

MBE Committee MBE & Y14 Harmonization Committee



Presenter Bio



Evan Kessick

Director of Model-Based Initiatives

Contact Info:

Phone: 269-400-4128

Email: evan.kessick@elysiuminc.com

- 18+ years working in engineering and design, 8+ GD&T Training/Mentoring
- Led and advised on MBD and MBE Implementations for 7 years
- Industry Standards Involvement:
 - ASME MBE Committee Chair
 - ASME MBE & Y14 Harmonization Committee Co-Chair
 - ASME Y14.41 Member
 - ASME Y14.47 Support Group Member
 - ASME Y14.5-2009 GDTP Senior Certified
 - DMSC Board of Directors

Presenter Bio



Blake Gorowsky

Senior Technical Fellow: MB-Design

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Blake.gorowsky@prattwhitney.com

- 18+ years working in manufacturing, quality & design engineering across automotive, medical and aerospace industries
- MBD, MBM & MBQ transformation efforts for 15+ years
- Industry Standards Involvement:
 - DMSC Member – QIF & MBC Standards
 - ASME Y14.46 - Member
 - ASME Y14.47 SC – Member
 - MBE Main – Vice Chair
 - MBE/Y14 JWG – Member
 - MBE 2 – Member
 - MBE 3 – Interim Chair

Agenda

(30 Minutes Total)

- **Introductions** [1 mins]
- **ASME Model-based Standards Overview** [Evan Kessick] [5 mins]
- **MBE Committee Overview** [Evan Kessick] [5 mins]
 - MBE1 Overview [Blake Gorowsky] [2 mins]
 - MBE2 Overview [Blake Gorowsky] [3 mins]
 - MBE3 Overview [Blake Gorowsky] [5 mins]
- **MBE & Y14 Harmonization Committee Overview** [Evan Kessick][10 mins]
 - Joint Working Group Overviews
- **Wrap up...GETTING INVOLVED**

!!Nerd Alert Warning!!

» Technical Conversation Incoming....



Important Notices:

- Model-Based Definition (MBD) and Model-Based Enterprise (MBE) workflows and digital tools are *mature, stable, and production ready*
- This Presentation Represents Unique Fringe Cases to:
 - Maximize The Interoperability to MBD and Product Data
 - Push Industry Standards Forward

Codes & Standards: Why Do We Need Them?

Promote **innovation**

Safety, uniformity, consistency, reliability, productivity, and efficiency

Help **communication** between producers and users

Product design and manufacturer

Considered a “**common language**”

Allows groups to communicate even when they are of different nationality

Promote **interchangeability**

Dimensioning is consistent

Promote **interoperability** and “**enterprise data**”

common information exchange for lifecycle activities

Allow for more **flexibility** for designers

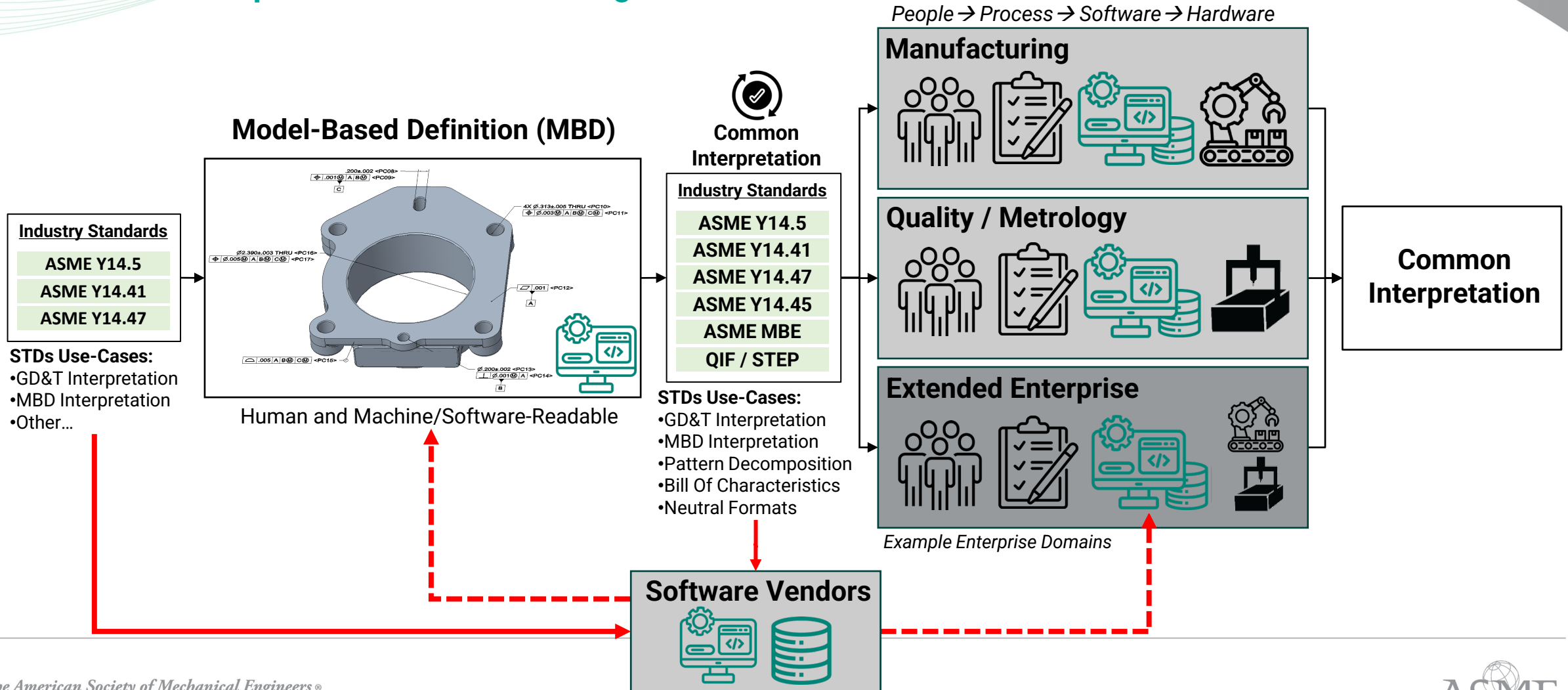
Design creativity is not infringed by use of standards

Satisfy **safety**, **performance**, and economic goals

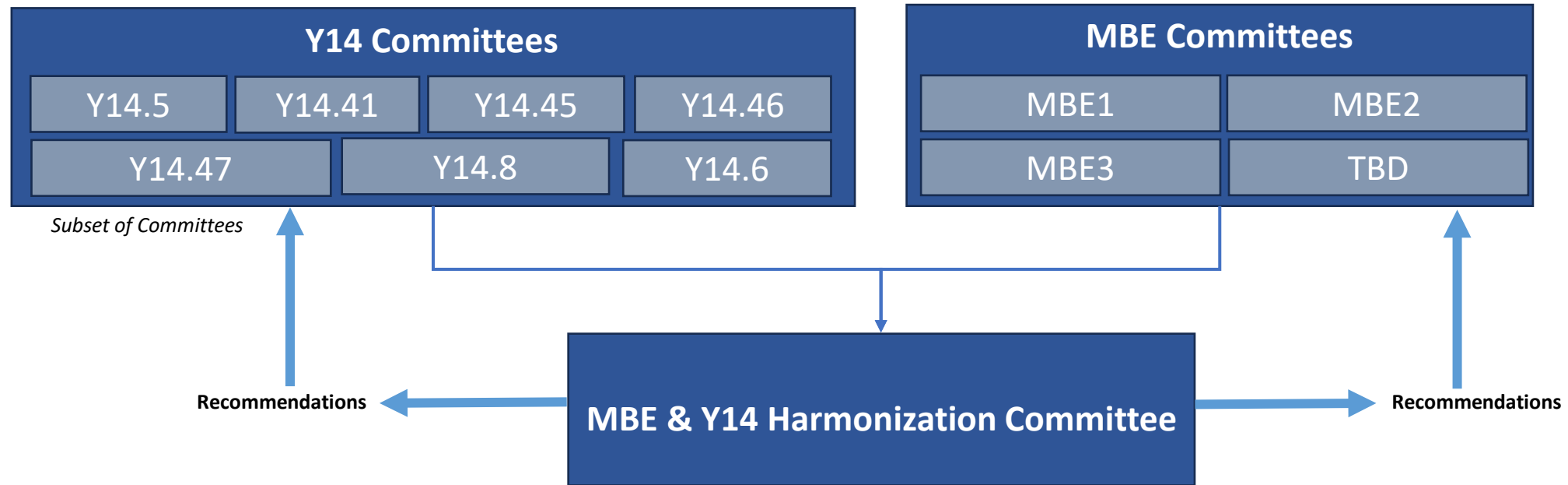
Provides for a “level playing field”

Importance of Industry Standards – Enterprise Focus

Industry Standards Drive
Common Interpretation for Data Exchange



ASME Model-Based Committees Overview



Y14.5 – Dimensioning and Tolerancing
Y14.41 – Digital Product Definition and Data Practices
Y14.45 – Measurement Data Reporting
Y14.46 – Product Definition for Additive Manufacturing

Y14.47 – Model Organization Practices
Y14.8 – Castings, Forgings, and Molded Parts
Y14.6 – Screw Thread Representation

MBE.1 – MBE Framework
MBE.2 – MBE Maturity Index
MBE.3 – Features & Characteristics of Enterprise Product Data

Model-Based Standards Growth

Contributors to Growth:

Spread Awareness:

Presenting at major industry conferences and tradeshow

Focused Alignment:

Aligning activity and Focus to current industry problems and needs

Inclusive Culture:

All model-based experience levels are encouraged to get Involved

Strength in Numbers:

150 Individuals on Mailing Distribution List
High meeting turnout and participation

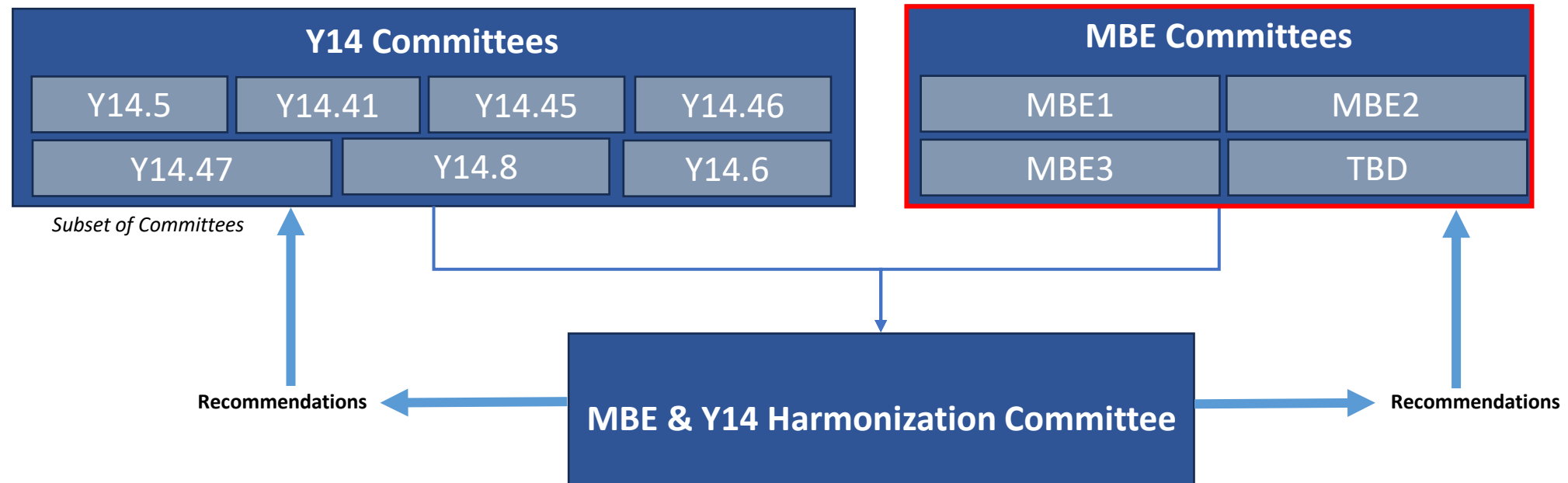
Committee/JWG Infrastructure:

Have dedicated positions where people can drive, lead, and own

MBE Committee (2019)

MBE and Y14 Harmonization Committee (2022)

ASME Model-Based Committees Overview



ASME MBE Standards Committee

Charter:

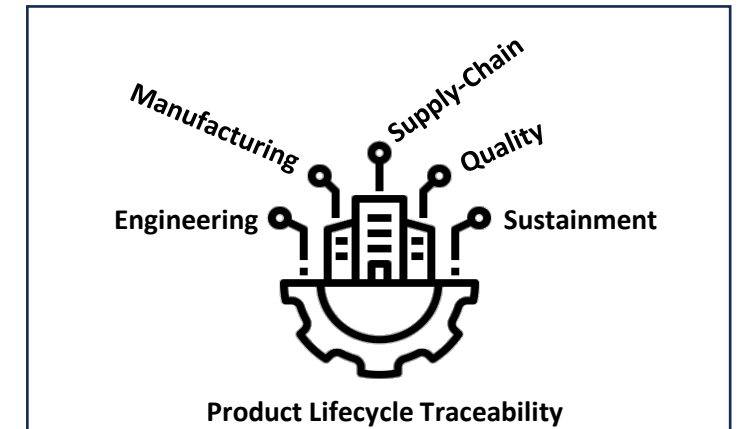
Develop standards or related products that provide rules, guidance, and examples for the creation, use and reuse of model-based datasets, data models, and related topics within a Model-Based Enterprise.

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

Focus Areas:

- Identify model-based datasets across the enterprise
- Identify the common information exchange to perform product lifecycle standards work
- Identify interoperability challenges of model-based datasets and technical data
- Manage gaps and concerns between existing standards affecting MBE/MBD adoption
- Manage model-based datasets, linkages, and dataflow between enterprise domains
- Develop and communicate MBE Capabilities and Maturity Levels
- **Establish Industry Standardization, Governance, and Rules for common Information Exchange**

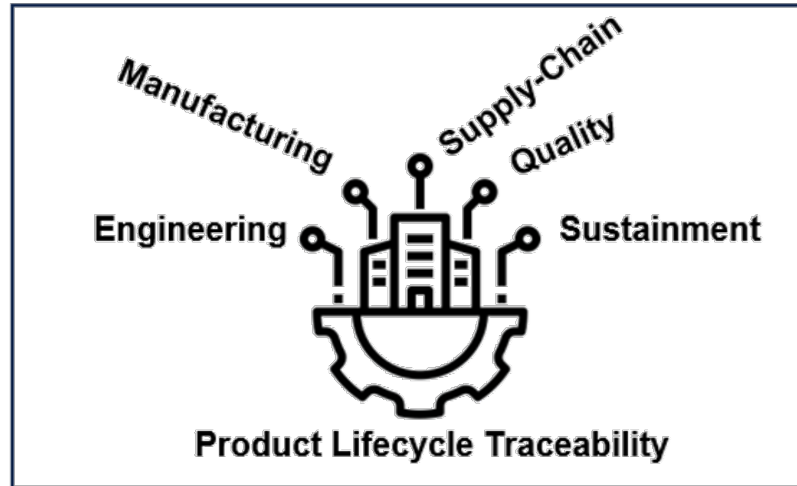


Meetings:

Virtual: 2nd Thursday of every other month
Time: 12:00 – 13:00 Eastern
In-Person: May 4th-8th Albuquerque, NM

ASME MBE Standards Committee

Model-Based Enterprise (MBE)



MBE

ASME MBE - Main

MBE1

MBE Framework

MBE2

MBE Maturity Index

MBE3

Features & Characteristics

ASME MBE Standards Committee

2026 Goals and Deliverables

MBE1 – MBE Framework

» MBE1 Deliverables:

- Launch Sub-Committee
 - Staff Leadership and Members
- Charter Review and update as needed
- Mockup/Example of MBE Framework
- Harmonizing MBE1 with MBE2 & MBE3
- MBE Committee Review and Improved Understanding

MBE2 – MBE Maturity Index

» MBE2 Deliverables:

- Develop MBE2 Index Final Draft
 - Final Index Draft as ASME Standard
- Release MBE Lexicon
 - Draft Final List of MBE Terms
 - Standalone Document (i.e., MBE0)
- MBE Committee Review and Improved Understanding

MBE3 – Features & Characteristics

» MBE3 Deliverables:

- Launch Sub-Committee
 - Staff Leadership and Members
- Define 3-year Roadmap
 - Key goals and deliverables
- Draft White Paper:
 - How MBE3 fits with other industry standards (i.e., MBE1, MBE2, DMSC, PDES)
- Define Industry Engagement

New MBE Focus Areas

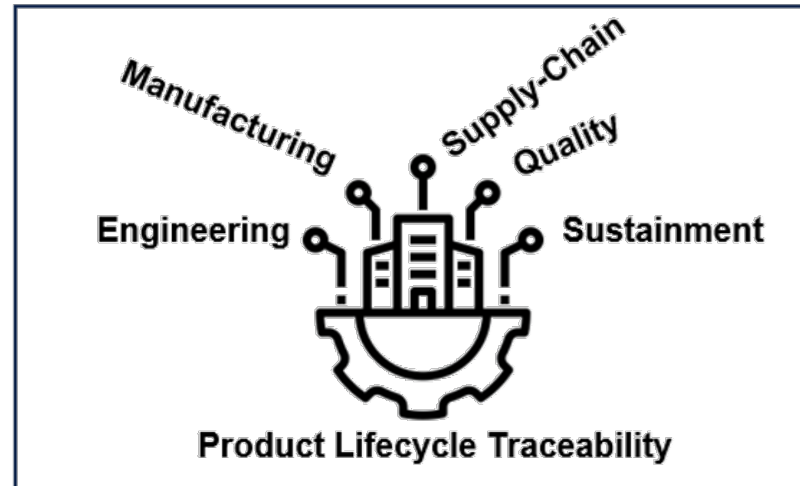
- Alignment with DoD and DOE Digital Standards Efforts
- Product Data Quality Standards
- Digital Certification

Harmonization Committee Flowdown

- Product Data Interoperability
 - What Standards Support Product Data Information Exchange
- Investigate Requirements:
 - Product Data Quality
 - Digital Certification

ASME MBE Standards Committee

Model-Based Enterprise (MBE)



MBE

ASME MBE - Main

MBE1

MBE Framework

MBE2

MBE Maturity Index

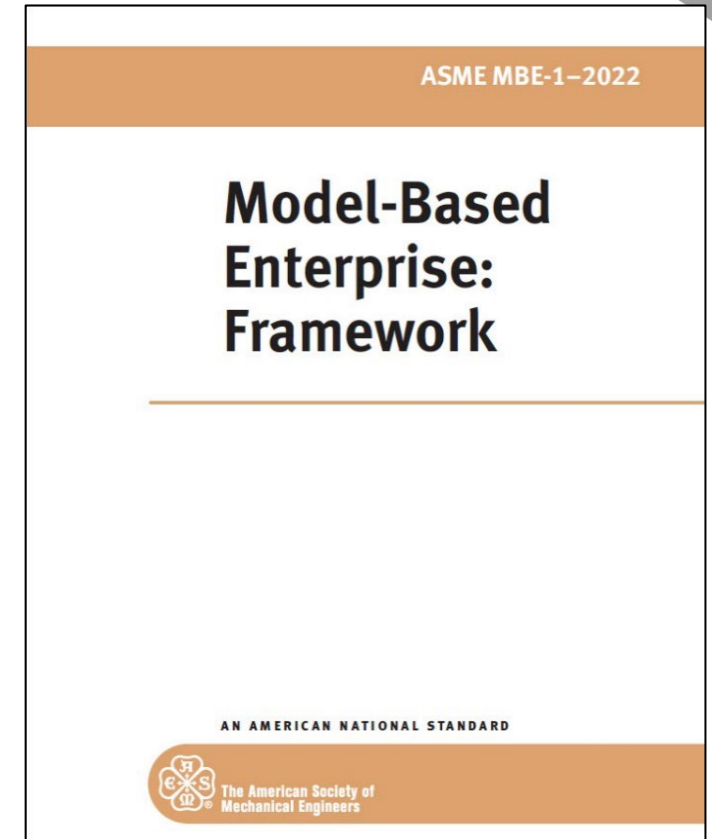
MBE3

Features & Characteristics

MBE1 – Model-Based Enterprise: Framework

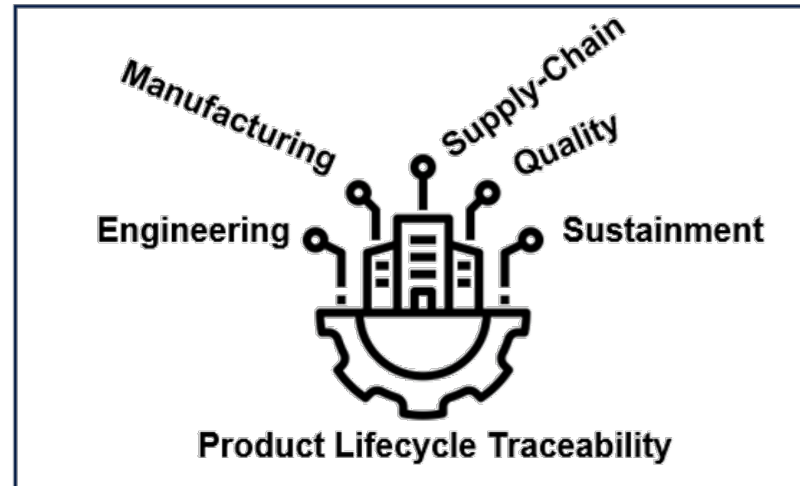
- ***Model-Based Enterprise: Framework***

- Developed by the ASME MBE Standards Committee, consisting of 10+ subject matter experts (SME) in different categories of industry (e.g., manufacturing, government, academic, etc.).
- Provides a high-level structural definition for the concept of an MBE
- Provides an architecture framework for the representation of an MBE
- Intended for use by MBE standard developers, MBE solution providers, and practicing MBE system architects



ASME MBE Standards Committee

Model-Based Enterprise (MBE)



MBE

ASME MBE - Main

MBE1

MBE Framework

MBE2

MBE Maturity Index

MBE3

Features & Characteristics

MBE2 – MBE Maturity Index

Charter: Approved 12/12/2024

The purpose of this charter is to establish a MBE Maturity Index Subcommittee, under the jurisdiction of the ASME MBE Committee, with the responsibility to develop and maintain deliverables which help guide organizations toward their progression as a model-based enterprise (MBE).

The intent of this subcommittee is to provide industry with an MBE rubric tool in the form of an MBE Maturity Index. **The proposed MBE Index will establish varying maturity levels of model-based capabilities across common product lifecycle activities** and will standardize a measurable scoring guide for which an organization can use toward assessing itself as, and facilitating itself along transitional levels towards, an extended Model-Based Enterprise (MBE).

Leadership: **Chair:** Curtis Brown
Co Vice-Chairs: Francine Perry, Ryan Gelotte
Technical Secretary: Chris Kulinka

Members:
Total Members: 20
-Current Members: 15

Meetings:
Bi-Weekly - Closed

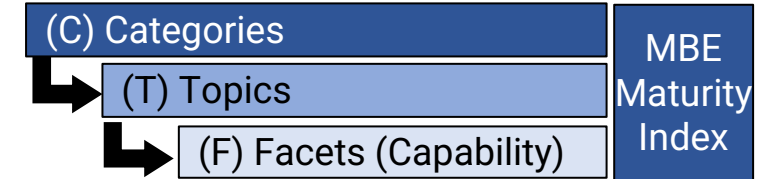
Focus Areas:

- Includes categories, topics, and facets for communicating MBE maturity.
- Conveys a measurable rubric towards becoming a MBE
- Allows an organization to assess and rate their current level of capability, readiness, and adoption.
- Permits an organization to document a target state maturity
- Inform software, system, and tool providers to assess and enhance capabilities

NSE – MBE Maturity Index

#NAME?										AS-IS Level Reset				TO-BE Level 4
Name	Maturity Level	Transition: As the maturity increases, the organization's ...	Drawing-Centric	Drawing Model-Centric	Validated Model-Centric	Formalized Model-Based Definition	Trusted Model-Based Definition	Integrated Model-Based Enterprise	Extended Model-Based Enterprise	Capability: Tools are Available?	Readiness: Processes are Ready?	Adoption: People are Using?	Target Adoption	
	Level		L0	L1	L2	L3	L4	L5	L6	N/A	N/A	N/A	N/A	
#	Categories (e.g., C1)													
C1: Design Activities	Activities involved in designing a product.	Product definition becomes a trusted model-based definition dataset.	2D Drawings used for all activities	2D Drawings derived from models	2D Drawings and other derivatives from validated 3D model	Semantic PMI included within 3D model	Certified, Authorized MBD	MBD dataset made useable for all lifecycle activities within enterprise	Product definition system model made useable for all lifecycle activities	N/A	N/A	N/A	N/A	
T1: Product Authority														
F1: Authorized Definition	Identifies the authorized product definition (i.e. legal definition).	MBD data collection becomes the product authority.	Paper 2D drawing with support documents	Electronic 2D drawing with support documents	2D drawing from 3D model with support documents and support model	3D drawing (e.g. 3D Interactive Viewable) from MBD model with support documents and support model	MBD model with support drawing and support documents	MBD dataset containing all authorized product definition artifacts	Product definition system model communicating all authorized product definition artifacts along with their relationships	N/A	N/A	N/A	N/A	
T2: Product Requirements Association														
F1: Form	States the representation of the product requirements as data.	Product requirements become more discrete and digital.	Non-electronic document	Electronic document	Same	Uniquely identifiable digital objects/records	Same	Same	Same	N/A	N/A	N/A	N/A	
F2: Associativity	States how well product requirements are linked to product definition.	Product requirements become more discrete and linked to distinct features of the model.	Disconnected	Manually linked to characteristic on 2D drawing	Replicated to part object in PDM system	Linked to part object in PDM system	Linked to product characteristics in 3D model	Bi-directional link	Automated bi-directional link	N/A	N/A	N/A	N/A	
T3: Product Definition Description														
F1: Shape Definition	States how to define the base shape definition.	Shape definition becomes more applicable, precise and unambiguous.	2D drawing	3D model as solid geometry	Same via feature-based design and parametric capabilities	Same with mixed modes of modeling (e.g., parametric, direct techniques)	Same with multiple feature-based disciplines (e.g., design, manufacturing, metrology, deburring)	Same with precise &	Same with generative.	N/A	N/A	N/A	N/A	
F2: Non-Shape Information	States how to define visible non-shape product and manufacturing information (PMI) (e.g., annotations and notes)	PMI becomes more semantic, embedded in the model, and linked to model elements.	Textual annotations and notes on 2D drawing	Same with textual notes driven from 3D model	Annotations and notes in 3D model	Semantic annotations and notes in MBD model	Same with common notes across inter-organization							
F3: Metadata	States where to record a product's metadata.	Metadata becomes digital and more complete, standardized, and managed.	As text on drawing	Parameters within 3D Model	Same	3D Model and PDM	Automatic syncing between Model and PDM							
F4: Presentation Views	Identifies the types of	Views become more	2D drawing views,	Standard 2D drawing	Same	3D model presented in	3D model presented in							

Lifecycle Activities



C# is a broad category of activities (e.g., C1: Design Activities)
T# is a topic (e.g., T1: Product Authority) within a category
F# is a facet (e.g., F1: Authoritative Source) of a topic

Maturity Levels L0-L6

Level	Level Name	Level Themes
L0	Drawing-Centric	2D Drawings Only; Disconnected
L1	Drawing Model-Centric	2D Drawings & STEP Derived from 3D Models; Drawings Managed, Disconnected from Models
L2	Validated Model-Centric	2D Drawings & Equivalent Derivatives from Validated 3D Models; Drawings Managed, Disconnected from Models
L3	Formalized Model-Based Definition	3D Models with Semantic PMI Added; Producing 3D Interactive Viewables, Managed as Part-Centric
L4	Trusted Model-Based Definition	Digital Model-Based Definition (MBD) , Certified & Authorized; Managed & Sourced as Part-Centric
L5	Integrated Model-Based Enterprise	Enterprise Integrated from Trusted Digital Product Definition Dataset; Process Data Managed with Part-Centric
L6	Extended Model-Based Enterprise	Enterprise Extended with Optimized Capabilities and Extended Partners

NSE MBE Maturity Index References:

- White Paper: [HERE](#)
- MBE Maturity Index: [HERE](#)

NSC – National Security Campus / NSE – National Security Enterprise

Source: ASME MBE Committee Overview Deck

NSE – MBE Maturity Index



VISION

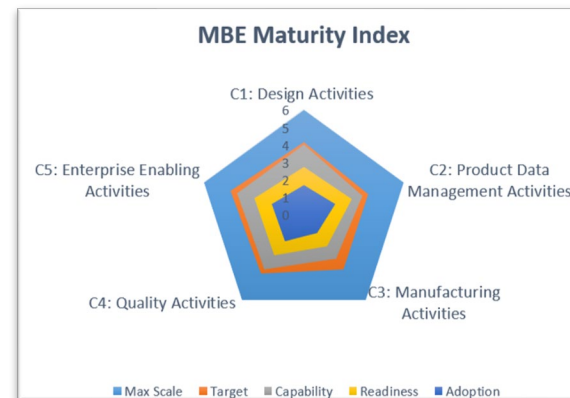
Enables your organization to get started

MBE Categories / Topic / Level		Description: How the organization transitions its maturity across the	Building Center (B1)	Model Center (B2)	Validated Model Center (B3)	Model Based Definition (B4)	Trusted Model Based Definition (B5)	Integrated Model Based Enterprise (B6)	Extended Model Based Enterprise (B7)
Assessment Identifier (AID):		Organization under assessment (OUA):	Description of Environment:						Assessor:
			Assessment conditions that establish and differentiate the organization under assessment:						(Individual or group)
Maturity Level Name			MBE Maturity Index - WIP Draft: 2019/2020						
Level #			Drawing-Centric	Model-Centric	Validated Model-Centric	Model Based Definition	Trusted Model Based Definition	Integrated Model Based Enterprise	Extended Model Based Enterprise
Categories (e.g., C1)		Topics (e.g., T1)							
1- Factors (e.g., F1)									
C1: Design Activities		Activities that relate to the design of a product or system, including the development of design data, design review, and design change management.	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design
C2: Product Data Management Activities		Activities that relate to the management of product data, including the development of product data, product data review, and product data change management.	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design
C3: Manufacturing Activities		Activities that relate to the manufacturing of a product or system, including the development of manufacturing data, manufacturing review, and manufacturing change management.	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design
C4: Quality Activities		Activities that relate to the quality of a product or system, including the development of quality data, quality review, and quality change management.	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design
C5: Enterprise Enabling Activities		Activities that relate to the enabling of an enterprise, including the development of enterprise data, enterprise review, and enterprise change management.	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design	2D Drawings used for all design

MATURITY INDEX

Provides focus for your organization to developing an MBE implementation plan

Helps your organization find an actionable path for success

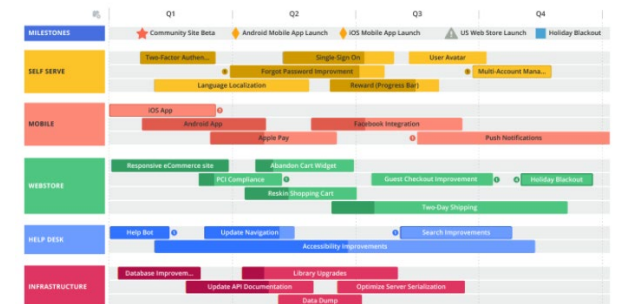


ASSESSMENT

Identifies MBE capability/readiness/adoption/target gaps within your organization

Allows organizations to tailor a MBE roadmap

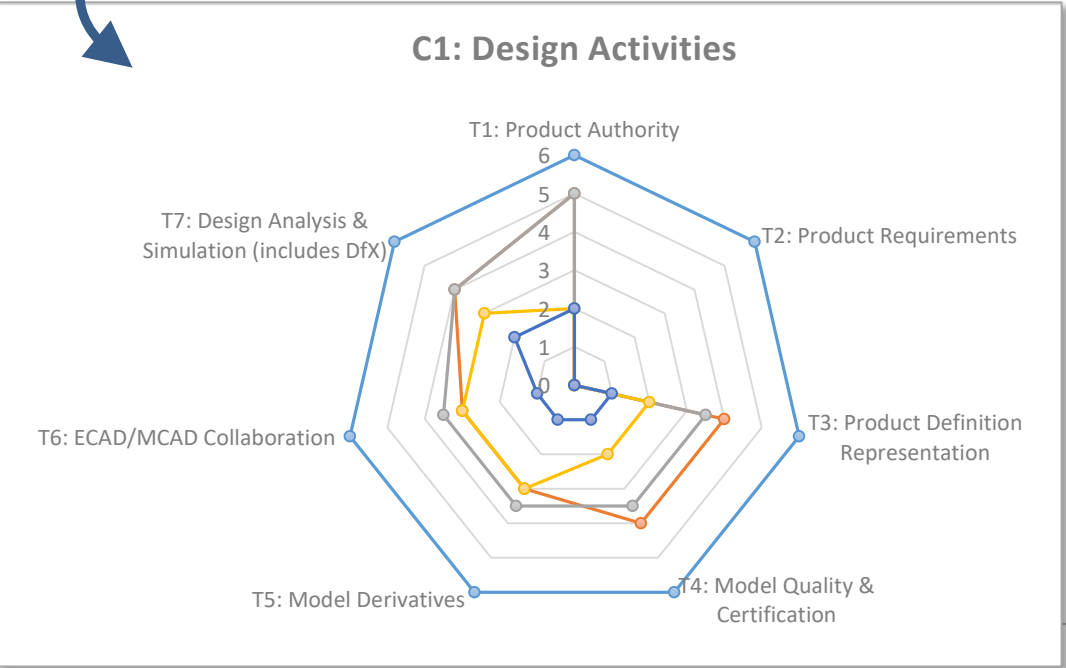
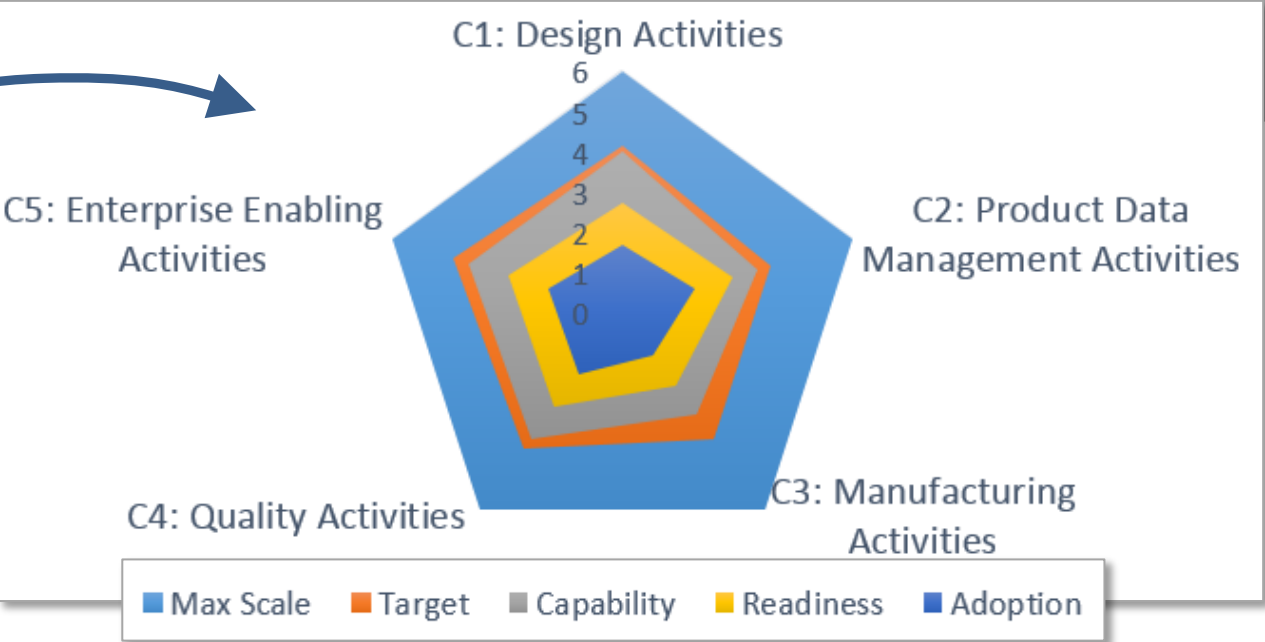
ROADMAP



NSE – MBE Maturity Index

Scores shown graphically as ‘RADAR’ charts.

- High-level showing all categories
- One for each category, showing topics

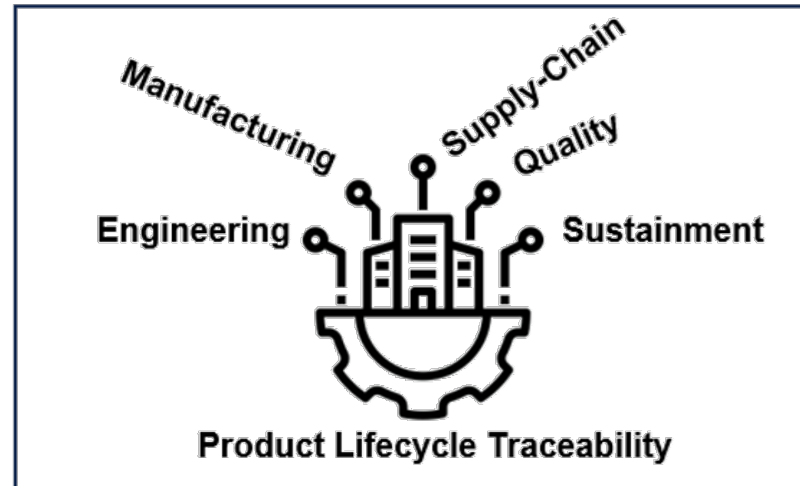


MBE Maturity Index Score Summary for Organization Under Assessment					Score Gaps			
MBE Category	Capability	Readiness	Adoption	Target	C-R	R-A	C-A	T-A
C1: Product Design	4.9	3.1	1.8	5.5	1.8	1.3	3.1	3.7
C2: Product Data Management	5.0	2.5	2.2	5.0	2.5	0.3	2.8	2.8
C3: Product Manufacturing	3.9	2.4	2.3	4.8	1.5	0.1	1.6	2.5
C4: Product Quality	5.1	2.2	2.2	5.5	2.9	0.0	2.9	3.3
C5: Enterprise Enabling	4.5	2.8	1.5	4.2	1.7	1.3	3.0	2.7

- Gaps identified with MBE Target/Capability/Readiness/Adoption
- Informs and provides focus for your organization’s MBE roadmap or action plan.
- Drives Action!

ASME MBE Standards Committee

Model-Based Enterprise (MBE)



MBE

ASME MBE - Main

MBE1

MBE Framework

MBE2

MBE Maturity Index

MBE3

Features & Characteristics

MBE3 – Features & Characteristics of Enterprise Product Data: Architecture

Charter: Approved 10/23/2025

The purpose of this charter is to establish a MBE3 Subcommittee under the authority of the ASME MBE Committee. **The intent of the MBE3 Subcommittee is to establish standards, methods, and guidance for the traceability of product data, features, and characteristics across the full product lifecycle within a Model-Based Enterprise (MBE).** This includes ensuring product data remains persistent, reusable, and interoperable through harmonized frameworks, ontologies, and metadata structures, enabling end-to-end traceability and feedback across enterprise systems of interest.

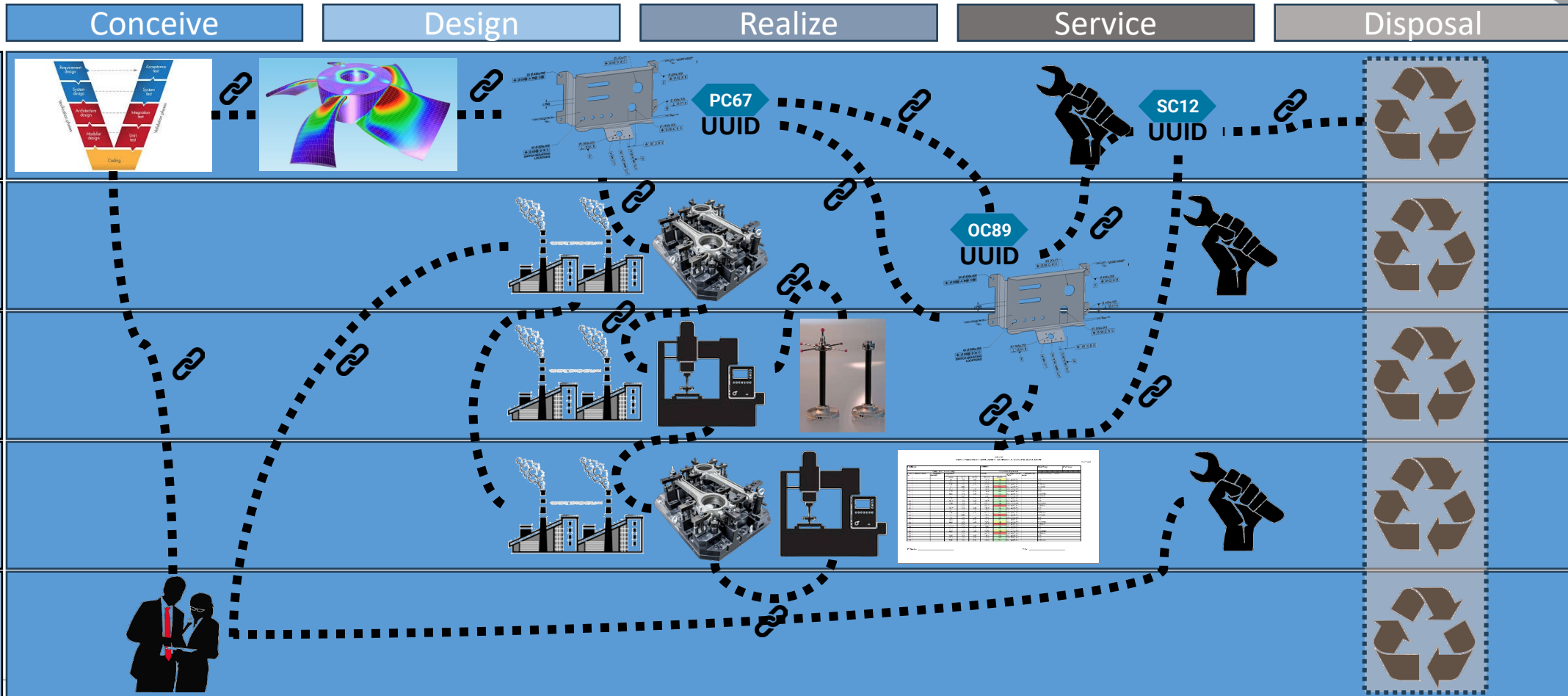
MBE3 shall harmonize with ASME MBE1 and MBE2, ASME Y14 standards, and other relevant industry standards (DMSC, PDES) to support consistent implementation and broad adoption.

Focus Areas:

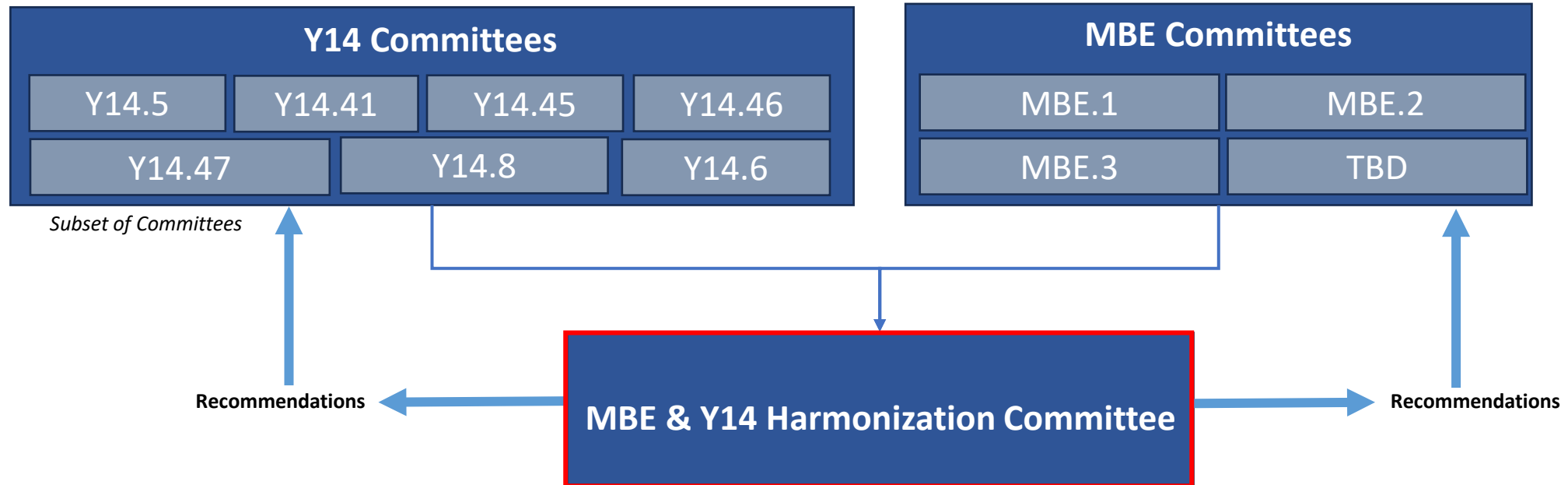
- Identify the creation, reuse, and linkage of features and characteristic requirements across enterprise domains
- Define feature types and their characteristics (e.g., CAD, Design, Operational, Quality, etc.)
- Define a common logical relationship framework for features and characteristics
- Define how and to what level UUID's should be authored within Product Data
- Develop a framework to provide software and tool providers with a data architecture to enhance capabilities
- Develop the ruleset for decomposition, extraction, use and reuse of product data, features and characteristics

MBE3 Within the Enterprise...

Model-Based Enterprise Umbrella



MBE & Y14 Harmonization Committee



MBE & Y14 Harmonization Committee

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)

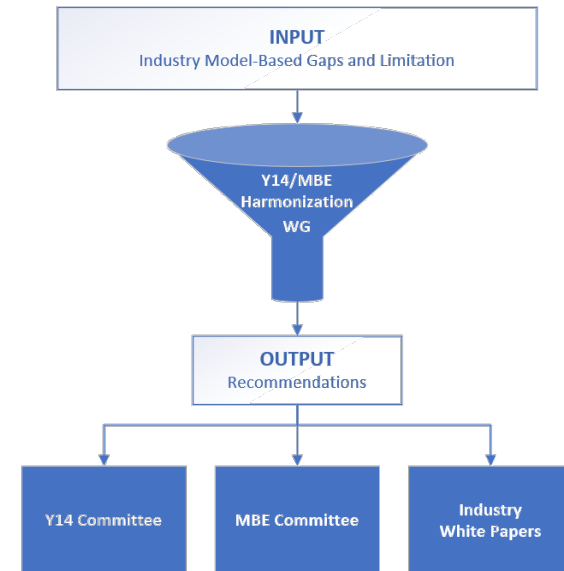
Leadership: Co-Chair Y14: Ashley Schmidt
Co-Chair MBE: Evan Kessick
Technical Secretary: Dan Feighery

Members:
Y14: 10 Members
MBE: 10 Members

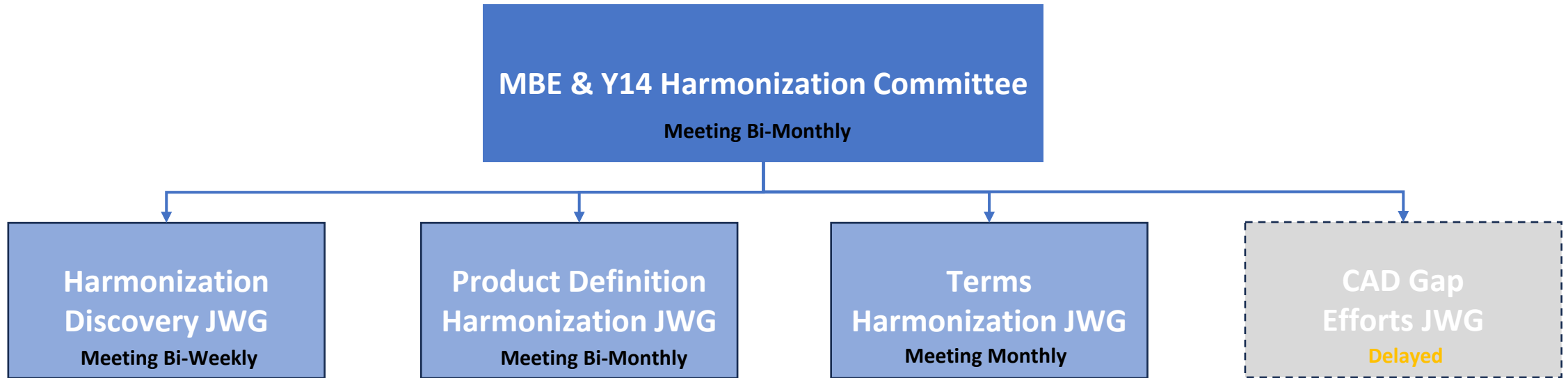
Meetings:
Virtual: Bi-Monthly Open Committee
In-Person: May 4th-8th Albuquerque, NM

How:

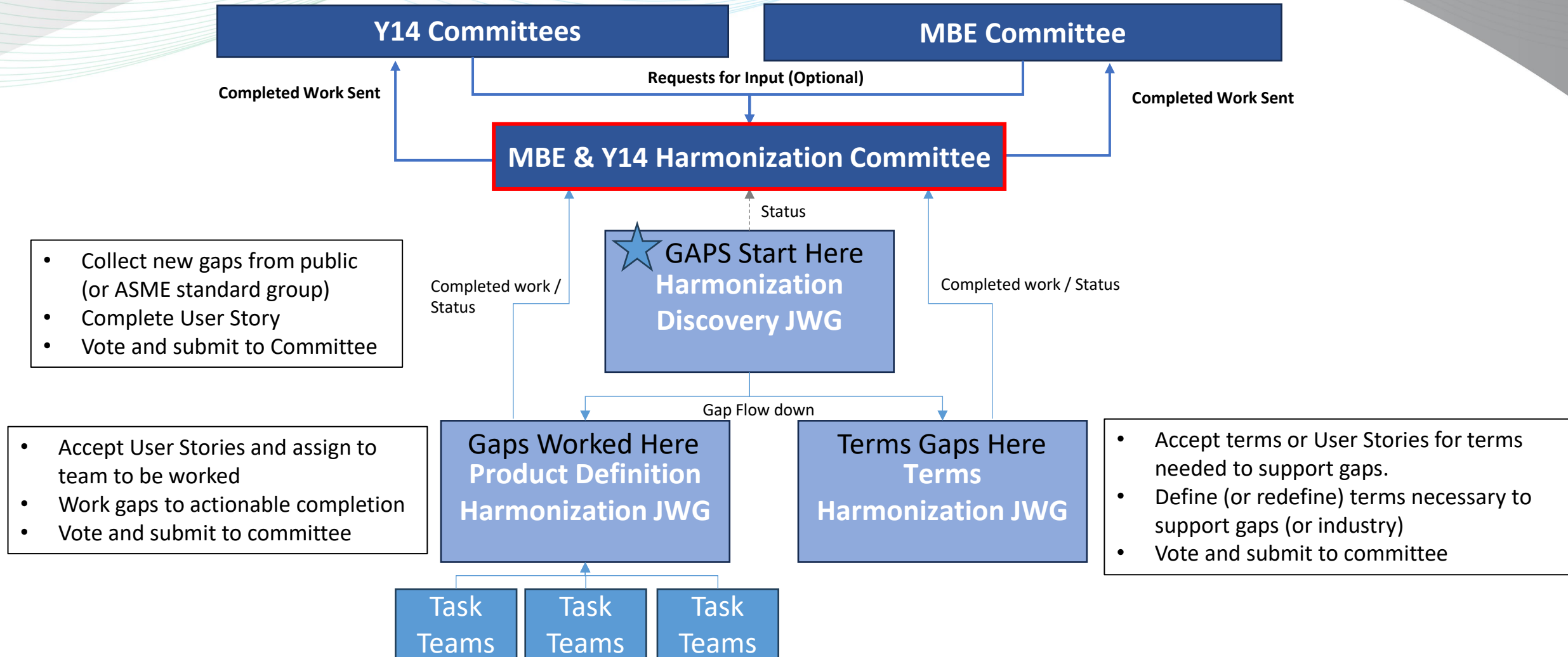
- Develop ASME Y14 Recommendations
- Develop ASME MBE Recommendations
- Develop White Papers:
 - Best practices
 - Industry and Standards Gap Analysis
 - Industry awareness of activities
 - How to best implement harmonized Y14 or MBE



MBE & Y14 Harmonization Committee



MBE & Y14 Harmonization Committee



MBE & Y14 Harmonization Committee

Industry Standards

ASME Y14.5

Geometric Dimensioning and Tolerancing

ASME Y14.41

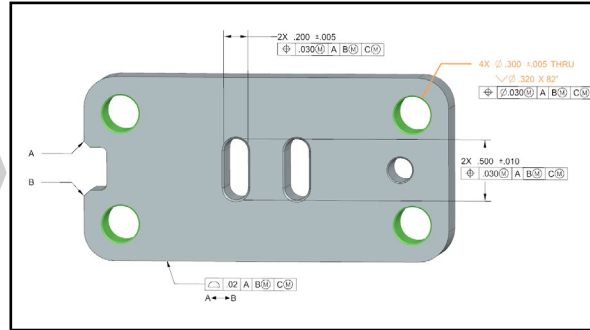
Digital Product Definition Data Practices

ASME Y14.47

Model Organization Practices

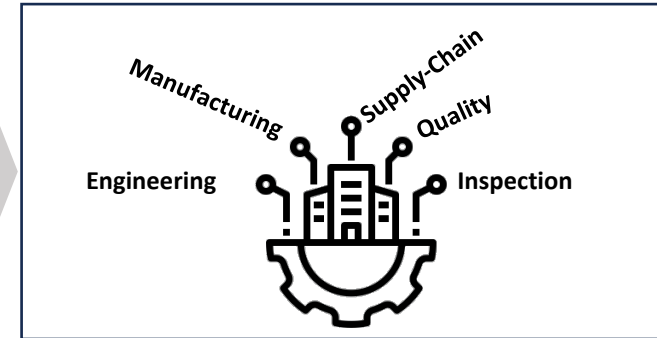
(Example Subset of Standards)

Model-Based Definition (MBD)



Human and Machine-Readable

Model-Based Enterprise (MBE)

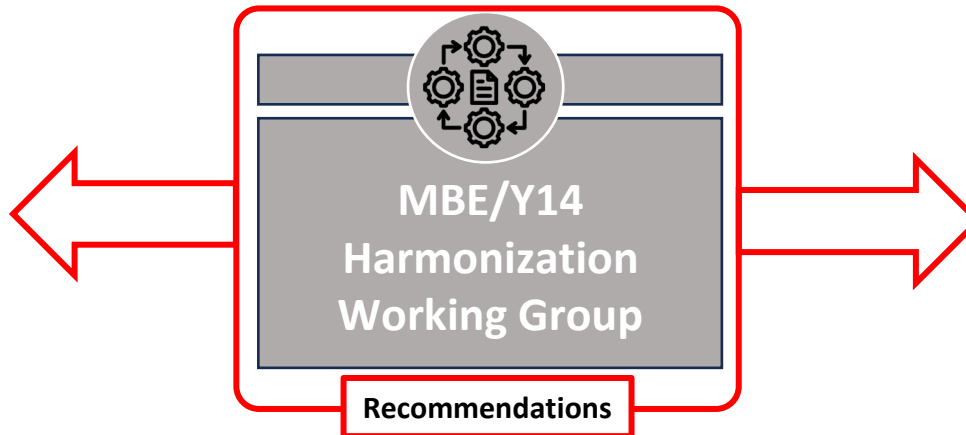


Human and Machine/Software-Consumption

Leverage Industry Standards

Standard Compliant Product Definition

Enterprise Reuse - Single Interpretation



Success Stories

MBE & Y14 Harmonization Committee

MBE Definition – Y14.47-2023

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

Definition Framework:

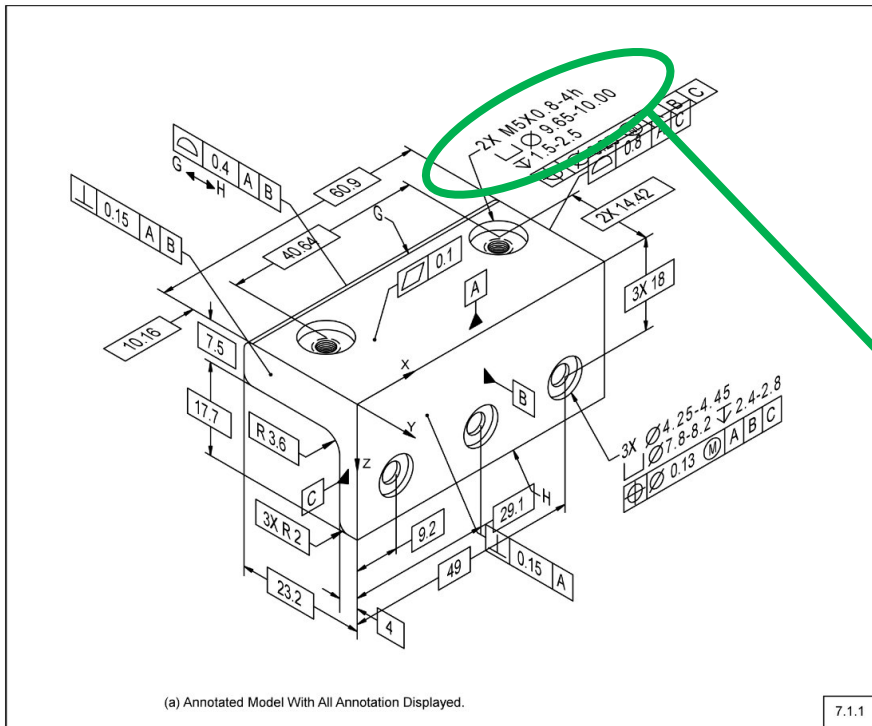
BLANK that uses BLANK as the foundation to BLANK

Multi-Feature 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.

Figure 7-1 Display Management



MULTI-FEATURED HOLE:

multi-featured hole: a hole containing more than one geometric digital element that can be characterized and toleranced.

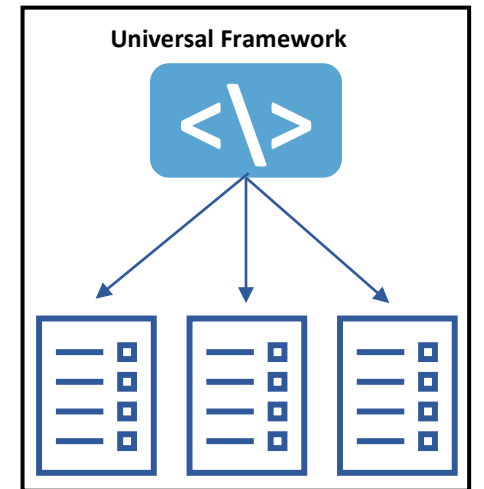
Example:

Element 1: Screw Thread

Element 2: Counterbore Diameter

Element 3: Counterbore Depth

ASME Y14.6: Screw Thread Representation



Multi-Feature Hole Definition

Multi-Featured Hole Definition GAP Proposal

- SC6** 1. Establish a Universal Attribute Framework (UAF) for threaded hole definition
- SC41** 2. Visual Response for Multi-Featured Hole Definition:
Each digital element of a multi-featured hole **shall** exhibit its own visual response when queried.
- SC6** 3. Threaded holes depicted in the model with a cylinder as the simplified representation shall use the MINOR diameter for the cylinder diameter unless otherwise modified and indicated w/ an attribute mapped to an annotation.

Associated Entities & Between Symbol

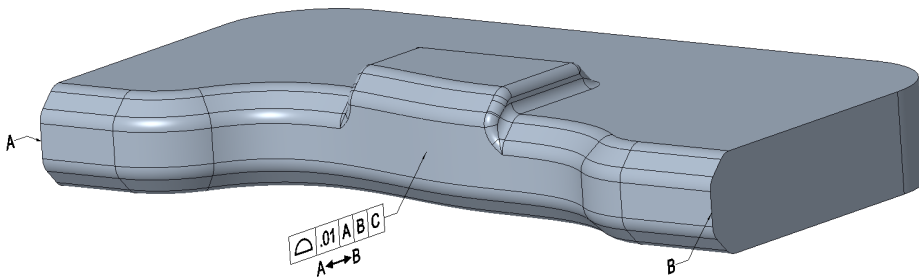
User Story:

As an **MBD Author**, and **MBD Consumer**,

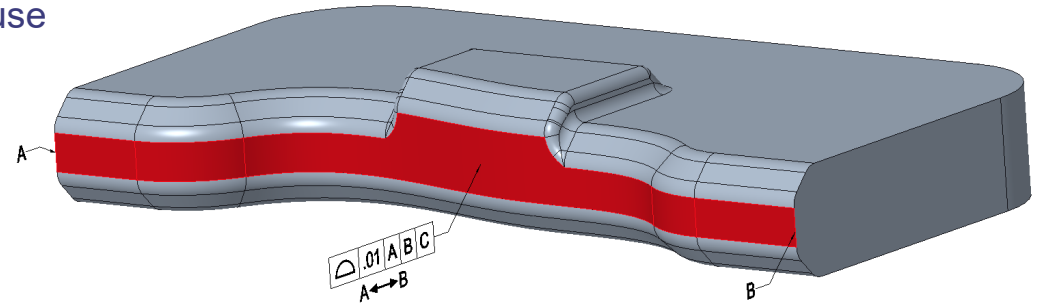
I want clear definition of features controlled by a feature control frame across an associated group of surfaces with common semantic requirements that clearly delineates the start and end limits for machine-readable application **without the use of supplemental information**

so that the MBD-authored design intent is clear and that the human and machine interpretation match and is non-ambiguous.

MBD Graphical Representation

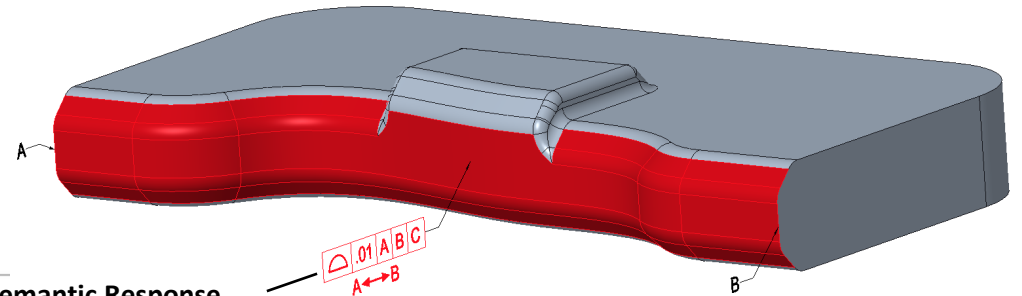


Human Interpretation



Machine/Software Interpretation

-Semantic Association



Semantic Response
(Associated Group)

Associated Entities & Between Symbol

SC41 Current Proposal: Classification Codes 3*, 4, & 5 Only (MBD)

*Visual Response – Associativity
(Terms JWG to Define)

1A • **Communicating the Boundary of Geometric Application for MBD:**

- The associated entities **shall** be a method of communicating the geometric tolerance boundary
 - Machine-Consumable, Human-Discoverable
 - Applies to all geometric control
 - Feature(s), groups, Complex Features, or other digital elements

1B • **Pattern Forming Method for MBD:**

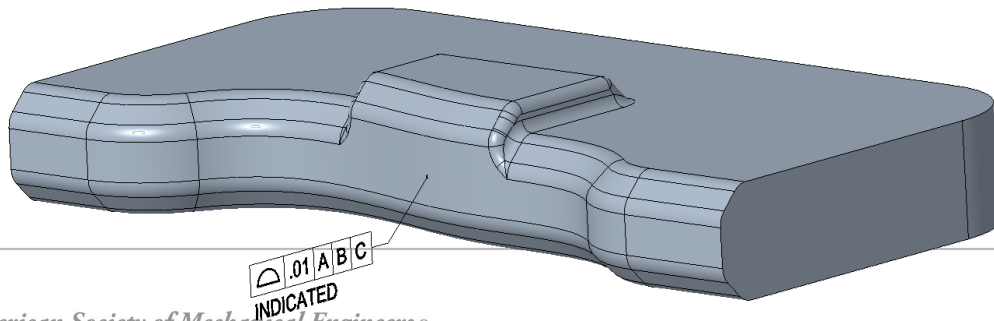
- In addition to the pattern forming methods listed in y14.5-2018, When applicable, the associated entities **shall** be a method of grouping two or more digital elements to which a position or profile tolerance is applied
 - Machine-Consumable, Human-Discoverable
 - Applies only to position and profile
 - Applies to two or more features, or digital elements

1C • As an optional practice, “INDICATED” **may** be used as a human cue to query the associated entities to replace the between symbol

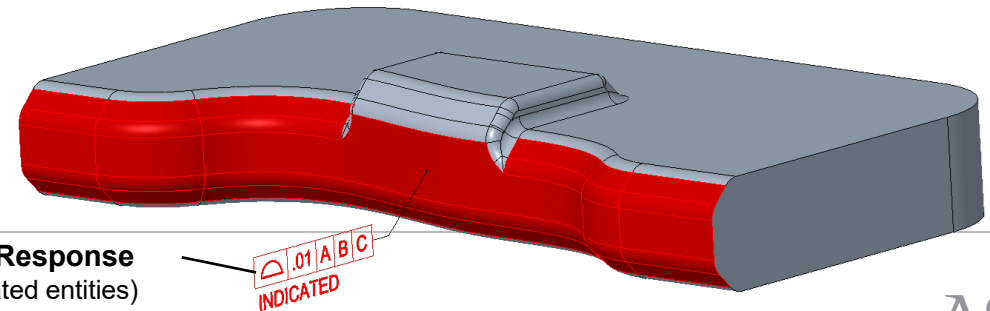
- Human-Readable Only

1D • When using additional pattern syntax notation (i.e., between symbol, nX, nSURACES, all-over, all-around) with associated entities:

- The associated entities **shall** take precedence for communicating the extent of the tolerance boundary



Visual Response
(Associated entities)



Associated Entities & Between Symbol

Y14.41 - Ballot Draft Aug 28, 2025 (Approved)

7.2.1 Associativity

The following are general requirements for defining an associative relationship between digital elements.

(a) *Selection of Associated Entities.* Annotation may be associated to a feature, a group of features, or a portion of an applicable feature. For an example of the associated features for a dimension, see Figure 7-3.

- (1) Geometric tolerance boundaries may be communicated with associated entities.
- (2) In addition to the pattern forming methods listed in y14.5-2018, when applicable, associated entities may be used to group two or more digital elements to which a position or profile tolerance is applied.
- (3) When using additional pattern syntax notation (i.e. between symbol, nX, nSURFACES) with associated entities, the associated entities and pattern syntax shall agree with each other. See section 7.2.1(c)

(b) *Associated Groups.* Annotation, model geometry, and supplemental geometry may be placed into associated groups to indicate their relationships. For example:

- (1) supplemental geometry used to define location, orientation, or further clarify the application of annotation in an annotated model
- (2) a coordinate system for datum symbols and datum targets
- (3) other annotation. This could include qualifying notes and size limit callouts

(c) *Associativity Agreement.* The associated entities, annotation, and attributes shall agree with each other.

(d) *Continuous Feature.* When features are designated as CONTINUOUS FEATURE or the continuous feature symbol is used, the appropriate features should be designated as the associated elements for the accompanying GD&T. Extension lines between the features shall not be used on annotated models.

Associated Entities & Between Symbol

Y14.41 - Ballot Draft Aug 28, 2025 (Approved)

12.2.3 Profile Tolerances

When a profile requirement is specified, it shall be attached using a directed leader. Table 12-3 lists profile applications.

- (a) *Conical Surface or a Surface of Revolution.* The feature control frame shall be placed on an annotation plane perpendicular to or containing the feature's axis of revolution. See Figure 12-14, illustration (b).
- (b) *Multiple or Coplanar Surfaces.* When a profile tolerance applies to multiple surfaces, the features shall be combined into an associated group. The feature control frame shall be placed on an annotation plane parallel or perpendicular to the referenced primary datum. See Figure 12-15.
- (c) *Between Basis.* When using associated entities to define the application boundary, INDICATED may be used to signify that a query of the associated entities is necessary for presentation of the applicable boundary. This method may be used in place of the between symbol to further clarify the application. See Figure 12-16.
 - (1) When INDICATED is used, a single leader line directed within the indicated geometry or group of geometric elements is required, additional leader lines are not required.
 - (2) When the associated geometry is not sufficient to indicate the application, labeled supplemental geometry may be added to indicate the boundary of application. The between symbol may be used to clarify the requirement. See Figure 12-16.
- (d) *All-Around Application.* When the all-around symbol is used, query shall be used to identify the controlled surfaces. See Figure 12-17.

Associated Entities & Between Symbol

Y14.41 - Ballot Draft Aug 28, 2025 (Approved)

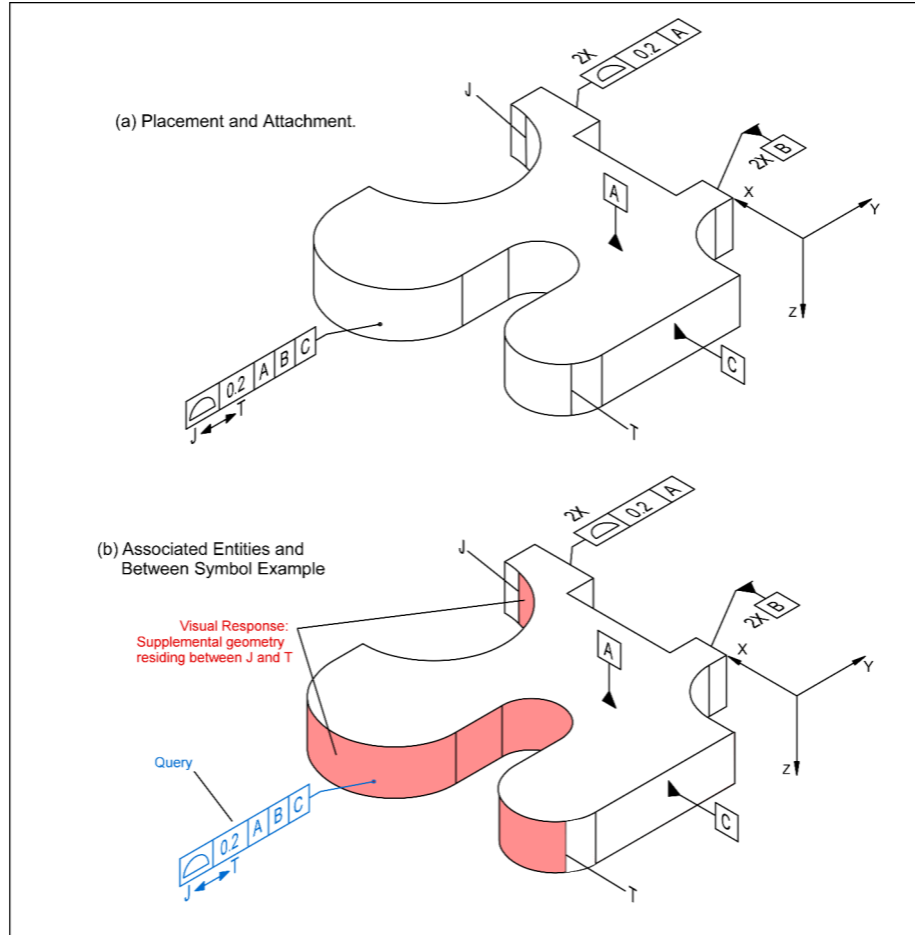
12.2.5 Runout Tolerances

Table 12-5 lists runout applications and the attachment method that may be used. Applications of circular runout to a spherical, conical, or revolved surface are also listed.

- (a) *Attachment Methods for Runout Tolerances.* When the same runout control with the same tolerance value and datum reference (s) is applied to multiple features, one of the following methods may be used:
 - (1) Create a single runout feature control frame for all identically controlled surfaces, and associate it to all applicable model surfaces. A note indicating the number of surfaces to which the tolerance applies may be included for additional associative emphasis. See Figure 12-27, illustrations (a) and (b).
 - (2) Define the geometric tolerance in a general note.
 - (3) Create and attach a separate runout feature control frame to each of the toleranced surfaces. See Figure 12-27, illustration (c).
- (b) *Circular Runout Applied to a Spherical or Conical Surface, or a Surface of a Revolution.* The circular runout feature control frame shall be placed on an annotation plane perpendicular to the conical or revolved feature's axis of revolution, or containing the centerpoint of a sphere. See Figure 12-29.
- (c) *Between Basis.* When using associated entities to define the application boundary, INDICATED may be used to signify that a query of the associated entities is necessary for presentation of the applicable boundary. This method may be used in place of the between symbol to further clarify the application. See Figure 12-27, illustration (d) and (e).
 - (1) When INDICATED is used, a single leader line directed within the indicated geometry or group of geometric elements is required, additional leader lines are not required.

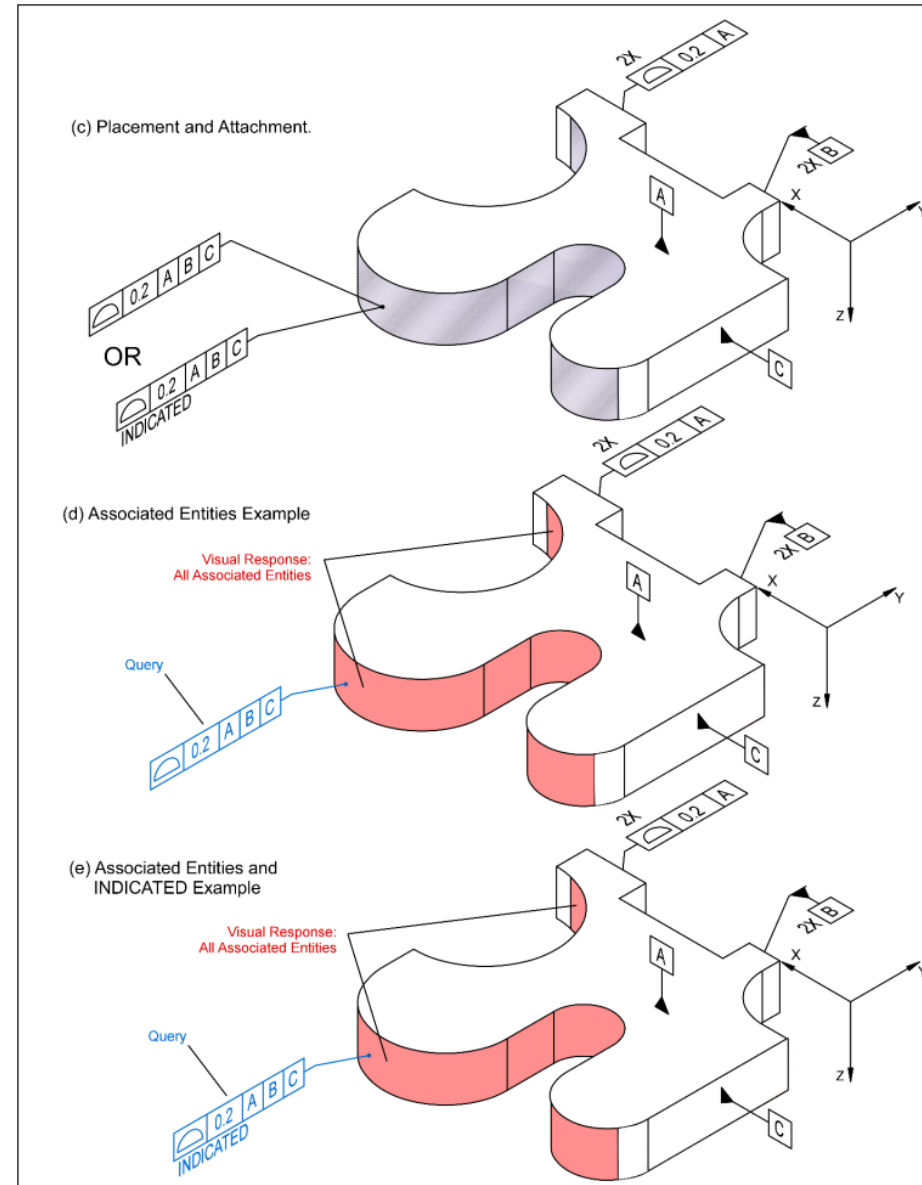
Associated Entities & Between Symbol

Figure 12-16 Profile – Between Basis



NOTE: Reference paragraphs 7.2.5, 12.2.3(c) and table 12-3 for additional information

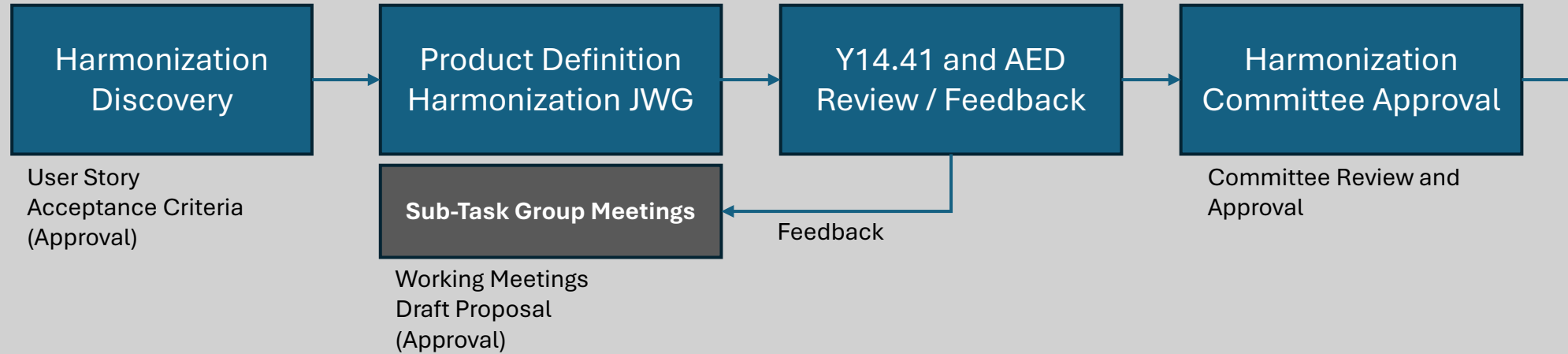
Figure 12-16 Profile – Between Basis (Cont'd)



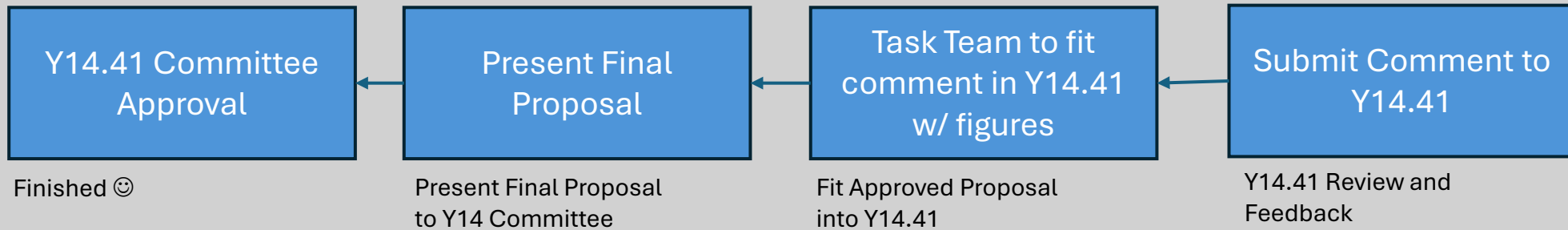
NOTE: Reference paragraphs 7.2.5, 12.2.3(c), 12.2.5(c) and table 12-3 for additional information

Associated Entities & Between Symbol

MBE & Y14 Harmonization Committee

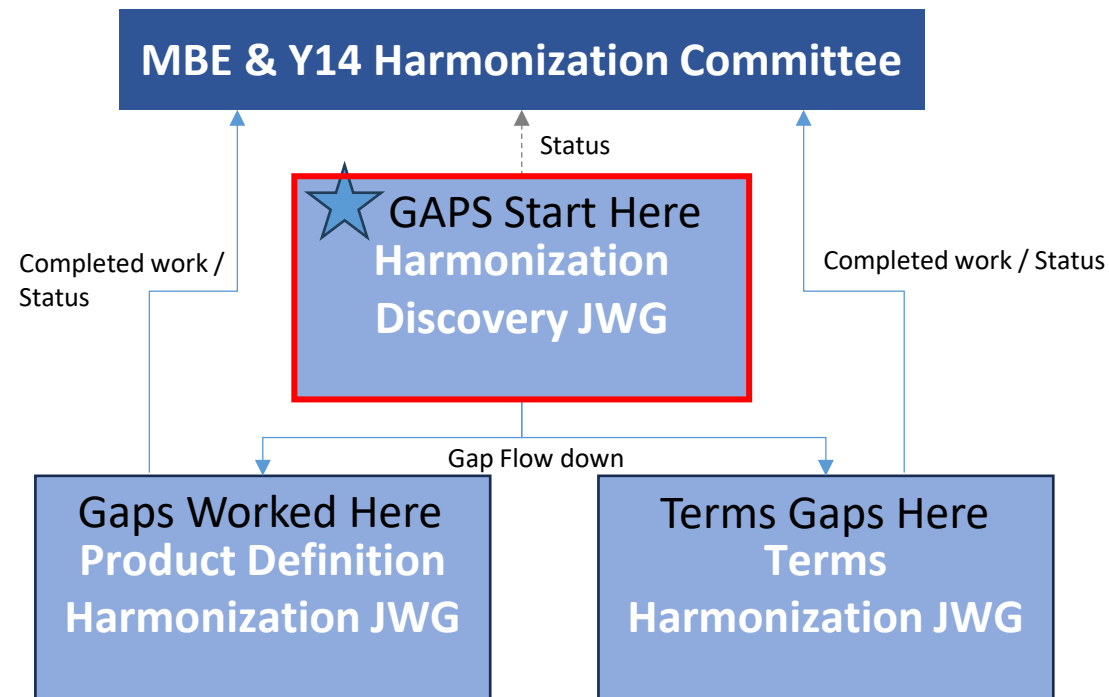


Y14.41 Committee



Harmonization Discovery JWG

MBE & Y14 Harmonization Committee



MBE & Y14 Harmonization Committee

Open “GAP” List: 100+ Backlog

Theme	Top Ranked Gaps
Product Definition	Pattern Syntax Authoring in MBD (i.e., Indicated, Individually, From-To Symbol, Multiple Leaders)
	Multi-Featured Hole Definition (i.e., Spotface, Threads, Counterbore, countersink)
	Geometric Tolerances Using Supplemental Geometry (i.e., Profile of a line, Straightness with direction)
	Draft on a Feature of Size
	Improved definition of “feature” or “Individual Feature”
	MIN and MAX dimensions in MBD
	Block tolerances in MBD – Title block tolerancing
	Tabular Tolerances in MBD
	Simplified representation of geometry (300 hole pattern, only modeling a portion)
	Modeling coating and plating in MBD
	Mirror and Alike/Tabled components in MBD
	Product Data Quality
	PDQ Model Certification

CAD Focused Gaps

Theme	Top Ranked Gaps
Manufacturing / Supply-Chain	Processing engineering changes, How to better understand changes in MBD? Model Quality Certification
	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 Symbolology - 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

Gap Discovery: Criteria

Gap: Clear gap/issue definition related to ASME Y14 or MBE standards or MBD practices.

User Story: *As an* (actor), *I want* to (blank), *so that* I (blank))

Acceptance Criteria: Criteria to define success

- Define unambiguous requirements for...
- Define how to ...
- Harmonize with current standards...

Example GAP Discovery – Criteria

GAP: Product Data Quality (PDQ) Standards for MBD (All MBD Elements).

User Story:

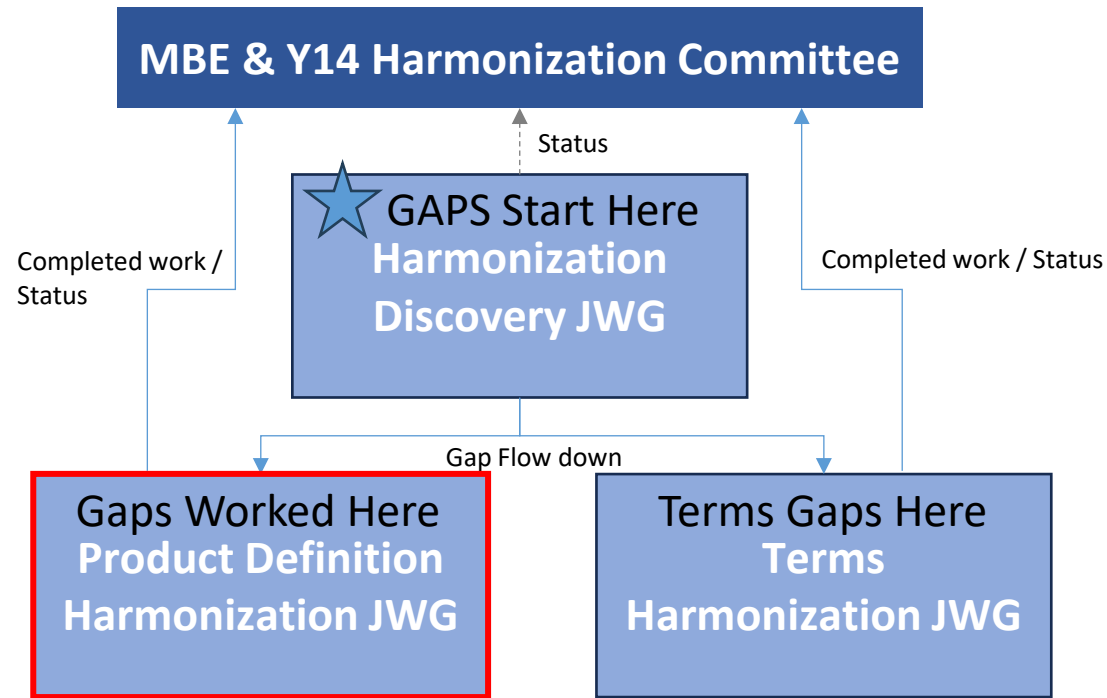
- As an **MBD Author** and **MBD Consumer**:
- **I want** a unified set of standards that clearly defines product data quality requirements and protocols for Model-Based Definition (MBD) and MBD derivatives (e.g., STEP, JT, QIF)
- **So that** product definition data is complete, accurate, interoperable, traceable, trusted, and enterprise-ready at release.

Acceptance Criteria:

- Define unambiguous requirements and protocols for MBD product data quality
 - Protocols for MBD Elements (Geometry, Annotations, Attributes and Parameters, Presentation States, Characteristics)
- Protocols framework should account for industry standards and custom OEM standards or requirements
- Harmonize with MBE2 MBE Maturity Index, HG012 Model Certification Gap, ISO 10303

Product Definition Harmonization JWG

MBE & Y14 Harmonization Committee



Product Definition Harmonization JWG

Active GAP being worked in the PDH-JWG

Gap ID	Gap Name	Gap Owner
HG001	Drafted Feature of Size	Andrew Pierce
HG002	INDIVIDUALLY	Larry Bergquist
HG003	Simultaneous Requirements	-
HG004	General Profile Tolerance	-
HG005	GD&T Metadata Schema	Dan Feighery
HG007	Pattern Decomposition	Evan Kessick

Gap Number: HG007



User Story

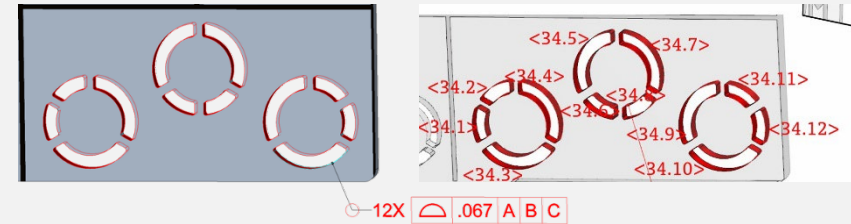
Gap Title: PATTERN AUTHORIZING FOR FEATURES AND CHARACTERISTICS – DECOMPOSING PATTERNS INTO ITS MINIMUM INSTANCE-LEVEL REQUIREMENTS FOR FEATURES AND CHARACTERISTICS

Gap Description: (See "Gap Title")

User Story: *As an* author and consumer of model-based product data, *I want* a standardized method for authoring design intent for pattern features to decompose patterns into the minimum instance requirements, *so that* features and characteristics can be consistently created, interpreted, and traced across domain lifecycle activities, enabling reliable automation and traceability of product data.

Acceptance Criteria:

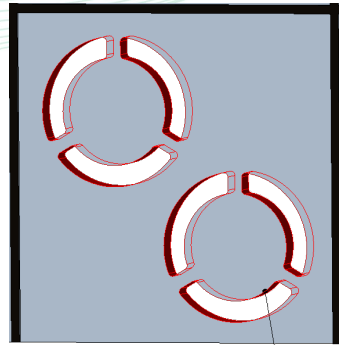
- Define unambiguous requirements pattern forming mechanisms
 - Pattern interpretation
 - Instance level decomposition
 - Feature Associativity (See Graphic), 96 faces to 12 groups – How to standardize feature creation
- Requirements support all enterprise lifecycle domain activities (i.e., MFG, Quality)
- Ensure harmonization with relevant industry standards (i.e., DMSC MBC 1.0, ISO)
- Authoring guidance includes explicit definitions for parent–instance, feature relationships, and characteristic inheritance.
- Pattern data authored in native MBD can be automatically translated into neutral formats (i.e. QIF, STEP) without loss of pattern structure, features, and characteristics.
- Harmonize with current PDHJWG gaps and Terms Gaps (HG002, HG003, Feature Terms)



How We Got Here: Intended Results

3D CIC – March 4, 2026

Example 1



Pattern Decomposition?

(Characterized and Reported)

48 Associated Entities (faces)

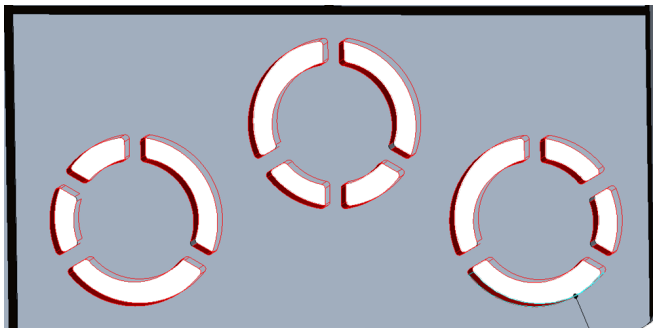
48X  .067 A B C

Options / Opinions:

- A. 1 Reported Value Comprised of 48 Faces
- B. 48 Individual Reported Value
- C. 6 Reported Values, Each Respective Loop
- D. A and C

What Industry Standards Support this Pattern Decomposition?

Example 2



Pattern Decomposition?

(Characterized and Reported)

12X  .067 A B C

96 Associated Entities (faces)

Options / Opinions:

- A. 1 Reported Value Comprised of 96 Faces
- B. 96 Individual Reported Value
- C. 12 Reported Values, Each Respective Loop



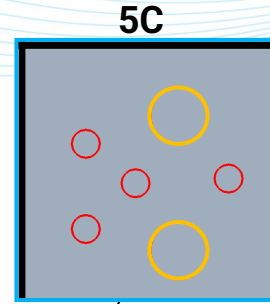
ASME Y14.45-2021

Measurement Data Reporting

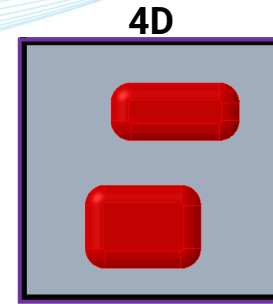
The Pattern Widget: Exploring Compliant Options

3D CIC – March 4, 2026

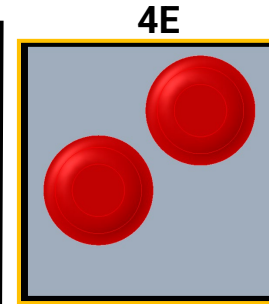
Category	Type	Geometry Types (quantity)	Pattern Syntax	Widget Position	Widget PMI Names
Feature of Size	Non-Uniform Spacing w/ Draft	Pins (3) Slots (3)	nX	2E 2F	2E - ad792, gp39 2F - ad795, gp40
	Across Multiple Planes	Pins (5) Slots (3)	nX	1G 2G	1G - ad774, gp31 2G - ad797, gp41
	Across Surfaces w/ draft	Lobbed (6)	nX	1H	1H - ad776, gp32
	Across Surfaces w/o draft	Lobbed (4)	nX	2H	2H - ad800, gp42
	FDS w/ draft in multiple directions	Slabs (2)	nX	1I	1I - ad777, gp33
	FDS w/ common plane reference	Planner Features (3)	nX	2I	2I - ad802, gp43
	Single Square Feature	Square	Square	1J	1J - ad783, gp34
Patterns of Features: Single Group of Connected Features	All Around Connected Features	Internal Racetrack External Racetrack	ALL-AROUND nX	3A	3A (ALL AROUND)- gp45 3A (nX)- gp46
		Internal D Shape External D Shape	ALL-AROUND nSurfaces	3B	3B (ALL AROUND)- dp47 3B (nSURFACES)- gp48
		Irregular - Single group Shape	ALL-AROUND	3C	3C- gp49
	Connected Features (Non-All Around)	Connected String of Features	BETWEEN sym nSurfaces	3D	3D (BETWEEN)- gp50 3D (nSURFACES)- gp51 3D (INDICATED)- gp52
		Connected String of Features	nSurface	4A	4A- gp53
		Connected String of Features	No Syntax	4G	4G- gp67
Patterns of Features: Group of Disjointed Features	Disjointed Features	Planner Features same plane (4)	nX nSurfaces	3E 3F	3E - gp53 3F - gp54
	Disjointed Features	Planner Features Different Heights (3)	nX	3G	3G - gp55
Patterns of Groups of Features	Disjointed Pattern of All Around Connected Features	Internal Racetrack (2) External Racetrack	All Around + nX nSurfaces	3H 3I	3H - gp56 3I - gp57
		Internal D Shape (2) External D Shape (2)	nX All Around + nX	2J 3J	2J - gp44 3J - gp58
		Fan Vent Shape	All Around + nX nX	4I 4H	4I - gp66 4H - gp65
		Different size shape group of features	Nk + nSurfaces Nk + INDICATED	4B 4C	4B - gp60 4C - gp61
		Same size shape group of features	nX nSurfaces	4D 4E	4D - gp62 4E - gp63
		Pattern of disjointed slots	nX + INDICATED	4F	4F - gp64
Misc	Designated Area Example	Pattern of disjointed surfaces	nX	5A	5A - gp68
	Continuous Feature Patterns	Slabs	CF symbol	5B	5B - ad872 5B - ad883
	Pattern w/ position with different size holes	Cylinders	nX	5C	5C - ad905, ad904, gp69



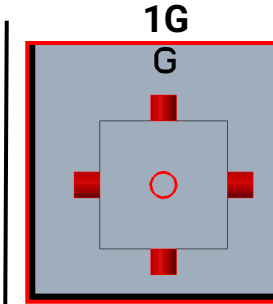
● 4X $\varnothing.220 \pm .005$
 ● 2X $\varnothing.450 \pm .003$
 ● 6X $\varnothing.005 \text{ (M)} \text{ A B C}$



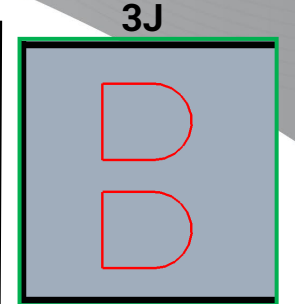
2X $\varnothing.005 \text{ A B C}$
 9 SURFACES



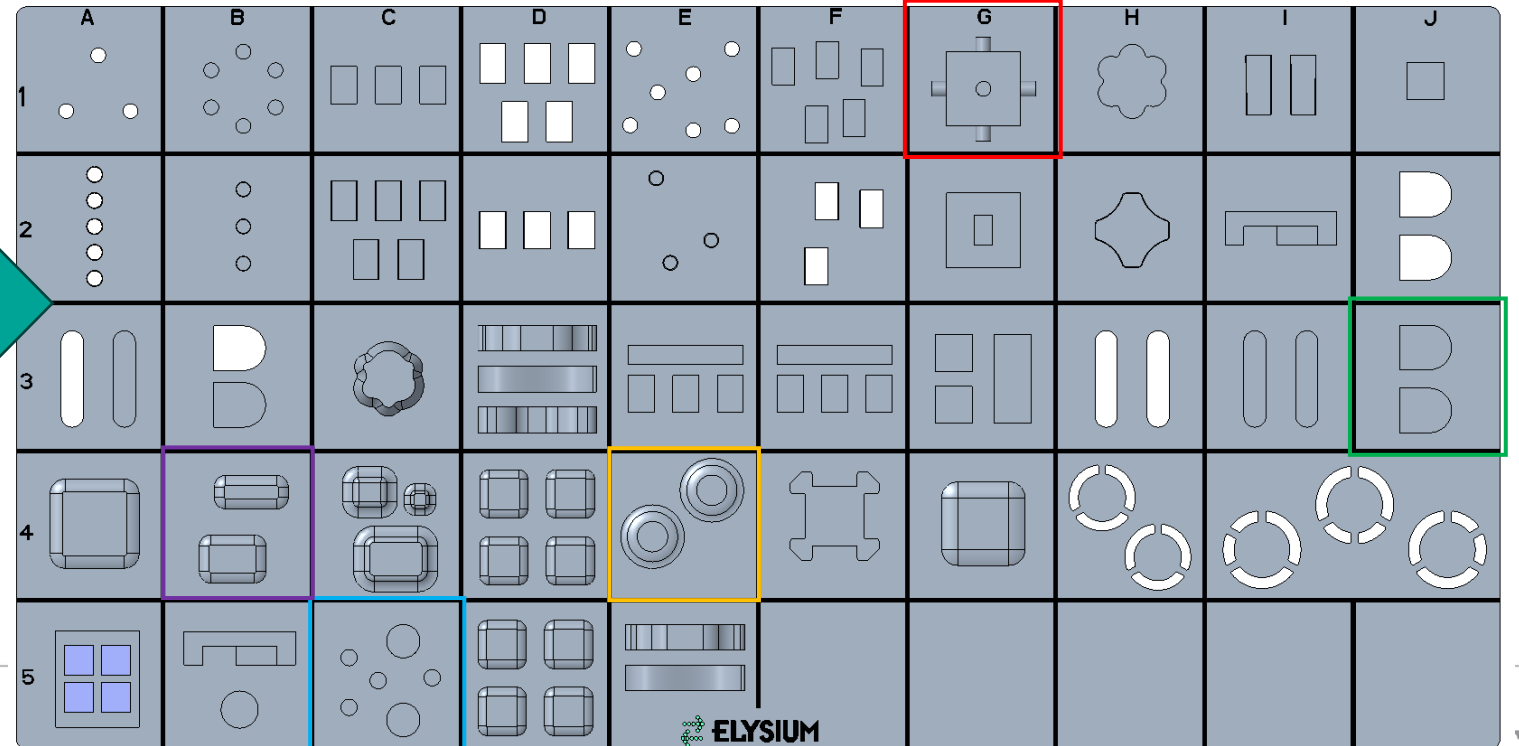
$\varnothing.005 \text{ A B C}$
 6 SURFACES



5X $\varnothing.200 \pm .005$
 $\varnothing.005 \text{ A B C}$



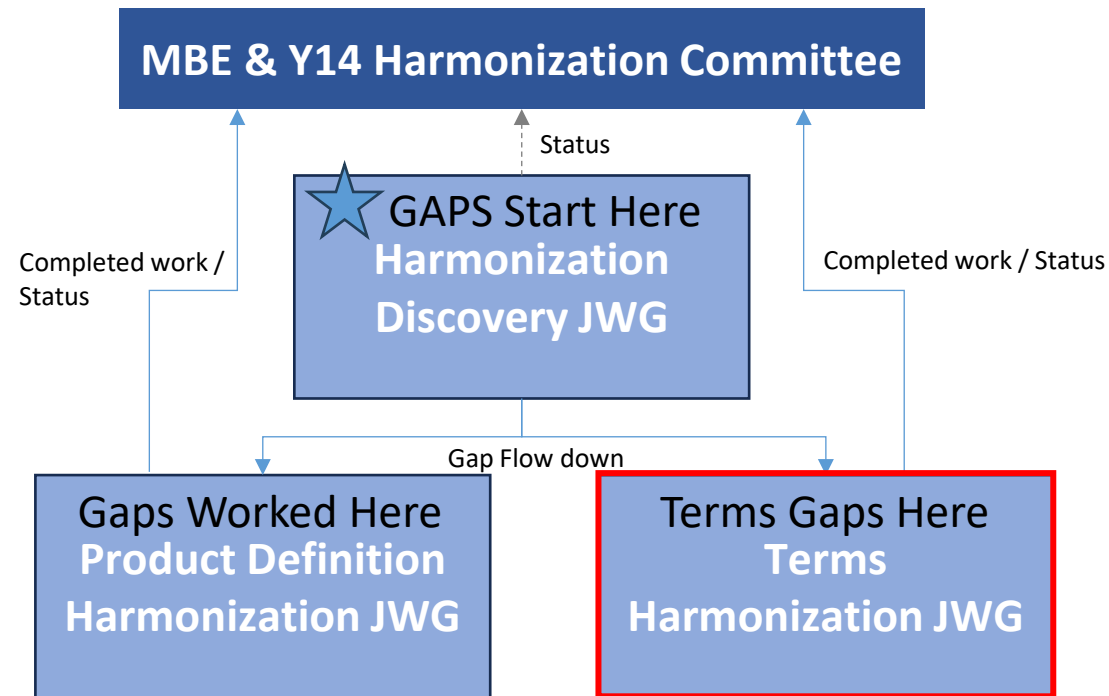
2X $\varnothing.005 \text{ A B C}$



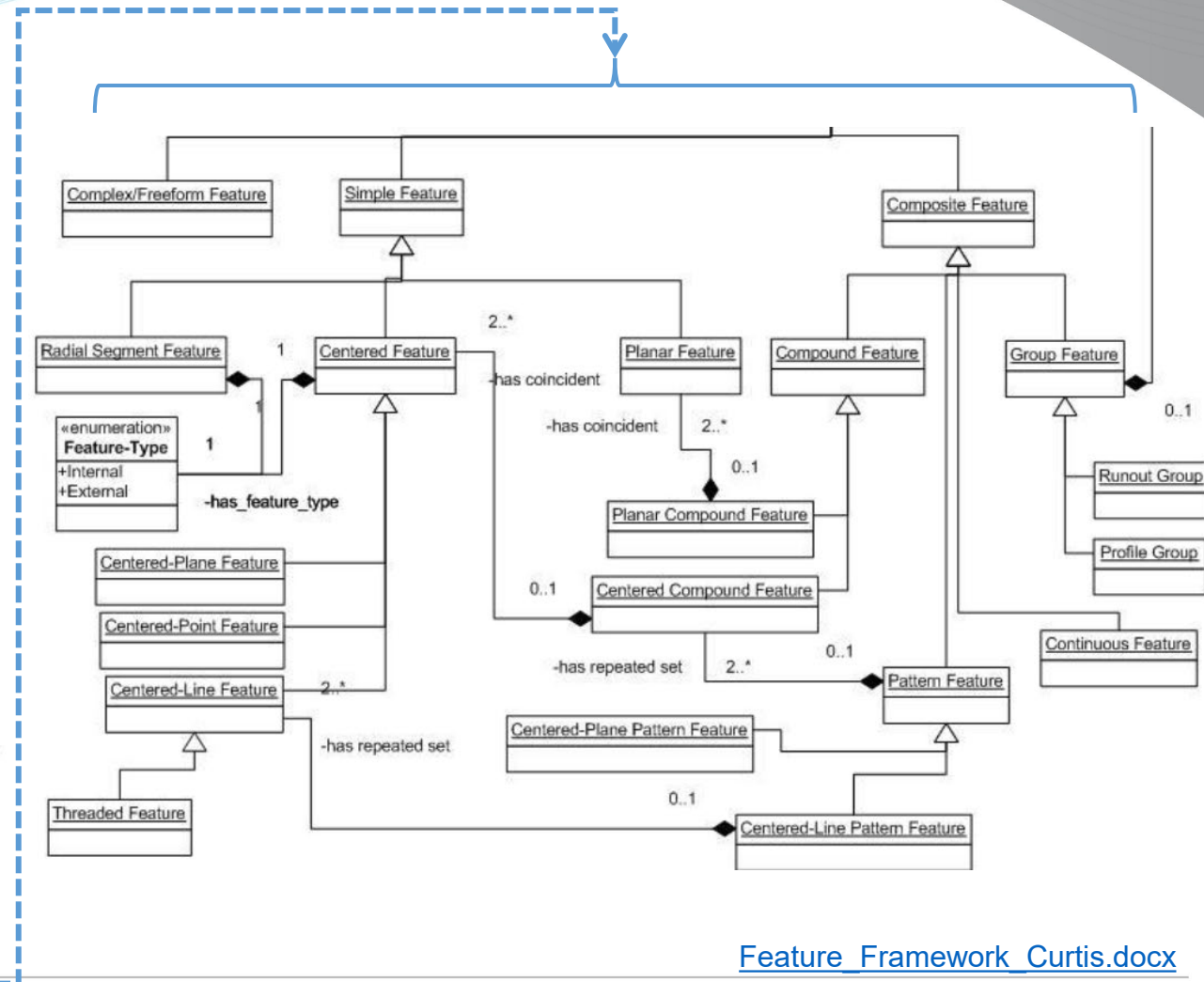
ELYSIUM

Terms Harmonization JWG

MBE & Y14 Harmonization Committee



ASME
SETTING THE STANDARD



How to Get Involved!

In-Person: May 4th-8th Albuquerque, NM

Who Should Get Involved?

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

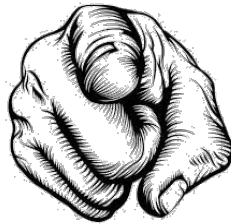
- Organizations that are implementing MBD/MBE
- Organization that are interested or investigating MBD/MBE
- Those who create, reuse, and consume product definition

How To Join?

- No fees or geographical restrictions
- Complete a Personnel Form (PF-1)
- Sign Participation Acknowledgment Form (PAF)

<https://www.asme.org/codes-standards/asma-code-committee/get-involved>

We Need You!



All Meetings Free and Open to Public

» **MBE & Y14 In-Person Meetings –**

- Dates: 4TH-8TH May 2026
- Locations: Albuquerque, NM
- More info: <https://event.asme.org/DGPSV>

» **ASME MBE-Y14 HC Virtual Meetings –**

- Date: Last Wednesday of every other month
- Time: 13:00 –14:30PM Eastern

» **ASME MBE Virtual Meetings –**

- Date: 2nd Thursday of every other month
- Time: 12:00 – 13:00 Eastern



Thank you for your kind attention!

- Fredric Constantino – MBE Standards Committee Staff
 - ASME S&C Project Engineering Manager
 - Phone: 212-591-8684
 - E-mail: ConstantinoF@asme.org
- ASME MBE Standards Committee Page
 - <https://cstools.asme.org/csconnect/CommitteePages.cfm?Committee=102216151>

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