# CIMdata Education Webinar

*Improving Collaboration in the Aerospace Design Chain*

## Improving Collaboration in the A&D Design Chain

Results from 2 Years of Research Sponsored by the Aerospace & Defense PLM Action Group

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## Presenter's Profile

*Your presenter's professional background*

- James L. Roche, Director, Aerospace & Defense Practice
  - Over 30 years of experience in the application of information technology to product development and manufacturing processes of large and medium-sized companies in aero, auto, consumer products, high tech, and medical devices industries. Before joining CIMdata, VP, Global Alliances and Sales Integration for Siemens PLM Software; PLM Practice Manager at CSC Consulting; PLM Practice Manager at A.T. Kearney; and Systems Design and Integration for the General Motors account at EDS. Before beginning his career in PLM, Project Manager at the General Motors Technical Center for advanced manufacturing engineering programs in CIM, Automotive Composites, and Metal Casting.

- Ken Versprille, PhD, Executive Consultant
  - Over 40 years of experience in the application of computer-based solutions for engineering and manufacturing. Research spans geometric design, design collaboration, and PLM standards and openness. During 15 years at Computervision, became the equivalent of CTO, and was R&D Vice President of core CAD and Mechanical applications. As General Manager of CV-Doors, led the group that introduced and managed the CAD industry's first geometric kernel business. Is recognized for publishing the first description of NURBS, the mathematical curve-and-surface formulation, now an international standard in CAD and Computer Graphics. In 2005, received a Lifetime Achievement Award by The CAD Society.

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## Our Mission...

*Strategic management consulting for competitive advantage in global markets*

**CIMdata is the leading independent global strategic management consulting and research authority focused exclusively on the PLM market.**

**We are dedicated to maximizing our clients' ability to design and deliver innovative products and services through the application of PLM.**

 

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*Creating, disseminating, and applying our intellectual capital*



**Research**
- Market research & analysis
- Technology research & analysis
- Reports & publications
- Market news
- Member services...

**Education**
- Executive seminars
- PLM Certificate Programs
- Technology seminars
- Int'l conferences & workshops
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**Consulting**
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- Needs assessment
- Solution evaluation
- Best practices
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- Program management
- Market planning...

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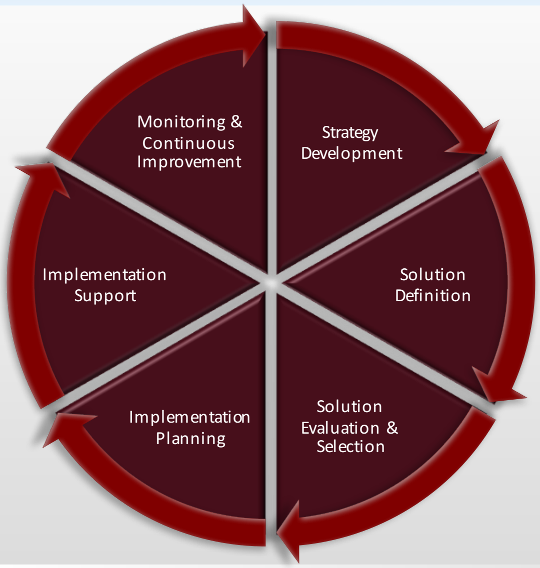


***CIMdata's PLM consulting methodology—transforming your business for a competitive advantage!***

***A comprehensive set of services tailored to fit your specific needs…***



## Our PLM Transformation Clients…

*A sampling of CIMdata's international industrial clients (1 of 2)*

| A&D | Auto | Fab & Assembly | High-Tech |
|---|---|---|---|

## Our PLM Transformation Clients…
*A sampling of CIMdata's international industrial clients (2 of 2)*

| CPG/F&B/Process | Medical/Pharma | Emerging Ind. | Other |
|---|---|---|---|

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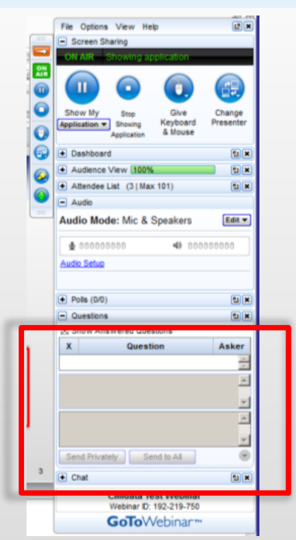
## Questions?
*Please use the GoToMeeting chat panel*

- We're hoping that the anonymity of the chat window might help participants ask more questions
- If you want to ask a question on the record, we'll certainly let everyone know you're asking
- The most important thing is interaction – let us hear from you on the call

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## Key Takeaways
*Improving design chain performance*

- A Design Chain Collaboration Taxonomy suitable for characterizing current state, documenting performance and identifying improvement opportunities
- Perception and assessment of collaboration performance and issues is relatively uniform across major A&D airframe OEMs
- Perception and assessment of collaboration performance and issues varies widely across the tiers of the A&D design chain and a large sample of companies
- The majority of collaboration problems relate to process rather than technology
- Collaboration Environment Set Up is the most problematic
- Standards-based data exchange is working in production today in the A&D supply chain
- In the A&D supply chain heterogeneity is a fact of life

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## Introduction
*About the research sponsors - Aerospace & Defense PLM Action Group*

- Founded in 2014
- Members

  AIRBUS GROUP | BOEING | EMBRAER | GE Aviation | Gulfstream | Rolls-Royce

- An association of aerospace OEMs and aircraft engine providers within CIMdata's globally recognized PLM Community Program, which functions as a ***PLM advocacy group*** to:
  - Set the direction for the aerospace & defense industry on PLM-related topics that matter to members (*including promoting, not duplicating, the work of standards bodies*)
  - Promote common industry PLM processes and practices
  - Define requirements for common interest PLM-related capabilities
  - Communicate with a unified voice to PLM solution providers
  - Sponsor collaborative PLM research on prioritized industry and technology topics
- CIMdata administers Group operations, coordinates research, and manages the progression of policy formulation

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## Introduction

*PLM Global Collaboration is a major topic of concern in the A&D industry*

**Global Collaboration** for the purposes of this research is defined to be comprised of data standards and work processes used for sharing and working with product data among A&D OEMs and their product design and manufacturing engineering partners and suppliers.

**Motivation for investment**

- Identifying, characterizing and remediating the points of friction in the flow of product information across locations, collaboration entities and between applications during product development
- Identifying and providing justification of the need for PLM software providers to support development and then to implement data exchange standards within their products

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## Phase 1 Overview

*Define taxonomy and identify improvement priorities for future in depth research*

- Taxonomy of six dimensional global collaboration space
  - Program phase (When)
  - Collaboration entity (Who)
  - Collaboration purpose (Why)
  - Collaboration environment (Where)
  - Collaboration content (What)
  - Collaboration process & technical capabilities (How)
- Survey of members
  - Determine Improvement Priorities – i.e., nodes with greatest improvement potential within the six dimensional global collaboration space
  - Initial characterization of gaps and trends for identified Improvement Priorities

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## Current State Assessment

*Collaboration characterization – volume by entity by program phase*

Table below shows collaboration entities and volume of collaboration during various program phases

| Program Phase | Collaboration Entity | | | | | |
|---|---|---|---|---|---|---|
| | OEM Remote Site (Internal) | Design & Build Partner | Equipment & System Supplier * | Design Supplier | Build to Print Supplier | Tooling Design Supplier * |
| Concept | 2.5 | 1.5 | 1.3 | 1.1 | 0.5 | 0.2 |
| Initial Development | 3.5 | 3.2 | 2.3 | 2.5 | 1.0 | 1.6 |
| Detailed Development | 4.3 | 4.8 | 3.0 | 3.3 | 2.0 | 3.3 |
| Test (partial) * | 4.0 | 3.7 | 2.7 | 3.3 | 3.0 | 2.3 |

* - Only 3 responses

| Legend |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |

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## Current State Assessment

*Collaboration characterization – volume by purpose by entity*

Table below shows the purpose and volume of collaboration with various collaboration entities

| Collaboration Entity | Collaboration Purpose | | | | | | |
|---|---|---|---|---|---|---|---|
| | Work assignment & des'n delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change | Supplier selection – RFx and response | Contractual Discuss'ns * |
| OEM Remote Site (Internal) | 4.0 | 4.5 | 4.6 | 4.3 | 3.8 | 0.2 | 1.0 |
| Design & Build Partner | 4.0 | 4.4 | 3.8 | 4.3 | 3.8 | 1.6 | 2.3 |
| Equip't & System Supplier * | 2.3 | 2.7 | 2.3 | 2.7 | 2.3 | 2.3 | 2.0 |
| Design Supplier | 3.6 | 3.8 | 3.4 | 3.4 | 3.7 | 1.6 | 1.7 |
| Build to Print Supplier * | 2.3 | 1.7 | 1.7 | 1.3 | 2.0 | 2.3 | 1.3 |
| Tooling Design Supplier | 2.3 | 1.6 | 2.3 | 1.5 | 2.0 | 1.1 | 1.3 |

* - Only 3 responses

| Legend |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

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## Current State Assessment

*Collaboration characterization – volume by environment by purpose*

Table below shows collaboration environments and volume of collaboration for various collaboration purposes

| Collaboration Purpose | Collaboration Environment | | | |
|---|---|---|---|---|
| | Joint session (inside firewall) | Joint project repository (inside firewall) | Joint sharing repository (outside firewall) | Send/receive files (outside firewall) |
| Work assignment & design delivery | 1.6 | 2.6 | 1.4 | 4.1 |
| Simultaneous design & eval'n | 3.2 | 4.4 | 3.0 | 2.7 |
| DMU Baselining | 4.0 | 4.6 | 3.5 | 1.8 |
| Design review & approval | 2.8 | 3.1 | 1.5 | 1.4 |
| Engineering change | 1.8 | 3.3 | 2.4 | 1.9 |
| Supplier selection – RFx and response | 0.2 | 1.1 | 0.1 | 1.7 |
| Contractual Discussions * | 0.0 | 0.3 | 0.0 | 1.3 |

* - Only 3 responses

| |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |




## Current State Assessment

*Collaboration characterization – volume by type of geometric content by purpose*

Table below shows types and volume of geometric content shared for various collaboration purposes

| Collaboration Purpose | Collaboration Content Type – Geometry | | | | |
|---|---|---|---|---|---|
| | Complete native 3D model | Simplified native 3D model | Standard format 3D model (STEP, IGES, other) | Visualization model (JT, 3D PDF…) | 2D models (images, drawings…) |
| Work Assignment & Design Delivery | 4.2 | 2.8 | 2.2 | 1.1 | 2.3 |
| Simultaneous design & eval'n | 5.0 | 2.6 | 1.8 | 1.5 | 2.3 |
| DMU Baselining | 4.3 | 2.8 | 1.0 | 1.6 | 1.5 |
| Design review & approval | 3.3 | 3.0 | 1.1 | 2.2 | 3.4 |
| Engineering change | 3.8 | 2.1 | 1.5 | 1.9 | 1.8 |
| Supplier Selection – RFx and Response | 3.2 | 1.8 | 1.1 | 1.0 | 2.2 |
| Contractual Discussions * | 0.0 | 1.0 | 1.0 | 0.0 | 2.0 |

* - Only 3 responses

| |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

## Current State Assessment

*Collaboration characterization – volume by type of ancillary content by purpose*

Table below shows types and volume of ancillary content shared for various collaboration purposes

| Collaboration Purpose | Collaboration Content Type – Ancillary Information | | | | | |
|---|---|---|---|---|---|---|
| | Requirements | Interface control specification | Technical standards | Simulation, analysis & test results | Bill of material | Planning Information * |
| Work Assignment & Design Delivery | 3.0 | 3.1 | 3.5 | 1.9 | 3.4 | 1.7 |
| Simultaneous design & eval'n | 2.9 | 3.1 | 2.8 | 2.5 | 4.0 | 0.7 |
| DMU Baselining | 1.8 | 3.4 | 2.3 | 2.8 | 2.8 | 1.0 |
| Design Review & Approval | 3.0 | 3.3 | 4.0 | 3.8 | 4.0 | 1.3 |
| Engineering Change | 2.9 | 2.8 | 2.9 | 2.4 | 3.3 | 1.3 |
| Supplier Selection – RFx and Response | 1.2 | 0.8 | 1.1 | 0.3 | 0.8 | 0.7 |
| Contractual Discussions * | 0.7 | 1.7 | 1.0 | 0.7 | 1.0 | 1.7 |

* - Only 3 responses

| |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

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## Current State Assessment

*Evaluation – Collaboration importance self-assessment (Importance~= Volume)*

Table below shows for each collaboration entity, how the importance of collaboration varies by collaboration purpose

| Collaboration Entity | Collaboration Purpose | | | | | | |
|---|---|---|---|---|---|---|---|
| | Work assignment & des'n delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change | Supplier select'n – RFx & response | Contractual Discussions * |
| OEM Remote Site (Internal) | 4.0 | 4.5 | 4.6 | 4.6 | 4.1 | 0.2 | n.a. |
| Design & Build Partner | 4.3 | 4.4 | 3.8 | 4.6 | 4.3 | 1.8 | 2.7 |
| Equip't & System Supplier * | 3.0 | 3.0 | 2.3 | 3.0 | 3.0 | 2.7 | 2.3 |
| Design Supplier | 3.8 | 3.8 | 3.4 | 3.7 | 4.2 | 1.8 | 2.0 |
| Build to Print Supplier * | 2.7 | 1.7 | 1.7 | 1.7 | 2.3 | 2.3 | 1.7 |
| Tooling Design Supplier | 2.5 | 1.6 | 2.3 | 1.8 | 2.3 | 1.6 | 2.0 |

* - Only 3 responses

| |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

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## Current State Assessment

*Evaluation – Collaboration performance self-assessment*

Table below shows for each collaboration entity, how the collaboration performance varies by collaboration purpose

| Collaboration Entity | Collaboration Purpose: Work assignment & des'n delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change | Supplier select'n – RFx & response | Contractual Discussions * |
|---|---|---|---|---|---|---|---|
| OEM Remote Site (Internal) | 3.6 | 3.8 | 3.8 | 3.9 | 4.2 | 1.7 | n.a. |
| Design & Build Partner | 2.2 | 2.3 | 2.8 | 2.8 | 3.1 | 1.7 | 2.0 |
| Equip't & System Supplier * | 1.3 | 1.3 | 1.7 | 1.7 | 2.0 | 1.3 | 2.0 |
| Design Supplier | 2.4 | 2.5 | 2.6 | 2.8 | 3.3 | 1.7 | 2.0 |
| Build to Print Supplier * | 1.7 | 0.7 | 0.7 | 0.7 | 2.3 | 1.3 | 2.0 |
| Tooling Design Supplier | 1.6 | 1.4 | 1.8 | 2.3 | 2.3 | 1.3 | 2.0 |

* - Only 3 responses

| Legend |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Fair (2.0-2.9) |
| Poor (< 2.0) |

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## Current State Assessment

*Evaluation – Improvement priorities – Importance minus performance*

The original method devised for rating improvement priorities was to subtract the performance rating from the importance rating.

| Collaboration Entity | Collaboration Purpose: Work assignment & des'n delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change | Supplier select'n – RFx & response | Contractual Discussions * |
|---|---|---|---|---|---|---|---|
| OEM Remote Site (Internal) | 0.4 | 0.8 | 0.8 | 0.7 | -0.1 | -1.5 | n.a. |
| Design & Build Partner | 2.1 | 2.2 | 0.9 | 1.8 | 1.3 | 0.2 | 0.7 |
| Equip't & System Supplier * | 1.7 | 1.7 | 0.7 | 1.3 | 1.0 | 1.3 | 0.3 |
| Design Supplier | 1.4 | 1.3 | 0.8 | 0.9 | 0.8 | 0.2 | 0.0 |
| Build to Print Supplier * | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | -0.3 |
| Tooling Design Supplier | 0.9 | 0.2 | 0.4 | -0.6 | -0.1 | 0.3 | 0.0 |

* - Only 3 responses

| Legend |
|---|
| Very High (2.1-3.0) |
| High (1.6-2.0) |
| Moderate (1.1-1.5) |
| Low (0.6-1.0) |
| Very Low (<0.6) |

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## Topics to Probe More Deeply

*Focus on collaboration processes most frequently cited for performance problems*

**Collaboration process steps with performance problems:**

| Opp'y # | Collaboration environment set up | Security Admin'n | Information Preparation | Information Send or Post & Notify | Inquiry & Response | Information Receive | Information QA & Remediation | Information Post & Notify Internally |
|---|---|---|---|---|---|---|---|---|
| 1 | XX | X | XX | XXX | XXX | | X | X |
| 1c | X | | X | X | X | | X | |
| 2 | XX | | XX | | X | | | |
| 2c | X | | X | | | | | |
| 3 | X | | X | X | | X | | |
| 3c | X | | X | X | | X | | |
| 4 | X | | X | X | X | X | X | X |
| 5 | | | X | X | X | X | | |
| Total | 10 | 1 | 10 | 8 | 7 | 4 | 3 | 2 |



## Topics to Probe More Deeply

*Focus on technical capabilities most frequently cited for performance problems*

**Technical capabilities with performance problems:**

| Opp'y# | Shared views | View manipulation | Markup | Metadata view & edit | Evaluation | Simulation |
|---|---|---|---|---|---|---|
| 1 | X | | | X | X | X |
| 1c | | | | X | | |
| 2 | XX | | | | X | X |
| 2c | | | | | | X |
| 3 | X | X | X | | X | X |
| 3c | X | X | X | | X | X |
| 4 | X | | | | X | X |
| 5 | | | X | X | X | |
| Total | 6 | 2 | 3 | 3 | 6 | 6 |

# CIMdata Education Webinar

*Improving Collaboration in the Aerospace Design Chain*

## Phase 2 Overview

*Research probes deeper across a broader cross-section of the industry*

### Scope

- Phase 1: Develop a taxonomy of product development collaboration, and survey Members to characterize PLM global collaboration as currently practiced and experienced within Member OEMs and their extended product development ecosystem.
- Phase 2: Conduct a deeper investigation of the high priority improvement areas identified in Phase 1, and heighten confidence in the findings by gathering information from a broader, statistically significant community.

Phase 2 Focus

| Collaboration Entity | Collaboration Purpose: Work Assignment & Des'n Delivery | Simultaneous Design & Evaluation | DMU Baselining | Design Review & Approval | Engineering Change | Supplier Selection – RFx & Response | Contractual Discussions * |
|---|---|---|---|---|---|---|---|
| OEM Remote Site (Internal) | | | | | | | n.a. |
| Design & Build Partner | 1<br>8.1 | 2<br>7.2 | 3<br>3.9 | 4<br>3.8 | 5<br>3.3 | | |
| Equip't & System Supplier * | | | | | | | |
| Design Supplier | 4.4 | 3.3 | 3.8 | | | | |
| Build to Print Supplier * | | | | | | | |
| Tooling Design Supplier | | | | | | | |

Very High (7.1-9.0)
High (5.1-7.0)
Moderate (3.1-5.0)
Low (1.1-3.0)
Very Low (<1.1)



## Information Gathering

*Extended effort yielded statistically acceptable level of response*

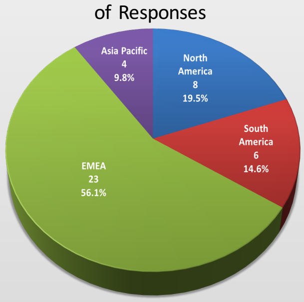
### Effort

- Response period extended from 6 weeks to 4 months
- Significant effort from A&D Members and CIMdata staff

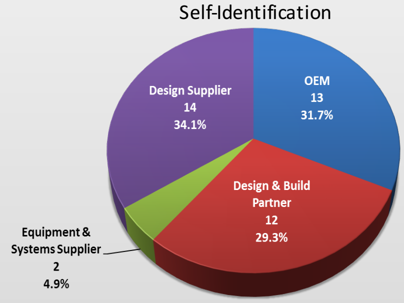
### Response demographics

- 41 survey responses from 20 companies received

Geographic Distribution of Responses




Respondent Companies Self-Identification



## Survey Results: Environments

*Collaboration ENVIRONMENT versus Collaboration PURPOSE*

- All four environments used equally on average
  - Environments inside firewall most used for Work Assignment & Design Delivery as well as Engineering Change
  - Environments outside firewall most used for DMU Baselining
- OEMs work most often:
  - Inside the firewall with Design & Build Partners
  - Outside the firewall with Design Suppliers

**Summary View (All Respondents)**

| Collaboration Environment | Collaboration Purpose: Work assignment & design delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change |
|---|---|---|---|---|---|
| Joint Session (inside firewall) | 3.3 | 3.6 | 2.7 | 3.2 | 3.2 |
| Joint Project Repository (inside firewall) | 3.4 | 2.8 | 2.8 | 3.2 | 3.6 |
| Joint Sharing Repository (outside firewall) | 2.6 | 2.9 | 3.3 | 3.7 | 2.6 |
| Send/Receive Files (outside firewall) | 2.9 | 3.0 | 3.6 | 2.7 | 2.7 |

| Legend |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

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## Survey Results: Content (Geometric)

*Collaboration CONTENT (Geometric Data) versus Collaboration PURPOSE*

- Pattern of usage similar across all Collaboration ENTITIES
- Highest volume for Work Assignment & Design Delivery
- Simplified native 3D CAD is most used by Design & Build Partners and least used by OEMs

**Summary View (All Respondents)**

| Collaboration Content | Collaboration Purpose: Work assignment & design delivery | Simultaneous design & evaluation | DMU Baselining | Design review & approval | Engineering Change |
|---|---|---|---|---|---|
| Complete Native 3D CAD Model | 3.7 | 2.5 | 2.5 | 2.9 | 3.4 |
| Simplified Native 3D CAD Model | 4.1 | 2.9 | 2.3 | 2.9 | 2.7 |
| Standard Format 3D Model (STEP, IGES, etc.) | 4.0 | 3.3 | 2.6 | 3.0 | 2.7 |
| Visualization Model (JT, 3D PDF, etc.) | 3.9 | 2.7 | 2.2 | 3.0 | 3.3 |
| 2D Models (images, drawings, etc.) | 3.6 | 2.5 | 2.2 | 2.7 | 3.3 |

| Legend |
|---|
| Very High (4.4-5.0) |
| High (3.7-4.3) |
| Moderate (3.0-3.6) |
| Low (2.0-2.9) |
| Very Low (<2.0) |

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## Survey Results: Process Problems

*Collaboration ENTITY versus Collaboration PROCESS STEP*

- Design & Build Partners voiced the most concerns

| Respondents' Self-Selected Collaboration Entity | Collaboration Process | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Collaboration Environment Set Up | Security Administration | Information Preparation | Information Send or "Post & Notify" | Inquiry & Response | Information Receive | Information QA & Remediation | Information "Post & Notify" Internally |
| OEM | 2.0 | 2.1 | 2.3 (1) | 1.0 | 1.4 | 1.0 | 2.0 | 1.2 |
| Design & Build Partner | (2) 2.3 | 2.1 (3) | 1.8 (1) | 1.8 | 2.3 (1) | 1.7 (1) | (1) 2.0 (1) | 1.5 |
| Equipment & Systems Supplier | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Design Supplier | (2) 2.4 (1) | (1) 1.9 | 1.5 | 1.3 | 1.5 | 1.5 | 1.6 (1) | 1.3 |

| |
|---|
| None |
| Severe (>4.0) |
| Very Bad (3.1-4.0) |
| Bad (2.1-3.0) |
| Moderate (1.1-2.0) |
| Minor (<=1.0) |

(n) - Number of responses with problems rated as Severe

(n) - Number of responses with problems rated as Very Bad

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## Survey Results: Technical Problems

*Collaboration ENTITY versus Collaboration TECHNICAL CAPABILITY*

- Design & Build Partners and Design Suppliers voiced the most concerns
- Often respondents answered that a capability was not used (CIMdata inferred that a collaboration tool was not used)

| Respondents' Self-Selected Collaboration Entity | Collaboration Technical Capabilities | | | | | | |
|---|---|---|---|---|---|---|---|
| | Shared Views | View Manipulation | Markup | Metadata View & Edit | Evaluation | Simulation | Geometry Edit |
| OEM | 1.7 | 2.0 | 2.0 | 0.8 | 1.6 | 2.2 | 1.8 |
| Design & Build Partner | 2.0 (1) | 1.6 | 1.6 | 2.0 (1) | 1.9 | 2.1 | 1.9 (1) |
| Equipment & Systems Supplier | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Design Supplier | 1.4 | 1.2 | 1.0 (1) | 0.7 | 1.1 | 1.5 (1) | (2) 1.8 |

| |
|---|
| None |
| Severe (>4.0) |
| Very Bad (3.1-4.0) |
| Bad (2.1-3.0) |
| Moderate (1.1-2.0) |
| Minor (<=1.0) |

(n) - Number of responses with problems rated as Severe

(n) - Number of responses with problems rated as Very Bad

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## Telephone Interview Results: Use of Standards

*Subset of respondents interviewed to understand use of standards in collaboration*

- Interview comments
  - Standards for CAD data exchange such as STEP are rarely used internally by OEMs. They use native data and direct translators for most internal exchanges. Exchange is often automated.
  - OEMs often do CAD data exchange with Suppliers using STEP (AP 203, AP214, AP 242), and sometimes IGES
  - JT is used for visual collaboration at some OEM sites
- CIMdata observations
  - OEMs tend to want their supply chain to use CAD data in its native format, yet
    - Some participants have older versions of CAD solutions that can't open data from newer versions
    - IP is more difficult to protect when native CAD files are used
  - All felt standard-based exchange was desirable and needed
    - Yet converters often fail on large data sets
    - Use of standards does not mitigate bandwidth issues

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## Conclusions

*Collaboration Problems*

- Majority of reported problems were related to process rather than technology
- Collaboration Environment Set Up is the most problematic
- Rather than the assumed belief that use of CAD data exchange standards would improve collaboration, surveyed respondents instead listed standardization of:
  - IP protection and export control
  - Workflow processes
  - CAD data quality validation
  - Stable data segmentation guidelines
- Improved logging and tracking of information requests needed
- Metadata sharing (configuration, change process, …) needed
- Most severe technical problem is network latency and data transfer rate

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## Conclusions

*Use of Standards*

- Standards-based data exchange is working in production today in the A&D supply chain
  - Could be used within OEMs, however, direct translators are already built into OEM processes
- In the A&D supply chain heterogeneity is a fact of life
  - Use of standards accepted and applied on a regular basis
  - View of standards is positive and "good enough"



## Recommendations

*Actions that can be taken in the near- and mid-terms (1 of 3)*

- Geometry validation should be performed before data is shared
  - CAD solution providers and third-parties already offer geometry validation tools, most of which can be customized to best fit a user's specific needs
  - At minimum the tools should validate that geometry does not have holes or gaps in the surfaces and solid model structures
- Companies should do a market review to identify any existing tools that can provide a solution to an inquiry and response tracking requirement
  - An inquiry and response tracking system should be put into place between collaboration entities
  - If an appropriate tool cannot be found, companies should work with their primary PLM solution providers to define and implement a collaboration inquiry and tracking tool that can be used between Collaboration Entities

## Recommendations

*Actions that can be taken in the near- and mid-terms (2 of 3)*

- Explore possibility of having solution providers implement a "Where located" capability for components and subassemblies
  - Companies should explore with their CAD solution provider the possibility of implementing a "Where Located" (i.e. in storage) capability
  - The solution providers already provide a "Where Used" function and the basic building blocks should already be in place to implement "Where Located"
- Investigate possibility of implementing PDF-building scripts for packaging data exchange between collaboration entities
  - Suppliers complain that each OEM with whom they deal has different standards of how to package and transfer data
  - Processes can be put in place when data is to be shared with a Collaboration Entity, the appropriate script is identified and run to build the necessary data package

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## Recommendations

*Actions that can be taken in the near- and mid-terms (3 of 3)*

- Available COTS collaboration solutions should be investigated, selected, and used
  - The response "not used" is repeated several times in the comments to indicate that a collaboration capability available in COTS collaboration solutions is not used

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## CIMdata 2016 PLM Road Map for A&D

*Please register today*

- November 8, 2016
- Renaissance Paris La Defense Hotel, Paris, France
- Held in conjunction with PDT Europe 2016 on 9-10 Nov

**PLM Road Map for Aerospace & Defense**

*Joining Forces to Remediate Common Pain Points and Build a Platform for the Next Generation of Product Lifecycle Management*

- Senior executives from the A&D PAG presenting their shared strategies for relieving persistent pain points
- Other speakers from Jet Aviation, DCNS, SAFRAN Helicopter Engines, BAE Systems Submarines, and CIMdata

**Webinar industrial attendees will receive code worth 25% discount**

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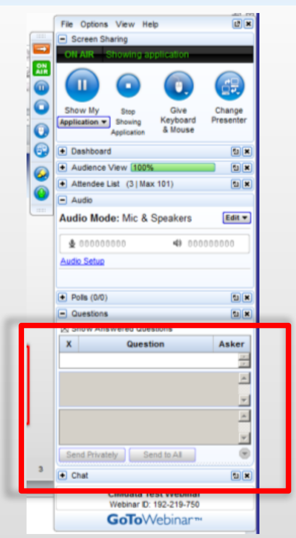
## Questions?

*Please use the GoToMeeting chat panel*

- We're hoping that the anonymity of the chat window might help participants ask more questions
- If you want to ask a question on the record, we'll certainly let everyone know you're asking
- The most important thing is interaction – let us hear from you on the call

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## Next CIMdata Leadership Webinar

- Please join us on October13, 2016 for the next CIMdata Educational Webinar
- Ed Martin, Director, AEC / Manufacturing Convergence Consulting Practice, CIMdata
- "Transforming AEC – Obstacles and Opportunities"



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## Appendix

PLM Global Collaboration Taxonomy



## PLM Global Collaboration Taxonomy

*Program Phase*

| | | |
|---|---|---|
| **1.** | **Program Phase (When)** | Subset of product lifecycle stages that focus on product design |
| **1.1** | **Concept phase** | Front-end research, program KPIs, requirements analysis, partner selection, conceptual design |
| **1.2** | **Initial development phase** | Joint development, product structure definition, systems engineering and interface design |
| **1.3** | **Detailed development phase** | Design and tooling supplier selection, detailed 3D modeling, analysis, BOM creation & release |
| **1.4** | **Tests phase (partial)** | Requirements verification, issues resolution and changes implementation and monitoring through to certification of supplier parts |

## PLM Global Collaboration Taxonomy

*Collaboration Entity*

| | | |
|---|---|---|
| **2.** | **Collaboration Entity (Who)** | Party with whom the OEM is collaborating |
| **2.1** | **OEM remote site (internal)** | Party internal to OEM at geographically different site(s) |
| **2.2** | **Design & build partner** | Program partner responsible for system or major subsystem design and build; data certified within OEM process (e.g. wing) |
| **2.3** | **Equipment & system supplier** | Supplier under evaluation or contracted for component design and build; data certified through testing or TSO (e.g. engine) |
| **2.4** | **Design supplier** | Supplier under evaluation or contracted for subsystem or component design |
| **2.5** | **Build to print supplier** | Supplier under evaluation or contracted for subsystem or component build |
| **2.6** | **Tooling design supplier** | Supplier under evaluation or contracted for tooling or mold design or design and build |



## PLM Global Collaboration Taxonomy

*Collaboration Purpose*

| | | |
|---|---|---|
| **3.** | **Collaboration Purpose (Why)** | Business purpose for the collaboration |
| **3.1** | **Simultaneous design & evaluation** | Synchronous modeling, simulation and or analysis |
| **3.2** | **DMU base lining** | Digital mockup generation for validation and baseline context for concurrent design |
| **3.3** | **Design review & approval** | Review of requirements and evaluation of design solution, with response and sign-off |
| **3.4** | **Supplier selection – RFx and response** | Request for information, request for proposal to support supplier evaluation and selection |
| **3.5** | **Work assignment and design delivery** | Deliver requirements and technical information to and receive design solution from supplier |
| **3.6** | **Engineering change** | Deliver changed requirements to and process proposal revision from supplier |
| **3.7** | **Contractual discussions** | Claims and decisions register; technical analysis workflows regarding issues |

## PLM Global Collaboration Taxonomy

*Collaboration Environment*

| | | |
|---|---|---|
| **4.** | **Collaboration Environment (Where)** | Location of the data used in the collaboration |
| **4.1** | **Joint session (inside firewall)** | Shared dataset during a live joint session of an application running inside OEM firewall |
| **4.2** | **Joint project repository (inside firewall)** | Data files accessible by role within the OEM PDM project repository inside OEM firewall |
| **4.3** | **Joint sharing repository (outside firewall)** | Data files accessible in OEM established and managed PDM repository outside OEM firewall |
| **4.4** | **Send/receive files (outside firewall)** | Data files sent from and received to an OEM established address outside the OEM firewall |




## PLM Global Collaboration Taxonomy

*Collaboration Content - Geometry*

| | | |
|---|---|---|
| **5.** | **Collaboration Content (What)** | Data that is the focus of the collaboration |
| **5.1** | **Geometry** | Geometric model of the design subject, alone or within its geometric context |
| **5.1.1** | **Complete native 3D model** | CAD native format mechanical or electrical data including design intent |
| **5.1.2** | **Simplified native 3D model** | CAD native format mechanical or electrical data without design intent |
| **5.1.3** | **Standard format 3D model (STEP, IGES, other)** | CAD data converted to industry standard format |
| **5.1.4** | **Visualization model (JT, 3D PDF…)** | CAD data converted to lightweight format |
| **5.1.5** | **2D models (images, drawings…)** | CAD data that is not 3D |

## PLM Global Collaboration Taxonomy

*Collaboration Content – Ancillary Information*

| | | |
|---|---|---|
| **5.** | **Collaboration Content (What)** | Data that is the focus of the collaboration |
| **5.2** | **Ancillary information** | Information in addition to the geometry that is relevant the design intent or design solution |
| **5.2.1** | **Requirements** | Specification of design form, fit, function and constraints (e.g. cost, weight, material) |
| **5.2.2** | **Interface control specification** | Boundary conditions between systems, subsystems and or components |
| **5.2.3** | **Technical standards** | Design standards and constraints, including prescribed design and manufacturing practices |
| **5.2.4** | **Simulation, analysis & test results** | Results from modeling behaviors and evaluating performance |
| **5.2.5** | **Bill of material** | Product structure, configurations, and attributes |
| **5.2.6** | **Planning information** | Main milestones, deliverables approvals and commercial information exchange |

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## PLM Global Collaboration Taxonomy

*Collaboration Processes & Capabilities – Processes*

| | | |
|---|---|---|
| **6.** | **Processes & Capabilities (How)** | Actions performed to facilitate collaboration, and capabilities used during collaboration |
| **6.1** | **Processes** | Actions performed by the OEM to facilitate collaboration |
| **6.1.1** | **Collaboration environment set up** | Configure hardware and software environment |
| **6.1.2** | **Security administration** | Administer security permissions and invitations, assuring IP protection and export control |
| **6.1.3** | **Information preparation** | Locate, collect, modify and assemble geometry and ancillary data into a collaboration package |
| **6.1.4** | **Information send or post and notify** | Send collaboration package to recipient or load in repository and send notification to recipient |
| **6.1.5** | **Inquiry & response** | Resolve issues or questions raised by recipient; locate and provide additional data as required; maintain transaction log of each interaction |
| **6.1.6** | **Information receive** | Receive information package or notification from sender and retrieve |
| **6.1.7** | **Information QA & remediation** | Examine and validate received data; raise issues and request additional data as required; maintain transaction log of each interaction |
| **6.1.8** | **Information post and notify internally** | Log final approved data, post to internal repository and issue internal notifications |

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## PLM Global Collaboration Taxonomy

*Collaboration Processes & Capabilities – Technical Capabilities*

| | | |
|---|---|---|
| **6.** | **Processes & Capabilities (How)** | Actions performed to facilitate collaboration, and capabilities used during collaboration |
| **6.2** | **Technical Capabilities** | Capabilities used during collaboration |
| **6.2.1** | **Shared views** | Live joint session of visualization application across multiple sites |
| **6.2.2** | **View manipulation** | Modify view of the visualized geometric model (e.g. zoom, rotate, page, section) |
| **6.2.3** | **Markup** | Highlight region of geometric model and add dimensions, labels, notes, etc. |
| **6.2.4** | **Metadata view & edit** | View and edit geometric model metadata (e.g. material, descriptions, tolerances) |
| **6.2.5** | **Evaluation** | Evaluate geometric model (e.g. dimensional measurement, center of gravity, weight) |
| **6.2.6** | **Simulation** | Fly through, motion simulation, post-analysis simulation, collision detection |