



# MODEL BASED ENTERPRISE / DIGITAL QUILT

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The world is moving toward the model based environment. Is the end of drawings in sight? For many industries the answer is yes, but in the shipbuilding industry the signals are mixed.

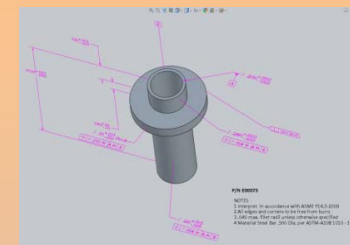
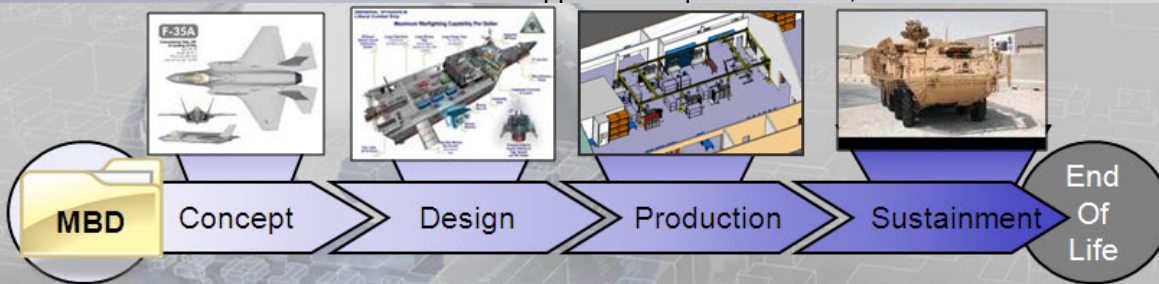
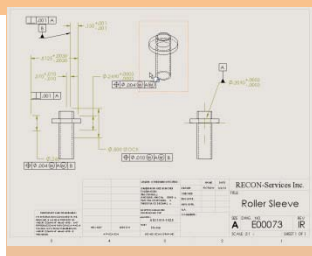
The first half of this session will be an overview of the perspective the DoD ManTech Advanced Manufacturing Enterprise subpanel has toward the model based enterprise and digital quilt. The second half will be a discussion about how we can increase the visibility of Navy shipbuilding product model issues to the subpanel.



# Digital Product Definition Roadmap for DoD

## 2D Drawing based to 3D Digital Product Definition

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### DoD Problem

### Warfighter Benefits

- How to be more agile and responsive to the needs to produce weapon systems to meet today's dynamic environment (typically beyond risk of industries)
- DoD/OEMs constantly recreating data during product lifecycle - 20% to 50% of an engineer's time, DoD & Commercial, lost due to incomplete data, therefore have to recreate, reinterpret design intent.
- DoD lacks standard way to receive, deliver, and use 3D digital data with Product Lifecycle Management (PLM) systems functionality that maintain the product structure needed for data reuse.
- Limited digital data training/educational programs to support/sustain technology transition.

- Reduction in time to mission, both at depot or supplier procured, that reduces overall cost and/or avoidance using validated TDP's
- Minimize lead times, cycle times and cost for product lifecycle which can lead to higher asset availability
- Digital Product Definition will allow use of emerging technologies ( example: Additive Manufacturing)

### Approach

### Needs

- Improve Technical Data decision making policies and directives to drive processes and procedures
- Address the deficiencies from the GAO Rpt 11-469 "Requirements for Assessing and Documenting Technical-Data Needs"
- Develop a common baseline approach to acquire and maintain data interoperability and integrity.
- Establish a standards based approach for the delivery of digital Technical Data Packages (TDPs) into Government PLM systems – leveraging and building on efforts from MIL-STD-31000
- Demonstrate, through the use of standards, software neutral methods that facilitate digital data interoperability.
- Identify & recommend training/educational strategy to support implementation

- Address Better Buying Power 2.0 Initiatives
- Address interoperability gaps between:
  - Mechanical and Electrical data formats
  - Product Lifecycle Management Systems
- Create a standard process for Digital Product Definition for receipt, delivery, and repurposing during the product's lifecycle:
  - Acceptance and Validation, Quality and Inspection, Manufacturing, Supplier Network interactions with source data (CAM Phase II)
- Focus workforce knowledge, training and development



# The MBE Capability Index

Provides a Basis for Optimal Data Systems Alignment

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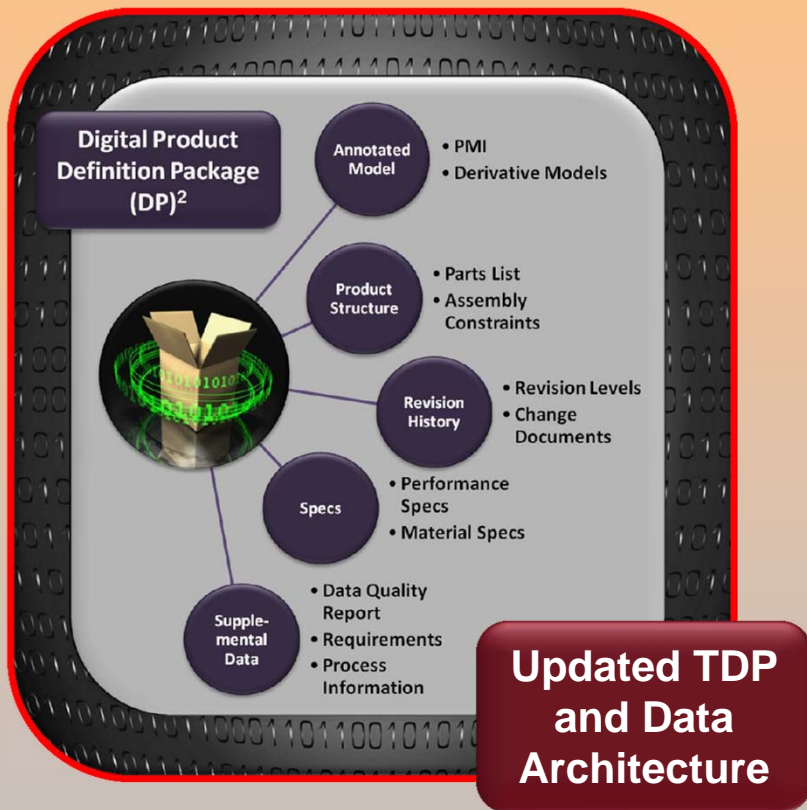


There are many levels of capability for the Model Based Enterprise. The key is to find the one that meets your usecase.

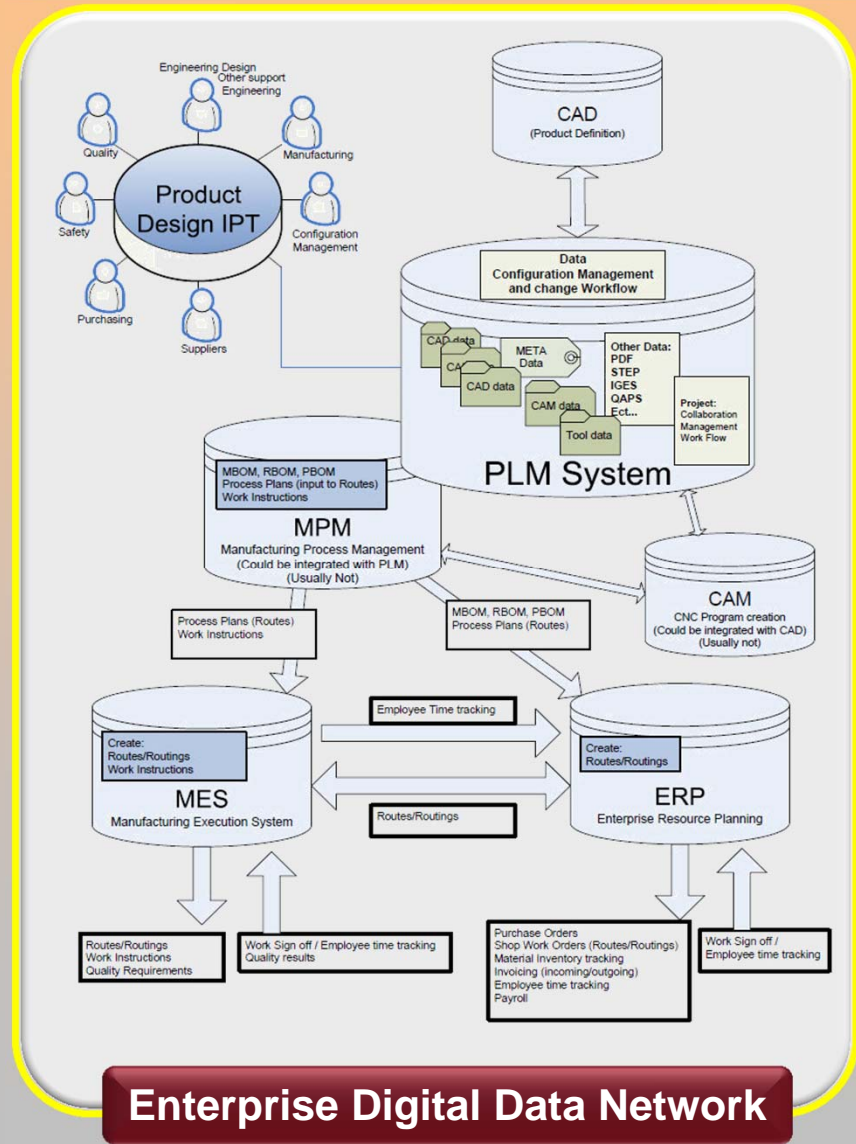
# Desired End State

## Notional Architecture MBE Level 4

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**Target Capability: MBE Level 4: Model Based Definition With Data Management**





# DoD Requirements and Research

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## Navy Requirements and Efforts

- Ship Acquisition Program rarely requests delivery of Product Model data
- The NAVSEA infrastructure is not prepared to exclusively operate within the model based environment
- NAVSEA has funded a project to study the transition to a 3D product model environment
- MIL-STD-31000
- Department of the Navy Policy to procure and accept product and technical data in a digital format<sup>1</sup>.
- NAVSEA Instruction to procure and accept product model data used for ship and ship system design, acquisition, and fleet support activities <sup>2</sup>.

## DoD Research Efforts

- National Shipbuilding Research Program
- DoD Engineering Drawing and Modeling Working Group
- Digital Manufacturing and Design Innovation Institute
- ManTech Program

<sup>1</sup> DON POLICY ON DIGITAL PRODUCT/TECHNICAL DATA, ASN(RDA), Washington D.C., 10/23/2004.

<sup>2</sup> ACQUISITION AND MANAGEMENT OF PRODUCT MODEL AND OTHER TECHNICAL DATA, NAVSEA Instruction 9040.3A, Naval Sea Systems Command, Washington D.C., 4/3/2013.



# Committed to a Model Based Environment

How about You?

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## Office of Naval Research

Recent Navy investment in the Model Based Environment are focused on completing the Digital Thread. These activities will help identify challenges, conduct research, overcome implementation issues, and provide lessons learned in manufacturing and quality assurance where a complete digital 3D product model serves as the authoritative information source for all activities in the product's lifecycle. In all, an effective and high quality digital foundation will help create affordable next generation naval platforms.

**John U. Carney, Director, Affordability Initiatives Division and Navy ManTech Program**

## Naval Surface Warfare Center Carderock Division

A strong model based enterprise is a prerequisite for advanced engineering and manufacturing technologies. Our incredible team of scientists and engineers is involved in the development of technologies that will advance the model based enterprise to meet the current and future operational needs of the fleet. At the Naval Surface Warfare Center and in particular Carderock, we are also committed to applying these technologies to weave the digital tapestry necessary to continually advance our in-house S&T, engineering, and manufacturing capabilities.

**Dr. Joseph T. (Tim) Arcano, Jr., Technical Director**

## Lightweight Innovations for Tomorrow

A major pillar of the model based environment is manufacturing process definition. There is great synergy with the Lightweight and Modern Metals Manufacturing Innovation Institute. LM3II's goal is to create market expansion and new consumers of lightweight products and to enable accelerated maturation and scale up of lightweight metals and manufacturing processes. Synergy with MBE is provided by LM3II's thrust in Integrated Computational Materials Engineering (ICME), which employs computational tools to integrate materials information, manufacturing process simulation, and product design and performance analysis.

**Johnnie Deloach, Program Manager**



## Digital Manufacturing and Design Innovation Institute

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DMDII defines digital design and manufacturing data and processes across the lifecycle of a manufactured product.

### DMDII technology thrust areas

- Advanced Manufacturing Enterprise (AME) - integration of information systems across the product lifecycle, digital links between design and fabrication, and smart manufacturing practices within the factory and supply chain.
- Intelligent Machines (IM) - integration of smart sensors and controls with manufacturing equipment, as well as machine intelligence at the level of the equipment and the cell.
- Advanced Analysis (AA) - data analysis, algorithms, and computing technologies. A

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