The power of 3D PDF

Use cases, history, status and future of 3D PDF in terms of ISO

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1. **Data, Documents, Packages and Records**

2. **3D PDF Overview. (Technical Data Package)**

3. **PRC Overview**

4. **The way from Model-Based Definition to Model-Based Enterprise**

5. **3D PDF Value and use-cases in Manufacturing and AEC**

6. **History – Status – Future of 3D PDF regarding ISO**

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Document = Data + Presentation

**Package
= (nDocument + nData)**
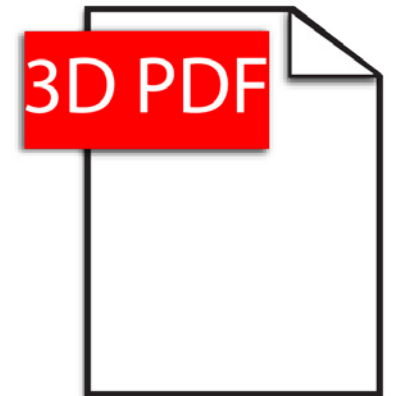
Record

= Package + Security + Persistence
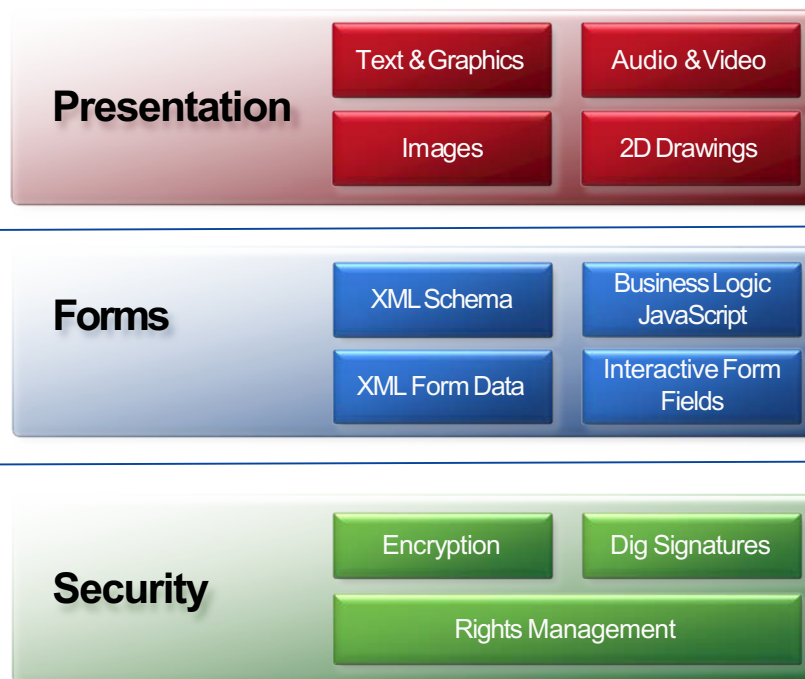
Archive = Data + Documents + Records + Security + Persistence

PDF is the only open format capable of archiving engineering data, documents, records and archives

3D PDF
The Portable Document Format for Engineering

3D PDF
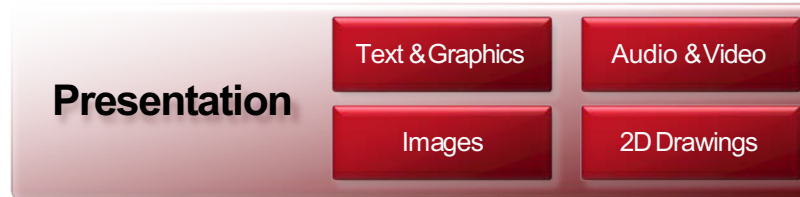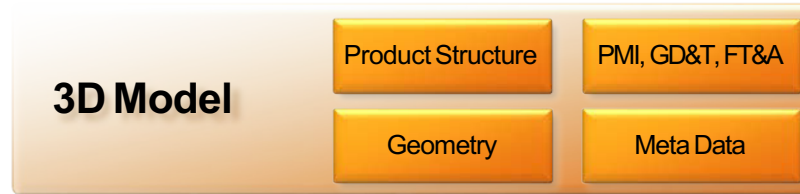
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PDF

Presentation
- Text & Graphics
- Audio & Video
- Images
- 2D Drawings

Forms
- XML Schema
- Business Logic JavaScript
- XML Form Data
- Interactive Form Fields

Security
- Encryption
- Dig Signatures
- Rights Management

JavaScript

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3D PDF

3D Model
- Product Structure
- PMI, GD&T, FT&A
- Geometry
- Meta Data

Presentation
- Text & Graphics
- Audio & Video
- Images
- 2D Drawings

Forms
- XML Schema
- Business Logic JavaScript
- XML Form Data
- Interactive Form Fields

Security
- Encryption
- Dig Signatures
- Rights Management

3D JavaScript

JavaScript

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3D PDF is an interactive 3D Model embedded into an interactive PDF document

Quality Control Checklist

Submit Completed Checklist
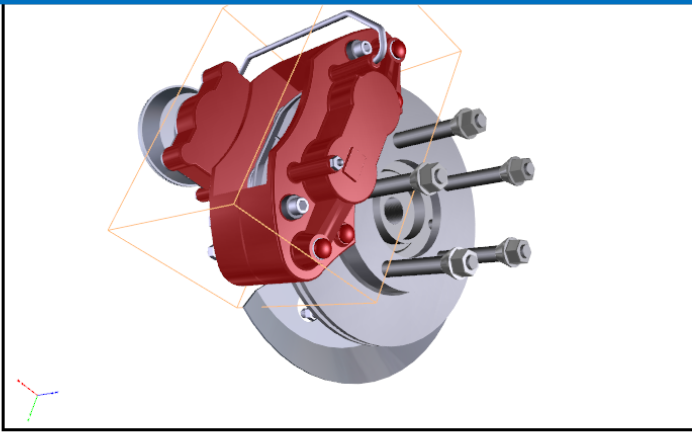
Step 1 - Select a part to view: **Calipers**

1. Ensure that **Booster** is securely fastened
2. Check piston and **Caliper** alignment
3. Ensure that **Rotor** is seated correctly
4. Check clearance between **Dust Cover** and Rotor

Step 2 - For detailed part data, select a part with the mouse in the 3D window. Additional part data appears in the section below.

Torque   281 ft/lbs for 3/4 inch bolts

Alignment   attaches to rotor and hub

Additional Info
this part must be placed before the dust cover or lug nuts are attached; piston must be in compressed position to attach

Step 3 - If a discrepancy is found, use the section below to provide details about the problem (s)

☐ Problem with fit
☒ Problem with tolerances
☐ Wrong parts/parts version

Remedy

Notes

Contact Supplier to discuss immediately

Assembly Name   Front Brake Assembly

Links that activate 3D Views

3D Viewport – Leverage CAD data from PLM system.

Selection event highlights geometry and triggers display of associated data in various form fields

3D View's Selected Node Name

Push button for Form Routing

3D Selection's associated XML Data in form fields from an Enterprise system

Data Collection via form fields

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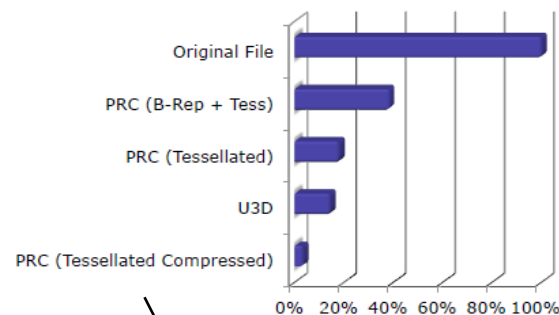Sr. BDM Document Cloud
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PDF 3D Geometry Standards

Universal 3D (U3D)
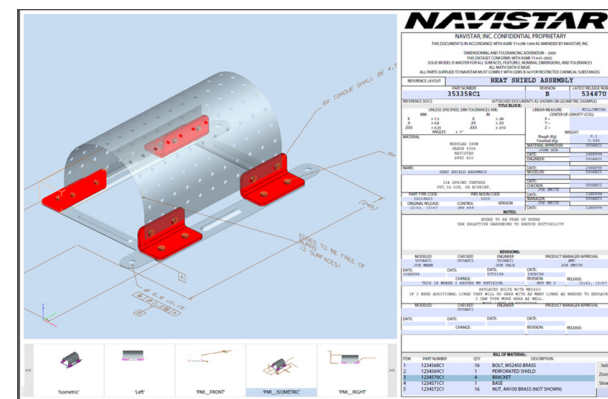### ECMA 363 Edition 1 (TC43)

- Tessellated meshes
- Structure
- Light sources
- Textures
- Animation (keyframe)

Product Representation Compact (PRC)
ISO 14379 (TC171)

- Tessellated meshes
- Precise B-rep geometry
- Product Structure
- Product manufacturing information (PMI)
- Properties / Metadata
- Highly compressible
- Animation through Javascript

THE Source for 3D PDF Technology

Getting Started with 3D PDF

Open the 3D PDF and select the option to establish "Security Trust" for 3D PDFs that include video, animations or scripts which is required to enable the embedded media. Find the Security Trust option in the upper right corner.

Rotate · Pan · Zoom

Original File	
PRC (B-Rep + Tess)	
PRC (Tessellated)	
U3D	
PRC (Tessellated Compressed)	

0% 20% 40% 60% 80% 100%

by factor 150

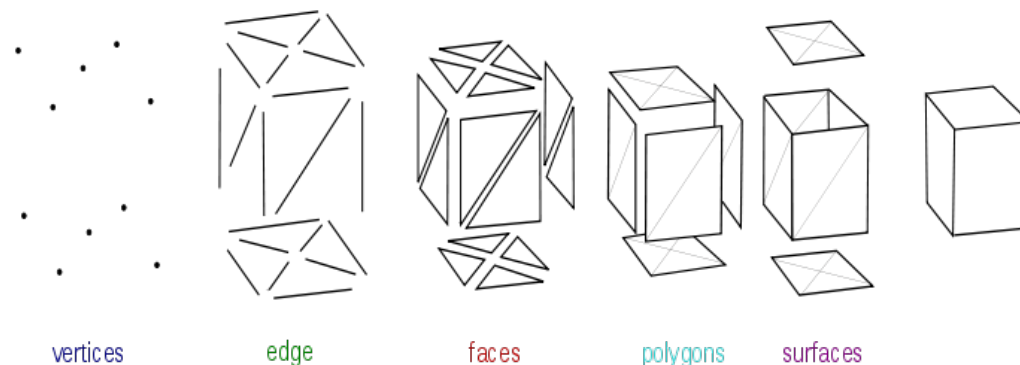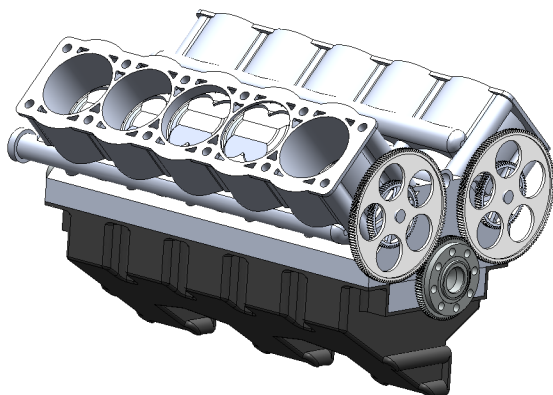Uli Isermeyer
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PRC Content B-Rep (Boundary Representation)

Topology

- **Complete topological description**

Geometry

- **Points, coordinate systems, polyhedra, curve and surface definitions**
- **Maintains periodic and parametric definition for curves/surfaces**
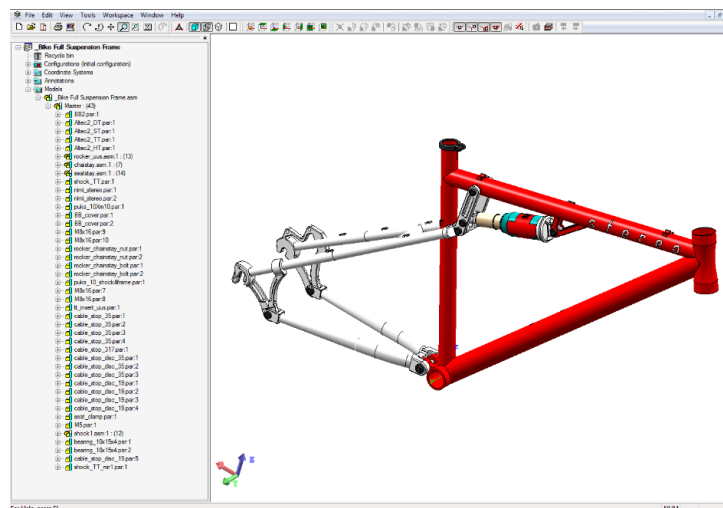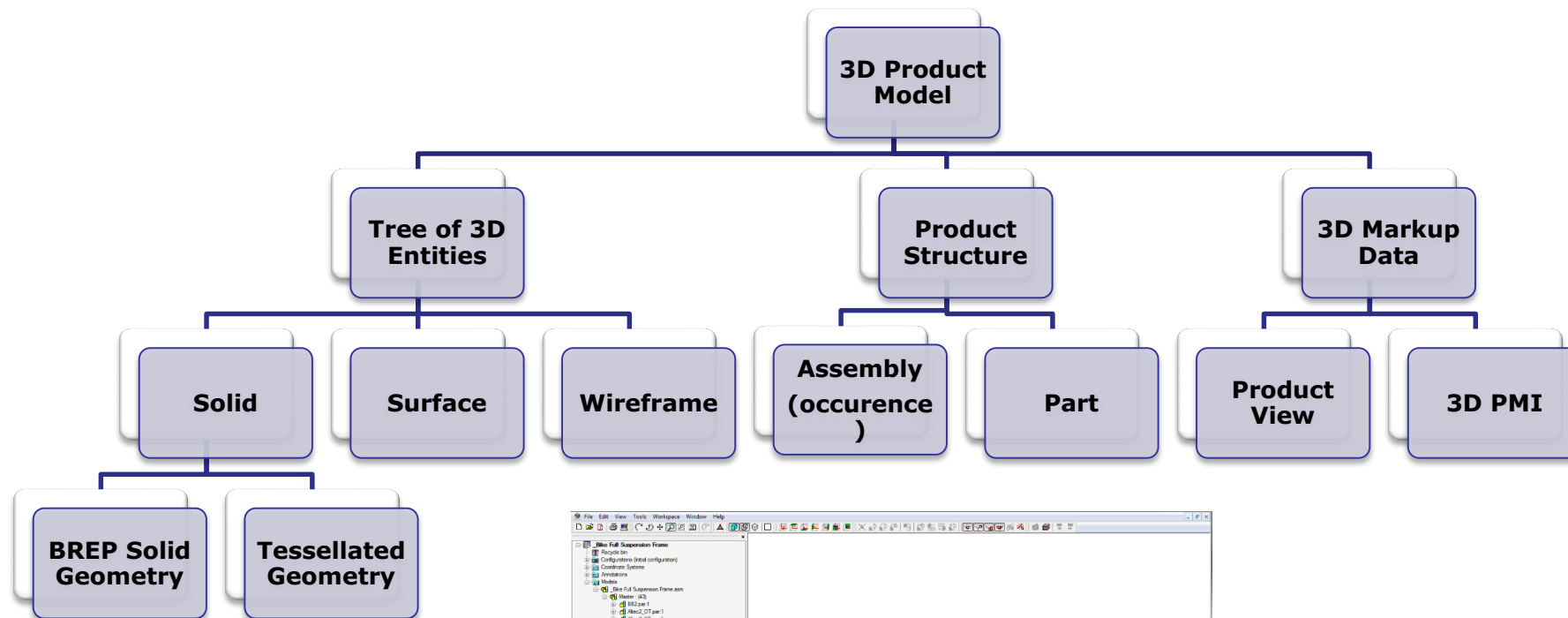- **All surface geometry can be converted to NURBS representation**

vertices   edge   faces   polygons   surfaces

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PRC provides mechanisms for the main constructs of 3D CAD models

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www.pdfa.org
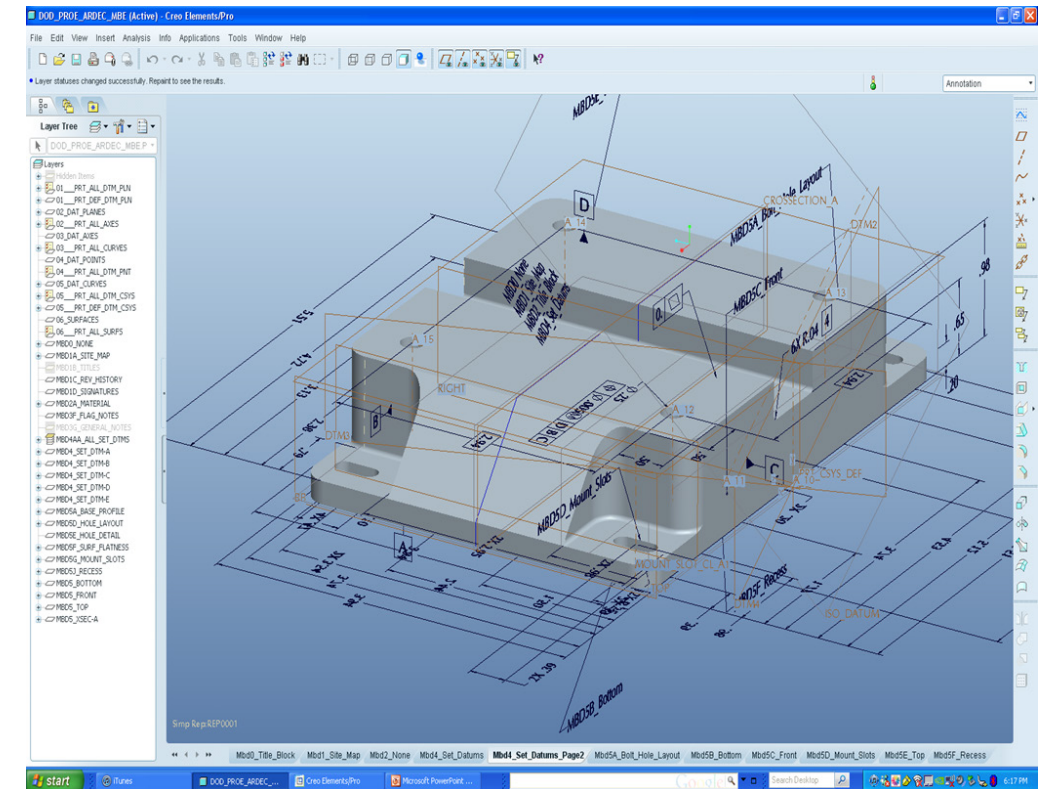
Model-Based Definition (MBD) means:

- the practice of using 3D digital data (such as solid models and associated metadata) within 3D **CAD** software to provide specifications for individual components and product assemblies

- **Implies no need for 2D drawings!**

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Model-Based Enterprise (MBE) means:

A fully integrated and collaborative environment which uses fully detailed MBD data throughout the value stream to enable rapid, seamless, and affordable delivery of product information from concept through disposal
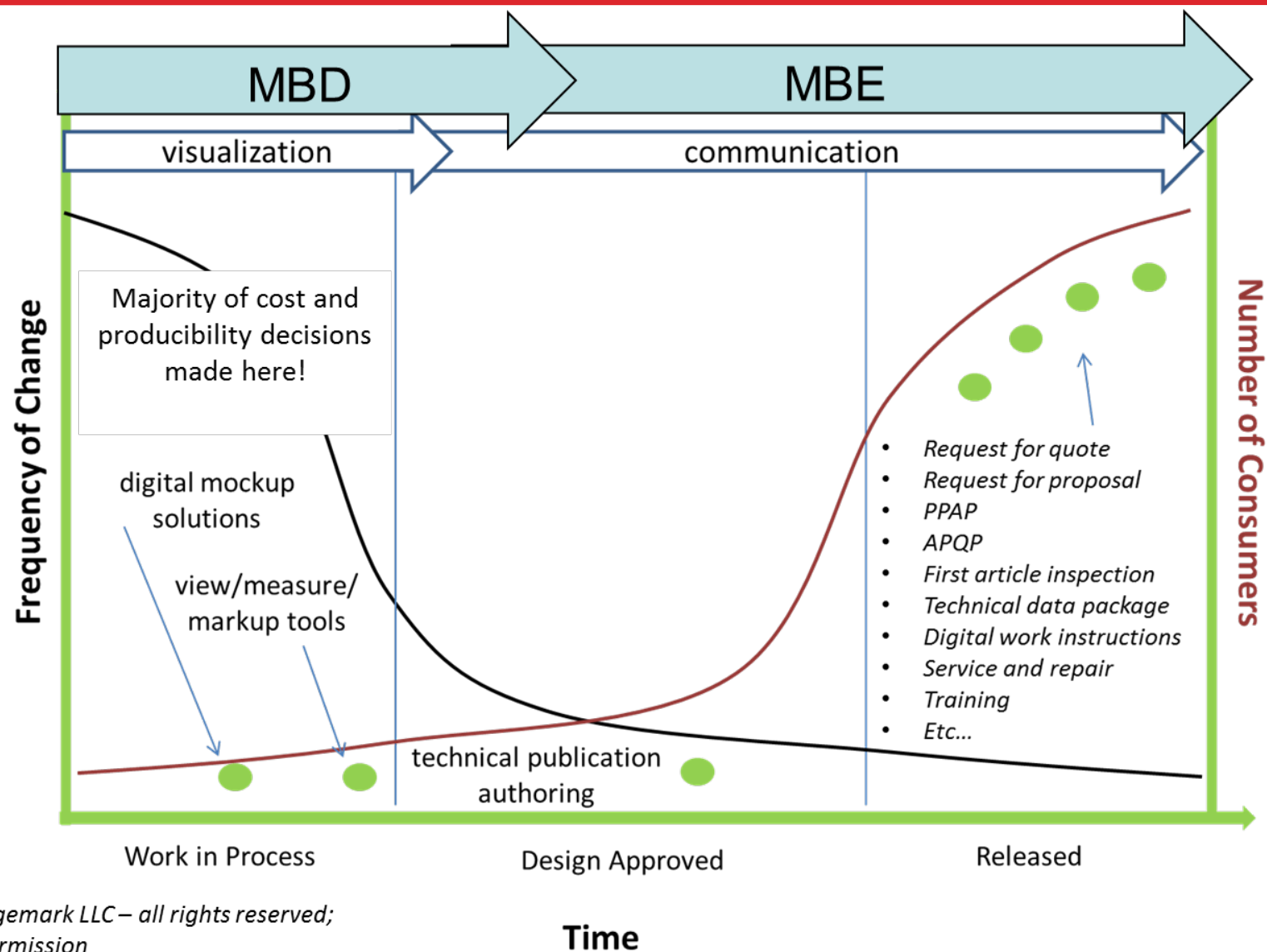

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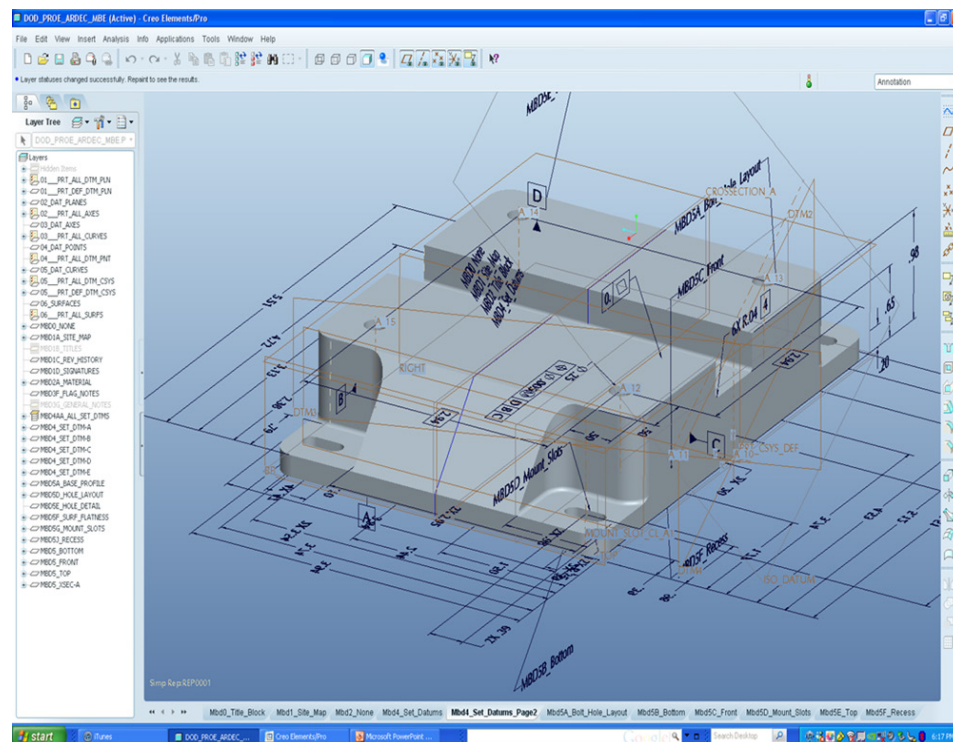Sr. BDM Document Cloud
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The Model Based Enterprise

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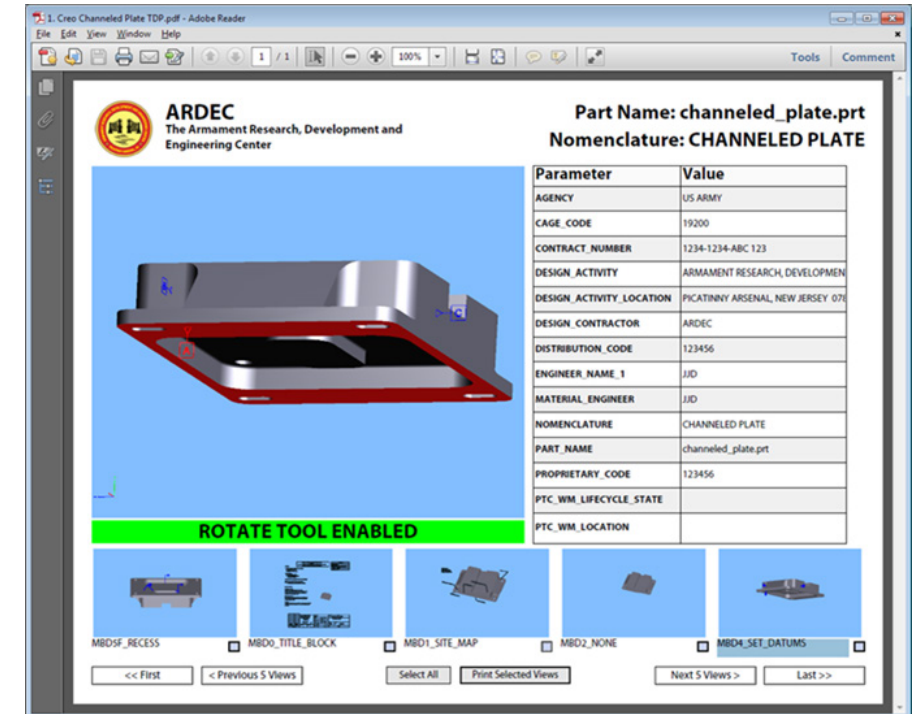
What is the problem to be solved?

How to leverage this...

...into this:

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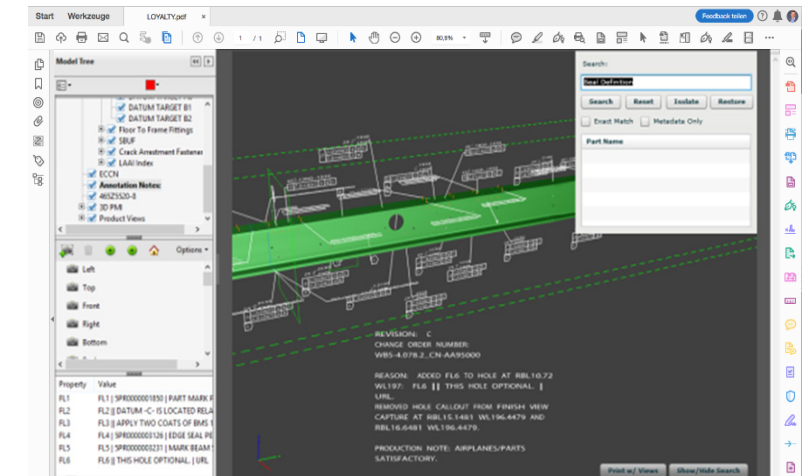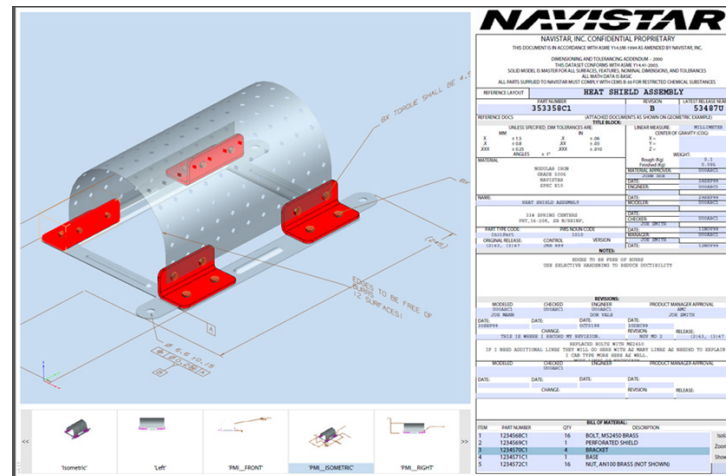
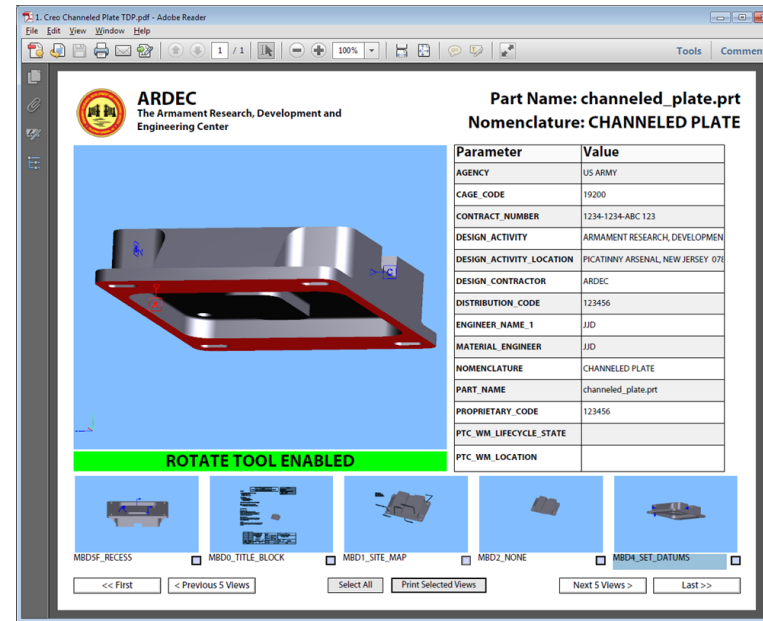# Why is 3DPDF important for MBE?

- availability of Adobe Acrobat Reader
- richness of ecosystem
- presence of infrastructure
- access to ERP and PLM data

- templates and portfolios
- digital rights management
- digital signatures
- not disruptive

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Summary of benefits

- Ideal means to leverage 3D data presented to a 2D world

- No special software or cost needed for consumption

- Existing infrastructure and processes already support PDF

- Web and mobile device consumption supported

- 3DPDF can accurately and fully represent MBD data
- Support for multimedia, business data, scripting, templates enables fit-for-purpose documents
- Security, commenting, digital signature natively supported

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3D PDF Value through Manufacturing livecycle

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It requires...
Combining increasingly complex measures to achieve completeness and classification.

Prof. Dr.-Ing. Martin Eigner

Use Case	STEP		3D XML		JT			PRC/3DPDF		
Viewing	●		● ●		● ● ●			● ● ●		
Data Exchange	● ● ●	●		● ●			●			
DMU	●		● ●		● ● ●			●		
Documentation and Archiving	● ●	●		● ●			● ● ●			
Portable PLM Document	●	●		●			● ● ●			

Service
Software
Electronics
Mechanics

OEM
Tier 1
Tier 2
Tier …

Requirement Definition	Product Planning	Product Design	Process Planning	Production	Operation

The intelligent incorporation of product lifecycle phases, domains and supply chain is key to improving the collaboration experience.

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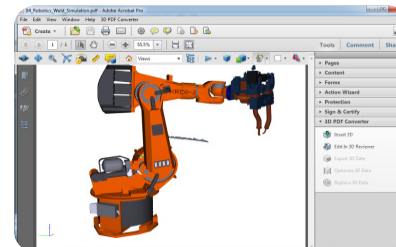Sr. BDM Document Cloud
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3D PDF: some use cases in Manufacturing
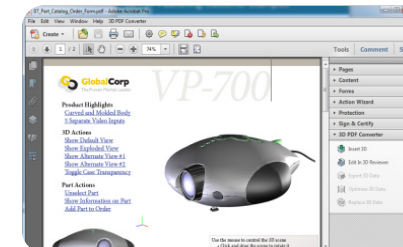
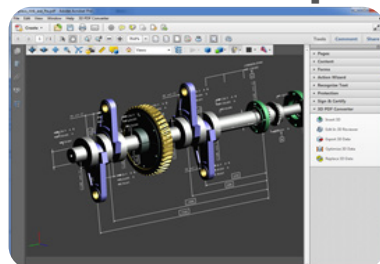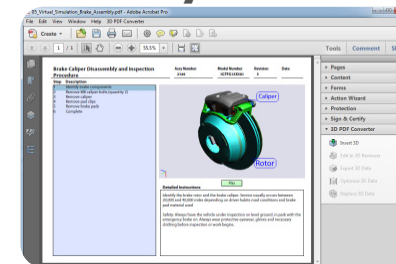### 3D Work Instruction
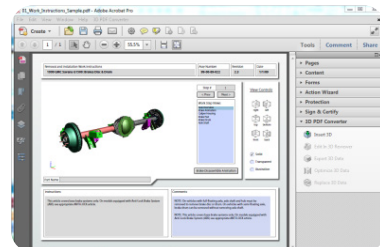
Virtual Simulation

Spare Part Order Form
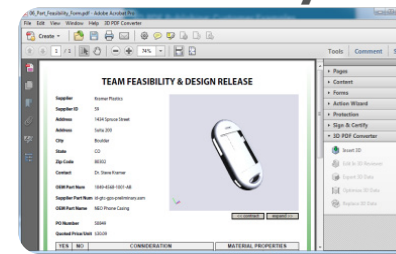

PMI Visual Response

Assembly Validation

Interactive BOM

Marketing Document

Part Feasibility Form

Digital Data Package

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Concept	Schematics	Design	Documentation	Construction	Facilities
Bubble diagrams	Building blocks	Floor plans	Plans	Submittals	TI
Space planning	Site photos	Elevations	Elevations	Change Orders	Asset tracking
Sketches	Floor plans	3D models	Sections	RFIs	Maintenance
	Interior design		Mechanical	Bid Management	Move planning
	Landscape design		Electrical	Photo Archive	Archival
	Model making		Plumbing		
	Digital illustrations				

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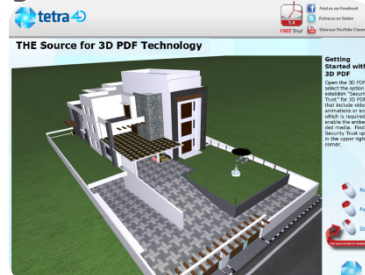Sr. BDM Document Cloud
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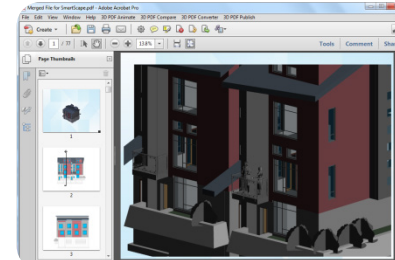# 3D PDF: some usecases in the AEC industry

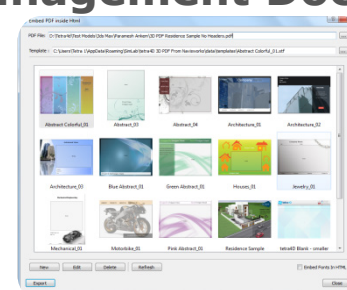**Design / Collaboration**   **Project Visualization**   **Construction Validation**
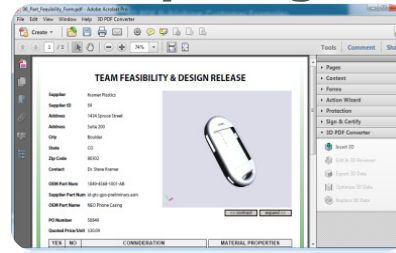

BIM Lifecycle Archiving   **Client Presentation**   **Project Management Documentation**
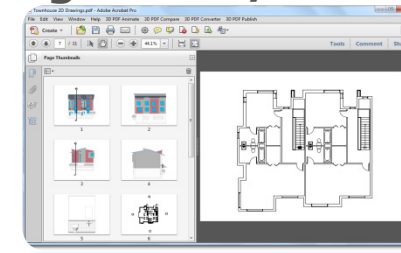

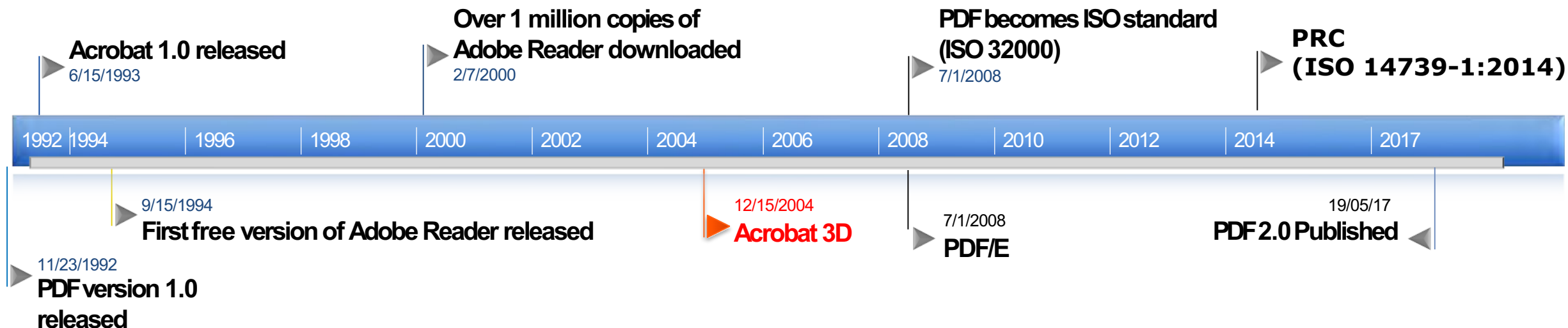**Marketing Document**   **Security / Signing**   **Merge Data / 2D & 3D**

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3D PDF - A Brief History

Acrobat 1.0 released
6/15/1993

Over 1 million copies of Adobe Reader downloaded
2/7/2000

PDF becomes ISO standard (ISO 32000)
7/1/2008

PRC (ISO 14739-1:2014)

| 1992 | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 | 2017 |

9/15/1994
First free version of Adobe Reader released

12/15/2004
Acrobat 3D

7/1/2008
PDF/E

19/05/17
PDF 2.0 Published

11/23/1992
PDF version 1.0 released

PDF 1.7 (ISO-32000)

| **PDF/A** Archive ISO 19005 (PDF 1.4) | **PDF/X** Graphic Arts ISO 15930 (PDF 1.4 & 1.6) | **PDF/E** Engineering ISO 24517 (PDF 1.6) | **PDF/VT** Variable Data ISO 16612-2 (PDF 1.6) |

PRC
Product Representation Compact
ISO 14739
(PDF 1.7)

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PDF/E (ISO 24517)

- ISO Standard Level 1 from 2008 based on PDF 1.6
- U3D only

PDF/E-2 (ISO 24517:2) (still in Work)

- Level 2 as DIS 40.60 (11/2013) based on ISO 32.000-2
  - includes PRC
  - Usable for 3D archiving
  - Very similar to PDF/A-2

- 3 levels
  - PDF/E-2
  - PDF/E-2s – Secure
  - PDF/E-2r – Restricted Attachments (Attachments are PDF/E-2 or PDF/A-2)

Plans are to go from PDF/E-2 directly to PDF/A 4

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The 3D PDF Consortium

The international developer of PDF standards

- **Experts in PDF for mechanical engineering**
- **Dedicated to open standards**
- **Non-profit**
- **ISO TC 171 SC2 Secretariat and US TAG Administrator**

3D PDF Consortium leadership at the ISO level
- 3D JavaScript ad-hoc committee – co chair
- PDF/E archiving ad-hoc committee – co chair
- Full PDF, PDF/E, and PRC committee participation

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3D PDF Consortium Members

- Manufacturing companies
- Software developers
- Consultants
- Government organizations
- Universities

Contact: phil.spreier@3dpdfconsortium.org

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PDF
association

Thank you! Any questions?

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