What is AAX?

When most people hear about the Advanced Assembly Extension (AAX), they think "Top Down Design," which is true, but AAX contains other great functionality such as Interchange Assemblies, Inheritance Features, Assembly UDFs, and Process Planning. In this article, we'll discuss some of the powerful tools of Top Down Design (TDD) and what the other capabilities allow you to do.

First, what does Top Down Design mean? Most designers create their models by designing individual parts, then assembling these parts into subassemblies, and once all the subassemblies are created, they build the top-level assembly. This is called "Bottom Up Design" (BUD). While it is a very common assembly modeling technique, it has its disadvantages. Oftentimes we want to build interdependencies among our components, so if one thing changes – such as the location of a tab or a hole – other related parts update appropriately. Or, a major design change may necessitate changing dozens or hundreds of parts. We can do this by designing with external references in either bottom-up or top-down design, but TDD gives us better organization of our assemblies, better control over our interdependencies, and the ability to make major design changes faster, simpler, and smarter.

The idea behind TDD is that we are going to start by creating the top-level assembly, and within the assembly we'll create our sub-assemblies and the individual parts without any solid geometry yet. We'll consolidate our important design information into special Pro/Engineer models called layouts and skeletons and connect the parts and assemblies to them. If we ever have to make any changes, rather than opening and modifying a number of individual parts, we can change the layout and/or skeleton, and all the necessary changes will propagate to our model quickly and easily.

TOP DOWN DESIGN

The major tools for TDD are:

- **Layouts**. These are 2-D sheets like pages in a notebook that will contain important dimensions, parameters, and relations that will affect multiple components. They can also contain rough sketches, tables, notes, and balloons.

- **Skeletons**. These are special part models that will be the framework of our assemblies. They will contain datum features and surfaces, and we will assemble all our components directly to the skeleton. That way we can assemble components in any order, instead of having to wait for all the individual parts to be designed before we can build the assemblies, and it reduces the chance of Resolve Mode failures. Also, we'll consolidate any important geometry that needs to be referenced by multiple components in the skeleton.

- **Data Sharing Features**. We can copy geometry from one component to another, or from the skeleton to a part, to design with external references. One major advantage of data sharing features is that we can toggle the dependency on and off, in case we no longer want changes from one model to affect another.

- **External reference control and investigation**. We can control the ability of a model to make external references to another model, or for other models to make external references to it. We can also track down any external references in our assemblies.

GENERAL ASSEMBLY CAPABILITIES

Now, let's talk about some of the other capabilities of AAX:

- **Interchange Assemblies**. These assemblies are like cabinets that contain related parts and subassemblies that can be easily swapped out one for another in other assemblies. An easy way to think of this are like different accessories you can put on Mr. Potato Head, or a variety of different nozzles you can put on a hose.

- **Inheritance Features**. These features allow you to inherit all the features from one part to another, and change dimensions and suppress features from the source model. It is a convenient way of making a different design without having to create a family table. They are also very useful in mold design, because we can apply shrinkage without changing the source model and turn off features that will be machined later. Furthermore, the dependency between the source and the target can be toggled on and off for change propagation.

- **Assembly User Defined Features (UDFs)**. These are components that we want to place in another assembly in one shot without them appearing as a subassembly in our BOMs. For example, we can create a UDF consisting of a fastener, washer, and nut, and place them in an assembly in one operation as opposed to three. And like UDFs in part mode, we can variable dimensions (like assembly constraint offsets) and pre-defined family table variations.

- **Pro/PROGRAM for Assemblies**. This module allows you to turn an assembly's regeneration cycle into an interactive process, in which you can specify values for various dimensions and parameters in order to generate custom variations. The new result then can be instantiated into a new model.

- **Process Planning**. The Pro/PROCESS module allows us to create process plans that document the steps in putting an assembly together along with fixtures and

fabrication units that are used in the assembly process. We can create drawings that show individual steps with exploded states and the Bill of Materials required at each step.

Configure To Order

AAX also provides Options and Variants functionality for Configure To Order (CTO) manufacturing strategies:

- **Configurable Modules**. Similar to an Interchange Assembly, a Configurable Module contains parts and/or assemblies that can be swapped out for one another as Options in a higher-level assembly. Reference Tags define how one component can be exchanged for another.

- **Configurable Products**. This is an "Overloaded BOM" or "Overloaded Assembly" that contains all the possible choices that can be selected when defining a Variant. The Configurable Product contains standard parts and assemblies, Configurable Modules, Options, and rules that define how choices result in a final end item.

As you can see, the Advanced Assembly Extension provides engineers and designers with a host of tools and capabilities for speeding up the design process and providing greater parametric control while making changes.

For more information about the differences between standard assembly functionality and AAX, please consult this document in the PTC Knowledge Base:

https://www.ptc.com/en/support/article?n=CS58879