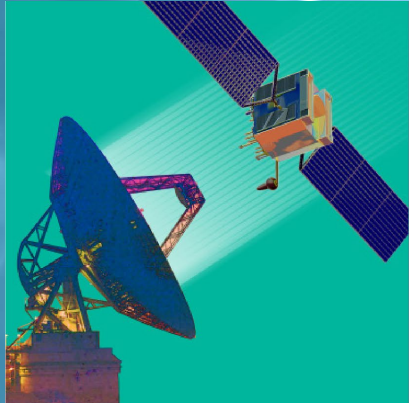


# ***Ground System Architectures Workshop*** ***Driving Innovation for Enterprise Integration***

February 23–March 3, 2022 | Virtual Event

# ***Welcome***

***28 February 2022***  
***9:00 AM PT***



# ***Ground System Architectures Workshop***

## ***Driving Innovation for Enterprise Integration***

February 23–March 3, 2022 | Virtual Event

### ***Working Group D (9:00 AM PT)***

#### ***Digital Standards Working Group***

***Dean Bucher***

***Principal Director, Digital Engineering Integration***

***Barbara Braun***

***Principal Director, Enterprise Systems Engineering Office***





# *Rules of Engagement*

- This workshop is entirely **UNCLASSIFIED**



**Proprietary**



**CUI**  
(Official Sensitive)



**Classified**



**Competition  
Sensitive**

- This workshop will be **recorded** for note-taking purposes

# Housekeeping Notes

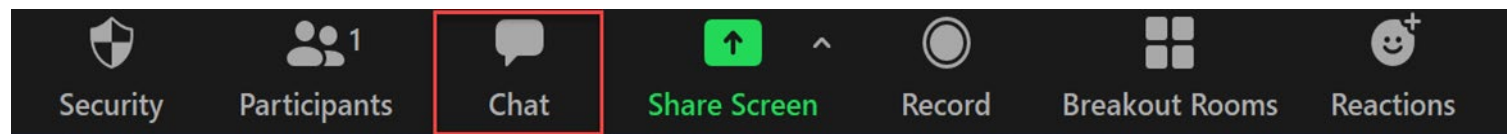
## Reminders:

- *Please keep your mic on mute*
- *Use your full name (no nicknames) when logging into Zoom*
- *If you experience any Zoom issues, please refer to [Troubleshooting Tips](#) and [Join Zoom Meeting instructions](#) links found in the chat box.*

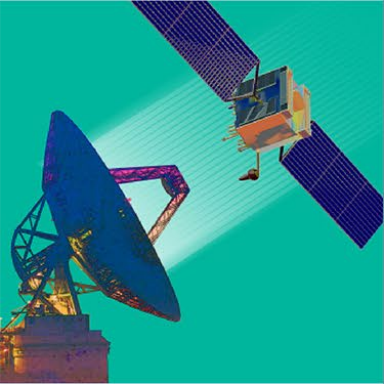
## Attendees are encouraged to use the chat box for questions or comments:

- *The host, if time permits, may ask the speaker to answer questions, recap, or provide closing thoughts after their presentation is complete.*
- *The facilitators will help consolidate the questions entered through the chat box interface and deliver them to the speaker during the live Q&A session.*
- *Questions and comments should be professional, relevant, and related to the subject.*

## Click on the Chat icon to:



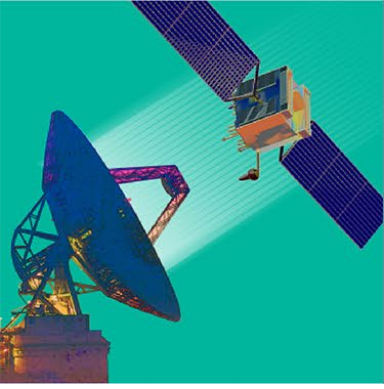
- *Send questions/comments to everyone.*
- *You can also click on the **drop-down arrow** next to **Everyone** and select a particular individual to chat with privately.*



# Digital Standards Working Group

## Introduction

- Problem Statement
  - *Tomorrow's space and ground architectures must be flexible, scalable, and interoperable*
  - *In an increasingly interconnected world, **standardization is critical for mission success, but all standardization requires compromise***
  - *What makes a good digital (data and models) standard, and where can standardization offer us the most return on investment?*
- This working group will discuss the role of standards in digital transformation from two perspectives:
  - *Utilization of digital engineering approaches and methodologies to define and manage design and interface standards across a complex space enterprise*
  - *Definition of digital standards to enable DE to be applied consistently across the enterprise (particularly between government and industry) and to enable interoperability between data, models, and tools*



# *Digital Standards Working Group*

## *Agenda*

- **Digital Engineering Overview**
- **Part 1:** Utilization of digital engineering approaches and methodologies to define and manage design and interface standards across a complex space enterprise
- **Break (5 min)**
- **Part 2:** Definition of digital standards to enable DE to be applied consistently across the enterprise (particularly between government and industry) and to enable interoperability between data, models, and tools
- **Summary**





# ***High Level Guide to Digital Engineering***

## ***Digital Engineering 101***

***Dean A. Bucher***  
***Principal Director***  
***Digital Engineering Integration***

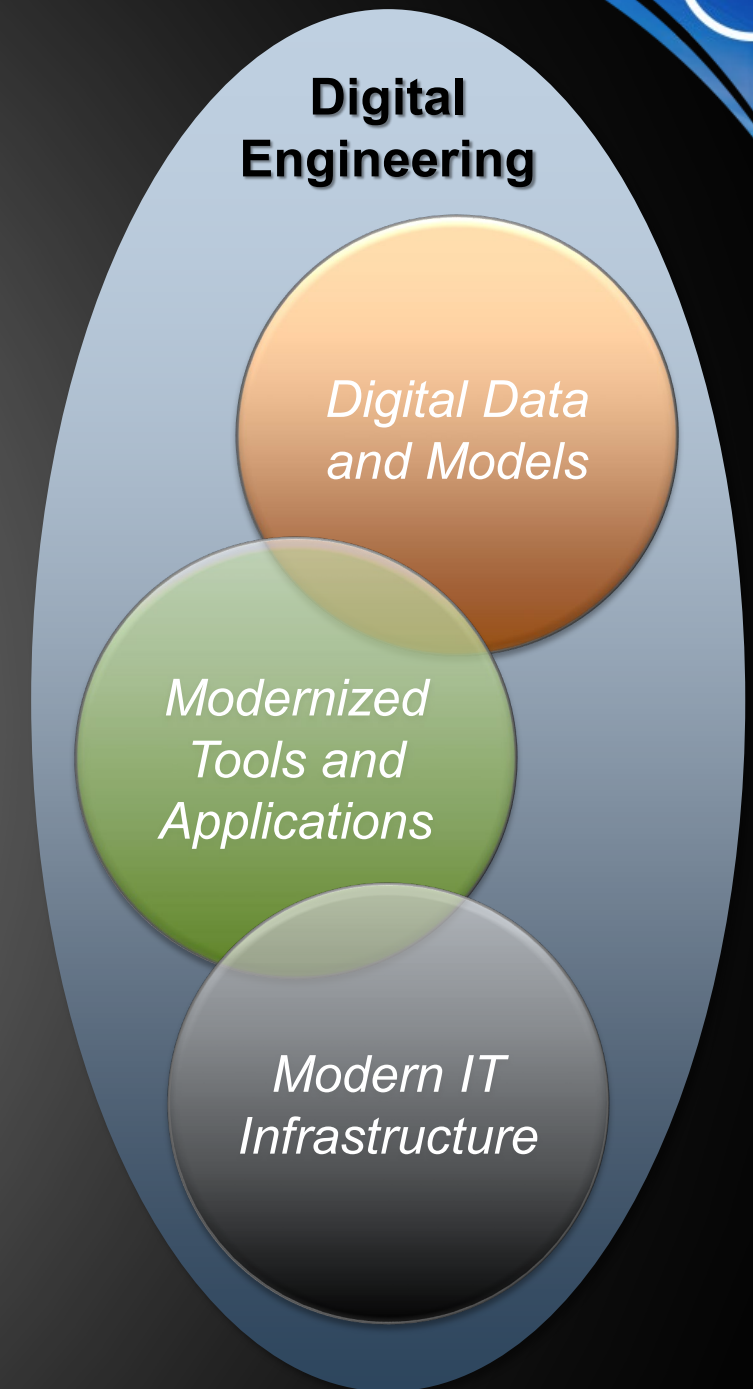
Approved for public release. Subset of OTR2021-00974.



# Digital Engineering “in a Nutshell”

## Digital Engineering 101

- At the highest level, DE is the next generation of modeling, simulation, and analysis tools, data, and supporting IT infrastructure
  - **Revolutionary** (vs. evolutionary) **transformation** in “doing business”
  - *Affects every aspect of the full system lifecycle, from cradle to grave*
- Primary features that differentiate DE from prior generations:
  - *Modeling, simulation, and analysis expected to be persistent and continuous*
  - *Models and data expected to be continually evolving, authoritative, and pervasive*
    - Rather than developed in stovepipes for single-purpose analyses/decisions
  - *Data, models, and analytical tools connected via fully digital interfaces*
    - Enables automation and the application of AI/ML technologies
    - Minimizes the need for human processing and translation to transfer data and analysis results across platforms
  - *Data, models, and tools consolidated into common enterprise-wide ecosystems*
    - Enables broader access and usage
    - Provides substantial increases in computing power and analysis efficiency



***Digital Engineering leverages modern technologies and processes at an enterprise scale to perform traditional engineering functions in new ways in order to improve efficiency and enhance capabilities delivered***



# What is a Digital Engineering Ecosystem?

## Digital Engineering 101



### Digital Engineering Environment

The application software, tools, visualizations, collaborations, workflows, and processes with which users interact to access and apply data/models/analyses to perform engineering functions

### Digital Engineering Users

## Digital Engineering Ecosystem

### Digital Engineering Environment

### Digital Data, Models, and Analyses

### Digital Engineering Infrastructure

### Digital Data, Models, and Analyses

The underlying data, models, and analyses accessible by users and supported by DE infrastructure to enable the configuration and data management for the Ecosystem

### Digital Engineering Ecosystem

The combination of DE infrastructure, DE environment, and federated digital data, models, and analyses required to enable DE for all user groups

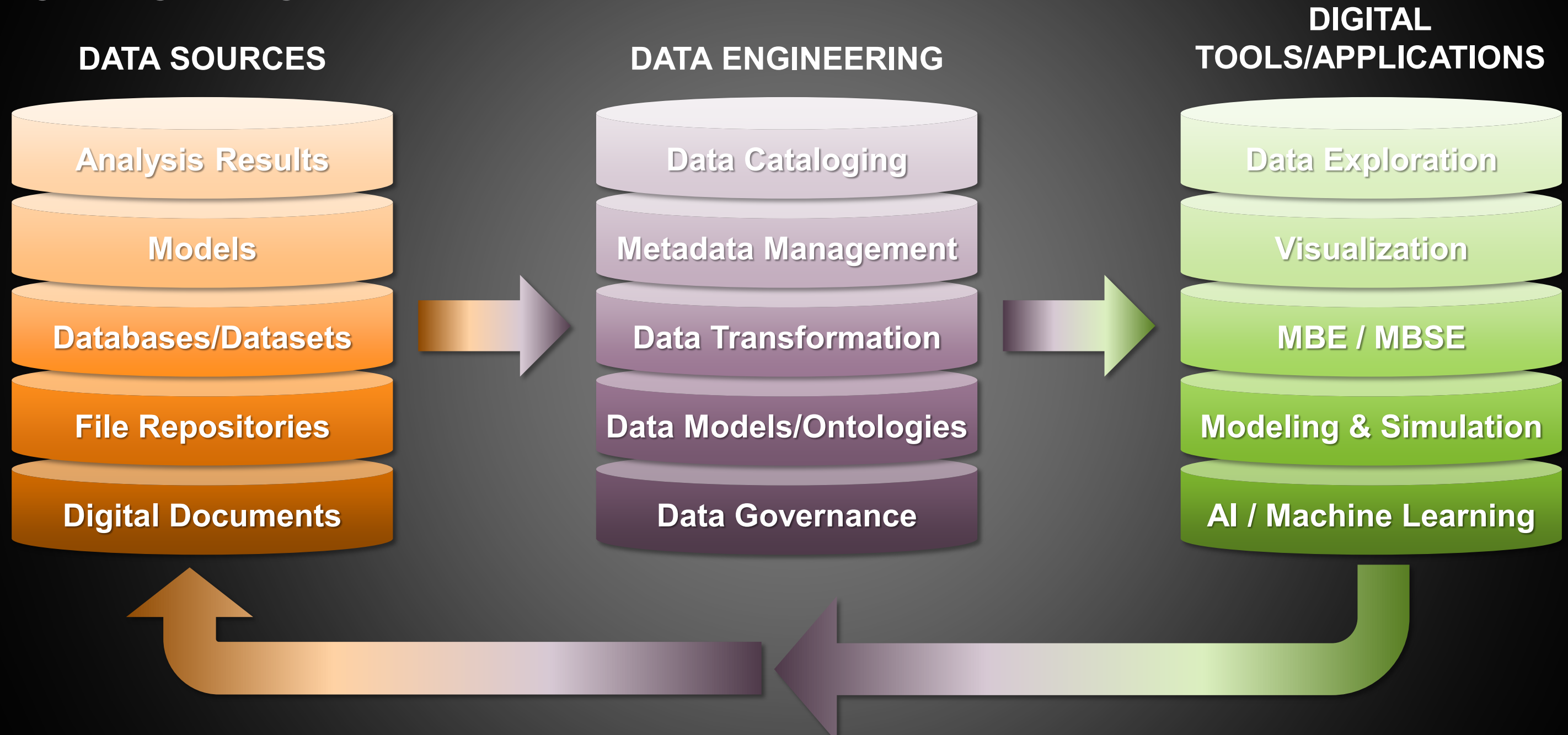
### Digital Engineering Infrastructure

The hardware, software, servers, storage, networks, encryption, authentication, and other IT elements that are required to implement the DE Ecosystem but are not typically user-facing

*Digital Engineering Ecosystem serves as a common interface for all user groups (e.g. engineers, analysts, program managers, decision makers) to support and execute all engineering and business functions*

# Data Engineering: Critical Enabler for Connecting Data to Applications

Digital Engineering 101

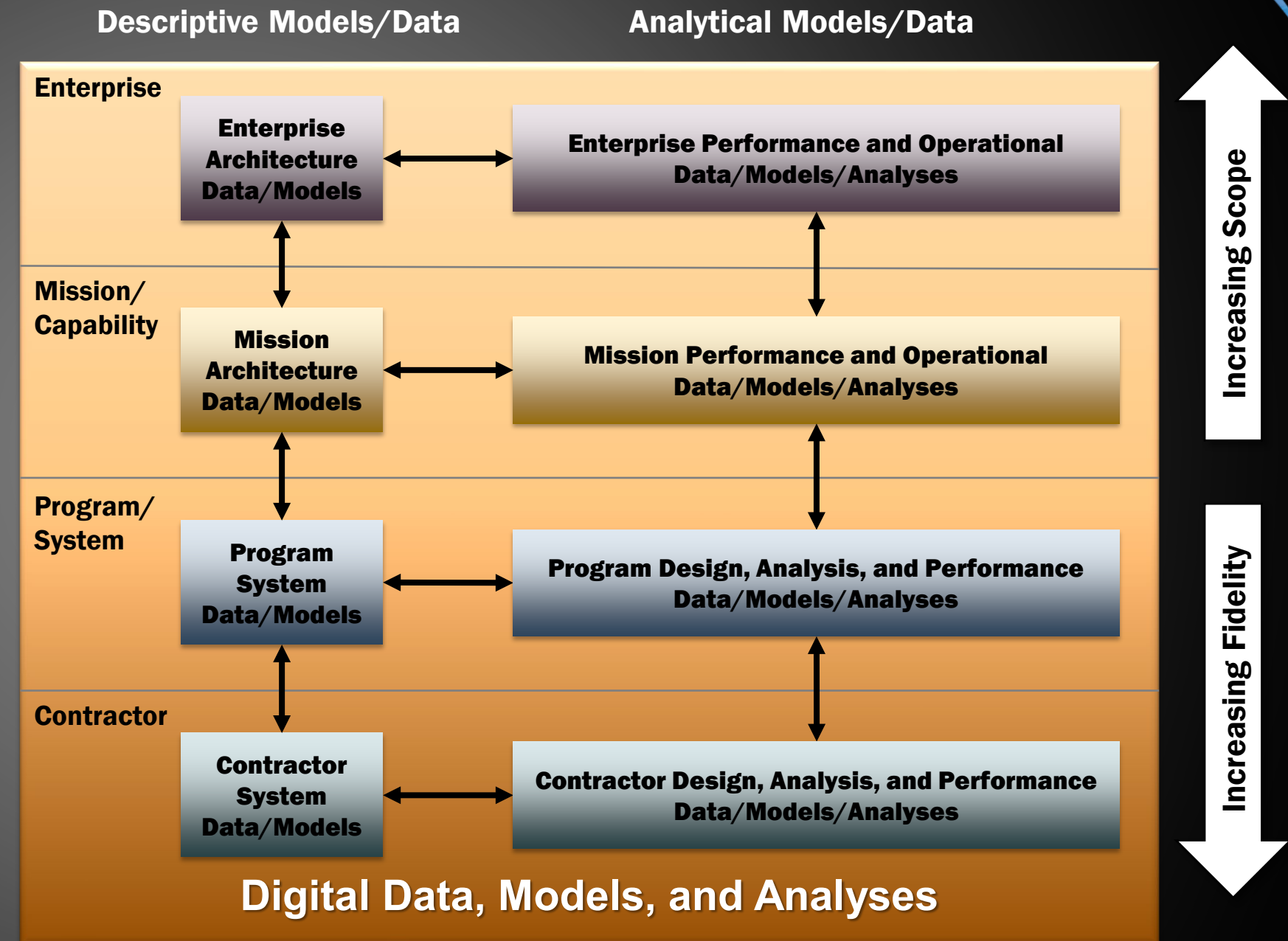


*Data Engineering focuses directly on the transportation, transformation, and storage of data for numerous digital applications including Digital Engineering*

# Digital Data, Models, and Analyses at All Levels of the Enterprise

## Digital Engineering 101

- Data/Models at each layer of the enterprise are loosely coupled with data/models in adjacent layers
  - Information flows down to inform acquisition activities
  - Information flows up to inform decisions at higher echelons of the organization
- Synchronization of data/models enforces the single authoritative source of truth
  - Sharing of models between layers prevents duplication of work



*Decisions at all levels of the enterprise require comprehensive knowledge of impacts and dependencies supported by authoritative data, models, and analyses managed at all levels in a common DE Ecosystem*

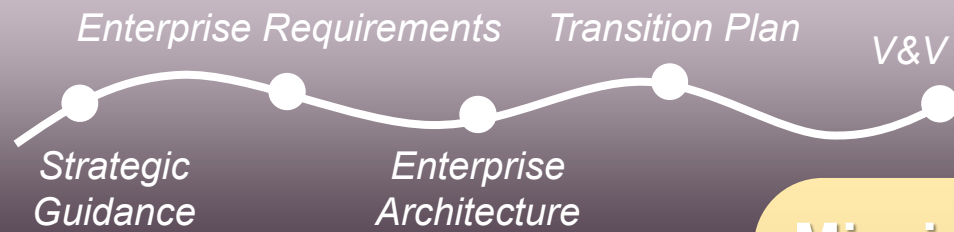


# Digital Threads and Digital Twins: Drivers for Data, Models, and Analyses

## Digital Engineering 101

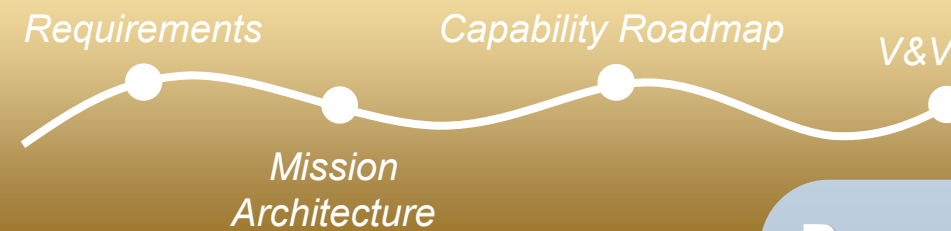


### Enterprise Digital Thread

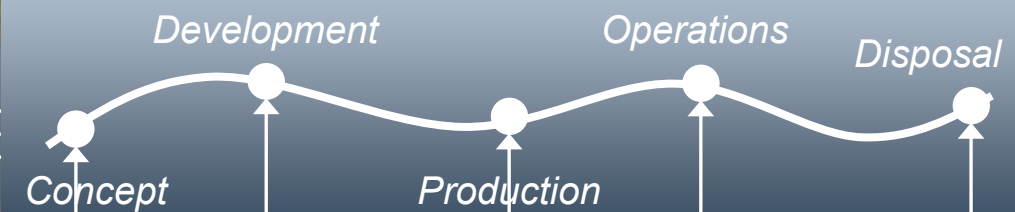


- **Digital Threads and Digital Twins** drive the needs for data, models, analyses, and simulations within a common Digital Engineering Ecosystem (or a federation of highly interoperable government-owned and contractor-owned DE Ecosystems)

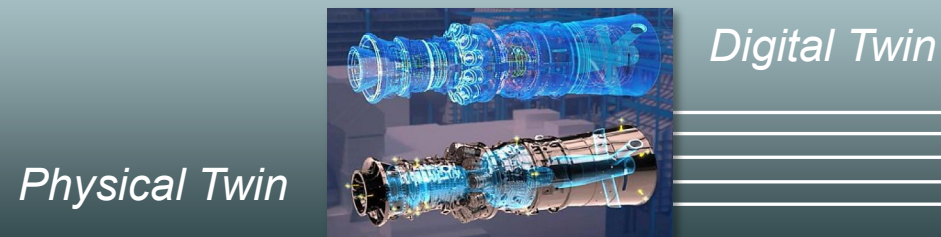
### Mission/Capability Digital Threads



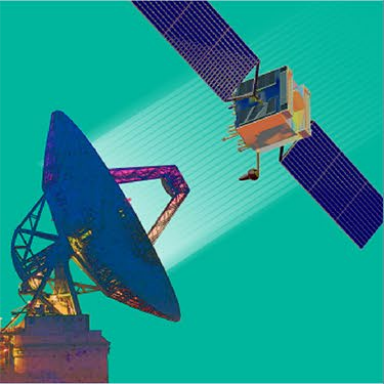
### Program/System Digital Threads



### System Digital Twins



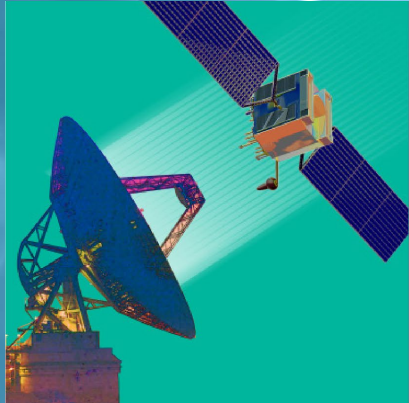
*Digital Threads exist across all levels to enable the digital integration of the enterprise, both vertically and horizontally*



# *Digital Standards Working Group*

## *Part 1*

- **Part 1:** Utilization of digital engineering approaches and methodologies to define and manage design and interface standards across a complex space enterprise



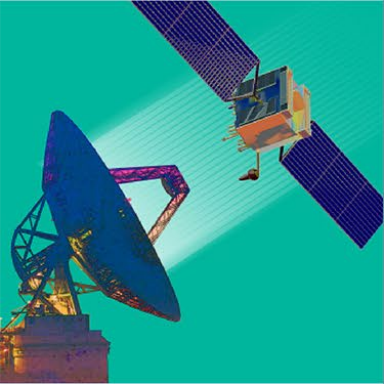
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**Break**

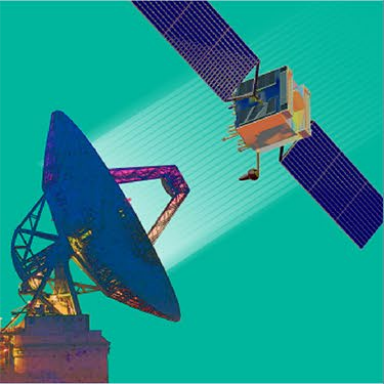




# *Digital Standards Working Group*

## *Part 2*

- **Part 2:** Definition of digital standards to enable DE to be applied consistently across the enterprise (particularly between government and industry) and to enable interoperability between data, models, and tools



# ***Digital Standards Working Group***

## ***Mission Success Improvement Workshop***

- **To continue the conversation.....**

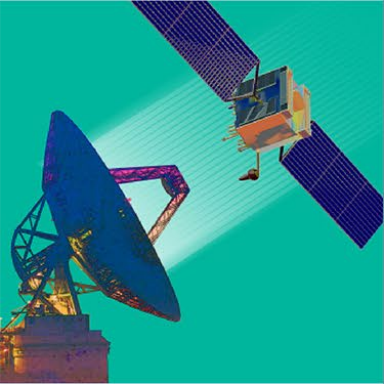


Formerly the Mission Assurance Improvement Workshop

## **Topic: Digital Engineering Standards**

- *Industry / Aerospace / Government Workshop*
- *Kickoff workshop mid- to late March 2022*
- *Weekly “tiger team” meetings*
- *Outbrief after 3-4 months*

**Contact Barbara Braun ([barbara.m.braun@aero.org](mailto:barbara.m.braun@aero.org)) if interested in participating**

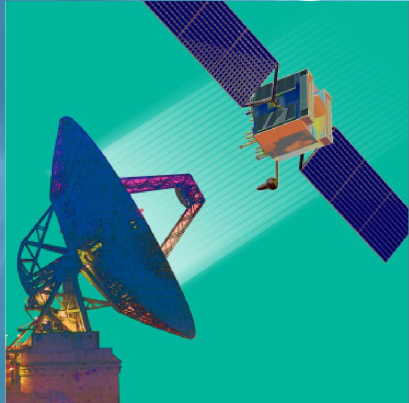


# *Digital Standards Working Group*

## *Summary*

- **Summary**





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**Thank you**