

CAPU Webinar Series presents

Imported Data: File Types

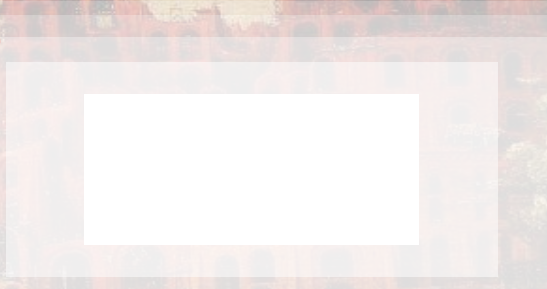
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Agenda

- Understanding the data translation process.
- Overview of CAD systems and file formats.

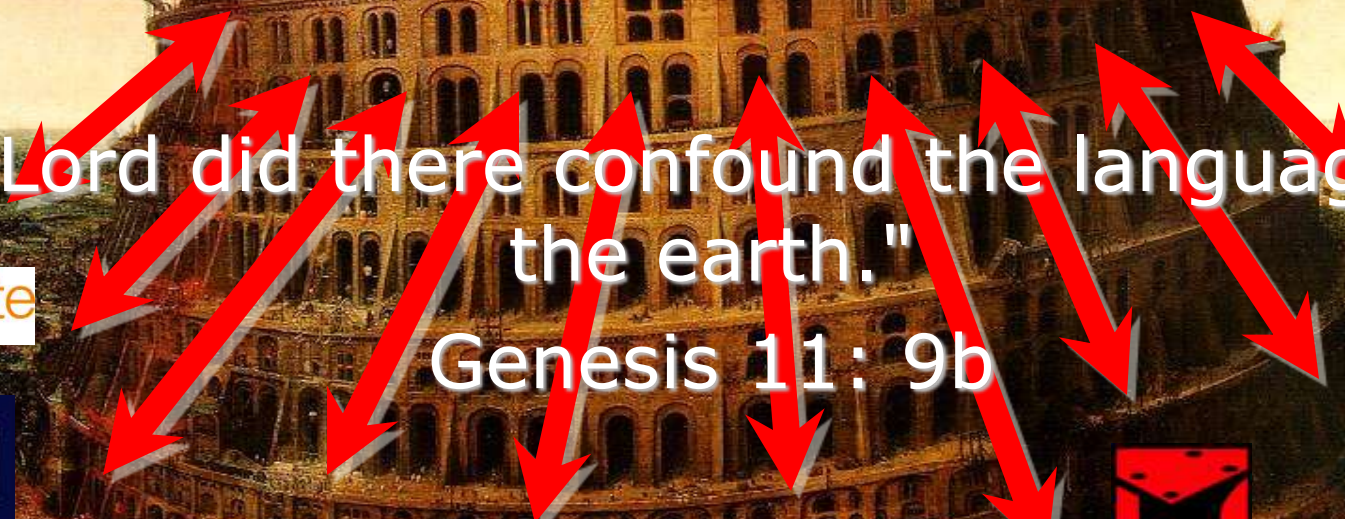
DS



SOLIDWORKS

"The Lord did there confound the language of all the earth."

Genesis 11: 9b





Lost in Translation

- When is translation needed?
- Why are you doing this?
- What are typical problems encountered?
- Where did the data come from?
- How can you get your job done?

When is translation needed?

- When implementing SolidWorks: **Legacy Data** can be a major hurdle.
 - You've done this before... remember the board?
 - Have engineers translate or recreate old designs as-needed for derivative work.
 - Hire a co-op for \$20/hr.
 - Keep a copy of your legacy software.
 - What better way to learn to use SolidWorks than on parts you already know!



When is translation needed?

- **Every day**, SolidWorks users around the world must try to work with data from other systems.
 - Suppliers of purchased parts, used in your assemblies.
 - Clients for whom you design automation equipment, mold and die work, tooling, fixturing, packaging, interfaces...
 - Shapes from non-engineering disciplines such as graphic arts, biology and medicine, industrial design...
- Consider 3rd-party translation services or software.

SolidWorks Partners: "Data Interoperability"

PRODUCTS INDUSTRIES HOW TO BUY SUPPORT COMMUNITY RESOURCE CENTER CUSTOMERS

Home > Products > Partner Products


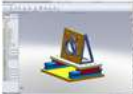


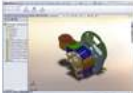
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View By Company: CAD
View By Product: Design
View By KeyWord: Data Interoperability

Show Certified GOLD Partner Products Only
 Show Certified CAM Partner Products Only

Search

Results 1-5 of 5

	CAPVIDIA	Product Name: FormatWorks Category: Design Subcategory: Data Interoperability Product Status: GOLD
	Datakit	Product Name: CrossCAD/Plg : Catia V5 3D ... Category: Design Subcategory: Data Interoperability Product Status: GOLD
	Delcam plc	Product Name: Delcam Exchange Category: Design Subcategory: Data Interoperability Product Status: Solution Partner
	TransMagic, Inc.	Product Name: TransMagic ADVANTAGE Category: Design Subcategory: Data Interoperability Product Status: Solution Partner
	TransMagic, Inc.	Product Name: TransMagic PowerPack for So... Category: Design Subcategory: Data Interoperability Product Status: GOLD

Why are you doing this?

- How you decide to handle non-SolidWorks data has a lot to do with **exactly** what you're trying to accomplish.
 - **Position** a purchased part in an assembly.
 - **Flatten** a sheet metal part.
 - Make design **changes**.
 - Apply **draft** and design a mold.
 - **Design** interfacing parts.
 - **Interference** checking.
 - **Reverse** engineer a design.
 - **Digitize** a physical model.

What are typical problems?

- Incompatible file formats.
 - Really old or obscure CAD files.
 - Newly-released version files.
 - Formats from non-MCAD industries:
 - 2D raster data (pixels)
 - Polygonal meshes
 - Other
- Incomplete import: Can't create a solid.
 - Gaps, holes, and surfaces that won't knit.
 - Bad faces and vertices.
 - Point cloud or wireframe data.
- Editability
 - Exporting the file "transparently".
 - Getting useful results from imported 2D data.
 - Making changes to a "dumb solid".

Where did it come from?

- Many times, problems are caused by the source system.
- SolidWorks has lots of import options.
- Other systems have varied export options.
- Let's take a look at available formats.
 - Neutral formats (IGES, STEP...)
 - Kernels (ACIS, Parasolid...)
 - Proprietary files (Pro/E, Inventor...)
 - Less common formats (VRML, STL...)

Preferred Import/Export Formats

1. SolidWorks native (*.sldprt, *.sldasm, *.slddrw)
2. Direct translation (included, or 3rd-party)
3. Parasolid (*.x_b, *.x_t)
4. ACIS (*.sat)
5. STEP (*.stp, *.step)
6. IGES (*.igs, *.iges)

IGES (*.igs, *.iges)

- Initial Graphics Exchange Specification.
- Created in 1979 by industry consortium, managed by NIST.
- Current version = 5.3 (1996)
- Entity type 144 = trimmed surfaces.
 - Entity type 186 = BREP solid.
- IGES comes in many "flavors".
 - Only the "STANDARD" flavor exports analytic data from SolidWorks.

STEP (*.stp, *.step)

- **S**Tandard for the **E**xchange of **P**roduct data
- First released in 1994 as "ISO 10303".
- Designed to accommodate lots of product data in addition to geometry.
- If ever a neutral format will support parametric history, it will likely be STEP, using a new AP.
 - AP-203: 3D designs of mechanical parts and assemblies.
 - AP-214: Like AP-203 plus layers, color, other extra info.
- Certification of compliance by PDES, Inc.

What's a kernel?



kernel?



Colonel?

What's a kernel?

- The **kernel** is the math engine that calculates the solid geometry of the CAD system.



Parasolid

(***.x_t**, ***.x_b**)

SIEMENS

- **x_t** = Text, **x_b** = Binary
- 3D modeling kernel originally from Unigraphics, made commercially available in 1988.
- Current version = 24.0 (Oct 2011)
- Used by SolidWorks, MicroStation, Solid Edge, Unigraphics/NX, EdgeCAM, ESPRIT, GibbsCAM, MasterCAM, SURFCAM.
- Two-way version compatibility.
- Very small file size.



ACIS (*.sat)



- ACIS is not an acronym, or is it?
 - Alan, Charles, and Ian's System
- 3D modeling kernel introduced by Spatial Technologies in 1990.
 - Spatial is a subsidiary of Dassault Systemes as of 2000.
- Current version = R22 (2011)
- Used by AutoCAD R13+, Alibre, CADKEY, CoCreate, IronCAD, Mechanical Desktop, Vellum, old MicroStation, old Solid Edge, old Inventor.
- Version 1.x does not support units.

Proprietary formats

- AutoCAD
- Mechanical Desktop
- Autodesk Inventor
- Pro/Engineer - Creo
- Solid Edge
- CADKEY
- Unigraphics - NX

AutoCAD

(* .dxf, * .dwg)



- Drawing EXchange Format, DraWinG
- 2D/3D proprietary format from Autodesk, version 1.0 shipped in 1982.
- Current version = "2012" a.k.a. R26 (2011)
 - DXF exists to exchange data with other CAD systems including other versions of AutoCAD and Mechanical Desktop.
- Could contain a variety of data structures depending on functions/methods employed.
- DXF and DWG have both become industry standards for 2D CAD data exchange.
 - DraftSight is free from Dassault Systemes!
 - DWGeditor is discontinued.

Mechanical Desktop (* .dwg)



- Autodesk's 3D parametric solid modeler introduced in 1996.
- Uses the same **dwg** file extension as AutoCAD to store product data.
- Requires MDT on the same computer
 - Imports ACIS data from native MDT file.
 - Or import **features** and **mates**!
- Otherwise, export from Mechanical Desktop to ACIS (*.sat) or 3D DXF file.

Inventor (* .ipt, * .iam)

The Autodesk logo is displayed in a white rectangular box in the top right corner. The word "Autodesk" is written in a blue, sans-serif font, with a registered trademark symbol (®) to its upper right.

- Autodesk's 3D parametric solid modeler introduced in 1999.
- Current version is Inventor 2012 (March 2011) release 16.
- Originally built on ACIS.
- "ShapeManager" kernel initiated in 2001.
 - Proprietary kernel derived from ACIS 7.
 - First used in Inventor 6 (Oct 2002).
- SolidWorks 2012 imports all Inventor versions.
 - **Feature** history can be imported!
 - Requires Inventor or Inventor View (free).

Pro/Engineer (*prt.*, *.asm.*)



- Proprietary 3D parametric data format from PTC.
- Pro/E first released in 1988 for UNIX.
 - v15 (1995) was first version to run on Windows.
 - Kernel released, called "Granite" (2001).
 - v28 "Wildfire 5" was renamed to "Creo Elements/Pro" in 2010.
- Current version = "Creo Parametric" (v1.0 July 2011)
- SolidWorks 2012 imports v20 through Creo 1.
 - Parts can be BREP, knit surfaces, or **features!**
 - Parts and assemblies.

Pro/ENGINEER

Other proprietary formats

- Solid Edge (*.par, *.psm, *.asm)
 - Originally developed by Intergraph using ACIS in 1996.
 - Acquired by UGS and converted to Parasolid in 1997.
 - SolidWorks extracts Parasolid data.
- CADKEY (*.prt, *.ckd)
 - SolidWorks extracts ACIS data (v19).



Other proprietary formats

- Unigraphics NX (*.prt)
 - Owned by Siemens
 - Based on Parasolid
 - Support to NX v7.5
- Rhino (*.3dm)
 - Inexpensive non-parametric CAD.
 - NURBS surfaces



Other neutral formats

- STL (*.stl)
 - STereoLithography
 - Faceted geometry (polygon mesh).
 - Quality (number of triangles) is adjustable.
 - Can be text or binary.
 - Best for 3D Printing export.
- VDAFS (*.vda)
 - Vereinigung Deutsche Automobilindustrie Flächen Schnittstelle
 - [United German Automobile Industry Surfaces Interface]
 - Two versions:
 - v1 cannot represent faces.
 - v2 has trimmed surfaces.
 - Similar to IGES, but usually larger files than IGES.
 - Created in 1982.

IFC 2x3 (*.ifc)

- Industry Foundation Class
- Neutral format for architecture, engineering and construction (AEC).
- Initiated by Autodesk in 1994.
 - Now maintained by buildingSMART and International Alliance for Interoperability
 - Registered as ISO 16739
- Version 2x3 released Feb 2006.
- Supports 3D models just like STEP.

VRML (*.wrl)

- Virtual Reality Modeling Language (world)
- Derived from the "Open Inventor ASCII File Format" from Silicon Graphics, Inc.
- Was originally designed to model virtual worlds as a highly-interactive user interface for networked data.
 - v1.0 (1995): Non-interactive, except for hyperlinking.
 - v2.0 a.k.a. VRML97: Interaction with Java or JavaScript.
- Faceted geometry, except for primitive shapes.
 - Quality depends on SolidWorks image quality.
- Good way to get from MCAD to Digital Content Creation (computer graphics and animation).

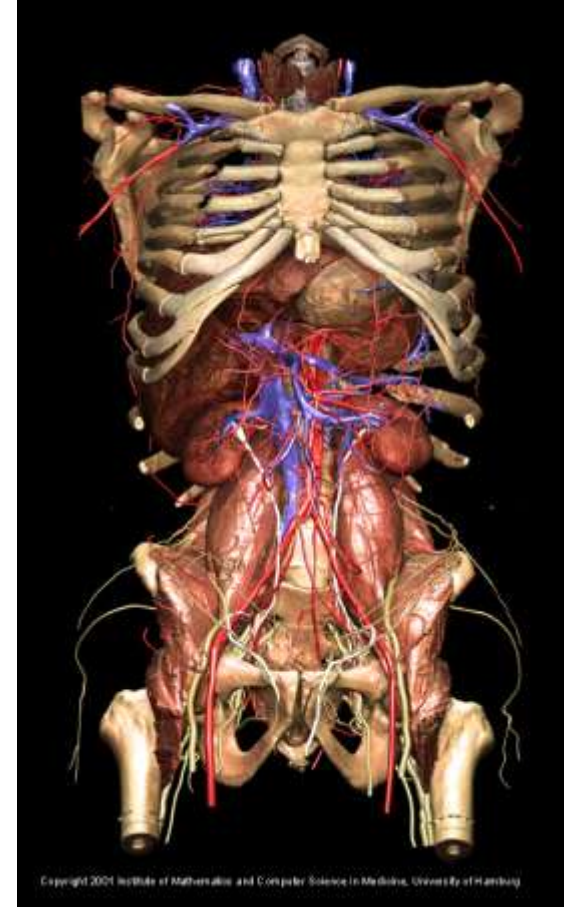
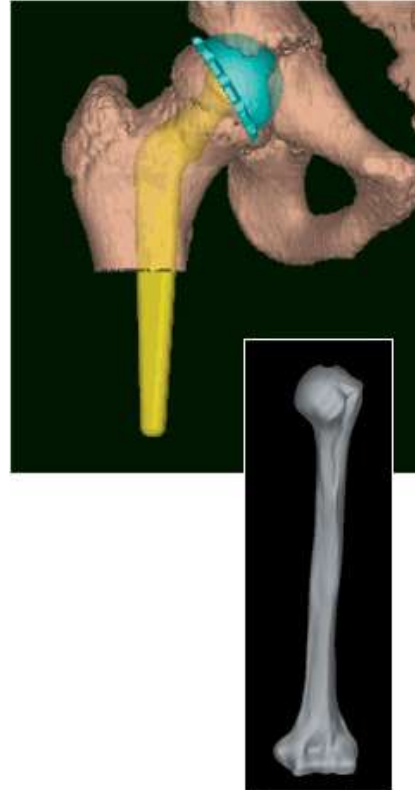
Non-CAD data

- Adobe Illustrator (*.ai) imports as a sketch.
 - Requires CS3 or later installed.
- EPS, HPGL, and other 2D vector formats. ☹
 - Need to convert to DXF/DWG.
- BMP, JPEG, GIF, TIFF, and other 2D raster formats.
 - Need to convert to "vector" and then to DXF/DWG.
 - Or use Sketch Tools – Insert Picture
 - Autotrace NEW in 2008!
 - Tools – Add-Ins - Autotrace



Non-CAD data

- CAT Scans, MRI, and other medical data.
 - "Mimics" by www.materialise.com
- Point Cloud and Polygon Meshes from 3D scanners or measuring probes.
 - ScanTo3D Add-In
 - Part of SolidWorks Premium



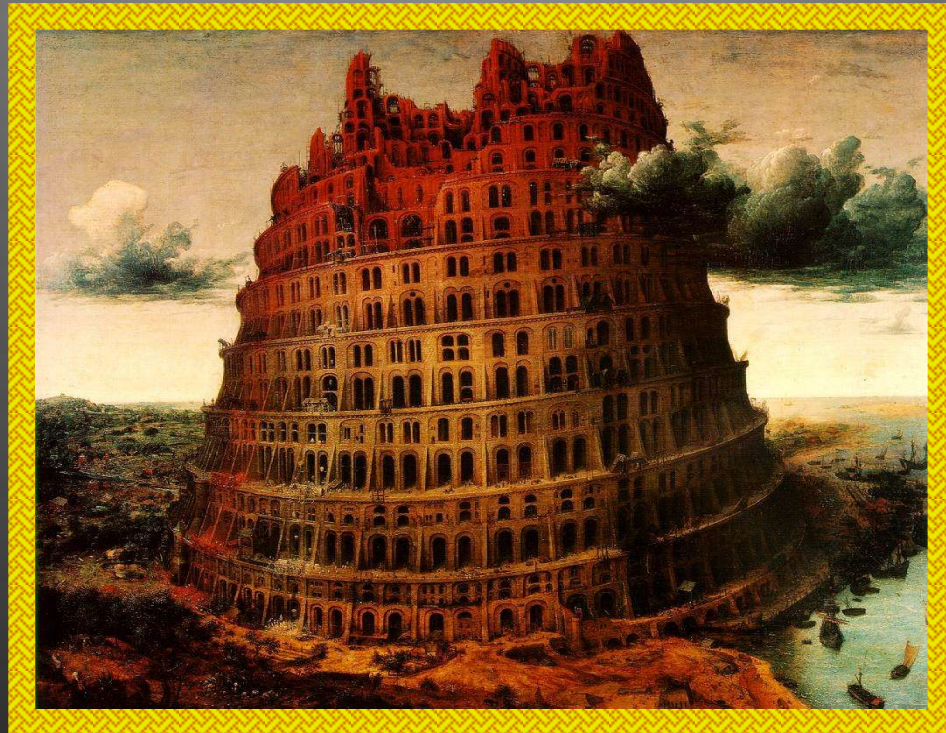
Summary

- Remember import priority:
 1. SolidWorks native
 2. Direct translation
 3. Parasolid / ACIS
 4. STEP / IGES
- Also depends on exporting system
- For 2D, it's all about DXF / DWG
- ScanTo3D enables non-CAD import

More Information

- DraftSight course (1 day) \$375
 - March 27
- Imported Data course (1 day) \$375
 - March 28
- Q1 CAPU events and webinars FREE
 - Feb 2 Portland ME
 - Feb 6 What's New 2012 webinar
 - Mar 1 Peabody MA
 - Mar 5 FeatureWorks webinar
 - Mar 15 Westboro MA

The End



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