

*An Independent
Development Framework
Compatible with Major
CAD Databases*

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GLOBAL PRODUCT DATA
INTEROPERABILITY
S U M M I T
2018



ELYSIUM

Parker Aerospace

NORTHROP GRUMMAN

BOEING

ELYSIUM

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BOEING



Who We Are

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- Headquarters – Marlborough MA
 - Worldwide VAR channel in 2018
 - Software Division of Kubotek USA
- Wholly owned independent subsidiary of Kubotek Corporation (Japan)

Software Products

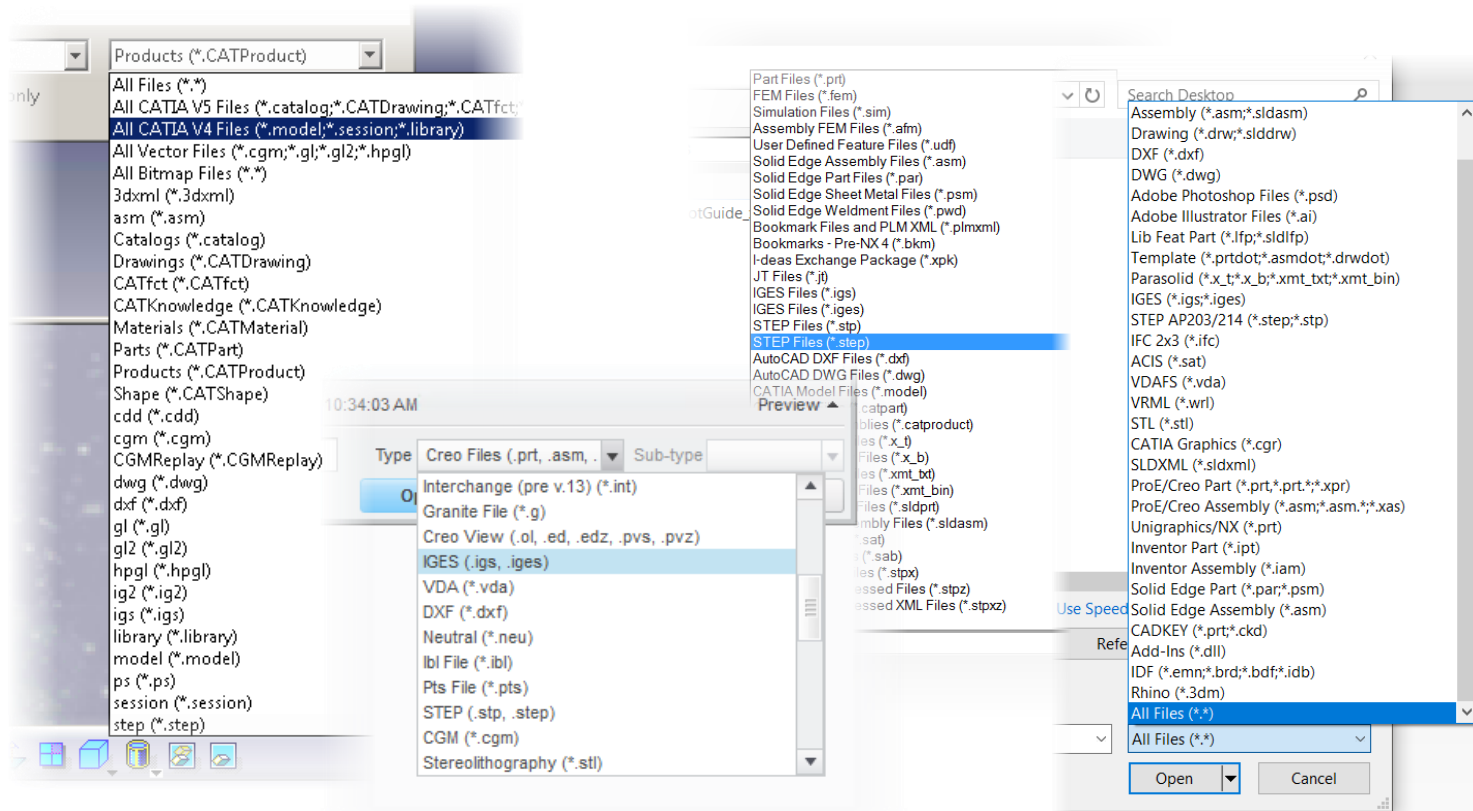
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- **KeyCreator – Mechanical CAD**
 - History free & Flexible Hybrid modeling software
 - Design & Manufacturing
 - Launched in 2003
 - Successor to CADKEY
- **Validation Tool & ECO Manager**
 - Model Comparison & Quality Documentation
 - Aerospace OEMs and several suppliers
 - Launched in 2007

CAD Data Migration

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State of Interoperability



CAD Data Migration

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Multiple CAD Databases

- **Modeling Kernels**
 - Parasolid (NX, Solidworks), ACIS, CGM (Catia), Granite (Creo), Shape Manager (Inventor),...
- **CAD Formats**
 - Solidworks, Catia, NX/UG, Creo/ProE, DWG, Inventor, JT,...
- **Neutral**
 - STEP, IGES

CAD Data Migration

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Translation Challenges for OEMs

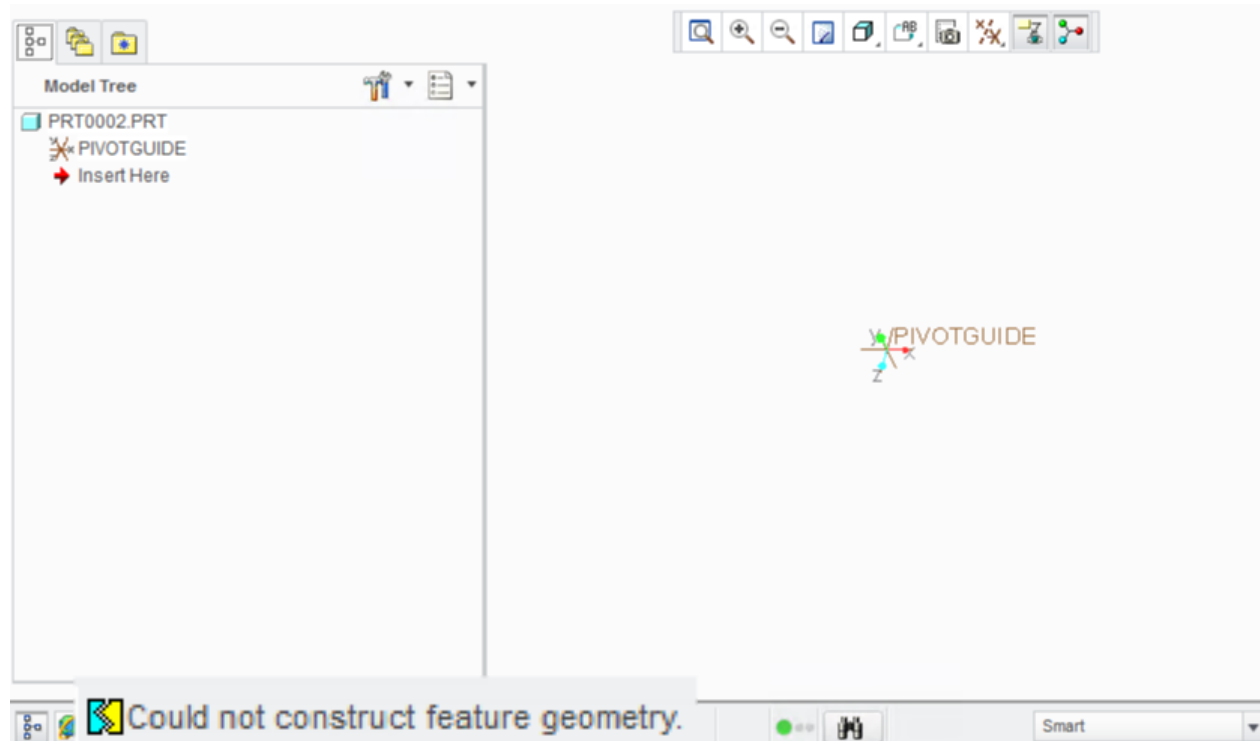
- How do you pick your suppliers?
- Do you offer multiple file formats to your suppliers?
- Do you validate files that you translate for your suppliers?
- Do you require your suppliers to validate any files that they translate from your native files?

CAD Data Migration

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Translation Challenges for Suppliers

- Challenge # 1: Does the file even read in?

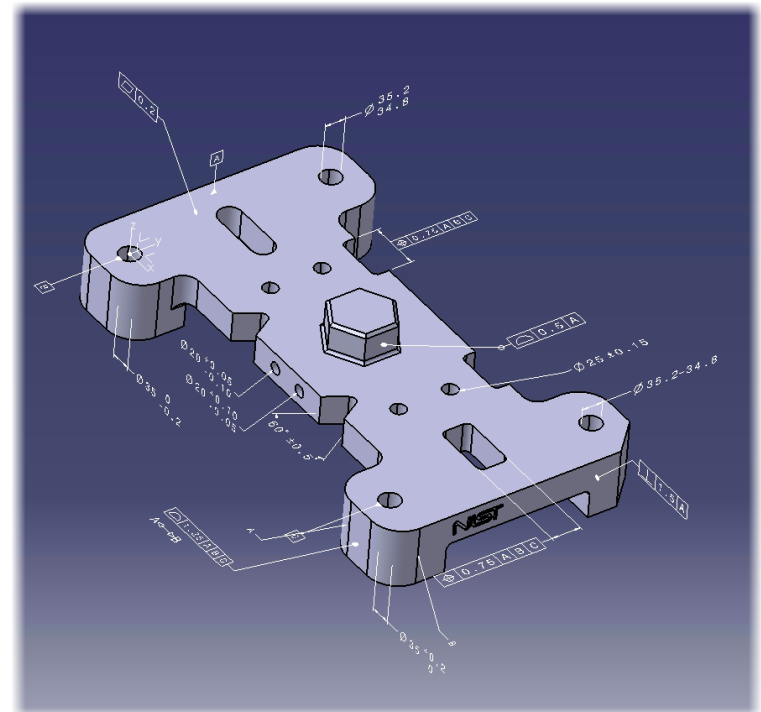
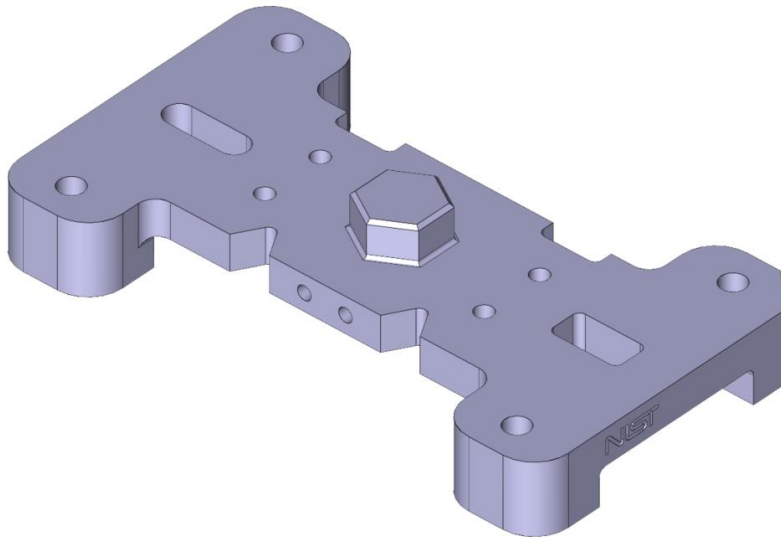


CAD Data Migration

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- Challenge #2: Is all the relevant information read in?

Where's the PMI?



CAD Data Migration

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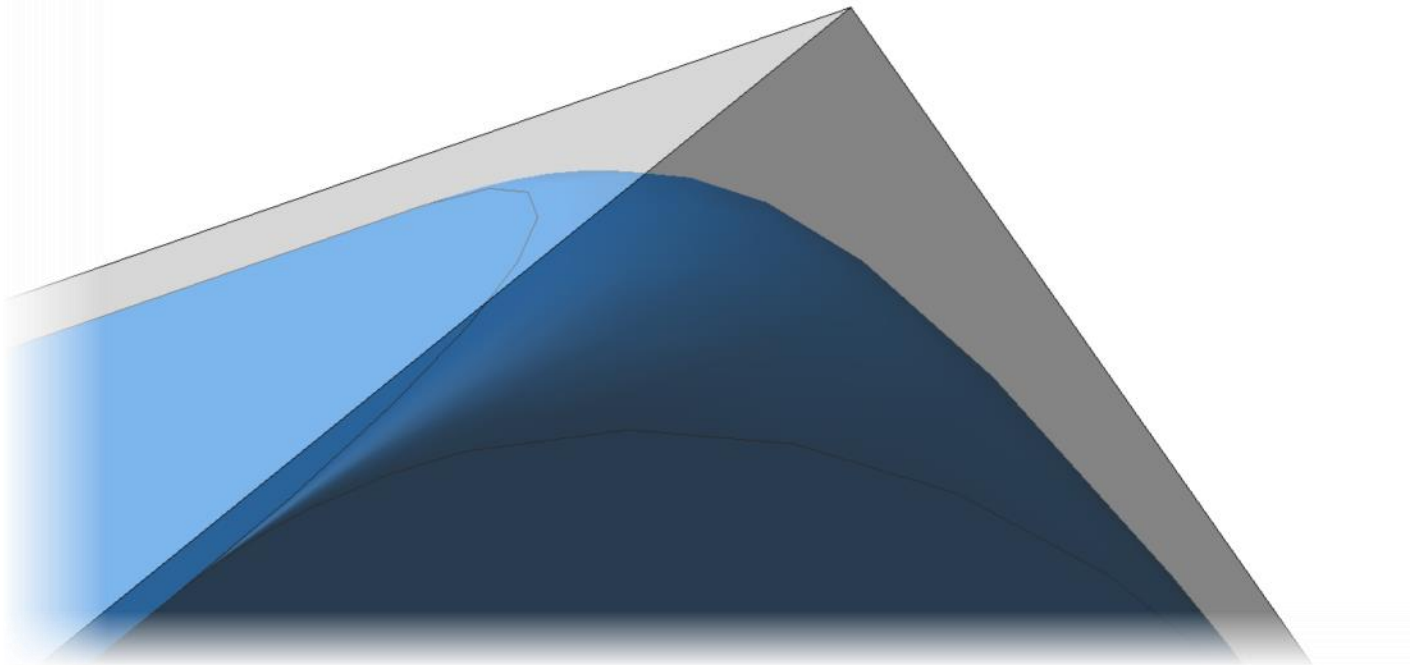
- **Challenge #3: How well did the data read in?**



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- **Challenge # 4: Can the converted data be manipulated with the same (or better) reliability as the native system?**

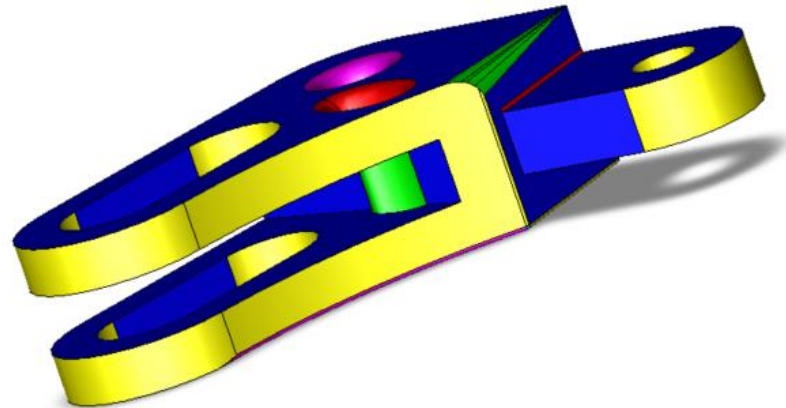
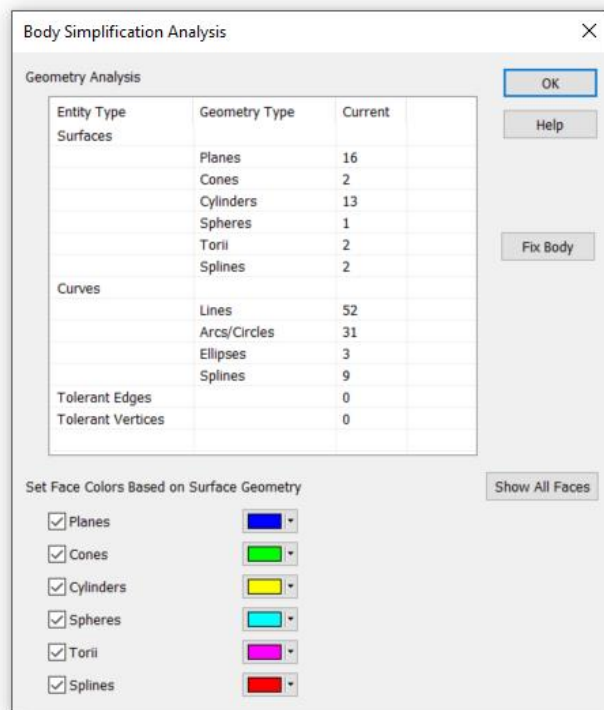


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Translation Challenges for Developers

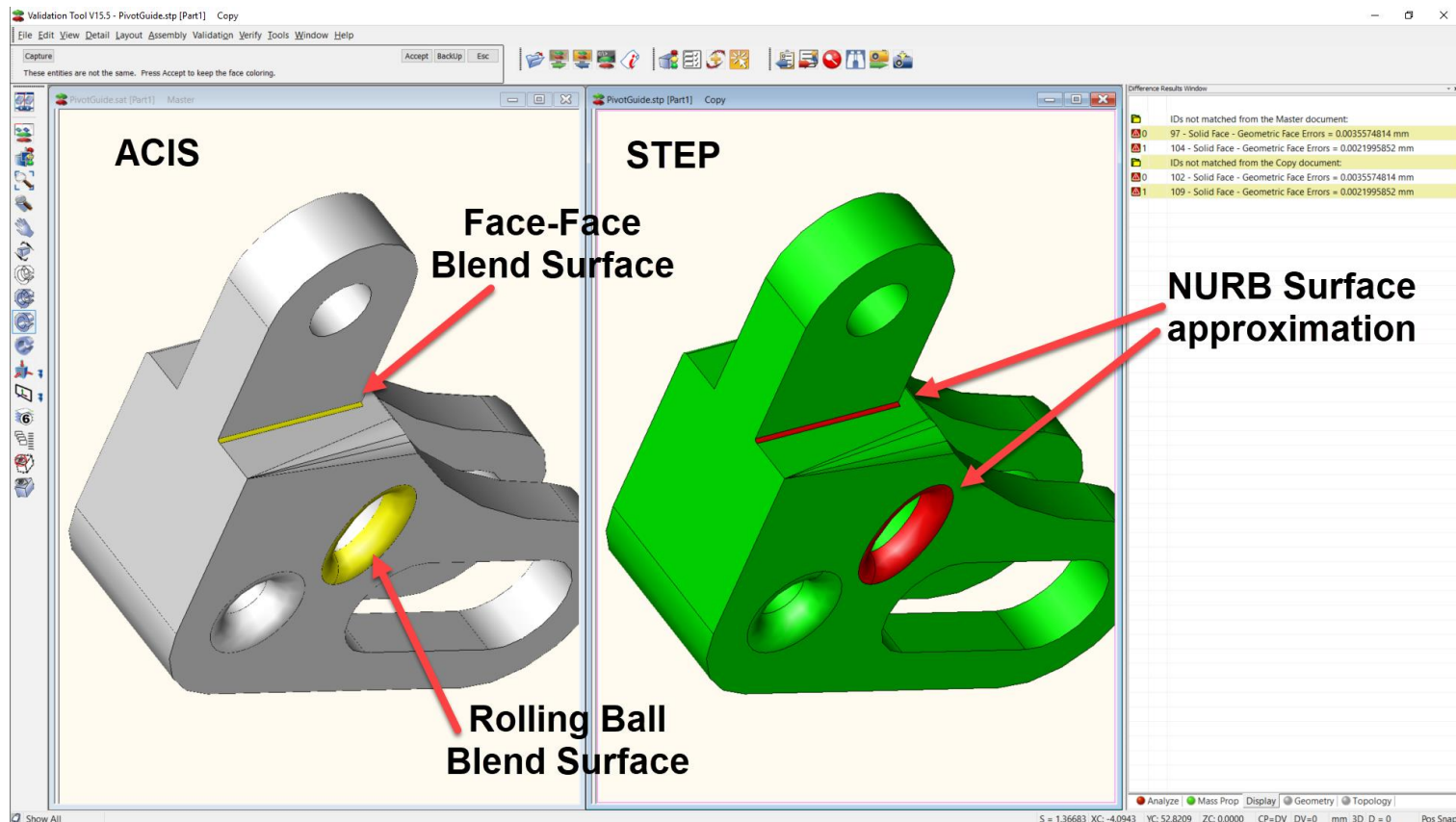
- Varied geometry definitions



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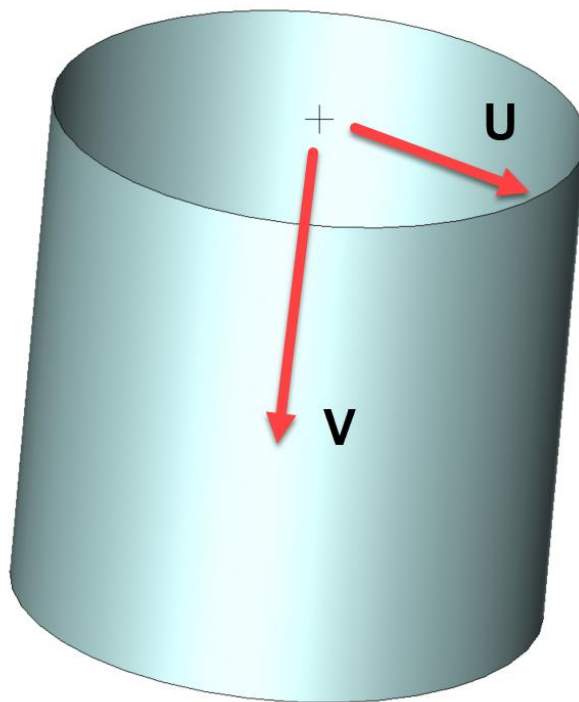
- ACIS to STEP translation



CAD Data Migration – Software Challenges

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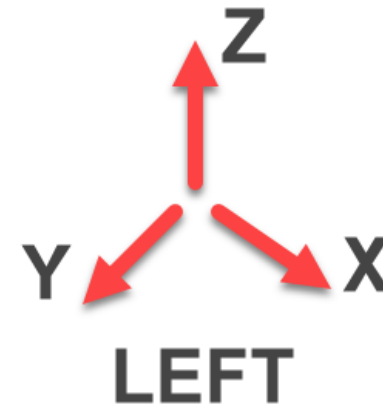
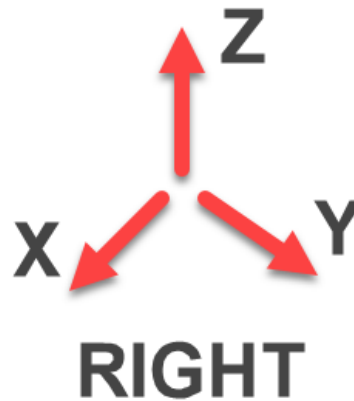
- **Differences in Curve, surface parametrization**
 - How are U, V directions defined? Example: In a Cylinder is U axial or radial?



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- Left handed / Right handed coordinate system



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109 Elements in a B-Rep Cube

1 Lump

6 Faces

6 (Plane) Surfaces

6 Loops

24 Coedges

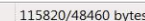
24 2D Curves

12 Edges

12 3D (Line) Curves

8 Vertices

8 Points

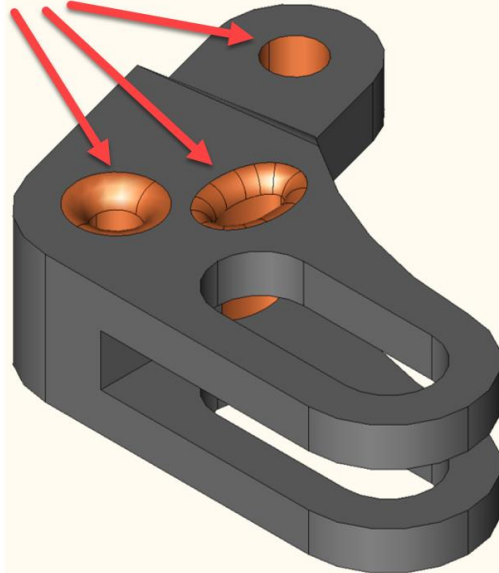


CAD Data Migration

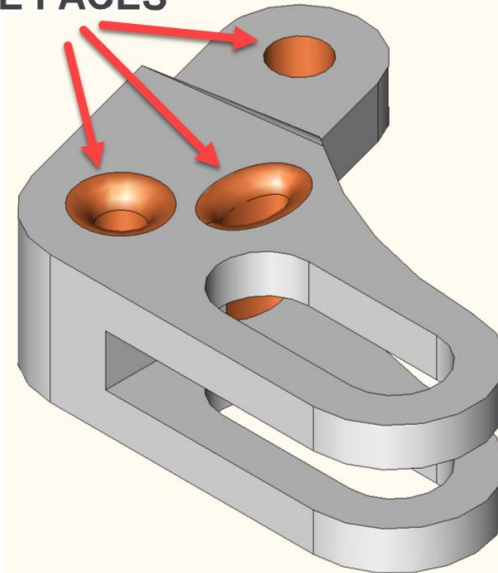
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- Varied Topology definitions
 - CATIA does not allow closed faces, ACIS does

SPLIT FACES



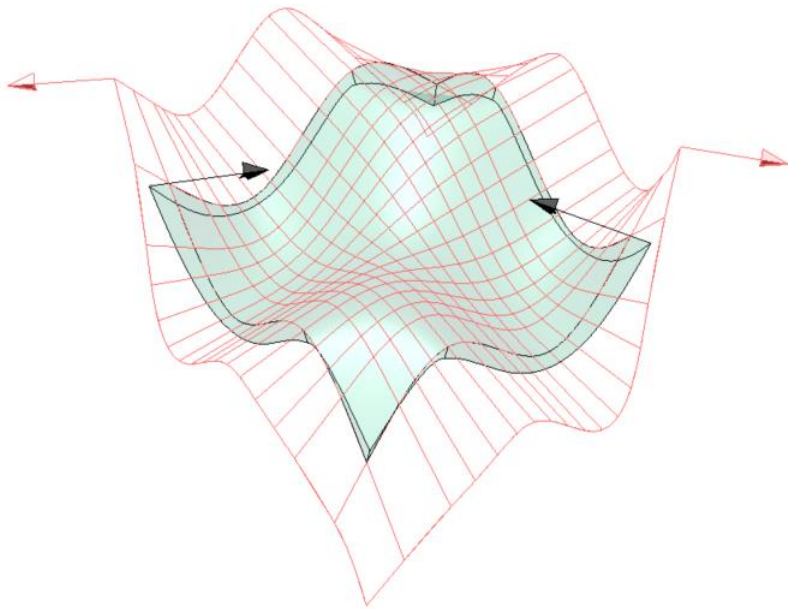
SINGLE FACES



CAD Data Migration

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- **Flipping Flags!!!** Face vs surface normal, edge vs curve direction, face loop orientation, ...



CAD Data Migration

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- **Database & Kernel Limitations**
 - Parasolid & ACIS databases 3D only
 - No support for PMI, 2D Drawing
 - Assemblies added much later, largely unused by industry
 - End user software store additional information separately
 - Tolerant modeling, afterthought in existing kernels
 - Algorithms were not equipped to handle parts that varied in accuracy (1e-02 to 1e-6)
 - Database units vs File Units (CATPART in MM, X_T in meters)
 -

CAD Data Migration

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- **Interoperability depends on convertor's ability to**
 - Keep up with changes to encryption, compression, data types
 - Disregard inconsequential errors
 - Account for corrupt data / missing links
 - Pay attention to flavoring or known issues (neutral formats)
 - Read all pertinent data
 - Faithfully preserve the original data & design intent

KOSMOS

Driven by the need to tackle interoperability issues

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What is it?

- A development framework that supports development of specialized design applications, CAD/CAM, CMM, and CAE utility programs, and high-fidelity movement of 3D data between engineering software programs

KOSMOS

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KOSMOS Core Modeler (KCM)

- **Geometric modeler, and math library**
 - Takes advantage of the many advancements in computer science and mathematics, over the last twenty years
- **Designed to work with Translated Data**
 - From the beginning KCM has been tested with many parts from around the world, created in different modelers
- **Variable Precision**
 - No global precision

KOSMOS

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- All new CAD data database designed to include superset of geometry/topology found in popular CAD formats
- Support for various CAD formats
- PMI and 2D drawing elements
- Lightweight data, features, attributes (render, metadata)

KOSMOS

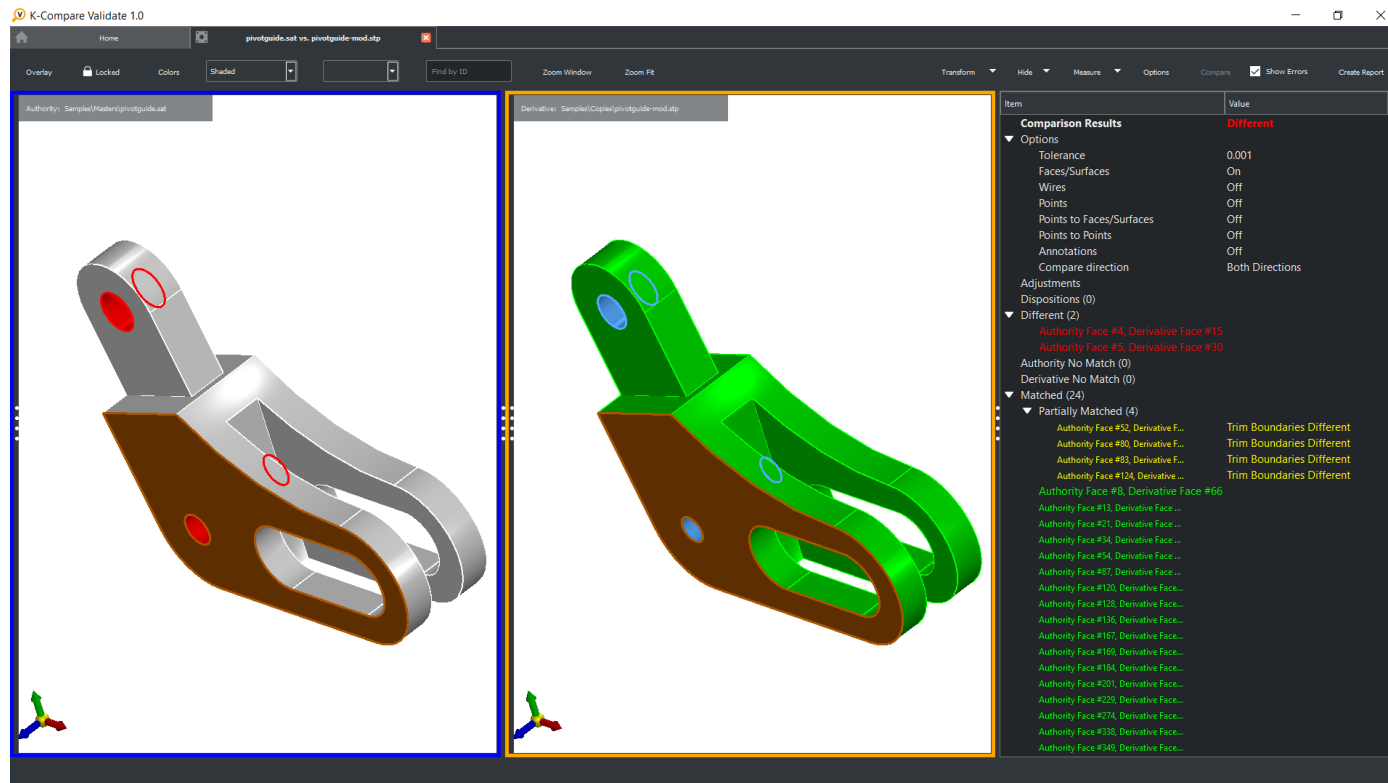
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- **Modern Architecture**
 - Able to efficiently run on multiple processors
 - Complete Multi-Language Support
 - Platform Independent
 - Never Go Dark Code Pool
- **Creation, Feature/Pattern Recognition, Query, Model Repair (Simplify, Merge, Stitch)**
- **Model Comparison**

KOSMOS

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- New end-user products completely based on KOSMOS
 - K-Compare Validate 1.0
 - K-Display View 1.0



QUESTIONS

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