Continued Work on Digital Engineering and Model, Simulation in DoD

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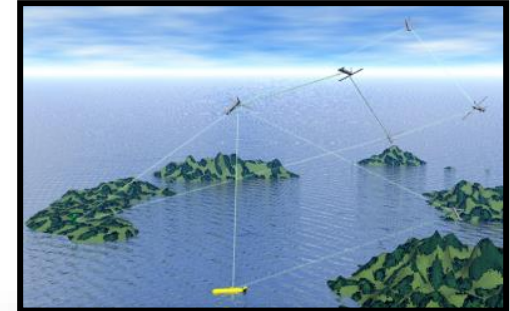
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- **Ensure Technological Superiority for the U.S. Military**

  – Set the technical direction for the Department of Defense (DoD)

  – Champion and pursue new capabilities, concepts, and prototyping activities throughout the DoD research and development enterprise

- **Bolster Modernization**

  – Pilot new acquisition pathways and concepts of operation

  – Accelerate capabilities to the Warfighter
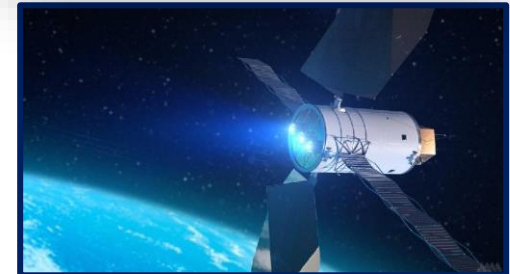
Digital Engineering Strategy: What not How

Describes an integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines <u>to support life cycle activities</u> from concept through disposal

1. Formalize the **development, integration and use of models** to inform enterprise and program decision making

2. Provide an enduring **authoritative source of truth**

3. Incorporate **technological innovation** to link digital models of the actual system with the physical system in the real world

4. Establish supporting **infrastructure and environments** to perform activities, collaborate, and communicate across stakeholders

5. Transform a **culture and workforce** that adopts and supports Digital Engineering across the lifecycle

DIGITAL ENGINEERING STRATEGY

1 Formalize Development Integration and Use of Models
2 Provide an Authoritative Source of Truth
3 Incorporate Technological Innovation
4 Establish Infrastructure and Environments
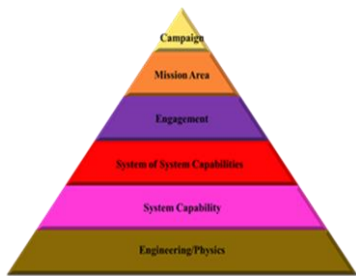5 Transform Culture / Workforce

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Layman's terms: combine standard representations of 'system', with computers, additional computational techniques as a <u>continuous, complete and evolving</u> ecosystem to provide data for data-informed decisions and interactive visualizations to a continuum of questions

Back to Basics: Digital Engineering Modeling Simulation

Digital Engineering considers models in the broadest sense – not just as a basis for simulations…..."The goals (of the Digital Engineering Strategy) promote the **use** of digital representations and components, and the **use** of digital artifacts as a technical means of communication across a diverse set of stakeholders."

Advancements in computing, modeling, data management, and analytical capabilities offer great opportunities for the engineering practice. The shift to digital practice enables us to apply these tools and methods, in our everyday practices.

Model: a representation of reality

We need to refresh our thinking from <u>traditional</u> use to <u>problem-solving</u> use

Digital Engineering & Modeling Simulation are not about better mousetraps; rather ~~it~~ is a better way to build better mousetraps

Traditionally "Modeling and simulation (M&S)" means the use of models (e.g.. physical, mathematical, or logical representation of a system, entity, phenomenon, or process) as a basis for simulations to develop data utilized for managerial or technical decision making

M&S (Modeling and Simulations) should be decoupled in phrasing, in order to realize they are separate disciplines; each valued independent of each other

Spectrum of Model and Model Use

- Model: representation of reality
- Simulation: model executed over time

MODEL is key

- Digital engineering emphasizes that a model can be data, process, and/or mathematics, formatted in a way that can be used in execution
  - Models of components
  - Model of components within a system
  - Model of a system (form and fit)
  - Model of system performance (function)
  - Model of system performance as part of a scenario in a mission
  - Model of mission as part of campaign
  - Etc.

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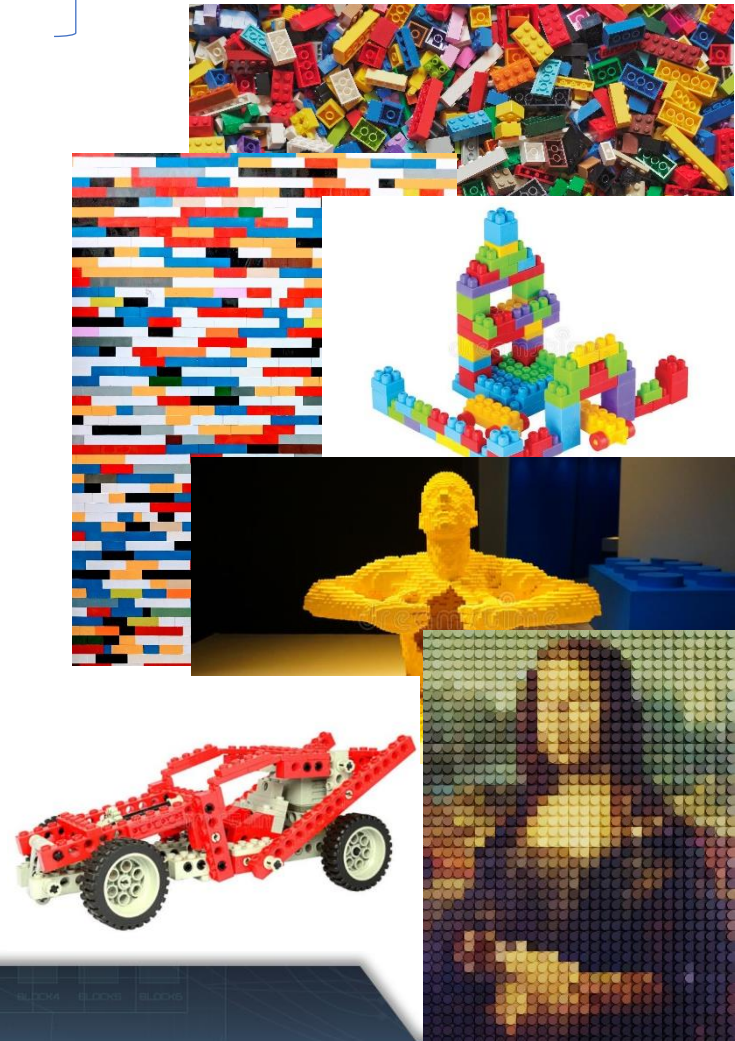
The Question is not "How do I do digital engineering....?"

Instead, the fundamental question should be: "How do I use digital engineering (techniques, tools, models, concepts,) to enable "activity X"?

Things to keep in mind:

- Digital Engineering does not replace good Systems Engineering. Proper application of Systems Engineering is still required.
    - Digital Engineering can be thought of as a modernization element of systems engineering

- Digital Engineering is not specific to an activity. It has the potential to benefit all activities where computation and precise understanding is useful
    - Not specific to acquisition activity, not solely for HW development, etc..
    - When you use computational methods, rigor is built in
    - Nothing in policy or statute prevents use of digital engineering tools and techniques

- Authoritative source of truth (element of the Strategy) becomes the communication medium across all project disciplines
    - Improves precision and understanding and removes barriers between project disciplines

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- Establish common digital engineering* elements within R&E development activities

  - Digital Engineering* as a part of System Engineering Modernization

  - Support to Mission Integration, Test and Evaluation, Assessments, etc..

- Enable balance of research and development with mission-aligned technologies

  - Conduct evolutionary technology evaluations in a virtual space – repeatedly and consistently

- Establish architectures as models rather than pictures

  - Establish a continuum of use across spectrum of engineering lifecycle activities and into operational activities

- Invest in technology infrastructure through evaluation of computational space(s), digital tools, identification of standards, modernization of processes

  - Need a focus on what we use to design systems, almost as much as we focus on the system itself

  - Focus on the elements of the engineering discipline that enable sound decision making

- Proliferate intentional decision making about digital engineering* application.

  - Fully incorporate digital engineering* into policy, guidance and planning, instead of just encouraging it

  - Develop metrics in order to measure the progress enabled by digital engineering*

- Aid the establishment of common digital engineering elements* within different communities

  - Be the catalyst and advisors to speed digital engineering* adoption in specific areas (e.g.. FCBs, Portfolio reviews, etc..)

> *Digital Engineering - includes modeling and simulation

DoD Research and Engineering Enterprise

Creating the Technologies of the Future Fight

QUESTIONS?

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Back-up Material