DoD and 3D Technical Data Through The Lifecycle

A standards-based approach

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The Model-Based Enterprise

- What is MBE?
  - Using annotated 3-dimensional models in the place of 2-dimensional drawings, for all purposes throughout the lifecycle
    - Can be CAD or SysML or other systems model
    - All purposes includes supporting tradespace analysis, other assessments (the “ilities”, cost and risk…..etc.)
    - That support comes from exchanging model data with the users performing those assessments
- Processes for Parts Management could be supported the same way?

The Foundation of Digital Product Definition [1]

Single Digital Master

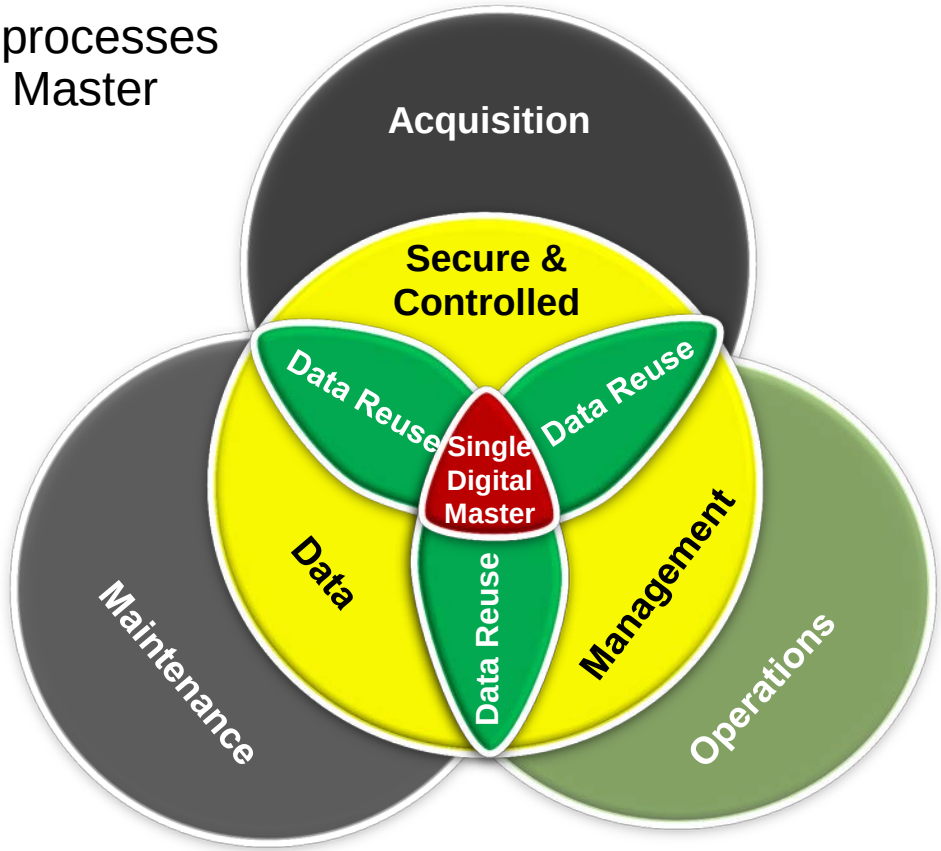
- Create the information **ONCE** and all processes consume and contribute to the Digital Master

Reuse vs. Re-Creating

- Utilize the Digital Master throughout the life-cycle eliminating the need to expend additional resources to re-create the data for each use

Secure & Controlled Data Management

- Trusted sharing of data throughout
- the integrated enterprise



1. From a Briefing by ARDEC

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Why Model-Based Enterprise – Benefits

- During Solution Analysis Phase:
  - Faster and more thorough trade-space evaluation
  - Improved cost modeling
  - Virtual manufacturing feasibility assessment
  - Virtual Design Reviews
  - Collaboration amongst stakeholders/data exchange
  - Real time configuration management
- During Technology Development :
  - Better assessments of producibility, maintainability and sustainability
  - Faster and more thorough risk identification and mitigation
  - Virtual manufacturing processes evaluation

Why Model-Based Enterprise – Benefits

- During Engineering and production:
  - Better assessments of producibility, maintainability and sustainability
  - Faster and more thorough risk identification and mitigation
  - Virtual manufacturing processes evaluation
  - Reduction in the amount of non-recurring engineering
  - Virtual prototyping
  - Fewer defects/less rework
  - Faster time to market
- During Sustainment:
  - Faster and less error-prone part sourcing/organic manufacturing
  - Potential for more competition in bidding
  - Reduction in the amount of non-recurring engineering
  - Faster and less error-prone production

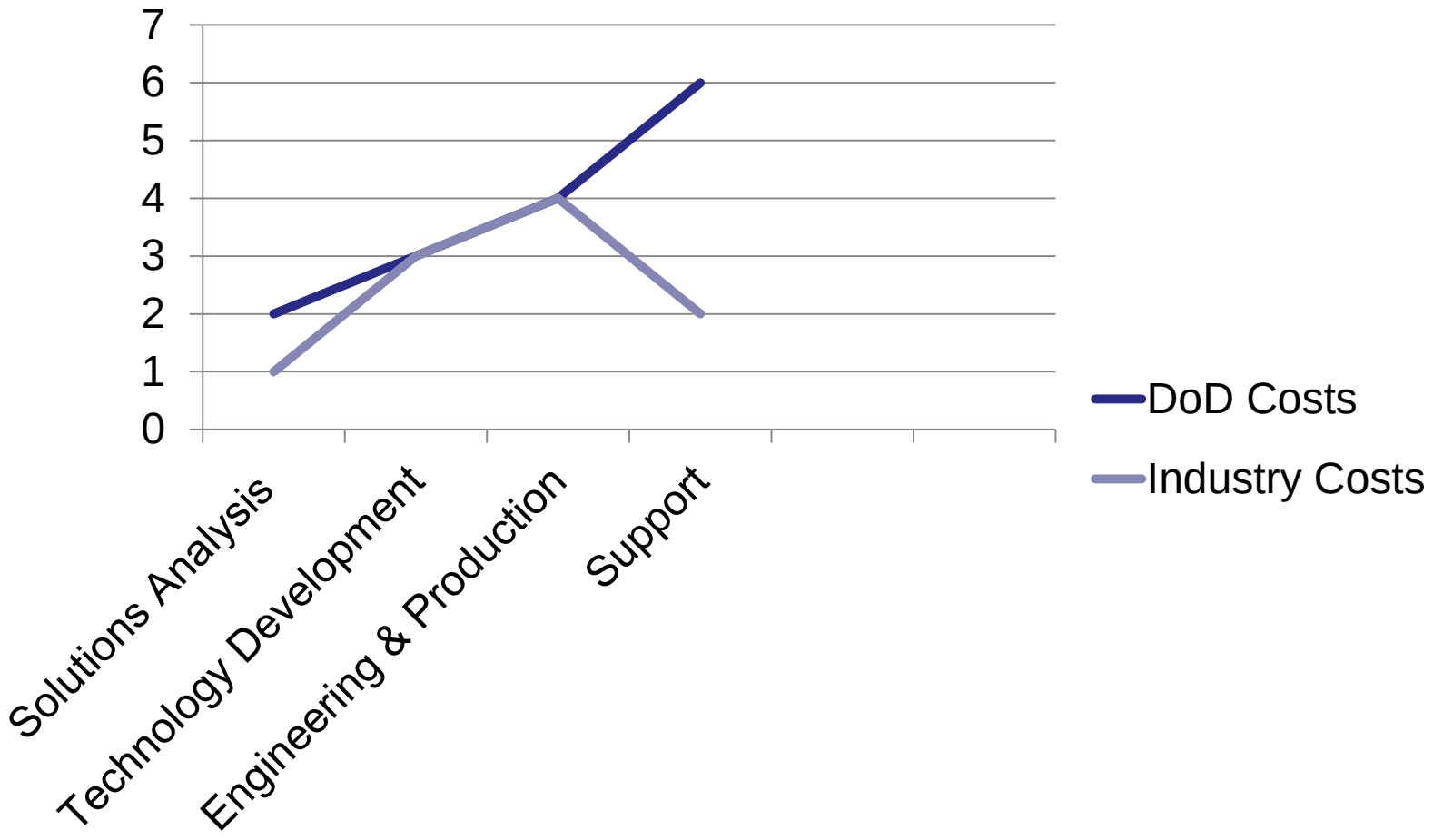
Costs of MBE

- During Solutions Analysis Phase
  - Establish governance and guidance for 3D data
  - [PMO] Develop staff training to define and contract for 3D data
  - OEMs and suppliers must develop guidance for delivery of 3D data
- During Technology Development
  - [PMO] Invest in hardware and software for collaboration on products
  - OEMs and suppliers update desktop procedures and integrate design and engineering

Costs of MBE

- During Engineering and Production
  - PMO] Invest in software for receipt and acceptance, and storage for 3D data
  - [PMO] Update configuration management processes
  - OEMs and suppliers update procedures and integrate engineering and manufacturing
  - Small suppliers invest in computer hardware and software to integrate 3D models with CAM and CNC systems
- During Sustainment
  - PMO, OEMs and suppliers Implement long-term storage process as needed for contractor-supported logistics

What are the costs and to whom do they accrue?



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Many, Many Unknowns for DoD

- This is a very complex undertaking—requires change in:
  - Contracting for data
  - DoD processes for Data Management and Configuration Management
  - DoD infrastructure – PLM and ERP needs
  - DoD Engineering processes (SE)
  - And more…..much more

Reducing unknowns

- Industrial Base Improvement Fund (IBIF*) research projects
  - Project 1: Comprehensive Technical Data Packages (TDPs) for Next Generation Business Exchanges
    - Focused on electrical components
    - STEP (ISO 10303) and S1000D v4
  - Project 2: TDP Integration and Validation for Government Delivery
    - Focused on PLM-to-PLM exchange
    - STEP PLCS (ISO 10303, AP239)
  - Project 3: Technical Data Package File Throughout The Supply Chain
    - Focused on 3 specific parts and data exchange with suppliers
    - 3D PDF, JT viewers and ISO10303

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1: Electrical components

- Environment:
  - Internally-developed design system
  - Currently deliver only a pin map and schematic as TD
  - Need to deliver S1000D format technical data

- Approach:
  - Because there are many different systems used for electrical component design, avoid a straight conversion or translation of the specific internal system to S1000D
  - Use a standards-based approach so other divisions can apply the resulting software (or parts of it)

2. OEM ←→ Government, PLM-to-PLM Exchange

- Environment:
  - Working with a PMO whose platform is in sustainment
  - PMO ordered TD in the form of the OEM's 3D models on OEMs PLM
  - But in processing ECOs, PMO has quite the collection of 3D TD….and no PLM
  - Available PLM SW different from OEM's SW
- Approach:
  - Implementing the latest version of PLM SW
  - Re-engineering ECO processes

3: Primes and Suppliers Data Exchange

- Environment
  - OEM working with suppliers for parts (from manufacture to providing finishing services.)
  - Currently exchanging TD by a combination of models and drawings
  - When supplier delivers the part back to the OEM, they deliver a *new* model in whatever CAD format that supplier uses
  - 3D model compatibility is a “happy accident” -- when not there, conversion and manual checking takes place on both sides
-

What we've learned so far

- Use of Open Standards has been key
  - More translators (though imperfect) available for those
  - Rather than translate directly from one proprietary format to a "vendor standard" – it is worth it to translate to a standard with a very large "use base"
    - More tools available, more knowledge in the vendor base
    - Every subsequent translation builds on the work done before; cost and time is reduced
  - Some 'standard processes' help reduce the Validation and Verification burden
    - Every derivative model, every transfer from one enterprise to another (Prime to Sub; OEM to Government, etc.)

MBE will eventually come to DoD

Lingering questions:

- What guidance is still needed?
  - MIL-T-31000, MILITARY SPECIFICATION: TECHNICAL DATA PACKAGES
  - MIL-STD-3046 INTERIM CONFIGURATION MANAGEMENT
- Where will PLMs reside?
  - Who will pay for them
- What are the remaining risks?

Thank you !

Questions: ?

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