Digital Engineering Tool Evaluation Criteria Template (DETECT) Overview

27th Annual National Defense Industrial Association Systems and Mission Engineering Conference

Mr. Daniel Hettema, Director, DEM&S
Office of Systems Engineering and Architecture
Office of the Under Secretary of Defense
for Research and Engineering

Norfolk, Virginia
October 2024

SETA Support: Jeffrey Nartatez, Frank Salvatore, Kelly Burton

Agenda

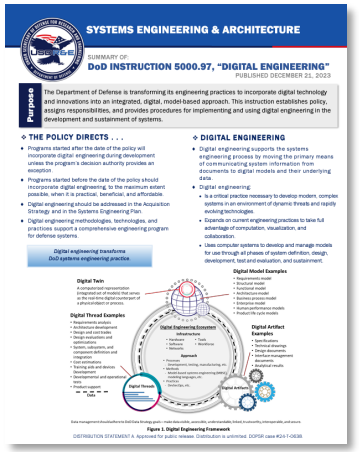
- Key DETECT Terms
- DEM&S Initiatives Supporting the DE Ecosystem
- Why DETECT? (Goals, Purpose, Outcomes)
- Who Would Use DETECT?
- Our Implementation
- Next Steps

Key DETECT Terms

- **Tools**: Software applications that provide digital engineering, modeling, & simulation functionality
  - **Tool Criteria**: Capabilities that a tool must meet

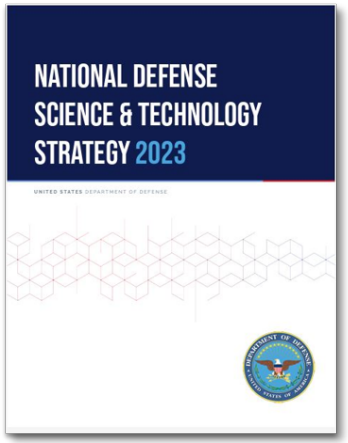
- **Digital Engineering Ecosystem**: The interconnected infrastructure, environment, and methodology (process, methods, and tools) used to store, access, analyze, and visualize evolving systems' data and models to address the needs of the stakeholders
  - **Digital Engineering Ecosystem Requirements:** Baseline system level functionality needed to satisfy DE implementation

DEM&S Initiatives Supporting the DE Ecosystem



DoDI 5000.97 DE Policy

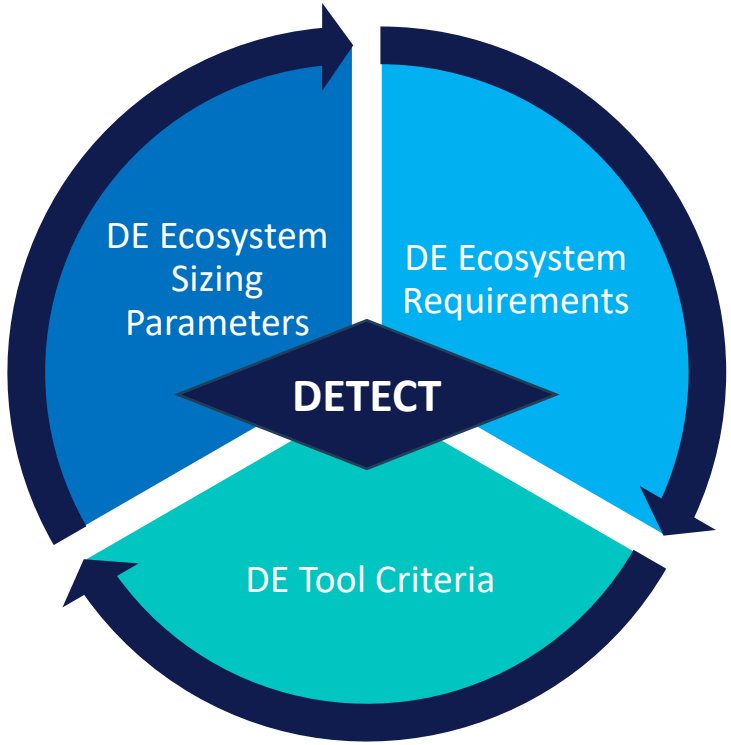
- OUSD(R&E) leads and coordinates efforts to define digital engineering data standards
- Develop digital models maximizing interoperability
- PMs should consider the need and resources required for interoperability and ease of integrating components together within the digital engineering ecosystem.



NDS&T Strategy – Importance of Standards

- Technology standards and protocols are core to our digital infrastructure, national security, and economic prosperity
- Modernize our digital infrastructure to improve information sharing and knowledge management

***DETECT** guides DE tool decisions in context of the ecosystem*



Why DE Tool Evaluation Criteria Template (DETECT)?

- **Goal:** To help organizations…
  - Lower the barrier of entry to digital engineering
  - Better understand their DE ecosystem
  - Determine tools/requirements needs and gaps
  - Improve on existing ecosystems and/or stand-up new ones
- **Purpose:** To provide tool & requirement planning guidance for DE ecosystem development
- **Objectives:** To provide…
  - Representative tool evaluation criteria
  - Representative DE ecosystem requirements
  - A method for tailoring criteria and requirements based on DE ecosystem characteristics.

DETECT: Let's Break It Down Further…

DETECT IS

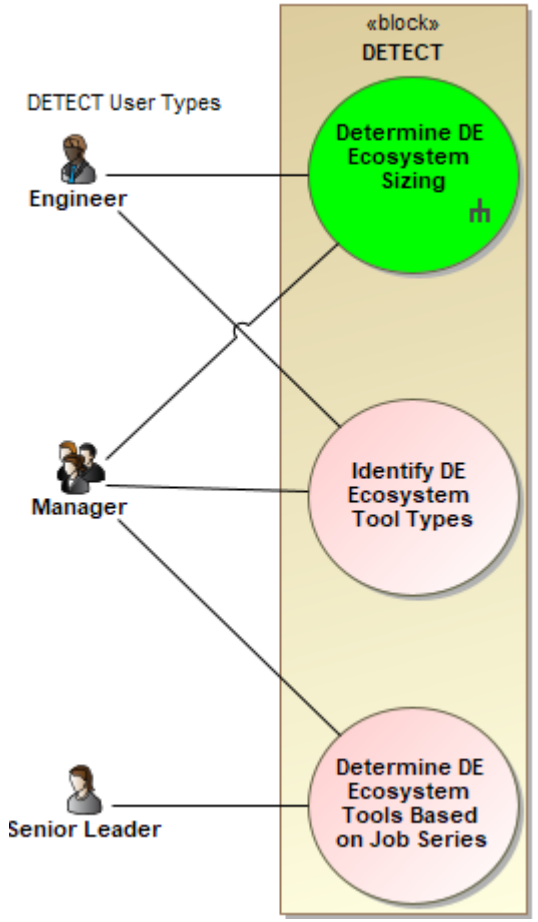
- Starting point model for Stakeholders
  - To establish an initial set of DE tool criteria to be used for tool trades
  - To establish an initial set of DE ecosystem requirements
- 80% solution
- Aligned with expectations from the DE Strategy

DETECT IS NOT

- Policy
- A list of tools or vendors
- A trade study tool
- A single point solution or one size fits all

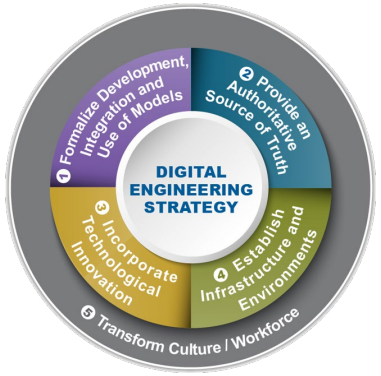
Who Would Use DETECT?

- **Engineer**
  - Streamline tool trades starting with DETECT criteria outputs
  - Establish initial DE ecosystem requirements
  - Helps with understanding DE ecosystem characteristics
- **Program/Engineering Manager**
  - Ensures ecosystem development is in alignment with organizational needs
  - Improves Planning & Budgeting for DE Ecosystem efforts for programs
  - Provides point of entry to DE implementation
- **Senior Leaders/Director**
  - Establish an organizational standard for developing DE Ecosystems
  - Drives towards standardizing tool chains across the enterprise
  - Improves year to year efficiencies for DE Ecosystem development and tools

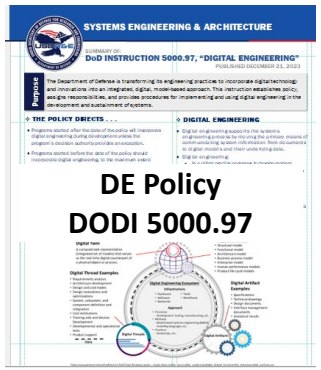


What is DETECT? A Closer Look At Our Implementation

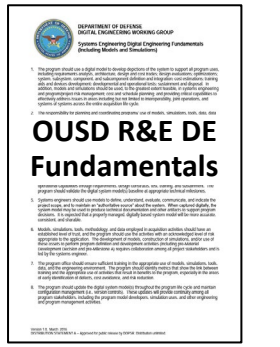
Authoritative Sources of Truth



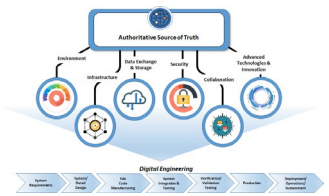
Trade Studies & Industry Input



DE Policy
DODI 5000.97



OUSD R&E DE Fundamentals

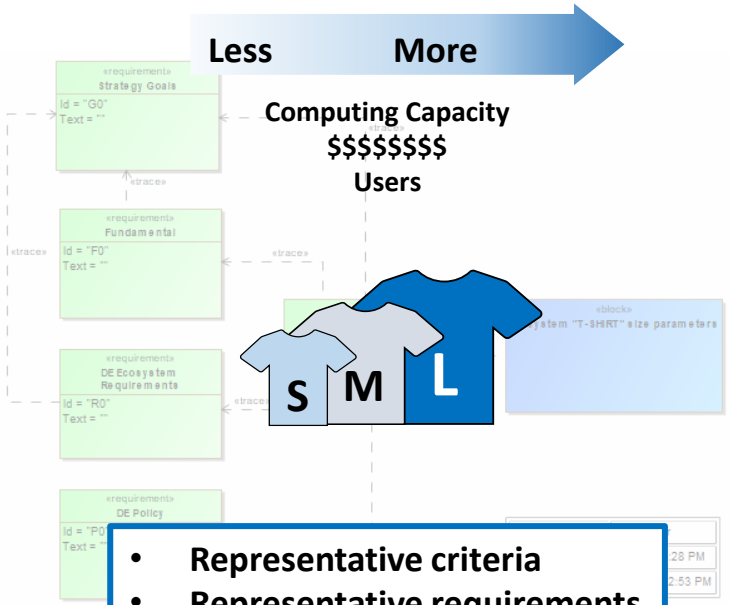


OUSD R&E DE Ecosystem Generic Requirements

SETDB
SYSTEMS ENGINEERING TOOLS DATABASE

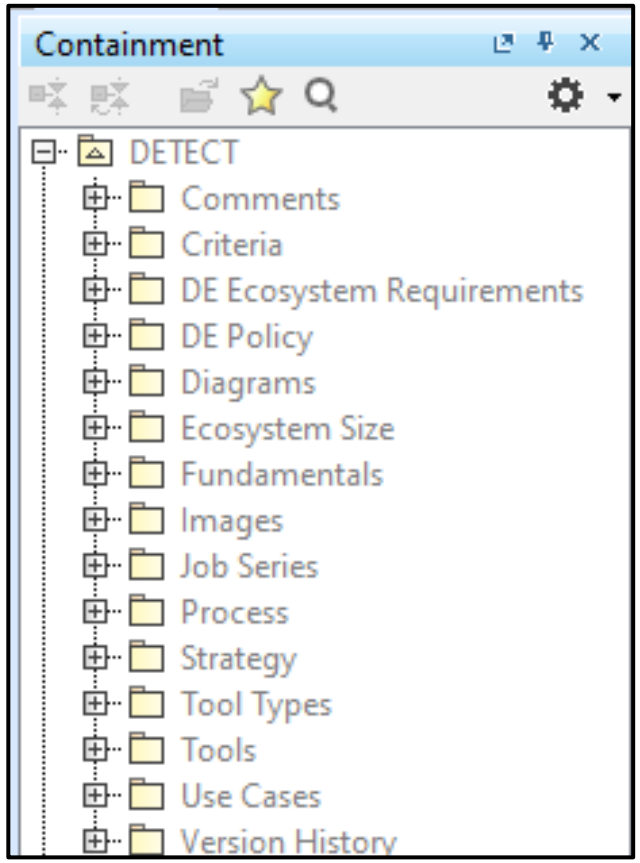
INCOSE Systems Engineering Tool Database

Our Translation

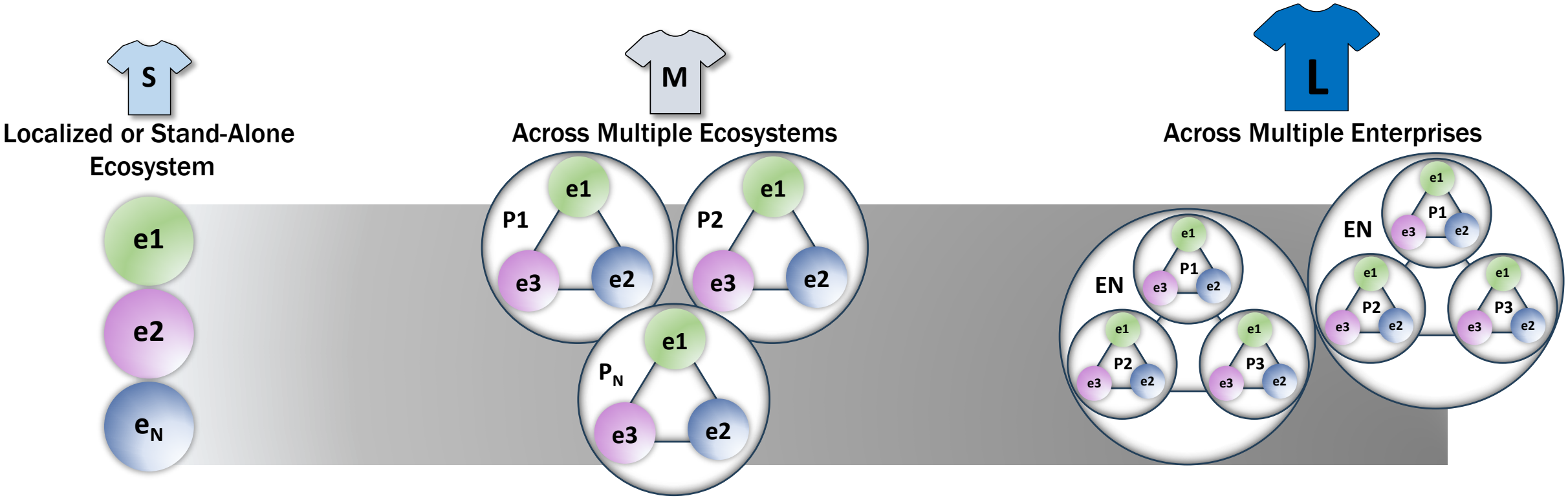


- Representative criteria
- Representative requirements
- Tailoring characteristics (size)

Result



Determining Your DE Ecosystem Size



Start small with local collaboration, address part of the life cycle, few stakeholders

Grow to medium through incremental growth, few external collaborations, include more of the life cycle, add security

Aspire to large through program adoption and continued incremental growth to extend capability across the full supply chain and the whole life cycle.

Small, Medium, Large Sizing Parameters (not a comprehensive list)

Criteria

Element Type: Property ... Scope (optional): Size Attributes [Element] ... Filter:

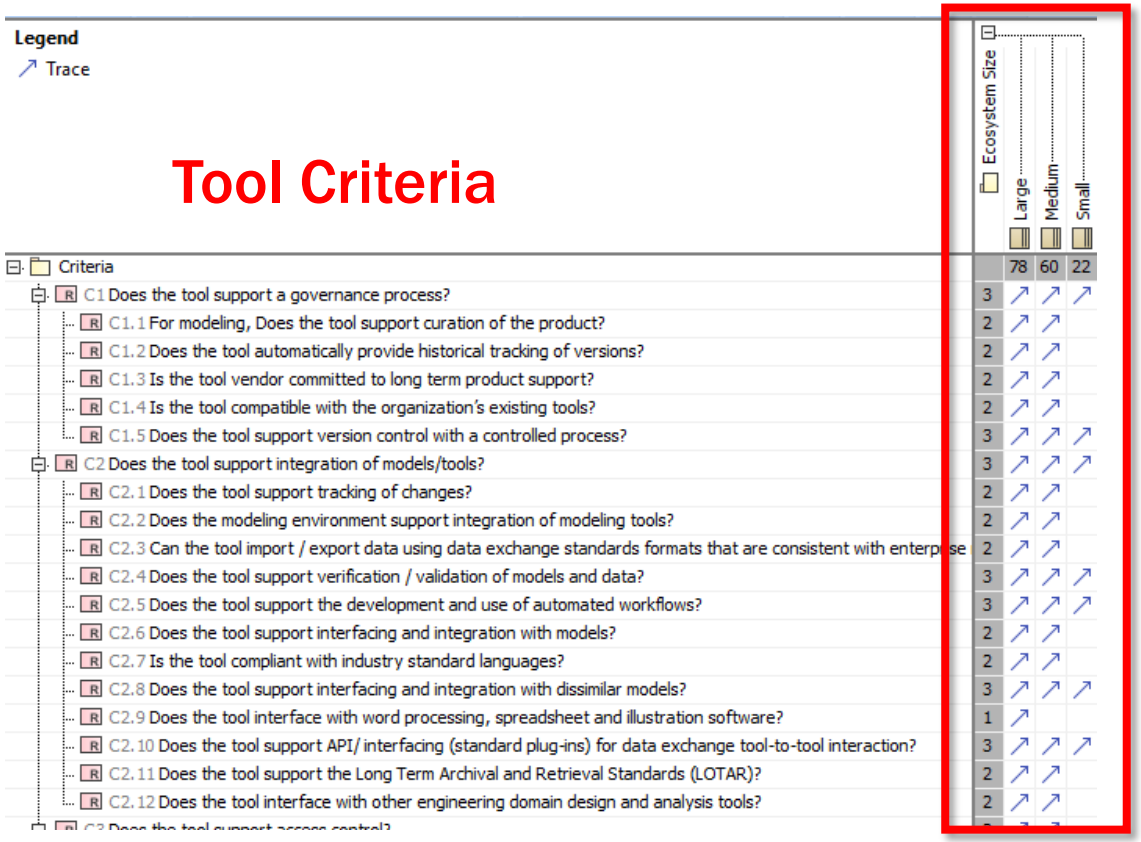
#	Name	Large	Medium	Small	User A
1	Automation	Advanced, Enterprise-Level, Full Integration	Moderate, Adoption of automation platforms, Ongoing integration efforts	Basic, Low integration	Advanced, Enterprise-Level, Full Integration
2	Collaboration Partners	>5	1 - 5	0 (regional)	0 (regional)
3	DE Investment	>$1m	$100's K	$10's K	$10's K
4	Enclaves	50 + enclaves	11-50 enclaves	1-10 enclaves	1-10 enclaves
5	Engineering Domains	>	>2	<=2	<=2
6	Geographic Locations	>5	2-5	1	1
7	Job Series	TBD	TBD2	TBD1	
8	Lifecycle Phases	All	>2	1-2	1-2
9	Project Deliverables	1000's	100's	10's	100's
10	Storage	Petabytes	Terabytes	Gigabytes	Petabytes
11	Tenants	Multi app, multi DB	Multi application, single DB	single application, single DB	single application, single DB
12	Users	>1000	100-1000	1-100	1-100

There are many dimensions and configurations to consider

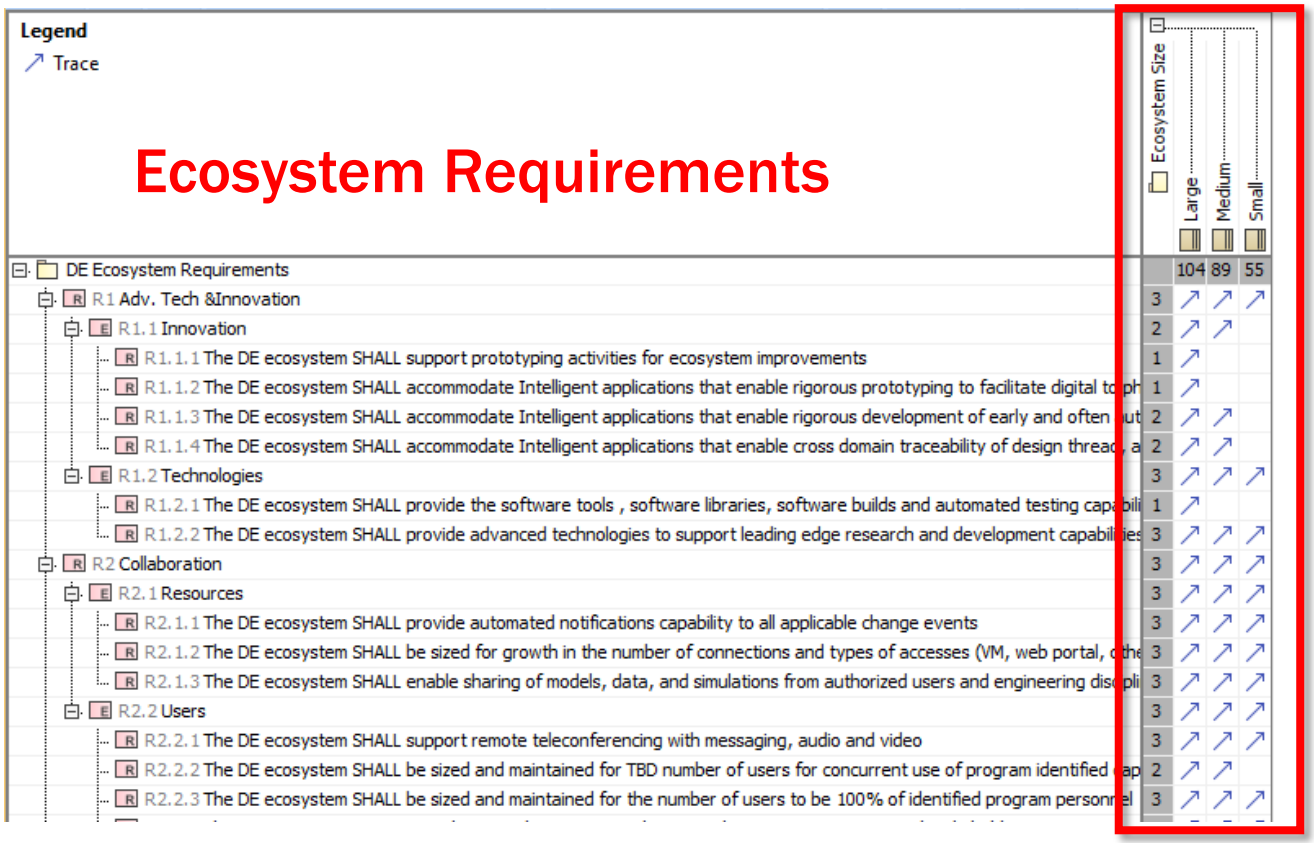
Initial Mapping of Tool Criteria and Ecosystem Requirements

DETECT model contains two master lists of criteria and requirements.

Tool Criteria

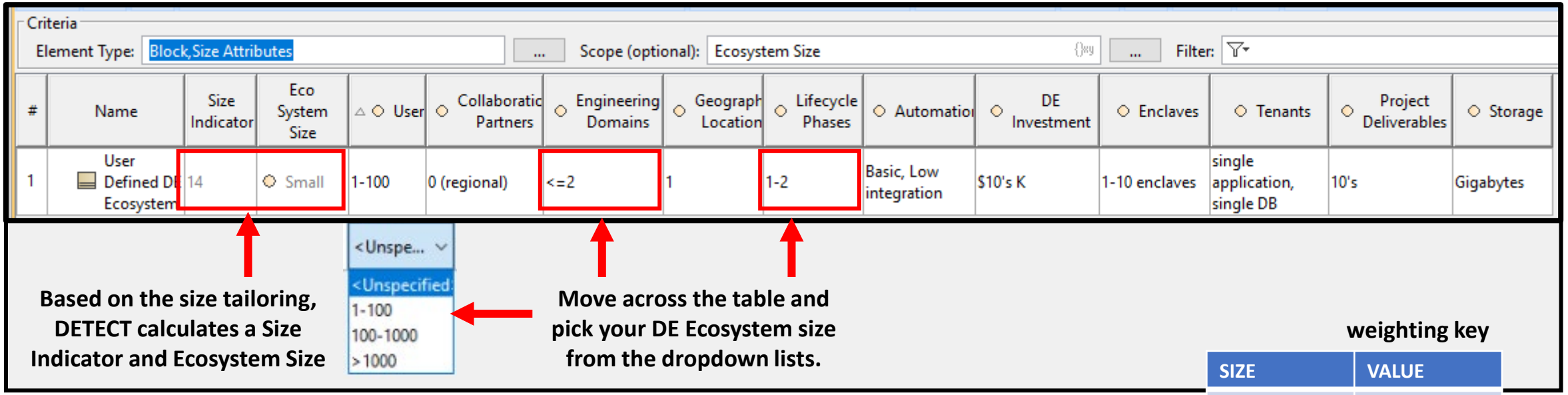


Ecosystem Requirements



Enter Your DE Ecosystem Size Parameters

User enters customized ecosystem data reflective of their personal environment.



weighting key

SIZE	VALUE
small	1
medium	2
large	3

Tailored Lists of Criteria and Ecosystem Requirements

DETECT model returns tailored tool criteria and ecosystem requirements based on ecosystem sizing.

Tailored Tool Criteria

Equal Weighting

Criteria

Element Type: Requirement ... Scope (optional): Criteria with Weights ... Filter:

#	Id	Name	Percentage
1	C1	Does the tool support a governance process?	0.1429
2	C1.5	Does the tool support version control with a controlled process?	1
3	C2	Does the tool support integration of models/tools?	0.1429
4	C2.4	Does the tool support verification / validation of models and data?	0.25
5	C2.5	Does the tool support the development and use of automated workflows?	0.25
6	C2.8	Does the tool support interfacing and integration with dissimilar models?	0.25
7	C2.10	Does the tool support API/ interfacing (standard plug-ins) for data exchange tool-to-tool interaction?	0.25
8	C6	Does the tool provide VAULTIS Capabilities?	0.1429
9	C6.4	Does the tool provide unique identifiers and common metadata standards	0.3333
10	C6.6	Does the tool support data source cataloging for access and sharing?	0.3333
11	C6.8	Can the Tool be interoperable with data that can be easily discovered, linked, retrieved, audited, trusted, understood, and referenced?	0.3333
12	C7	Does the ecosystem facilitate collaboration?	0.1429
13	C7.2	Does the tool support a variety of privledges for sharing data?	0.3333
14	C7.6	Does the tool support simultaneous use with multiple users in multiple locations?	0.3333
15	C7.8	Does the tool support activity and task planning?	0.3333
16	C10	Does the tool support cyber security requirements?	0.1429
17	C10.1	Is the tool compliant with the NIST Cyber Security Framework?	1
18	C11	Does the tool provide a user friendly experience?	0.1429
19	C11.3	Does the tool support multiple simultaneous sessions?	1
20	C12	Does the tool provide product support?	0.1429
21	C12.4	Does the tool support automated reporting (e.g. metrics, use, health, status, reminders to users, etc.)?	0.5
22	C12.5	Does the tool include user templates and examples to learn from?	0.5

Tailored Ecosystem Requirements

Equal Weighting

Criteria

Element Type: Requirement ... Scope (optional): Requirement with Weights ... Filter:

#	Id	Name	Percentage
1	R1	Adv. Tech &Innovation	0.1667
2	R1.2	Technologies	1
3	R1.2.2	The DE ecosystem SHALL provide advanced technologies to support leading edge research and development capabilities such as , but not limited to ; big data analytics, machine learning , artificial intelligence, ontology, virtual reality, augmented reality, and 5G technologies	1
4	R2	Collaboration	0.1667
5	R2.1	Resources	0.5
6	R2.1.2	The DE ecosystem SHALL be sized for growth in the number of connections and types of access (VM, web portal, others) to support (TBD) users	0.3333
7	R2.1.3	The DE ecosystem SHALL enable sharing of models, data, and simulations from authorized users and engineering disciplines	0.3333
8	R2.1.1	The DE ecosystem SHALL provide automated notifications capability to all applicable change events	0.3333
9	R2.2	Users	0.5
10	R2.2.3	The DE ecosystem SHALL be sized and maintained for the number of users to be 100% of identified program personnel	0.3333
11	R2.2.4	The DE ecosystem SHALL provide network access to authenticated users, organizations and stakeholders	0.3333
12	R2.2.1	The DE ecosystem SHALL support remote teleconferencing with messaging, audio and video	0.3333
13	R3	Data	0.1667
14	R3.2	Curation	0.3333
15	R3.2.3	The DE ecosystem SHALL accommodate discovery of models and associated data, from outside the local ecosystem instantiation	0.2
		The DE ecosystem SHALL contain an organized data storing structure for ease of discovery and	0.2

Next Steps

- Controlled release of the DETECT model for community feedback
  - Representative of minimally viable product of DETECT model
  - Include DETECT model user guidance
  - Update DETECT model based on user feedback
- Future Enhancements
  - Include job codes so users can make tool decisions based on their job roles
  - Include tool types and tool listing to support DE tool trade studies
- Continue to present DETECT to community and evaluate similar work efforts
  - Please let us know if you are working on any efforts related to DETECT
  - If you have feedback, please let us know!

Contact

Office of the Under Secretary of Defense for Research and Engineering

Systems Engineering and Architecture

osd-sea@mail.mil | Attn: DEM&S

https://www.cto.mil/sea

Appendix: User Tailoring of Tool Criteria and Ecosystem Requirements

DETECT provides equal priority weighting that can be tailored

Add New | Add Existing... | Delete | Remove From Table | Columns | Export

#	Id	Name	Traced To Large	Large Weight Calculated	Traced To Medium	Medium Weight Calculated	Traced To Small	Small Weight Calculated
1	R1	Adv. Tech &Innovation	X	0.1667	X	0.1667	X	0.1667
2	R1.1	Innovation	X	0.5	X	0.5		1
3	R1.1.1	The DE ecosystem SHALL support prototyping activities for ecosystem improvements	X	0.125				
4	R1.1.2	The DE ecosystem SHALL accommodate Intelligent applications that enable rigorous prototyping to facilitate digital to physical prototypes and proof of concept activities	X	0.125				
5	R1.1.3	The DE ecosystem SHALL accommodate Intelligent applications that enable rigorous development of early and often automated testing of system performance requirements	X	0.125	X	0.25		
6	R1.1.4	The DE ecosystem SHALL accommodate Intelligent applications that enable cross domain traceability of design thread, analytical thread and proof of concept analysis	X	0.125	X	0.25		
7	R1.2	Technologies	X	0.5	X	0.5	X	1
8	R1.2.2	The DE ecosystem SHALL provide advanced technologies to support leading edge research and development capabilities such as , but not limited to ; big data analytics, machine learning , artificial intelligence, ontology, virtual reality, augmented reality, and 5G technologies	X	0.25	X	0.5	X	0.5
9	R1.2.1	The DE ecosystem SHALL provide the software tools , software libraries, software builds and automated testing capabilities needed for DEVOPs process implementations.	X	0.25				
10	R2	Collaboration	X	0.1667	X	0.1667	X	0.1667
11	R2.1	Resources	X	0.5	X	0.5	X	0.5
12	R2.1.3	The DE ecosystem SHALL enable sharing of models, data, and simulations from authorized users and engineering disciplines	X	0.1667	X	0.1667	X	0.1667