

U.S. Department of Homeland Security | Science and Technology Directorate

Implementing Digital Engineering in DHS



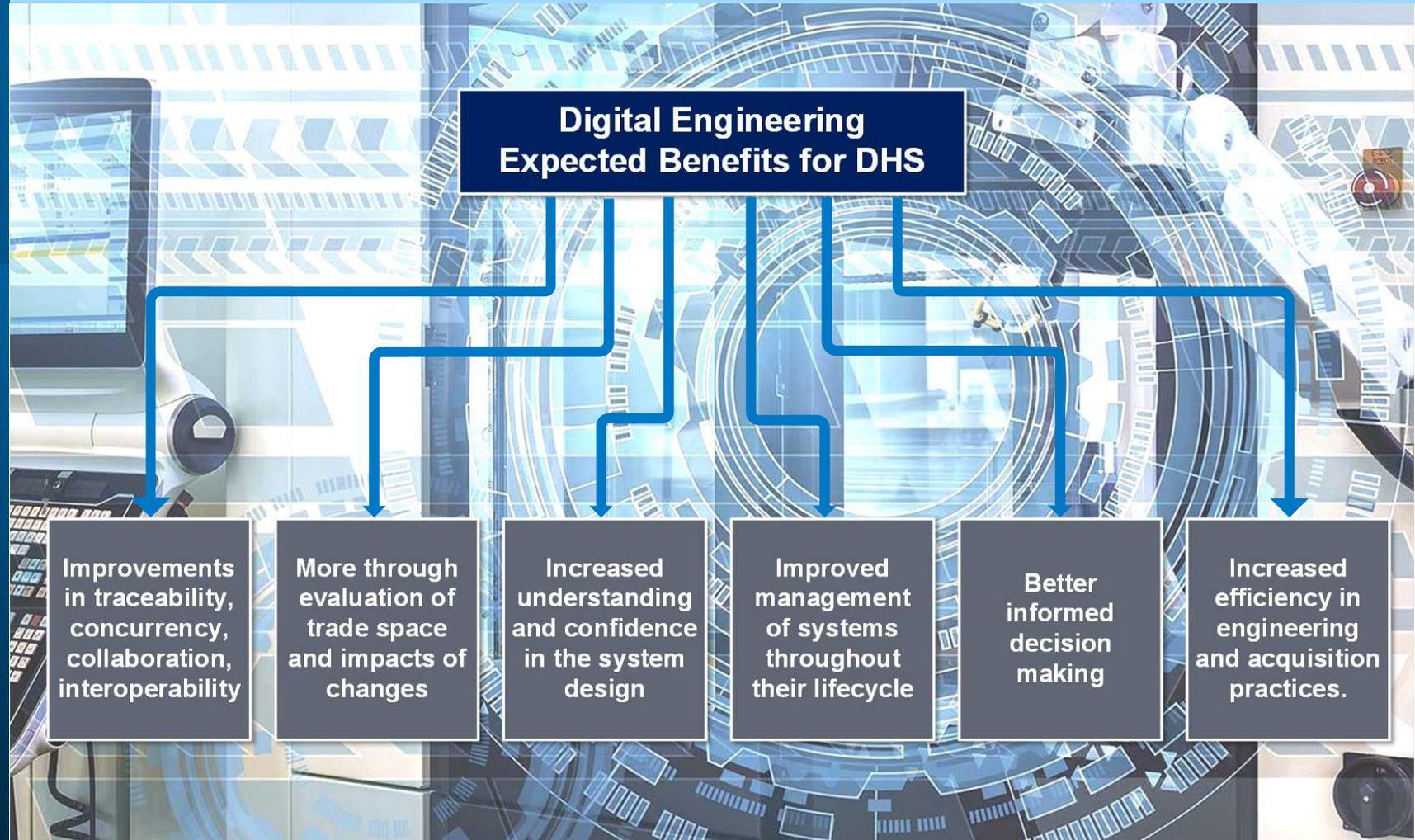
Science and
Technology

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Office of Science and Engineering
Science and Technology
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Agenda

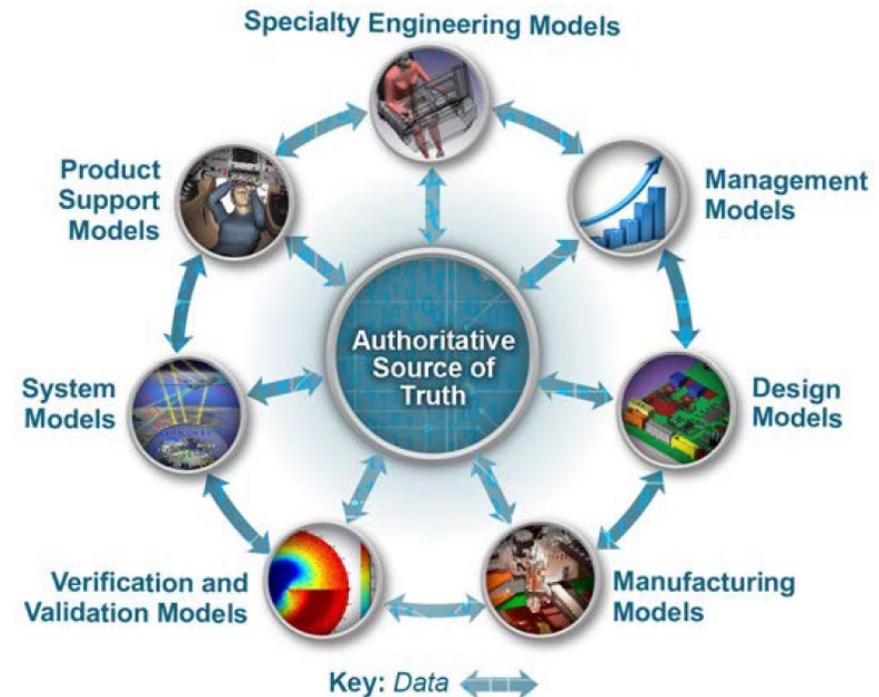
- Why DHS is pursuing DE
- Overview: DHS organization
- Current state: DHS Digital Engineering activities
- Next Steps: Implementing Digital Engineering in DHS
- Conclusion

Why DHS is pursuing Digital Engineering



Digital Engineering – Interconnected Models and Data

- Digital Engineering integrates:
 - The various models,
 - The data & model ontology,
 - With an Authoritative Source of Truth,
 - In an Integrated IT Environment.
- This is what transforms the individual benefits of M&S, MBSE, and MBE into a powerful engineering capability.
 - Using models is not a new concept, DE emphasizes the continuity of use of models across the life cycle.



DoD View of Interconnected Models with each other and the Authoritative Source of Truth

Achieving more than the sum of what the individual models can provide!

Overview: DHS Missions and Acquisition Landscape

DHS Headquarters

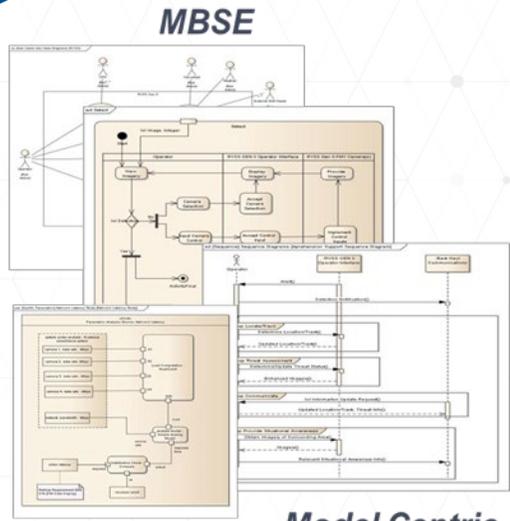


* For major acquisition programs, as defined under DHS Instruction

DHS Operational Components



Document Centric



Model Centric

Each Component has a Component Acquisition Executive and Acquisition Programs

Current State of Activities

CBP is engaged in M&S projects focused on specific areas:

- S&T/CBP/FFRDC static model of Port Los Angeles/Long Beach
 - Simulates and measures IP traffic from devices at 13 LALB seaport terminals.
- S&T/CBP/FFRDC model of NII network at Brownsville POE
- CBP Communications Backhaul model of El Centro Sector
 - Model and simulation of communications networks in region.
- Several CBP Programs are making use of MBSE Tools such as Cameo



Increasing number of DHS Components are moving out on independent modeling, simulation, and digital engineering efforts

Current State of Activities



United States Coast Guard is the DHS Organization that is farthest along in the move towards Digital Engineering

- Driven by Shipbuilding Industry 3D CAD Capabilities
- Ship Design Modeling for new ship acquisitions
- Product Lifecycle Management/Logistics Management Systems
- Model Based Systems Engineering (MBSE)
 - DOORS
 - CAMEO
 - GENESYS

CREDIT: Dassault Systèmes, 3DEXPERIENCE CATIA Assembly Design

Increasing number of DHS Components are moving out on independent modeling, simulation, and digital engineering efforts

Current State of Activities

Requesting funding for combined S&T/CBP Digital Twin of Southern Border

Extensive, multimodal digital twin:

- POEs, Surface and Subsurface Between POEs
- >10,000's models
 - Topology
 - Geology
 - Sensors
 - Wall
 - City Infrastructure
 - Agent models



Increasing number of DHS Components are moving out on independent modeling, simulation, and digital engineering efforts

DHS's Next Steps to Implement Digital Engineering

Vision – Defining the scope and anticipated level of effort

Strategy – Create an optimal DE strategy for DHS

Roadmap – Goals and actions towards achievable DE process implementation

Sponsorship – Garner Leadership support to champion and prioritize DE

Education – Educate the direct and indirect workforce

Roles and Responsibilities – HQ vs Components vs Programs

Policies – Changes to policies to incentivize DE

Resources - Funding, Human Resources, and Infrastructure

Informs



Next Steps: Implementing DE in DHS

Develop DHS Digital Engineering Vision



- In 20 years, Digital Engineering in DHS will be the norm.
- Leverage industry's rapidly evolving modeling, simulation, & MBSE capabilities to enable DE in DHS.
- Facilitate DHS Components' transition to a digital future vice try to control it.
- Address the big challenges to transformation and find solutions to enable a true DHS DE Ecosystem.
- Transition and piloting approach tempered by a more federated leadership model and funding limitations.

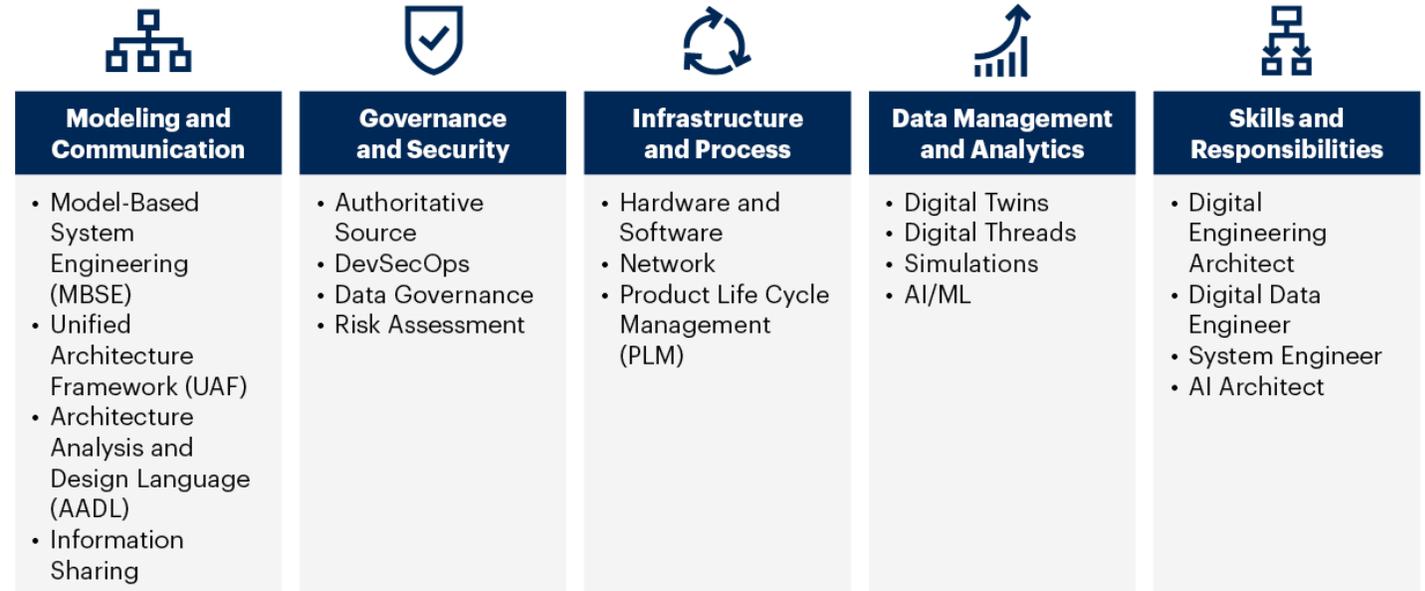
S&T to lead development and implementation of DHS Digital Engineering Vision.

Next Steps: Implementing DE in DHS

Develop DHS Digital Engineering Implementation Strategy

- Establishing the infrastructure to support the collaboration and communication across the diverse stakeholders is emerging as a major element that DHS will need to address.
- DHS is looking at Gartner's 5 Digital Engineering Discipline Areas to shape key elements of our strategy.
- These map closely to several of the DoD Focus Areas

Digital Engineering Discipline



Source: Gartner
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Next Steps: Implementing DE in DHS

Develop DHS Digital Engineering Implementation Strategy

Leverage DoD's Digital Engineering Strategy as well as Industry and Academia guidance

- Formalize 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 lifecycle



Five focus areas in the DoD DE Strategy resonate with DHS

Challenges to Implementing Digital Engineering in DHS



- Funding Limitations
 - How much and over what period of time can DHS commit towards moving to DE tools and infrastructure?
 - Individual Programs will not have the money or resources to develop the Digital Ecosystem or develop a comprehensive ASOT.
 - Component and Department level commitment to developing the Digital Ecosystem and the ASOT will be necessary.
- Developing an Authoritative Source of Truth (ASOT) and the Digital Ecosystem.
 - Identification of the M&S tools, model and data standards, and IT infrastructure to enable DE.
 - Obtaining valid & verified data
- Protecting intellectual and property rights while enabling data and model exchanges
 - Protecting copyrights, trademarks, patents, and competition-sensitive information.

Challenges to Implementing Digital Engineering in DHS



- Protecting the IT Infrastructure (DE Ecosystem) while facilitating the flow of information between stakeholders.
 - Access and controls to the ASOT and applicable models (right people, right time)
 - Government and vendor access with appropriate roles and authorities.
 - Cybersecurity (Program Protection) to ensure information integrity, confidentiality, and access.
- Maintaining the ASOT/Digital Ecosystem once programs transition to O&M.
 - Additional resources, costs, and effort to enable DE until disposal.
 - Updates to Acquisition Policies to support continued engineering past Full Operational Capability.

Closing Remarks

- The Benefits for DHS to pursue DE are compelling!
 - However, DE is NOT a substitute for GOOD Engineering/Systems Engineering!
- The Challenges to implementing true DE in DHS are daunting!

DE approaches and tools do not replace solid, rigorous, and disciplined processes.



- The DHS DE Strategy being developed will:
 - Leverage existing lessons and strategies from other organizations,
 - Leverage Industry,
 - Focus on finding solutions to the challenges,
 - Facilitate Digital Transformation vice trying to control it,
 - Be implemented through a Federated Leadership Model.

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