# Use of Data Models for Department of Defense Acquisition

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**Unified Architecture Framework & Model Based Systems Engineering**
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# DASD, Systems Engineering

DASD, Systems Engineering
Stephen Welby
Principal Deputy Kristen Baldwin

Major Program Support
James Thompson

Engineering Enterprise
Robert Gold

*Supporting USD(AT&L) Decisions with Independent Engineering Expertise*

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Assessments
- Overarching Integrated Product Team and Defense Acquisition Board Support
- Systems Engineering Plans
- Systemic Root Cause Analysis
- Development Planning/Early SE
- Program Protection

*Leading Systems Engineering Practice in DoD and Industry*

- Systems Engineering Policy and Guidance
- Technical Workforce Development
- Specialty Engineering (System Safety, Reliability and Maintainability, Quality, Manufacturing, Producibility, Human Systems Integration)
- Security, Anti-Tamper, Counterfeit Prevention
- Standardization
- Engineering Tools and Environments

**Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs**

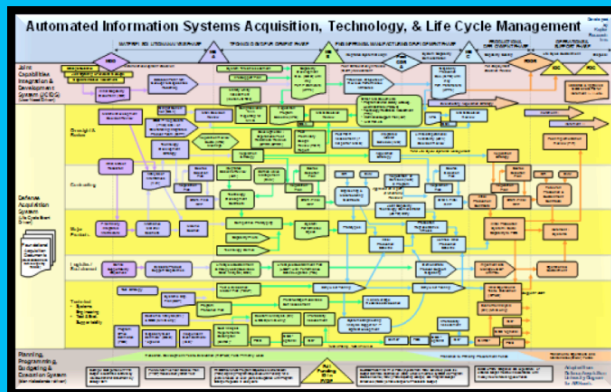# Change the Focus for Modeling and Simulation Use in Acquisition

**(1) WSARA**

**(2) DoDI 5000.02**

**(3) DAG Chapter 4**

**(4) Fundamentals**



Automated Information Systems Acquisition, Technology, & Life Cycle Management

**Modeling and Simulation as SE enabler: shift in focus: Establishes modeling and simulation needs from acquisition use, data consumed, and results produced**

**1  Weapon Systems Acquisition Reform Act of 2009**
- The Act of Congress passed in 2009 that was created to reform the way the Pentagon contracts and purchases major weapons systems. (http://www.ndia.org/ Advocacy/PolicyPublicationsResources/Documents/ WSARA-Public-Law-111-23.pdf)

**2  Interim DoDI 5000.02, Operation of the Defense Acquisition System**
- Requires the integration of Mod/Sim activities into program planning and engineering efforts (http://www.dtic.mil/whs/ directives/corres/pdf/500002_interim.pdf)

**3  Defense Acquisition Guidebook (DAG) Ch 4 – System Engineering**
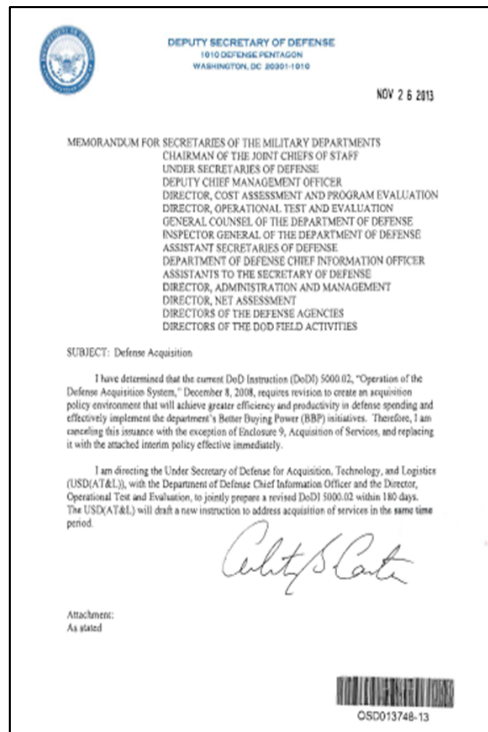- Defines the Mod/Sim capabilities, benefits, roles, responsibilities, and activities (https://acc.dau.mil/dag4)

**4  MS&A Fundamentals**
- Defines a set of high-level truths for Mod/ Sim usage in Systems Engineering support to acquisition (http://www.acq.osd.mil/ se/docs/SE-MSA-Fundamentals.pdf)

## ENCLOSURE 3 SECTION 9: " MODELING AND SIMULATION



"The Program Manager will integrate modeling and simulation activities into program planning and engineering efforts. These activities will support consistent analyses and decisions throughout the program's life cycle. Models, data, and artifacts will be integrated, managed, and controlled to ensure that the products maintain consistency with the system and external program dependencies, provide a comprehensive view of the program, and increase efficiency and confidence throughout the program's life cycle."

# Definitions Recall

**Models and Simulations are separate but related disciplines.**

- Model: A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process; i.e. "a representation of reality"
- Simulation – a model executing over time

**Models come in many shapes and sizes:**

- Text vs Graphic-based models
- High- vs Low-level models
- Flat vs Hierarchic models
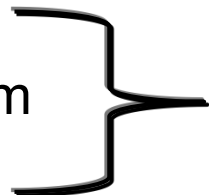- Degree of rigor in the modeling methodology

**4 Basic types of models used in (Systems) Engineering:**

- Physical
- Data
- Algorithm
- Process

- **Can be hybrid of 2 or all three**
- **DIGITAL vs digitized**

# What is Data Model?

- A data model organizes data elements and standardizes how the data elements relate to one another

- Data models are based on data, data relationships, data semantics and data constraints. It depicts the data flow and logical interrelationships among different data elements.

- Data models define the information requirements of the process and tracks the flow of information through functional areas.

# Types of Data Models

- **Conceptual Data Model** identifies the highest-level relationships between the different data elements.

- **Logical Data Model** describes the detailed attributes and the relationships between data elements.

- **Physical Data Model** describes the physical instantiation of the logical data model elements.
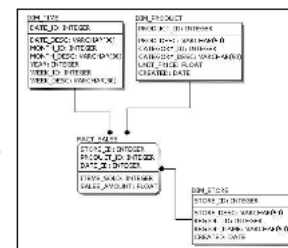
**Conceptual Model Design**
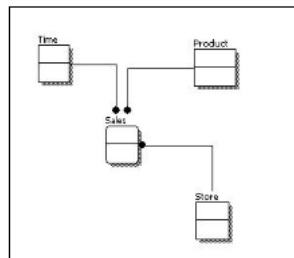
**Logical Model Design**
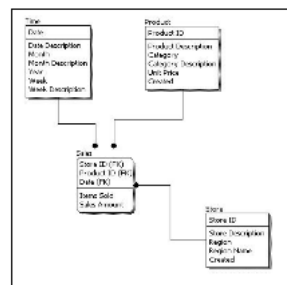
**Physical Model Design**

# Definitions

**Digital System Model:**

A digital representation of the system, generated by all stakeholders, that integrates the authoritative technical data and associated artifacts, which define all aspects of the system for the specific activities throughout the system lifecycle. (M&S Glossary proposed)
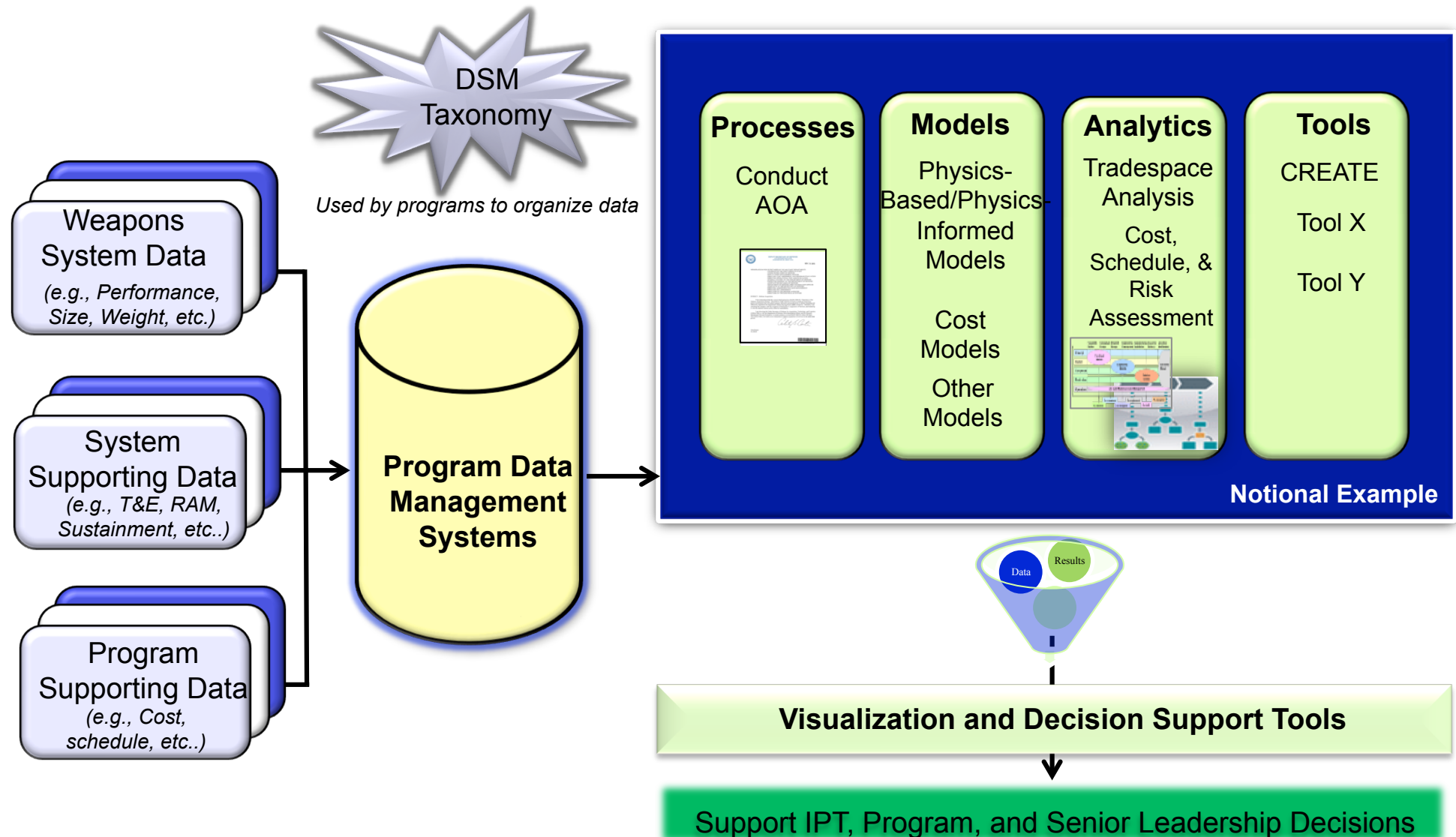
**Digital Thread:**

An extensible, configurable and Agency enterprise-level analytical framework that seamlessly expedites the controlled interplay of authoritative technical data, software, information, and knowledge in the enterprise data-information-knowledge systems, based on the Digital System Model template, to inform decision makers throughout a system's life cycle by providing the capability to access, integrate and transform disparate data into actionable information.  (M&S Glossary proposed)

**Technical Data :**

Means recorded information, regardless of the form or method of the recording, of a scientific or technical nature (including computer software documentations). The term does not include computer software or data incidental to contract administration, such as financial and/or management information. (DFARS 252.227-7103(a)(15))

# Digital System Model/Digital Thread use of Data Models

*Used by programs to organize data*

**Weapons System Data**
*(e.g., Performance, Size, Weight, etc.)*

**System Supporting Data**
*(e.g., T&E, RAM, Sustainment, etc..)*

**Program Supporting Data**
*(e.g., Cost, schedule, etc..)*

**Program Data Management Systems**

**Processes**
Conduct AOA

**Models**
Physics-Based/Physics-Informed Models

Cost Models

Other Models

**Analytics**
Tradespace Analysis

Cost, Schedule, & Risk Assessment

**Tools**
CREATE

Tool X

Tool Y

**Notional Example**

Data

Results

**Visualization and Decision Support Tools**

**Support IPT, Program, and Senior Leadership Decisions**

# For Information

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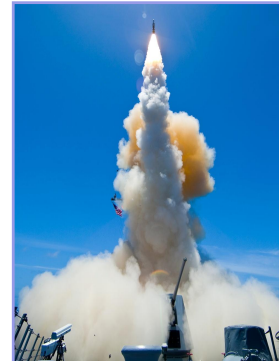**571-372-6695 | philomena.m.zimmerman.civ@mail.mil**

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# Systems Engineering:
# Critical to Defense Acquisition



***Defense Innovation Marketplace***
*http://www.defenseinnovationmarketplace.mil*

***DASD, Systems Engineering***
*http://www.acq.osd.mil/se*