A Brief History of Shipbuilding Digital Technical Data

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1760
1990
2000
2010
2020
Why do we care about the 3D Model-Based Definition?

Entered service : 21 October 1797
Years in Service : 223 years
DDG 51 Digital Data Transfer Program
SEAWOLF Digital Data Transfer Program
San Antonio Program
Zumwalt Program
EXCHANGING DESIGN AND CONSTRUCTION INFORMATION BETWEEN U.S. SHIPBUILDERS, SUPPLIERS, AND CUSTOMERS

- Enable the virtual shipyard.
- Enhance the competitive position of the US shipbuilding industry.
- Improve the communication processes within the shipyard
- Improve the product model capabilities within the shipyard
- Standardize product model definition within the US marine industry
Evolution of STEP
Evolution of STEP

<table>
<thead>
<tr>
<th>AP216 Ship moulded forms</th>
<th>AP218 Ship structures</th>
<th>AP227 Plant spatial configuration</th>
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STEP Tools, Inc.

NORTHROP GRUMMAN

Ship Systems

NAVSEA

CARDEROCK

INTERGRAPH

SOLUTIONS GROUP

atlantec

enterprise solutions

ABS

SENER

GENERAL DYNAMICS

Electric Boat

LMi
Integrated Shipbuilding Environment
Navy Product Data Initiative

**INTEGRATED PRODUCT DATA ENVIRONMENT (IPDE)**

- Design
- Engineering
- Material Management
- Planning
- Construction
- Test
- Logistics Support
- REGTS. Management
- Collaboration
- Publishing

**APPLICATION INTEGRATION**

**PROCUREMENT**

**MRP**

**EXT. APPLICATION**

**OTHER IPDEs**

**DATA EXCHANGE**

**IPDE CORE CAPABILITIES**

- **Configuration Management**
  - Configuration Identification
  - Change Management
  - Configuration Status Accounting

- **Product Data Access**
  - Access Controls
  - Product Model Navigation
  - Collaboration Tools
  - Visualization Tools
  - Reporting Tools

- **Business Process Control**
  - Work Authorization
  - Requirements Tracking
  - Configurable IPDE

**PRODUCT DATA MANAGER**

**Scope of IPDE Specification**

**Ship Common Information Model**

- Structures
- Piping
- HVAC
- Equipment
- Logistics
- Early Stage
Life After SEAWOLF

- VIRGINIA Class
- LPD 17
- DDG 1000
- COLUMBIA Class
- Coast Guard
- Common Amphibious Ship Design Environment
Minimal Data Content
Minimal Data Content

ISO 19363
- 3-D Geometry
- Product Manufacturing Information
- Plant Spatial Configuration
- Product Lifecycle Support
- Ship Design and Construction

ISO 14306
- 3D Technical Data Packages
- Product Visualization
- CAD Data Exchange

ISO 19975
- 3-D Scenes
- Scientific Visualization

ISO 19650
- Building Information Model
- Physical characteristics
- Functional characteristics
- Construction logistics
- Building operations
- Building Maintenance

ISO 14739
- 3D Technical Data Packages
- Document Exchange
- Optimized to PDF

Integrated Logistics Support Specifications
- $1000D
  - Illustrated Parts Data
  - Maintenance and Operation
  - Descriptions
  - Procedures
  - Troubleshooting
  - Training Modules

- $2000M
  - Initial Provisioning Lists
  - Illustrated Parts Data

- $3000L and $4000P
  - Logistic Support Analysis (LSA)
  - Maintenance Concept
  - Corrective Maintenance Tasks
  - Preventive Maintenance Tasks
  - Maintenance Task Analysis and Planning
  - Operational Tasks
  - Human Factor Analysis
  - Spares
  - Tooling

- $6000T
  - Training Needs Analysis
  - Training Objectives
A two level approach for the exchange of product model data

First level: Support configuration management, logistics support, provisioning, spares, and repairs through the use of STEP for geometry, product structure, non-graphical attributes, and to manage configuration items of the as-built / as-maintained ship.

Second level: Deliver the as-designed class model of
1) molded forms suitable for defining a general arrangement
2) scantling level of detail of structure to support structural (and other types of) analysis
3) functional distributed systems model (i.e. path, components, and connections)
4) compartmentation, including accesses, opening, and tightness
5) plates, stiffeners, brackets, collars, and other structural components as parts
6) distributed system components, fittings, and equipment as parts.
Why do we care about the 3D Model-Based Definition?

Availability of 3D Model Based Technical Data to Support the Next Generation of Cataloging, Sustainment, and Procurement

- **Model-Based Enterprise Readiness**
  - Do you have the tools?
  - Do you have the people?
  - Do you have a Digital Thread Enable Integrated Digital Environment?
  - Can you collaborate with other enterprises using 3D Product Model and other Technical Data?

- **Intellectual Property Strategies**
  - Do you have the appropriate IP rights?
  - Do you understand the trade space, and what options it has to acquire more rights?
  - Does the program have a plan to mitigate risk of changing requirements?

- **Technical Data Availability**
  - Can you acquire technical data?
  - Can you create technical data?
  - Is the technical data appropriate?

- **Legacy Data Conversion & Validation**
  - Can you arbitrate authoritative source of truth?
  - Does the program understand what capabilities both now and future are precluded by legacy data?
  - Does the program have a plan for converting data if the capability is needed, does it understand the potential costs and risk of conversion?

Providing the foundation for the 3D MBE
But what is the MBE?

It is an Attitude, State of mind, and being.

Model-Based Enterprise
MBE is the Model-Based Enterprise. All of the information typically found in an entire set of engineering drawings and associated lists. Traditionally this included shape definition, product manufacturing information, materials, and assembly fit-up. This must expand beyond the domain of design and manufacturing.

Model-Based Environment
MBE is the Model-Based Environment. Leveraging the Digital Thread to integrate between data repositories and applications; in which you can determine the pedigree of the data and identify the source of truth; that you can generate derivative data to meet a specific need, and forever associate that derivative data to its authoritative source, that you can augment derivative data and the source of truth with additional data thus increasing the scope of authoritative data.

Model-Based Engineering
MBE is Model-Based Engineering. Performing engineering tasks using 3D Model-Based Product Data and other Technical Data in lieu of extracting information from documents.
DoD Engineering Data and Modeling Working Group

Held during the 2021 Model-Based Enterprise Summit
Friday April 16, 2:00PM EDT