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Development of Digital Engineering Artifacts in Support of MBSE-Based Test Planning, Execution, and Acquisition Decision Making

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Craig Arndt—currently serves as a principal research engineer on the research faculty of the George Tech Research Institute (GTRI) in the System Engineering Research division of the Electronic Systems Lab. Arndt is a licensed Professional Engineer (PE), and has over 40 years of professional engineering and leadership experience. Arndt holds engineering degrees in electrical engineering, systems engineering and human factors engineering and a Masters of Arts in strategic studies form the U.S. Naval War college. He served as Professor and Chair of the engineering department at the Defense Acquisition University, and as technical director of the Homeland security FFRDC at the MITRE Corporation. In industry he has been an engineering manager, director, vice president, and CTO of several major defense companies. He is also a retired naval officer. [Craig.Arndt@gtri.gatech.edu]

Abstract

In order to effectively implement MBSE in all aspects of testing and in system engineering for the department of defense we need to create models of the acquisition system (acquisition process, as described by the acquisition pathways), models of the critical acquisition artifacts (CDD, RFP, Acq Strategy, SEP, TEMP, AoA, etc.), and key events (technical reviews, SFR, PDR, CDR, TRR, etc.).

Many related efforts are underway throughout the DoD and DOT&E's Strategic Initiatives, Policy, and Emerging Technologies (SIPET) division has sponsored Model-Based TEMP (MBTEMP) Workshops at Johns Hopkins University Applied Physics Laboratory (JHU/APL) in July 2022 and February 2023 to foster collaboration and knowledge exchange to advance MBSE for T&E.

Most of these efforts are looking at one of three paths for creating MBTEMPs:

1. Digitizing the current acquisition artifacts;
2. Creating a hybrid MBTEMP based on the current format and integrating with different models that are being developed within MBSE environments;
3. The development of a completely new method to do T&E planning in a model-based system.

This report summarizes the presentations of the February 2023 workshop, along with the challenges and actions captured there, so as to provide the reader an overview and community entry-point to the many T&E focused digital engineering (DE) efforts that are ongoing across our Department.

Keywords: Model Based System Engineering, Acquisition artifacts, Model based test planning, Digital TEMP

Introduction

The transformation from the historical, document-based acquisition system to DE is resulting in some of the most significant changes to the way the DoD has engineered and developed weapon systems in decades. The shift to the use of DE will not only impact the DoD but the entire military industrial complex. Coined by President Eisenhower in a 1961 address to the American people, the “military-industrial complex” includes the contractors that develop and manufacture the nation’s combat systems (History.com Editors, 2009).

In some ways, the transition to DE is the DoD’s reaction to the larger endeavor in the engineering community to reduce development time and cost by using digital data management technologies across development and manufacturing enterprises. In the DoD’s “Digital Engineering Strategy,” the DoD states that “current acquisition processes and engineering methods hinder meeting the demands of exponential technology growth, complexity, and access to information” (DoD, 2018). DoD leadership believes that DE will enable the DoD to meet the current and upcoming challenges to delivering new capabilities to the warfighters in support of the DoD’s numerous complex missions. To accomplish this, it is crucial to have a realistic DE strategy in place that can be implemented with new DE technologies while maintaining compliance with current acquisition processes. The development of standardized digital data about systems under development and test has other significant advantages. Specifically, the potential of digital systems to accelerate acquisition programs, and the ability to more effectively manage large numbers and systems (portfolios), and mission sets.

The defense acquisition system is defined and governed by both federal law and DoD regulations. The majority of these rules and processes are contained in the Defense Federal Acquisition Regulations (FAR), DoD Instruction 5000.02, and the Defense Acquisition Guidebook (DAG). The methods used across the DoD to develop requirements, perform systems engineering, select vendors, and manage contracts are embedded in these regulations. Included in these processes is the generation and maintenance of major acquisition artifacts. These artifacts have traditionally been written planning documents and analysis that play a major part in both coordinating the agreed-upon approach to the development, T&E, and fielding of systems among decision makers and oversight organizations. These documents have for decades been static; in many cases they have not been effectively updated and managed throughout the lifetime of a programs. As a result, they have less value to the overall success of programs that they are created to support.

None the less, the creation of artifacts is a critical part of the acquisition process, as these artifacts are used to manage acquisition processes and decisions. As part of the effort to digitize the acquisition and the engineering process, these artifacts also need to be digitized; the need to provide decision makers better data to make decisions is one underlying diver for digitizing these artifacts. One of the key acquisition artifacts that needs to be digitized is the Test and Evaluation Master Plan (TEMP) that captures the key elements of acquisition programs’ T&E strategy and associated resources and schedule.

As part of the ongoing effort to advance the state of practice in the use of digital engineering and model-based systems engineering in DoD test and evaluation Model-Based TEMP (MBTEMP) Workshops have been conducted at Johns Hopkins University Applied Physics Laboratory (JHU/APL) in July 2022 and February 2023 to foster collaboration and knowledge exchange to advance MBSE for T&E.

The next section of this paper is a review of the work that was presented at these workshops.

Summary of February 2023 MBTEMP Workshop Presentations

Note: These summaries are impartial and do not indicate any endorsement on behalf of DOT&E. All complete presentations from the workshop are available for the community here: https://www.trmc.osd.mil/wiki/download/attachments/184156180/mb_temp_workshop_2_2023-02-26.zip?api=v2

Jessica Ma, JHU/APL—Background from Workshop 1

Jessica Ma provided an overview of the first MBTEMP workshop sponsored by DOTE's SIPET division and host at JHU/APL in July 2022. The first workshop kicked off with an introduction to the fundamentals of digital engineering and its application to DoD programs provided by Edward Kraft. From there, Suzanne Beers provided a discussion on the key role of using Integrated Decision Support Keys for developing T&E strategies. DOT&E's Chief Scientist, Jeremy Werner, then provided an overview of his objectives with an emphasis on the development of MBTEMPs. Karl Glaeser then provided an overview on the Navy's iTEMPS effort to develop fully-integrated digital T&E strategies, inclusive of not just TEMPS but actual test data and assessments, across the DoN; although the Navy's strategy involves modern digital technologies such as web-based applications and SQL databases it is unique in that it does not invoke SysML. Craig Arndt and Mike Shearin provided an overview of GTRI's MBTEMP-associated efforts. Praveen Chawla of Edaptive Computing, Inc., demonstrated a model-backed word processing and content management solution that DOT&E is funding the development of for MBTEMPs. The fundamentals of SysML were then introduced, which was followed up with a demonstration of a SysML model for the MBTEMP using a torpedo as an exemplar. Finally, table top exercises were conducted to explore future efforts.

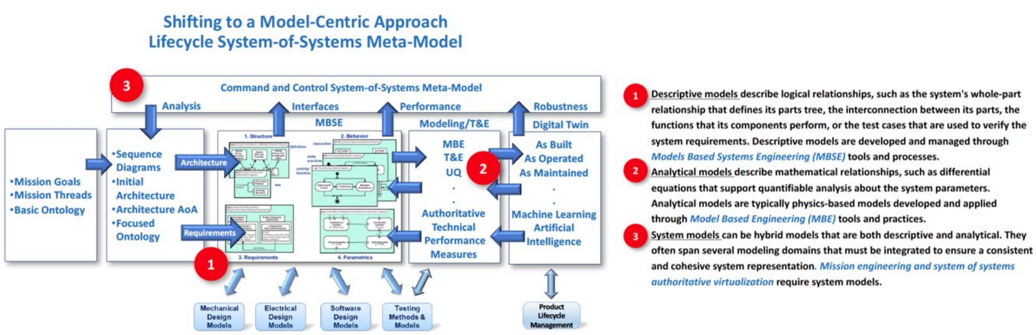

Figure 1. Life Cycle System of Systems Meta-Model

Ed Kraft, JHU/APL—Model-Based TEMP Workflow

Ed Kraft outlined a workflow for developing MBTEMPs (Figure 2) that link mission and systems engineering to the IDSK. He further described an approach for shifting left (and looking right) through the development of early (and late) virtual integrated and operational test. The approach emphasized using graph theory and iterative analysis as the mathematical basis for injecting testing of mission threads via mission model simulations, both early and often.

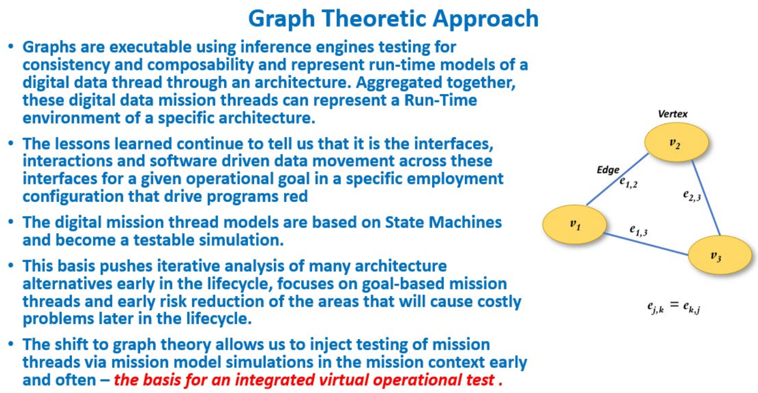

Figure 2. Model-Based TEMP Workflow

Darryl Howell, Contractor Support to DEM&S, R&E, SE&A—Digital/Mission Engineering

Darryl Howell presented R&E SE&A's views on digital and mission engineering with a T&E focus on behalf of Daniel Hettema Director, Digital Engineering, Modeling & Simulation (DEM&S, R&E, SE&A). DEM&S's vision for Digital Engineering was conveyed as:

1. Digital becomes the normal
2. Data and Information flow across disciplines and ecosystems throughout the life cycle
3. Powerful modeling, simulation, and visualization tools are used
4. AI is used to elevate experts and gain insights
5. Decisions are data driven and made with confidence earlier
6. Innovative culture is adaptive and continuously improves practices across the Defense Acquisition life cycle

with the goals of:

- Outpacing rapidly changing threats and technological advancements
- Delivering advanced capabilities more quickly and affordably with improved sustainability to the warfighter

DEM&S's near-term focus is on advancing a community of practice and body of knowledge for digital engineering (Figure 3).

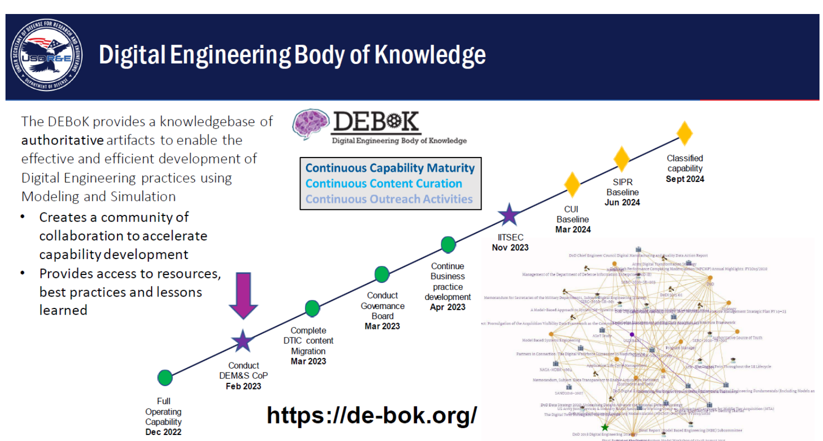

Figure 3. DEBOK

Randy Saunders, JHU/APL—MBTEMP Roadmap and Vision

Randy Saunders presented a roadmap (Figure 4) including a POAM with scheduled roll-out of MBTEMP solutions and outreach to future pilot programs. He described the MBTEMP vision and objectives of:

- Representing the content of current TEMPs to support processes dependent on TEMPs
- Maximizing reuse of model-based artifacts produced already
- Leveraging existing standards for MBSE in the DoD
  - SysML modeling diagrams and tools
  - Integrated Decision Support Key (IDSK, from DoD 5000.89)
- Minimizing effort to express T&E content in an MBTEMP
- Enabling continuous T&E feedback with agile programs
- Encouraging utilization of common infrastructure (at TRMC) for data sharing, analytic tools hosting, and collaboration between programs if they so choose

He detailed a value model for the MBTEMP while conveying that the MBSE will "transform T&E from a source of data to the source of authoritative knowledge for effective decisioning."

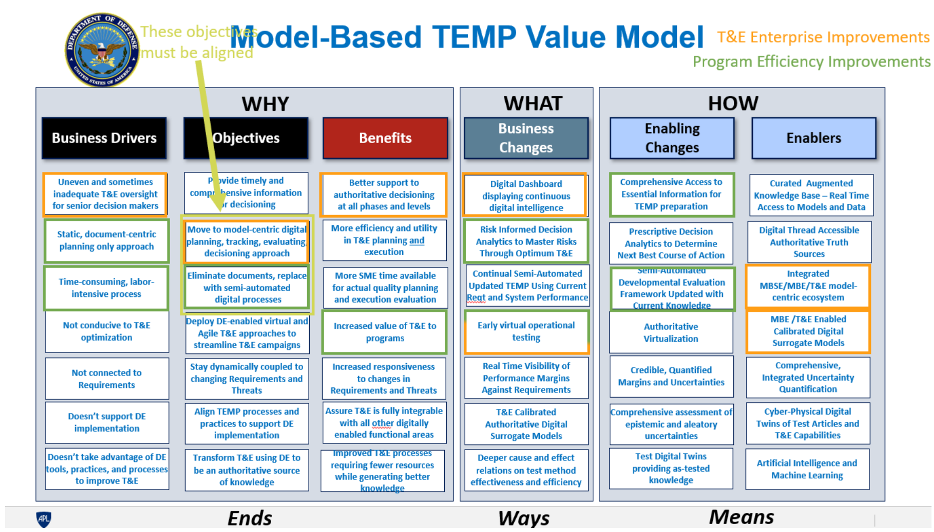

Figure 4. Model-Based TEMP

Jeremy Werner, DOT&E—DOT&E S&T Initiatives

Jeremy Werner provided an update on DOT&E's science and technology plan and associated implementation plan (Figure 5). The implementation plan is aligned to DOT&E's five strategic pillars (Figure5) shown below and it's overarching goal of: Transforming T&E to enable delivery of the world's most advanced warfighting capabilities at the speed of need.

Werner then discussed his FY23 objectives to advance:

- Enterprise data/knowledge management and analysis
- Credible, data-backed all-domain M&S as a service to include Uncertainty Quantification
- Sequential T&E
- Digital transformation and Model-Based Systems Engineering

- T&E of AI, Autonomy, Human Systems Integration (HSI), and Human Machine Teaming (HMT)
- Workforce upskilling, career-long learning, and career pathing.

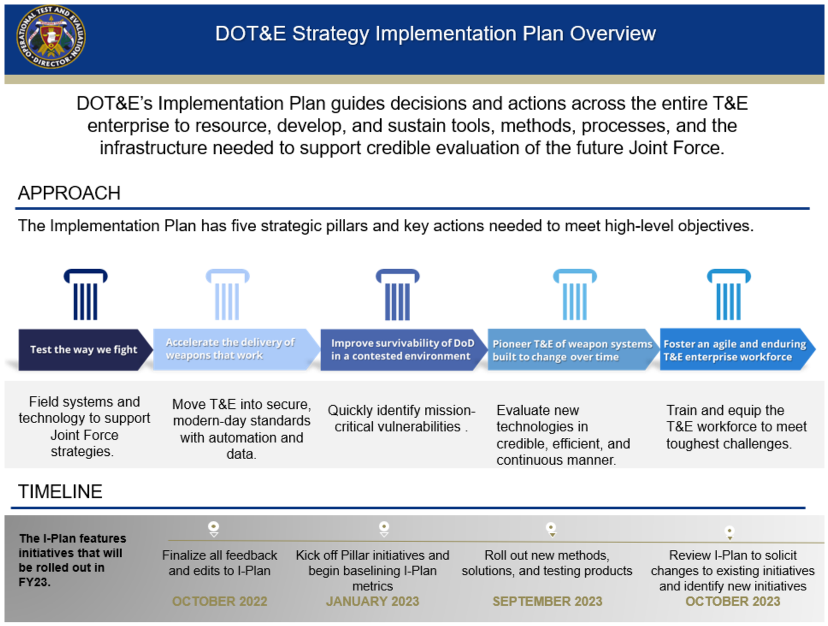

Figure 5. Five Strategic Pillars

Navreeta Singh, DOT&E and Princeton University—Digitally Implementing IDSK as a Relational Database

Navreeta Singh presented a proof of concept implementing an IDSK as a Relational Database Using the Mk 54 Lightweight Torpedo as an exemplar. All related tables from the January 2021 draft of the Mk 54 Lightweight Torpedo TEMP were integrated into this relational database. All steps and code needed to recreate the proof of concept are available here: https://www.trmc.osd.mil/wiki/download/attachments/184156180/mk54_idsk_cui.zip?api=v2

Singh implemented the IDSK database in two languages: R Project, which is popular among the T&E analyst community, and SQLite, which is the world's most popular enterprise SQL database engine and was invented as part of a Navy project that developed software for Arleigh-Burke-class destroyer's damage control.

Praveen Chawla, Edaptive Computing, Inc.—Smart Documentation from Edaptive Computing

Praveen Chawla demonstrated a mature model-backed word processing and document content management system that Edaptive is enhancing for MBTEMP. The solution stores content modules (e.g., system descriptions) in a backend database so that they can be used across multiple documents in a version-controlled way. The solution is integrated into Microsoft Word so that document developers can continue to work in their native environment. The system is currently being enhanced to pull IDSK tables into Microsoft Word–developed TEMPs from a backend SQL database. A future iteration will enable the full generation of IDSK databases directly within the web app from a set of templates without the user needing to have any knowledge of SQL.

Suzanne Beers and William Fisher, MITRE—IDSK Concept & Digital Implementation Vision

Suzanne Beers and William Fisher presented a concept for IDSK and vision for implementing it digitally (Figure 6). The concept described how IDSKs can be used to enable better programmatic decision making. In particular, how the IDSK can articulate a logical evaluation strategy to inform decisions was discussed. IDSKs can convey:

- Decisions to be made and knowledge needed for informed decisions.
- Operational and technical capabilities evaluation to generate knowledge.
- Wargames, experimentation, M&S, test events, analyses and other data sources provide data for evaluation.

Their vision for implementing the IDSK using a variety of tools was then discussed, as seen in Figure 6.

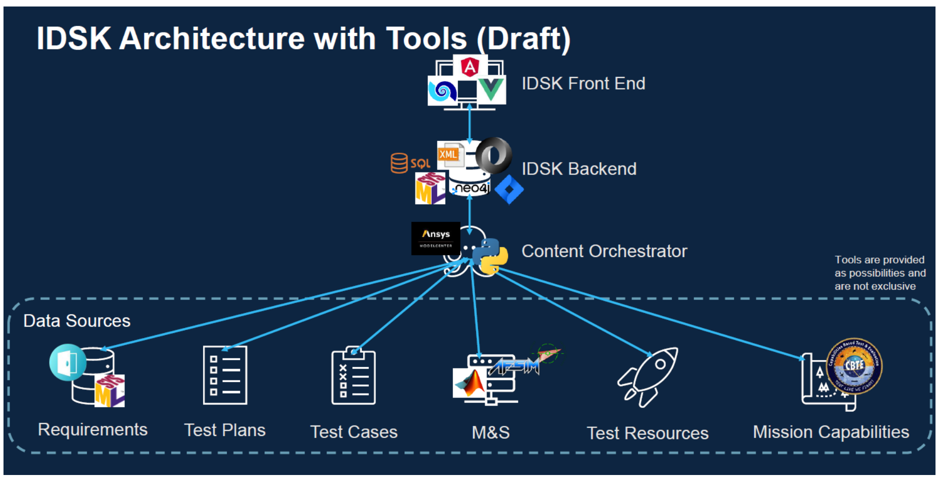

Figure 6. IDSK

Thomas Llanso, JHU/APL—MBTEMP Profile/Data Dashboard

Thomas Llanso discussed creating MBTEMP profiles in SysML and connecting them and their underlying data to dashboards for analytics. The question of "How can we identify and locate test-relevant digital model data for a variety of T&E stakeholders?" was discussed from multiple different viewpoints including MBSE (Figure 7) and the more traditional data engineering approaches used across the modern business enterprise (e.g., SQL).

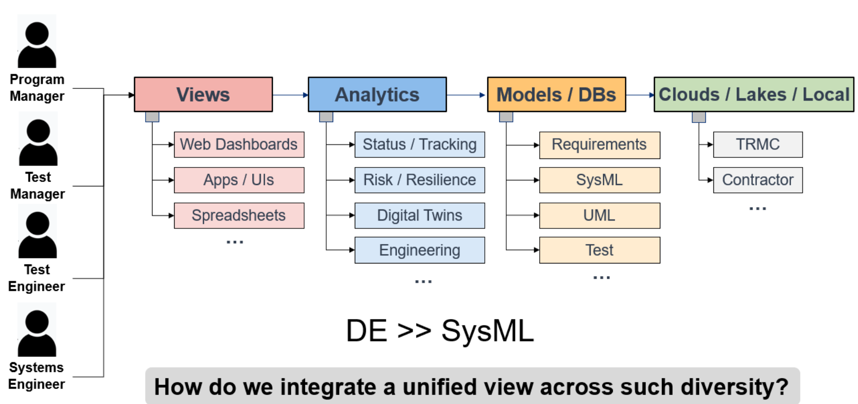

Figure 7. MBTEMP Data Dashboard

Hans Mair, JHU/APL—Torpedo Exemplar

Hans Mair discussed JHU/APL's MBTEMP exemplar of the Mk 54 lightweight torpedo. The analytic augmentation of this MBTEMP to act as an acquisition milestone decision-support planning tool was discussed, in particular. The SysML models of both the TEMP elements (e.g., system description) and the actual system (e.g., guidance and control) were displayed and then put into a unified mission context for T&E to assess the system's operational effectiveness, suitability, reliability, and lethality.

Douglas Kelly, JHU/APL—Enterprise Data Lake

Douglas Kelly provided an overview of the several different data architectures and data solutions, including data lakes, that are commonly used across the business enterprise. One objective was to provide the audience an understanding of these different architectural alternatives. Solutions like data lakes, data warehouses, and data marts were all discussed, as were their advantages and disadvantages, as well as their associated extract, transform, load (ETL) processes, and the types of live end-user applications such as analytics and machine learning they can support. This was all contextualized in terms of DOT&E's vision for building a common, automated data and data analysis environment for the T&E enterprise (Figure 8)—all the way from the tactical edge (e.g., test range) to the C-Suite (e.g., Advana).

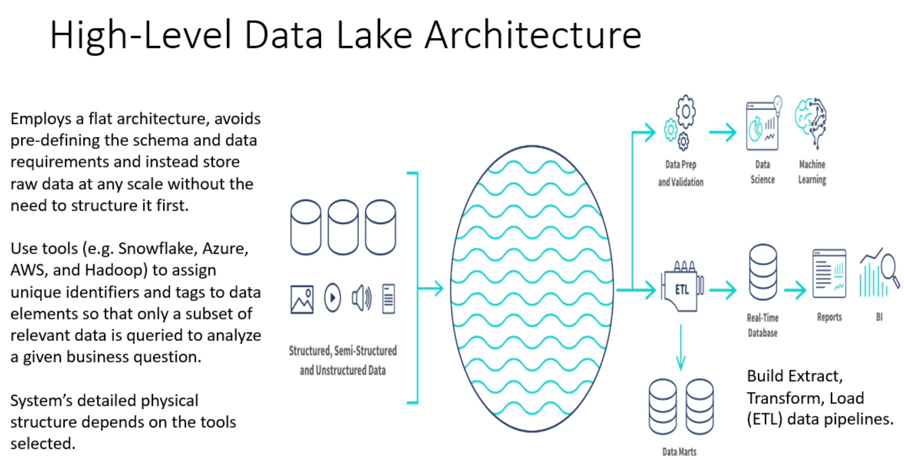

Figure 8. Data Lake

Ryan Norman, Test Resource Management Center (TRMC)—TRMC MBTEMP Supporting Capabilities

Ryan Norman discussed achieving the T&E continuum goal of "shared capability across the continuum life cycle" and result of "shared knowledge informing decisions across systems' life cycles" as well as how "future RDT&E relevance depends on our ability to modernize." He detailed how JMETC is providing an agile infrastructure to enable rapid acquisition with the desired result of providing an "an operationally-realistic environment for rapid experimentation, testing, training, and mission rehearsal across warfighting domains." From there Norman described TRMC's related investment areas as well as the mature capabilities they have available to provide, including TENA, the JMETC 266nramp, CHEETAS—which, among other things, provides a tactical system-to-engineering units data interoperability layer—and many others. Finally, Norman discussed TRMC's upcoming investments in knowledge management, big data analytics (Figure 9), and data science capabilities with a view to conveying CHEETAS central role in this.

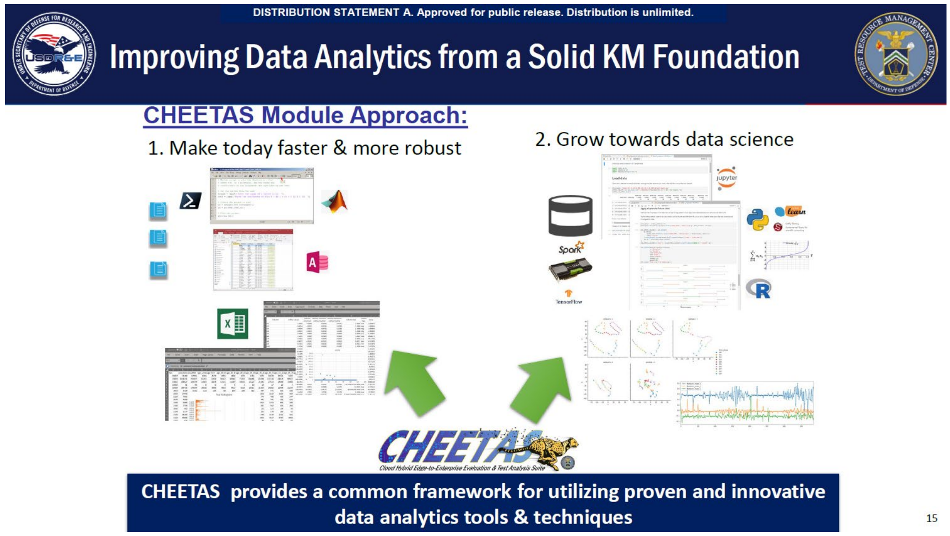

Figure 9. Data Analytics

Martha McNeil, JHU/APL—MBTEMP Analytics

Martha McNeil first presented how an MBTEMP can be used in conjunction with analytics to answer a variety of stakeholder questions (Figure 10) and then facilitated a discussion with the audience about the questions different people would want MBTEMPs to answer. She then provided examples of tools that can be used to generate analytics from SysML models such as Cameo Report Wizard and BluGen.

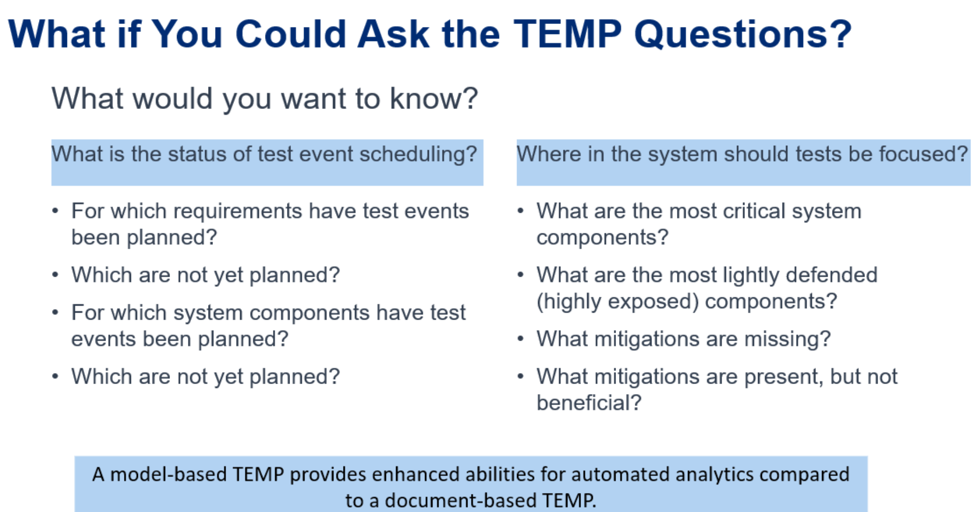

Figure 10. TEMP Questions

Karl Glaeser and Caitlin Szymendera, Department of the Navy (DoN)—Integrated Test & Evaluation Management System (iTEMS) Update from Navy

Karl Glaeser and Caitlin Szymendera provided an updated on the development and rollout of the DoN's iTEMS, which they described as follows:

> The Integrated Test & Evaluation Management System (iTEMS) is a suite of web-based software applications. iTEMS was developed in an effort to streamline the tools currently used across multiple DoN Programs and

platforms. It leverages existing tools, best practices, and lessons learned to reduce development and operation costs. Through the use of iTEMS, data is used, controlled, and expelled in a consistent and measurable manner, providing data consolidation and accurate translation.

iTEMS is the DON's solution (Figure 11) for fully-integrated digital T&E strategies, inclusive of not just TEMPS but actual test data, assessments, and acquisition/test planning; although the Navy's solution involves modern digital technologies such as web-based applications and SQL databases it is unique in that it does not invoke SysML. IOC of iTEM including iTEST (Figure 12) is scheduled for April 2023. The DoN's strategy of "right time" annual updates to TEMPs vice real-time updates was also discussed.

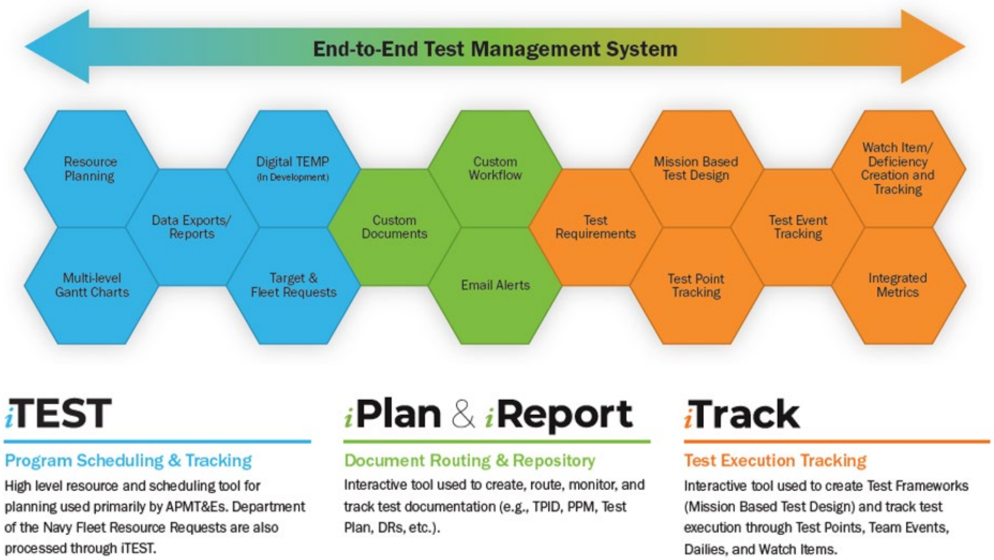

Figure 11. iTEMS

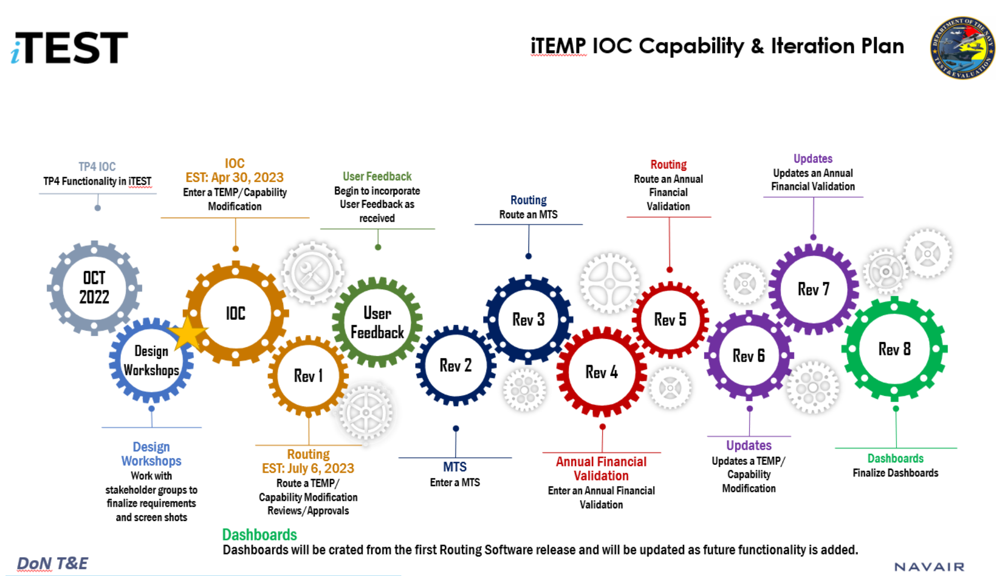

Figure 12. iTEST

Day 3

Ken Senechal, NAVAIR—CBTE / MBSE / IDSK Leading Change

Ken Senechal described NAVAIR's and the DoN's approach to Capabilities-Based Test and Evaluation (CBT&E) and its underlying "Test Like We Fight!" mantra, including a mission-based test design process, as part of capability based acquisition (Figure 13). One goal of CBT&E is to unify CT/DT/IT/OT into a single holistic test and evaluation construct—a holistic "T&E Continuum" using DE and MBSE that includes virtually executing T&E and blending it with systems engineering on the left side of the systems engineering "V." Finally, Senechal reported on the hack-a-thon recently hosted by NAVAIR and the "Raspberry Jammer" developed there.

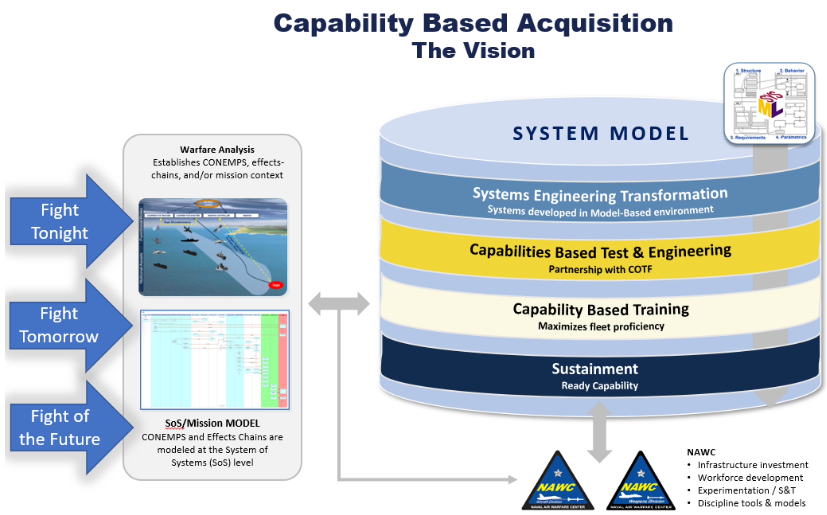

Figure 13. Capability Based Acquisition

Jerome Hugues (CMU, SEI), Dionisio De Niz (CMU, SEI), Zamira Daw (Universitat Stuttgart), and Laura Epifanovskaya (OUSD R&E contractor support)—Transforming MBSE Models into Formally Verifiable Language to Support Test and Evaluation as a Continuum

Jerome Hugues and team introduced the method of formal verification as a rigorous means to test software across vast phase spaces (Figure 14). They described how MBSE reduces the effort of developing complex system by improving:

- Requirements
- Traceability
- Code generation
- Design reuse
- Validation and Verification
- Communication

And how formal verification can reduce fault leakage in the acquisition process that leads to major delays and costs in rework to correct. Future Vertical Lift was provided as an example of how formal verification successfully generated test and development efficiencies. Furthermore, Hugues and team described how reducing fault leakage is a necessity for safety critical systems.

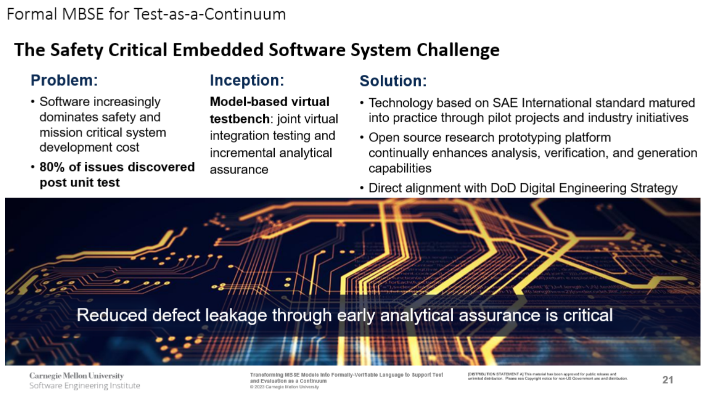

Figure 14. Test as a Continuum

Kent Laursen, General Dynamics Information Technology (GDIT)—GDIT Digital Engineering Environment for USAF Sentinel Ground Based Strategic Deterrent Program

Kent Laursen opened his presentation by conveying the DoD's digital engineering strategy which promotes the use of digital representations of systems and components and the use of digital artifacts to design and sustain national defense systems. He described the department's five strategic goals of digital engineering as:

- Formalize the development, integration, and use of models to inform enterprise and program decision making
- Provide an enduring, authoritative source of truth
- Incorporate technological innovation to improve the engineering practice
- Establish a supporting infrastructure and environment to perform activities, collaborate and communicate across stakeholders
- Transform the culture and workforce to adopt and support digital engineering across the life cycle.

Laursen then described GDIT's enterprise digital engineering stack (Figure 15) and it how it is being used by Sentinel. Finally, Laursen described GDIT's Navigable Relationships (NavRel) framework which can be thought of as a next generation high-dimensional database that incorporates digital threads, schemas, queries with DOORS, Jira, Cameo Systems Modeler, Ansys Model Center integrations along with high level analytics and visualizations.

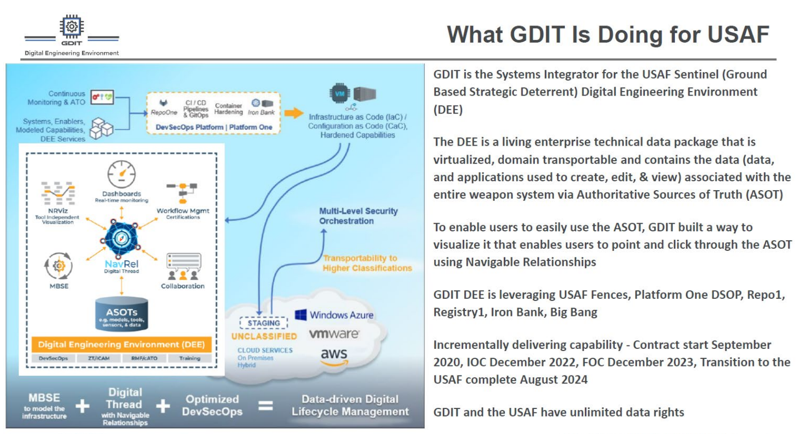

Figure 15. GDIT's USAF MBSE

Tyson Blauw, Space Systems Command—Lead Developmental Test Organization (LDTO): Digital Engineering with Protected Tactical SATCOM (PTS) Developmental Evaluation Framework Demonstration (Space Systems Command)

Tyson Blauw presented the Space Systems Commands' LDTO Developmental Evaluation Framework (DEF) model development progress (Figure 16) and LDTO short-term and long-term goals for digital engineering. Their short-term goals are to:

- Copy critical TEMP inputs into MBSE ecosystem
- Create system under test diagrams in the model for each test event
- Generate use cases/test procedures based on CONOPs and trace to system capabilities
- Trace system under test diagrams to resource allocations
- Generate entry/exit criteria in model for test event.

And their long-term goals are to:

- Conduct daily T&E activities using models
- Utilize model to generate test plans
- Trace known deficiencies to models instead of the Joint Deficiency Reporting System.

Blauw also described the hurtles seen in Figure 16.

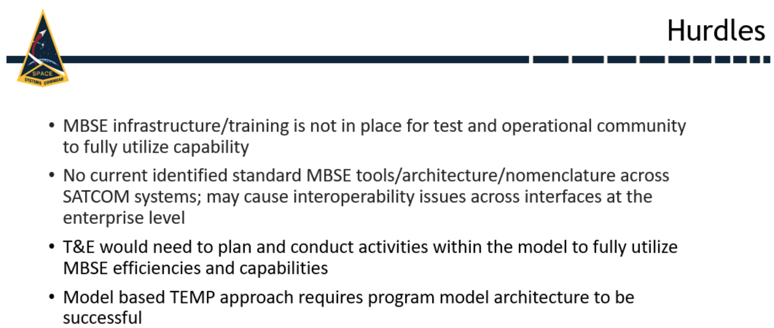

Figure 16. MBSE in Space Systems

Craig Arndt / Michael Shearin, GTRI—MBSE in T&E

Michael Shearin described a GTRI project that uses an exemplar electronic warfare system to:

- Develop a representative set of models linking requirements, design, testing, and risk using MBSE
- Model an example system and demonstrate how test organizations can integrate MBSE models to inform the development of testing documents and plans
- Develop and implement a risk function this will be linked to the integrated model
- Include in the risk model a method for linking to program risks

The project also included modeling and linking test range capabilities. Shearin communicated the impact of the project as follows:

- The model-based test risk function is a new development that gives the program office and the different test organizations better visibility into the different critical aspects of program performance all along the development and testing life cycle of the program.

- By integrating testing and model-based systems development we are extending the current methods of Model Based System Engineering (MBSE) in their application to DoD systems.

Kishor Ramaswamy, Ansys—Digital Engineering Exemplar: Air Force Test Center Targeting Pod

Kishor Ramaswamy described how Ansys is providing simulation capabilities and developing workflows to perform virtual testing of infrared search and track (IRST) systems for the Air Force. These solutions are increasing test coverage and reducing risk by leveraging simulation to gain information on scenarios that would otherwise be unattainable in the real world. From there, Ramaswamy described the M&S architecture, multiphysics models of aircraft sensors, and ability to generate accurate lightweight, fast-running reduced order models (Figure 17) using a combination of statistical and physics-based machine learning techniques.

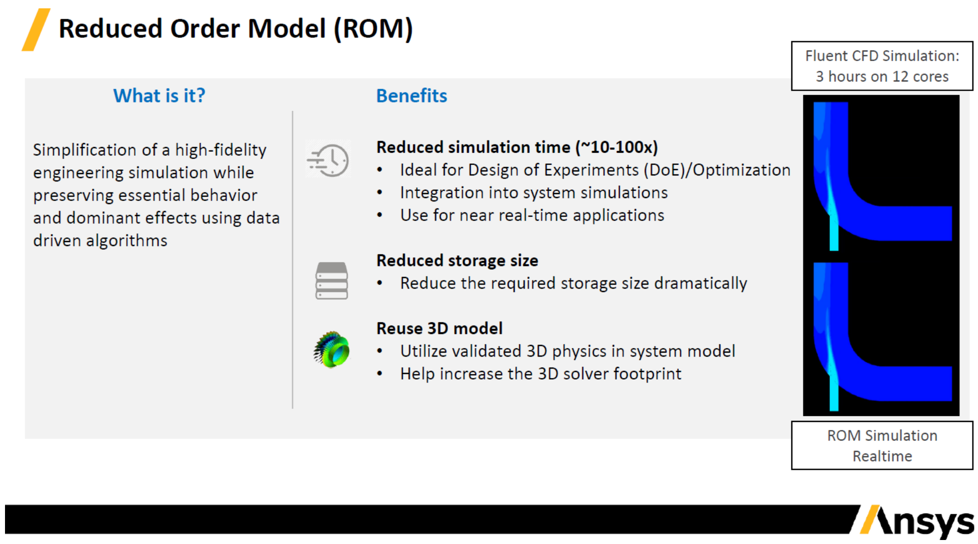

Figure 17. Reduced Order Model

This workshop was a great success in continuing to share project and research progress across the T&E digital engineering community. As the MBSE test community continues to move forward in implementing digital technology into all aspects of the DoD test and evaluation processes, there have been a number of challenges identify that will need to be addressed.

Key Challenges Identified

There are a number of challenges both technically and policy-oriented to finalizing and implementing methods and tools to enable MBTEMPs and other digital acquisition artifacts.

Some of the technical challenges question that need to be answered include:

a. Modeling structures, e.g., MBSE vs. relational database implementations
b. Hosting environments
c. Data standards
d. Enterprise (vice desktop) MBSE solutions.
e. Interoperability requirements of different versions of tools or models.

In addition to the technical challenges there are larger policy issues that will need to be decided and agreed upon across a wide range of stockholders. These issues include but are not limited to:

a. Who will have authority over the format and the content of the digital artifacts?
b. What will be the best practices for developing and maintaining them?
c. What will be the incremental implementation of the new digital formats?
d. How will legacy and in-flight programs be handled?

Impact

The development of MBTEMPs will have a positive impact across DoD acquisition. Specifically, MBTEMPs will lead to better data for better decision making, and better risk management. In addition, the goal of program acceleration will be more achievable if testing and evaluation can provide early insights into what testing is most critical and when that testing can be done early in the program to inform design decisions, before subsequent verification testing. Also, better planning that can be digitally aggregated across the enterprise will lead to better management and planning of test and evaluation resources to support current and future programs, and better integration of capabilities from different parts of the test community.

Actions Identified / Recommended

The MBTEMP workshop at John Hopkins APL earlier this year made significant progress in sharing different approaches and results in developing digital versions of test planning and test execution artifacts. Some of the key actions that were identified by the stakeholders at the workshop include the following:

1. To shift the focus of future workshops more towards usable examples / demonstrations vice Power Point presentations, in an effort to generate product of greater use to the practitioners in the program offices and test centers .
2. Delineate MBTEMP work from fully digitized/integrated T&E strategies (i.e., DoN iTEMS discussed below). While both efforts are needed and valuable there is a need to effectively advance both simultaneously while distinguishing between the two.
3. Establish a working group on DE for T&E that meets monthly to highlight different efforts and cross-coordinate findings and products created by different groups.
4. Identify and convey best practices that can then be used to develop helpful guidance.
5. Work to ensure interoperability across the different technologies being used.

Conclusions and Recommendations

This paper explored the ongoing development of digital versions of acquisition artifacts in an effort to develop methods to realistically develop these artifacts in a manner both consistent with the DoD DE strategy and immediately useful to a wide range of program offices and the test community. This effort was contextualized in terms of the most recent Model-Based TEMP workshop that DOT&E sponsored at JHU/APL in February 2023; this article provided summaries of all of the presentations given at this workshop. Moreover, all of the complete presentations from the workshop are available for the community here: https://www.trmc.osd.mil/wiki/download/attachments/184156180/mb_temp_workshop_2_2023-02-26.zip?api=v2

We are building a growing digital engineering community for T&E and have discovered several key aspects of the development of sustainable digital engineering and digital acquisition practices and systems across the DoD.

1. Because of the current state of DoD acquisition and all of the legacy contracting and engineering processes in use, it is necessary that key acquisition artifacts including the Test and Evaluation Master Plan (TEMP) be digitized in a manner that is consistent and compatible across different organizations, as well as new and legacy programs.
2. The cost and complexity of wide-spread implementation of DE and digital acquisition means that we should consider an incremental approach to implementing these technologies and methods across new and legacy programs. One of the critical advantages of DE and digital acquisition is the ability to accelerate the acquisition process; critical to achieving this acceleration is ensuring that digital transformation does not itself slow programs down.
3. The development of new tools and processes including the MBTEMP should focus on the addressing the needs of acquisition and test practitioners for us to accelerate the delivery of weapons that work vice imposing new cumbersome requirements.
4. We should prioritize integrating our T&E community and processes with the rest of the DE community.
5. Fully realizing DE's potential for T&E's will depended on tight collaboration between the DoD and our industry partners.

We will continue to advance the state of the art of DE for T&E, host and support future events—such as the upcoming DTE&A-sponsored Connect the Dots workshop to be hosted at Institute for Defense Analyses June 27–29, 2023—and collaborate across the DoD and industry to do our part to transform T&E to enable delivery of the world's most advanced warfighting capabilities at the speed of need. We seek your proposals to collaborate with us.

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