Digital Engineering Tool Evaluation Criteria Template (DETECT) Overview

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- 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

	ERING & ARCHITECTURE
DoD INSTRUCTION 5	DUBLISHED DECEMBER 21, 2023
The Department of Defense is transforming its e and innovations into an integrated, digital, mode assigns responsibilities, and provides procedure development and sustainment of systems.	ngineering practices to incorporate digital technology el-based approach. This instruction establishes policy, s for implementing and using digital engineering in the
THE POLICY DIRECTS	OIGITAL ENGINEERING
 Programs started she the data of the policy NII isopponent optical engineering data (development unless the program's decision suthority provides an exception. Programs started before the data of the policy should isocopponent digital engineering to the maximum entern parallel, when its practical, behaviola, and affordable. 	 Ogisial engineering supports the systems engineering process by moving the primary means of communicating system initiation from documenta to signit needs and their underlying data. Digital engineering: Is affineering: Is affineering: Is affineering: Is affineering: Is affineering: Is affineering: Is affineering:
Digital engineering should be addressed in the Acquisition	systems in an environment of dynamic threats and rapidly
 Digital engineering methodologies, technologies, and practices support a comprehensive engineering program for defense systems. 	 Expands on current engineering practices to take full edvertage of computation, visualization, and collaboration. Uses computer systems to develop and manage models
Digital anglesering transforma DoD systems engineering practice.	for use through all phases of system definition, design, development, test and evaluation, and sustainment.
Page 128 Standard S	
End management Auditablewis Bald Cas Strategy pairs materials Figure 1. Org/Pai ORTRIBUTION STATEMENT A Approved for public	unitelia, antoniano, un deratana della falsa de la constanta de la constanta de la constanta de la constanta de La présente de forma escolo de la constanta de

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.

NATIONAL DEFENSE Science & Technology Strategy 2023

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







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

Our Translation

Deutonment, Source of the and Source of the and Source of the and Digital Engineering Strategy Source of the and Digital Engineering Strategy Source of the and Digital Engineering Source of the and Source of

Trade Studies & Industry Input





OUSD R&E DE Ecosystem Generic Requirements



INCOSE Systems Engineering Tool Database



Result





Determining Your DE Ecosystem Size





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

		L	M	S	?					
Crite	Criteria									
Eler	nent Type: Property		Scope (optional): Size Attributes [Element]	{)«y	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	01	01					
7	 Job Series 	♦ TBD	♦ TBD2	• TBD1						
8	Lifecycle Phases	♦ All	◊ >2	0 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	O Users	♦ >1000	◎ 100-1000	0 1-100	1-100					

There are many dimensions and configurations to consider

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Initial Mapping of Tool Criteria and Ecosystem Requirements

DETECT model contains two master lists of criteria and requirements.

Legend → Trace	stem Size	Legend ↗ Trace	tem Size		
Tool Criteria	Ecosys Large Medium	Ecosystem Requirements	Ecosys	Large	Small
🖃 🛄 Criteria	78 60 22	□. □ DE Ecosystem Requirements	Heri	104 8	9 55
E C1 Does the tool support a governance process?	3 7 7 7	🗇 🖪 R1 Adv. Tech &Innovation	3	77	77
R C1.1 For modeling, Does the tool support curation of the product?	2 7 7	E R1.1 Innovation	2	70	7
R C1.2 Does the tool automatically provide historical tracking of versions?	2 7 7	R R 1, 1, 1 The DE ecosystem SHALL support prototyping activities for ecosystem improvements	1	7	
R C1.3 Is the tool vendor committed to long term product support?	2 7 7		oh 1	7	
R C1.4 Is the tool compatible with the organization's existing tools?	2 7 7	P 11 3 The DF encounter of the accommodate Intelligent applications that enable rigorous development of early and then	11 2	7	7
R C1.5 Does the tool support version control with a controlled process?	3 7 7 7	D 1 1 4 The DE ecosystem SHALL accommodate Intelligent applications that enable roots development of design thread	2	<u>_</u>	7
E C2 Does the tool support integration of models/tools?	3 7 7 7	In the Net Article File De Cossistent Shake accommodate intelligent applications that chable closs domain traceability of design threat	a 2 2	4	7 7
🗷 C2.1 Does the tool support tracking of changes?	2 7 7		3	44	<u>~</u> _
🗷 C2.2 Does the modeling environment support integration of modeling tools?	2 7 7	- R1.2.1 The DE ecosystem SHALL provide the software tools , software libraries, software builds and automated testing capa	011	4	
- 🗷 C2.3 Can the tool import / export data using data exchange standards formats that are consistent with enterp	se 2 🥂 🥂	in IR 1.2.2 The DE ecosystem SHALL provide advanced technologies to support leading edge research and development capabil	e: 3	//	
🗷 C2.4 Does the tool support verification / validation of models and data?	3 ア ア ア	E R2 Collaboration	3	//	~ ~
R C2.5 Does the tool support the development and use of automated workflows?	3 ア ア ア	E R2.1 Resources	3	77	~ ~
R C2.6 Does the tool support interfacing and integration with models?	2 7 7	🗷 R2.1.1 The DE ecosystem SHALL provide automated notifications capability to all applicable change events	3	77	77
R C2.7 Is the tool compliant with industry standard languages?	2 7 7	🖪 R2.1.2 The DE ecosystem SHALL be sized for growth in the number of connections and types of accesses (VM, web portal, c	he 3	11	77
R C2.8 Does the tool support interfacing and integration with dissimilar models?	3 7 7 7	🗷 R2.1.3 The DE ecosystem SHALL enable sharing of models, data, and simulations from authorized users and engineering disc	pli 3	11	77
C2.9 Does the tool interface with word processing, spreadsheet and illustration software?	1 🦯	E R2.2 Users	3	71	77
R C2.10 Does the tool support API/ interfacing (standard plug-ins) for data exchange tool-to-tool interaction?	3 7 7 7	🗷 R2.2.1 The DE ecosystem SHALL support remote teleconferencing with messaging, audio and video	3	71	77
R C2.11 Does the tool support the Long Term Archival and Retrieval Standards (LOTAR)?	2 7 7	R2.2.2 The DE ecosystem SHALL be sized and maintained for TBD number of users for concurrent use of program identified	ap 2	70	7
R C2.12 Does the tool interface with other engineering domain design and analysis tools?	2 7 7		el 3	70	77



Enter Your DE Ecosystem Size Parameters

User enters customized ecosystem data reflective of their personal environment.





Tailored Lists of Criteria and Ecosystem Requirements

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

Tailored Tool Criteria				qual ghting			T	ailored Ecosyste
Crite	eria	Pequirement Scope (antionally Criteria with Weights	Eilten 🖂		□	Crite	ria	Duminment
Ele	ment Type:	Requirement Scope (optional): Criteria with Weights 00	Filter:			Eler	ment lype:	Requirement Sco
#	Id	Name		Percentage		#	ld	
1	C1	Does the tool support a governance process?		0.1429		1	R1	Adv. Tech &Innovation
2	C1.5	Does the tool support version control with a controlled process?		1		2	R1.2	E Technologies
3	C2	R Does the tool support integration of models/tools?		0.1429		-		The DE ecosystem SHALL prov
4	C2.4	Does the tool support verification / validation of models and data?		0.25		3	R1.2.2	R development capabilities such
5	C2.5	Does the tool support the development and use of automated workflows?		0.25				intelligence, ontology, virtual r
6	C2.8	Does the tool support interfacing and integration with dissimilar models?		0.25		4	R2	Collaboration
7	C2.10	Does the tool support API/ interfacing (standard plug-ins) for data exchange tool-to-tool interact	on?	0.25		5	R2.1	
8	C6	Im Does the tool provide VAULTIS Capabilities?		0.1429		-		
9	C6.4	Does the tool provide unique identifiers and common metadata standards		0.3333		6	R2.1.2	web portal others) to support
10	C6.6	Does the tool support data source cataloging for access and sharing?		0.3333				The DE econystem SHALL enab
11	C6.8	Can the Tool be interoperable with data that can be easily discovered, linked, retrieved, audited, to understood, and referenced?	isted,	0.3333		7	R2.1.3	engineering disciplines
12	C7	Does the ecosystem facilitate collaboration?		0.1429		8	R2.1.1	The DE ecosystem SHALL prov
13	C7.2	Does the tool support a variety of privledges for sharing data?		0.3333		9	R2.2	🗉 🔳 Users
14	C7.6	Does the tool support simultaneous use with multiple users in multiple locations?		0.3333		10	222	The DE ecosystem SHALL be si
15	C7.8	Does the tool support activity and task planning?		0.3333		10	N2.2.3	program personnel
16	C10	Does the tool support cyber security requirements?		0.1429		11	R2.2.4	The DE ecosystem SHALL prov
17	C10.1	Is the tool compliant with the NIST Cyber Security Framework?		1		12	R2.2.1	The DE ecosystem SHALL supp
18	C11	Does the tool provide a user friendly experience?		0.1429		13	R3	🗆 🖪 Data
19	C11.3	Does the tool support multiple simultaneous sessions?		1		14	R3.2	Curation
20	C12	Does the tool provide product support?		0.1429				- The DE ecosystem SHALL acco
21	C12.4	Does the tool support automated reporting (e.g. metrics, use, health, status, reminders to users, e	:.)?	0.5		15	R3.2.3	ecosystem instantiation
22	C12.5	Does the tool include user templates and examples to learn from?		0.5				The DE ecosystem SHALL cont

	Equal Weighting					
rite	iteria					
Eler	Element Type: Requirement 🦾 🦾 Scope (optional): Requirement with Weights 🖤 🛄 Fit			ter: 🛛		
#	ld	△ 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 , artifi intelligence, ontology, virtual reality, augmented reality, and 5G technologies	;ial	1		
4	R2			0.1667		
5	R2.1	E Resources		0.5		
6	R2.1.2	The DE ecosystem SHALL be sized for growth in the number of connections and types of accesse web portal, others) to support (TBD) users	(VM,	0.3333		
7	R2.1.3	The DE ecosystem SHALL enable sharing of models, data, and simulations from authorized users engineering disciplines	and	0.3333		
8	R2.1.1	The DE ecosystem SHALL provide automated notifications capability to all applicable change even	nts	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 identifi program personnel	d	0.3333		
11	R2.2.4	The DE ecosystem SHALL provide network access to authenticated users, organizations and stake	nolders	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	E Curation		0.3333		
15	R3.2.3	The DE ecosystem SHALL accommodate discovery of models and associated data, from outside ecosystem instantiation	ne local	0.2		
	1	The DE econystem SHALL contain an expansion data staring structure for eace 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!



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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 🛍 🔹 👯 🗸 🗍 😴 🗄 🗐 🤤							
#	ld	Name	Tra △ T Lai	ced Large o Weight ge Calculated	Traced To Medium	Medium Weight Calculated	Traced To Small	Small Weight Calculated
1	R1	R Adv. Tech &Innovation	Х	0.1667	Х	0.1667	Х	0.1667
2	R1.1	Innovation	Х	0.5	Х	0.5		1
3	R1.1.1	The DE ecosystem SHALL support prototyping activities for ecosystem improvements	Х	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	х	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	х	0.125	х	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	х	0.125	x	0.25		
7	R1.2	🗆 📧 Technologies	Х	0.5	Х	0.5	Х	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	х	0.25	x	0.5	х	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.	х	0.25				
10	R2	Collaboration	Х	0.1667	Х	0.1667	Х	0.1667
11	R2.1	🖂 📧 Resources	Х	0.5	Х	0.5	Х	0.5
12	R2.1.3	The DE ecosystem SHALL enable sharing of models, data, and simulations from authorized users and engineering disciplines	Х	0.1667	x	0.1667	Х	0.1667