Does your DevSecOps Pipeline only Function as Intended?

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Document Markings

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Agenda

About DevSecOps

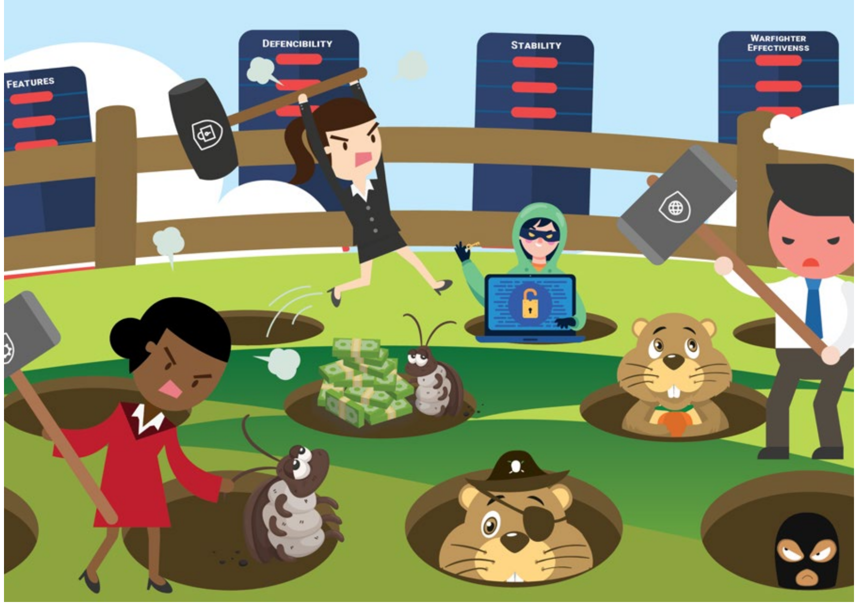
Challenges associated with DevSecOps

- **Challenge 1: Connecting process, practice, and tools**
- **Challenge 2: Cybersecurity of pipeline and product**

Addressing the Cybersecurity challenges with MBSE

About DevSecOps

Today: Program Office Whac-A-Mole



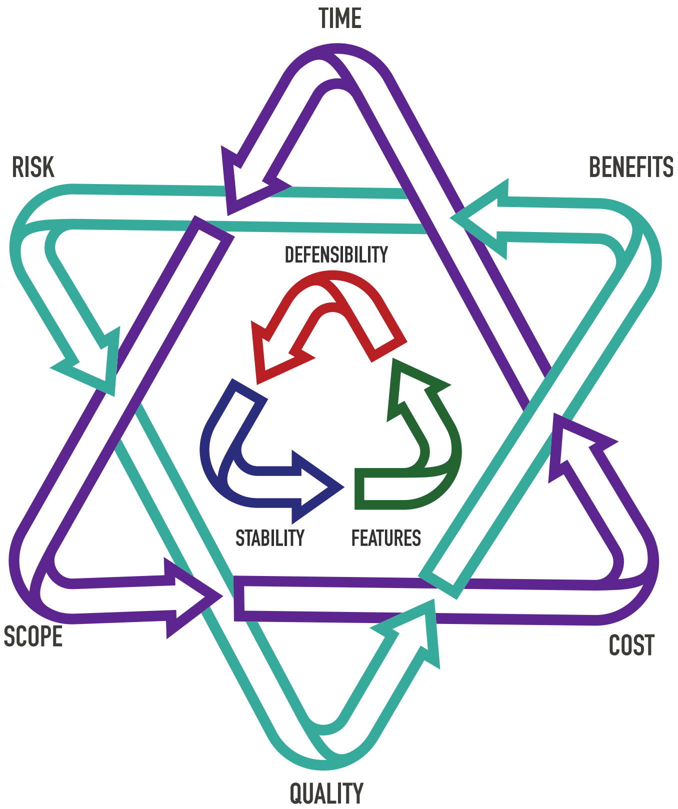
Winning in Features and Effectiveness, but Losing in Defensibility and Stability

In June of 2020 a generally successful DoD program completed an **8 week "Hardening the Software Factory" effort** in order to address **accumulated technical debt** and to address **insufficient security and operations** practices **due to the narrow focus on speed of delivery**.

These things occur, even in small relatively successful programs, when technical debt and insufficient security and operational practices are in place **due to lack of knowledge, experience, and reference material to fully design and execute an integrated DevSecOps strategy in which all stakeholder needs, including cybersecurity, are addressed.**

While playing Whac-A-Mole is inevitable, instead of missing the holes, or constantly hitting the same hole, the key is to fill in the holes.

DevSecOps: Modern Software Engineering Practices and Tools that Encompass the Full Software Lifecycle



DevSecOps is a cultural and **engineering practice** that breaks down barriers and opens **collaboration between development, security, and operations** organizations **using automation** to focus on rapid, frequent delivery of secure infrastructure and software to production. It encompasses intake to release of software and manages those flows predictably, transparently, and with minimal human intervention/effort [1].

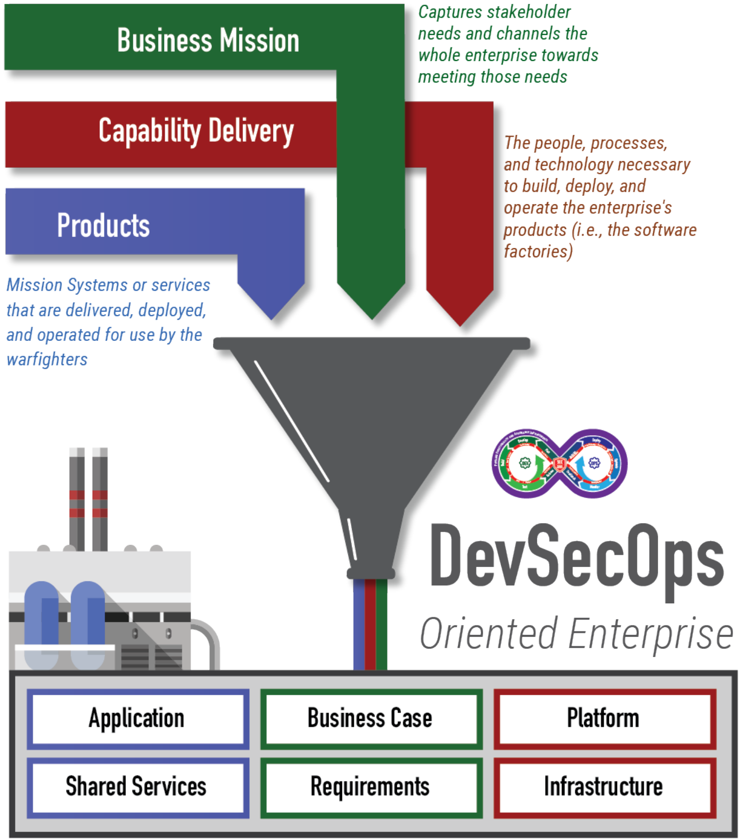
A **DevSecOps Pipeline** attempts to seamlessly integrate “three traditional factions that sometimes have opposing interests:

- **development**; which values features;
- **security**, which values defensibility; and
- **operations**, which values stability [2].”

Not only does one need to balance the factions. They must do so in a way that balances **risk**, **quality** and **benefits** within their **time**, **scope**, and **cost** constraints.

[1] DevSecOps Guide: Standard DevSecOps Platform Framework. U.S. General Services Administration. https://tech.gsa.gov/guides/dev_sec_ops_guide. Accessed 17 May 2021
[2] DevSecOps Platform Independent Model, https://cmu-sei.github.io/DevSecOps-Model/

An Enterprise View



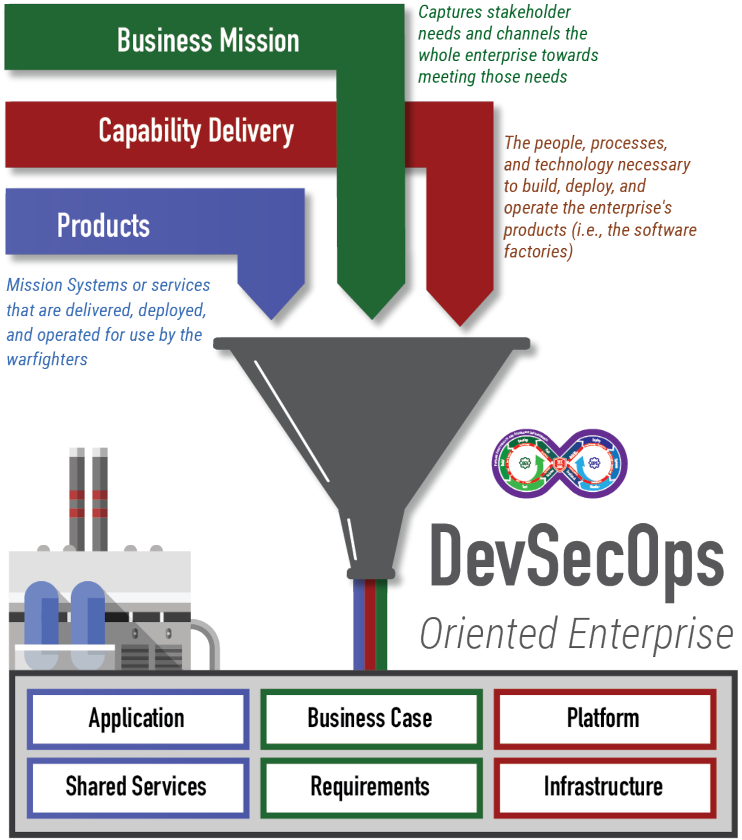
All DevSecOps-oriented enterprises are driven by three concerns:

- **Business Mission** – captures stakeholder needs and channels the whole enterprise in meeting those needs. It answer the questions *Why* and *For Whom* the enterprise exists
- **Capability to Deliver Value** – covers the people, processes, and technology necessary to build, deploy, and operate the enterprise's products
- **Products** – the units of value delivered by the organization. Products utilize the capabilities delivered by the software factory and operational environments.

Challenges Associated with DevSecOps

Carnegie Mellon University Software Engineering Institute

Challenge 1: connecting process, practice, and tools



Creation of the DevSecOps (DSO) pipeline for building the product is not static.

- Tools for process automation must work together and connect to the planned infrastructure
- Infrastructure and shared services are often maintained across multiple organizations (Cloud for infrastructure, third parties for tools and services, etc.)
- Processes, practices, and tools must evolve to meet the needs of the products being built and operated

Many valid approaches to implementation[1]

George Box is famously quoted as saying, “All models are wrong but some are useful.” The same can be said for the various Agile and DevSecOps methods, as much of the material around Agile and DevSecOps assumes a simplification or idealization of a model development team.

The key to successful Agile and DevSecOps implementation is understanding how you will instantiate the Agile manifesto, Agile principles and DevSecOps principles.

The principles have implications for the characteristics of the lifecycle that can be used. But there’s still more than one valid way of implementing the principles…

Many Valid Approaches to Implementation[2]

- The family of Agile and DevSecOps methods has grown since 2000 to incorporate techniques that address team, project, and enterprise levels of scaling.
- Hybrids of multiple methods and techniques are common practice in both industry and government.
- This is one reason it’s so difficult to say a program is “Agile” or “doing DevSecOps correctly,” or not.
- To succeed, you must select the correct techniques, regardless of chosen methods, to meet your organization’s and customer’s goals, objectives, and missions.

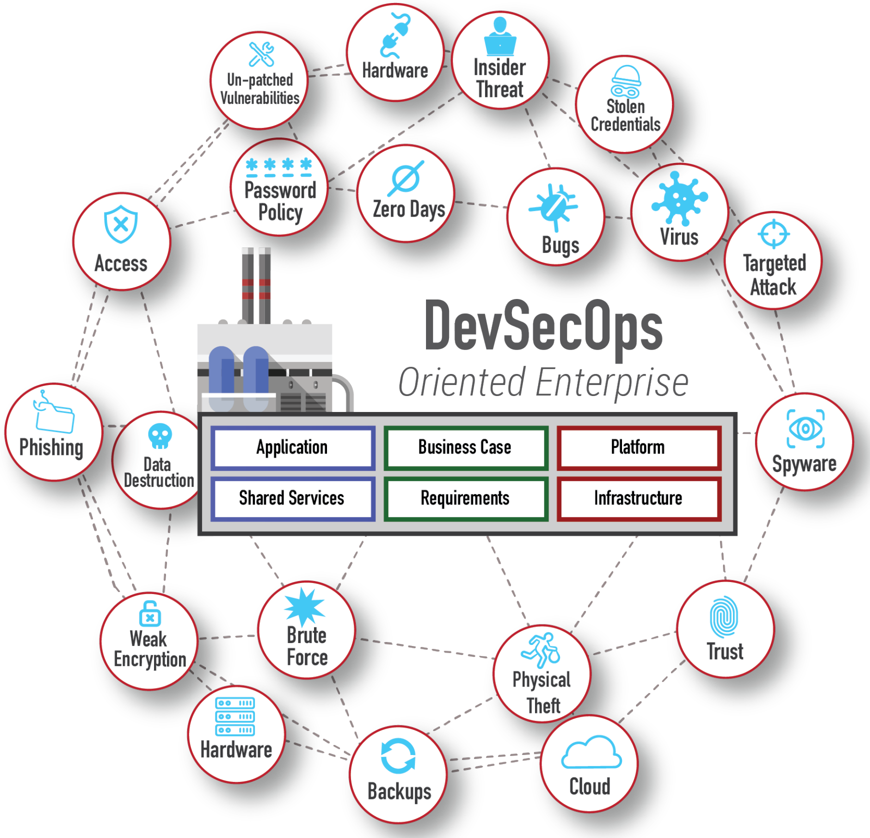
Selecting the Appropriate Techniques

Three Fundamental Factors

1. Identifying **the ability of the organization** to adopt new techniques
   - Successful adoption requires the absorption of associated costs, as well as expending the required time and effort.
2. Determining **the suitability of Agile and DevSecOps practices in the development** of a given product or system
   - Development and product characteristics play a large role in determining the suitability of a particular agile technique.
   - The desired product qualities also play a role in determining appropriate agile technique
3. Determining **the suitability of Agile and DevSecOps practices for the organization** developing the product or system

Adapted from Sidky, Ahmed; James Arther, *Determining the Applicability of Agile Practices to Mission and Life-critical Systems,* Proceedings of the 31st IEEE Software Engineering Workshop (SEW 2007). pp 3-12.

Challenge 2: Cybersecurity of Pipeline and Product



The tight integration of Business Mission, Capability Delivery, and Products, using integrated processes, tools, and people, increases the attack surface of the product under development.

Managing and monitoring all the various parts to ensure the product is built with sufficient cybersecurity and the pipeline is maintained to operate with sufficient cybersecurity is complex.

How do you focus attention to areas of greatest concern for security risks and identify the attack opportunities that could require additional mitigations?

Software Assurance (SwA)

DoD definition:

"the level of confidence that software is free from vulnerabilities, either intentionally designed into the software or accidentally inserted at anytime during its lifecycle, and that the **software functions in the intended manner**."

[CNSS Instruction No. 4009; DoDi 5200.44 p.12]

SwA Curriculum Model definition:

Application of technologies and processes to achieve a required level of confidence that **software systems and services function in the intended manner**, are free from accidental or intentional vulnerabilities, provide security capabilities appropriate to the threat environment, and recover from intrusions and failures.

[Mead, Nancy; Allen, Julia; Ardis, Mark; Hilburn, Thomas; Kornecki, Andrew; Linger, Richard; & McDonald, James. *Software Assurance Curriculum Project Volume I: Master of Software Assurance Reference Curriculum.* CMU/SEI-2010-TR-005. Software Engineering Institute, Carnegie Mellon University. 2010. http://resources.sei.cmu.edu/library/asset-view.cfm?AssetID=9415]

Risk

The perception of risk drives assurance decisions

- Assurance implementation choices (policies, practices, tools, restrictions) are based on the perception of threat and the expected impact should that threat be realized
- Perceptions are primarily based on knowledge about successful attacks
  - the current state of assurance is largely reactive
  - successful organizations learn from attacks and figure out how to react and recover faster and be vigilant in anticipating and detecting attacks
- Misperceptions are failures to recognize threats and impacts – "how could it happen to us?" or "it could not happen here!"

Interactions

Highly connected systems require alignment of risk across all stakeholders and systems otherwise critical threats will be unaddressed (missed, ignored) at different points in the interactions.

- There are costs to addressing assurance which must be balanced against the impact of the risk.
- Risk must also be balanced with other opportunities/needs (performance, reliability, usability, etc.).
- Interactions occur at many technology levels (network, security appliances, architecture, applications, data storage, etc.) and are supported by a wide range of roles.

Trusted Dependencies

Your assurance depends on other people's decisions and the level of trust you place on these dependencies:

- Each dependency represents a risk
- Dependency decisions should be based on a realistic assessment of the threats, impacts, and opportunities represented by an interaction.
- Dependencies are not static and trust relationships should be reviewed to identify changes that warrant reconsideration.
- Using many standardized pieces to build technology applications and infrastructure increases the dependency on other's assurance decisions.

Attacker

There are no perfect protections against attacks.

There exists a broad community of attackers with growing technology capabilities able to compromise the confidentiality, integrity, and availability of any and all of your technology assets, and the attacker profile is constantly changing.

- The attacker uses technology, processes, standards, and practices to craft a compromise (socio-technical responses).
- Attacks are crafted to take advantage of the ways we normally use technology or designed to contrive exceptional situations where defenses are circumvented.

Mitigating Risk with Assurance Cases

Understanding risk is hard!

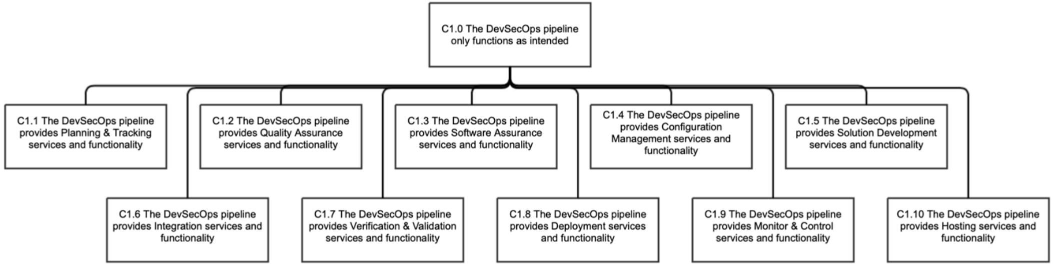
Without being able to quantify, or reason around, the cybersecurity risks associated with your product and DevSecOps pipeline, you will not be able to:

- properly balance between features, defensibility, and stability
- make necessary trade-off choices to achieve your organization’s mission and vision in a cost-effective way

An assurance case can be used to reason about the adequacy for both the pipeline and the product.

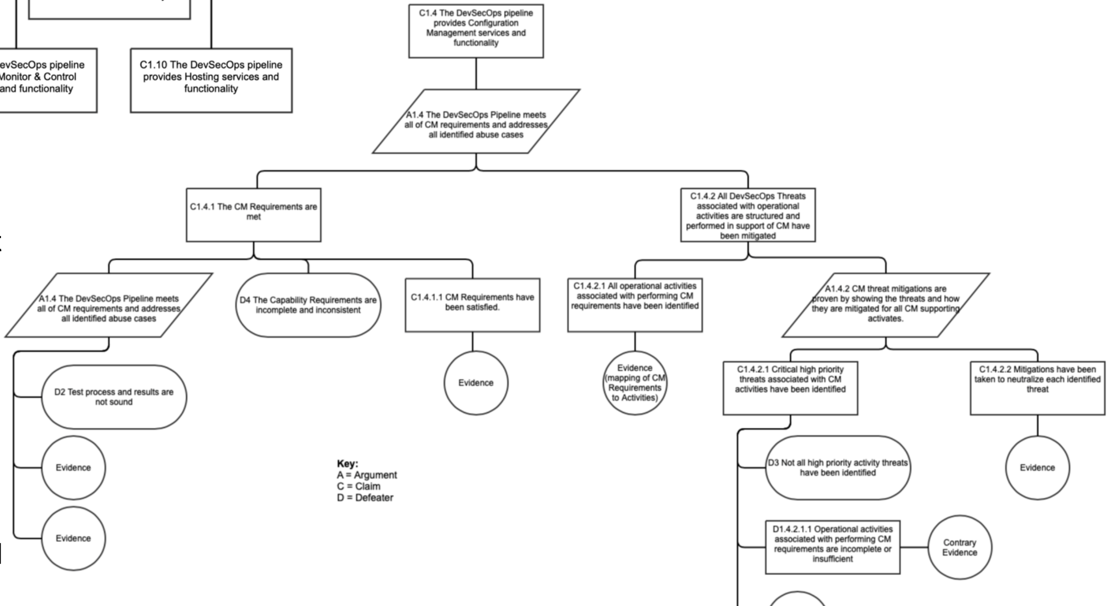
- It is a structured approach used to argue that available evidence supports a given claim
- It provides the organization with the basis for making risk-based choices tied to assuring that the pipeline only functions as intended.
- It provides requirements for automated systems testing, or other evidence collection techniques.
- Actual test results provide the evidence needed to support the assurance claims.

Structuring a DevSecOps Assurance Case



Assurance cases are composed of the following elements:

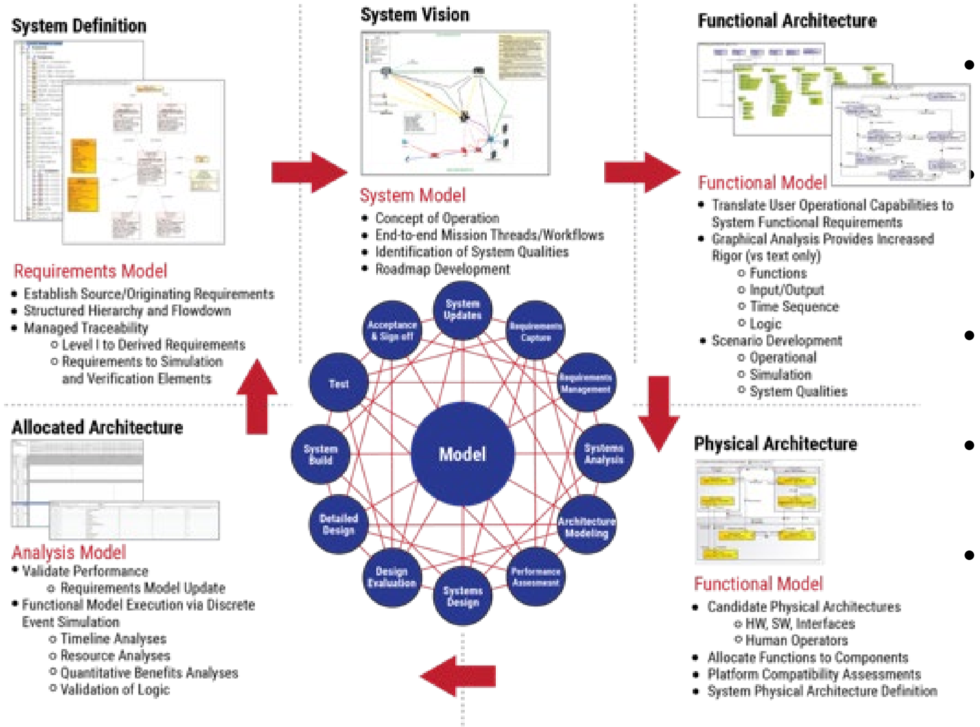
- Claims– "assertions put forward for general acceptance. They are typically statements about a property of the system or some subsystem. Claims that are asserted as true without justification become assumptions and claims supporting an argument are called subclaims [1]."
- Arguments – "link the evidence to the claim [1]" by stating the assumption(s) on which the claim and the evidence are built upon.
- Evidence – "Evidence that is used as the basis of the justification of the claim. Sources of evidence may include the design, the development process, prior field experience, testing, source code analysis or formal analysis [1]."
- Defeaters – "possible reasons for doubting the truth of a claim [2]."



[1] Bloomfield, R. E. and Netkachova, K. Building Blocks for Assurance Cases. Paper presented at the International Symposium on Software Reliability Engineering (ISSRE), 03-11-2014 - 06-11-2014, Naples, Italy.
[2] Goodenough, John B., Charles B. Weinstock, Ari Z. Klein. Toward a Theory of Assurance Case Confidence, CMU/SEI-2012-TR-002 September 2012.

Addressing the Cybersecurity Challenge with MBSE

Model Based Systems Engineering

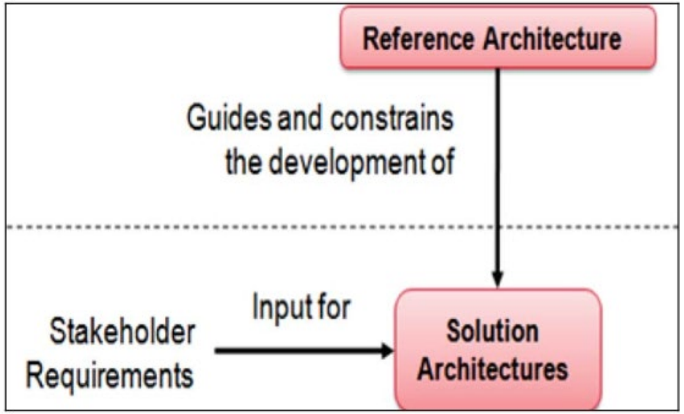


*The Digital System Model contains the most current requirements, key mission/business operations, architecture, design details, implementation details, test and evaluation details, and supporting documentation.

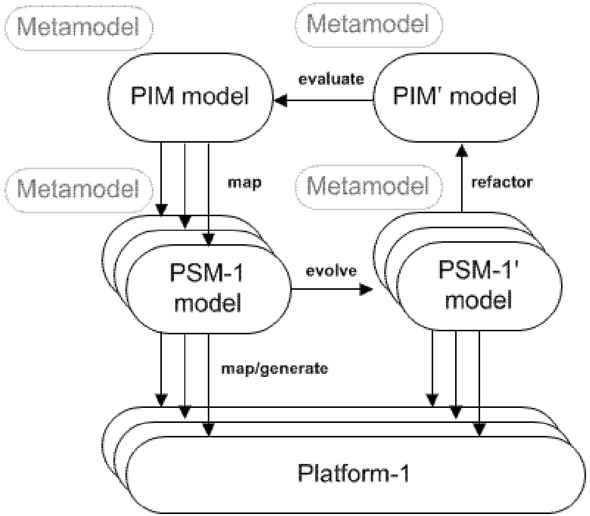
- ***Not* yesterday's Document-Centric Systems Engineering!**
- MBSE uses a Digital System Model* to facilitate common system understanding and decision-making.
- The Digital System Model* is the single authoritative source of truth
- System and Components can be integrated at various levels of abstraction and fidelity
- Model Views are chosen to best communicate information to a variety of stakeholders via the dynamic creation of multiple, consistent, accurate views
- Impacts of changes are more easily analyzed and evaluated

Reference Architecture/Platform Independent Model (PIM)

A **Reference Architecture** is an authoritative source of information about a specific subject area that guides and constrains the instantiations of multiple architectures and solutions [1].



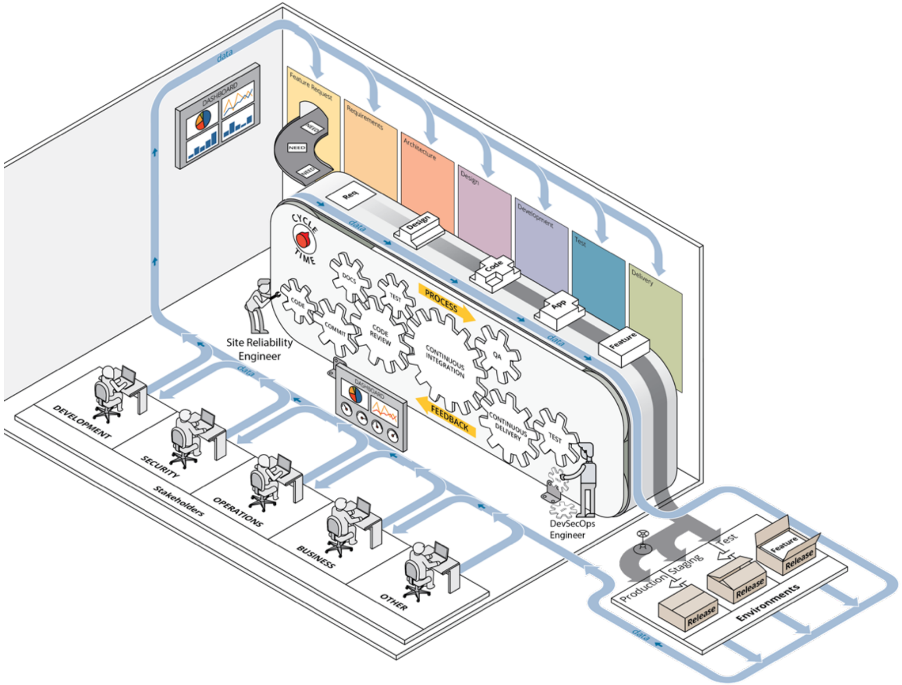
A PIM is a general and reusable model of a solution to a commonly occurring problem in software engineering within a given context and is independent of the specific technological platform used to implement it.



[1] DoD Reference Architecture Description, https://dodcio.defense.gov/Portals/0/Documents/DIEA/Ref_Archi_Description_Final_v1_18Jun10.pdf

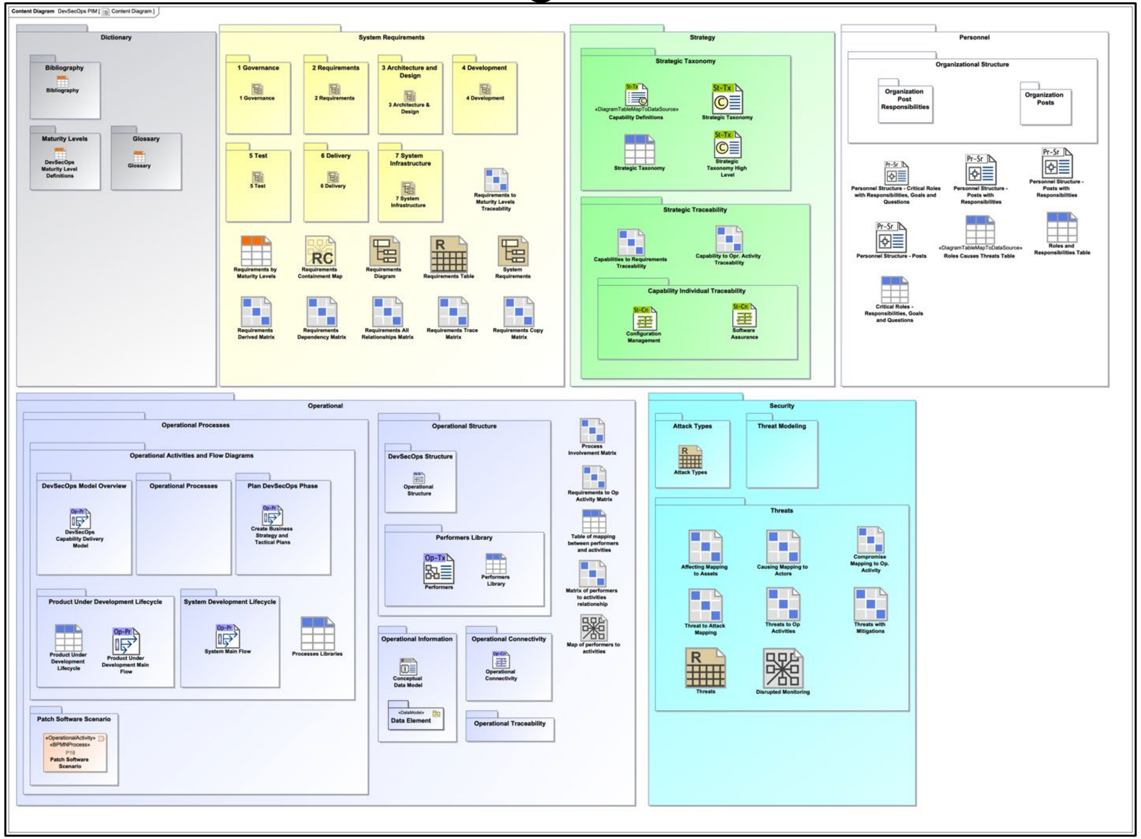
NOTE: PSM = Platform Specific Model

DevSecOps Platform Independent Model (PIM)



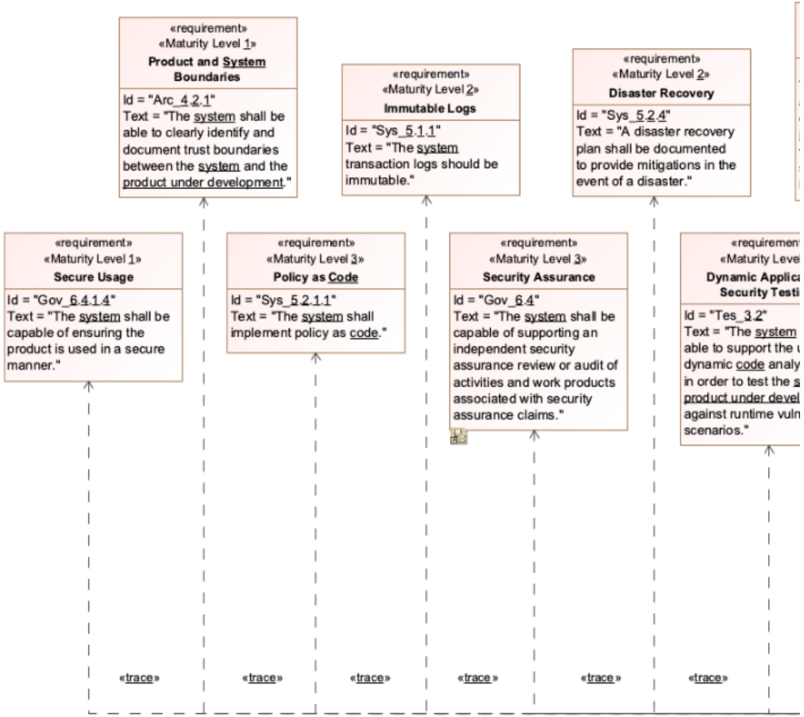
- is an authoritative reference to fully design and execute an integrated Agile and DevSecOps strategy in which all stakeholder needs are addressed
- enables organizations to implement DevSecOps in a secure, safe, and sustainable way in order to fully reap the benefits of flexibility and speed available from implementing DevSecOps principles, practices, and tools
- was developed to outline the activities necessary to consciously and predictably evolve the pipeline, while providing a formal approach and methodology to building a secure pipeline tailored to an organization's specific requirements

DevSecOps PIM - Content Diagram



https://cmu-sei.github.io/DevSecOps-Model/

DevSecOps Requirements



Example of Requirements Representation in Diagrams from PIM

All requirements are organized into categories based on logical and functional groupings:

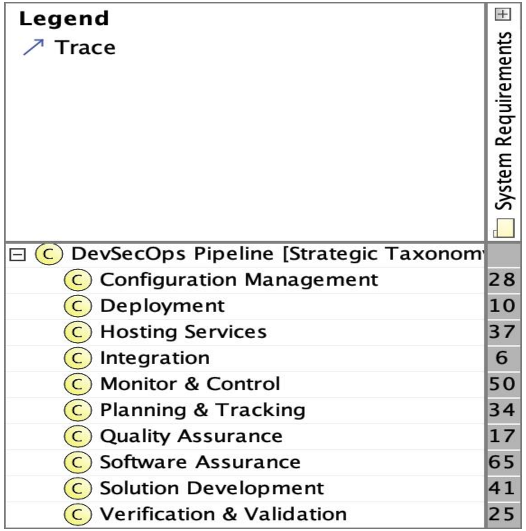
- Governance
- Requirements
- Architecture and Design
- Development
- Test
- Delivery
- System Infrastructure

Requirements Table Link

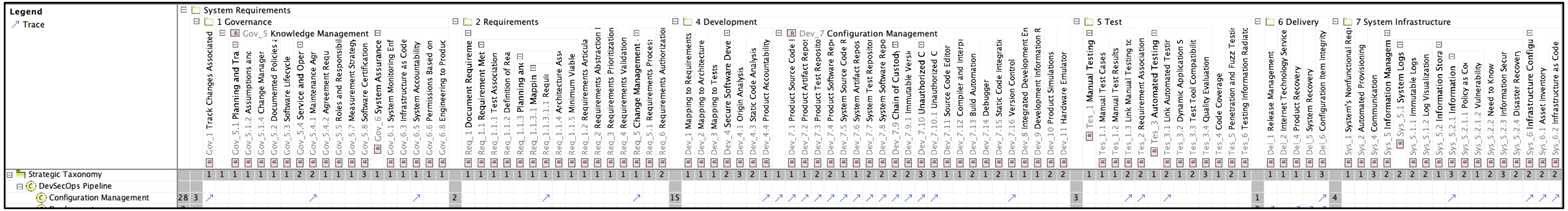
DevSecOps Capability/Strategic Viewpoint

A capability is a high-level concept that describes the ability of a system to achieve or perform a task or a mission.

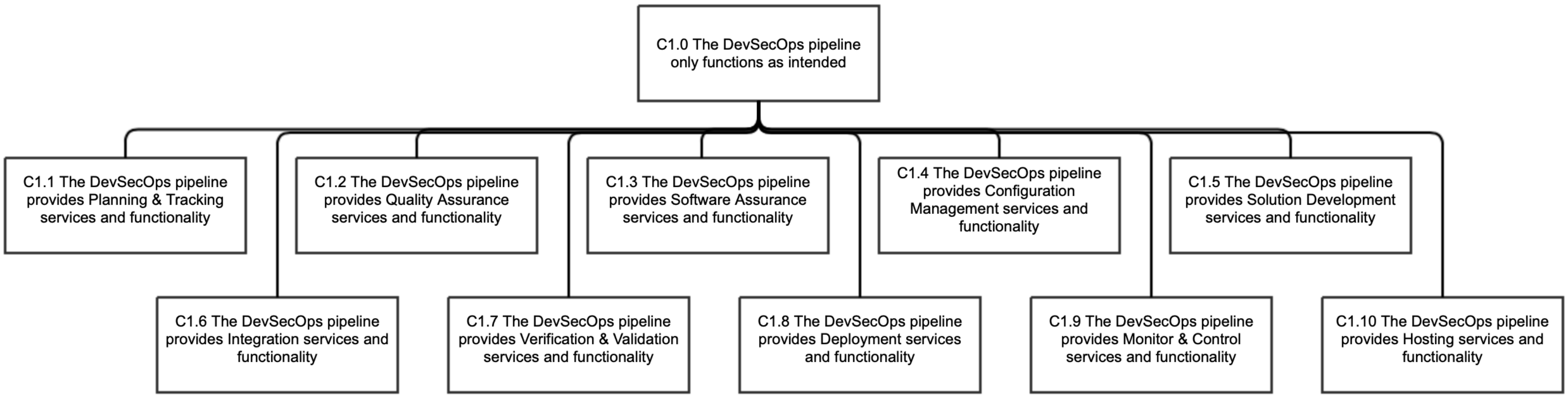
All requirements in the DevSecOps PIM were allocated to corresponding capabilities.



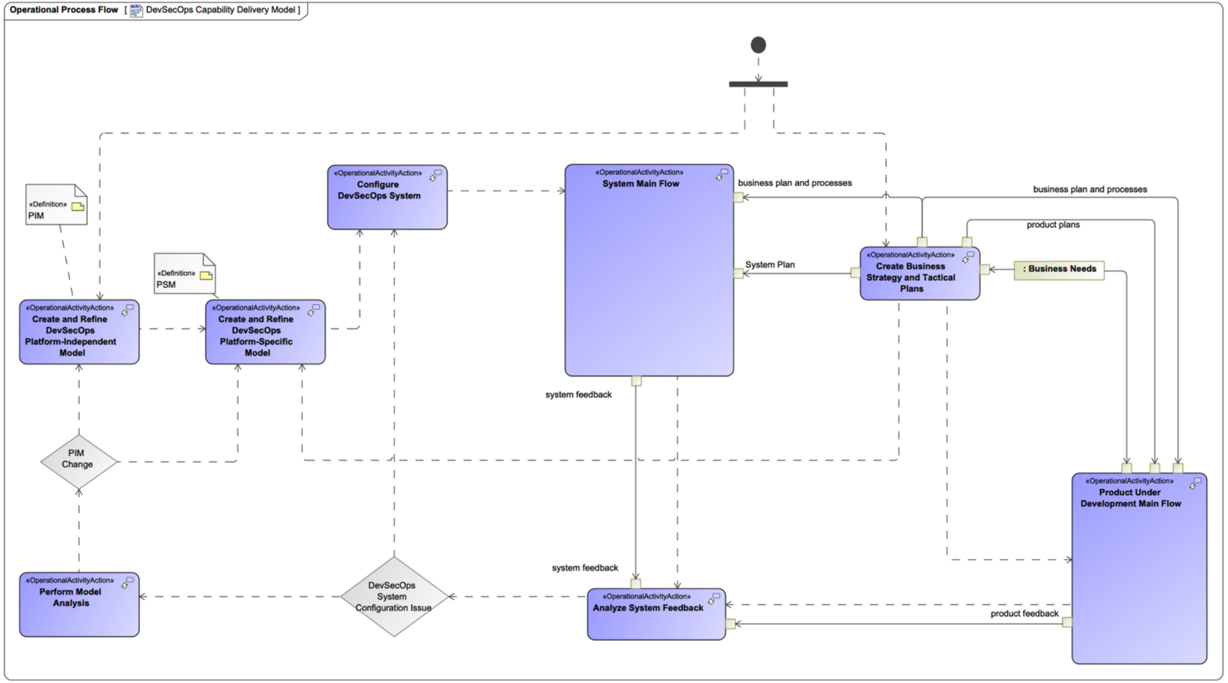
- [Capability to Requirements Traceability Link]
- [Capability to Operational Activity Traceability Link]
- [Capability Definitions Link]
- [Strategic Taxonomy High Level]



Structuring a DevSecOps Assurance Case Around Capability



DevSecOps Operational Viewpoints

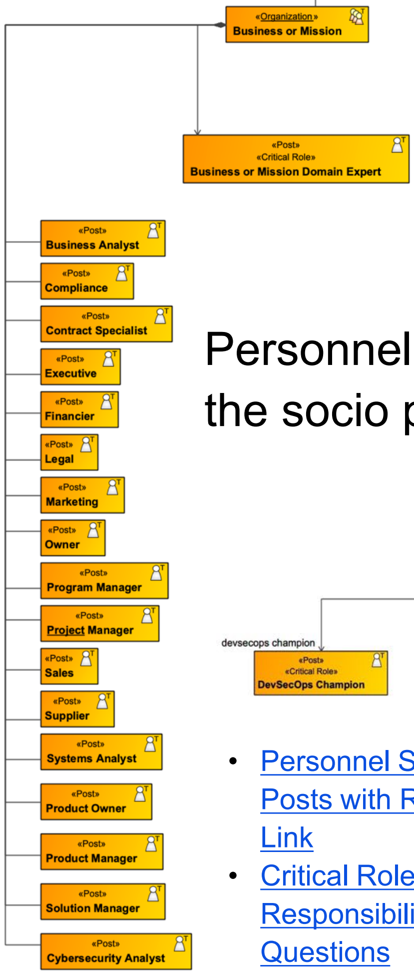


- [DevSecOps Capability Delivery Model Link]

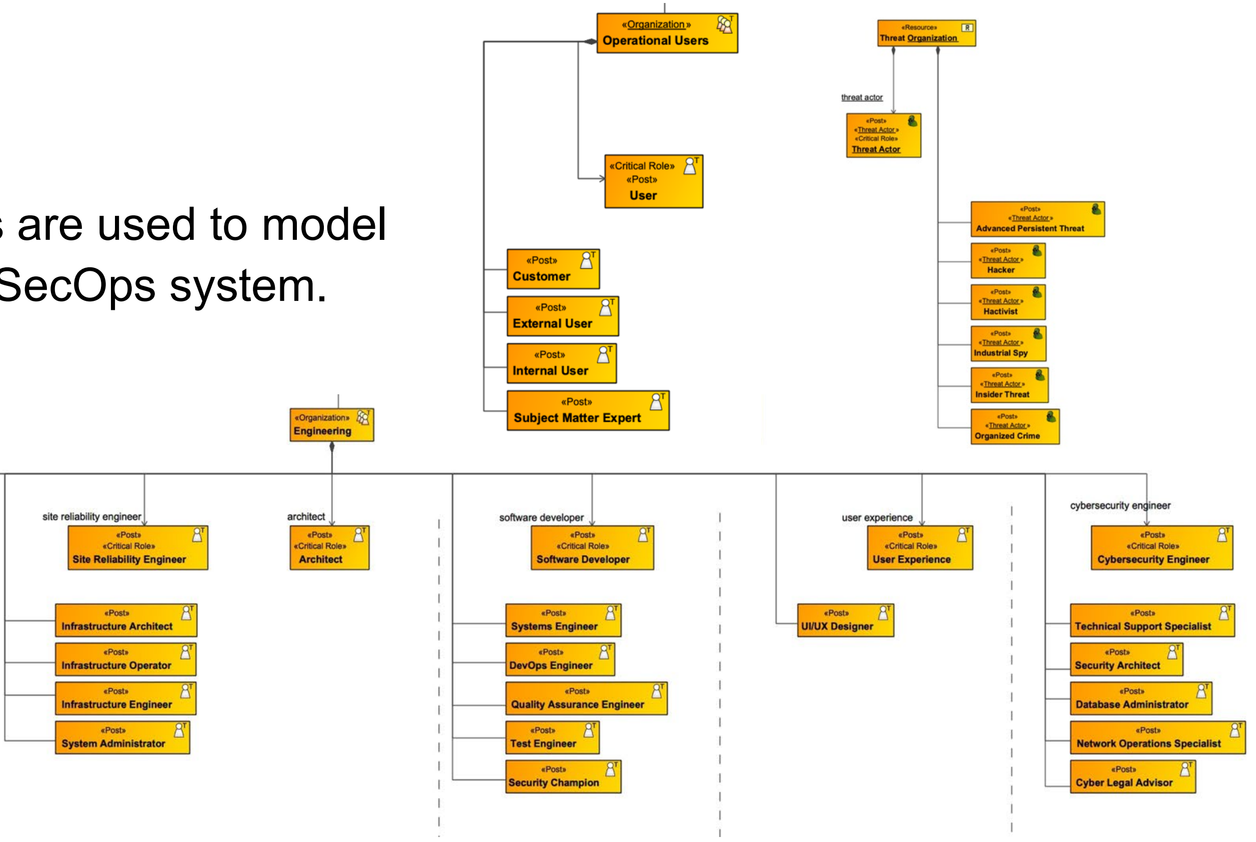
An operational model for a system describes behavior of the system to conduct enterprise operations.

The main operational processes for DevSecOps includes development process for the product, as well as the DevSecOps process itself.

DevSecOps Personnel Viewpoints



Personnel viewpoints are used to model the socio part of DevSecOps system.



- Personnel Structure – Posts with Responsibilities Link
- Critical Roles – Responsibilities, Goals and Questions

Everyone Plays a Role in DevSecOps

Legend
- Approves
- ContributesTo
- Is Capable To Perform
- Observes
- *Multiple (one-way)*

Organization Posts

Operational Activities and Flow Diagrams		Architect	Business Analyst	Business or Mission Domain I	Compliance	Contract Specialist	Customer	Cyber Legal Advisor	Cybersecurity Analyst	Cybersecurity Engineer	Database Administrator	DevOps Engineer	DevSecOps Champion	Executive	External User	Financier	Infrastructure Architect	Infrastructure Engineer	Infrastructure Operator	Internal User	Legal	Marketing	Network Operations Specialis	Owner	Product Manager	Product Owner	Program Manager	Project Manager	Quality Assurance Engineer	Release Engineer	Relevant Stakeholders	Sales	Security Architect	Security Champion	Site Reliability Engineer	Software Developer	Solution Manager	Subject Matter Expert	Supplier	System Administrator	Systems Analyst	Systems Engineer	Technical Support Specialist	Test Engineer	UI/UX Designer	User	User Experience
Operational Activities and Flow Diagrams		93		69	1	3				99		3	58								2				4	14				101					10(	102					14					29	92
DevSecOps Model Overview		6		5						5			5																	5					5	5										2	5
Plan DevSecOps Phase		17		16						15			15																	15					15	16										7	15
Product Under Development Lifecycle		70		47	1	3				79		3	38								2				4	14				81					80	81					14					20	72
P2 Product Under Development Main Flow																																															
P2-1 Plan Product		40		23		2				40		1	18								2				4	11				41					41	41					14					15	40
P2-2 Develop Product		10		3						10			4																	11					9	10											10
P2-4 Validate Product		2		1						4																1				4					5	5											3
P2-5 Deploy Product										6		2														2				6					6	5										2	
P2-6 Operate Product	7			↙						↙																				↙					↙	↙										↙	↙
P2-7 Monitor Product		11		11						11			11																	11					11	11											11
P2-8 Manage Contracts, Licenses and Agreements	8	↙		↙		↙				↙																				↙					↙	↙											↙
P2-9 Provide Feedback	9	↙		↙						↙			↙																	↙					↙	↙										↙	↙
P2-10 Perform Quality Assurance	9	↙		↙	↙					↙			↙																	↙					↙	↙											↙
P2-11 Perform Data Analysis	8	↙		↙						↙			↙																	↙					↙	↙											↙
P2-12 Monitor Development and Test Environment	7	↙		↙						↙																				↙					↙	↙											↙
P2-13 Perform Configuration Management	2			↙																																↙											
P2-14 Store and Manage Code and Artifacts	8	↙		↙						↙			↙																	↙					↙	↙											↙
P2-15 Aggregate, Store and Report on Product Collected Monitoring, Pla	9	↙		↙						↙			↙																	↙					↙	↙										↙	↙

- [Process Involvement Matrix Link]

Critical Roles are mapped to Operational Activities.

Threat Scenarios

Template:

Part	Description
Activity	The activity diagrammed in the PIM or PSM. There can be more than one activity applied to the Threat Scenario.
Actor	The person, or group, that is behind the threat scenario. Threat actors can be malicious or unintentional. Developing a standard set of actors is beneficial for this step. Persona non grata could be useful in determining malicious actors. Threat actor may be a person, or group, internal to an organization structure.
Action	A potential occurrence of an event that might damage an asset, a mission, or goal of a strategic vision.
Attack	An action taken that utilizes one of more vulnerabilities to realize a threat to compromise or damage an asset, a mission, or goal of a strategic vision.
Asset	A resource, person, or process that has value.
Effect	The desired or undesired consequence resulting from the attack.
Objective	The threat actor's motivation or objective for conducting the attack
Statement	Structured prose summarizing the 6-part security scenario

Example:

Part	Description
Activity	Develop Product, Static and Dynamic Analysis
Actor	Insider Threat
Action	Results from analysis are disclosed for effect
Attack	Information Disclosure
Asset	Analysis Results
Effect	Damage organization, vulnerabilities are publicly enumerated for a product under development
Objective	Develop a targeted exploit for the product under development, financial attack
Statement	An insider threat publicly releases the results of static and dynamic analysis to the public to damage the organization's reputation.

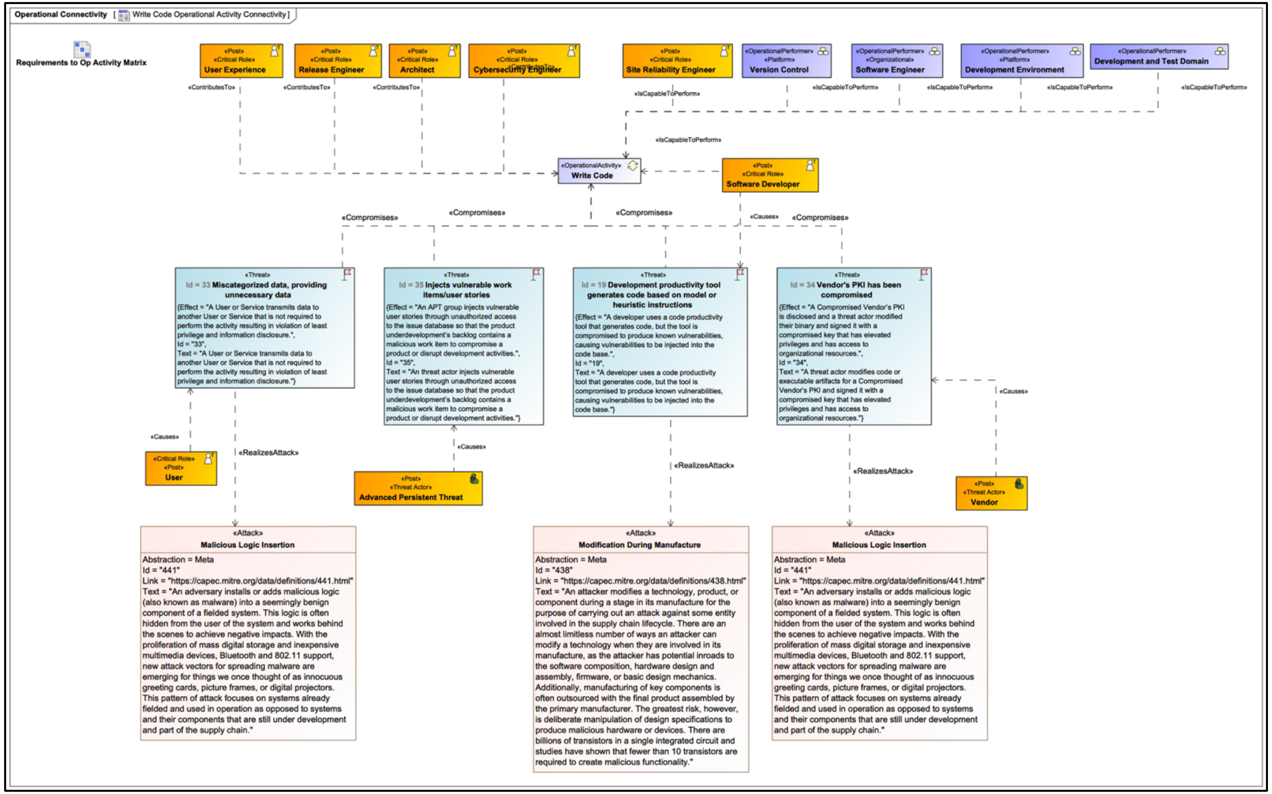
Threat Scenario Generation Workshop

Purpose	Identify threat scenarios for a given system	
Entry Criteria:	The following Unified Architecture Framework (UAF) defined views have been created for the system under evaluation: • Requirements Diagrams • Operational Process Flows • Relationships between Operational Activities and System Requirements • Operational resource structure, Posts (i.e. roles) and corresponding responsibilities including the Involvement relationships.	
General	• As the system architecture and associated system instantiation evolves, so will the threats and corresponding mitigations. While this process defines an approach to systematically define applicable threat scenarios for the given system, threats should be identified, evaluated, and captured continuously outside this process. • During the structured and unstructured brainstorming activities, there are no right or wrong ideas. The goal is to identify any reasonable action that can be taken to exploit the various activities within the system to ultimately impact the final product. The ideas will be evaluated later in the process.	
Step	**Activities**	**Description**
1	Planning	• Identify relevant stakeholders. Participants must contain a mix of engineering, operational, user, business, and cyber security experience. • Schedule a date and time, or series of events, in which all relevant stakeholders can actively participate.
2	Kick-off Event	• Review the workshop process and introduce participants • Discuss the goals and objectives of the workshop • Introduce participants to the concept of system threats and review a few example threat scenarios that follow the format of the Threat Scenario Template.

3	System and Architectural Overview	• Outline system purpose and constraints
		• Review system's architectural views and relationships
		  o Requirements
		  o Strategy
		  o Personnel
		  o Operational

4	Operational Process Flow Focus Area	• Select an operational process flow to focus the threat scenario generation • Review the selected operational process flow to gain understanding of the process, data flow between operational activities, and performers involved. This may include reviewing associated requirements to understand the scope and context of the various operational activities.
5	Unstructured Brainstorming	• Select an operational activity within the operational process flow • Either working individually or in pairs, brainstorm threats for the selected operational activity and write them down. Threats can bridge multiple operational activities. The brainstormed ideas should be captured in the individual's natural language. • Using an affinity diagram, organize the threats identified by the whole group and remove duplicates. • Create a list of potential threats to the system.
6	Structured Brainstorming	• Use the same operational activity as in step 5. • Break into groups of 2-3 people. • In small groups, identify ways that the operational activity may be exploited to interrupt the confidentiality, integrity, and/or availability of the system. Utilize the Process Specific STRIDES Threat Modeling Taxonomy to reduce individual bias and to holistically identify threats to the given activity. • Using an affinity diagram, organize the threats identified by the whole group and remove duplicates. • Add new threats to the list of potential threats to the system created in step 5.
7	Define Threat Scenarios	• If this is the first time any of the participants have written threat scenarios, select a threat from the list and complete the Threat Scenario Template as a group. Repeat until everyone understands how to complete the Threat Scenario Template. • Break into small groups of 3-4 people. • Divide the list of potential threats to the system between the small groups. Alternatively, create a pull system in which the small groups claim a potential threat from a centralized list as needed. • In small groups, complete the Threat Scenario Template for each assigned, or pulled, potential threat. • Review and update all completed threat scenarios as a whole group, removing or consolidating duplicates.
8	Operational Activity Threat Identification	• Select next operational activity within the selected operational process flow. • Repeat steps 5-7. • Repeat step 8 until threats have been identified for all operational activates within the selected operational process flow.
9	Identify Operational Process Flow Threats	• Repeat steps 4-8 until threats have been identified for all operational process flows for the given system.
10	Consolidate and Review	• Consolidate all threat scenarios into a central list. • Review and accept the threat scenarios
Exit Criteria		A list of structured threat scenarios that cover the operational activities in the given system.

Example Threat Modeling Diagram for Write Code Operational Activity



Write Code Operational Activity Connectivity Link

DevSecOps Threat to Operational Activity Matrix

Legend: ↗ Compromises

Product Under Development Lifecycle — P2 Product Under Development Main Flow (P2-1 Plan Product; P2-2 Develop Product; P2-4 Validate Product); System D — P239

Threats	Plan DevSecOps Phase	P2-1-2 Design Pro	P2-1-3 Plan for Mea	P2-1-4 Plan for Contra	P2-2 Develop Product	P2-2-4 Write Code	P2-2-6 Review Code ar	P2-4-1 Perform Sta	P2-4-2 Build and Packa	P2-4-4 Perform Dynam	P2-14 Store and Manage C	P2-15 Aggregate, Store an	System D	P239
Threats		1		1	2	4	3	5	1	6	1	13		3
1 Reduced monitoring	1											↗		
2 Disrupted Monitoring	1											↗		
3 Unauthorized Access/Modifies logs to divert attribution	1											↗		
4 Inadequately configures system logging	1											↗		
5 Intentionally misconfiguring	1											↗		
6 Intentionally locks out accounts responsible for recovering, inv	1											↗		
7 Intentionally misconfiguring 2	1											↗		
8 Intentionally misconfiguring 3	1											↗		
9 Decrease Document Markings	1											↗		
10 Unauthorized Access/Modifies logs to divert attribution 2	1											↗		
11 Insert Malicious Code in tool chain, code repository, build art	1											↗		
12 Patch Tools in the pipeline	1											↗		
13 Slow Approval Process	1											↗		
14 Disable the static analysis	1								↗					
15 Alters Automated analysis reports	1						↗							
16 Configures analyzer in a way that is not best practice	1						↗							
17 Results from analysis are disclosed for effect	1				↗									
18 Production data (configurations, tokens, accounts, PII, etc) is	1				↗									
19 Development productivity tool generates code based on moc	1					↗								
20 Tool generates code based on predetermined code snippets														
21 Perform a code review without sufficient security review criter	1						↗							
22 Review is skipped for items not covered by other defect ider	1			↗										
23 Poisoning data while aggregating it	1		1											
24 Requirements exploration and documentation	1	↗												
25 Modifies measurement Metrics	2							↗		↗				
26 Misleading Contracting Practices	2							↗		↗				
27 Misinterpreting the results of the analysis	2							↗		↗				
28 Using careless or naïve code idioms	2							↗		↗				
29 Build tools are misconfigured	2							↗		↗				
30 Upstream activity provide false/modified data	2									↗	↗		1	↗
31 Tampering without data													1	↗
32 Data is intercepted between activies													1	↗
33 Miscategorized data, providing unnecessary data	1					↗								
34 Vendor's PKI has been compromised	1					↗								
35 Injects vulnerable work items/user stories	1					↗								
36 Compromises a vendor														
37 Injects exploitable/malicious code into upstream open sourc														
38 Encryption														

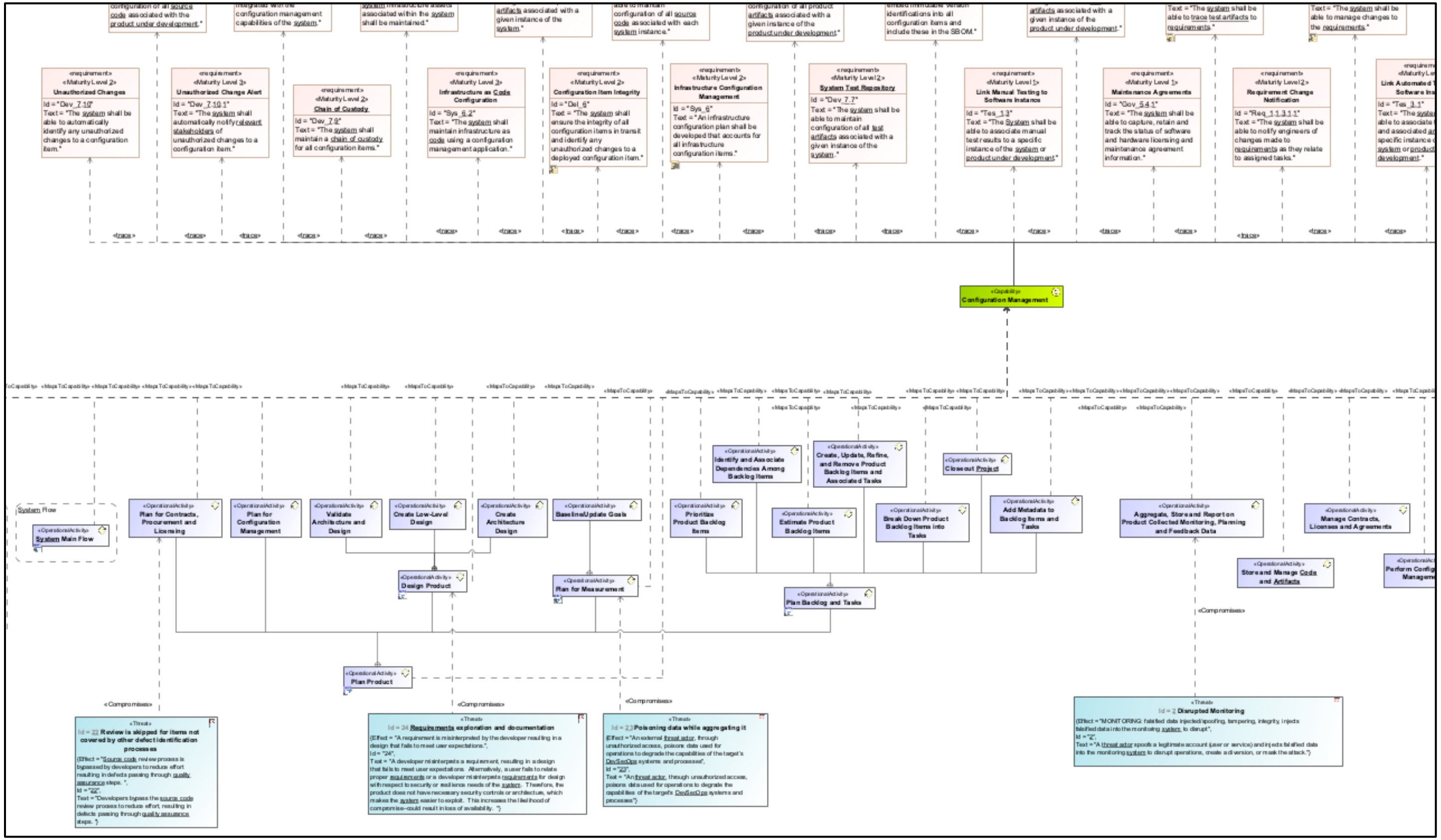
Threats to Operational Activities Link

DevSecOps Threats with Attributes

Id	Name	Text	Effect	Compromises	Realized By Attack	Caused By	Mitigated By	Documen
1	Reduced monitoring	A threat actor is made aware of a monitoring system's reduced capacity resulting in regular service outages leaving an open window of opportunity for an unobservable attack.	Reduced or misconfigured monitoring allows for nefarious activity to occur	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	607 Obstruction	Insider Threat		Much of this was pulled fron CAPEC info https://capec.m org/data/definitions/1000.h
2	Disrupted Monitoring	A threat actor spoofs a legitimate account (user or service) and injects falsified data into the monitoring system to disrupt operations, create a diversion, or mask the attack.	MONITORING: falsified data injected/spoofing, tampering, integrity, injects falsified data into the monitoring system to disrupt	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	161 Infrastructure Manipulation	Advanced Persistent Threat Insider Threat Architect Cybersecurity Engineer	SC1 Mitigation Strategy 1	Keep at the Meta Level and better explained in the "star
3	Unauthorized Access/Modifies logs to divert attribution	A threat actor gains unauthorized access to logging data, alters system logs to conceal illicit activity from forensic audits, automated responses and alerts, or to divert attribution.	Logs: insider threat modifies the logs to conceal activity	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	161 Infrastructure Manipulation	Insider Threat Site Reliability Engineer Cybersecurity Engineer		
4	Inadequately configures system logging	A threat actor has configured the collection of system logs in a way that limits the effectiveness of forensic audit activities.	Accidentally misconfiguring Logging – can't perform forensics work against what is captured	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	176 Configuration/Environment Manipulation	Software Developer		Could be 161? Most significa improper configuration
5	Intentionally misconfiguring	A threat actor has configured the collection of system logs in a way that limits the effectiveness of forensic audit activities in order to conceal subsequent activities.	Intentionally misconfiguring the system	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	176 Configuration/Environment Manipulation	Insider Threat		
6	Intentionally locks out accounts responsible for recovering, investigating, or repairing the system	A threat actor spoofs an individual's account in order to create user action logs with the objective of making a targeted user in violation of security policy and reducing the targeted individual's organizational effectiveness.	Targeting Individual with the intent that their login is denied, locking out individuals who should have access	P2-15 Aggregate, Store and Report on Product Collected Monitoring, Planning and Feedback Data	212 Functionality Misuse	Insider Threat		Could be a CAPEC – 184 So Attack
		Unit testing is insufficient to cover the requirements and abuse cases. A software or site reliability engineer doesn't	[illegible]	P2-15 Aggregate, Store and Report on Product Collected	176 Configuration/Environment	Software Developer		

Threats Link

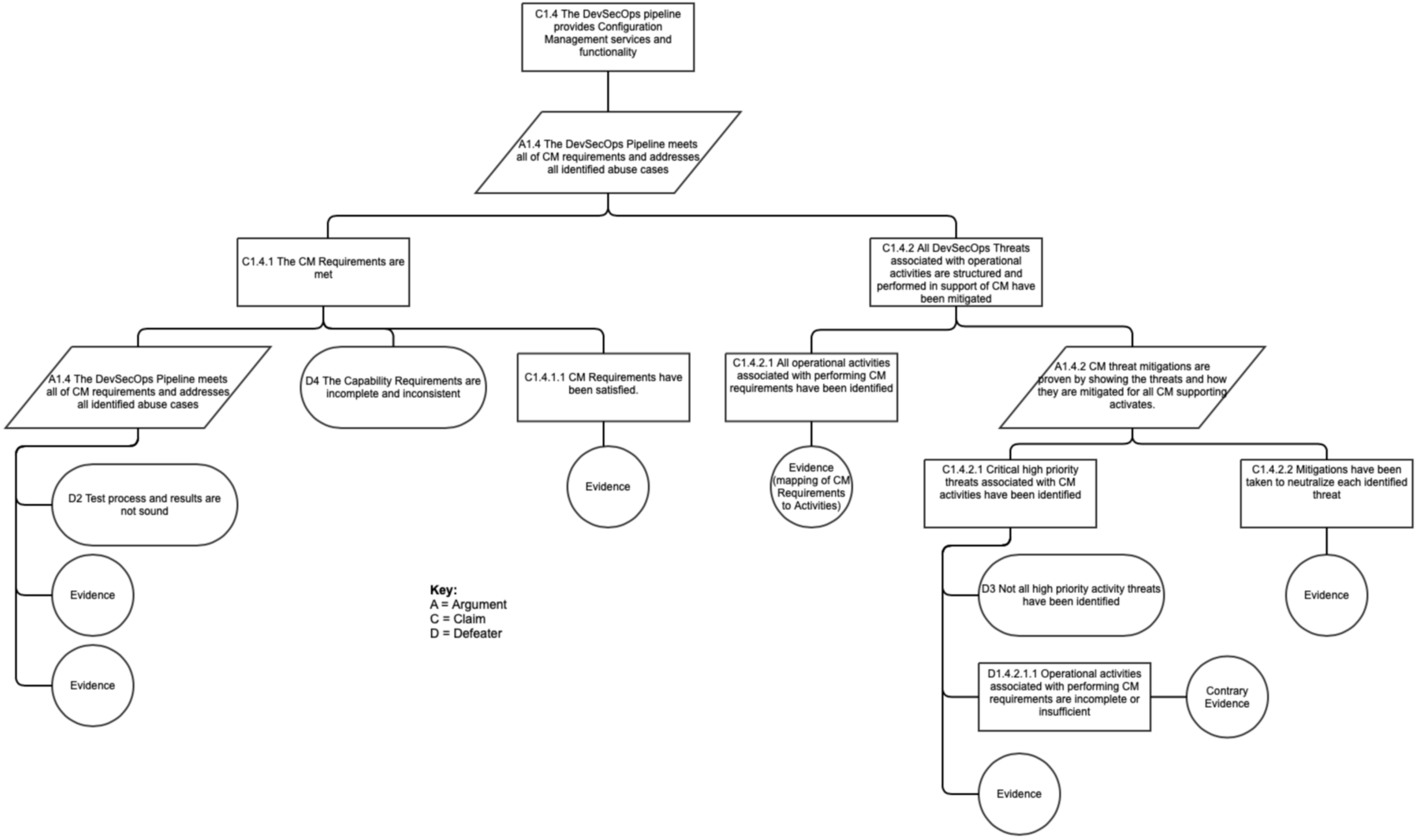
Capturing the Complexity of the DevSecOps System



Example of Threats Traced to Capabilities via Operational Activities

[Configuration Management Complexity Link]

Addressing Assurance Case Defeaters



Identifying and Mitigating Threats helps to address Defeaters in your Assurance Case

The DevSecOps PIM enables Organizations, Projects, Teams, and Acquirers to

- specify the DevSecOps requirements to the lead system integrators tasked with developing a platform-specific solution that includes the designed system and continuous integration/continuous deployment (CI/CD) pipeline
- assess and analyze alternative pipeline functionality and feature changes as the system evolves
- apply DevSecOps methods to complex products that do not follow well-established software architectural patterns used in industry
- provide a basis for threat and attack surface analysis to build a cyber assurance case to demonstrate that the product and DevSecOps pipeline are sufficiently free from vulnerabilities and that they function only as intended

Summary

The use of model based systems engineering in the design, implementation, and sustainment of your DevSecOps socio-technical system will assist you in building a system that is:

- Trustworthy – No exploitable vulnerabilities exist, either maliciously or unintentionally inserted.
- Predictable – When executed, software functions as intended and only as intended.
- Timely – Features are delivered as the speed of relevance.

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