Systems Engineering - Track Summary

Conference Report

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GLOBAL PRODUCT DATA INTEROPERABILITY
SUMMIT
2014

ELYSIUM Parker NORTHROP GRUMMAN BOEING

Roundtable Agenda

- **Summarize what we heard at this conference (the SE presentations) and registered headcount**
- **Use cases, pain points, and the unique aspects of Systems Engineering interoperability solutions.**
- **How to address the adoption of the ISO standards in the tools?**
- **What message should we be giving to the solution providers, and their feedback at the conference?**
- **Specific feedback, future direction, and input for next year's Systems Engineering track**
- **Info to report-out at closing session.**

Scope and Purpose (not segregated by Tech or Business)

1. How do we make this conference different (not INCOSE, or IBM World) and add value?
2. What can we deliver to the industry? Complementary additions to the stds driven by regulatory deliverables (e.g. ARP4754A)
3. Unity around solving a business problem, in a mix of track/ topic exchanges
4. A focus on the product costs and impact of MBSE, and conversion of industry emphasis
5. Merge more pieces of the V Diagram where MBSE is dominate LHS and huge conference focus on RHS and where the ISO stds are having the biggest impact

Scope and Purpose (page2)

6. How to get the tool/solution providers to listen to/participate in this part of the industry (aerospace MBSE)
7. Heterogeneous tool capabilities, not just CAD
8. Need to partner with other industries (automotive, consumer) for the tool functionality
9. Fight against the “barrier to exit” when using proprietary tools
10. Move to open source and extend invitations to more OS solution providers. OS also have more influence on stds
11. Overlap between the Academic and the SE track subject areas (analysis and SE modeling)

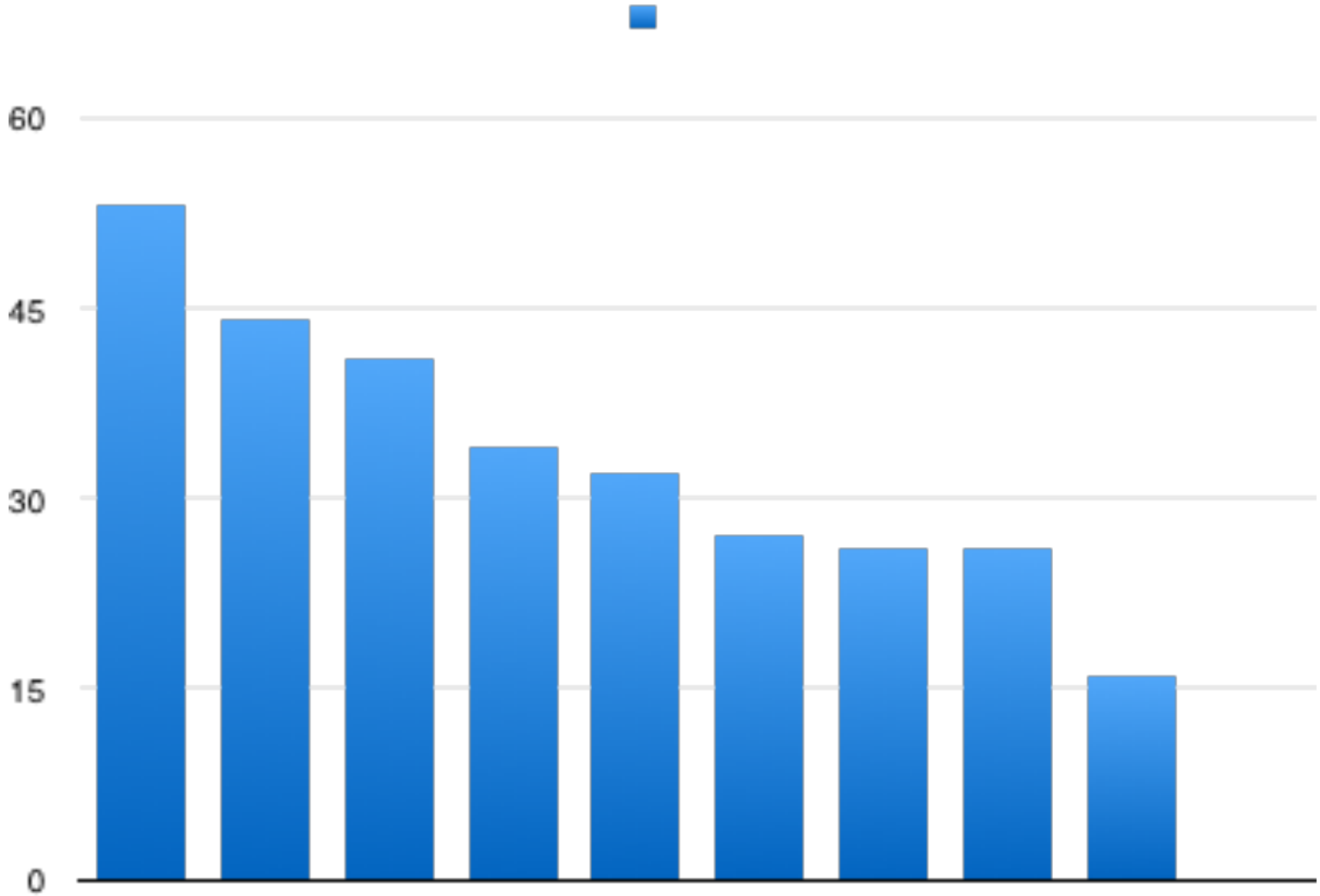
METRICS

Sessions – 9 open and 4 closed

WHO (Presenter)	PERSONS	TYPE
Boeing	40	Closed
Boeing	35	Closed
Boeing	38	Closed
Boeing	28	Closed
Boeing	36	Open
Mentor Graphics	42	Open
AVSI	24	Open
Rockwell Collins	20	Open
Honeywell	43	Open
Airbus	32	Open
IBM	50	Open
Boeing	26	Open
MSC	14	Open
Roundtable	14	Open

SE Track Attendence

Global Product Data Interoperability Summit | **2014**



Attendee Recommendations

- **Reduce presentation times and add a discussion period following each presentation**
- **Add several focused Industry meeting sessions**
- **Market conference to bigger SE skills group**
- **How do we address design complexity?**
- **Develop list of products and their compliance with stds. Identify the biggest gaps in the stds?**
- **Tool interactions are not good between solution providers**
- **Need a std way to create 2D drawings from models (2D or 3D)**

Samples from presentations

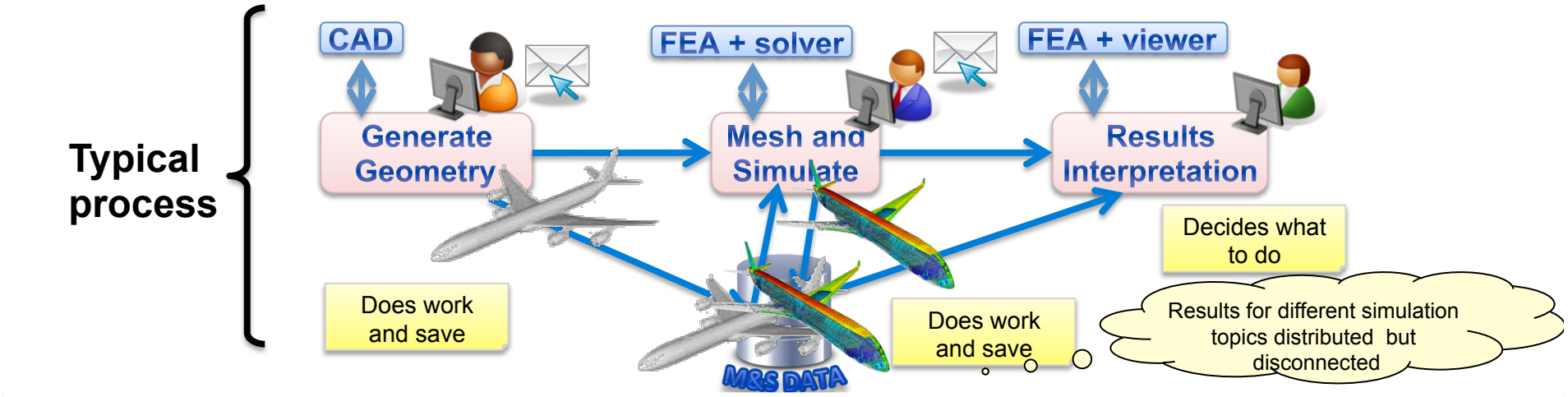
Global Product Data Interoperability Summit | **2014**

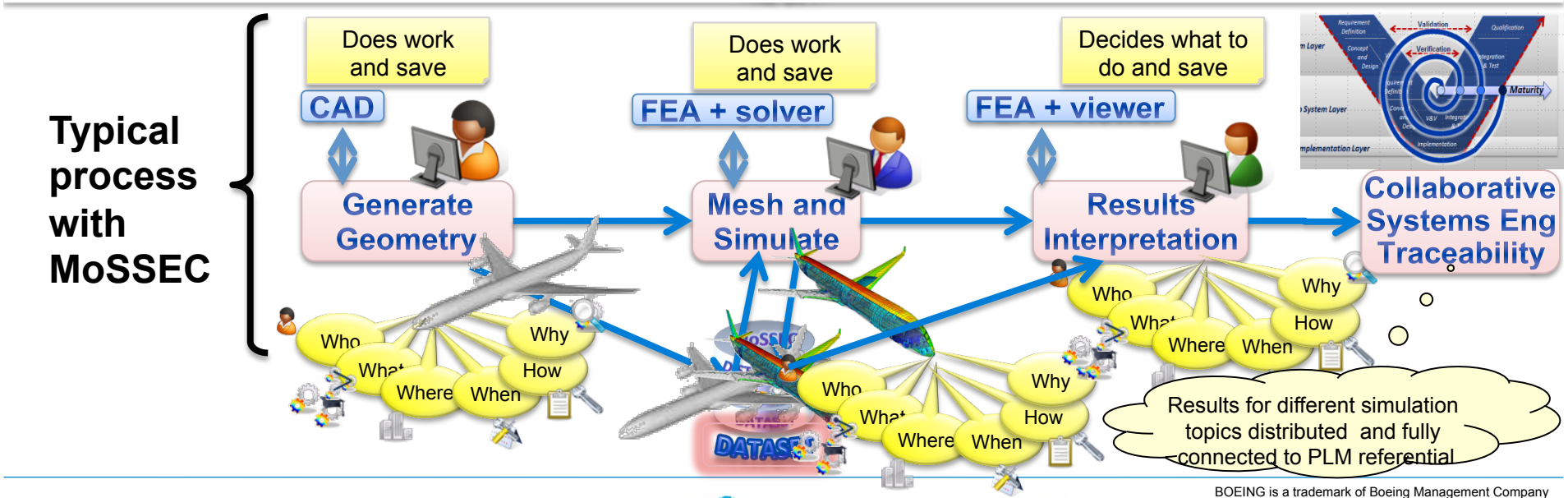
SAVI Interconnect Consistency Check Project Goals

- **Explore how SAVI VIP (Virtual Integration Process) can address the electrical interconnect "Pin 1 Problem"**
  - **Prove physical matches the logical**
- **Develop a solution using commercially available tools**
  - **No duct tape and bailing wire solutions**
- **Minimize impact to existing design processes**
  - **Minimize business process risk**
- **Achieve TRL (Technical Readiness Level) 6 or above**
  - **Reliable and robust**

How is MoSSEC used in practise

Modelling and Simulation information in a SE context
Airbus Operations Ltd (UK)
Adrian Murton





Lessons Learned To Date

- Basic text requirement exchange work within most cases – properties and traces have been more difficult.
- Pre-release version of STEP AP233 being used in some translators.
  - Project is investigating the differences; expect them to be solvable to a certain level
  - Text requirements issues appear minor, situation with common tracing relationships not fully known yet
- Visualization tools and STEP translations improving in retaining CAD PMI (electrical and mechanical) for requirements tracing
  - STEP AP239/233 provides mechanism for linking disparate sources of information.
  - GUID's by themselves are sometimes not enough to guarantee uniqueness
- Investigating ReqIF and XMI best practices for improved alignment.
  - ReqIF development improved through use of purchased ReqIF Guidelines
- **A common Implementer's Forum would accelerate interoperability**

Development of an OSLC-based Design Environment

Model-Based Safety Analysis Platform
The Boeing Company
Ricardo Fricks

OSLC History Lesson (through September 2013)

OSLC

OSLC Steering Committee votes to pursue OASIS: The plan that will eventually see OSLC specification development happen at OASIS is approved

Charter for OSLC Core TC submitted to OASIS by Ericsson, IBM, KTH, Software AG, and Tasktop

First OSLC Member Section Election: **Boeing** joins the Steering Committee

2013, May

W3C Linked Data Platform WG approved: Parts of OSLC Core V2 spec contributed and used as the seed document; OSLC Core V3 work started with plans to rebase off of this future W3C Standard

OASIS

OSLC Member Section at OASIS created by 22 co-founders

W3C WORLD WIDE WEB consortium

OSLC V2 specs start finalizing: there are a growing number of implementations, many popular ALM tools are made available through adapters using a façade pattern

2012, June

2012, May

OSLC Governance Matures: More rigorous IP policies introduced and Steering Committee created; members from: **Accenture, Creative Intellect, EADS, IBM, Siemens, and Tasktop**

OSLC Architecture matures: OSLC Core WG founded, it will serve as the common basis for the OSLC V2 specs

2011, June

OSLC WGs start to address new segments: DevOps and Product Lifecycle Management first, Integrated Systems Management follows

OSLC Change Mgmt V1 spec released: impls available from 3 vendors and in open source

2010, Feb

Eclipse Lyo project created: it is to become *the* resource for OSLC developers

Eclipse Lyo
Enabling tool integration with OSLC

2009, June

Many new WGs get started, including: Quality Mgmt, Requirements Mgmt, and Architecture Mgmt

2008, June

OSLC Change Mgmt is the first WG: scenario discussions will lead to a draft, implementations, and the V1 spec

OSLC announced: seeks to make heterogeneous integrations as simple & effective as those demonstrated within the Jazz Platform

Integration and GPDIS

- **late 80s/early 90s** – CAD was limited to a National focus: SET in France, VDAFS in Germany and the Initial Graphics Exchange Specification (IGES) in the USA
- **1991** - internal McDonnell Douglas exchange using STEP for the C-17
- **1992** - Ford, Allied Signal and STEP Tools, Inc. demonstrated the first successful data exchange of 3D geometry using STEP.
- **1993** - Boeing pilot project called AeroSTEP, was organized between the engine vendors using CATIA, ComputerVision, Unigraphics. The focus on solid geometry, changed the CAD industry
- **1995** – Boeing project called PowerSTEP, formalize the translation process and spawned a new industry of translation applications
- **GPDIS – a Data Exchange Conference with a focus on CAD Integration and Translation. Before 2009, only CAD exchange**
- **2015 Proposal** – Industry project called MBSE_STEP

Integrated Applications

Unite Engineering Teams with OSLC
IBM Software Group
Greg Gorman

Smarter Product Development with RELM and Context SDM

Rational software

- Rational DOORS
- Rational Team Concert
- Rational DOORS NG
- Rational Quality Manager
- Rational Rhapsody
- Rational Design Manager
- Rational Asset Manager
- Rational Focal Point

Mentor Graphics

- Capital
- Volcano
- DxDesigner
- Expedition
- SystemVision

National Instruments
hp
Bugzilla
MathWorks

OASIS
The Organization for the Advancement of Structured Information Standards

OSLC

Eclipse Lyo
Enabling tool integration with OSLC

eclipse

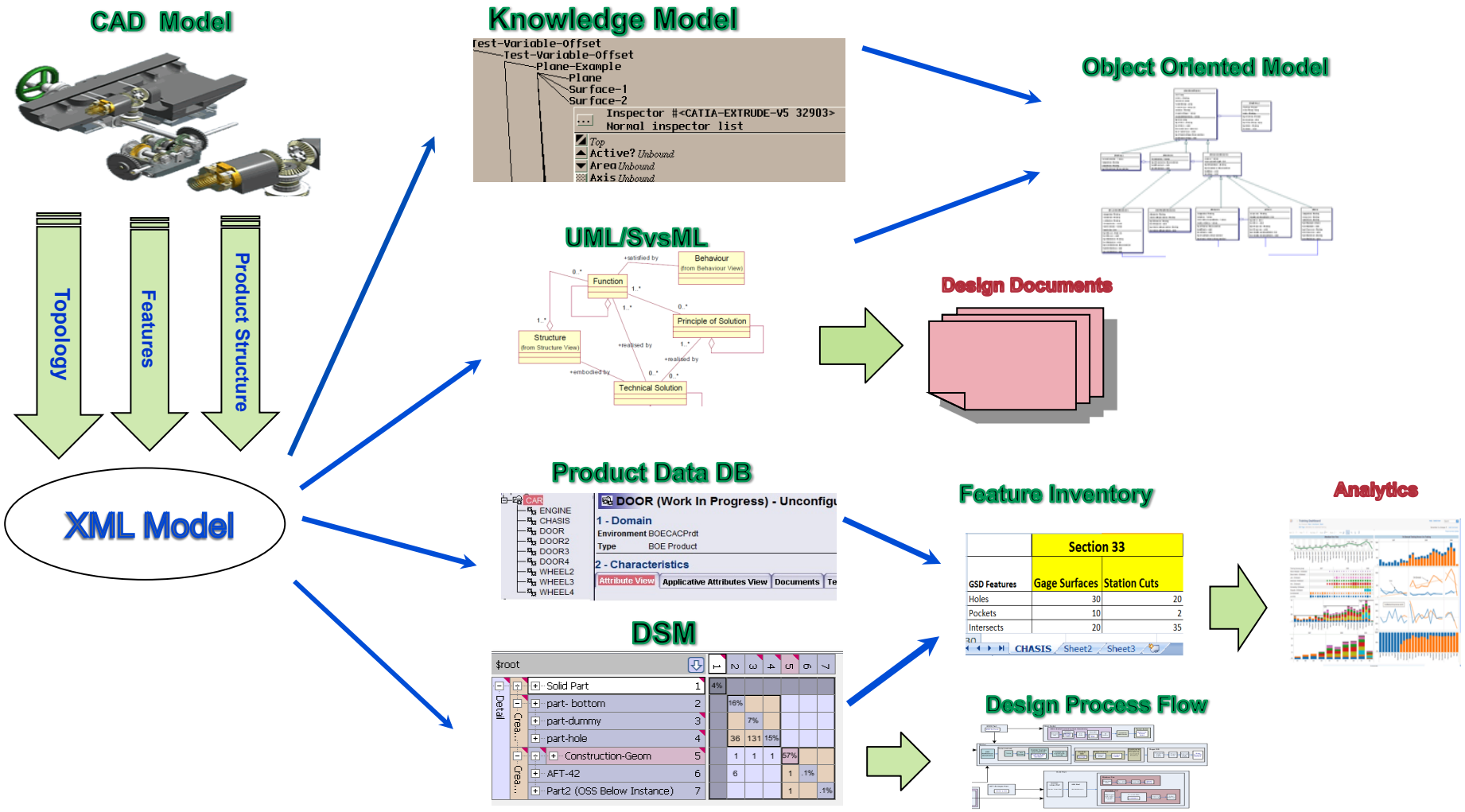
A core set of data sources from IBM Rational

A growing ecosystem of 3rd party data sources

Extensible via open specifications and toolkits

Open & federated, not proprietary & monolithic

A Structured Transformation Process

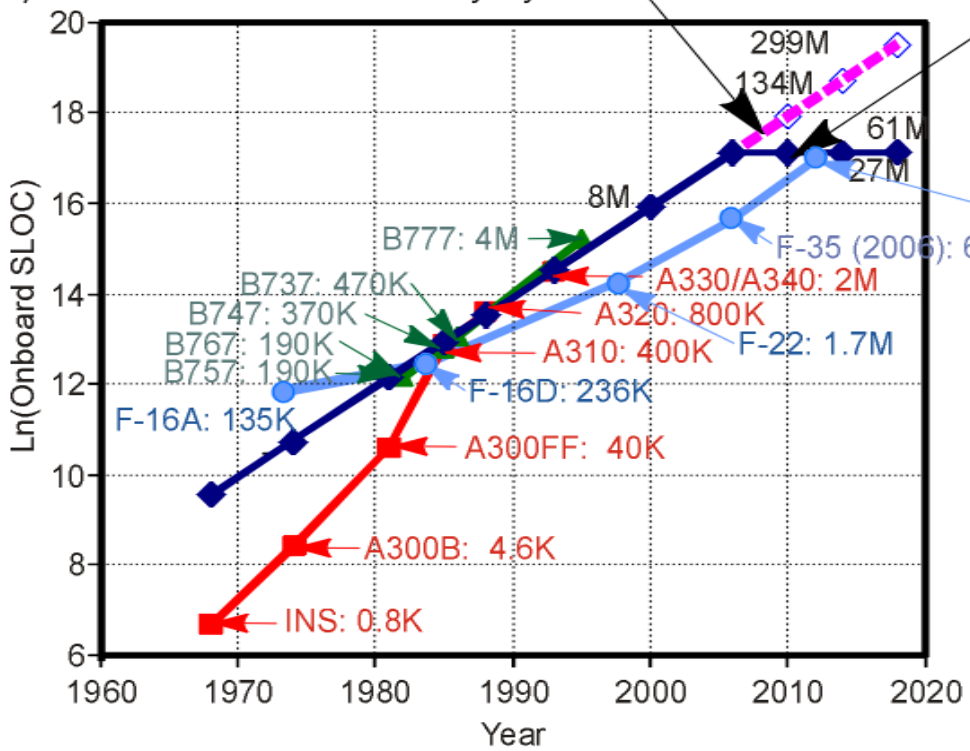


Systems Are Becoming More Complex (potentially exceeding affordability ROI)

SAVI Consistency Checking
Aerospace Vehicle Systems Institute
Dr. David Redman

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