MA2787: Harnessing the Power of Top-Down Design in Autodesk® Inventor®

Nolan Friesen – IMAGINiT Technologies

MA2787   In this class, we examine some of the methods to better define our models using design techniques that follow the "Top-Down Design" philosophy. We cover some of the most popular and useful methods of assembly modeling, including multi-body parts, layout assemblies, and adaptive assemblies and parts. These powerful models can adapt to design changes easily and save hours of part editing and manipulation. By focusing on the relationships between parts in the assemblies, we can remove the need to modify each part independently.

Learning Objectives

At the end of this class, you will be able to:

- Create multi-body parts and generate assemblies from them
- Create layout-based assemblies
- Describe the relationships created between parts created in the assembly environment and explain their adaptive nature
- Save time and effort in future designs by setting up models that adapt to change quickly and efficiently

About the Speaker

Nolan Friesen is an Application Expert with IMAGINiT Technologies and provides training and consultation for Inventor, AutoCAD and Vault products. Nolan is an Autodesk certified professional for Inventor and an authorized Autodesk trainer. He has had a variety of experience using Inventor software in the design of emergency vehicles, agricultural implements and industrial fabrication, and 8+ years designing with AutoCAD and Inventor. Nolan enjoys combining his real world experience with his knowledge of the software to help make his students more productive and efficient in their work.

nfriesen@rand.com

Design Styles

Bottom-Up Design

This is the classic design process. Where a user may have an overall idea of the assembly but each individual component is created then brought together in an assembly.

Think of physically building an IKEA shelf. To begin, you have a box full of loose parts, brackets and hardware. You have to manually attach the parts together one by one until you have the final assembly. This is like drawing that same shelf in 3D by first measuring and drawing each individual piece. Then creating an assembly and placing each part into the file and manually assigning all the constraints for each piece. This design process has come from the way we do things in the physical world.
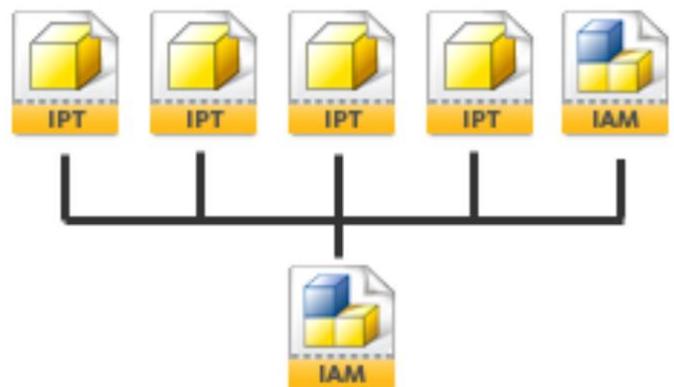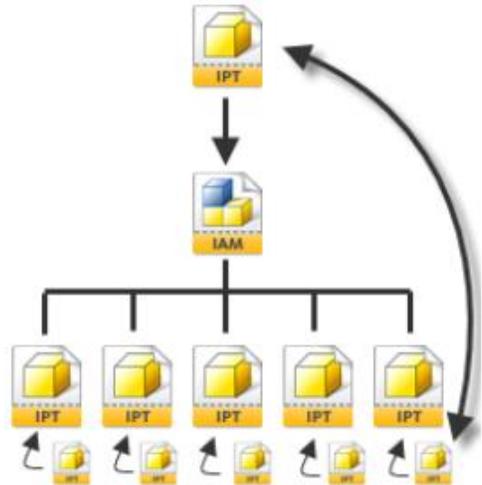
Top Down Design

Multi-body Parts

The entire assembly structure is contained within an IPT file

Simple structure – no need for file/folder structure

Each solid body can be extracted as a separate derived part

Layout Based Design

The Assembly starts from a blank assembly file. Within that assembly, we create a new part using the **Create Component** command for use as the layout. (*layout.ipt*)

Create sketch blocks inside a sketch within the layout.ipt

Constrain blocks to each other to test motion and fits

Extract those blocks to parts in the main assembly file

Parts are derived and driven by the layout sketch in the layout part
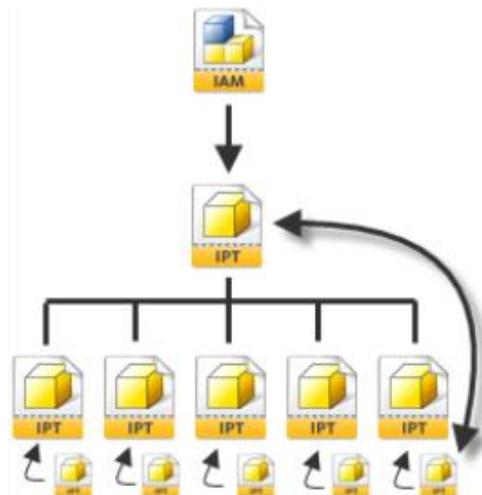
Adaptive Parts

The Assembly starts from a blank assembly file. We may place a few base parts in the assembly. Most new parts that connect to others (or require references from other parts) are create using the **"Create Component"** command and are created within the context of the assembly. We can project part edges.
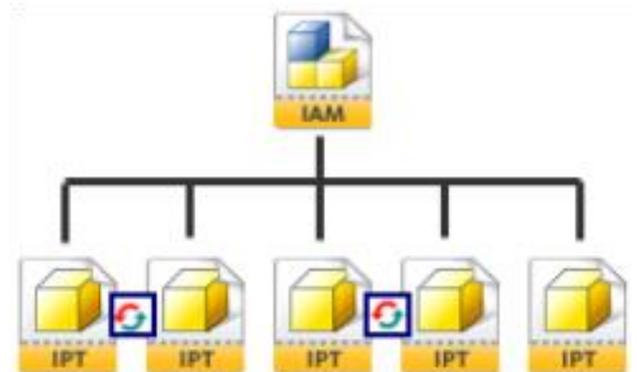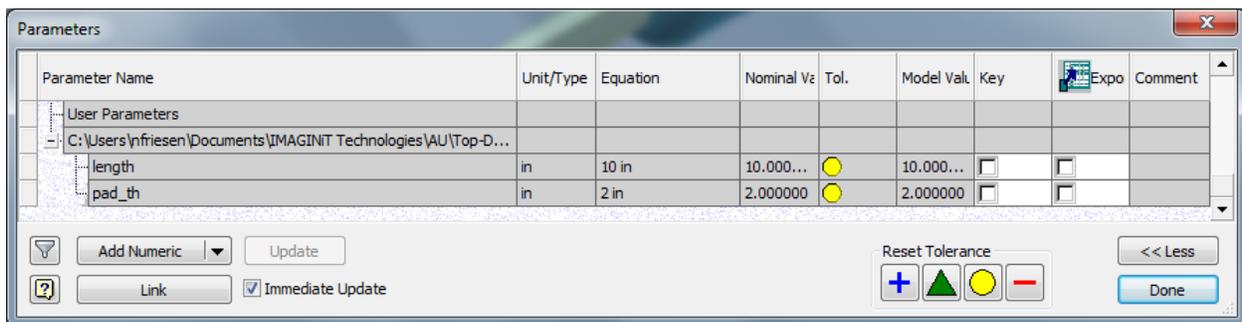
Linking Parameters

Within Inventor, we have to ability to link parameters from an outside source.

This can include:

- Excel spreadsheets
- Inventor Part files (IPT)
- Inventor Assembly Files (IAM)

When we link to outside sources, it creates a folder within the parameters manger with new user defined parameters that are greyed out for edit.

Parameter Name	Unit/Type	Equation	Nominal Va	Tol.	Model Valu	Key	Expo	Comment
User Parameters								
C:\Users\nfriesen\Documents\IMAGINiT Technologies\AU\Top-D...								
length	in	10 in	10.000...	◯	10.000...	☐	☐	
pad_th	in	2 in	2.000000	◯	2.000000	☐	☐	

Design Accelerators and Part Modification

Inventor contains the built in Design Accelerators as a way for users to avoid spending extra time on menial parts that they more than likely don't fabricate themselves.

Bolted Connections:

- Have to ability to pull pattern information from connected parts
- Have the ability to create holes in parts that are driven by the bolted connection.

Power Transmission Accelerators

- Select references from assembly parts
- Can access "Named Parameter" as well for reference