Digital System Model Development and Technical Data

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Office of the Deputy Assistant Secretary of Defense for Systems Engineering

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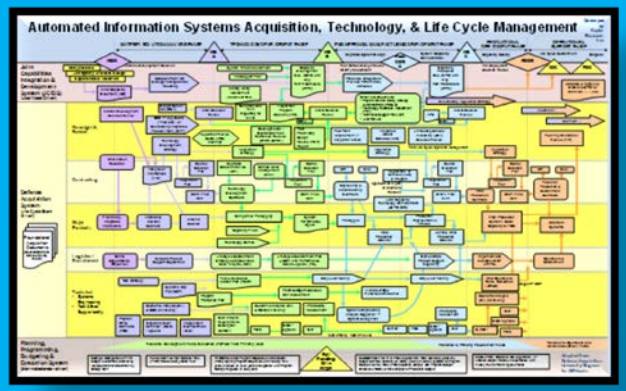
Change the Focus for Modeling and Simulation Use in Acquisition

(1) DoDI 5000.02

(2) DAG Chapter 4

(3) Fundamentals



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

1 **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)

2 **Defense Acquisition Guidebook (DAG) Ch 4 – System Engineering**

- Defines the Mod/Sim capabilities, benefits, roles, responsibilities, and activities (https://acc.dau.mil/dag4)

3 **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)

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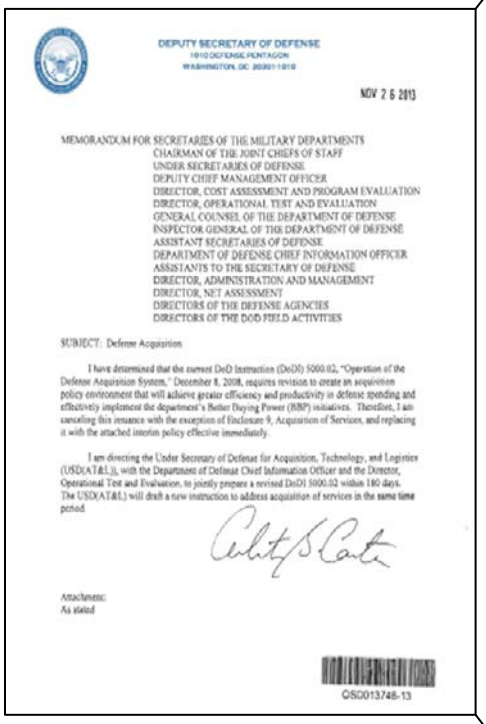
Interim DODI 5000.02, November 2013

ENCLOSURE 3 SECTION 9: " MODELING AND SIMULATION



DEPUTY SECRETARY OF DEFENSE
1010 DEFENSE PENTAGON
WASHINGTON, DC 20301-1010

NOV 26 2013

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
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DEPUTY CHIEF MANAGEMENT OFFICER
DIRECTOR, COST ASSESSMENT AND PROGRAM EVALUATION
DIRECTOR, OPERATIONAL TEST AND EVALUATION
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
ASSISTANT SECRETARIES OF DEFENSE
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR, ADMINISTRATION AND MANAGEMENT
DIRECTOR, NET ASSESSMENT
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Defense Acquisition

I have determined that the current DoD Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," December 8, 2008, requires revision to create an acquisition policy environment that will achieve greater efficiency and productivity in defense spending and effectively implement the department's Better Buying Power (BBP) initiatives. Therefore, I am cancelling this issuance with the exception of Enclosure 9, Acquisition of Services, and replacing it with the attached interim policy effective immediately.

I am directing the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), with the Department of Defense Chief Information Officer and the Director, Operational Test and Evaluation, to jointly prepare a revised DoDI 5000.02 within 180 days. The USD(AT&L) will draft a new instruction to address acquisition of services in the same time period.

Ashton B. Carter

Attachment:
As stated

OSD013748-13

"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."

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How Does Modeling Support SE?

Critical items in DoD Systems Engineering

- **Flexible designs that adapt and are resilient to unknown missions and threats**
- **Cost and affordability as quantifiable attributes of the trade space**
- **Systems of Systems, and Enterprise, contexts responding to multiple stakeholders**
- **Responsive, balancing agility with rigorous analysis and data**
- **Safeguarding critical information while designing for interoperability**
- **Applied across significantly diverse domains**

Balancing these axioms is challenging to SE. It drives the need for and use of engineering models
- to maintain consistency about the system,
- to integrate technical and non-technical drivers
- to understand the various perspectives on the system under development

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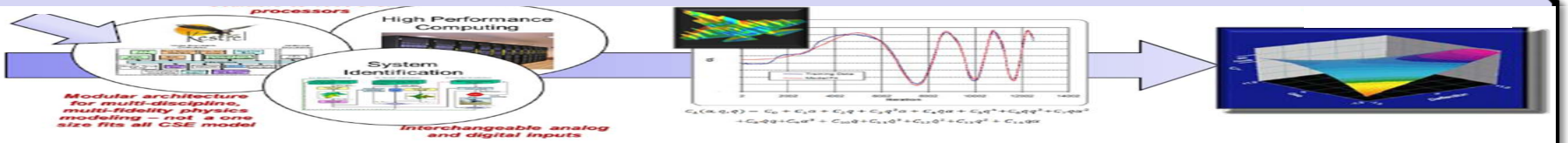
Modeling Support to DoD Acquisition

JCIDS

Materiel Solution Analysis	A	Technology Maturation & Risk Reduction	B	Engineering & Manufacturing Development	C	Production and Deployment	IOC	Operations and Support	FOC

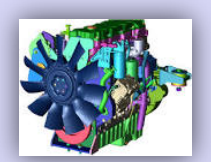
Digital System Model - Data



Digital Thread – Framework for DSM Use

Information Management System Supporting Digital Artifacts

Distributed Collaboration	Automated Artifact Generation	Visualization	Analytics	Configuration Management	Decision Support



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Definitions

- **<u>Digital System Model</u> – A digital representation of a weapon system, generated by all stakeholders, that integrates the authoritative data, information, algorithms, and systems engineering processes which define all aspects of the system for the specific activities throughout the system lifecycle. (M&S Glossary proposed)**

- **<u>Digital Thread</u> – An extensible, configurable and Agency enterprise-level analytical framework that seamlessly expedites the controlled interplay of authoritative data, 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)**

- **<u>Technical Data</u> – 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))**

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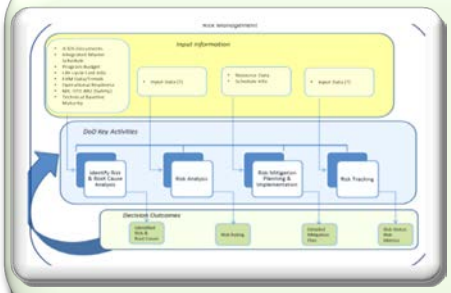
Approach for Building the Taxonomy

Identify

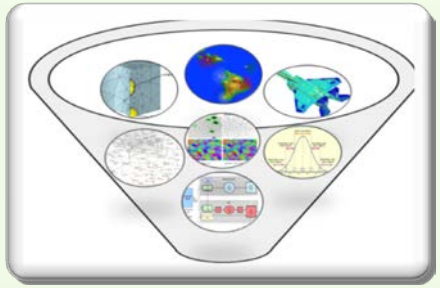


- Identify the processes, artifacts, and key decision points

Define

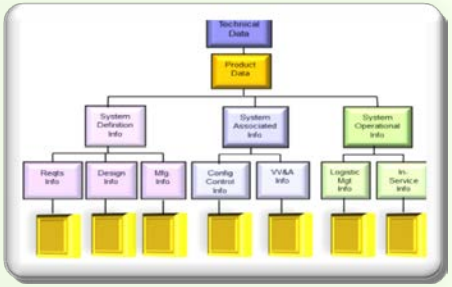
- Use the 881C WBS as the basis for defining the groupings of technical data by defense materiel commodity systems
- Define the technical data to support key decisions

Inventory



- Inventory existing technical data, models, and algorithms to support key decisions

Develop



- Develop technical data taxonomy to support key decision points across the lifecycle

Developed approach to identify the data, processes, and algorithms at key decision points across the lifecycle

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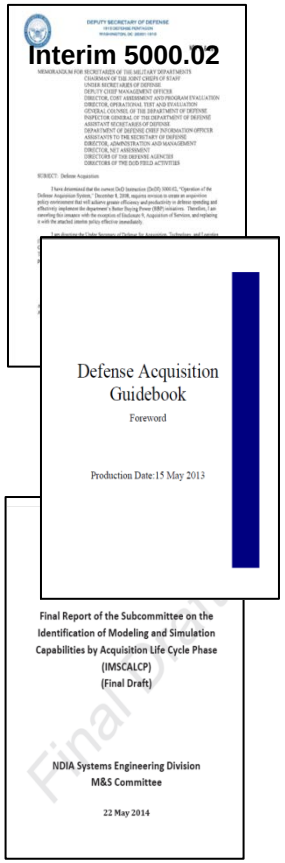
Step 1: Identify



JCIDS

MDD

A

B

C

IOC

FOC

Material Solution Analysis

Technology Maturation and Risk Reduction

Engineering and Manufacturing Development

Production and Deployment

Operations and Support

- Activity: Define Support and Maintenance Effectiveness Needs
  - Artifacts: ICD
    - Decision Milestone: ASR

- Activity: Determine Sustainment Metrics and Corresponding Test Methods
  - Artifacts: LCSP, T&E Strategy/TEMP
    - Decision Milestone: MS A

- Activity: Finalize the sustainment metrics and Corresponding Test Methods
  - Artifact: LSCP
    - Decision Milestone: MS B

- Process: Provide performance to date for verification methods
  - Artifacts: LCSP
    - Decision Milestone: MS C

Notional Sustainment Example to Illustrate Approach

Identify the processes, artifacts, and key decision points across the lifecycle

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Step 2: Define

Work Breakdown Structure tailored for the following systems:

- **Aircraft**
- Electronic
- Missile
- Ordnance
- Sea
- Space
- Surface Vehicle
- Unmanned Air Vehicle
- Unmanned Maritime
- Launch Vehicle
- Automated Information

Used the 881C WBS to define the groupings of technical data elements by defense materiel commodity systems

WBS 881C
Aircraft
(Appendix A)

1.1.1 AIRFRAME
1.1.1.2 FUSELAGE
1.1.1.3 WING
1.1.1.4 EMPENNAGE
1.1.1.5 NACELLE
1.1.2 Propulsion
1.1.3 Vehicle Subsystems
1.1.3.1 Subsystem Integ. & Checkout
1.1.3.2 Flight Control Subsystem
1.1.3.3 Auxiliary Power Subsystem
1.1.3.4 Aux. Power Subsystem Hardware
1.1.3.4 Hydraulic Subsystem
1.1.3.5 Electrical Subsystem
1.1.3.6 Crew Station Subsystem
1.1.3.7 Other Specified Subsystems
1.1.4 Avionics
1.1.4.1 Avionics Integ. & Checkout
1.1.4.2 Communication/Identification
1.1.4.3 Navigation/Guidance
1.1.4.4 Mission Computer/Processing
1.1.4.5 Fire Control
1.1.4.6 Data Display and Controls
1.1.4.7 Survivability
1.1.4.8 Reconnaissance
1.1.4.9 Automatic Flight Control
1.1.4.10 Health Monitoring System

- Activity/Process: Determine Sustainment Metrics
  - Artifacts: LCSP
    - Decision Milestone: MS-B
      - Commodity: Aircraft System
        - Technical Data: **Airframe Data**
          - Models: Predictive Maintenance Model
            - Technical Parameters:
              - MTBF - Design Controllable
              - Failures - Design Controllable

Notional Example

Define the framework for capturing the data, processes, and algorithms to support key decisions

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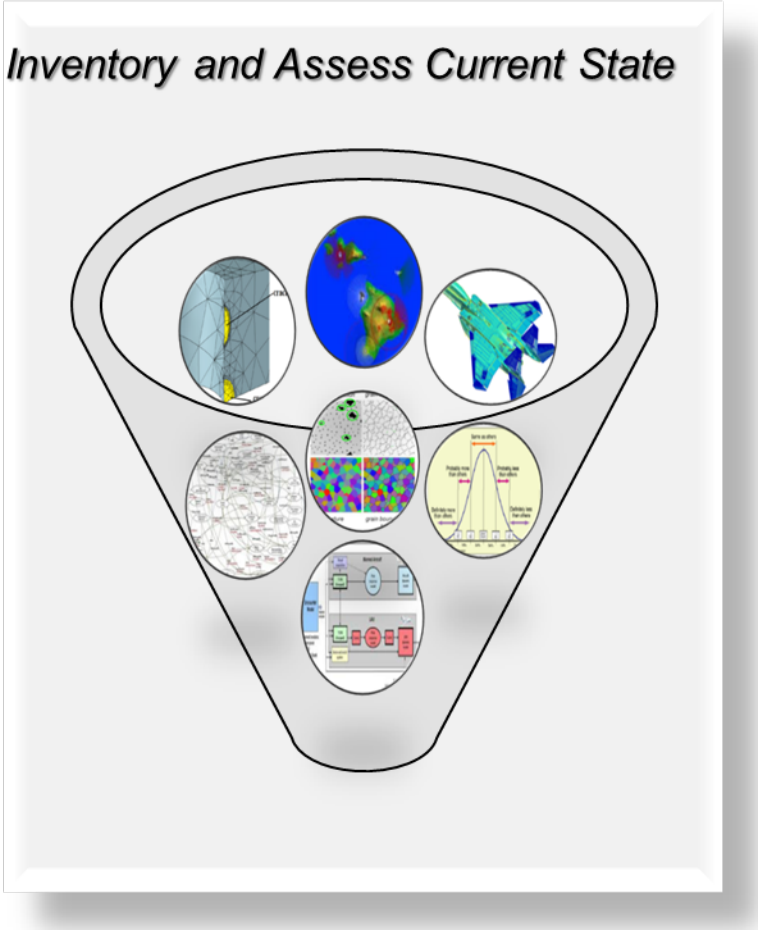
Step 3: Inventory

Data

Processes

Algorithms



- Current focus on sustainment with USA/USAF collaboration
- Utilize the framework to inventory existing data, processes, and algorithms to support decisions across the lifecycle
- Identifies gaps
- Sets the stage for developing the technical data sub-packages (by activity areas) across the lifecycle

Inventory existing data, processes, and algorithms to support key decisions from active programs

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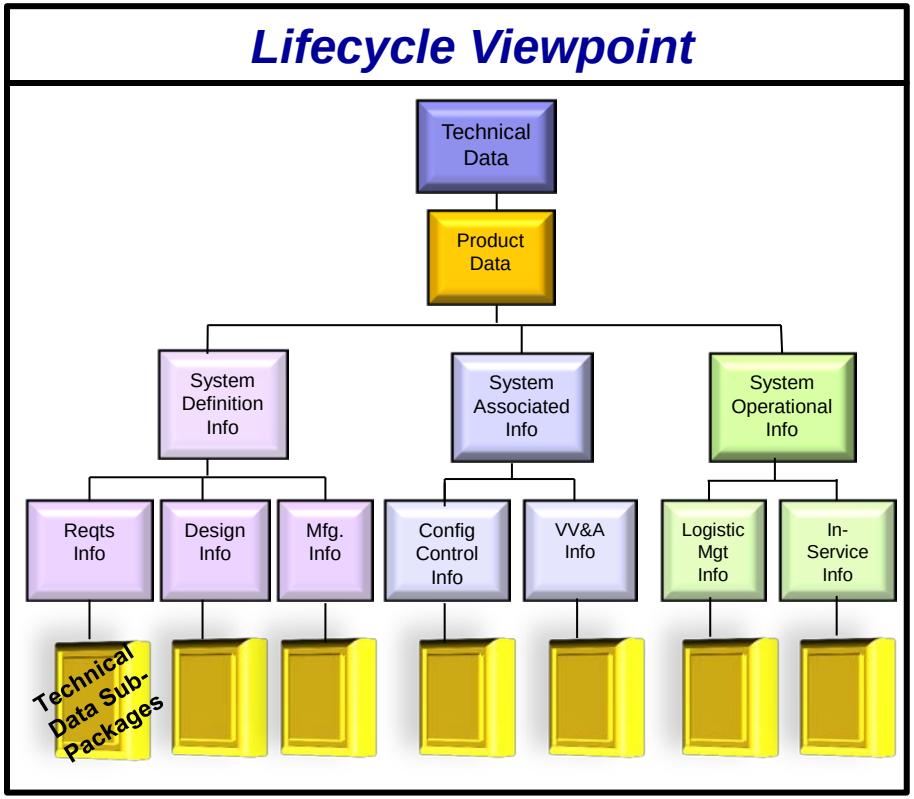
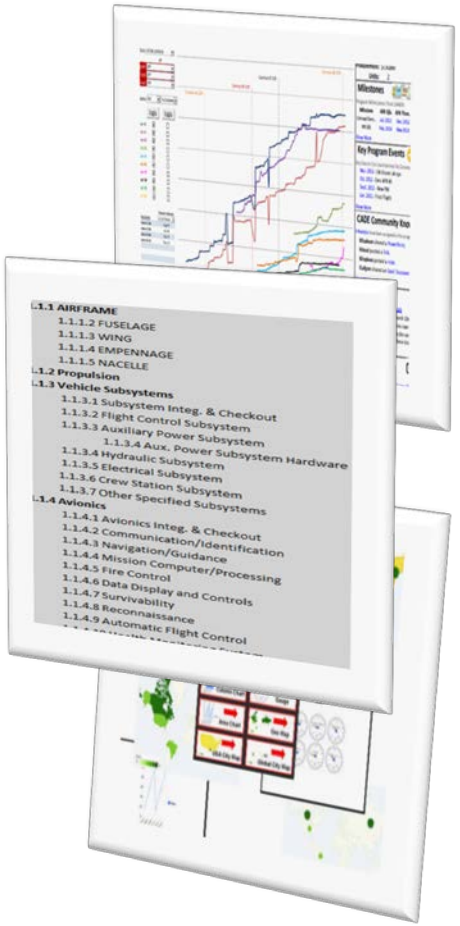
Step 4: Develop



Cost Viewpoint

WBS Viewpoint

Other Viewpoints



Develop technical data taxonomy (and sub-taxonomies) to support key decision points across the lifecycle

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Current Collaborators

Digital System Model/Digital Thread

Army (AMSAA, CECOM)

Common product data and processes shared and employed by program, engineering and product support functions

Air Force (SAF-AQ)*

Develop the technical data taxonomy

Navy

Technical exchange regarding MBSE, Digital Thread/Digital System Model (i.e., CVN-78)

CAPE- AFCAA

Define the cost driving technical data parameters

Evolution, and introduction of model-centric concepts to revise the conduct of engineering functions.

NASA*

Promote innovation through collaboration

Working Groups
Acquisition Modeling Working Group
Digital Thread Working Group
INCOSE

Study to identify the essential elements of the system model

**National Defense Industrial Association*
-Mod/Sim Subcommittee**

* Briefings at SE Conference

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Technical Data and Data Rights

- **Data rights are granted to the Government for technical data and computer software.**
- **The Defense Federal Acquisition Regulations (DFARS) prescribe policies, procedures and clauses pertaining to data rights for DoD.**
- **Data Rights guidance exists as a starting point for matching data to data rights necessary to support the data <u>use</u> throughout acquisition.**
- **Data Item Descriptions exist for acquisition of technical data.**

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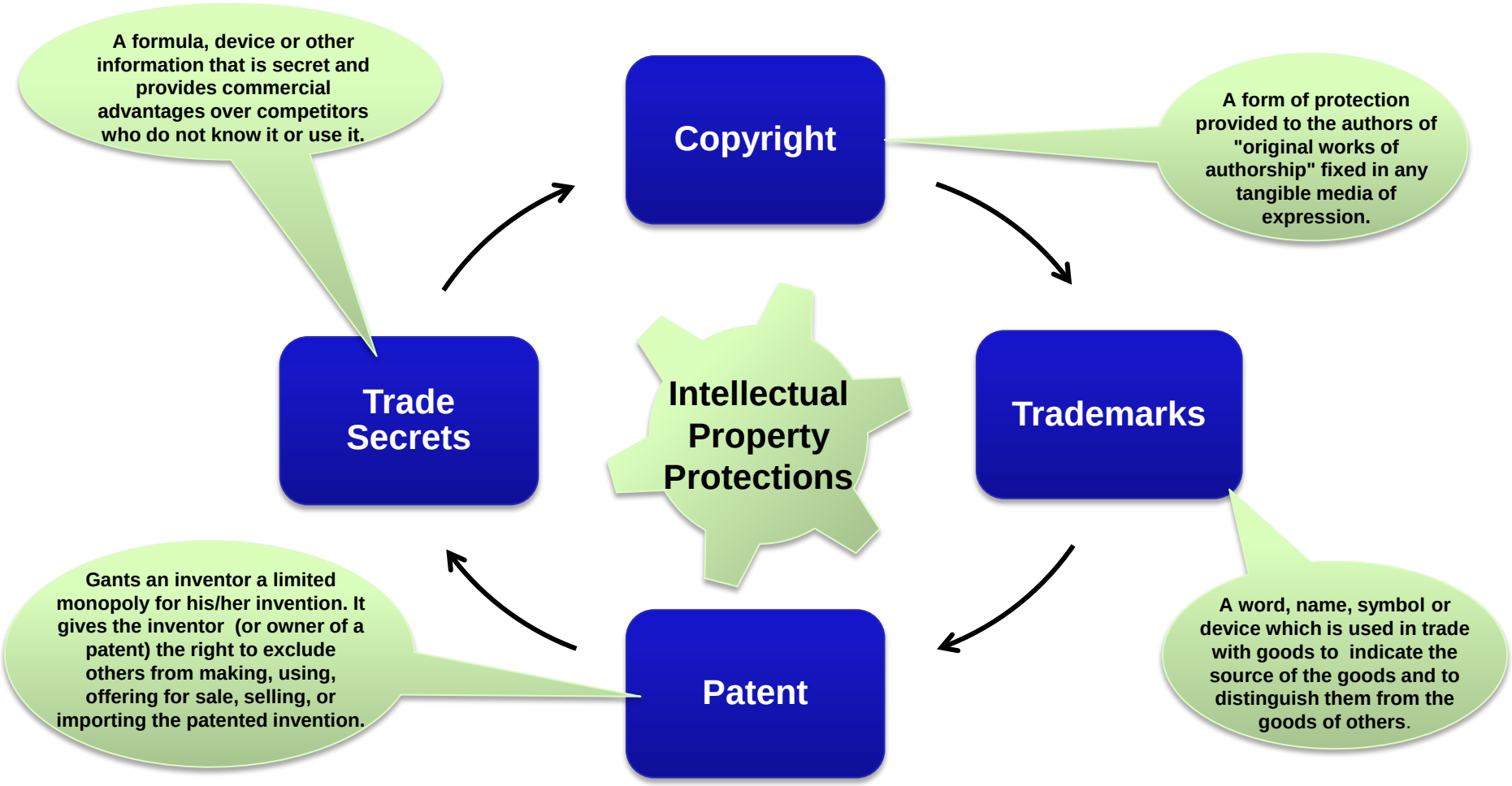
Intellectual Property (IP) Protections



Industrial and Governmental protections for IP need to be understood for negotiation of data rights for DSM/DT.

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Summary

- **Digital System Model / Digital Thread (DSM/DT) can identify the data necessary for continuity of the system from concept development through disposal**
- **From the standpoint of negotiating data rights, the DSM/DT can also be a means for understanding IP rights necessary to procure the technical data**
- **Many unknowns still exist in use of the DSM/DT. For example:**
  - Data Item Description coverage of the technical data in the DSM/DT
  - Examination of data markings to ensure they are correct, as not all the elements of the DSM/DT are procured with the same data rights
  - Contract clause support for DSM/DT, et al.

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For Additional Information

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Systems Engineering: Critical to Defense Acquisition

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

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