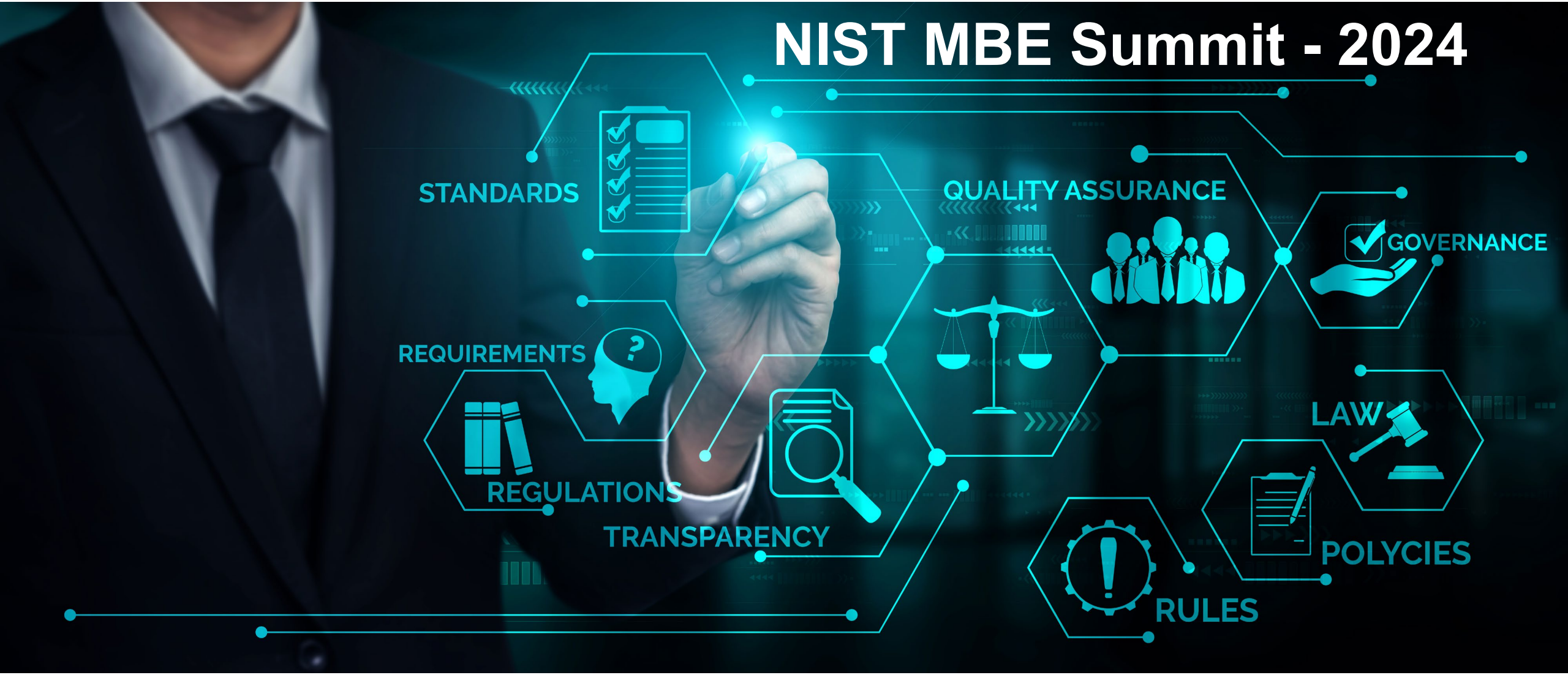
MBE Committee & Y14/MBE Harmonization JWG Update



BIO – Evan Kessick

Evan Kessick
MBE Discipline Manager
Belcan

- Joined Belcan in 2023 as MBE Discipline Manager
- Helping organizations bridge strategy and execution to achieve digital visions
- 16+ years working in engineering and design
- Led MBD and MBE Implementation at large consumer goods OEM
- Industry Standards Involvement:
  - ASME MBE Committee Chair
  - ASME Y14/MBE Harmonization JWG Co-Chair
  - ASME Y14.41 Member
  - ASME Y14.5-2009 GDTP Senior Certified
  - Involved with the DMSC, and DEDMWG

Belcan

- 65 years of Engineering Better Outcomes
- Global Delivery Network
- 10,000 Professionals
- Annual Revenue of ~$1B

Aerospace
Defense
Space
Marine
Automotive
Government
Off-Highway
Industrial

AGENDA

Review MBE Committee and Y14/MBE Harmonization JWG Charter

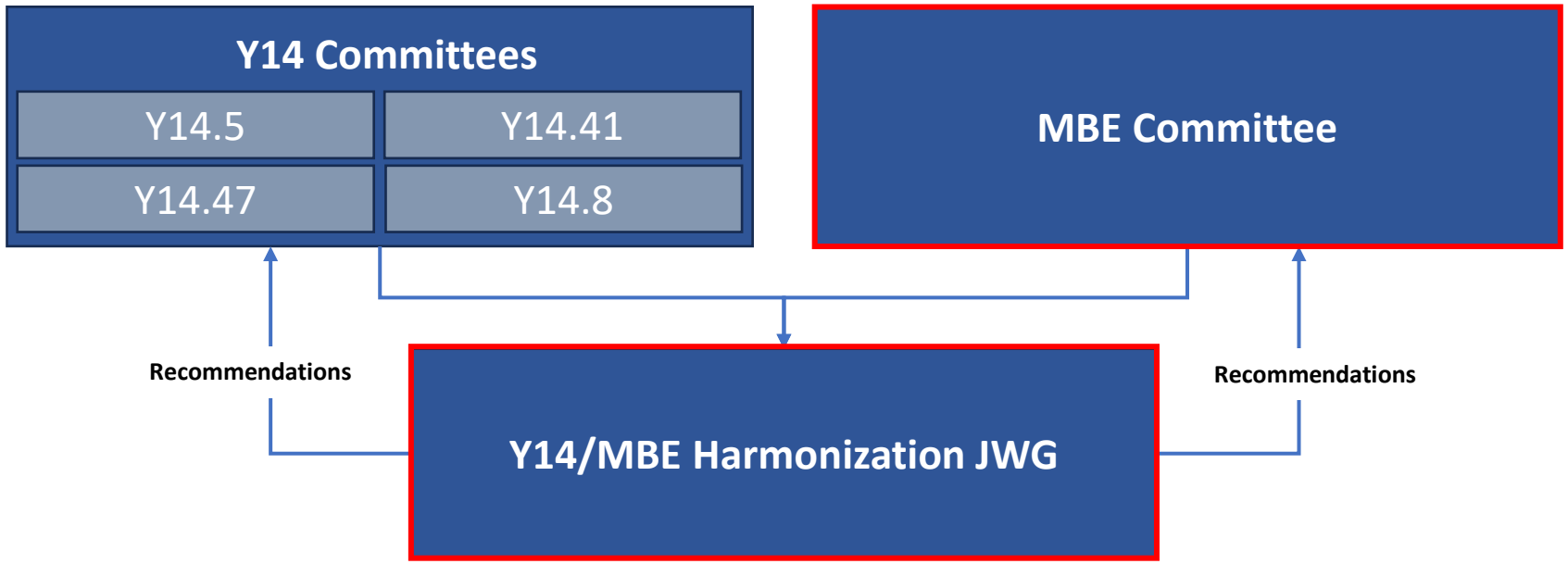
Why Industry Standards Matter and MBE Committee Role

Understand the Role the Harmonization WG Plays

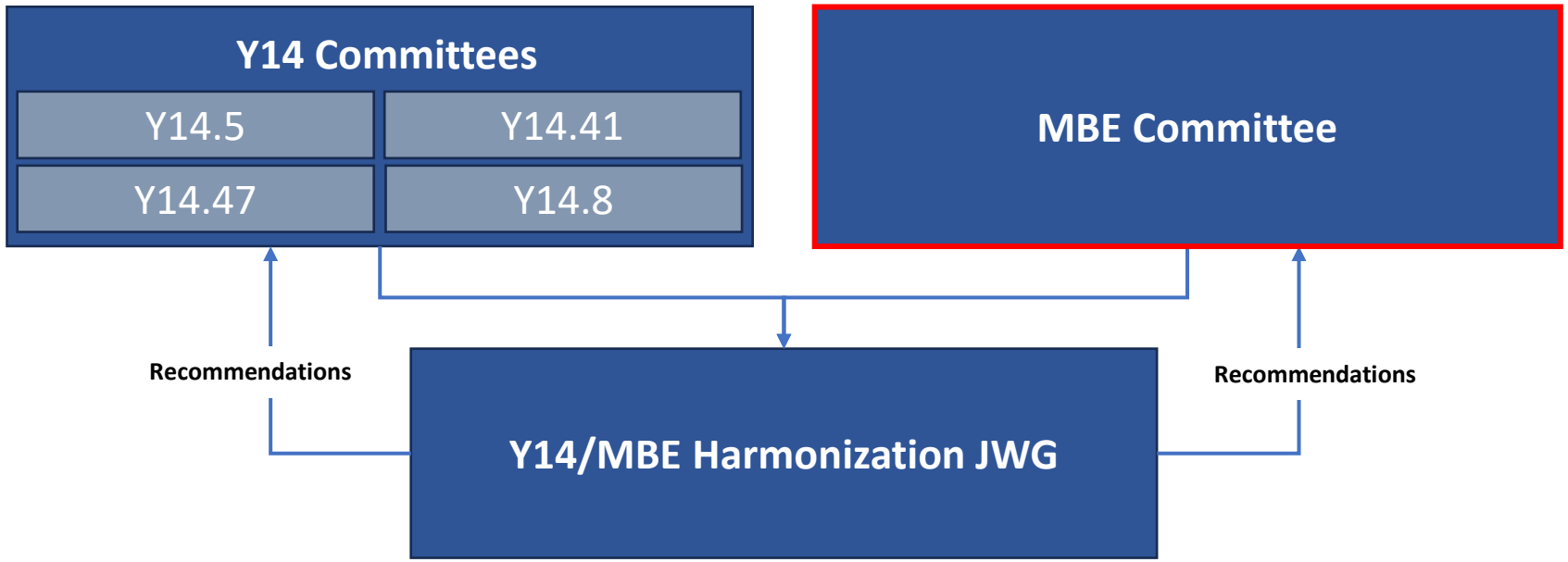
Y14/MBE Harmonization WG Overview

How To Get Involved!

ASME Committee Overview



Model-Based Enterprise (MBE) Committee



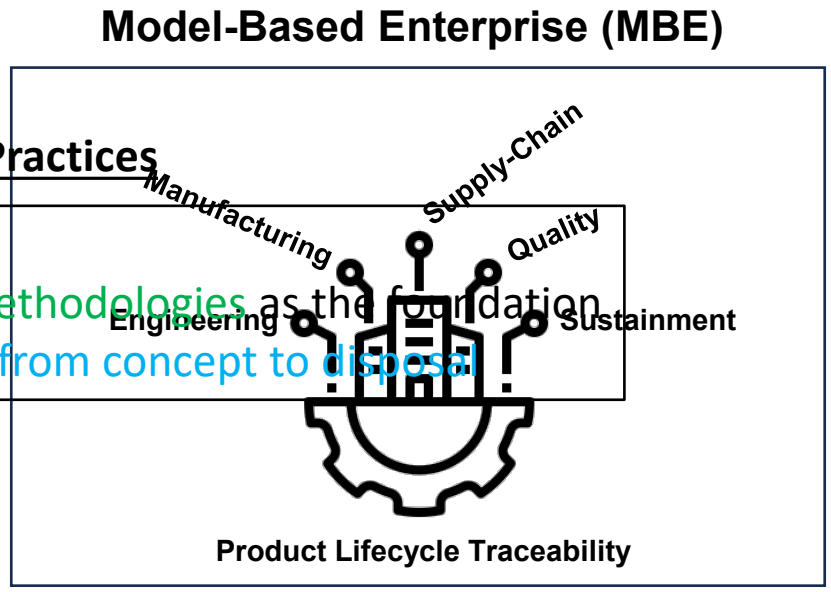
Model-Based Enterprise (MBE) Committee

Charter:

Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Y14.47-2023: Model Organization Practices

Model-Based Enterprise (MBE):
An organization that uses digital methodologies as the foundation to enable deployment of products from concept to disposal



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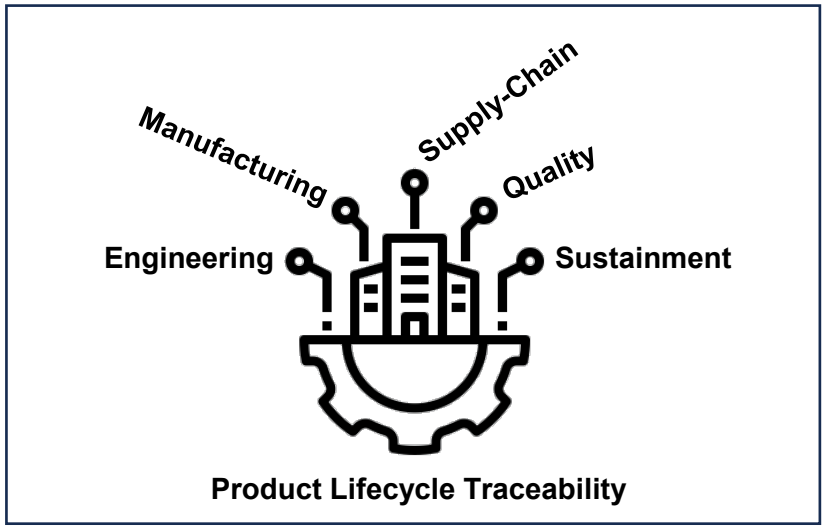
Model-Based Enterprise (MBE)



Model-Based Enterprise (MBE) Committee

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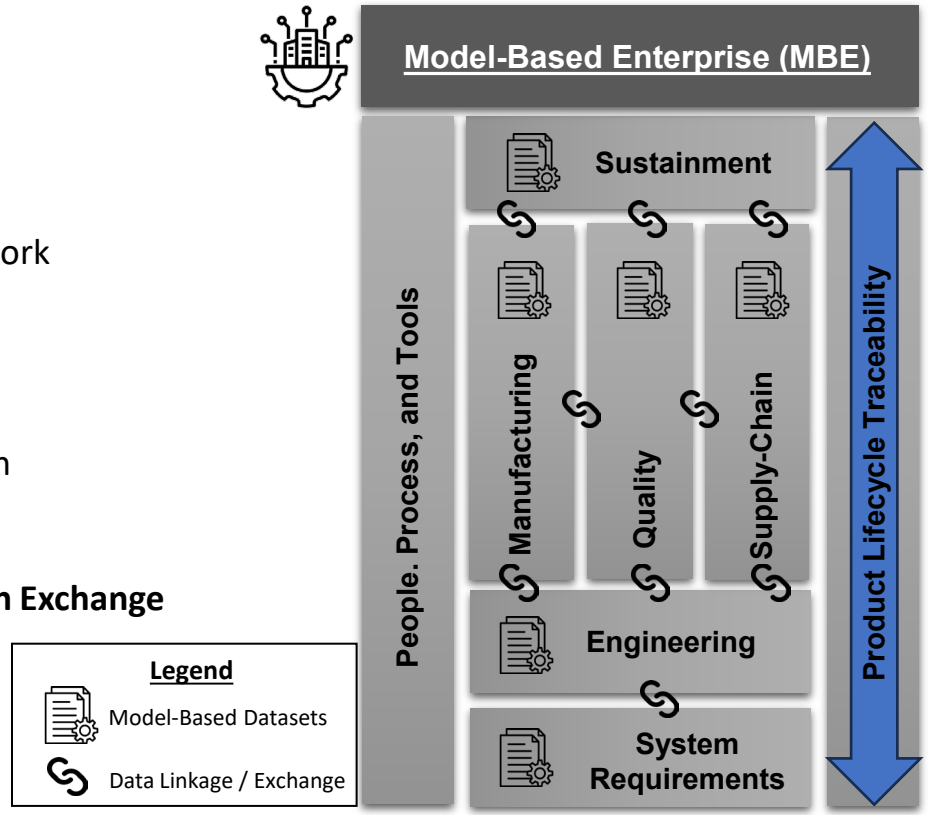
Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Focus Areas:

- Identify model-based datasets across the enterprise
  - Identify the origin of creation, reuse, and augmentation
- Identify the common information exchange to perform product lifecycle standards work
  - Identify and digitally connect the information exchange between enterprise domains
- Identify interoperability challenges of model-based datasets and technical data
  - Internal OEM Focus, Supply-Chain (External) Focus
- Manage gaps and concerns between existing standards affecting MBE/MBD adoption
- Manage model-based datasets, linkages, and dataflow between enterprise domains
- **Establish Industry Standardization, Governance, and Rules for common Information Exchange**



Model-Based Enterprise (MBE) Committee

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Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

Leadership:	**Members:**	**Meetings:**
Chair: Evan Kessick **Vice Chair:** Mark Morreale **Technical Secretary:** Open for Nom.	9 members and Looking to Grow	Virtual Meetings: Bi-Weekly TBD In-Person: ASME April 30th 1-4pm MST

Focus Areas:

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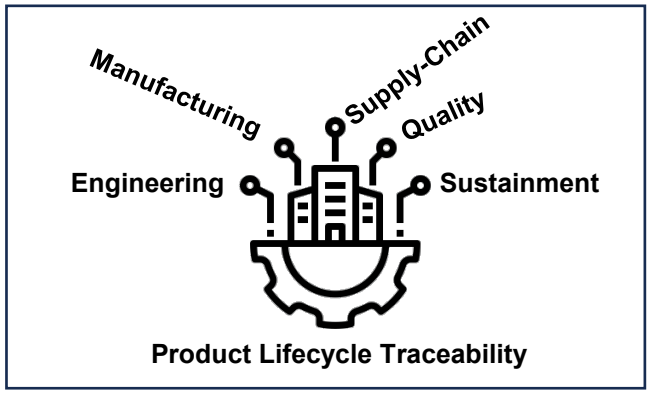
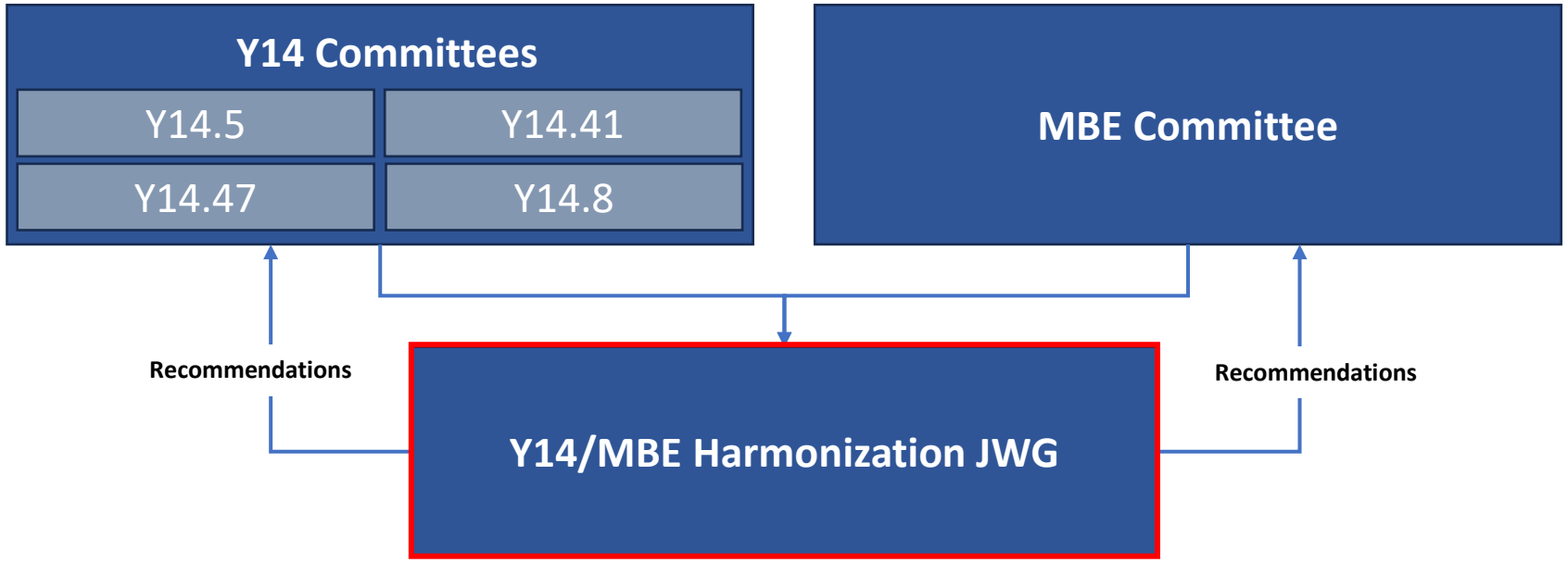
Model-Based Enterprise (MBE)



Y14 & MBE Harmonization Joint Working Group



Y14 & MBE Harmonization Joint Working Group

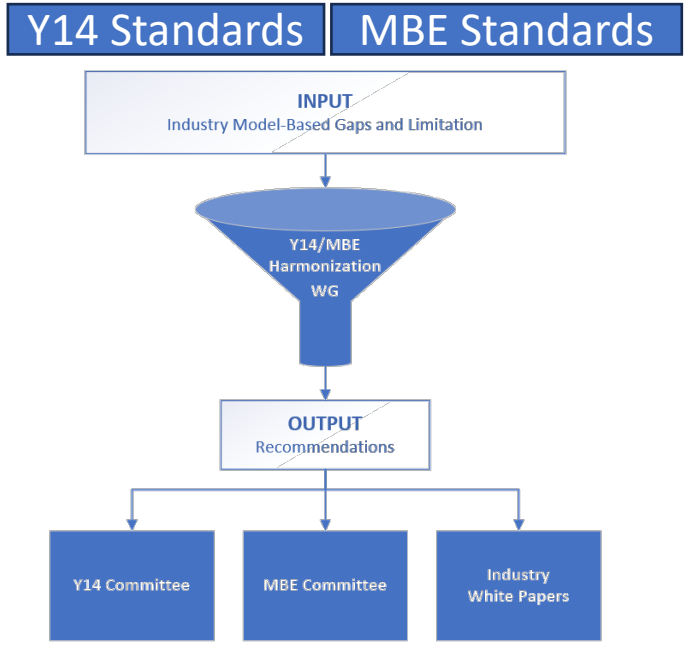
Charter:

Collect MBD/MBE concerns and ideas in relation to the current Y14 standards and where said standards need to be adapted to meet the emerging needs of Model Based Enterprise activities. Ensure MBE and Y14 harmonization, supporting the creation and the interoperability of MBD.

(Established: March 2022)

How:

- Develop ASME Y14 Recommendations
- Develop ASME MBE Recommendations
- Develop White Papers:
  - Best practices
  - Industry and Standards Gap Analysis
  - Industry awareness of activities
  - How to best implement harmonized Y14 or MBE



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(Established: March 2022)

Leadership:
Co-Chair Y14: Ashley Schmidt
Co-Chair MBE: Evan Kessick
Technical Secretary: Dan Feighery

Members:
Y14: 10 Members
MBE: 10 Members

Meetings:
Monthly OPEN Meetings: April 24th
In-Person: ASME April 29th 9-5pm MST

How:

- Develop ASME Y14 Recommendations
- Develop ASME MBE Recommendations
- Develop White Papers:
  - Best practices
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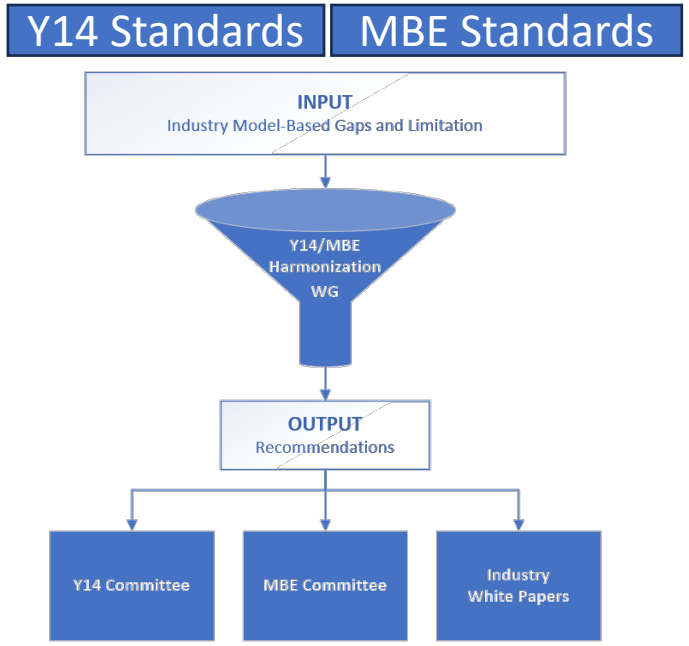

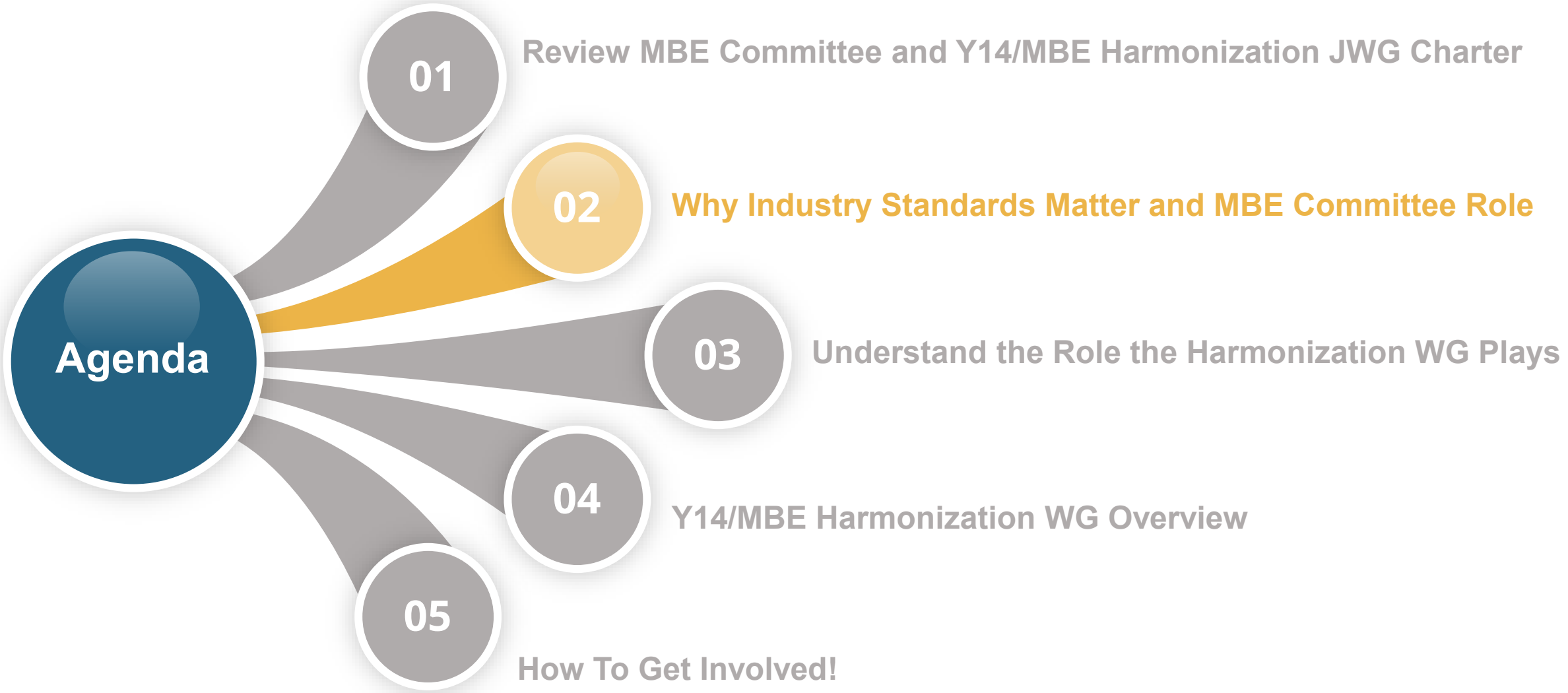
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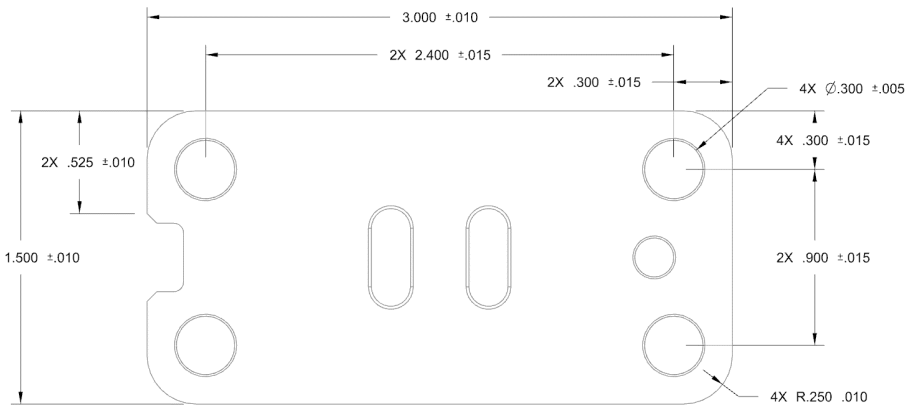
Why Industry Standards Matter?

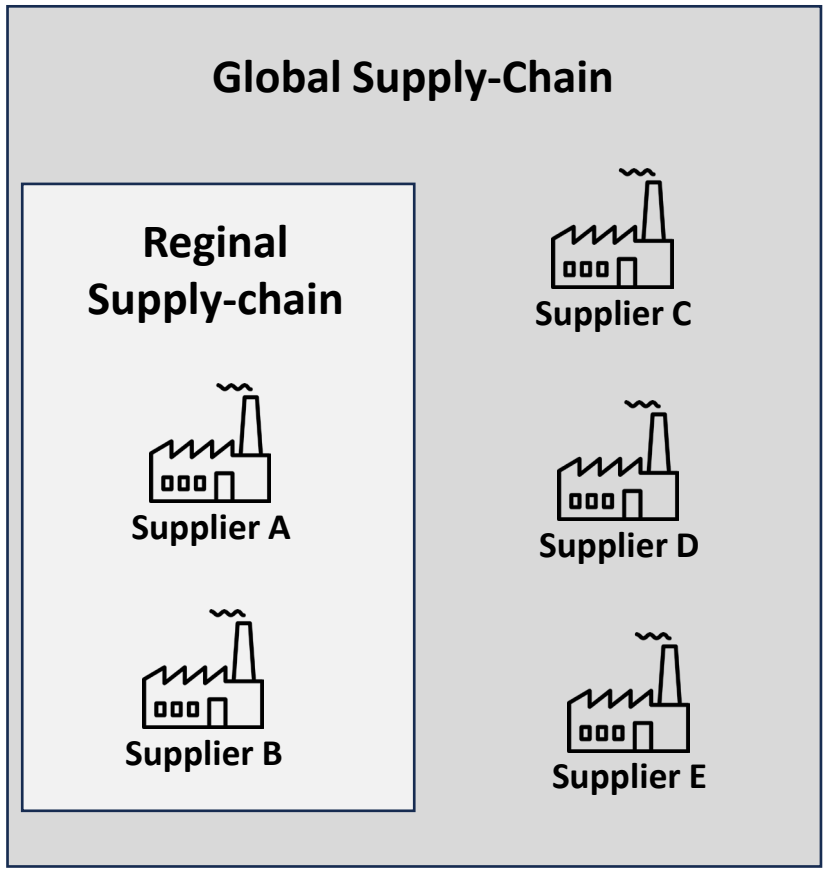
Product Definition Without Industry Standards



Product Definition
(2D Drawing)

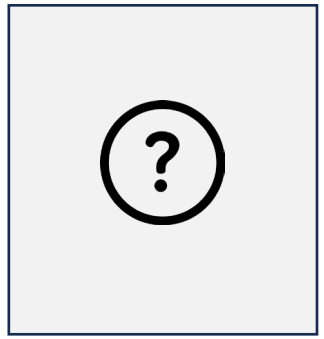
- Non-functional Product Definition
- No Datum System (Implied Datums)
- Ambiguous Requirements

Interpretation Across the Supply-Chain



- Multiple Languages
- Multiple Interpretation
- Multiple Inspection Methods

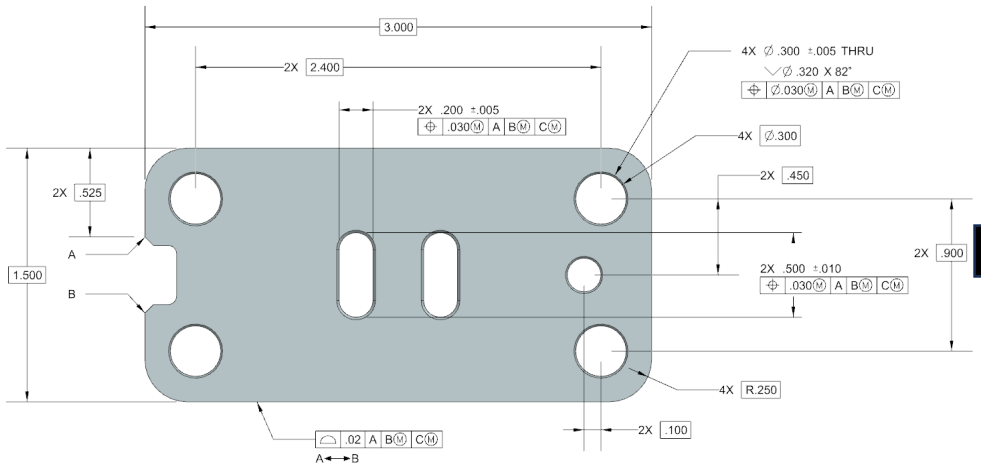
Part Acceptance?



Why Industry Standards Matter?

Product Definition With Industry Standards

ASME Y14.5 | ASME Y14.41 | ASME Y14.100



Product Definition
(2D Drawing or MBD)

- Functional Product Definition
- Datum System
- Clear and Understood Requirements

Interpretation Across the Supply-Chain

Global Supply-Chain

Reginal Supply-chain

Supplier A

Supplier B

Supplier C

Supplier D

Supplier E

ASME Y14.5 | ASME Y14.100 | ASME Y14.45

- Global Symbolic Language
- Single Interpretation
- Single Inspection Methods

Part Acceptance?

Model-Based Enterprise

Model-Based Enterprise

Lifecycle Phase: Product Development | Plan, Source, Build | Operate and Maintain

MB-X

Digital Thread

MB-Definition

- Engineering PMI/GD&T
- Bill of Characteristics
- MBD Derivative Formats
- 3D Data Package

MB-Manufacturing

- 3D Process Planning
- NC Programming

MB-Quality

- Inspection Plans & Rules
- Program Creation & Execution

MB-Assembly

- Assembly Models
- 3D Work Instructions

MB-Testing

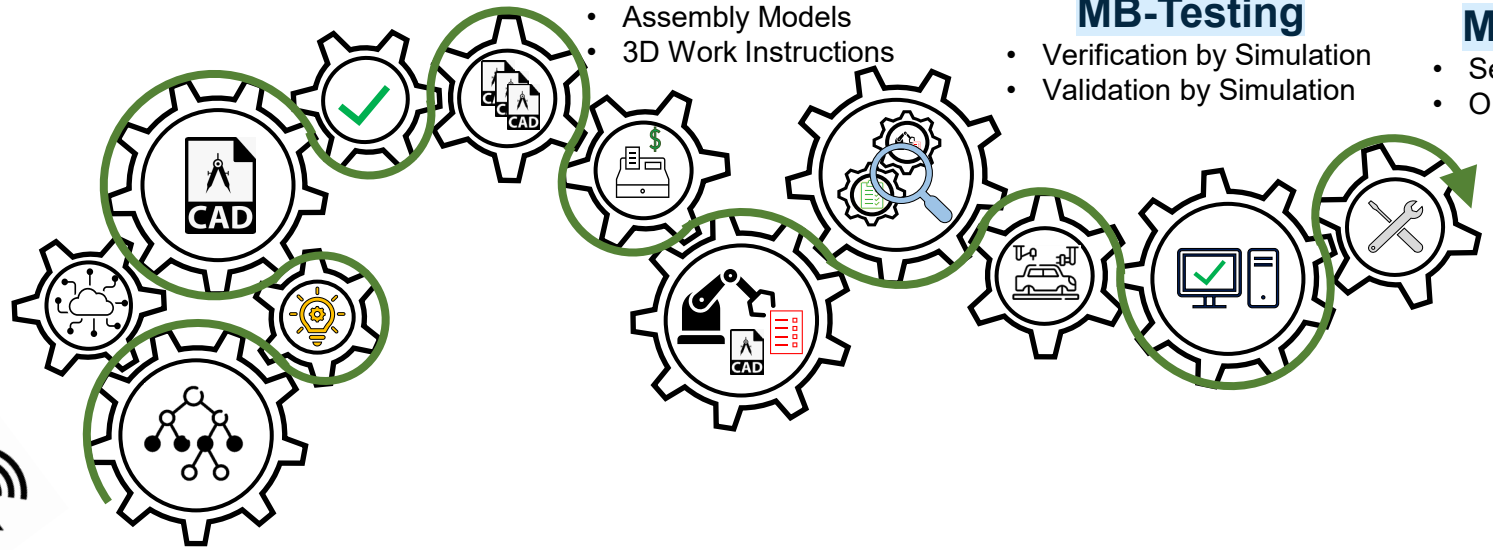
- Verification by Simulation
- Validation by Simulation

MB-Sustainment

- Service, Overhaul & Repair
- Operational Data

MB-Design

- 3D Tolerance Analysis
- Simulation & Validation



MB-Software

- Model Based Software
- Connected Systems

Voice of Customer

MB-Systems Engineering

- Requirements Engineering
- System Architecture Development

Industry Standards Landscape and MBE Committee Role

Model-Based Enterprise

Lifecycle Phase: Product Development | Plan, Source, Build | Operate and Maintain

MB-Systems Engineering
- Requirements Engineering
- System Architecture Development

INCOSE | ISO 15288 | DoDI 5000.97

MB-Software
- Model Based Software
- Connected Systems

Standards

MB-Design
- 3D Tolerance Analysis
- Simulation & Validation

ASME Y14.5 | ASME Y14.41

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ASME Y14.5 | ASME Y14.8 | ASME Y14.100 | ASME Y14.5.1 | ASME Y14.47 | ASME Y14.46 | ASME Y14.41 | MIL-STD-31000

MB-Manufacturing
- 3D Process Planning
- NC Programming

ASME Y14.43

MB-Quality
- Inspection Plans & Rules
- Program Creation & Execution

ASME Y14.45 | ISO 23592 (QIF) | ISO 9001 | Emerging MBC ANSI Standard | AIAG

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Standards

MB-Sustainment
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- Operational Data

Standards

Neutral Formats
ISO 10303 (STEP) | ISO 14306 (JT) | ISO 23592 (QIF) | ISO 14379 (PRC)

Industry Standards Landscape and MBE Committee Role

Model-Based Enterprise

Lifecycle Phase: Product Development | Plan, Source, Build | Operate and Maintain

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Belcan

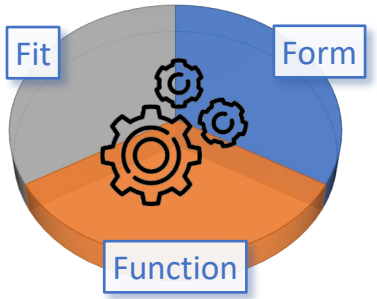
Interoperability of Technical Data

TDP
Technical Data Package

A **3D Technical Data Package** The complete authoritative technical description of a part comprised of artifacts that support the interoperability, traceability, and human-readability of technical data; ranging from engineering CAD data, specifications, standards, and more. ***-Belcan***

Contains Complete Product Definition

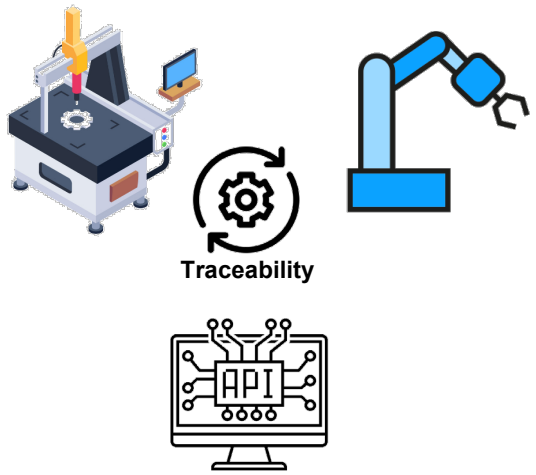
TDP Completeness



Support Downstream Audience

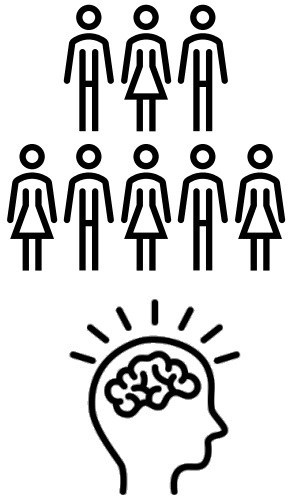
Machine/Software-Readable

Supports Interoperability



Human-Readable

Supports Human Readability



Why Industry Standards Matter?

-Interoperability of Product Definition Without Industry Standards-

OEM Technical Data Package

Native CAD

Neutral CAD

3D Viewable

2D Specifications

Why Industry Standards Matter?

-Interoperability of Product Definition Without Industry Standards-

OEM Technical Data Package

Native CAD

SIEMENS NX · CATIA · SOLIDWORKS · creo

Neutral CAD

QIF · STEP · IGES · JT

3D Viewable

3DPDF · HTML5 · creo view · JT2Go · SIEMENS

2D Specifications

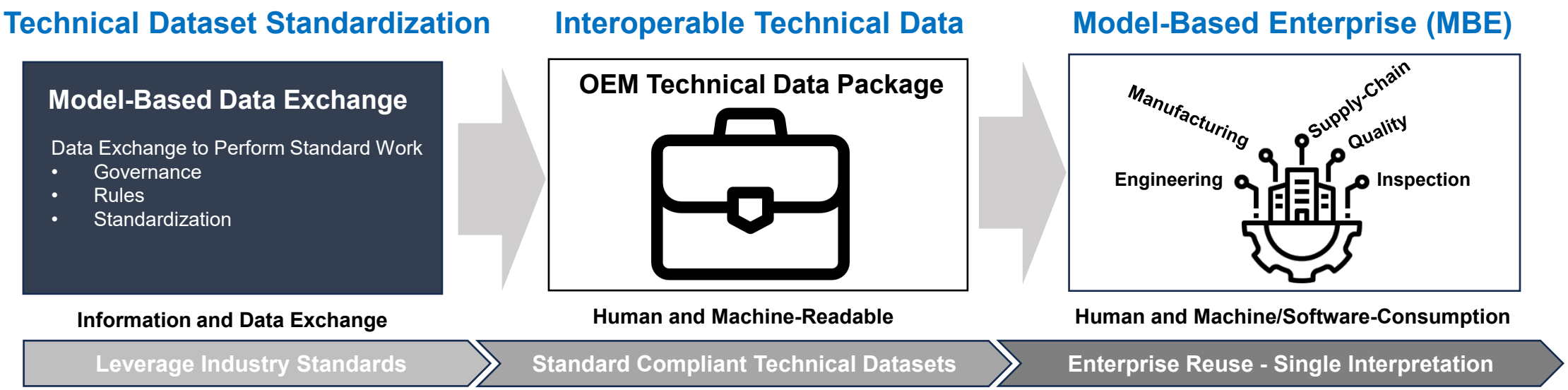
PDF · W · TXT

Supply-Chain Software Soup

Supply-Chain Look Across

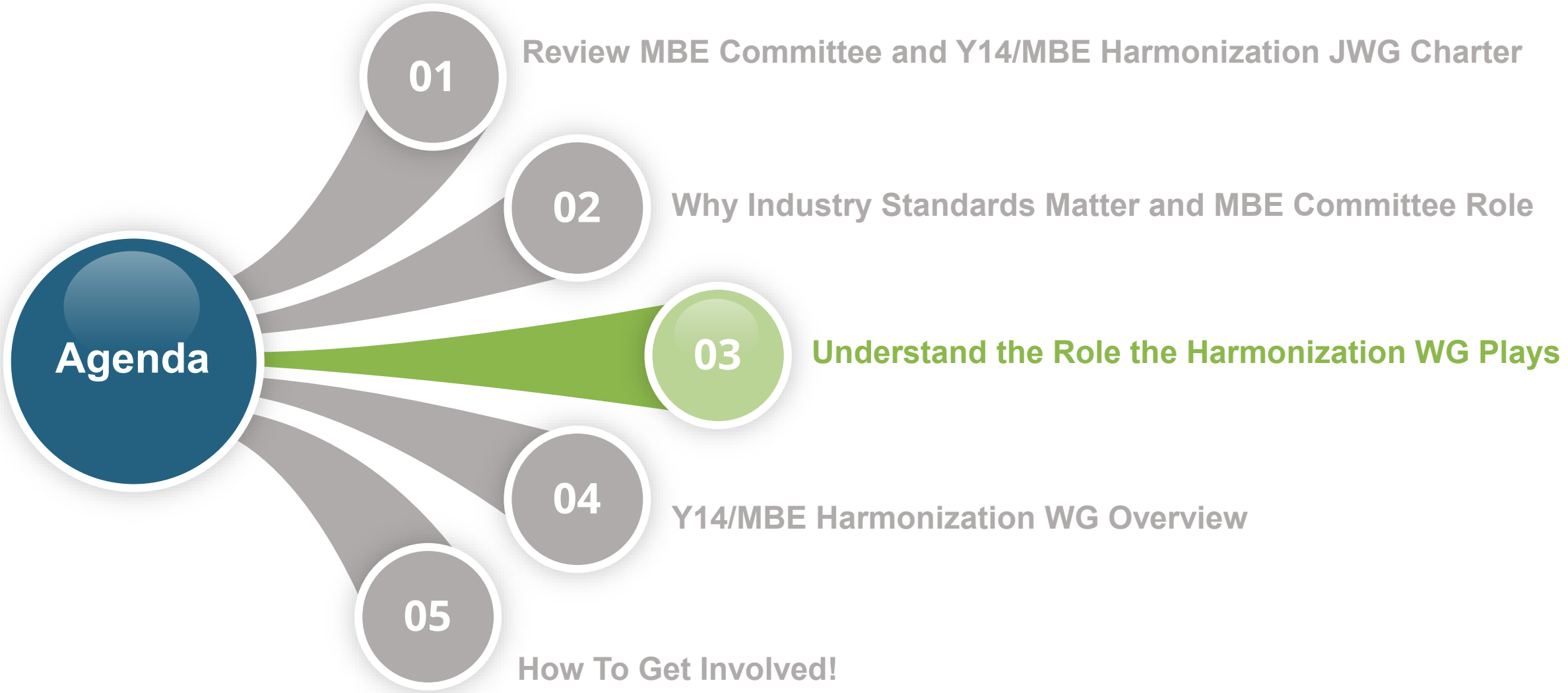
CAD System	CAM Tools	Inspection Tools
SIEMENS NX	SOLIDWORKS	ZEISS
CATIA	NXCAM	HEXAGON
SOLIDWORKS	Mastercam	RENISHAW
creo		PolyWorks Inspector

Standardized Model-Based Dataset



Provide standardization, governance, and rules to perform standard lifecycle activates:

- Providing industry guidance for authoring interoperable Technical Data Packages
- Standardizing the information exchange with consumption software, systems, and tools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Y14/MBE Harmonization WG Role

Charter:

Collect MBD/MBE concerns and ideas in relation to the current Y14 standards and where said standards need to be adapted to meet the emerging needs of Model Based Enterprise activities. Ensure MBE and Y14 harmonization, supporting the creation and the interoperability of MBD. Present collected concerns in recommendation format to existing standards for incorporation.

Industry Standards

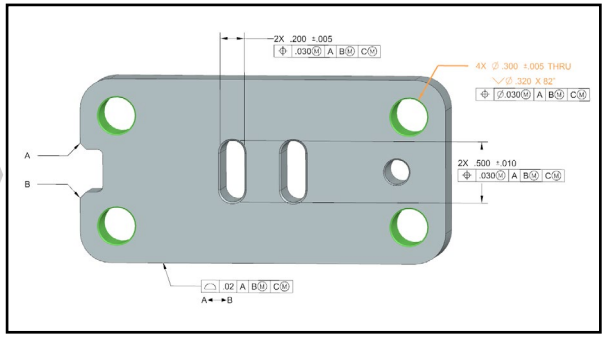
ASME Y14.5
Geometric Dimensioning and Tolerancing

ASME Y14.41
Digital Product Definition Data Practices

ASME Y14.47
Model Organization Practices

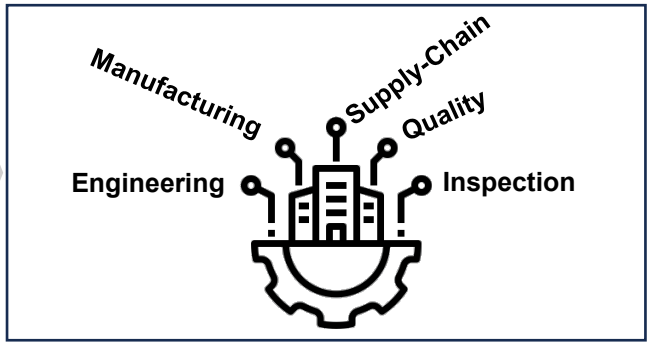
(Example Subset of Standards)

Model-Based Definition (MBD)



Human and Machine-Readable

Model-Based Enterprise (MBE)



Human and Machine/Software-Consumption

Leverage Industry Standards → **Standard Compliant Product Definition** → **Enterprise Reuse - Single Interpretation**

Y14/MBE Harmonization WG Role

Industry Standards

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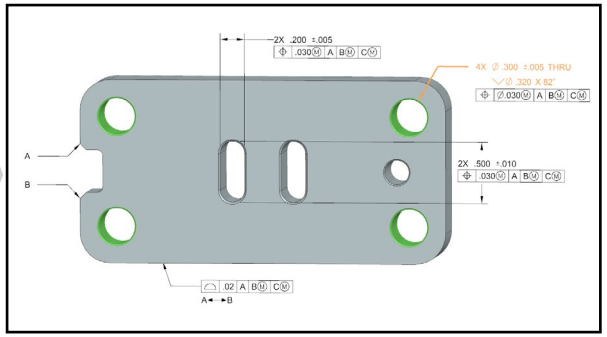

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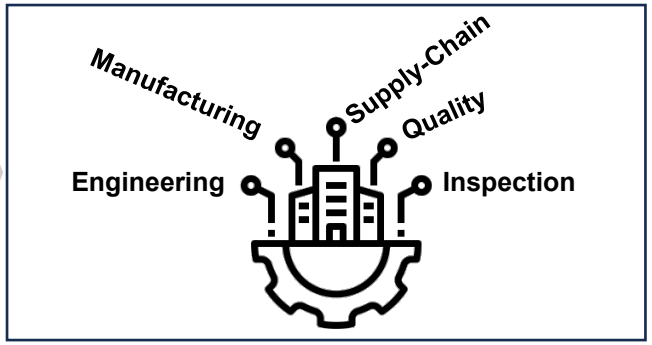

Human and Machine/Software-Consumption

Leverage Industry Standards → **Standard Compliant Product Definition** → **Enterprise Reuse - Single Interpretation**

Y14 Standard Committees

Y14/MBE Harmonization Working Group

Recommendations

MBE Standard Committee

Y14/MBE Harmonization WG Overview

MBD & MBE Adoption Gaps:

- 50+ Model-Based Gaps Have Been Identified By Group Members

Theme	Top Ranked Gaps
Product Definition	Pattern Syntax Authoring in MBD (i.e., Indicated, Individually, Between Symbol, From-To Symbol, Multiple Leader Lines)
	Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)
	Geometric Tolerances That Require Supplemental Geometry for Interpretation (i.e., Profile of a line, Straightness with direction)
	Improved Definition and Interoperability of a Feature of Size w/ and w/o Draft
	Improved definition of feature or “Individual Feature”
	Torque Validation (sequence if required) and Standard Torque Spec and Symbols
	Block tolerances in MBD – Title block tolerancing
	Tabular Tolerances
	Simplified representation of geometry (300 hole pattern, only modeling a portion)

Y14/MBE Harmonization WG Overview

MBD & MBE Adoption Gaps:

- 50+ Model-Based Gaps Have Been Identified By Group Members

Theme	Top Ranked Gaps
Manufacturing / Supply-Chain	Processing engineering changes, How to better understand changes in MBD?
	Commenting and Markups in 3D MBD
Quality	Assigning Characteristics ID's (and augmentations) and traceability through enterprise
	MBD authoring that supports a Bill of Characteristics (BOC)
Inspection	Associating inspection results to model features
	Downstream users want access to inspection data
	Visual Inspection Symbology - For non-critical features
	Flexible part inspection/requirements in MBD. Restrained/as-installed inspection in MBD.
Customer Logistics	Manuals are not digitally connected to product definition
	Documentation of hazardous materials within digital datasets

Y14/MBE Harmonization WG Overview

MBD & MBE Adoption Gaps:

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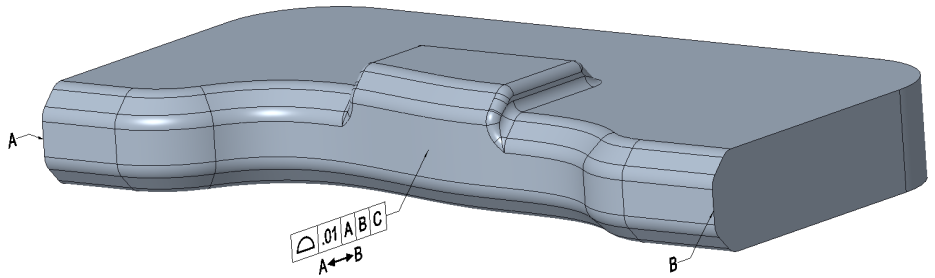
Pattern Syntax In MBD - Between Symbol

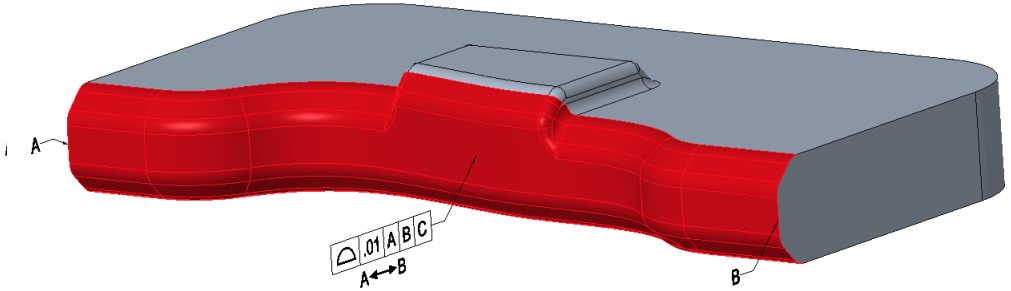
User Story:

As an **MBD Author, and MBD Consumer,**
I want clear definition of features controlled by a feature control frame across an associated group of surfaces with common semantic requirements that clearly delineates the start and end limits for machine-readable application **so that** the MBD-authored design intent is clear and that the human and machine interpretation match and is non-ambiguous.

MBD Graphical Representation

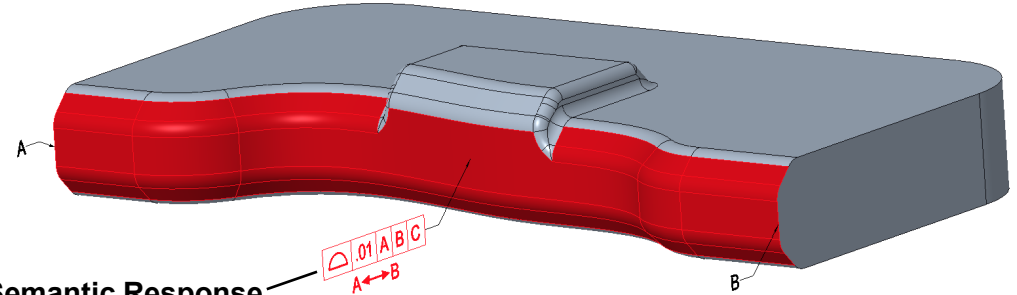


Human Interpretation



Machine/Software Interpretation

-Semantic Association



Semantic Response
(Associated Group)

Y14/MBE Harmonization WG Overview

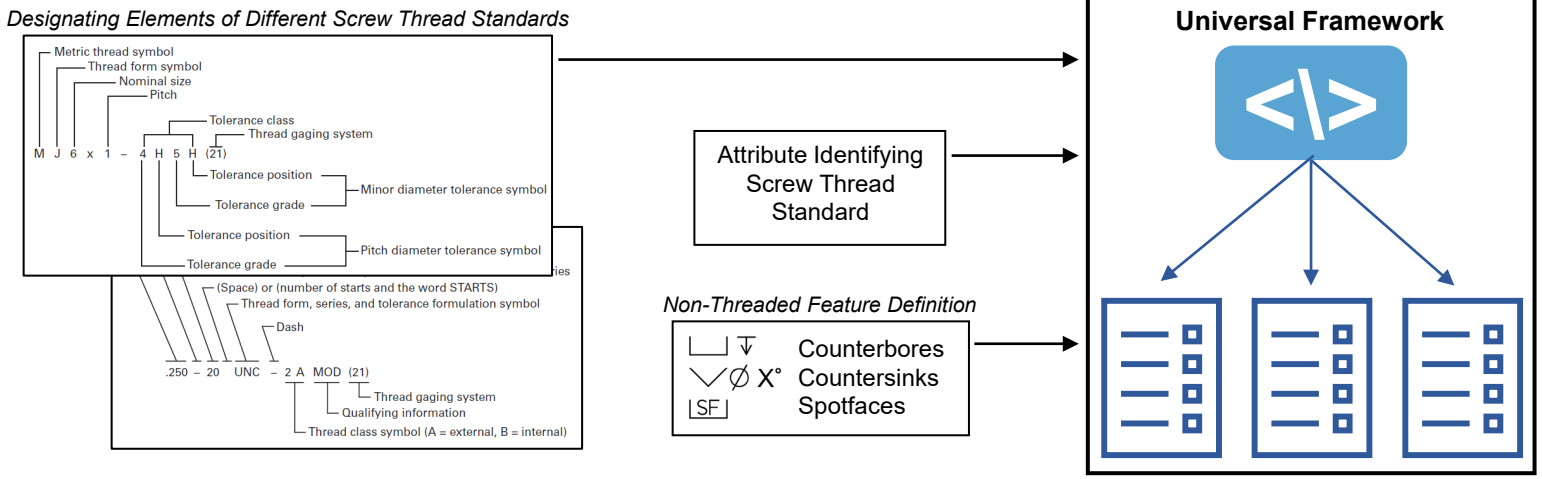
MBD & MBE Adoption Gaps:

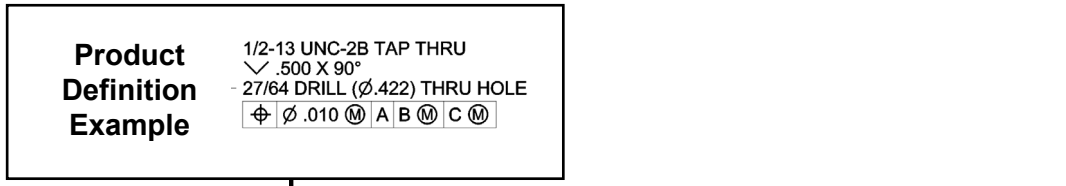
- 50+ Model-Based Gaps Have Been Identified By Group Members

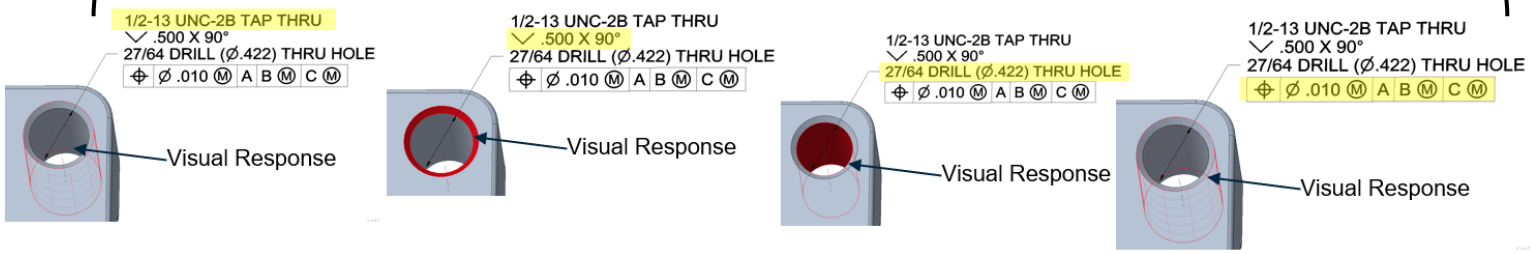
Theme	Top Ranked Gaps
Product Definition	Pattern Syntax Authoring in MBD (i.e., Indicated, Individually, Between Symbol, From-To Symbol, Multiple Leader Lines)
	Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)
	Geometric Tolerances That Require Supplemental Geometry for Interpretation (i.e., Profile of a line, Straightness with direction)
	Improved Definition and Interoperability of a Feature of Size w/ and w/o Draft
	Improved definition of feature or “Individual Feature”
	Torque Validation (sequence if required) and Standard Torque Spec and Symbols
	Block tolerances in MBD – Title block tolerancing
	Tabular Tolerances
	Simplified representation of geometry (300 hole pattern, only modeling a portion)

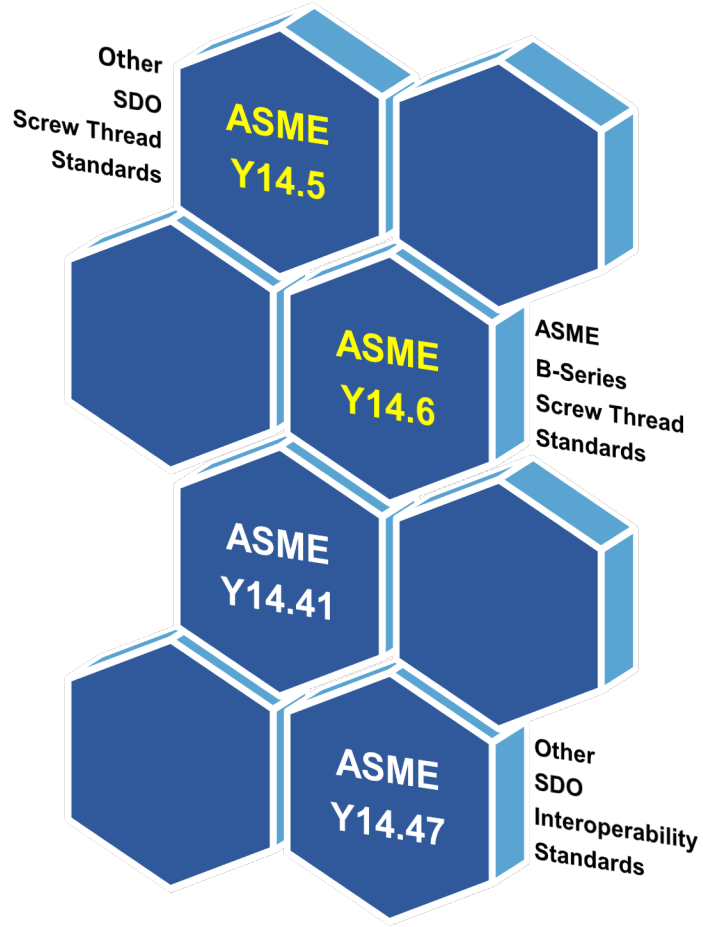
GAP: Multi-Featured Hole Definition

User Story: As an ***MBD Author***,
I want ***a framework to define complex (multi-featured) holes in my product definition data***,
so that ***I can produce an extensible machine and human readable requirement***.





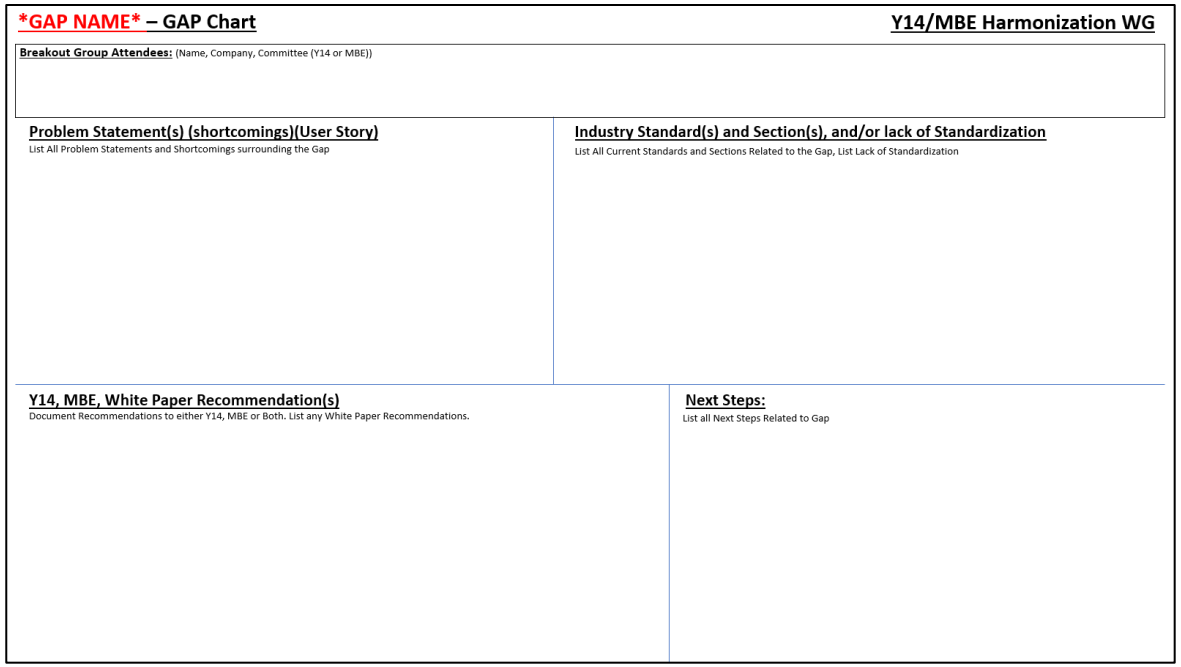




In-Flight Model-Based Gaps

Active Gaps	Gap Owner
Pattern Syntax Authoring in MBD (Between Symbol, From-To Symbol)	Evan Kessick
Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)	Dan Feighery
Improved Definition and Interoperability of a Feature of Size w/ and w/o Draft	Andrew Pierce
Commenting and Markups in 3D MBD	Mark Morreale

Gap Chart Framework


GAP NAME – GAP Chart

Y14/MBE Harmonization WG

Breakout Group Attendees: (Name, Company, Committee (Y14 or MBE))

Problem Statement(s) (shortcomings)(User Story)
List All Problem Statements and Shortcomings surrounding the Gap

Industry Standard(s) and Section(s), and/or lack of Standardization
List All Current Standards and Sections Related to the Gap, List Lack of Standardization

Y14, MBE, White Paper Recommendation(s)
Document Recommendations to either Y14, MBE or Both. List any White Paper Recommendations.

Next Steps:
List all Next Steps Related to Gap

GAP Chart Framework

***GAP NAME* – GAP Chart** **Y14/MBE Harmonization WG**

Breakout Group Attendees: (Name, Company, Committee (Y14 or MBE))

Problem Statement(s) (shortcomings)(User Story)
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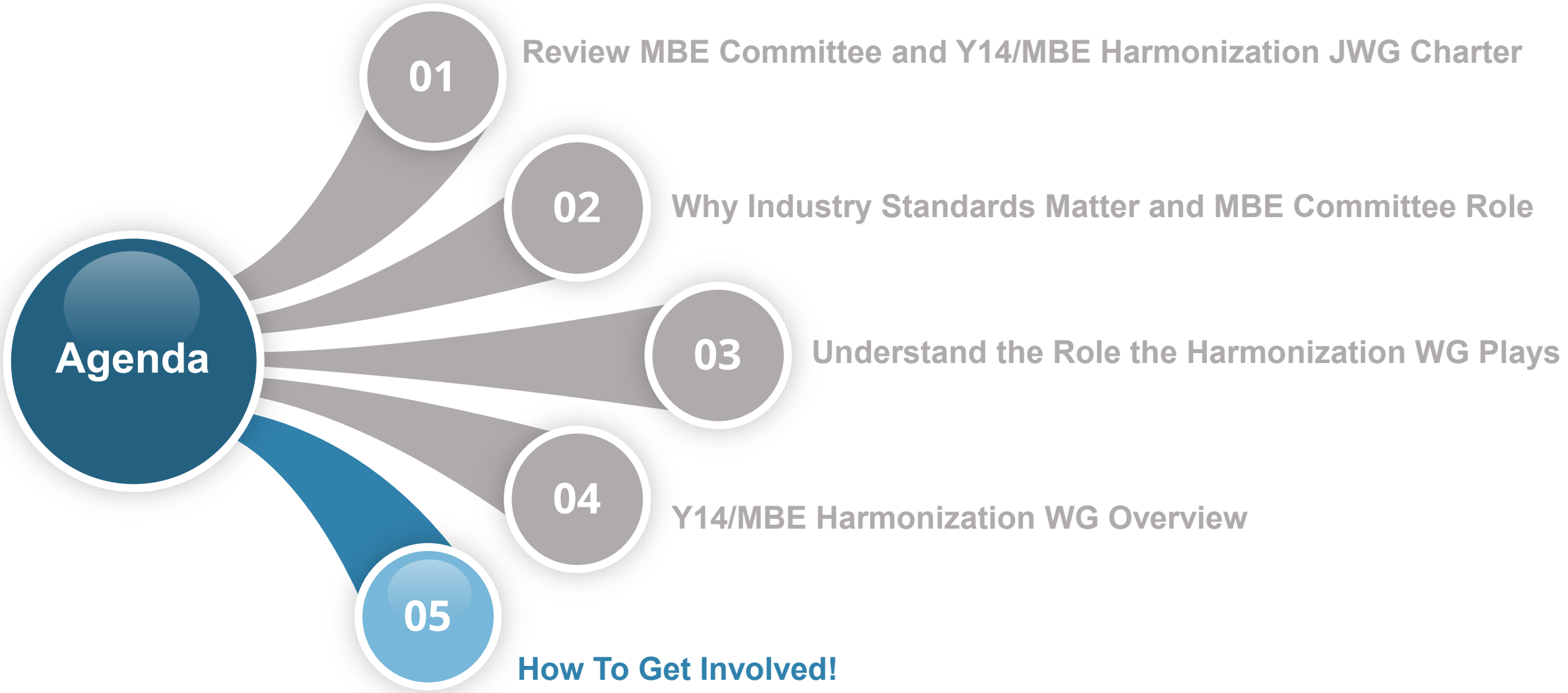
List All Current Standards and Sections Related to the Gap, List Lack of Standardization

Y14, MBE, White Paper Recommendation(s)
Document Recommendations to either Y14, MBE or Both. List any White Paper Recommendations.

Next Steps:
List all Next Steps Related to Gap

3DCIC Y14/MBE Harmonization Joint WG

Model-Based Therapy (MBT) - Sponsored by ASME


Agenda
01
Review MBE Committee and Y14/MBE Harmonization JWG Charter
02
Why Industry Standards Matter and MBE Committee Role
03
Understand the Role the Harmonization WG Plays
04
Y14/MBE Harmonization WG Overview
05
How To Get Involved!

How To Get Involved!

Who Should Get Involved?

****All Experience Levels Wanted!****

- All Interested organization and Individuals
- Organizations that are implementing MBD/MBE
- Organization that are interested or investigating MBD/MBE
- Those who create, reuse, and consume product definition

How To Get Involved?

****Please Contact:****

- Evan Kessick: ekessick@belcan.com
- Fred Constantino: constantinof@asme.org

We Need You!

Upcoming Meetings:

Y14/MBE Harmonization Joint Working Group

- **In-Person Meetings:**
  - ASME Spring Committee Meetings: Denver, CO
    - Monday April 29th @9am-5pm MST
- **Monthly Virtual Meetings:**
  - Upcoming Virtual Meeting:
    - April 24th @1-2:30pm EST
    - May 29th @1-2:30pm EST

ASME MBE Committees:

- **In-Person Meetings:**
  - ASME Spring Committee Meetings: Denver, CO
    - Thursday April 30th @1am-4pm MST
- **Monthly Virtual Meetings:**
  - Upcoming Virtual Meeting:
    - Bi-Weekly Meeting: TBD

Thank You For Participating!