious' Log4j vulnerability likely to affect hundreds of millions of devices

CISA's director said that the vulnerability "is one of the most serious I've seen in my entire career, if not the most serious."

(x) ensuring and attesting, to the extent practicable, to the integrity and provenance of open source software used within any portion of a product.

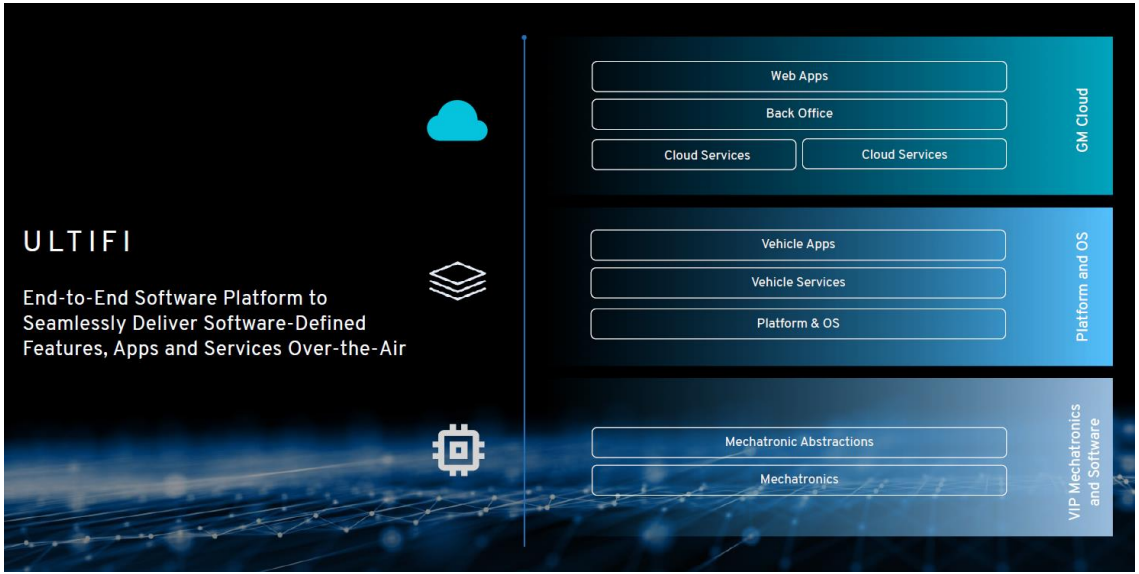
Example 4: Require third parties to provide provenance[5] data and integrity verification mechanisms for all components of their software.

Secure Software Development Framework (SSDF) Version 1.1:

Recommendations for Mitigating the Risk of Software Vulnerabilities

develop and maintain their software products and services. This safe harbor will draw from current best practices for secure software development, such as the NIST Secure Software Development Framework. It also must evolve over time, incorporating new tools for secure software development, software transparency, and vulnerability discovery.

Today: SDV == VM Effort ↑



> General Motors is now a platform company and working with Red Hat is a critical element in advancing our Ultifi software development. Incorporating the company's expertise in open source solutions and enterprise networks will pay dividends as we aim to provide the most developer-friendly software platform in the industry.
>
> **Scott Miller**
> Vice President, Software Defined Vehicle and Operating System, General Motors

Vehicle as a Platform

- Before
  - Suppliers wrote most application code
- Now
  - GM is writing a lot of code

- A paradigm shift
  - Cultural
  - Procedural
  - Practical

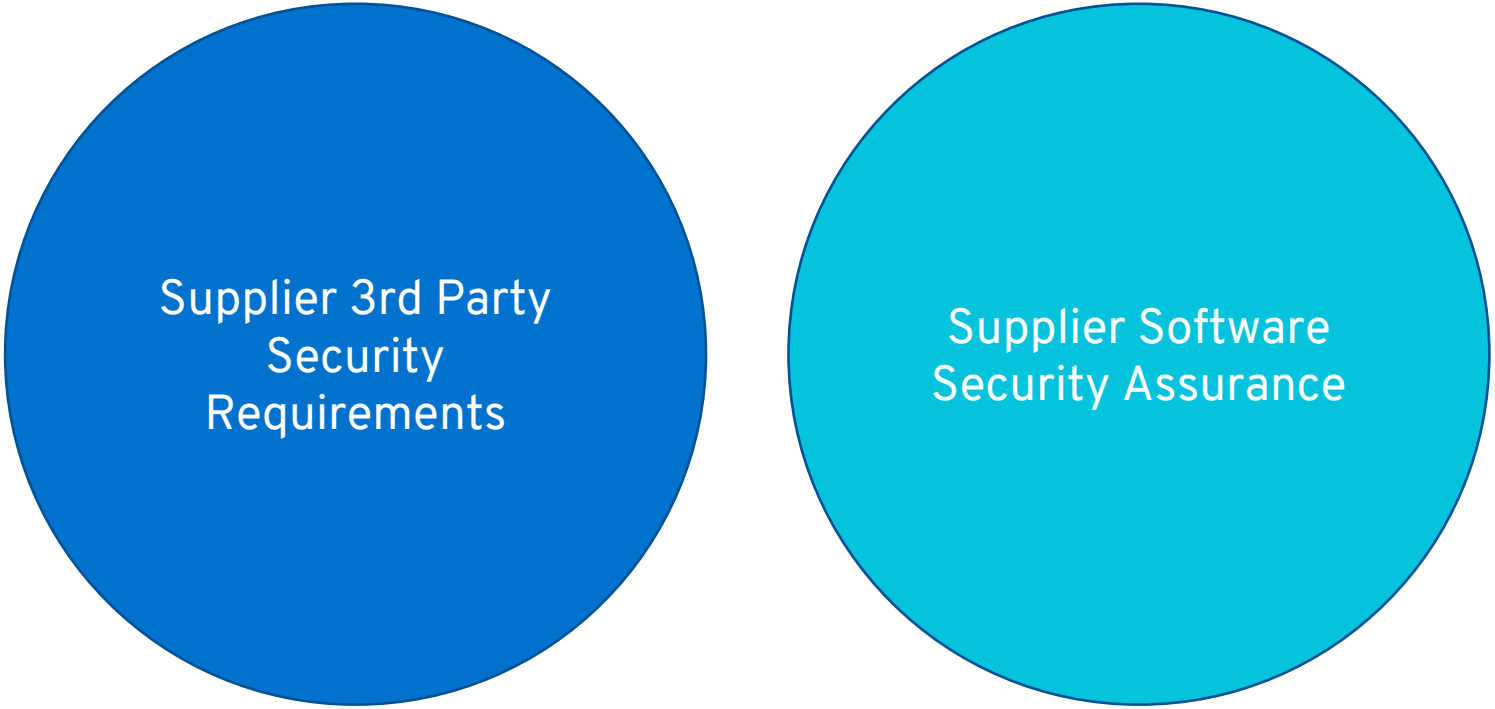
Internal Software Supply Chain Security Assurance

- DevSecOps establishment
  - Secure coding policies
  - SCA source code scans supporting multiple platform CI/CD build chains
- SBOM creation, ingestion, analysis
  - Basis for VM / threat monitoring
  - Inform pen test and TARA modeling

DevSecOps helps ensure that security is addressed as part of all DevOps practices by integrating security practices and automatically generating security and compliance artifacts throughout the processes and environments, including software development, builds, packaging, distribution, and deployment. This is important for several reasons, including:

- reducing vulnerabilities, malicious code, and other security issues in released software without slowing down code production and releases;
- mitigating the potential impact of vulnerability exploitation throughout the software lifecycle, including when the software is being developed, built, packaged, distributed, deployed, and executed on dynamic hosting platforms;
- addressing the root causes of vulnerabilities to prevent recurrences, such as strengthening test tools and methodologies in the toolchain, and improving practices for developing code and operating hosting platforms; and

Supply Chain Security Viewpoints



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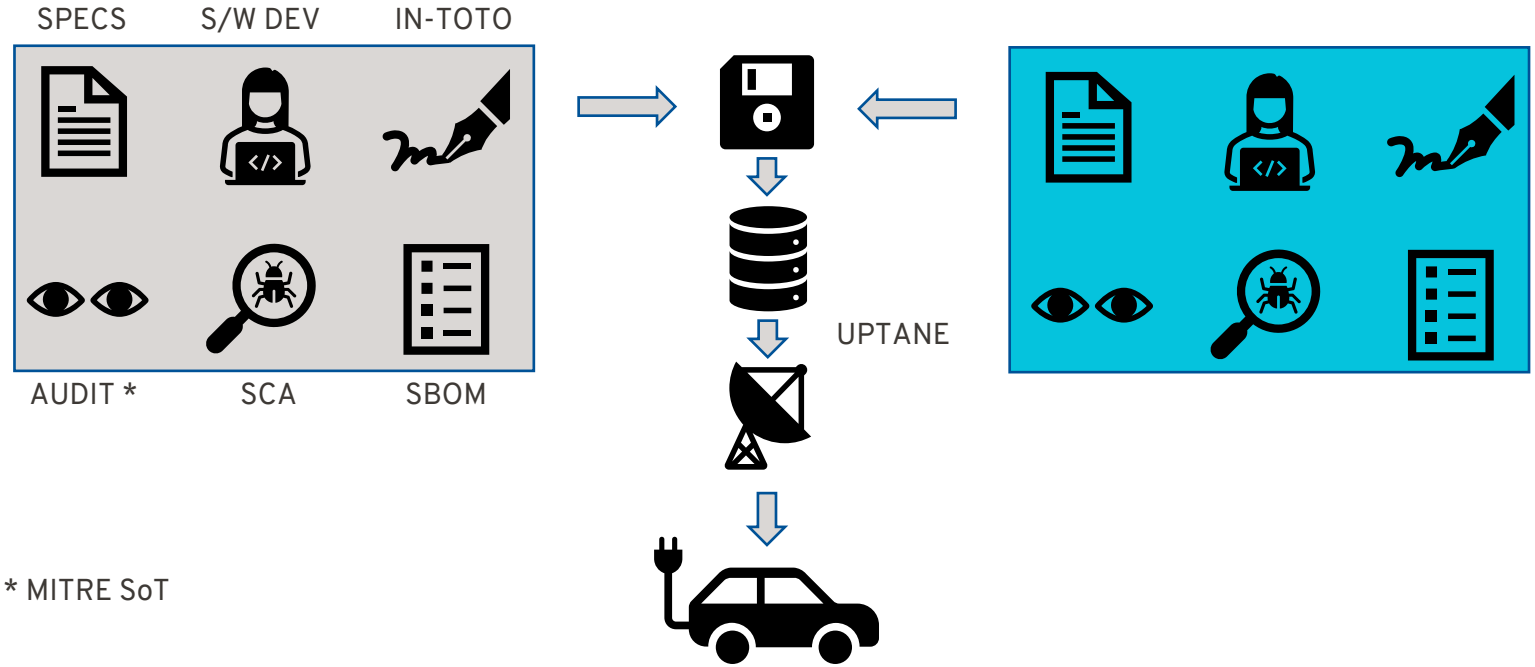

* MITRE SoT

SUPPLY CHAIN SECURITY IS INSEPARABLE FROM VM