Boeing Research & Technology

Enabling Model-Based Collaboration with External Stakeholders

Brendan Mark

Systems Engineer, Boeing Research & Technology

PLM Road Map™ & PDT North America 2023

The Digital Thread in a Heterogeneous, Extended Enterprise Reality

A call for PLM Professionals to share their knowledge & experience

CIMdata May 3 & 4 eurostep

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Presenter's Bio

Brendan Mark – Systems Engineer, Boeing Research & Technology

Systems Engineer and Supply Chain MBE Product Owner. As a Systems Engineer, he works closely with BR&T's Integrated Vehicle Systems (IVS) and Mission Systems & Autonomy (MS&A) Integrated Technology Teams to develop technical requirements for buy packages. As a Product Owner, he leads research activities guiding the development of capabilities to enable Supplier MBE. Brendan holds a Bachelor of Science degree in Mechanical Engineering from Bradley University and a Master of Science degree in Aerospace Engineering from Washington University in St. Louis, as well as several professional certificates. He serves on the AIAA Public Policy Committee and the A&D PLM AG Standards team. He also brings five years of Systems Engineering experience from the power industry.

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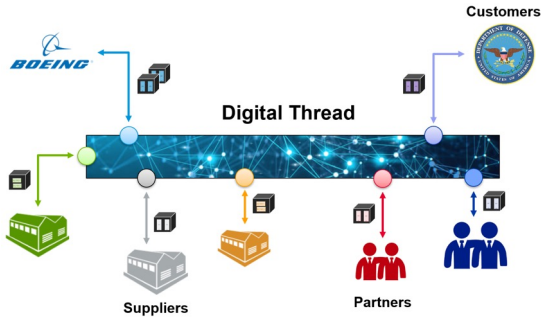
Problem Overview – Supply Chain MBE Perspective

Rising Customer Expectations



✓ driving quality across value stream
✓ improving engineering integration and efficiency
✓ ensuring data & architecture interoperability

What's the challenge?

- OEMs are required to use Digital Engineering (DE) tools and processes to design, develop, test, verify, validate, and certify systems.
- OEMs must levy these same requirements to any subcontractors and vendors at all tiers.
- Digital models must be able to be ingested into customer PLM without loss of context (e.g., metadata, linkages) and functionality

How do we solve it?

- Establish and mature Supplier MBE processes, data and tools – leveraging **data interoperability standards**.
- Guide Suppliers and set clear expectations for collaboration that aligns with Customer needs

Supply chain model-based engineering is a critical part of the digital transformation

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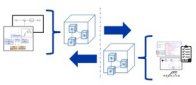
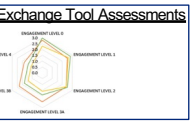
Supply Chain MBE Focus Areas

Areas of Emphases for SC MBE	Solutions	Need for Industry Alignment
[Processes] How • Promoting Common Frameworks & Methodologies • Developing Advanced Contractual Methods • Protecting Intellectual Property During Digital Collaboration	MBE Supplier Engagement Framework 	Medium 
[Tools] Implementation • Assessing Industry Tool Capabilities • Defining Tool Interfaces & Integration • Determining Data Authority	Model Based Exchange Tool Assessments 	Low 
[Data] What • Technical Data Package Optimization • Utilizing Model Metadata • Leveraging Data Interoperability Standards	Digital Technical Data Packages 	High 

Extending our Digital Thread Architecture with a focus on Data, Processes & Tools

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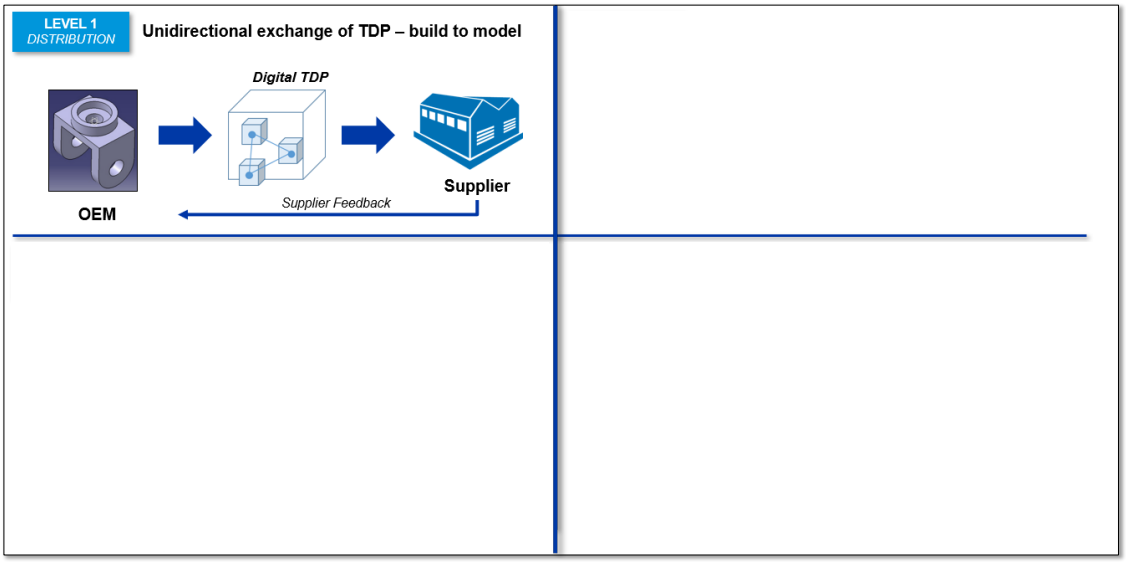
The Boeing MBE Supplier Engagement Framework (SEF)



New Model Based Exchange (MBX) tools are required to enable digital exchange and collaboration

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Assessing New Tools for Digital Exchange & Collaboration

Emerging technology, tools, and user stories require formal assessment and evaluation

1 MBX Tool Capability Assessment

Requirements derived from the Supplier Engagement Framework

MBX Capabilities Evaluation Tool
- Evaluates 150+ Requirements
- Includes 23 Standards

Functional, repository, exchange, and digital thread capabilities

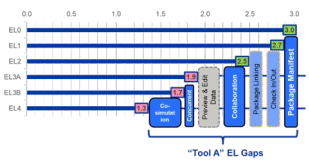
2 Post Assessment Gap Report

Tool assessments reveal gaps in key areas in industry tools

Gaps in EL3-4 capabilities and standards implementation

3 Tool Enhancement Requests

Feedback is provided to tool owners and vendors



Gap closure reports drive enhancements to tools

Further assessment of model-based collaboration environments is needed

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Technical Data Package Optimization

Utilizing model manifests and data standards to capitalize on metadata

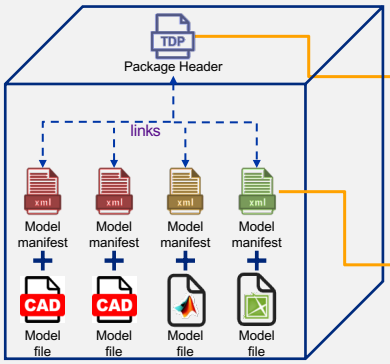
- Metadata is approached with Manifest concept:
  - Identify the asset and related resources, validity, and how to use
  - Protect its content (ownership, Export Control, IP, …)

TDP Package Manifest Formats:

XML format:
- Machine readable.
- Integrate to PLM environment.
- Read links stored in each model

Visualization formats:
- Human-readable (such as HTML)

Embedded Manifest:
- Depends on the file/tool



Package Header – compliant with STEP AP239 and AP243

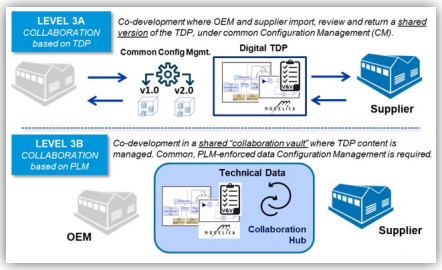
Key Data Standards

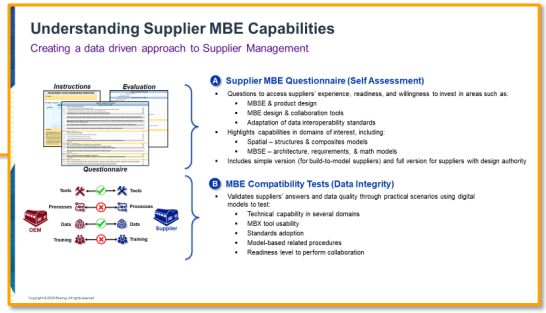
Model Manifests – compliant with STEP AP243

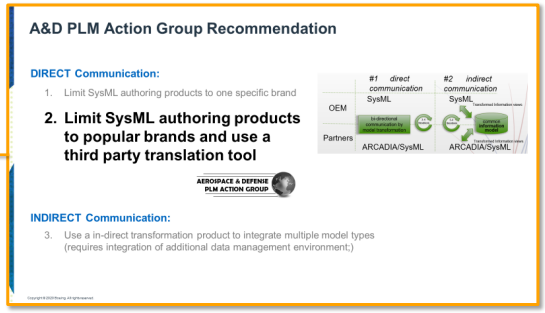
Enabling data exchange between stakeholders regardless of the tool

Additional Challenges of Collaboration

- Unknown capabilities of supply base
- Lack of tool vendor support of data interoperability standards
- Model translation (to common standard) and validation
- Change management and configuration control
- IP protection and obfuscation
- Strategies for MBSE data interoperability







Key Takeaways

1. Customer expectations for digital collaboration are driving the MBE transformation for Supply Chain.
2. Robust Model Based Exchange (MBX) tools are required to enable digital exchange and collaboration
3. Emerging technology, tools, and user stories require formal assessment and evaluation. Data from assessments should provide guidance for future capabilities development.
4. Current tools lack capabilities for concurrent collaboration (OEMs must be prescriptive to tool vendors).
5. OEM – Supplier Compatibility is key for a successful collaboration (advocating for the adoption of data interoperability standards).

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Q&A Placeholder

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