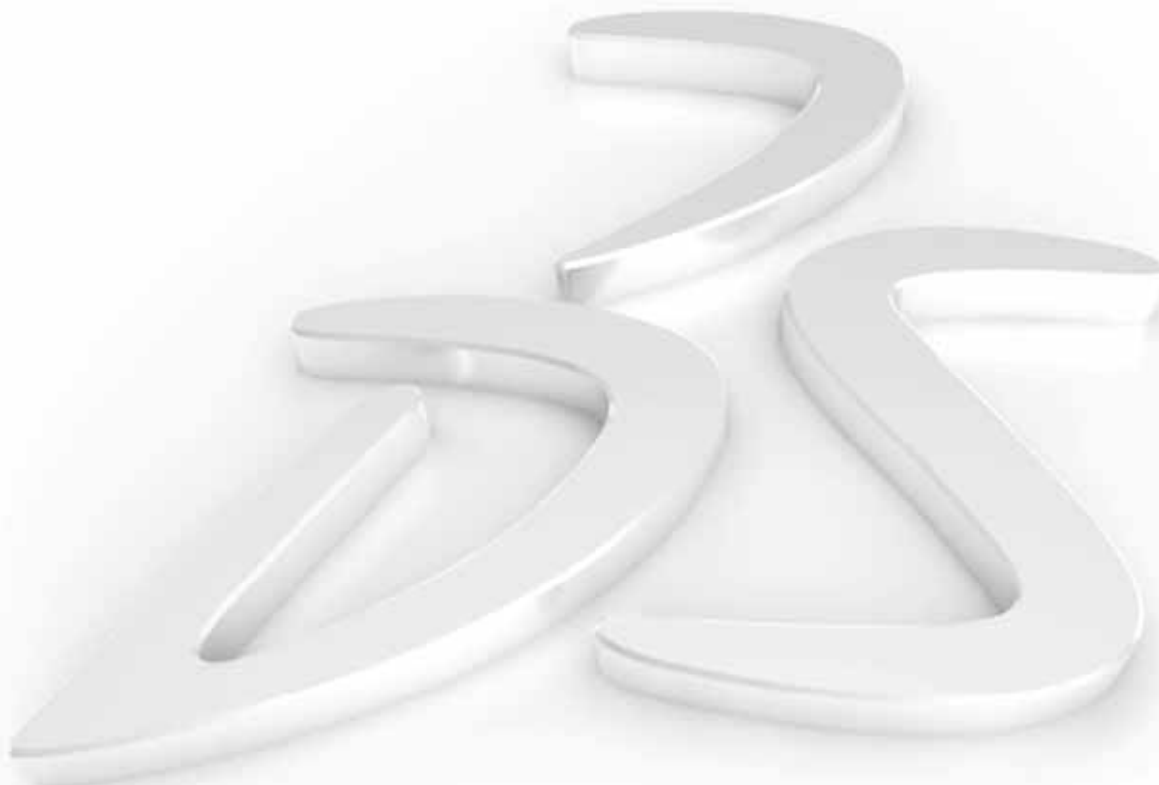


ECAD to MCAD integration using CircuitWorks

Eric Leafquist



Introduction

- **Eric Leafquist**

- SolidWorks CAD Product Manager
 - Various product responsibilities

- **Thanks to Rob Lacey**

- CircuitWorks Development Manager
 - Responsible for CircuitWorks Development.

Introduction

● What we're going to cover today:

- Why link ECAD & MCAD?
- How do we link ECAD & MCAD?
- The file formats used.
- Demonstrations:
 - CircuitWorks Lite.
 - CircuitWorks.
- The future of ECAD – MCAD integration.
- Questions

Why link ECAD systems to SolidWorks?

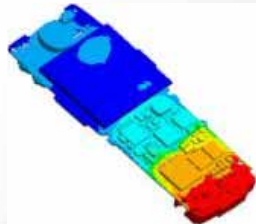
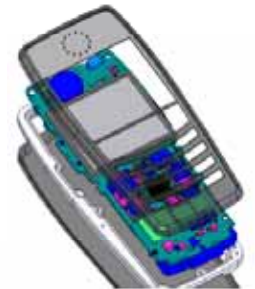
- **Mechanical and Electrical Engineers tend to work separately when designing an electro-mechanical product.**
- **Closer integration between Mechanical and Electrical design benefits both disciplines.**



The benefits for Mechanical Design

● Accurate Circuit Board models help Mechanical Design:

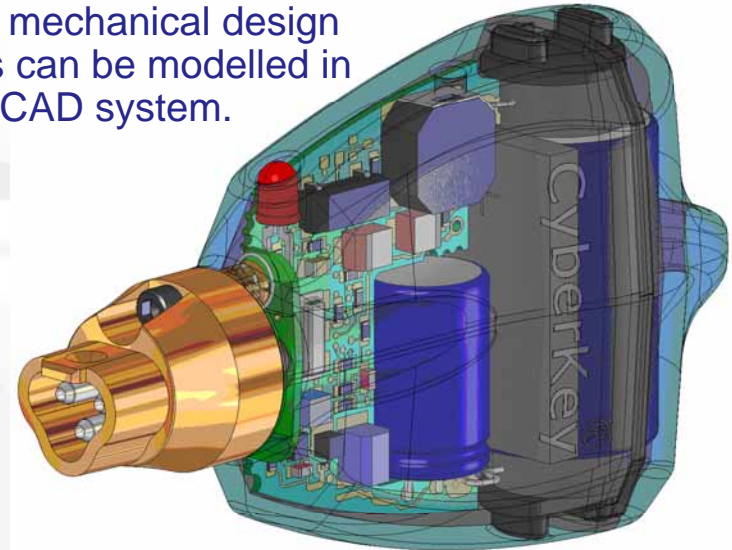
- Design:
 - Will it fit? Avoid collisions between the PCB and enclosure.
 - Know the position of key electrical components.
Large Components, Connectors...
 - Both lead to more efficient and accurate enclosure design.
- Analysis:
 - Models can be used for thermal analysis.
 - Models can be used for electromagnetic analysis.
- Sales use:
 - Models can be used for visualization – *PhotoView 360, etc...*



The benefits for Electrical Design

● Accurate mechanical PCB models help Electrical Design:

- Board Shape:
 - Complex Board shapes can be created in SolidWorks and then accurately transferred to the ECAD system.
- Component Location:
 - 'Keep Out' / 'Keep In' areas defined in SolidWorks can be transferred to the ECAD system.
- Key Components:
 - Key electrical components that affect the mechanical design such as screens, buttons and connectors can be modelled in SolidWorks and then transferred to the ECAD system.



How can ECAD and MCAD be linked?

- **Intermediate Data Format (IDF)** is the industry standard data exchange format between ECAD and MCAD systems:

- Open format designed by a group of ECAD and MCAD companies.
- Supported by most ECAD systems and many MCAD systems including SolidWorks.
- Currently 3 versions – *IDF v2.0, v3.0 and v4.0*.
- An IDF 2.0 or 3.0 ‘file’ is actually two files (normally *.emn & *emp).
- IDF 4.0 files are just one file with an *.idf suffix.

```
.HEADER
BOARD_FILE 3.0 "VeriBest Expedition PCB" 2000/01/11.15:28:28 1
Example2 THOU
.END_HEADER
. BOARD_OUTLINE UNOWNED
62.000000
0 0.00000 1.00000 0.00000
0 3149.00000 1.00000 0.00000
0 3149.00000 5946.00000 0.00000
0 0.00000 5946.00000 0.00000
0 0.00000 1.00000 0.00000
.END_BOARD_OUTLINE
.ROUTE_OUTLINE UNOWNED
ALL
0 222.00000 15.00000 0.00000
0 2912.00000 15.00000 0.00000
0 2912.00000 5930.00000 0.00000
0 222.00000 5930.00000 0.00000
0 175.00000 45.00000 0.00000
```

```
IDF_Header
(
  Version ("v4.0"),
  Creation_Date_Time ("2006/02/24.11:13:30"),
  Owner_Name ("koarai"),
  Owner_Phone ("042-333-6212"),
  Owner_Email ("Cad@ydc.co.jp"),
  Source_App_Type ("Hand_Generated"),
  Source_App_Vendor ("N/A"),
  Source_App_Name ("N/A"),
  Source_App_Version ("N/A"),
  IDF_Tx_Name ("N/A"),
  IDF_Tx_Version ("N/A"),
  Entity_Count
  (
    Elec_Part_Defs (31),
    Elec_Part_Insts (166),
    Board_Part_Defs (25)
```

Who supports IDF?

- **These ECAD systems produce IDF output either directly or via a third party translator:**

- Altium Designer, Altium P-CAD.
- Cadence Allegro, Cadence Orcad.
- Mentor Graphics BoardStation & Expedition.
- Mentor Graphics PADS Power PCB.
- Yokogawa Cadvance, Zuken CR-5000 & Cadstar ...and many more.
- A more complete list is at www.solidworks.com – search for 'CircuitWorks'.



- **SolidWorks supports the IDF file format:**

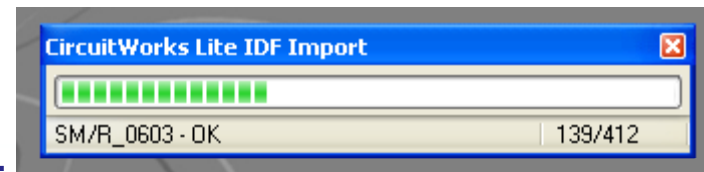
- CircuitWorks Lite (*in all versions of SolidWorks from SW2005*).
- CircuitWorks (*in SolidWorks Premium only from SW2008 sp4.0*).

CircuitWorks Lite (in SW2005 onwards)

- **CircuitWorks Lite produces a SolidWorks part file from an IDF file, representing the PCB and Components.**

- **Advantages:**

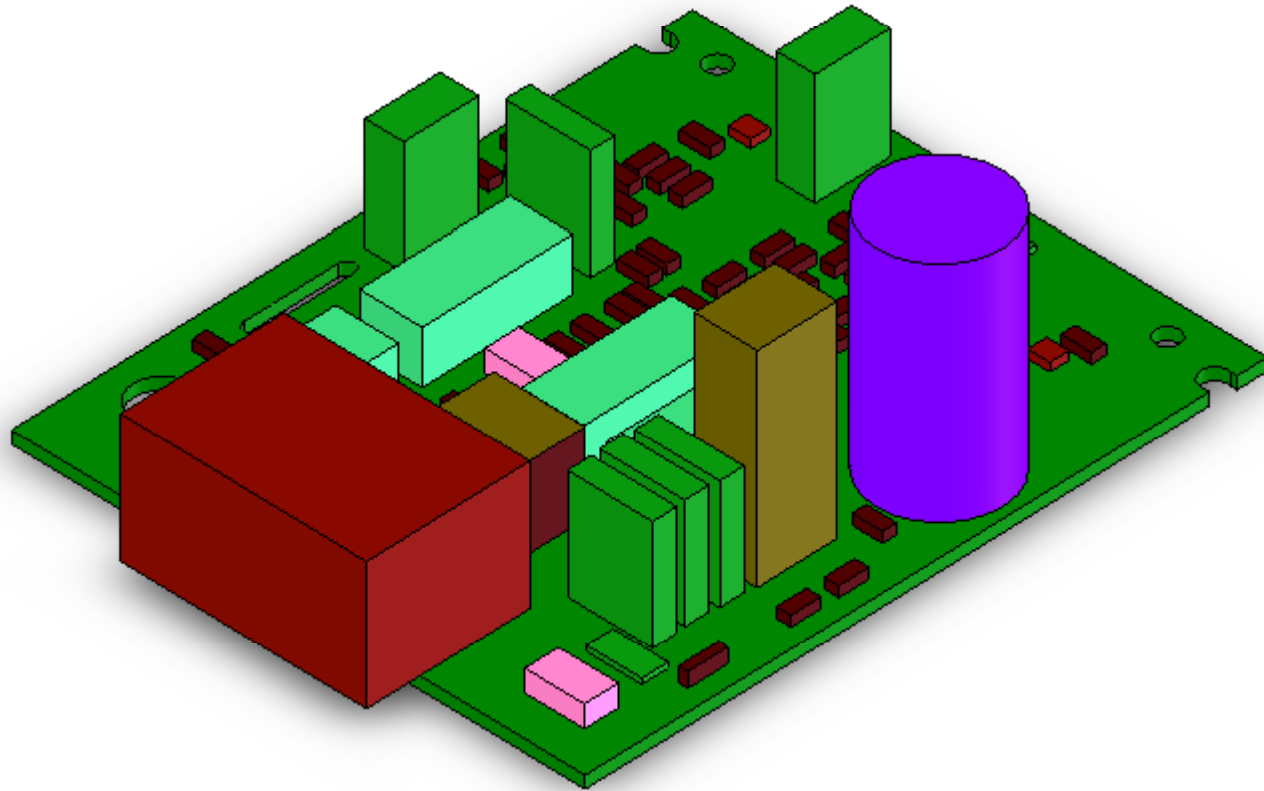
- Free, simple and easy to use.



- **Disadvantages:**

- Import only - No ability to save SolidWorks models as IDF data.
- IDF 2.0 and 3.0 only. No support for IDF 4.0.
- No tools - Creates a 'dumb' model.
- No filtering of any type.
- Shows only board, components and mechanical holes.
- Cannot be used with a pre-existing component models.
- Will struggle with larger PCBs (500 components maximum).

CircuitWorks Lite Demonstration



CircuitWorks (in SolidWorks Premium)

- **CircuitWorks produces a SolidWorks assembly from the IDF file, representing the PCB and components.**

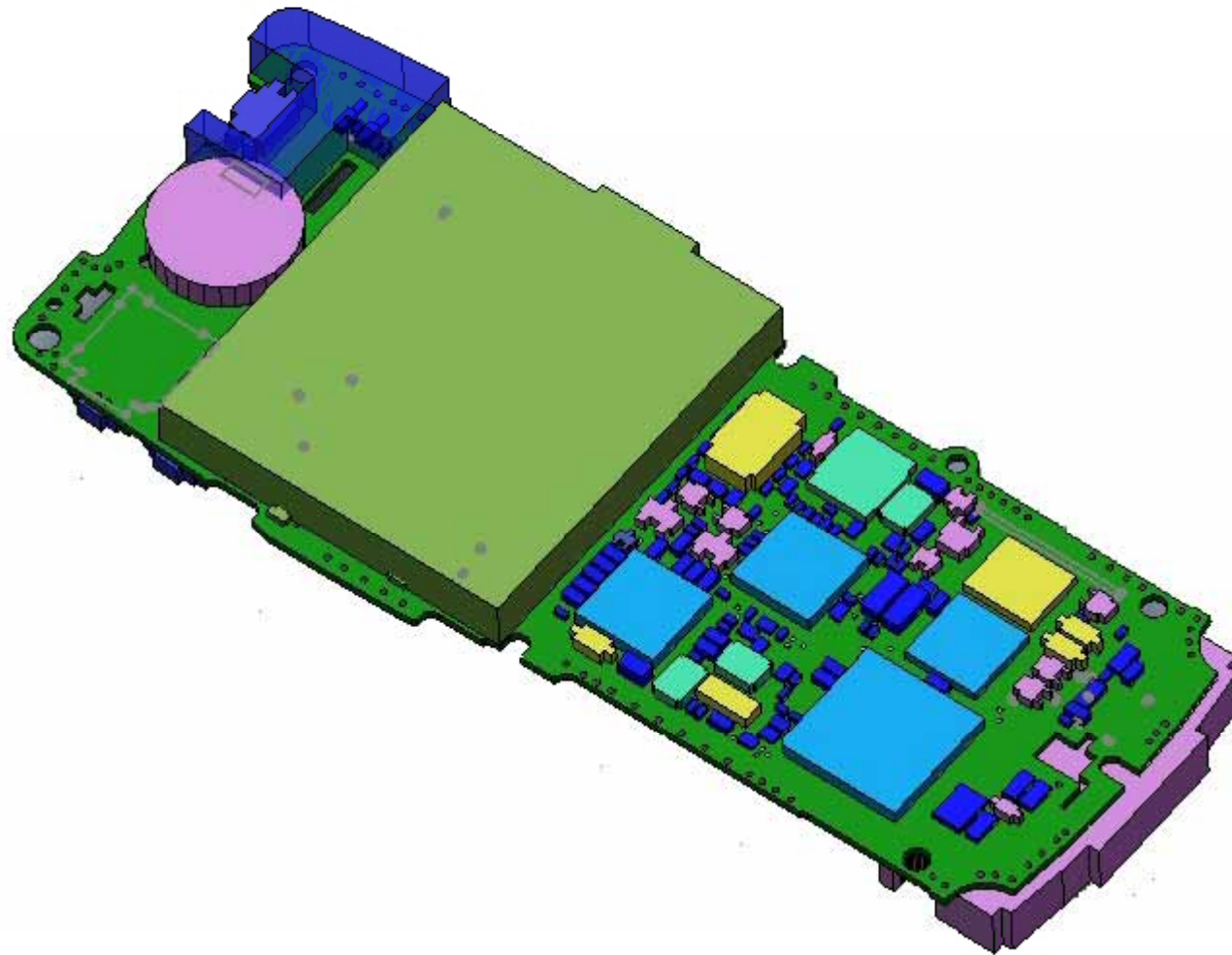
- **Advantages:**

- Can import and export IDF, so IDF files can be saved out of SolidWorks for reuse with an ECAD system.
- Uses a component library, so can be used with a pre-existing component models.
- Supports advanced filtering.
- Supports all information in the IDF file: Holes, Cut-outs, Keep-Out Areas, Notes etc...
- Supports IDF 2.0, 3.0, 4.0 & PADS (*.asc) files.
- Much faster than CircuitWorks Lite.

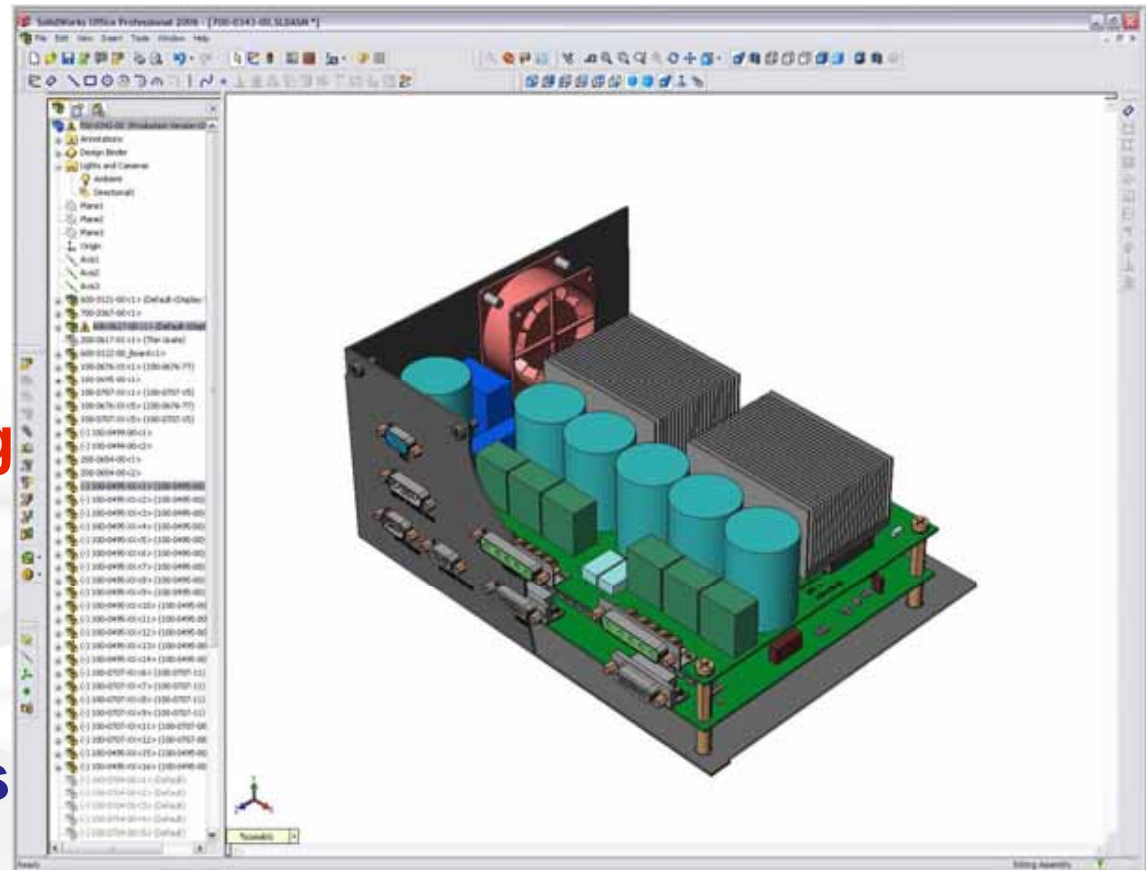
- **Disadvantages:**

- Only available as part of SolidWorks Premium.

CircuitWorks Demonstration

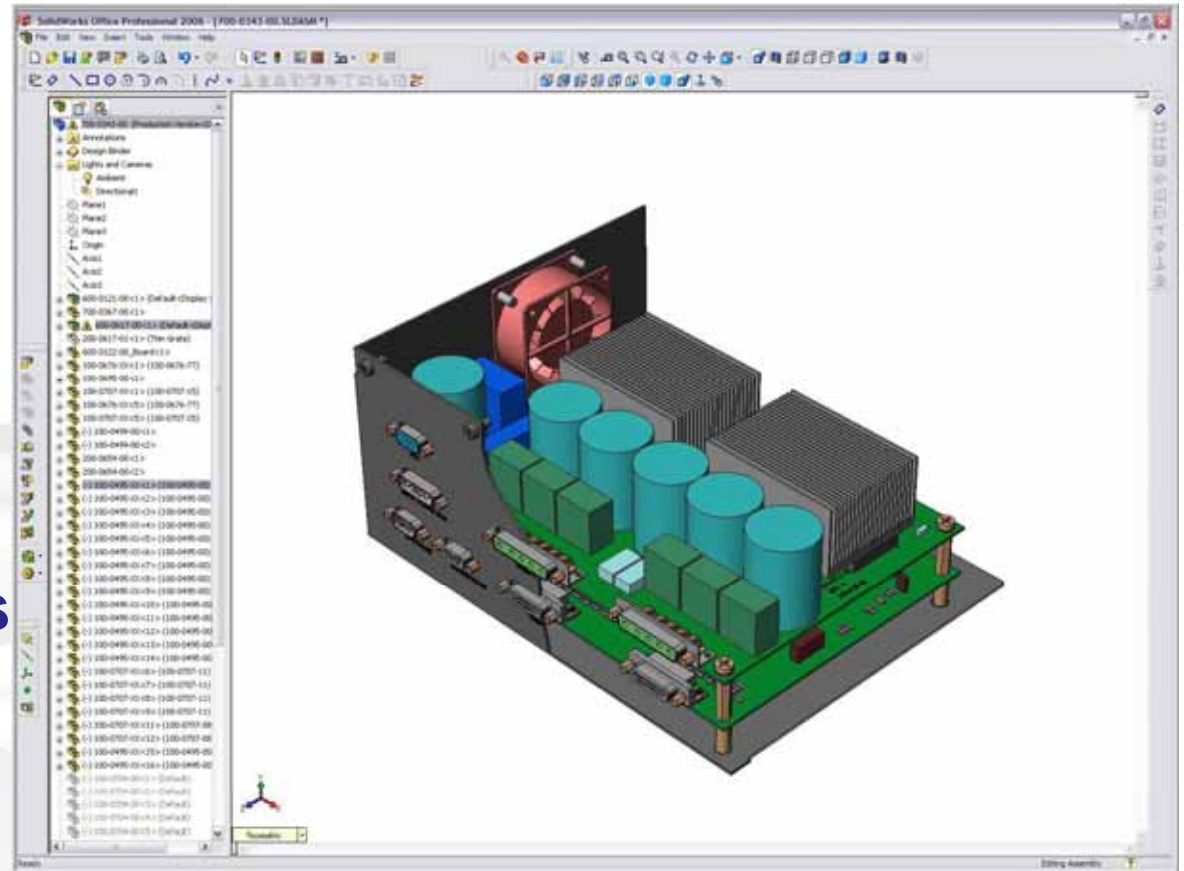


- Specifications
- Initial 3D CAD design
- Initial PCB design
- **Manual 3D modeling of PCB**
- PCB-to-3D CAD Integration
- Additional iterations



**Manually sketch and extrude
add each component on the PCB
to show proper height**

- Specifications
- Initial 3D CAD design
- Initial PCB design
- PCB-to-3D CAD Integration
- Additional iterations



Each PCB iteration reduced from 1 day to ½ hour using CircuitWorks (full version)!

The Future

- The IDF format is now quite old, and is no longer being developed.
- CircuitWorks' main limitation is the IDF 2.0/3.0 file format.
- ECAD and MCAD companies are working on new formats, one of which may eventually replace IDF 2.0 & 3.0:
 - IDF 4.0
 - IDF 4.0 supports multi-layer boards, traces, filled areas and much more complex shapes .
 - Currently only Japanese system YDC Cadvance supports IDF 4.0.
 - CircuitWorks supports IDF 4.0 (not supported by Lite)
 - Pro Step
 - Designed to replace IDF.
 - Currently has “IDF 3.0” levels of detail, but plans to develop the standard further.
 - Allows user to send incremental changes (*e.g., add, move or remove a component*)
 - Backed by Mentor Graphics and some MCAD vendors

Find out more

- IDF*
 - A list of systems that support IDF is on www.solidworks.com - search for 'CircuitWorks'.
 - Ask your ECAD vendor for advice and information.
- CircuitWorks Lite
 - Included in all versions of SolidWorks from SW2005.
 - Find an IDF file and give it a try!
- CircuitWorks
 - Only available in SolidWorks Premium – check the 'CircuitWorks' add-in.
 - Contact your SolidWorks Reseller for more information about CircuitWorks or upgrading to SolidWorks Premium.

* Don't forget that the most common IDF file formats (2.0 & 3.0) are two files on disk, normally with the suffixes **.emn/*emp*, but other suffixes are also used like **.brd/*.lib* and **.idb/*.idl*.

Any Questions?

