ELYSIUM - Global Interoperability Provider

Enabling the Digital Thread

James Martin
Director of Business Development
GPDIS – September 2015

James Martin

- **SDRC (Now Siemens PLM) - 1988-2001**
  - **Design, CAE, Data Management, Pre-Sales, Marketing, Open Ideas Product Manager, established ESTECH in Japan**
  - **At NISSAN for 5 years to start up SDRC engagement, rolled into Mazda C3P with FORD, Yamaha as a supplier, more**
- **ITI TranscenData - 2001-2009**
  - **Asia Pacific Partner Management, JAMA PDQ Engagements**
  - **Account Manager for Boeing, Lockheed, re-engaged A&D**
  - **Technical Marketing Manager – MBE, Standards, Validation**
- **Jotne - 2009-2014**
  - **President of Jotne North America operations**
  - **Strategy, Marketing, Deployment of PLCS solutions to the Aerospace & Defense + Building Information Management**
- **Elysium since 2014**
  - **Business Development, Marketing, Strategy**

Digital Thread, Tapestry, etc.

The ‘digital thread’ that integrates and drives modern design, manufacturing and product support processes can be exploited to reduce cycle time and achieve first pass success

It is the only feasible way to deal with the complexity of today’s products

Digital Thread for Smart Manufacturing
National Institute of Standards
April 25, 2014

Digital Thread Trending

- **National Shipbuilding Research Program (NSRP) IT Panel name / focus change to "Digital Shipbuilding Panel"**

  www.nsrp.org

- **Lockheed Martin Digital Tapestry**

  www.lockheedmartin.com/us/what-we-do/emerging/advanced-manufacturing/digital-tapestry.html

- **Model Based Enterprise**

  www.model-based-enterprise.org

  SASIG Investigation of MBE initiatives

Elysium Background

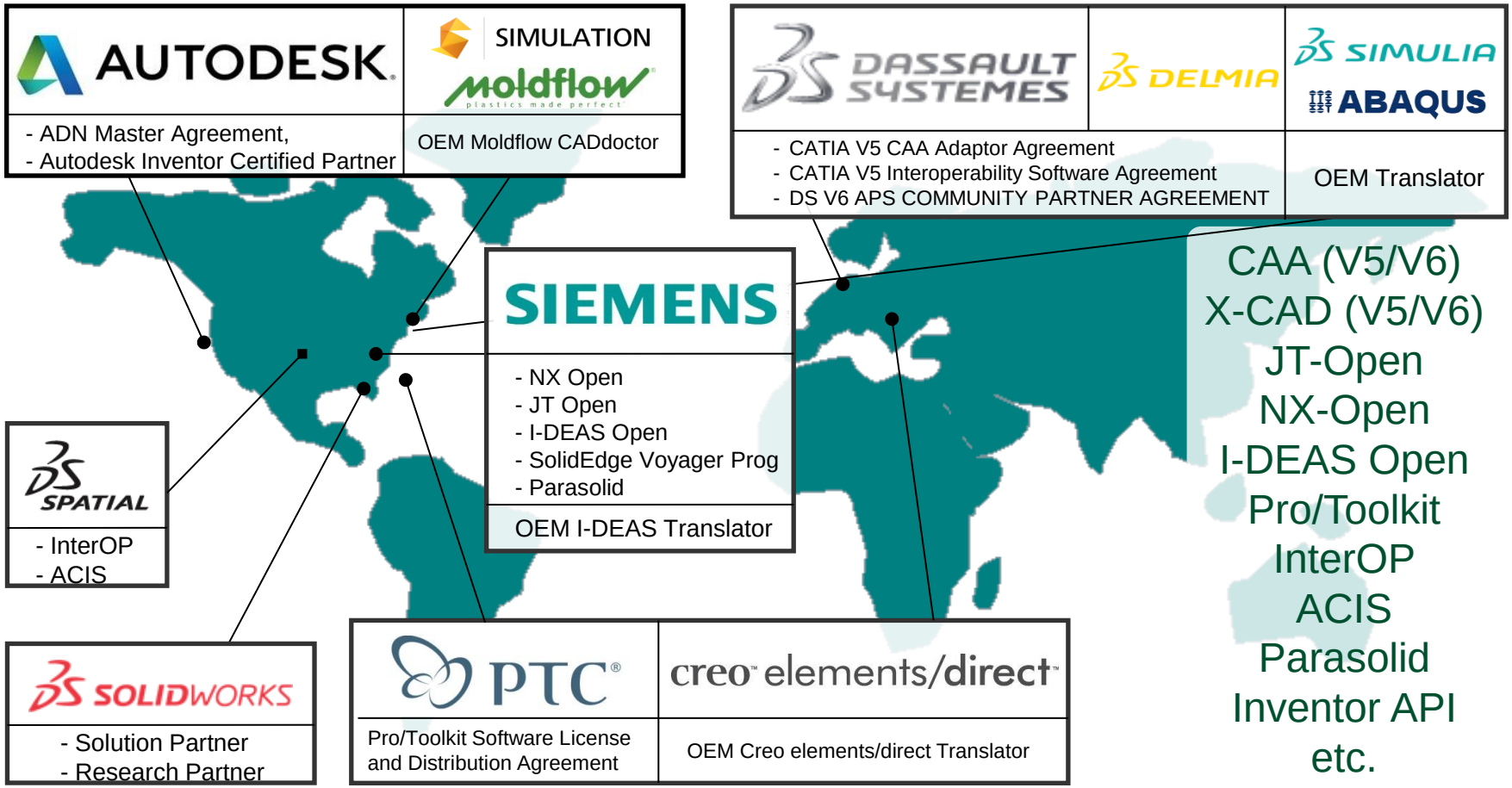
Delivering digital data interoperability solutions for manufacturing collaboration via high quality, robust engineering software applications

- **Global with 95+ employees - 60+ Developers**
- **Debt Free, Private, Profitable from the start**

- **Enabling digital thread solutions for 30+ years!**

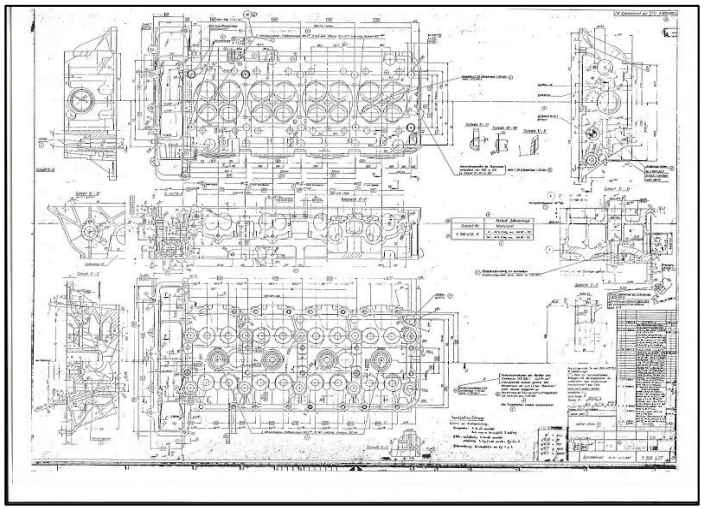
Global Partnerships

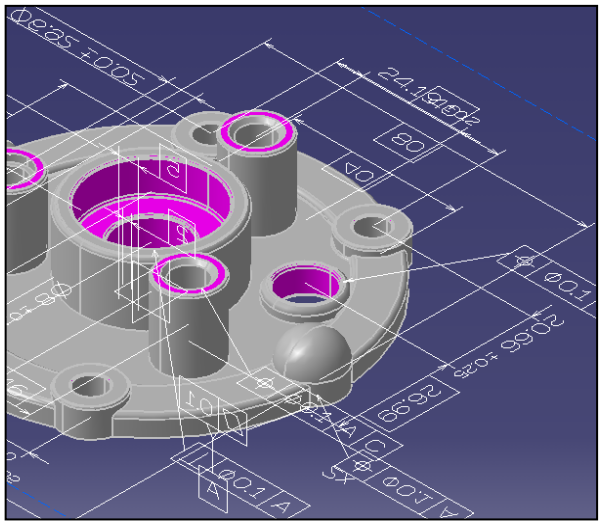
ELYSIUM keeps expert knowledge of all major CAD systems by making contracted partnership with all major venders.

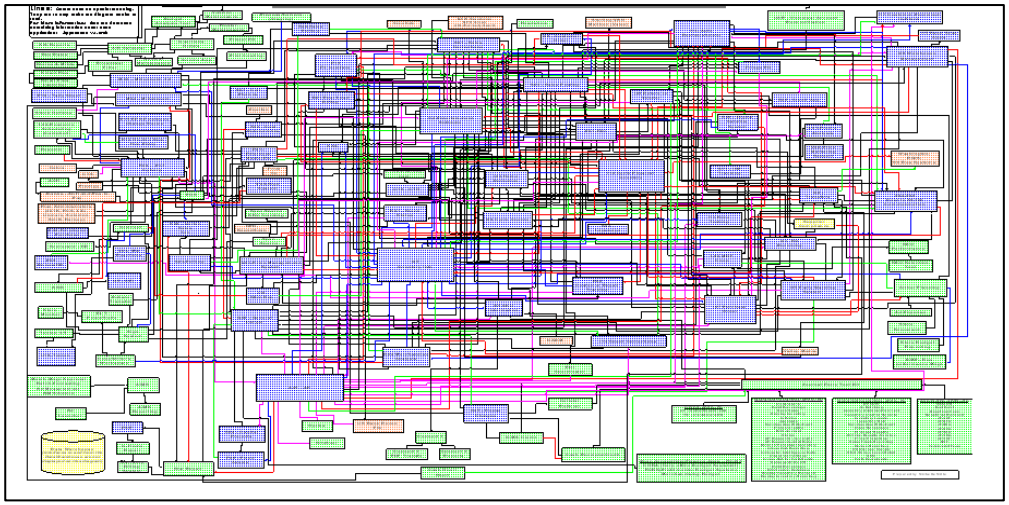


Is your thread improving productivity and ROI?

Global Product Data Interoperability Summit | **2015**





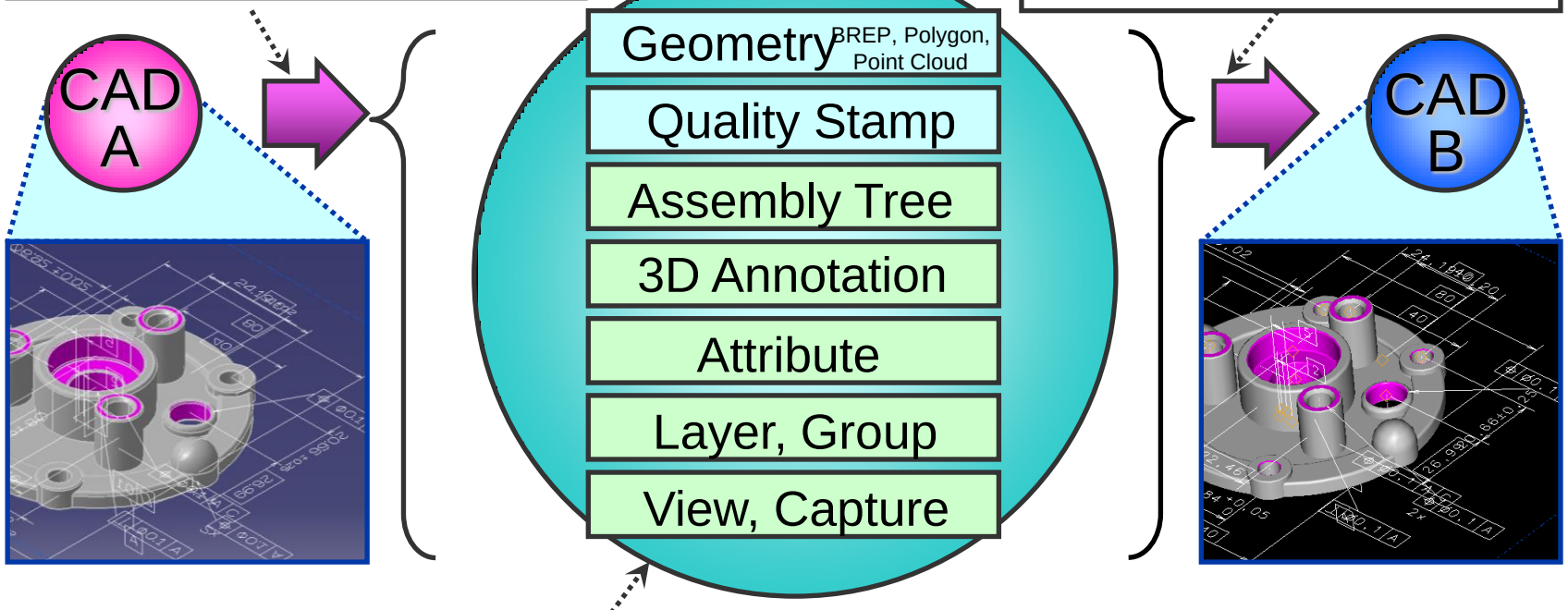


Tight control of the Digital Thread

Combination of three key technologies provides high quality 3D data translation.

Deep knowledge of various 3D-CAD systems enable to translate fully annotated MBE data.

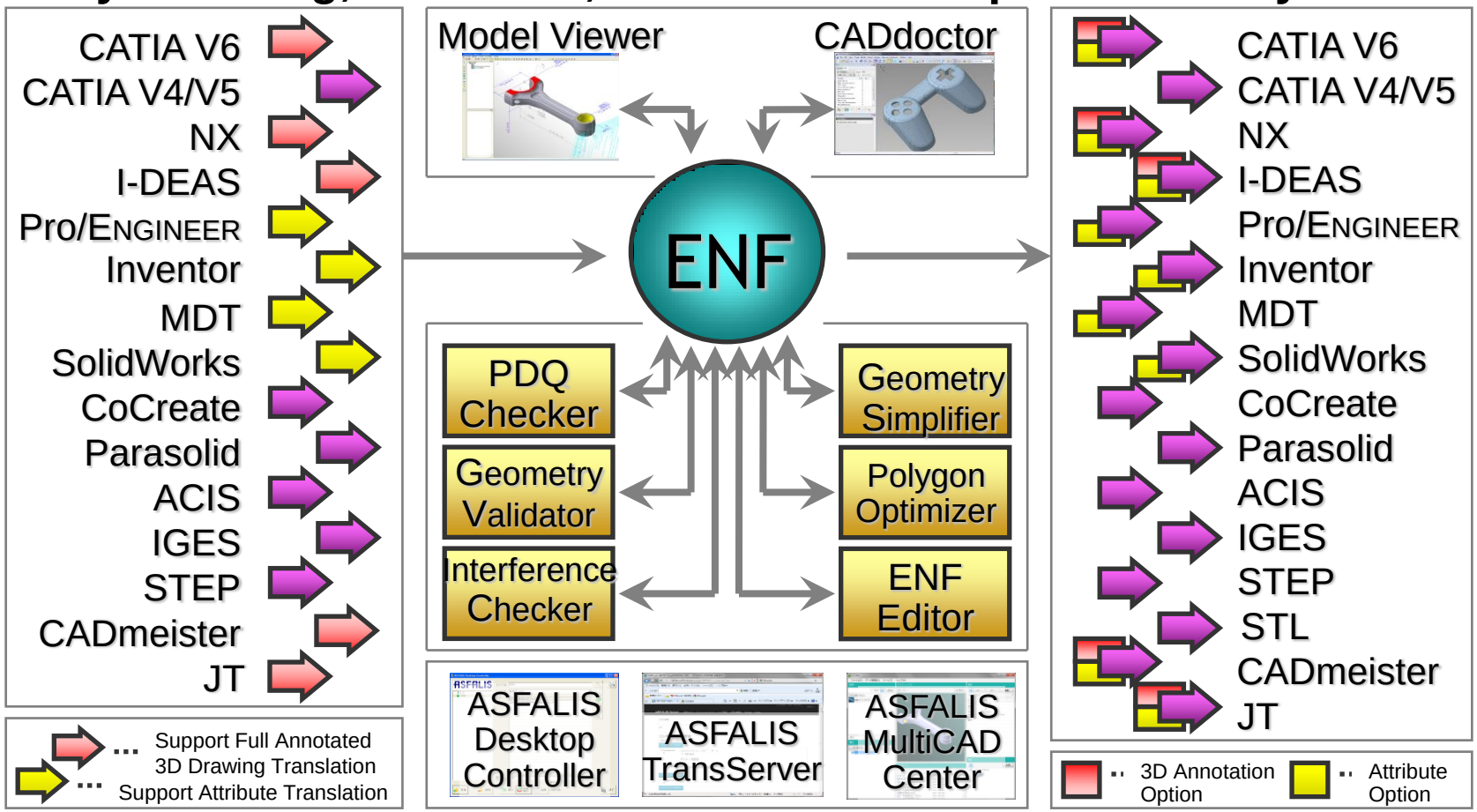
Elysium's industry standards based PDQ check and geometry healing technology minimize errors.



Elysium core ENF capabilities provide the flexibility to read/map information generated to/from most CAD systems

Elysium's view of Interoperability

Component products to build custom and large scale digital data quality checking, validation, translation and optimization systems.



Elysium Products

- **CADdoctor – User Interactive**
  - **Data healing, translation, PDQ Check, Comparison**
- **ASFALIS – Desktop or Enterprise**
  - **Conversion, Validation, Distribution. Mappings**
- **CADfeature – Native feature based translation**
  - **Drawing associativity, 3D MBE Parts, Product structure**
- **InfiPoints – Scanned Data Efficiency**
  - **Processing, Feature recognition, 2D/3D Interoperability**
- **CATIA V6/V5 to/from JT, NX, Creo Direct**

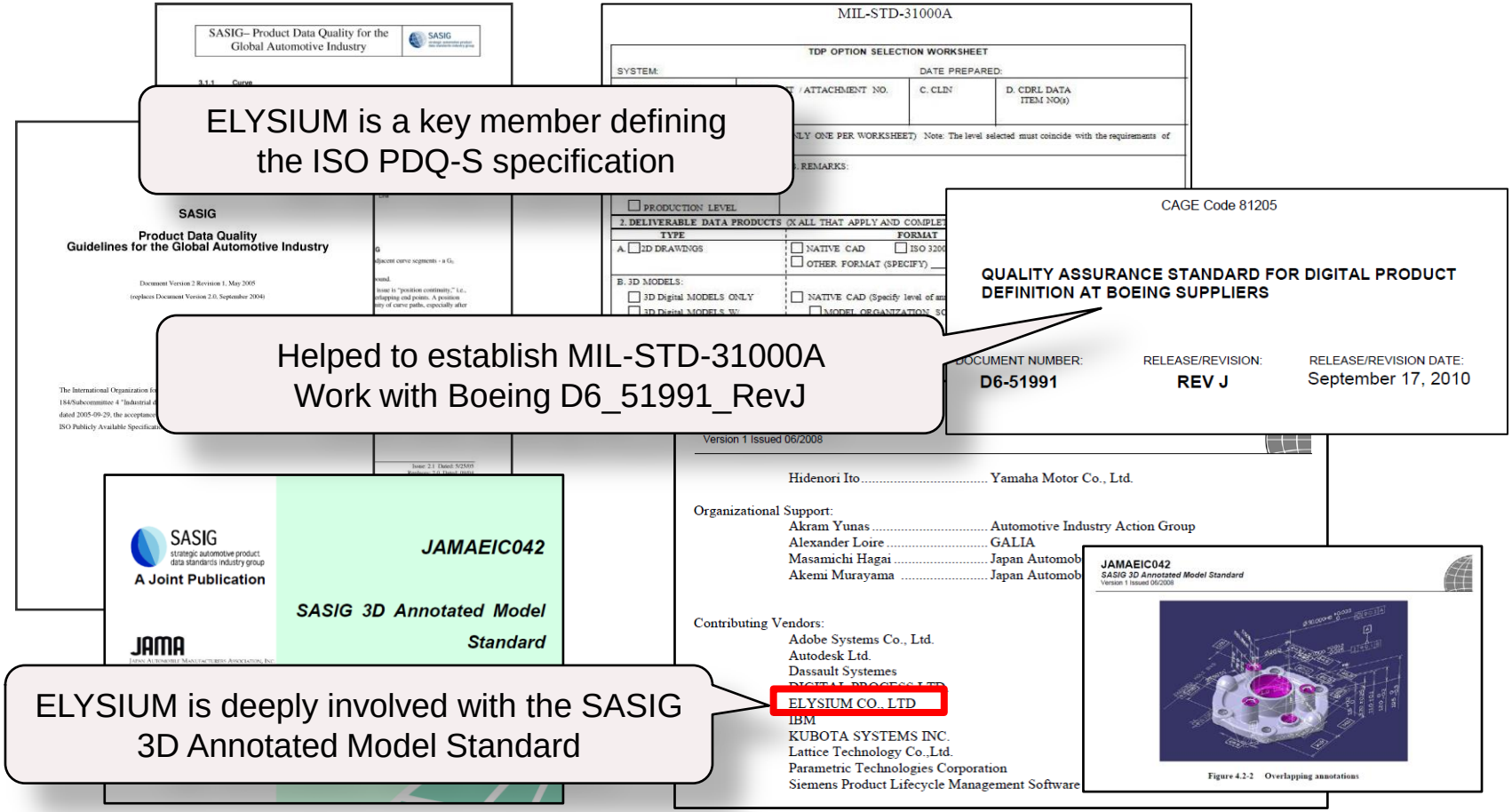
Initial Quality of the Digital Thread

Initial quality assured via PDQ guidelines from JAMA, ISO Part 59, SASIG, MIL-STD-31000A, Boeing D6_51991_RevJ

ELYSIUM is a key member defining the ISO PDQ-S specification

Helped to establish MIL-STD-31000A Work with Boeing D6_51991_RevJ

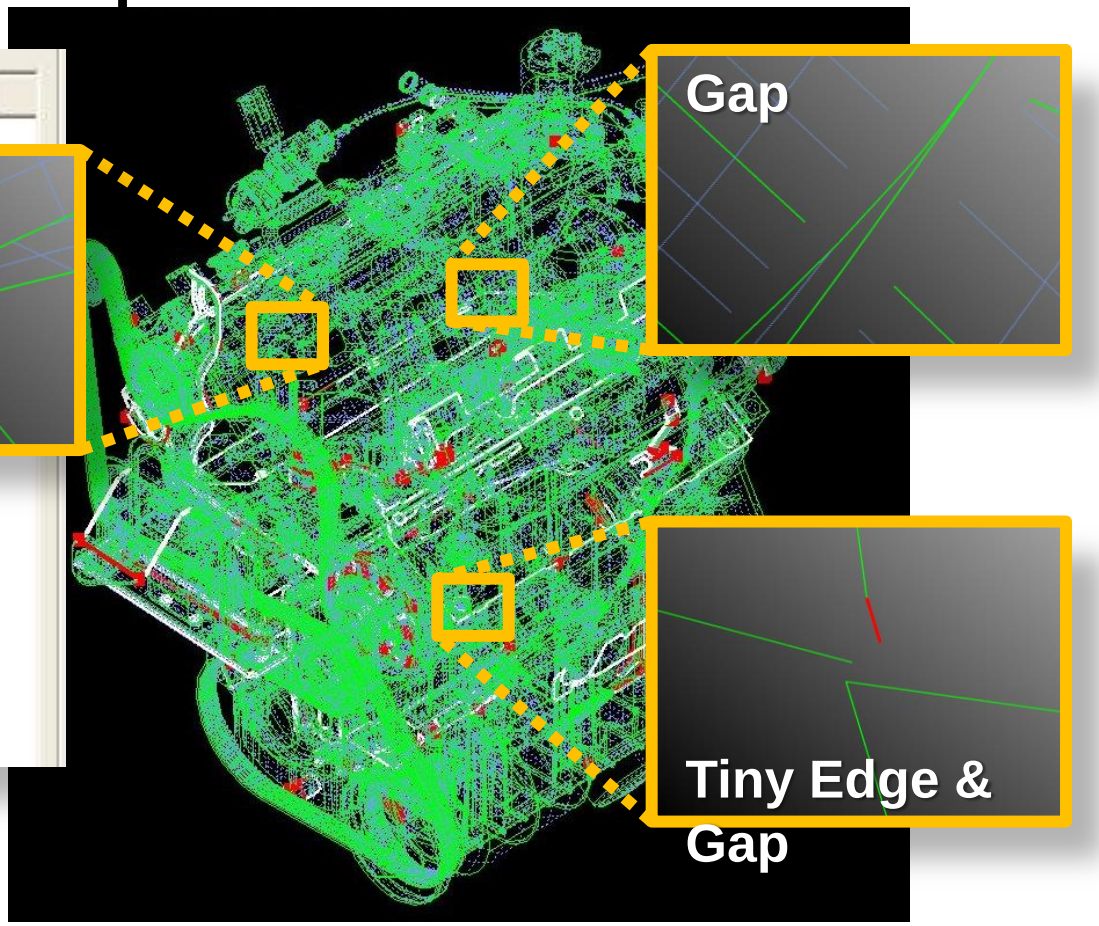
ELYSIUM is deeply involved with the SASIG 3D Annotated Model Standard



Geometry Quality Checking

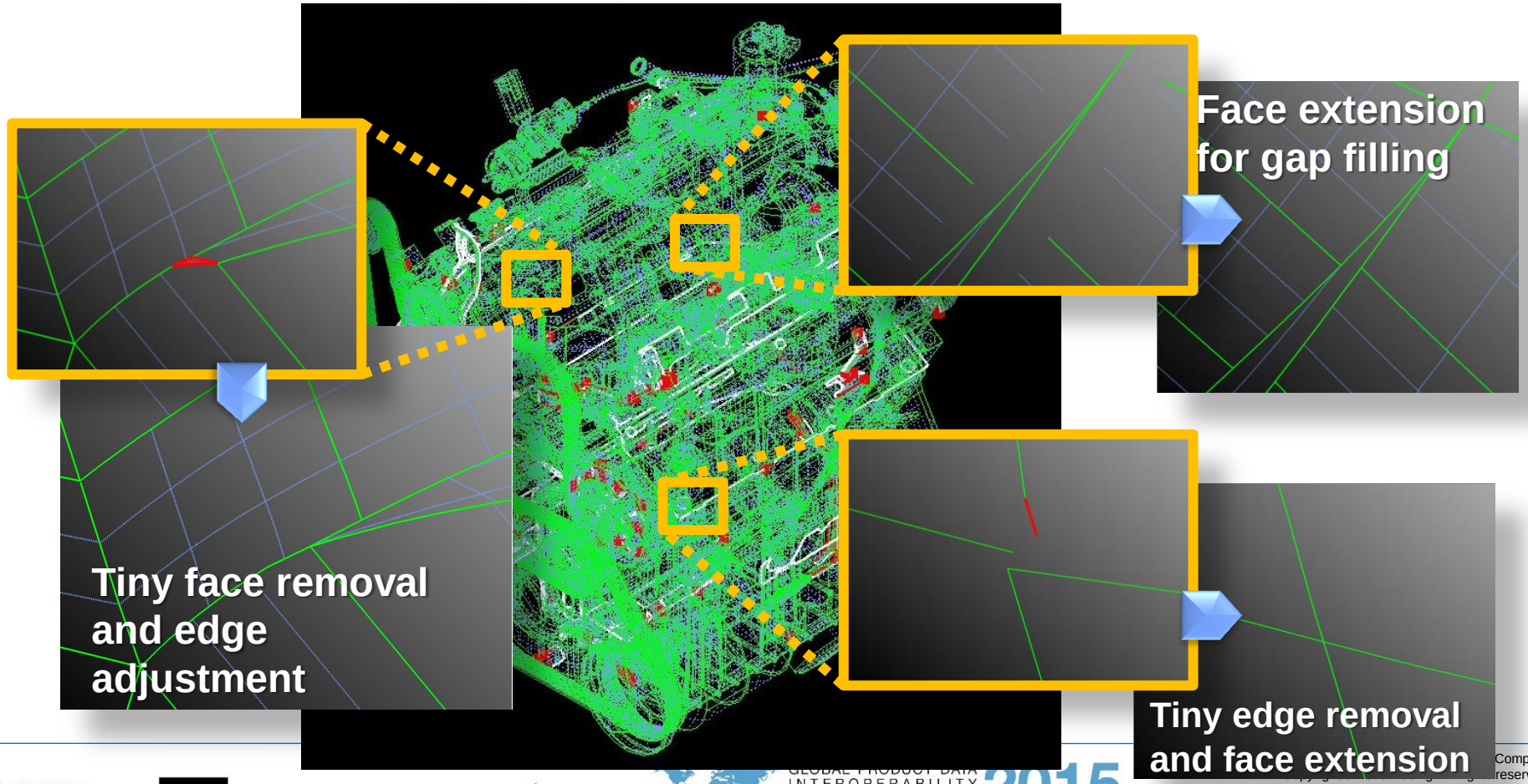
Product Data Quality checking to assure high fidelity models for a digital enterprise

Category	Errors	Severi...
Short curve	263	Critical
Sliver face		
Edge direction		
Free edge		
Loop of free edges		
Gap: In loop		
Gap: Edge and base su		
Gap: 2D trimming curv		
Intersecting loops		
Loop with self-intersection	547	Serious
Surface with self-intersection	0	
Surface with small patches	96	Serious
Curve with short segments	273	Serious
Surface with oscillations	0	



Sophisticated Geometry Healing

Geometry healing capability creates optimal geometry for downstream consumption

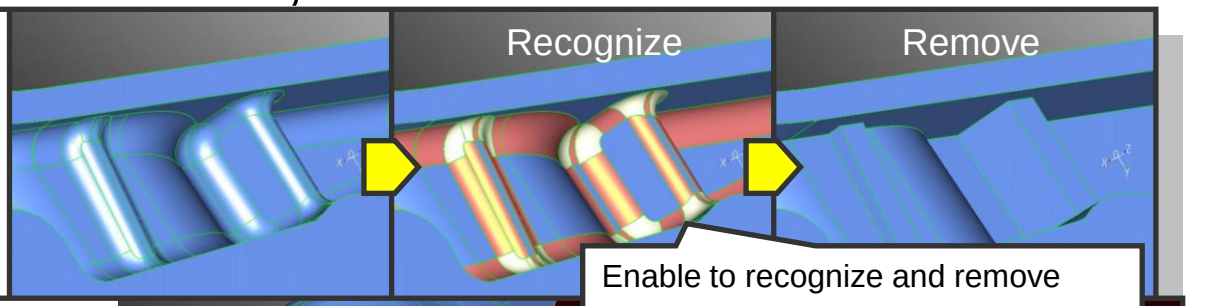


Optimization of Geometry

Geometry optimization provides geometry modification to get simplified 3D model for CAE, DMU etc.

Feature Recognition and Simplification

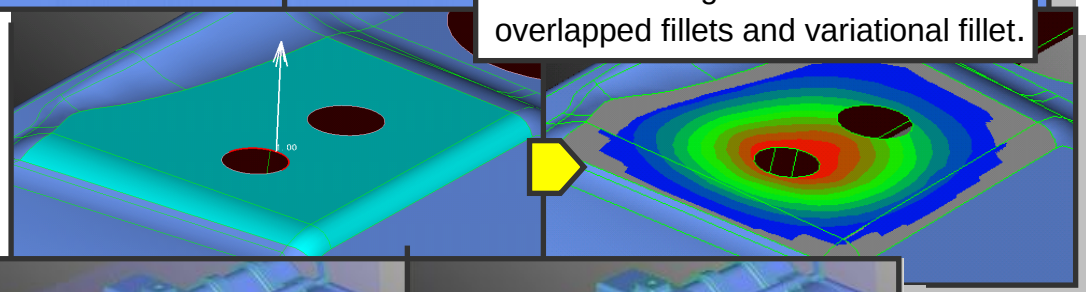
Automatically recognize geometric features like fillets from shape, and properly remove the features.



Enable to recognize and remove overlapped fillets and variational fillet.

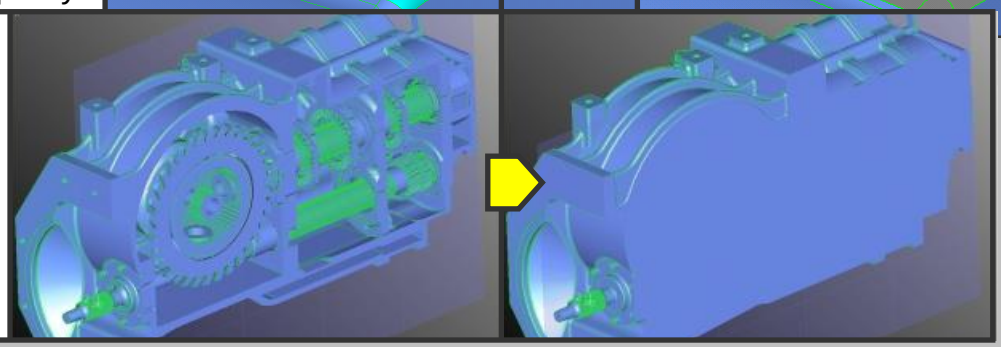
Flexible Geometry Deformation

Flexible shape deformation keeping curvature continuity and face quality.



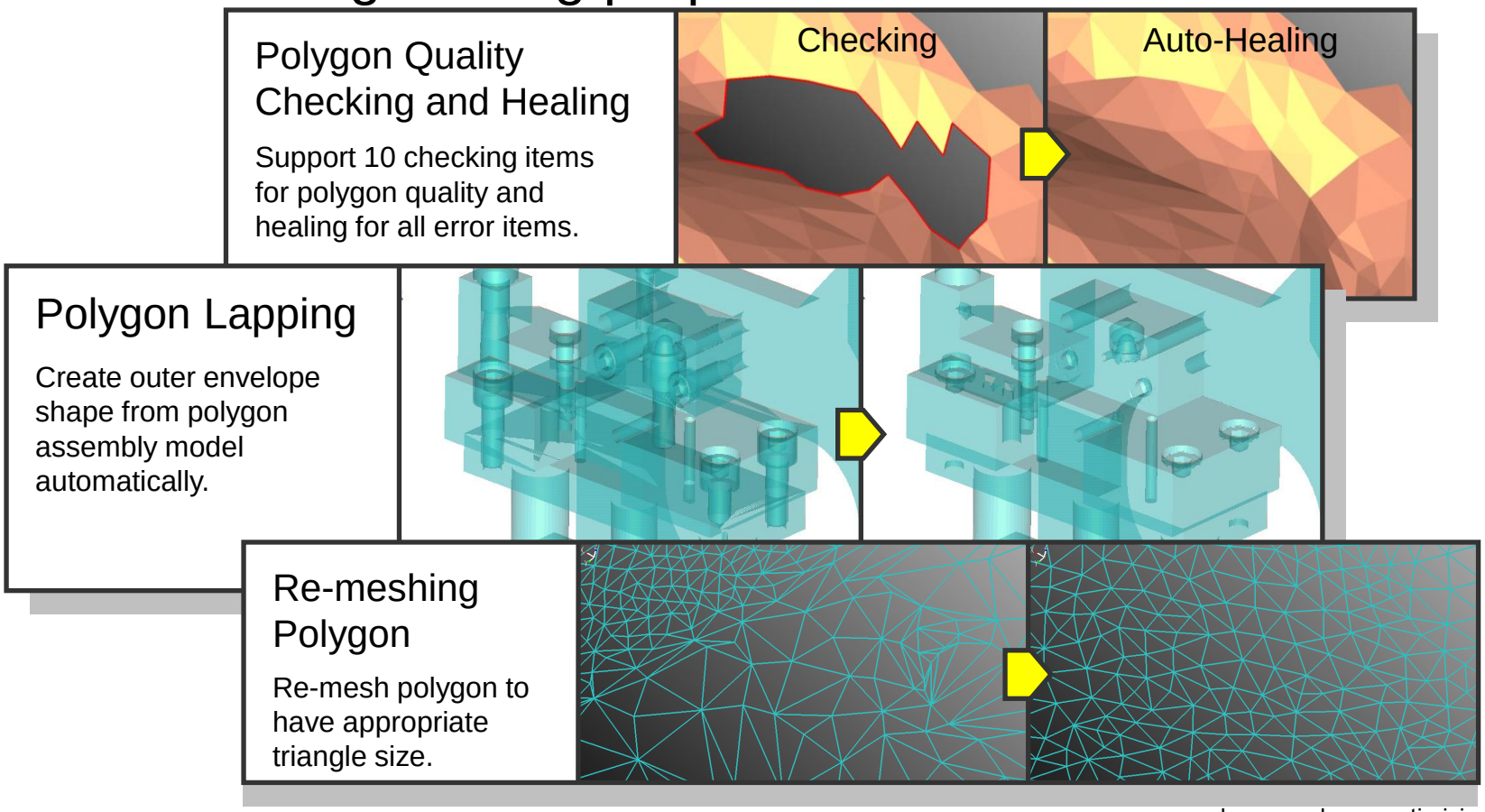
Solid Envelope

Fill up inside of assembly model and make one solid model for size reduction and know-how protection.



Tessellation is part of the Digital Thread

Rich functions maintain STL and/or scanned data for CAE, RP, and reverse engineering purposes



and more polygon optimizing functions …

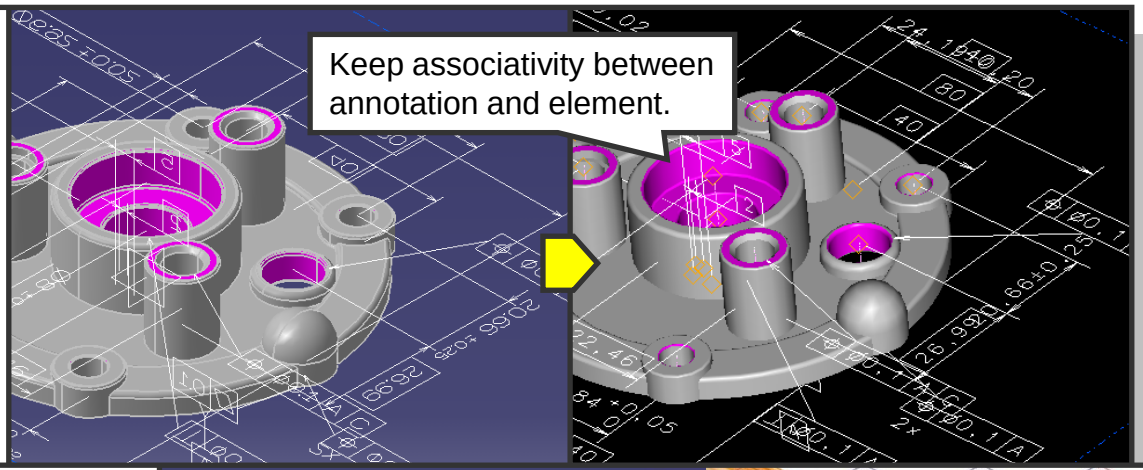
and more polygon optimizing functions …

PMI/FTA Conversions

Translation of fully annotated digital models for CATIA V5, NX, Pro/ENGINEER and I-DEAS.

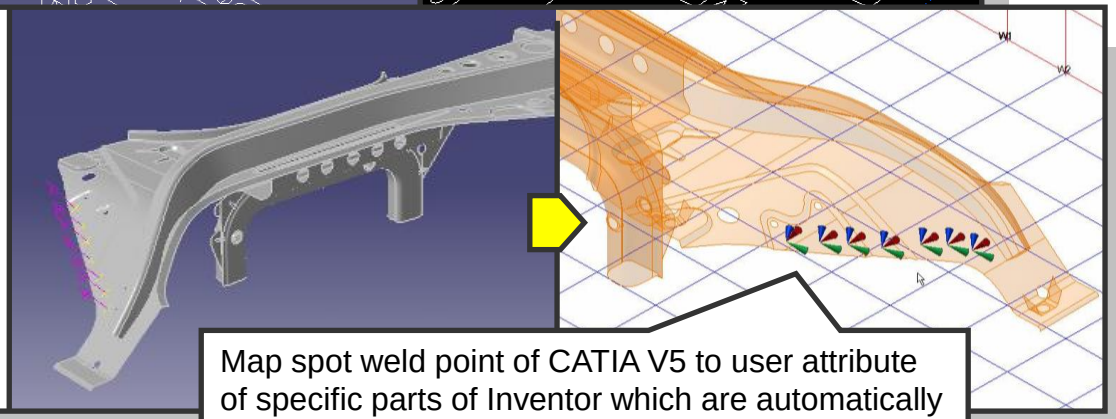
Fully Annotated 3D Model Translation

Supports both native PMI/FTA translation for representation and semantic information.



Flexible Mapping between PMI/FTA and Attributes

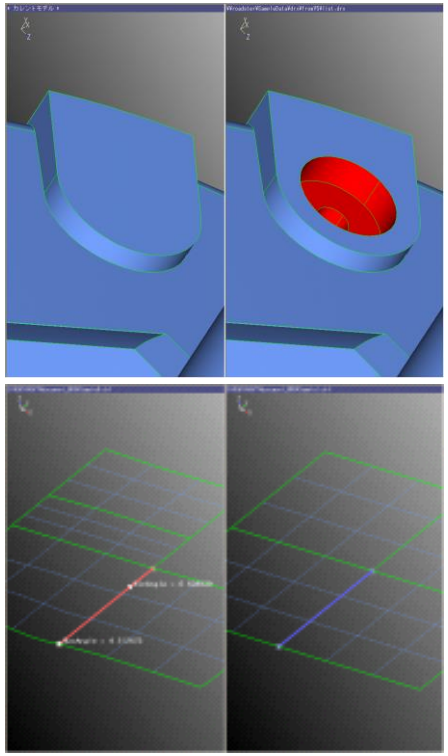
Enable to map specific annotation and attribute to others to recover non-supported entities at destination CAD.



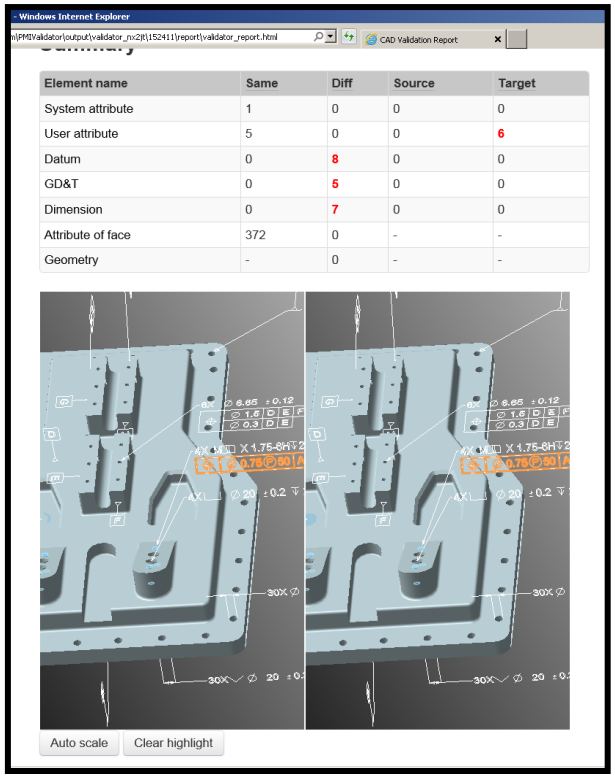
Validation of the Digital Thread is Key

Digital Data Validation

Validation is necessary to extend the thread for any conversion of digital data into other formats

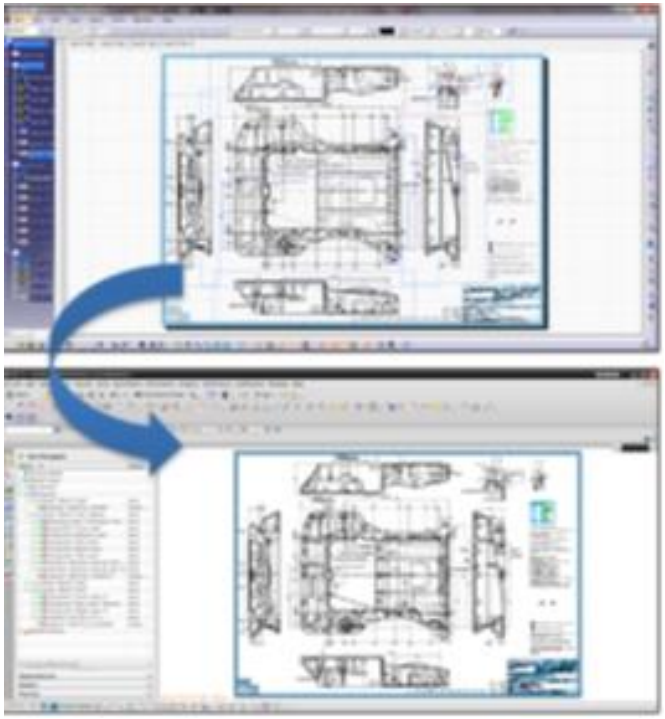


Geometry Validation



Element name	Same	Diff	Source	Target
System attribute	1	0	0	0
User attribute	5	0	0	6
Datum	0	8	0	0
GD&T	0	5	0	0
Dimension	0	7	0	0
Attribute of face	372	0	-	-
Geometry	-	0	-	-

PMI Validation

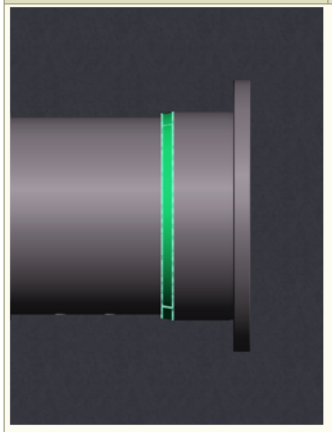
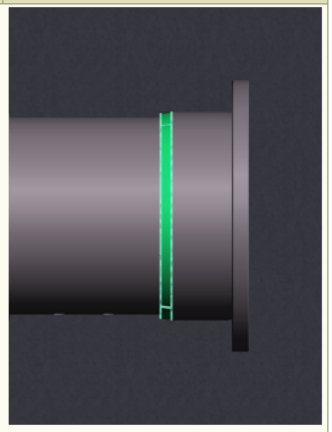


Drawing Validation

ECO Validating and Reporting

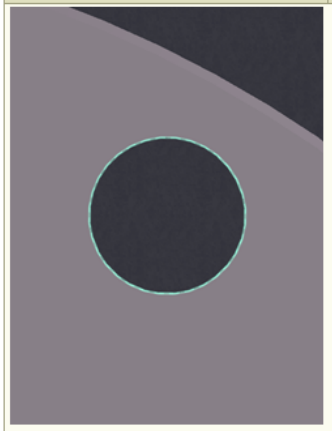
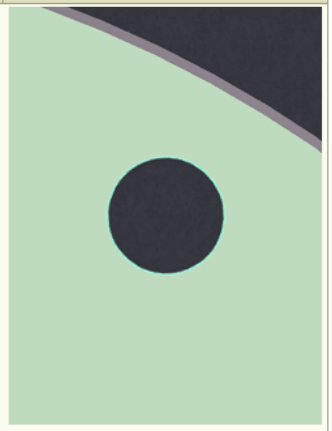
Difference List

1

040-288	040-288
	

Item	Value
No.	1
Check	
Left Feature	Changed
Left Max Distance	-0.33961 mm
Left Max Distance Coordinate	(-54.49, 80.08, -75.75)
Right Feature	Changed
Right Max Distance	0.35219 mm
Right Max Distance Coordinate	(-29.92, 80.50, 88.68)
Comment	

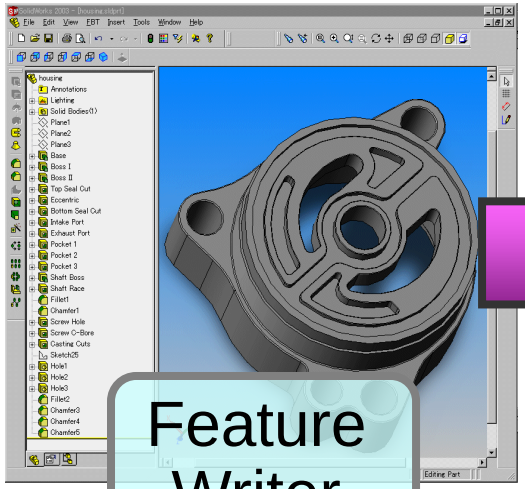
2

040-288	040-288
	

Item	Value
No.	2
Check	
Left Feature	Hole D16.00
Left Max Distance	-2.00000 mm
Left Max Distance Coordinate	(47.93, 2.92, 98.96)
Right Feature	Hole D12.00
Right Max Distance	2.00000 mm
Right Max Distance Coordinate	(59.43, 1.20, 90.98)
Comment	

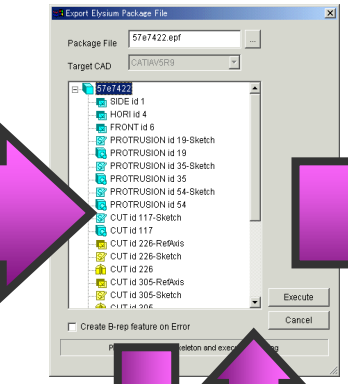
CADfeature – Migration Digital Thread

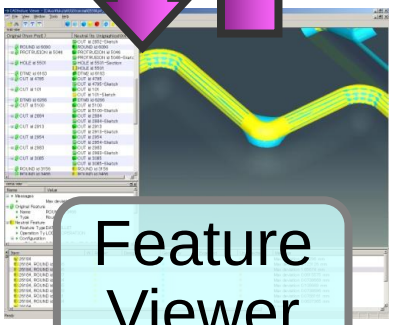
Feature based 3D data translator to support automatic feature translation and hybrid translation with feature and geometry.



Feature Writer

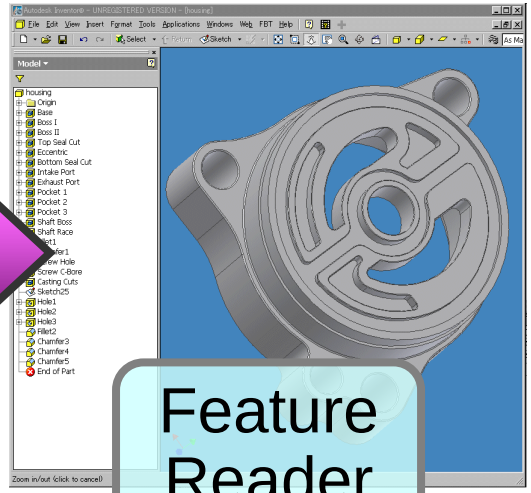
- Read feature tree from source CAD.
- Map to feature tree of destination CAD.
- Write out intermediate feature file.





Feature Viewer

- View and Check the feature and corresponding geometry.



Feature Reader

- Read intermediate feature file.
- Re-built model from feature tree.

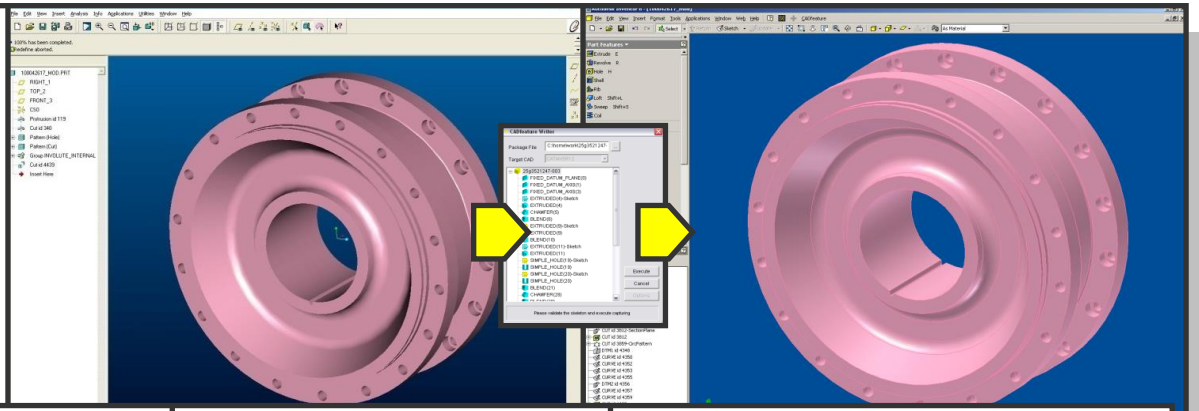
CADfeature is a semi-custom tool and Elysium supports the customer's design methodologies. Proper mapping maintains the thread

Migrating Fully Featured Models

Feature based 3D data translation enable the digital thread to maintain feature modification and design intent

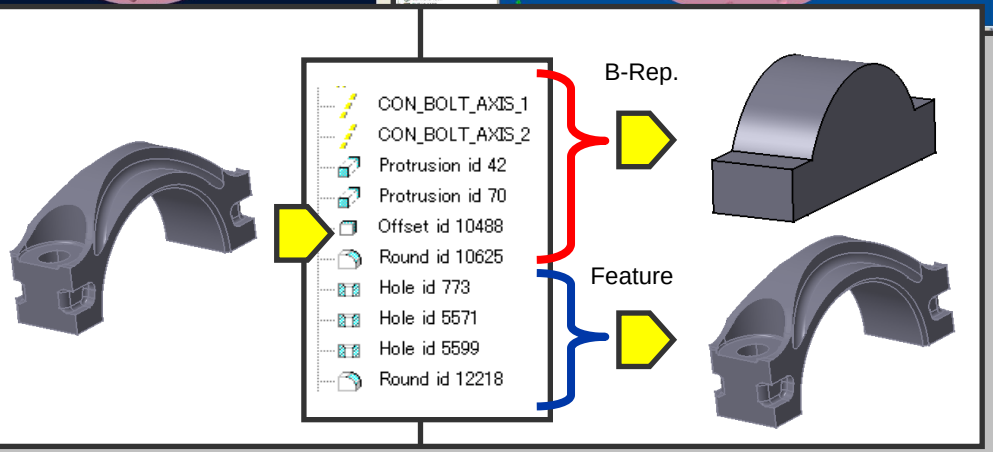
Full Automatic Translation

Automatically extract feature tree from source CAD, map the feature tree to destination CAD, and re-built 3D model at destination CAD with the



Hybrid Feature and Geometry Translation

1. Translate representation of fabricated material as geometry and definition of machining feature as feature tree.
2. Recover un-supported feature as B-Rep translation.



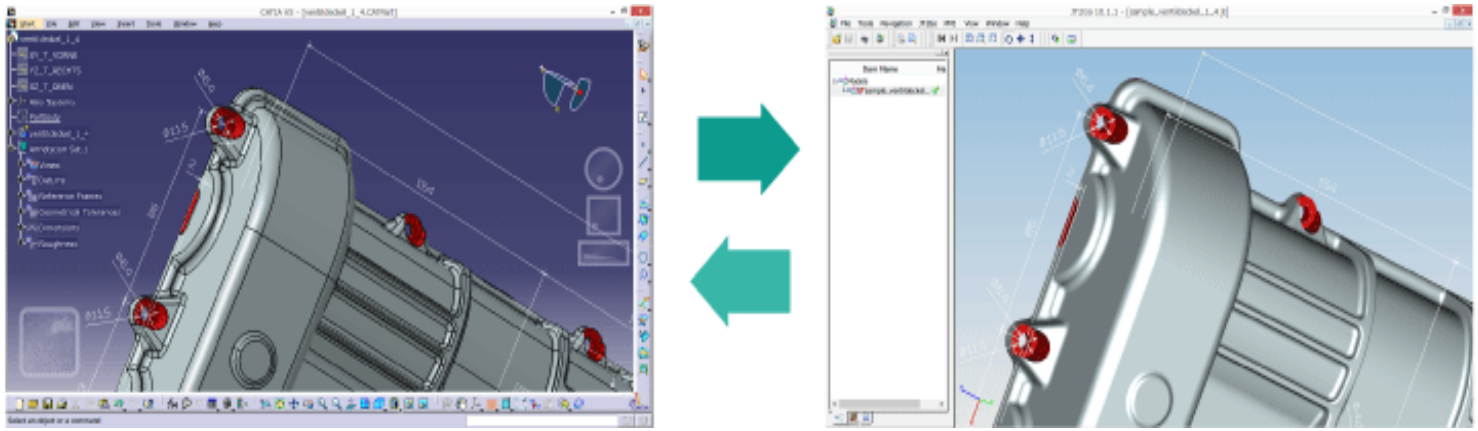
Support all major 3D-CAD for feature translation.

Daimler and JT

OFFICIAL DAIMLER PLM 2015 TOOL

PLM 2015

- **Elysium JT Translator is Daimler PLM 2015 compliant**
- **Masterdata support, JT Moniker, QEV Number, more**

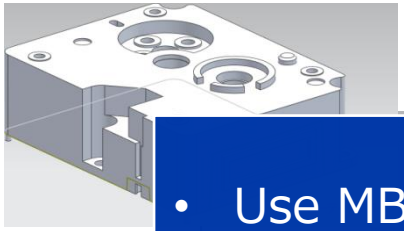


Upcoming Digital Touch Points

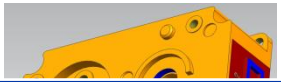
- STEP AP242 (Part of JT now, full in 2016)
- 3D PDF – PRC Format
- QIF – Quality Information Framework
  - Validation of MBE models down to the manufactured part via structured measurements
  - Overlapping with DMIS based Processes

JEITA – Japan Electronics and IT Association

1. 3D shape + GD&T
   + mold requirements by attributes



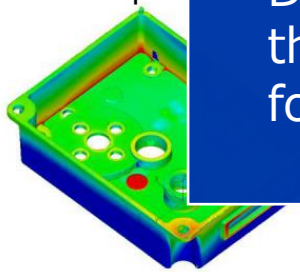
2. 3D shape + GD&T
   + mold requirements with detailed geometry



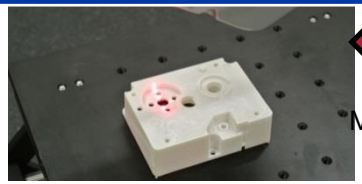
- Use MBD data to include tolerance and manufacturing requirements information
- These information shall be standard and model-based so that unnecessary re-input of information can be avoided and software automation in downstream process is possible.
- Deploy standard formats for data distribution so that users can select the most appropriate tools for each functionality

Feed back result to CAD

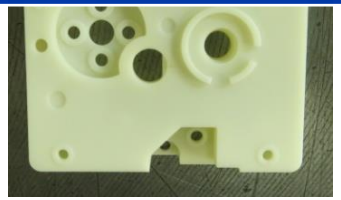
5. Test report

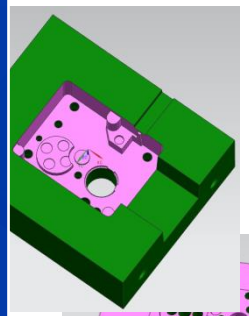


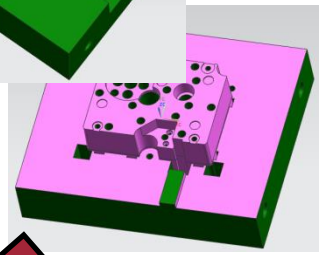
Compare measured points against CAD data. Judge OK/KO automatically



Measure





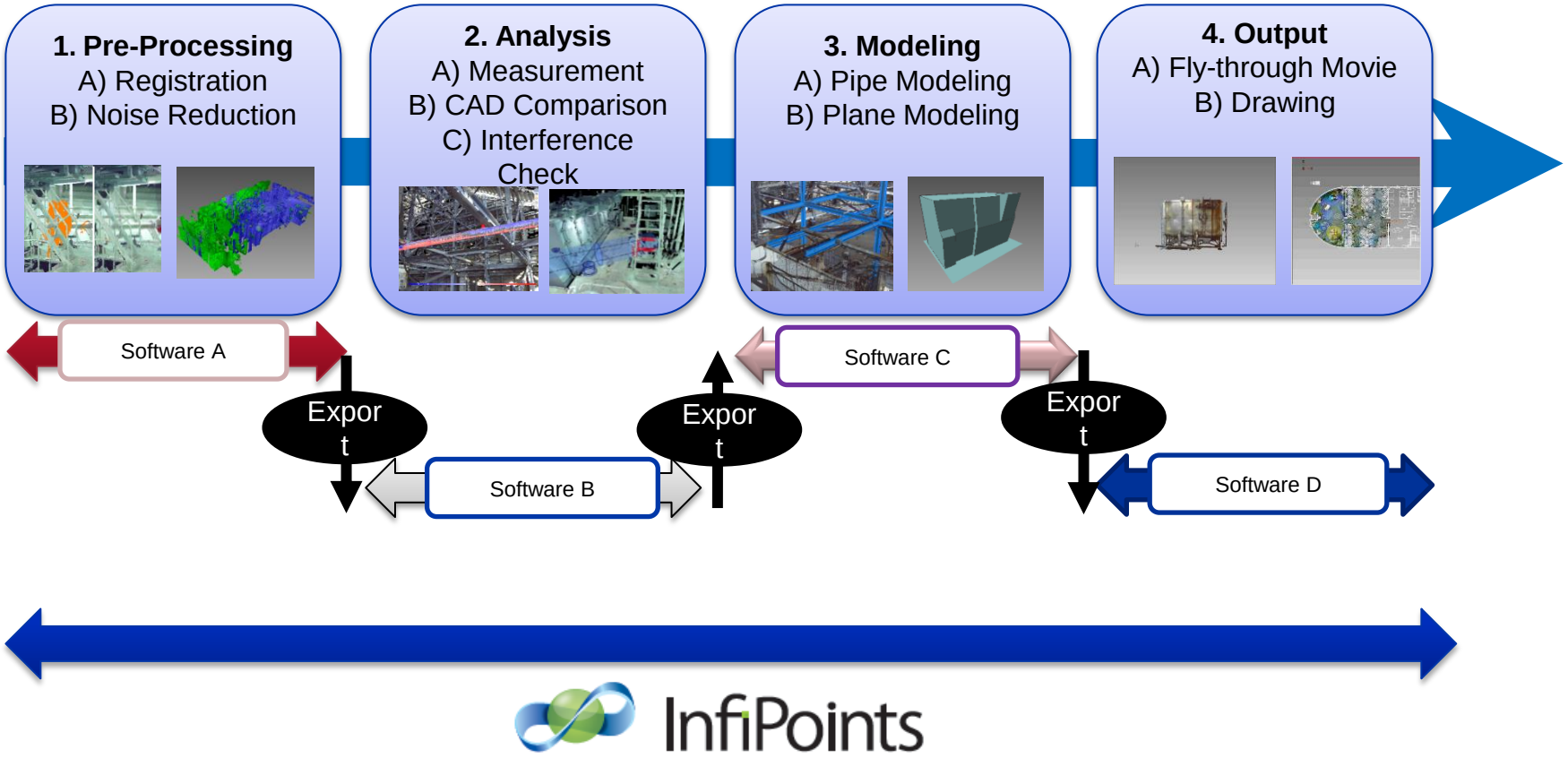


Infipoints – Moving the Thread

www.youtube.com/channel/UC-ipbMreyGP4lO8TKimXJBQ

Consolidate multiple scanning processes

- ✓ **InfiPoints aims to offer a one stop solution for 3D point cloud data handling and analysis. Takes multiple steps into one digital thread**



ROI Considerations

- **When using an inferior interoperability solution, what problems are introduced?**
- **By not executing validation processes, what issues are getting overlooked?**
- **How much are you paying to maintain legacy CAD formats and IT systems?**
- **How efficient are your designers in getting data to/from CAE, prototyping, other formats?**
- **What is the real cost incurred by forcing your supply chain to use the same CAD format?**
- **Are your designers and engineers spending a great deal of time converting and pushing data?**

Conclusions

- **Elysium are the data interoperability experts for an assortment of domain areas.**
- **We deploy mature processes to assure a digital thread is maintained and validated**
- **Fully featured and associative migration works!**
- **The digital thread can start from non-traditional CAD/PLM sources, clouds, tessellation**

Elysium together with our customers determine the ROI of introducing a digital thread process

Thank You

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