2019
Annual INCOSE
international workshop
Torrance, CA, USA
January 26 - 29, 2019

Mark Williams
The Boeing Company

MBSE Data Standards

Engaging the Industry

MBSE Presentation Agenda

- A&D PLM Action Group
- MBSE for PDES
- LOTAR for MBSE
- GPDIS
- PDES – INCOSE MoU

Contrast MBSE – Baseline Definitions

Define **MBSE**: Model-based Systems Engineering

The application of modeling to support system requirements, design, analysis, verification and validation throughout the development lifecycle.

Define **MBD**: Model-based Design

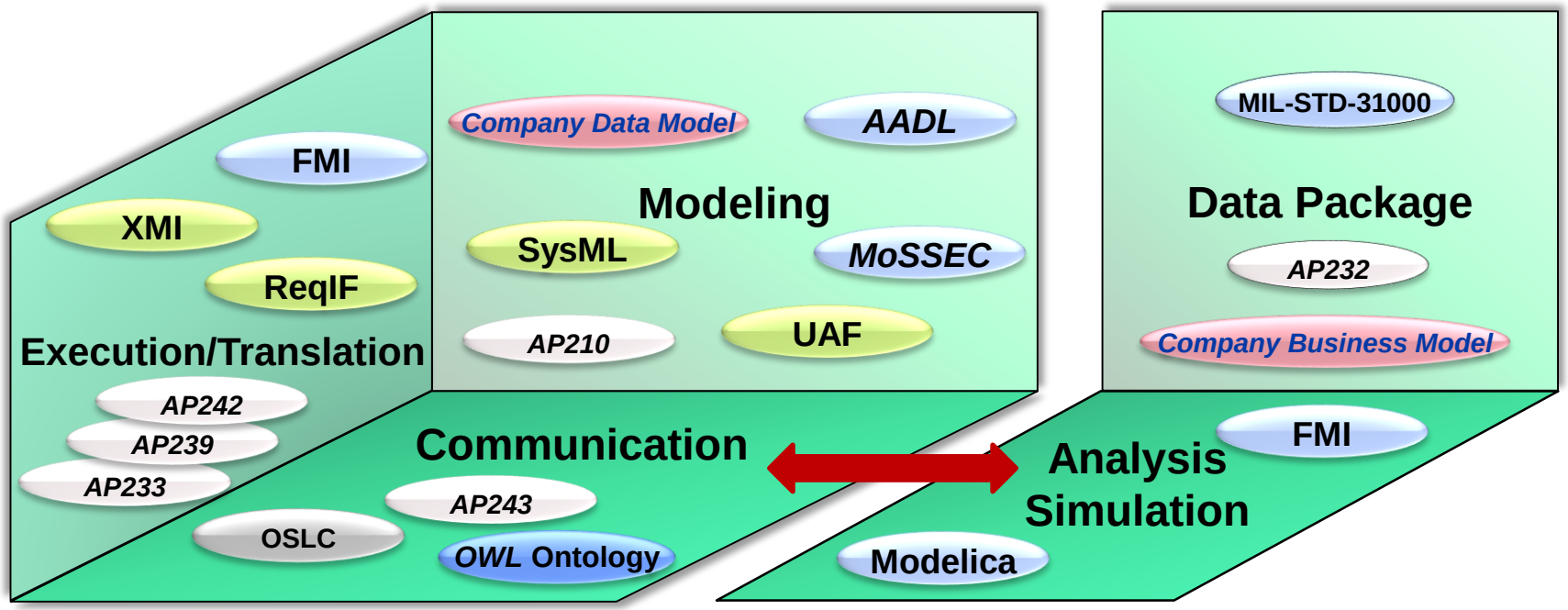
The mathematical representation of design functions, behavior, and software interactions.

Define **3DMBD**: 3D Model-based definition

The use of 3D ECAD (digital geometry, 3D PMI and associated metadata) to define individual components, assemblies, and/or the complete product.

The System (MBSE) Model is the connective tissue between the domains….. John Sperling, ARAS Corp

MBSE Data Standards



Critical Enablers !

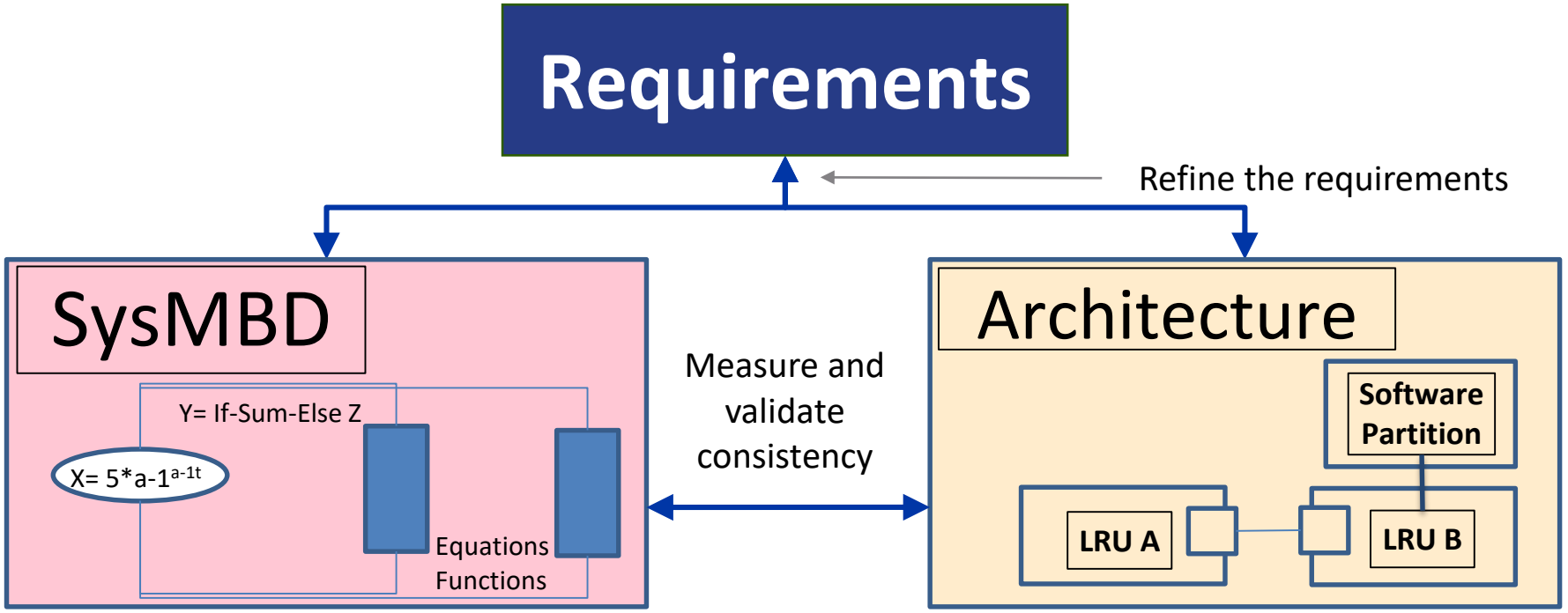
- Info Data Model
- Modeling Architecture
- Process

Standard Body Legend

Company | OMG | OASIS | W3C | ISO | SAE/other

CREDIT: Bill Chown, Mentor Graphics; MBSE Roundtable, 2015 GPDIS

MBSE Digital Artifacts

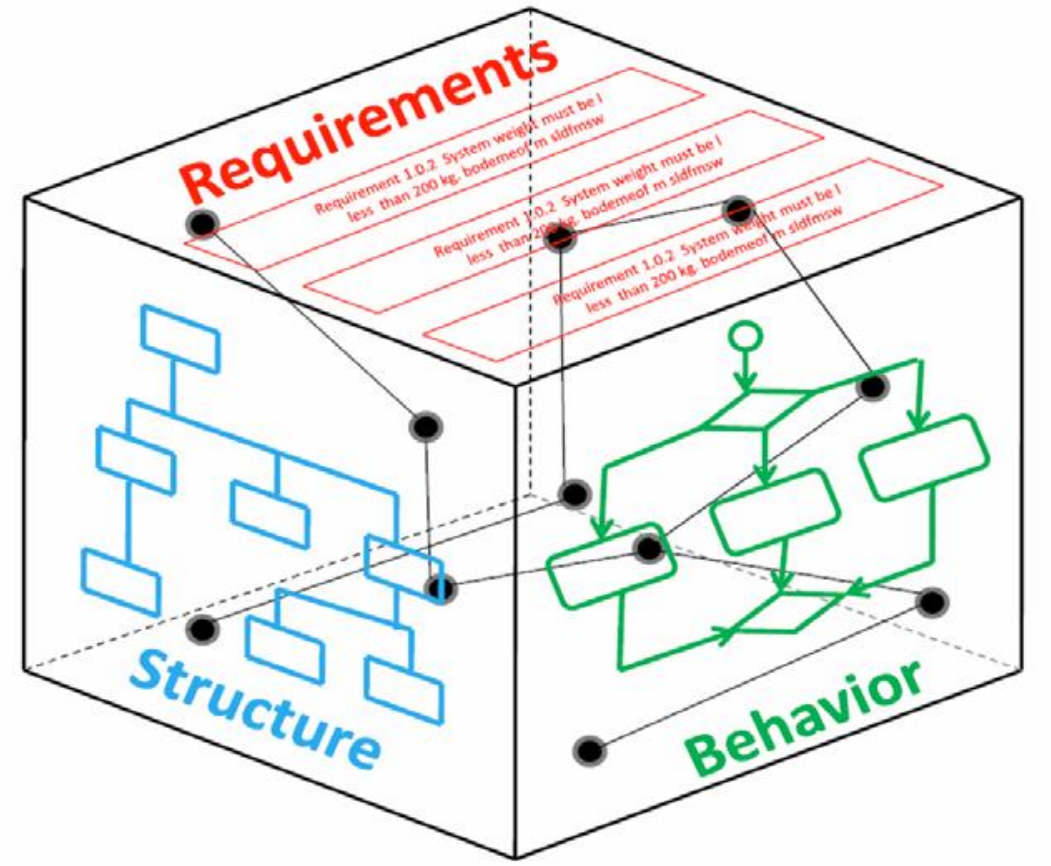


Functional Behavior, Performance, Parametric analysis, Code Generation

Architecture, Connectivity, Links Requirements Allocations, Data I/O,

The MBSE purpose is achieved if the models are consistent and can be used downstream **without recreation**

System Development view from AIA



Critical MBE Themes that Enable a Collaborative Government-Industry Digital Engineering Process throughout the DOD Acquisitions Lifecycle,
Dr. Peter Pan, Northrop Grumman
NIST MBE Summit presentation

Evolution of the Engineering Vee

Compare AP233 with Dan Seal's Diamond presentation from GPDIS

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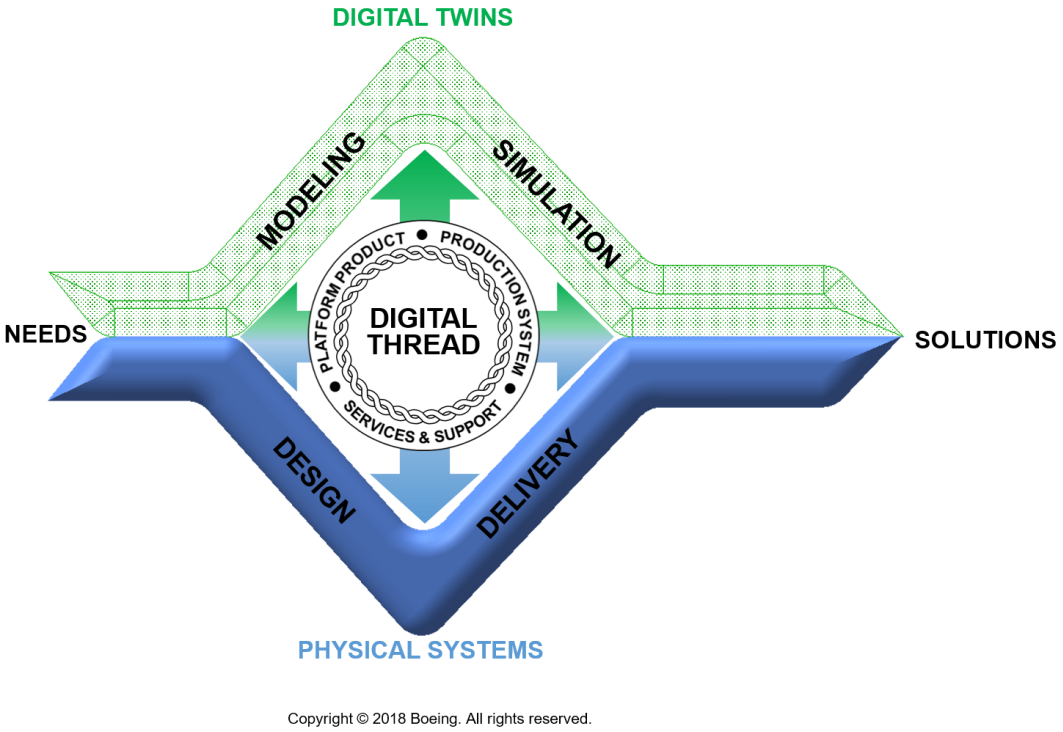
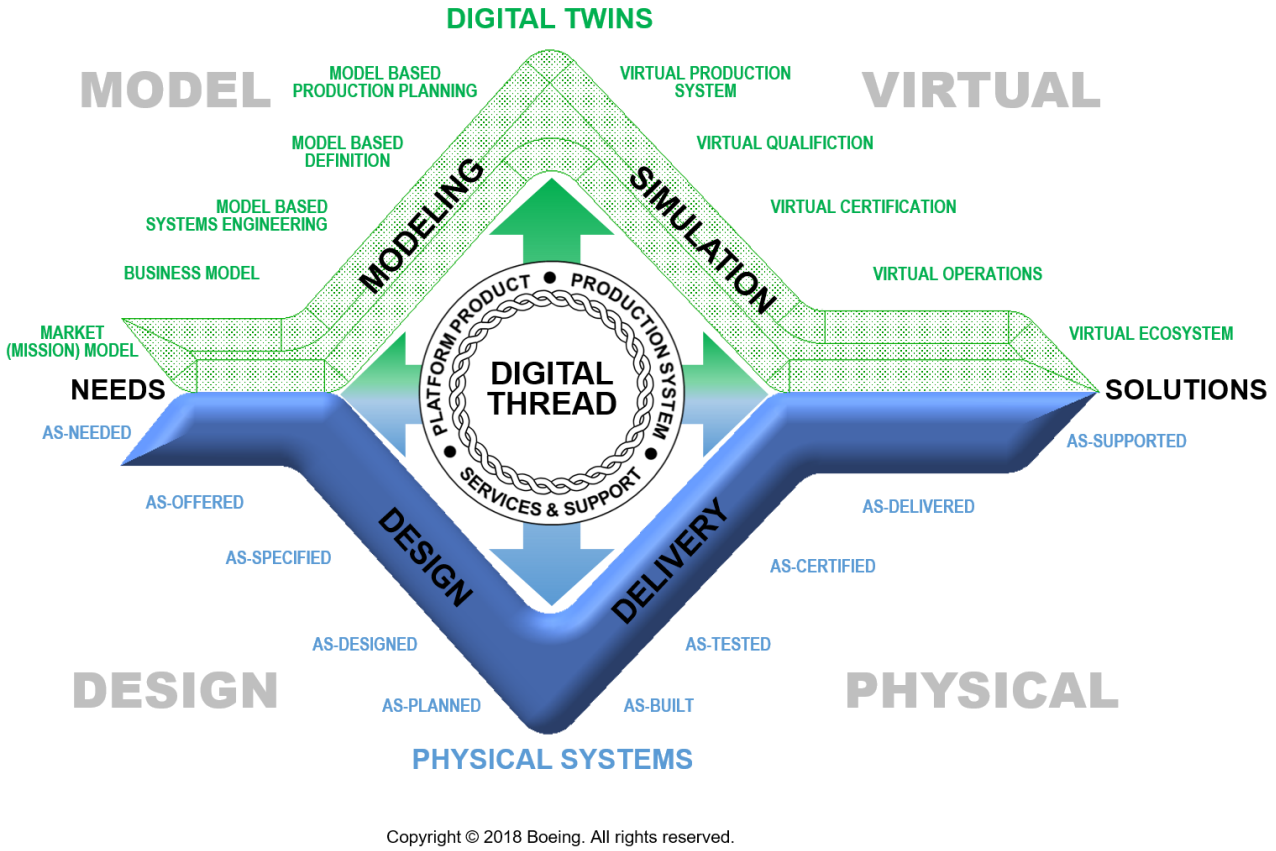




Advocating for MBSE

CIMdata The Leader in PLM Education, Research, and Strategic Management Consulting

PLM RESOURCES EDUCATION PLM CONSULTING RESEARCH MEMBERSHIPS EVENTS CALENDAR

- Home: Aerospace & Defense PLM Action Group
- Members
- Mission
- Publications
  - Direction Statements
  - Research Reports
  - Position Papers

HOME > HOME: AEROSPACE & DEFENSE PLM ACTION GROUP

Founded in 2014, the Aerospace & Defense PLM Action Group is an association of aerospace & defense companies within CIMdata's globally recognized PLM Community Program, which functions as a PLM advocacy group.

Our stated mission is to:

- Set the direction for the aerospace & defense industry on PLM-related topics that matter to members
- Promote common industry PLM processes and practices

MBSE Working Group

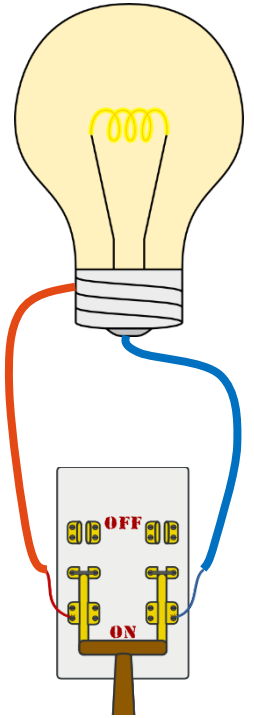
The MBSE Project is one of several focus areas

- Recognize that all Aerospace OEMs essentially use the same suppliers.
- Develop guidelines to exchange MBSE data between the OEMs and the Tier 1 Suppliers.
- Test our capabilities to exchange basic digital models
- Define gaps, develop Position Paper, explore near term opportunities.

Aerospace & Defense PLM Action Group

Summary for Phase 1 Testing

MBSE Data Exchange Trials		All participants prepared OEM SCDR & Tecnhical Data Package; All models and Trial results data uploaded into AirCollab project folders				Red= Faliure Grey= Partial Success Green= Success	Red= Faliure Grey= Partial Success Green= Success
Round 1	**OEM Role**	**OEM Modeling Tools Used**	**Data Export Standards Used**	**Supplier Role**	**Supplier Tools Used**	**Trial Outcome (System Model)**	**Trial Outcome (Requirements)**
	Boeing	MagicDraw v18.1	UML 2.5 XMI	GE	IBM Rhapsody v8.2.1	**Failure**	**Failure**
	Boeing			Rolls-Royce	PTC Integrity v8.3.18 & Enterprise Architect, DOORS v9.5	**Failure**	**Partial Success**
	Boeing	DOORS v9.6	ReqIF v1.1	Airbus	IBM Rhapsody v8.1.4	**Failure**	**Failure**
Round 2	**OEM Role**	**OEM Modeling Tools Used**	**Data Export Standards Used**	**Supplier Role**	**Supplier Tools Used**	**Trial Outcome (System Model)**	**Trial Outcome (Requirements)**
	Airbus	IBM Rhapsody v8.1.4 (Reqs included in SysML model)	XMI	Rolls-Royce	PTC Integrity v8.3.18 DOORS v9.5	**Failure**	**Failure**
	Airbus			GE	IBM Rhapsody v8.2.1	**Failure**	**Failure**
	Airbus			Boeing	Rhapsody 8.1.5	**Failure**	**Partial Success**
	Rolls-Royce	PTC Integrity Modeler v8.3.18	XMI	Boeing	Rhapsody 8.1.5	**Failure**	**Failure**
	Rolls-Royce			GE	IBM Rhapsody v8.2.1 DOORS NG	**Failure**	**Partial Success**
	Rolls-Royce	DOORS v9.5	ReqIF v1.0	Rolls-Royce	PTC Integrity Modeler v8.3.18	**Failure**	**Partial Success**
	GE	IBM Rhapsody v8.2.1	UML 2.3 XMI	Boeing	Rhapsody 8.1.5	**Failure**	**Failure**
	GE	DOORS NG	ReqIF v1.2	Rolls-Royce	PTC Integrity v8.3.18 DOORS v9.5	**Failure**	**Failure**



MBSE Working Group

Aerospace & Defense PLM Action Group

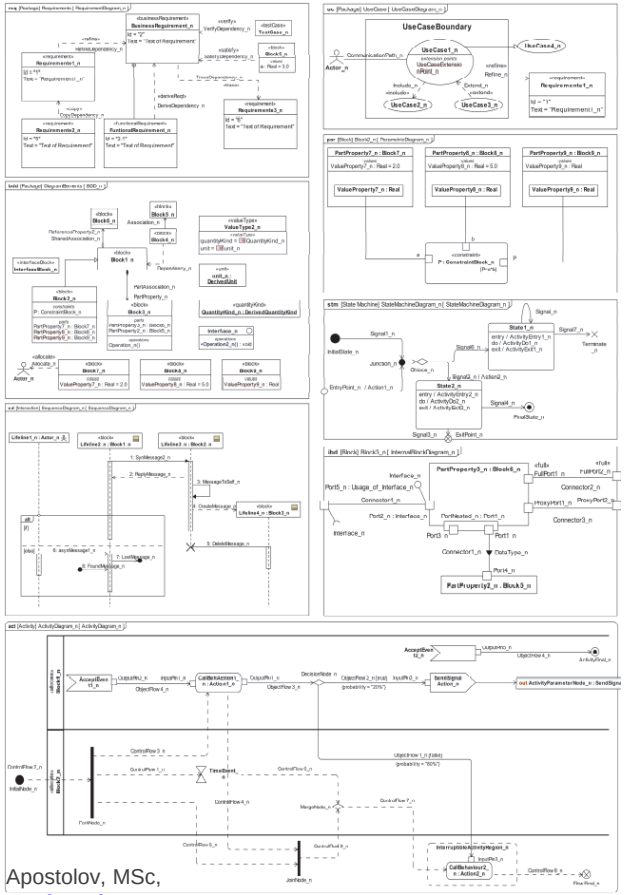
An Academic Analysis

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN
VPE

Current Status of SysML Model Interchange between Common Modeling Tools via XMI – A Practical Study

Hristo Apostolov, Damun Mollahassani Madjdabadi
University of Kaiserslautern, Institute of Virtual Product Engineering (VPE),
EMEASEC 2018 / TdSE 2018

Standard SysML Test Models



Used with permission : Hristo Apostolov, MSc, [Institute for Virtual Product Engineering], Technische Universität Kaiserslautern

Source tool >	IBM RR					NM CSM				
Target tool >	IBM RR	NM CSM	PTC IM	SS EA	cluster total	IBM RR	NM CSM	PTC IM	SS EA	cluster total
Structural Elements	72%	83%	0%	50%	51%	31%	100%	6%	88%	56%
Activities	100%	100%	82%	65%	87%	81%	100%	81%	81%	86%
Interactions	86%	100%	0%	100%	71%	86%	100%	0%	100%	71%
State Machines	100%	100%	25%	100%	81%	60%	80%	20%	60%	55%
Use Case	100%	100%	40%	100%	85%	100%	100%	40%	100%	85%
Requirements	100%	17%	0%	83%	50%	0%	100%	0%	17%	29%
	89%	86%	30%	72%		58%	98%	31%	78%	

Source tool >	SS EA					PTC IM				
Target tool >	IBM RR	NM CSM	PTC IM	SS EA	cluster total	IBM RR	NM CSM	PTC IM	SS EA	cluster total
Structural Elements	56%	31%	6%	100%	48%	19%	31%	44%	69%	41%
Activities	81%	100%	63%	100%	86%	82%	88%	88%	76%	84%
Interactions	86%	100%	0%	100%	71%	14%	14%	14%	14%	14%
State Machines	100%	100%	50%	100%	88%	100%	100%	75%	100%	94%
Use Case	100%	100%	40%	100%	85%	100%	80%	40%	100%	80%
Requirements	33%	0%	0%	100%	33%	0%	0%	17%	50%	17%
	72%	69%	28%	100%		49%	53%	53%	67%	

The Top Three Alternatives

for SysML Interoperability

1. Use a software adapter and/or service to facilitate data exchange

2. Require the use of a single brand of SysML-based authoring tools

3. Invest in the manual conversion of paper-based documents and/or hybrid

MBSE Working Group

Aerospace & Defense PLM Action Group

Recommendations

Short term:

Evaluate, validate, and employ the use of third-party MBSE interoperability software tools/adapters that supplement the basic capabilities present in the major SysML authoring tools, and/or the use of a translation service for more robust MBSE data exchange.

Interim:

We all must use an ISO 42010-compliant architecture description language (ADL) and deploy a common exchange service/ methodology across the aerospace industry. The INCOSE's recommendation and the prevalent standard is SysML.

Long term:

- Endorse the SysML 2.0 RFP content, the non-mandatory features describing model interchange and formal semantics, and recommend the incorporation of UMLDI or equivalent into future SysML specifications.
- Encourage our tool Vendors to prioritize an industry wide exchange strategy and to implement new industry standards (e.g. SysML 2.0) when they become available.

Future Opportunities

- Define the requirements for a 3rd Party software adapter and translation service
- Understand our own requirements about what we want to exchange
- Define a set of priorities to be addressed by the standard bodies and industry consortiums
- Monitor the market for solutions in the space of data interoperability and 3rd party adapter software

MBSE Working Group **REQUEST the Position Paper**

Press Release

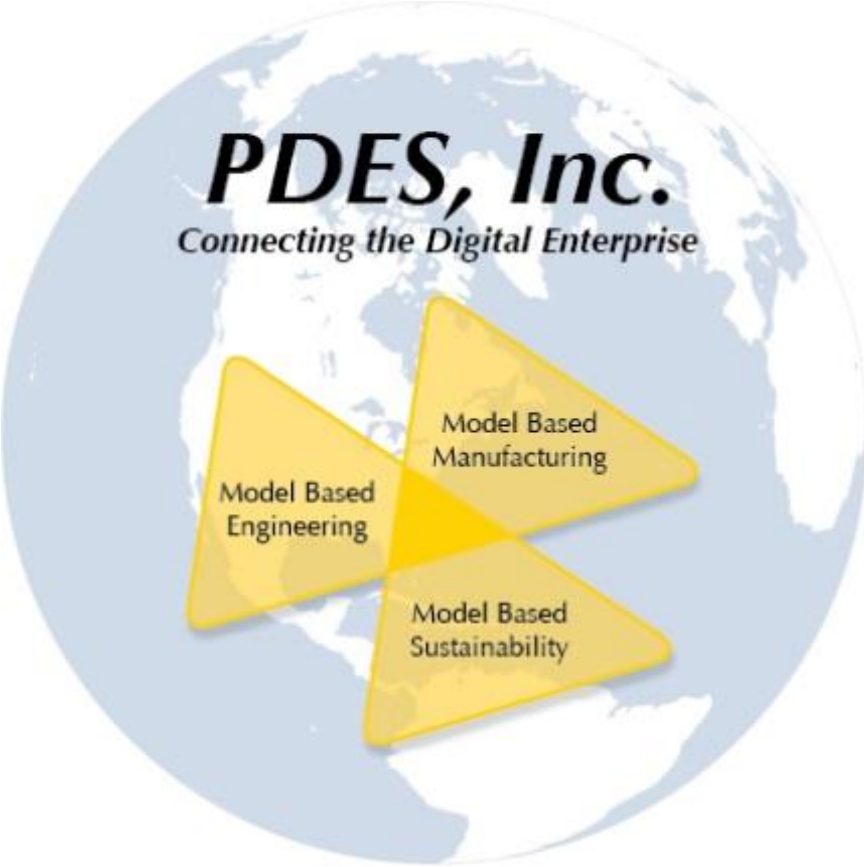
To realistically reduce the cost of developing new products the Systems Engineering community must evolve from our document based paradigm and embrace MBE. The foundation of this evolution is MBSE. But the slow implementation of MBSE is an industry problem that relies on data standards, defining WHAT must be exchange, HOW to exchange, data interoperability and preservation. We also need Leadership and a robust source of Vendor products. Any alternatives must include not just the OEMs, but also the supply base.

This presentation addresses some of those issues, and the communities engaged in identifying potential opportunities and solutions. Can you identify the role of PDES, LOTAR, and/or the industry consortiums aligned to implement change? Bring your questions and ideas to this two part session inspired by the need to empower INCOSE's thriving membership.

Why PDES ?

PDES, Inc. is an international consortium joining industry, government and academia.

Formed in 1988 to standardized data exchange and accelerate the development and implementation of standards.



PDES = Product Data Exchange using STEP

The PDES Focus is on STEP

- STEP is officially called ISO 10303
- ISO 10303 is the standard for the digital representation and exchange of product modeling information
- STEP standards are computer sensible

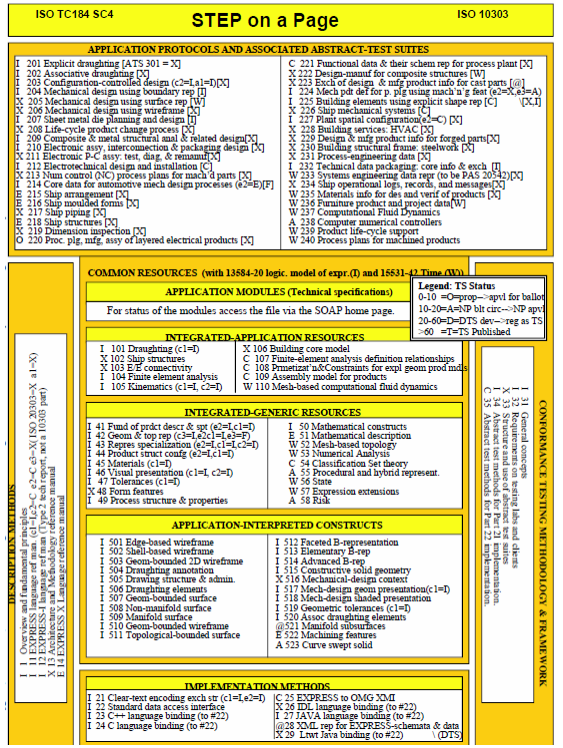
STEP *= Standard for the Exchange of Project model data*

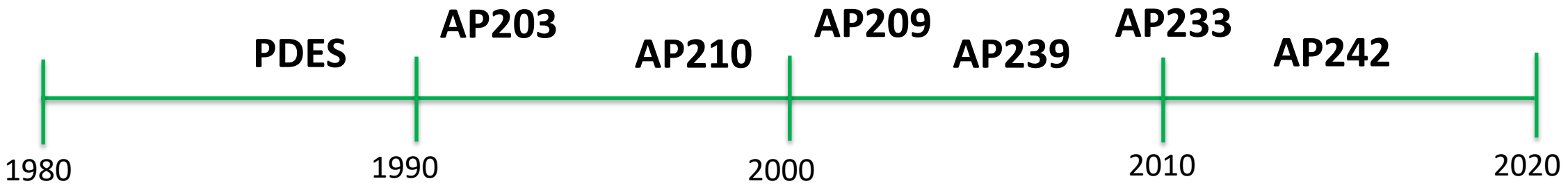
Why Standards?

PDES, Inc.
Connecting the Digital Enterprise

PDES, Inc.
Model-Based
Sys Eng.

- Reduce Cost $$
- Control Part and Process Quality
- Support for Design Reuse
- Avenue for Data Exchange





MBSE for PDES

2008 – 2010, AP233 exchange of system engineering data

2014 Requirements Traceability

2017 Evaluate Industry Tools

2018 Organize applicable tools, define **HOW**

MBSE for PDES

PDES, Inc.
Model-Based
Sys Eng.

The Team's Current Focus:

Define **HOW** to assemble/bundle/couple/package the MBSE business objects (MBSE TDP) that need to be exchanged (architecture of the process), and **HOW** the exchange/sharing/access should occur.

the new TDP = the MBSE version of SE Handbook

MBSE for PDES – HOW Activities

PDES, Inc. Model-Based Sys Eng.

1. Packaging - unpacking (containers, media, data types, etc.)
2. Define and maintain model relationships
3. Manifest of package contents and features
4. Marking and Security of package and contents
5. Reference a **WHAT** document for creation of TDP
6. How to manage the MBSE Diversity (mixed IP, obfuscated data/models, compiled code, software, CAD, documentation)

HOW *to assemble/bundle/couple/ package the MBSE business objects that need to be exchanged (architecture of the process), and* ***HOW*** *the exchange/sharing/ access should occur.*

But – Where is the WHAT definition?

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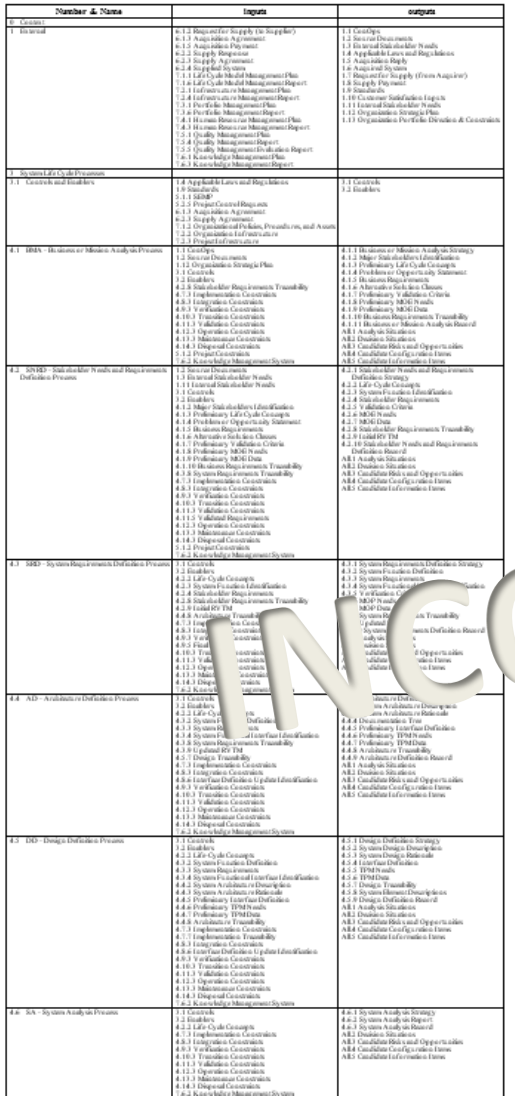
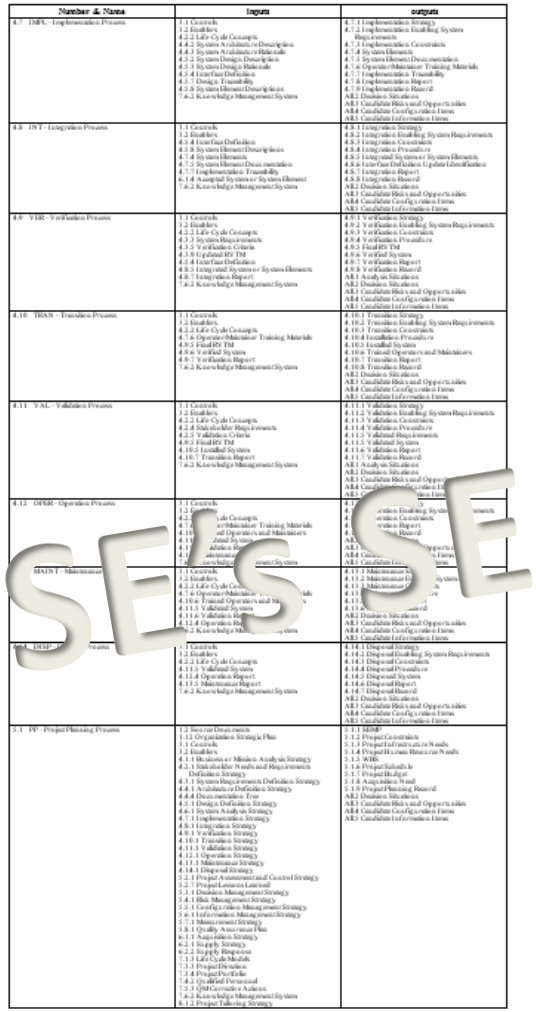
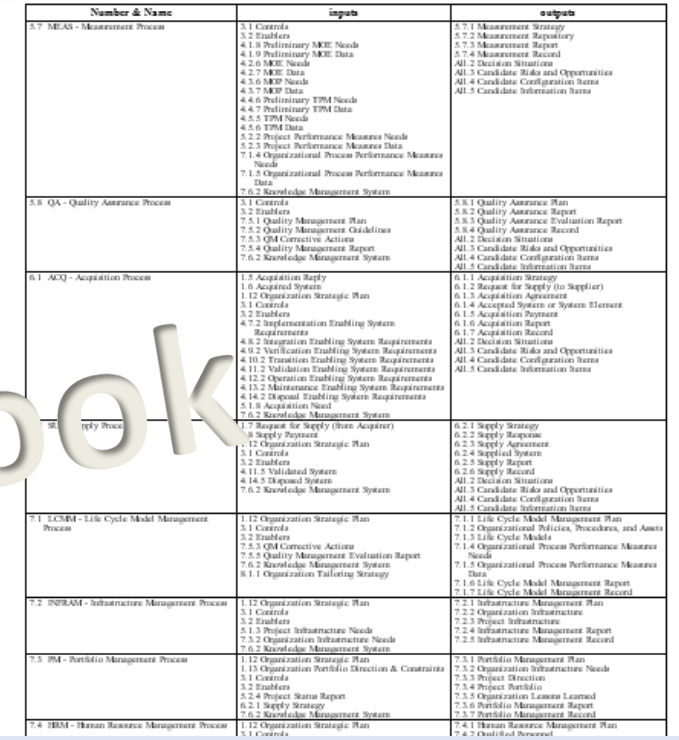
Sys Eng.







~~MIL-STD-31000B~~

emphasizes CAD 3D-PDF

~~AP232~~

too antiquated (floppy disk?)

Sample Document Taxonomy

PDES, Inc. Model-Based Sys Eng.

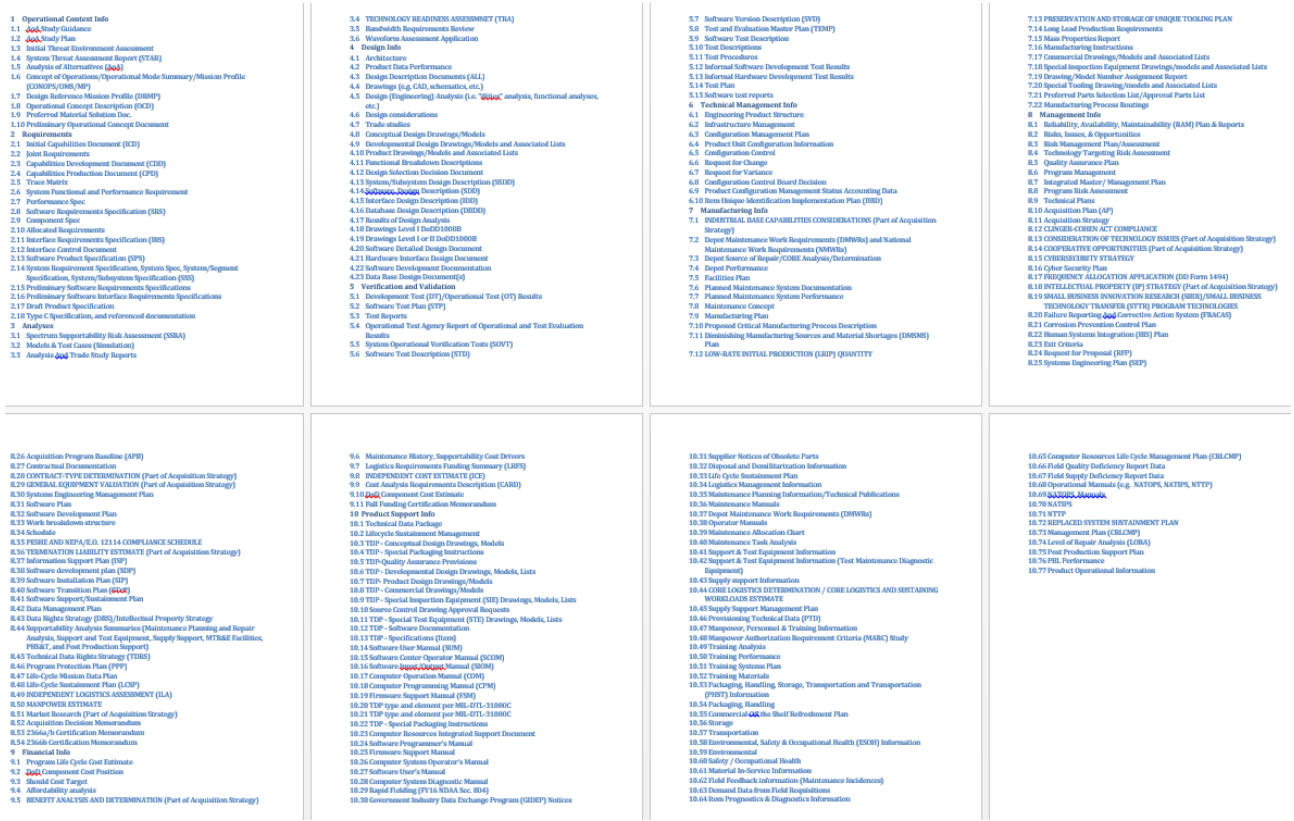
Originally focused on **Digital Artifacts**, INCOSE's DEIX WG (Digital Engineering Information Exchange) has the incentive to fix this

Number & Name	inputs	outputs
0 Context		
1 External	6.1.2 Request for Supply (to Supplier) 6.1.3 Acquisition Agreement 6.1.5 Acquisition Payment 6.2.2 Supply Response 6.2.3 Supply Agreement 6.2.4 Supplied System 7.1.1 Life Cycle Model Management Plan 7.1.6 Life Cycle Model Management Report 7.2.1 Infrastructure Management Plan 7.2.4 Infrastructure Management Report 7.3.1 Portfolio Management Plan 7.3.6 Portfolio Management Report 7.4.1 Human Resource Management Plan 7.4.3 Human Resource Management Report 7.5.1 Quality Management Plan 7.5.4 Quality Management Report 7.5.5 Quality Management Evaluation Report 7.6.1 Knowledge Management Plan 7.6.3 Knowledge Management Report	1.1 ConOps 1.2 Source Documents 1.3 External Stakeholder Needs 1.4 Applicable Laws and Regulations 1.5 Acquisition Reply 1.6 Acquired System 1.7 Request for Supply (from Acquirer) 1.8 Supply Payment 1.9 Standards 1.10 Customer Satisfaction Inputs 1.11 Internal Stakeholder Needs 1.12 Organization Strategic Plan 1.13 Organization Portfolio Direction & Constraints
3 System Life Cycle Processes		
3.1 Controls and Enablers	1.4 Applicable Laws and Regulations 1.9 Standards 5.1.1 SEMP 5.2.5 Project Control Requests 6.1.3 Acquisition Agreement 6.2.3 Supply Agreement 7.1.2 Organizational Policies, Procedures, and Assets 7.2.2 Organization Infrastructure 7.2.3 Project Infrastructure	3.1 Controls 3.2 Enablers

Another Document Taxonomy of a TDP

PDES, Inc. Model-Based Sys Eng.

DoD CDRL DIDs



And the DoD has also asked for help

- 8.26 Acquisition Program Baseline (APB)
- 8.27 Contractual Documentation
- 8.28 CONTRACT-TYPE DETERMINATION (Part of Acquisition Strategy)
- 8.29 GENERAL EQUIPMENT VALUATION (Part of Acquisition Strategy)
- 8.30 Systems Engineering Management Plan
- 8.31 Software Plan
- 8.32 Software Development Plan
- 8.33 Work breakdown structure
- 8.34 Schedule
- 8.35 PESHE AND NEPA/E.O. 12114 COMPLIANCE SCHEDULE
- 8.36 TERMINATION LIABILITY ESTIMATE (Part of Acquisition Strategy)
- 8.37 Information Support Plan (ISP)
- 8.38 Software development plan (SDP)
- 8.39 Software Installation Plan (SIP)
- 8.40 Software Transition Plan (STrP)
- 8.41 Software Support/Sustainment Plan
- 8.42 Data Management Plan
- 8.43 Data Rights Strategy (DRS)/Intellectual Property Strategy
- 8.44 Supportability Analysis Summaries (Maintenance Planning and Repair Analysis, Support and Test Equipment, Supply Support, MTR&E Facilities, PHS&T, and Post Production Support)
- 8.45 Technical Data Rights Strategy (TDRS)
- 8.46 Program Protection Plan (PPP)
- 8.47 Life-Cycle Mission Data Plan
- 8.48 Life-Cycle Sustainment Plan (LCSP)
- 8.49 INDEPENDENT LOGISTICS ASSESSMENT (ILA)

AP233 + AP239 + AP243

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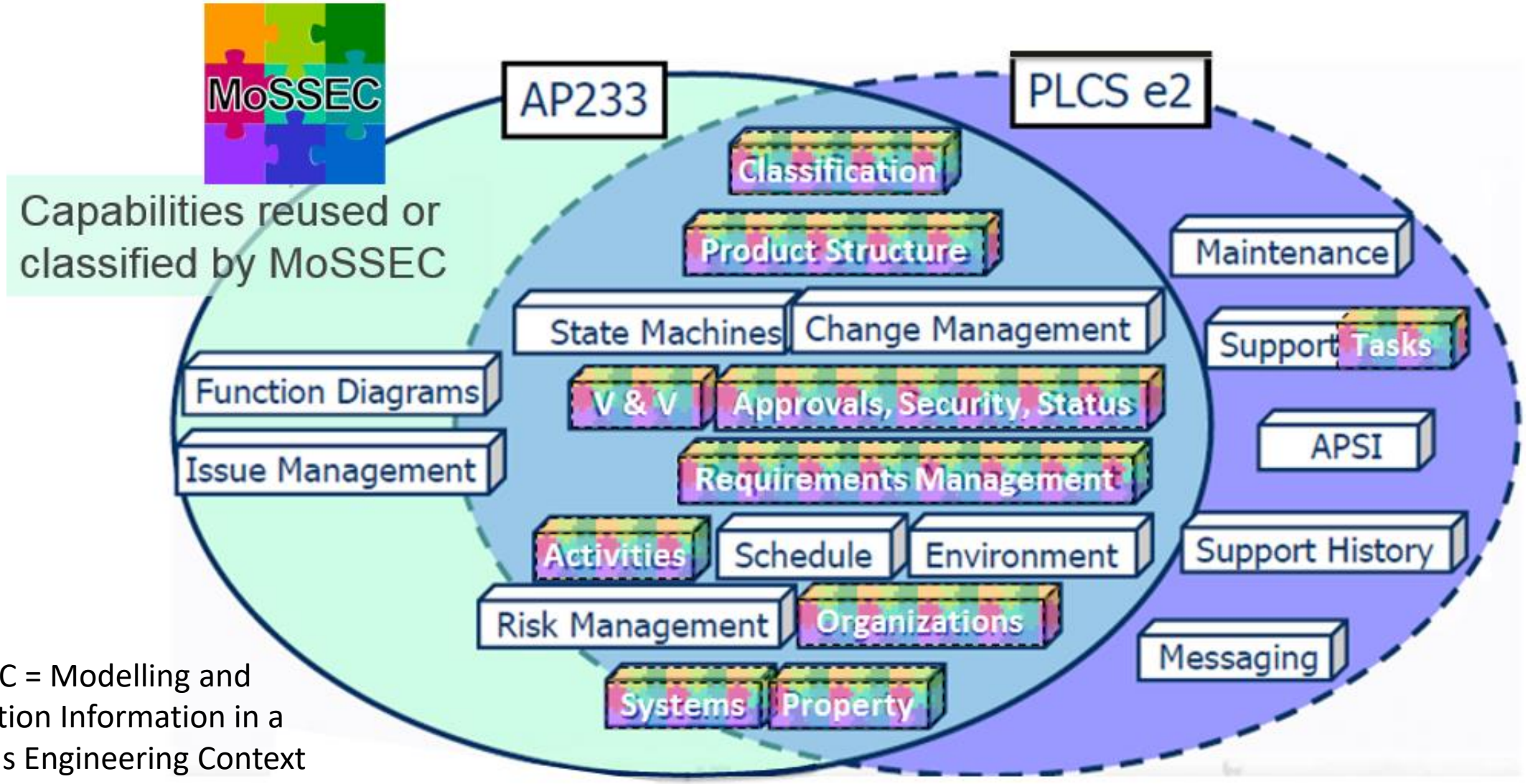

MoSSEC = Modelling and Simulation Information in a Systems Engineering Context

MBSE for PDES (cont)

PDES, Inc. Model-Based Sys Eng.

Strategic Issues

- The HOW strategy is dependent on a clear definition of **WHAT**
- The MBSE view of WHAT to exchange is not clearly defined
  (missing from MIL-STD-31000 and AP232)
- The MBSE view of **WHAT** is not defined by INCOSE's SE Handbook
- The viewpoint of OMG's UAF is at a very high level, has limited adoption, and is defined without an ontology supporting exchange
- AP233 is out of date and missing some critical features

MBSE for PDES (cont)

PDES, Inc. Model-Based Sys Eng.

Technology Fallout

- The document taxonomy is not mapped to a model ontology
- Many industry segments have delayed their MBSE conversion
- The Vendor tools do not promote integration and data exchange
- The big PLM Vendors are late and only offer MBSE add-ons
- The transfer of requirements to CAD is still paper based
- Unlike Europe, major American industry players are not represented in many of the standard bodies and consortiums

The Hard Work

PDES, Inc. Model-Based Sys Eng.

Next Steps

- Initiate a draft conceptual model for “HOW” (start with roadmap)
- create a draft for missing MBSE TDP standards based on INCOSE’s SE Handbook product requirements *(from DEIX)*
  - Publish a position paper on the TDP gaps
  - Initiate update proposals for AP232 and/or MIL-STD-31000
- Define a model ontology based on the document taxonomy
- Define the AP233 gaps (age related)

INCOSE - PDES MoU (MBSE view)

PDES, Inc. Model-Based Sys Eng.

How You can HELP?

- Promote the TIMLM initiatives and update the tools database
- Promote the DEIX initiative and help define the model-based deliverables
- Contribute to the plan phase that defines changes to the SE Handbook
- Follow the changes promoted by prostep ivip, the MoSSEC initiative, and Modelica Association
- Join work groups promoting the digital thread and digital twins
- Promote the INCOSE MoUs with PDES and NAFEMS

MBSE for PDES – Priority Use Cases

System Models

- Industry stds (SysML, AADL)
- Architecture Rep Definition (leaves)
- Architecture Views
- Architecture Context (tree)
- Data Exchange
- Requirements model development
- Other modeling languages
  Model management
- Model Integration
- Consistency verification
- Analytical/performance models
- Unified data model for design iterations
- Analysis, Simulation, test, logistics, training

Process Compatibility

- Artifacts, e.g. Views, products, deliverables
- Security and IP protection
- Recipe for lifecycle states
- Status, milestone, measurement for completeness, quality, and closure
- Task goals and Tool applicability
- Business data exchange type/ timing/agreements
- Versioning, ConfigMgmt
- UAF – Unified Architecture Framework

Requirements Mgmt

Requirements

- V&V distinctions
- Product design specific
- Tool Exchange
- Lifecycle states
- Derivation and linking
- Hierarchy/history
- OEM-Supplier Iterations
- Combo Models and Docs

Meta Data

Meta Data

- Model application
- Model Identification/Activity/Mgmt
- Collaboration
- Terminology/taxonomy/ontologies
- Suitability for Exchange
- Who, What, When, Why, Where

Use Case defines transition to digital from document based process

Evolution of the Engineering Vee

Compare AP233 with Dan Seal's Diamond presentation from GPDIS

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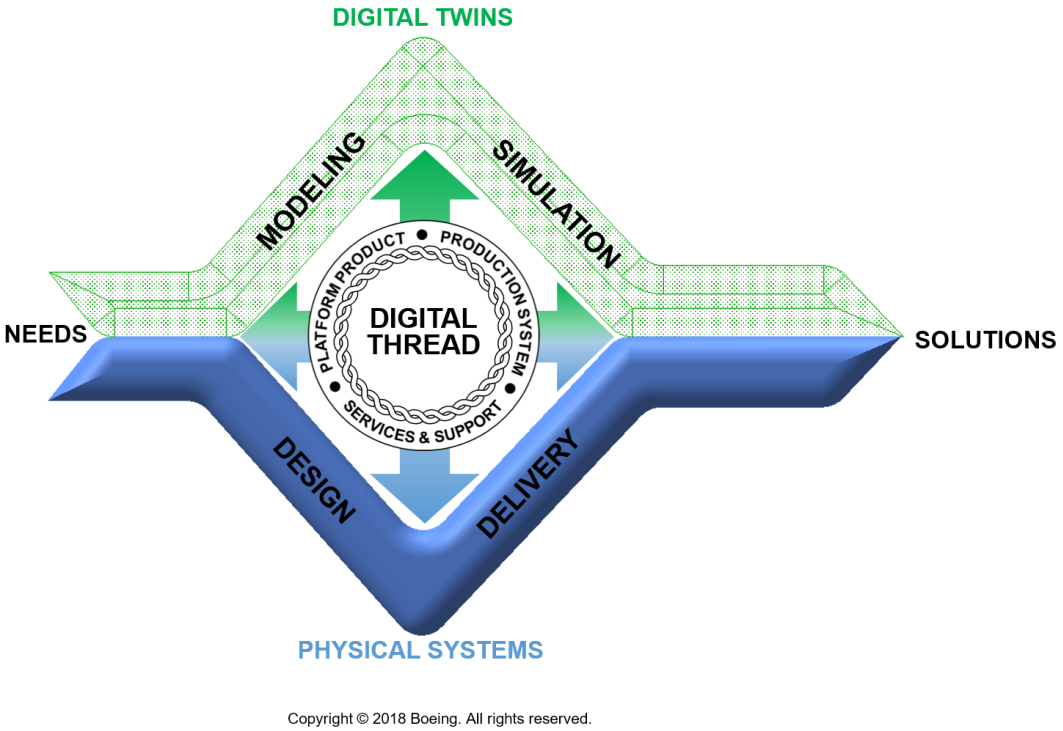
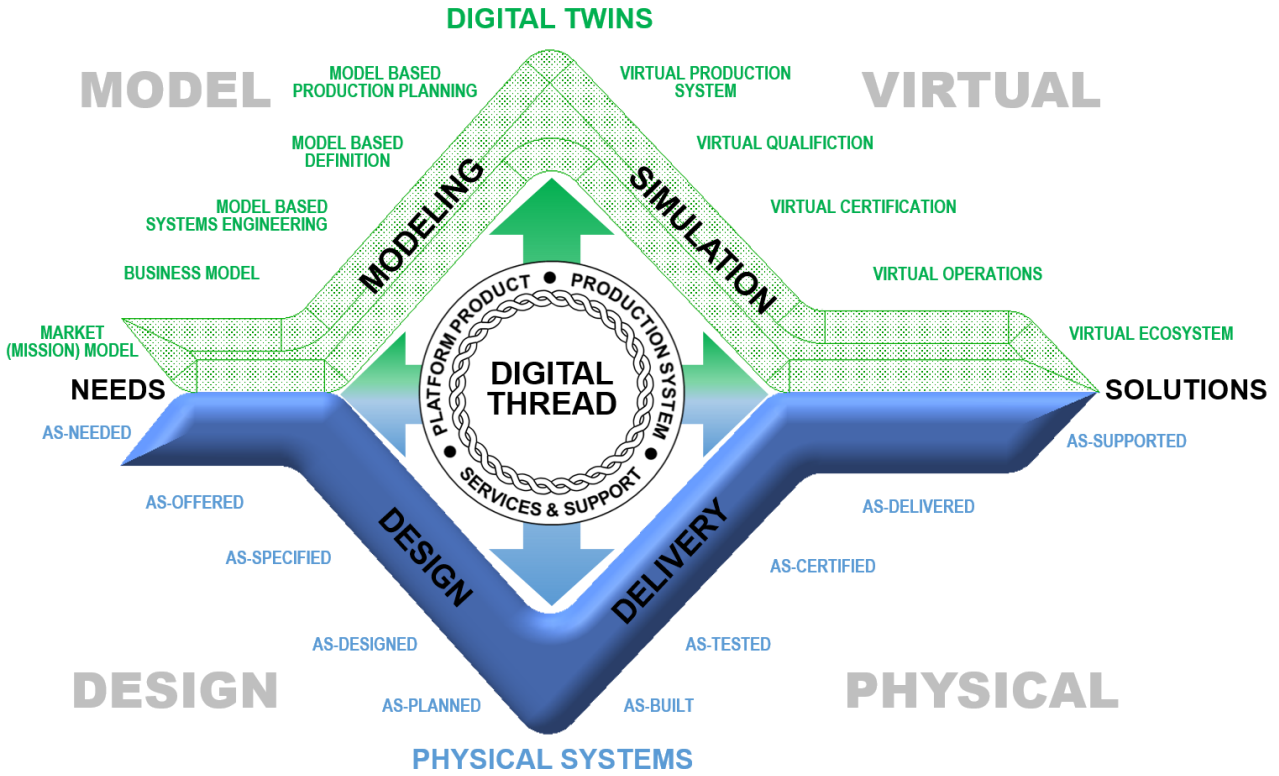
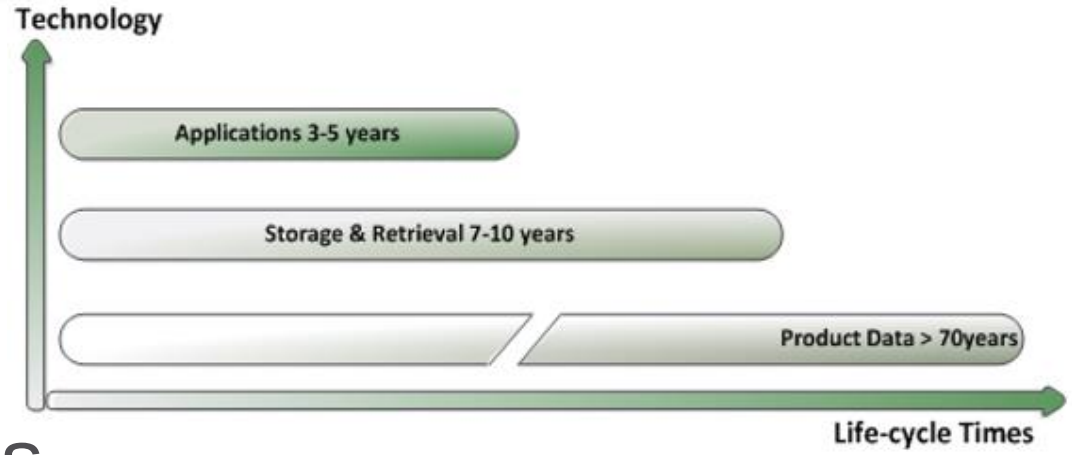




Why LOTAR?

LOng Term Archiving and Retrieval



- LOTAR is Enabled by Standards
- MBSE Justification: Safety, Accident Investigations, Maintenance, Regulations, Obsolescence
- Assume Application versions 3yr; storage/access 10yrs; translate to stable formats for 50yr product cycles.

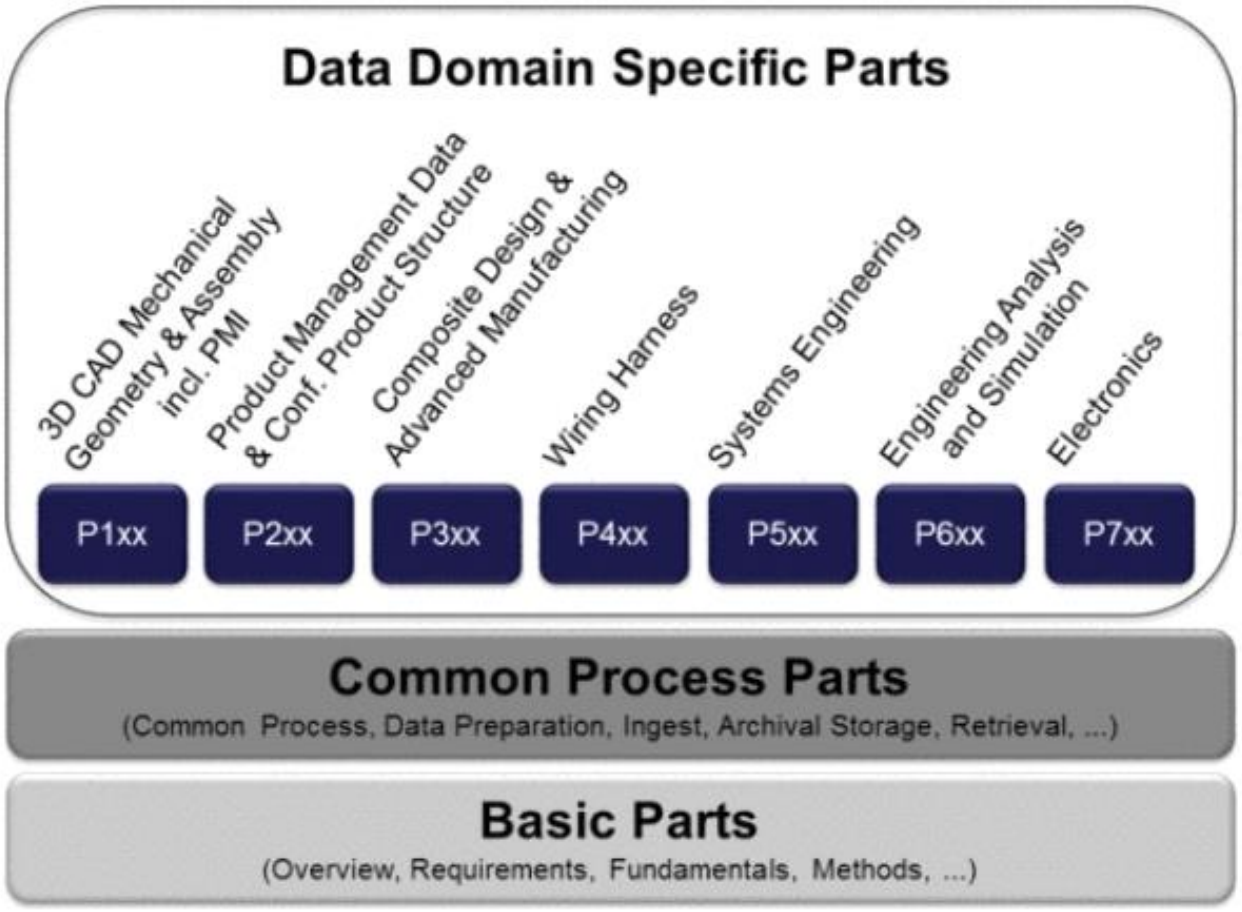
LOTAR Parts Structure

LOTAR International is a working group, supported by the AIA and PDES Inc. in the US, and ASD-STAN and the ProSTEP iViP Associations in Europe.

LOTAR began in late 90s; Europe and USA initiate merger in 2005; first pubs in 2012. In 2013 there was no plan for SE (MBSE).

http://www.lotar-international.org

EN/NAS 9300 Specifications



Developing LOTAR 5xx standards

The structure of the family, organized in a series of parts, NAS 9300:

- **Part 500**: Fundamentals and Concepts for long term archiving and retrieval of Model-Based Systems Engineering information
- **Part 510**: Long term archiving and retrieval of Requirement management “text, graphics, table based” and “parameter based” information
- **Part 515**: Long term archiving and retrieval of Validation and Verification “text based” and “parameter based” information (expanding Part 515)
- **Part 520**: Long term archiving and retrieval of analytical models described by specification or executable code, containing differential, algebraic and discrete equations
- **Part 530**: Long term archiving and retrieval of models defined using architecture description languages (ADLs), ISO 42010, e.g. industry standards: AADL, SysML, UML etc.

(proposed)

LOTAR for MBSE View

GOAL: Retrieval using a standard data representation and available tools

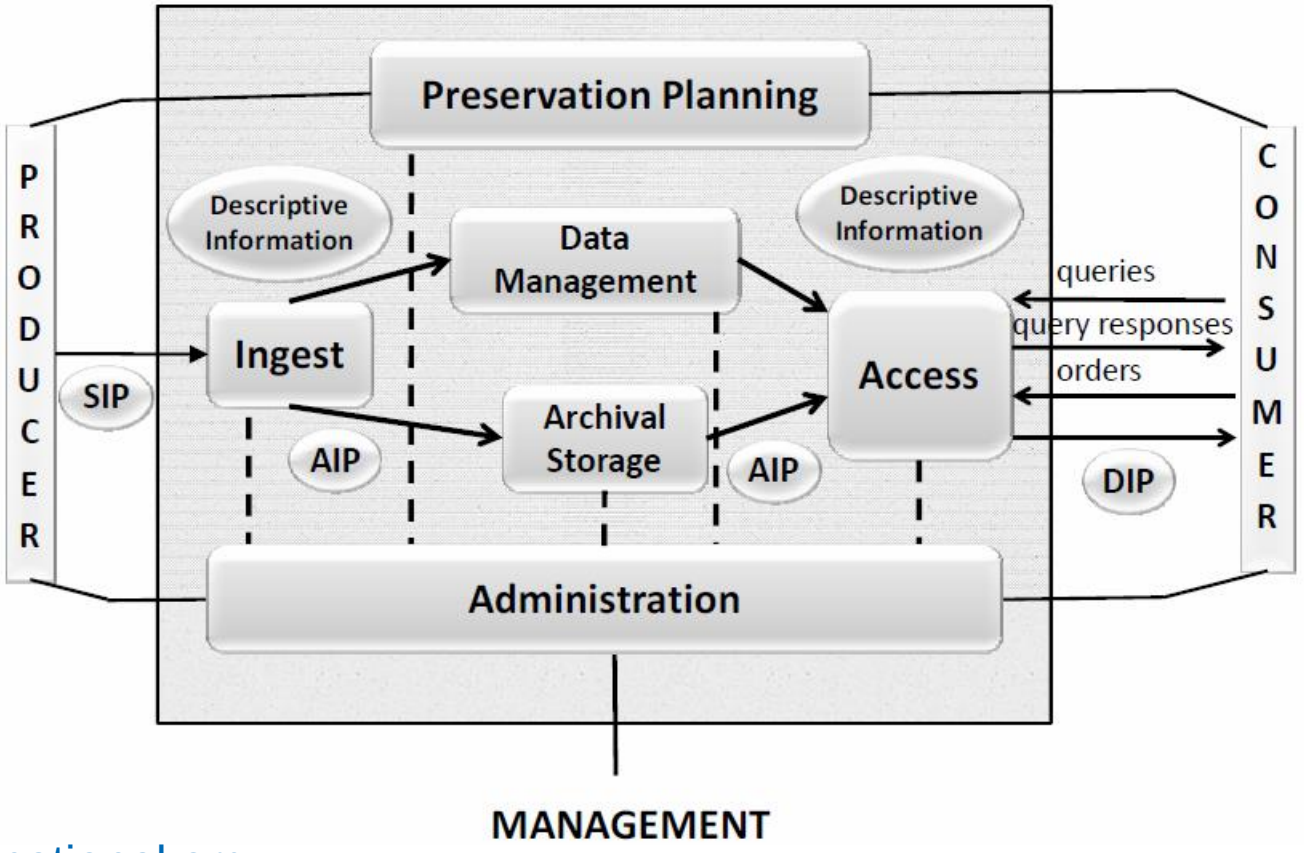
WHAT: Basis for Certification/Qualification, After-market Support Customer Services, Field and Accident Investigations, Part Obsolescence, Design Reuse, New Technology Development

DATA: Systems Architecture not captured on schematics, the LBOM, Requirements traceability, software function

HOW: Capture the Object model, relationships, and metadata

OPEN ARCHIVAL INFORMATION SYSTEM

OASIS reference model - ISO 14721



http://www.lotar-international.org

Related organisations

- PDES - prostep ivip – AFNET
  - Process-Tool-Standards Consortia and Implementers Forums
- INCOSE:
  - a variety of working groups and activities for Systems Engineering
- NAFEMS:
  - Systems Modeling and Simulation Tech Group
    (National Agency for Finite Element Methods and Standards.)
- Aerospace and Defense PLM Action Group:
  - MBSE Working Group

LOTAR for MBSE Opportunities

- Purpose: Design Reuse, obsolescence, accident investigations, after-market support

FUNCTIONAL MOCK-UP INTERFACE

MoSSEC

(ISO 10303-243)

ReqIF

Requirements Interchange Format

Detail 5xx parts

- For each part detail:
  - The business requirements and associated use cases,
  - The identification of the essential information to be preserved for long term,
  - The identification of the appropriate standard(s) (ISO or recognized internationally
  - The description of the test and verification rules for quality control, as required

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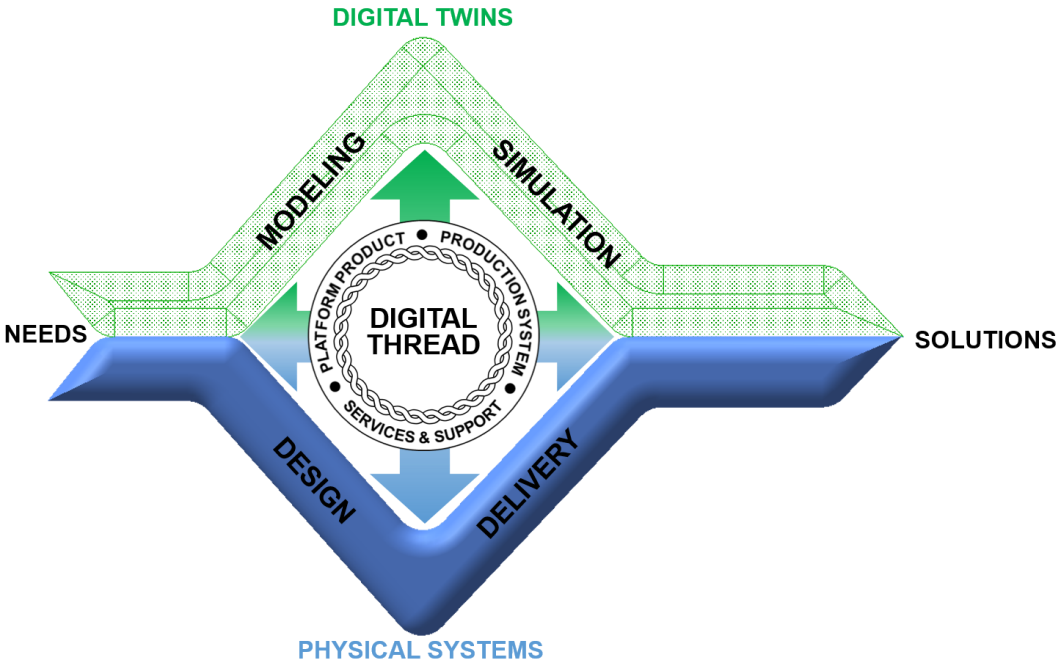
Related standards

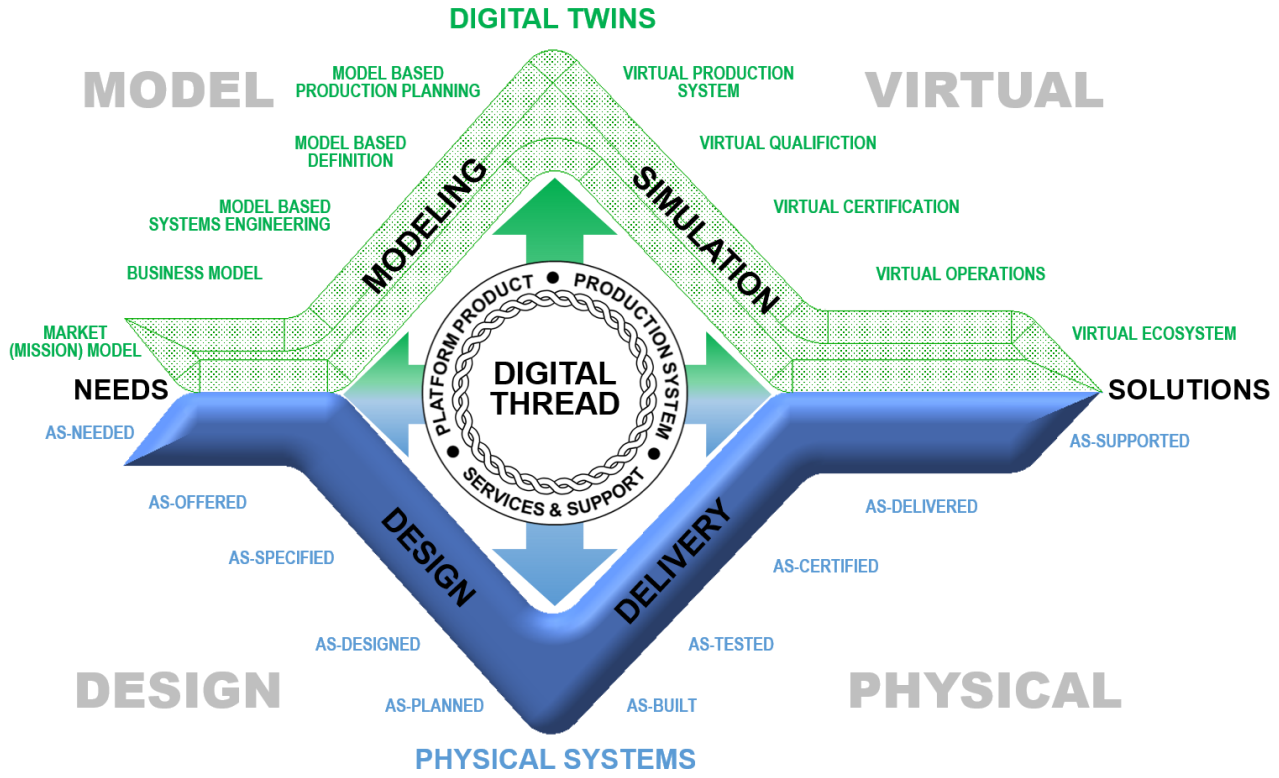
- ISO STEP AP233 Systems Engineering; AP242 Managed model-based 3D engineering; AP239 Product life cycle support
- ISO STEP AP243 Modeling and Simulation information in a Collaborative Systems Engineering Context (in-work, MoSSEC)
- FMI V2, Functional Mockup Interface
- Modelica Language Specification (for physics based equations and models)
- OMG, W3C, and OASIS standards (SysML V2, XMI, UML, OWL, OSLC)

Evolution of the Engineering Vee

Compare AP233 with Dan Seal's Diamond presentation from GPDIS

(must include "Copyright © 2018 Boeing. All rights reserved" statement with the symbol anytime that it is used external to Boeing)





2018 MBSE Workshop

Greg Pollari, Rockwell Collins

and

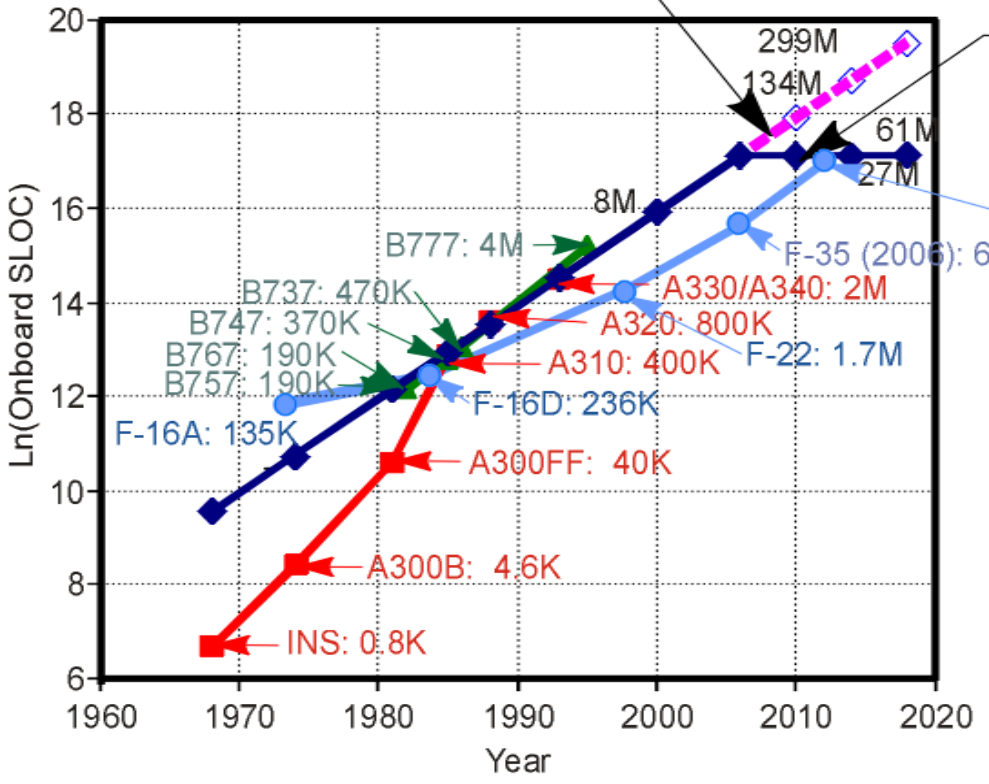
Mark Williams, Boeing Company

GPDIS MBSE - The Landscape

GPDIS Incentive – Affordability and COST Variables

Estimated Onboard SLOC Growth

Slope: 0.1778 Intercept: -338.5
(commercial airliners only)
Curve Implies SLOC doubles about every 4 years



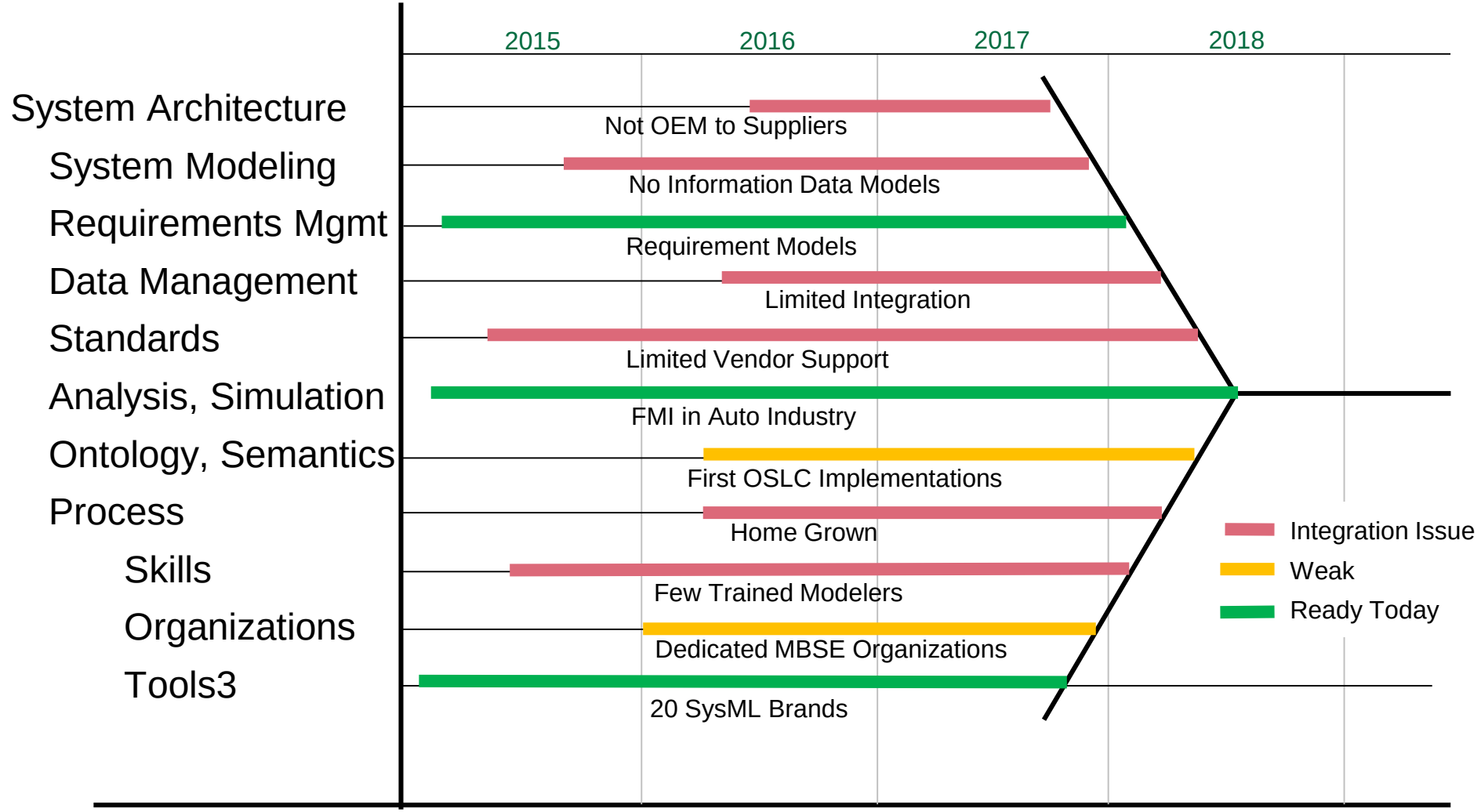
This line fit is pegged at 27.5 M SLOC because the SLOC sizes for 2010 - 2020 are not affordable. The COCOMO II estimated costs to develop that much software is in excess of $10B

- Straight line curve fit
- Boeing aircraft
- Airbus aircraft
- USAF fighter aircraft
- Not affordable extrapolation

Airbus data source: J. P. Potocki De Montalk, "Computer Software in Civil Aircraft," Sixth Annual Conference on Software Assurance (Compass '91), Gaithersburg, MD, June 24-27,1991
Boeing data source: J. J. Chilenski, 2009
USAF fighter data source: Hagen and Sorenson, "Delivering Military Software Affordably,: Defense AT&L, March-April 2013

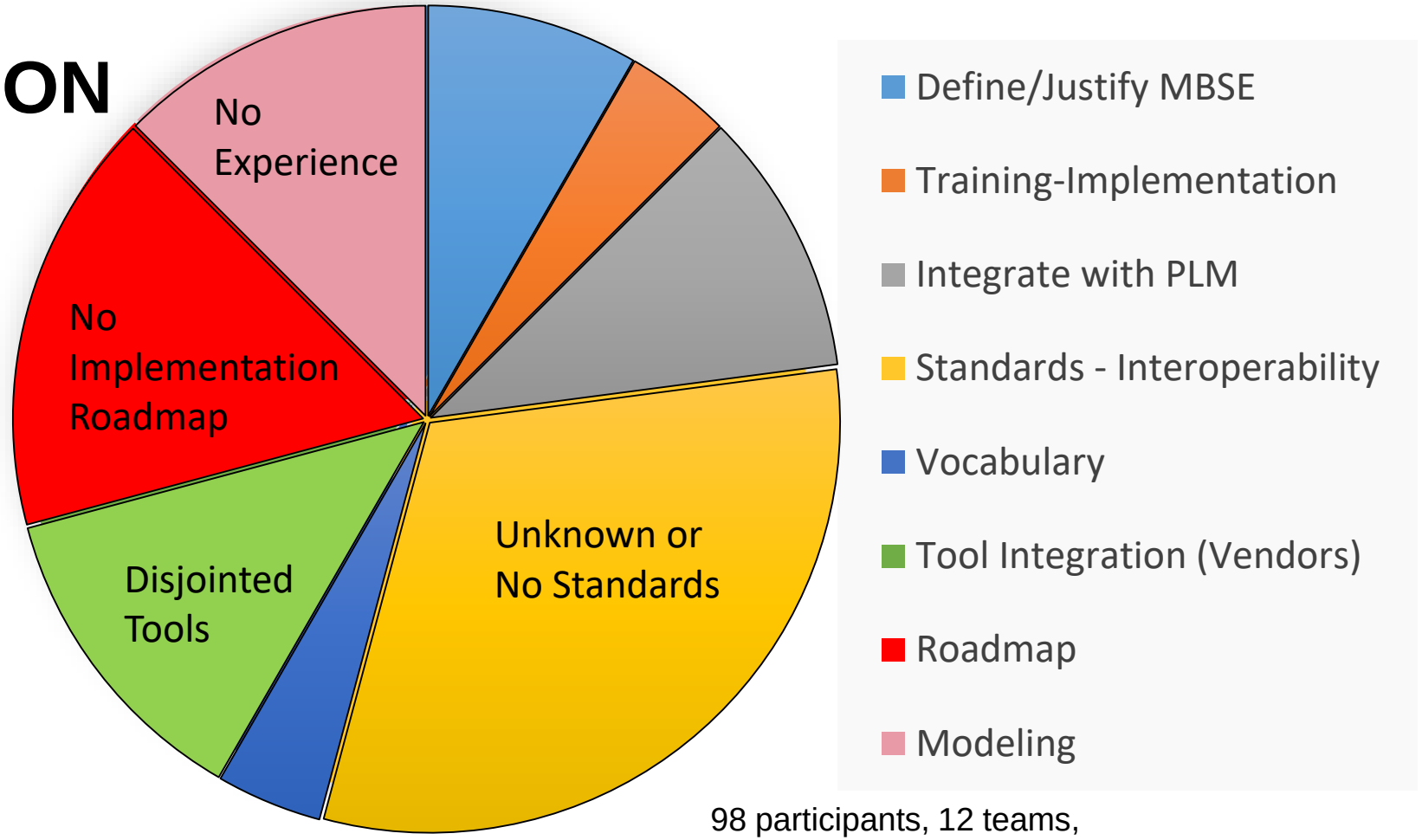
2014 GPDIS Presentation: Dr. David Redman, Director, Aerospace Vehicle Systems Institute (AVSI)

MBSE Workshop: Industry Roadmap



MBSE Workshop: Participant Survey

IMPLEMENTATION ISSUES

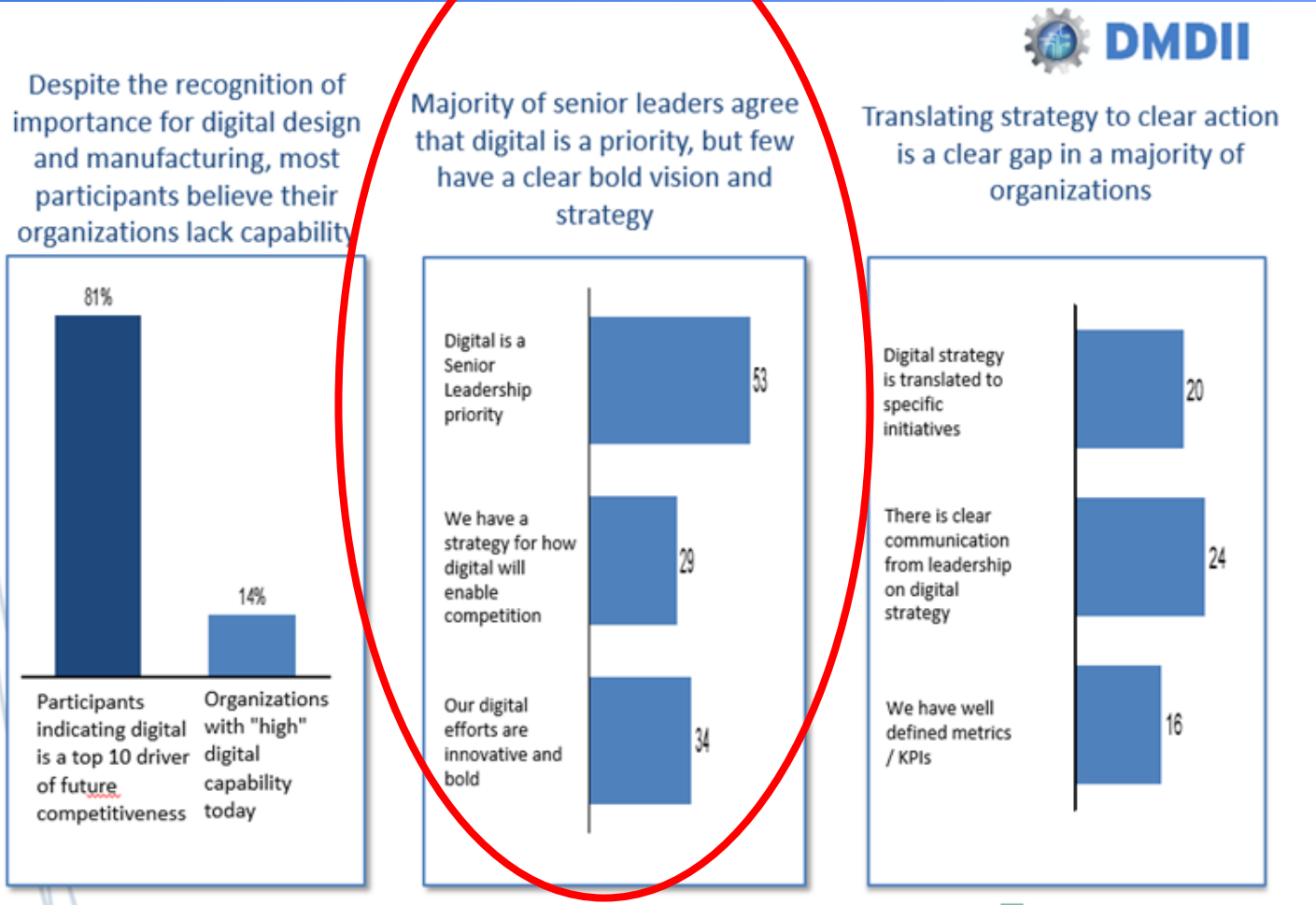


98 participants, 12 teams,
33 written submissions and 104 comments

2018 MBSE Workshop – Greg Harris Keynote

The implementation of digital capabilities in the product realization process, such as early consideration of manufacturability during the development of the science & technology and the design & acquisition phases, is essential to dealing with this complexity and succeeding in this 4th industrial revolution.

Gregory A. Harris, PH.D. – Auburn University

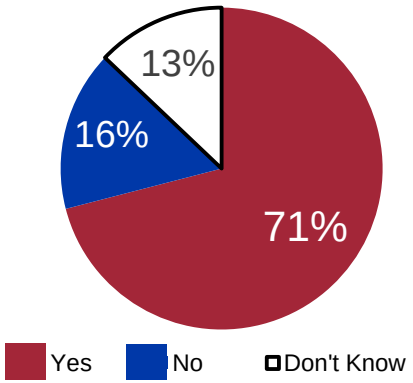


Workshop History at GPDIS

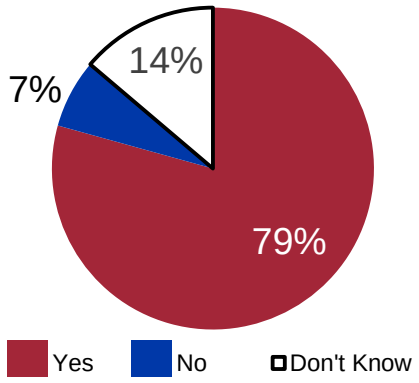
- **The first Systems Engineering Track in 2014**
  - **Solidified the impact on PLM**
  - **Contributions from Multiple Industries**
- **2015 - The first Workshop**
  - **Prioritized Industry Data Standards: SysML, OSLC, FMI, ReqIF**
  - **Focus on OEM to Supplier Interoperability**
- **2016 Workshop produce a Roadmap outline**
  - **Implementation issues - where/how to start**
  - **Future capabilities from the PLM Vendors**
- **2017 Gaps in the Roadmap**
  - **Interoperability Issues**
  - **The need for Leadership**

2018 MBSE Workshop Agenda at GPDIS

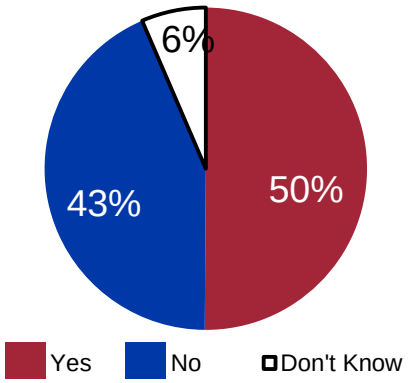
Do you have access to MBSE tools?



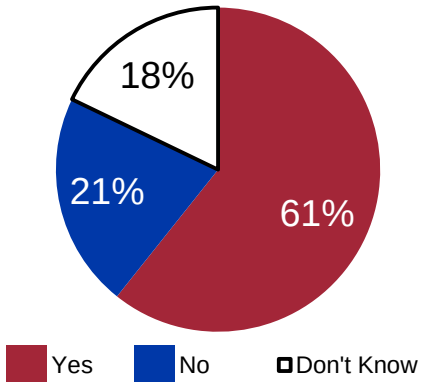
Company recognition of MBSE as contributor?



Do you have multiple ADL Tools?



Company has MBSE department



- Industry CIMdata
- Explore MoSSEC Build a Bicycle
- GPDIS Work Statement and Survey

Presentation	Participants
Airbus/Prostep iViP	63
Airbus	31
ANSYS	43
Aras	33
Boeing	43
Boeing	59
Boeing	42
Northrop Grumman	42
Northrop Grumman	73
Phoenix Integration	31
MBSE Workshop	70

MBSE Workshop - We need to make it work!

Overwhelmed by implementation issues we lose sight of the technology's collaboration opportunities. Define NEXT STEPS:

Define process to integrate Data authored in multiple sources, places, formats, tools

Clarify the alternative avenues for managing IP and copyrights

Use standards to expand the views of diverse data

Overcome the Diversity in modeling methods, architecture frameworks

Educate the workforce, Management, Suppliers, Prod System

Define the Details: meta-data, data models, nomenclature, usability, product structure and configuration management

Every interoperability exercise is unique.

2019
Annual INCOSE
international workshop
Torrance, CA, USA
January 26 - 29, 2019

www.incose.org/IW2019

Presented to the TIMLM Working Group as part of IW2019.

Mark Williams, mark.Williams@boeing.com

Industry Data Standards for MBSE,
Engaging and Influencing the Industry