# SOLIDWORKS SOFTWARE SWIFT TECHNOLOGY

Overview

While most designers understand how powerful the capabilities of 3D CAD software can be, many of these same users may have felt they were forced to spend a significant amount of time mastering the system to recognize the inherent benefits. SWIFT™ is just one of the things that lets any SolidWorks® software user realize the benefits of 3D CAD without having to learn complicated techniques. In other words, SWIFT lets you focus less on the CAD tool and more on your design.

3S
SOLIDWORKS
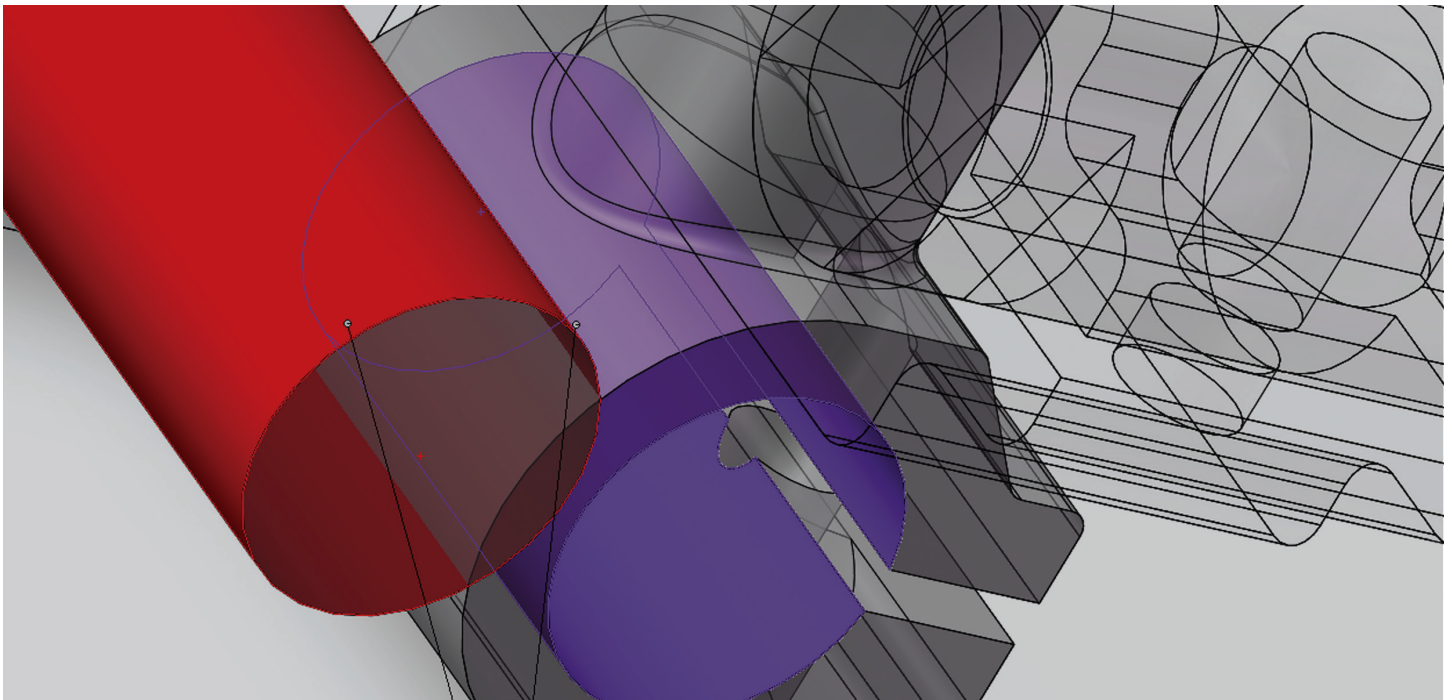
Introduction

It's no secret that 3D CAD provides tremendous creative power to mechanical design engineers. However, along with that power can come complexity where users are forced to become experts to leverage all of this design potential and power. Expert CAD users know many of the secrets inherent in their CAD systems, and are too often the only users who can take advantage of all of the power that 3D CAD provides.

For the first time in any CAD system, SolidWorks software includes sets of "expert" software tools, not simply to automate rudimentary, common functions, but to actually solve design problems like the most accomplished CAD expert would. The goal of these tools, known collectively as SWIFT—SolidWorks Intelligent Feature Technology, is to eliminate the need for users to learn how 3D CAD software "thinks," and to make every SolidWorks software user an expert from the start. What automatic transmissions have done for novice drivers, what GPS has done for travelers, SolidWorks SWIFT is doing for 3D CAD users.

From the beginning, Dassault Systèmes SolidWorks Corp. has focused its efforts on the needs of its users, providing more time to design, and less time worrying about how to operate the CAD system. Regardless of a user's level of expertise, everybody needs a little help modeling 3D parts and assemblies, and this is where SWIFT comes in.

The power of 3D and its ability to communicate design intent is well known to be superior to 2D. 3D provides the ability to model all geometry that sometimes cannot be modeled in 2D. However, 3D can also present challenges with regard to ordering part features, but these challenges are shared by almost all 3D CAD systems. To help users, only SolidWorks software provides the expert-level SWIFT functions for successfully resolving some of 3D CAD's most challenging design operations.

SWIFT provides all users, even those who are novices transitioning from 2D to 3D, with the ability to design like an expert without having to master all of the capabilities of the entire system. SWIFT is one of the ways that DS SolidWorks lets users focus on innovative design and not the design software.

Addressing 3D CAD's perpetual paradox

At issue is the power versus complexity paradox. The true power of 3D parametric solid modeling is its ability to capture design intent—a very significant capability that 2D CAD cannot perform. Capturing design intent helps manage inevitable change in a design, and ensures that individual parts are designed correctly and assembly components interact correctly. The price of this power, however, has been that users have been forced to learn myriad 3D modeling commands, details, and special techniques, as well as master work-arounds when all else failed. In other words, users have been subjected to dealing with the inherent complexity of the CAD system itself. Historically, it's been analogous to learning the grammar rules of a foreign language just to visit the country in which it's spoken.

SWIFT provides all users, even those who are novices transitioning from 2D to 3D, with the ability to design like an expert without having to master all of the capabilities of the entire system.

The intent and purpose of SWIFT technology is to resolve this power-complexity paradox. The system itself has been developed so that it has mastered many of 3D CAD's most frustrating and time-consuming aspects on behalf of all users, whether novices, intermediates, or experts. With SWIFT, users can focus on what they want to accomplish and the design intent they want to fulfill, not the rules of 3D CAD software. With several patents pending, SWIFT powers a series of expert tools that diagnose and resolve problems such as feature order, mates, sketch relationships, and other issues and operations.

SWIFT consists of six capabilities that address the complex problems that virtually all users encounter, and helps them realize the full power of SolidWorks software.
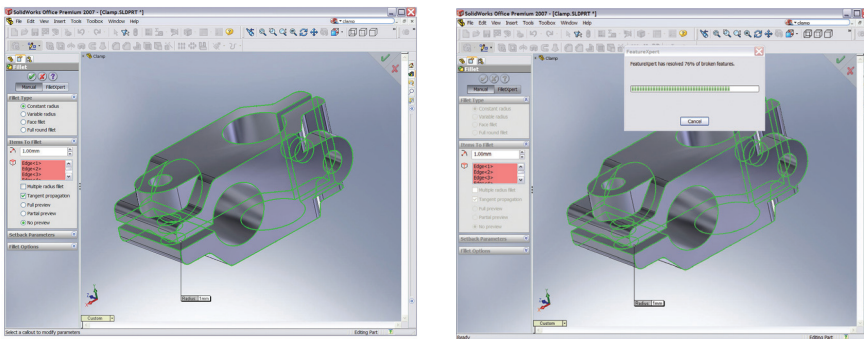
Automatically fix features when they fail

As a first example, consider feature order. In most 3D CAD systems, users create parts by building a series of "features." Think of features as the building blocks of a part. A feature may be something like a chamfer or a fillet which can be located on the edge of a part, or it may be something like a cube (an extruded square) or a cylinder (an extruded circle). Traditionally, users have been forced to concern themselves with the order in which they create part features, such as drafts or fillets, in order to create a 3D design reflecting their true intent. For example, if a designer makes a cube and then fillets all the edges, he won't be able to add a draft angle to the straight walls of the cube. He will have to know to go back in the history of the part, before the fillets were created, and then draft the walls. This is a very simple example. You can imagine how complex this problem can be. Say for instance you needed to add draft to the wall of a cell phone housing. Traditional 3D CAD systems force users to know expert techniques, like going back into the history of a part model and inserting features. Typically new users struggle for many months until they learn all the expert techniques needed to make them productive.

SWIFT's FeatureXpert in SolidWorks software changes all that. When a user tries to create a feature (such as a draft or a fillet) that needs to be inserted earlier in the part history, FeatureXpert automatically figures out what has to be done, and the features are reordered to the proper position in the model history. The user can now proceed directly to the next design task rather than trying to figure out a work-around for the CAD system.

Specifically, FeatureXpert helps users having difficulties making fillets and drafts. Filleting and drafting a part can often be tedious tasks. Many CAD products resort to a trial and error approach for arriving at the correct grouping and ordering of these features. But in SolidWorks software, if users have trouble with a fillet or draft feature, the FeatureXpert automatically fixes the problem.

SWIFT powers a series of expert tools that diagnose and resolve problems such as feature order, mates, sketch relationships, and other issues and operations.

FeatureXpert helps users having difficulties making fillets and drafts.

FeatureXpert automatically fixing the fillets

Sometimes when filleting a part a user, must break up the fillets into groups. Also the order in which the rounds are applied is important. This is very frustrating for new and experienced users. FeatureXpert has a FilletXpert capability that figures this out for you.

Removing rounds is easy with the FilletXpert. It allows you to resize and remove rounds independently of the feature grouping.
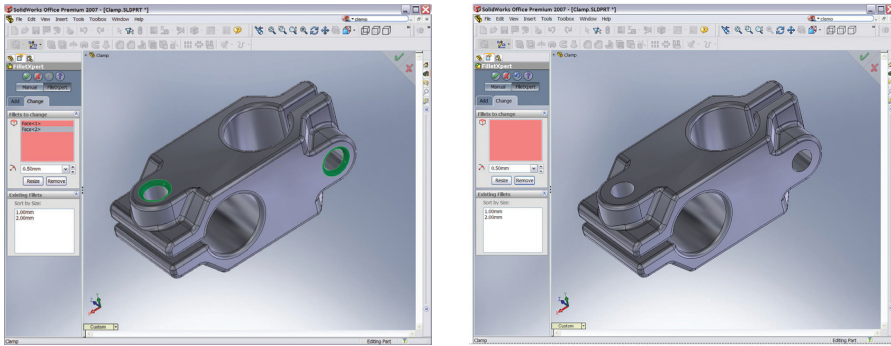
The part with a couple of fillets removed

Take control of fillet and draft management

In addition to the FeatureXpert, there is a FilletXpert and a DraftXpert to help users manage fillets and drafts. Users can select multiple fillets or drafts on a part and change or remove them. As they are selected, fillets and drafts are added to a collection list for visualization and easier management. The DraftXpert also includes an integrated draft analysis function for further assistance.
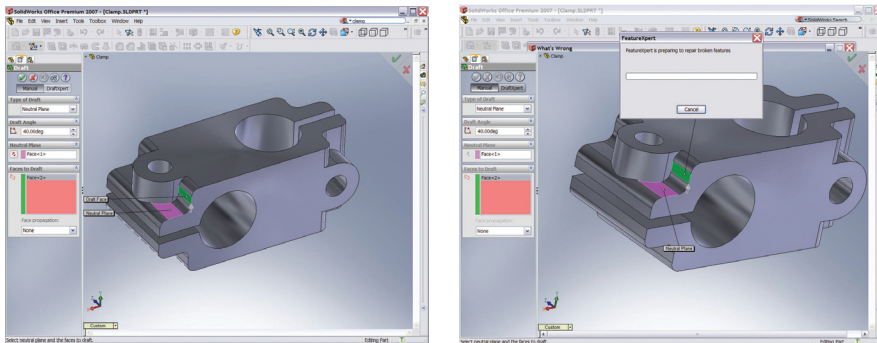
When trying to apply draft to a part, sometimes the draft can't be created because of neighboring features, like fillets (left). In these cases, the FeatureXpert can be activated to figure out how to reorder the draft so that it can be created without having to remove other features (right).

Now, users can select multiple fillets or drafts on a part and change or remove them.
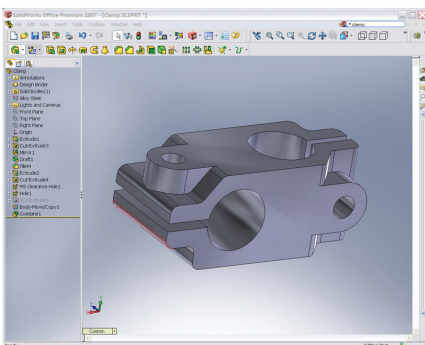
The final drafted part after FeatureXpert has reordered the draft to come before the rounds which were restricting feature creation

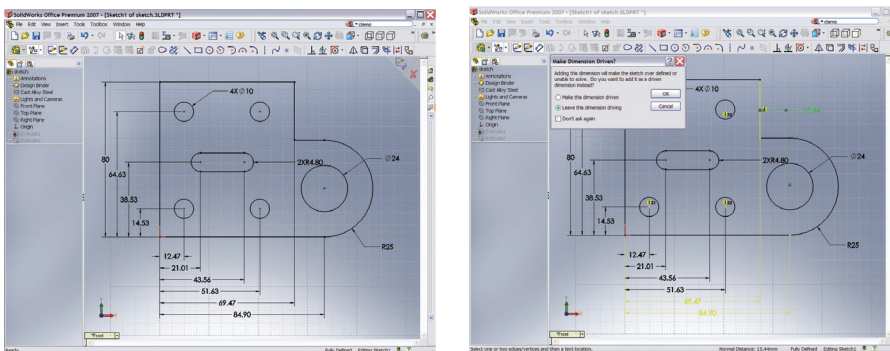## Automatically resolve dimensional conflicts when sketching sections

SWIFT works with sketches similar to the way it works with features. In 2D systems, sketched sections are often left overdefined or underdefined. Either case can lead to errors when manufacturing the part. Parametric 3D modeling systems add important dimensional and geometric relationships to the lines, arcs, and 2D shapes created in sketches in order to capture design intent and propagate change. Sometimes users overdimension their sketches by adding more dimensions than are required to define the sketch. Traditionally, users must stop and solve these problems manually in order to continue with the design. Often the process is trial and error—a complicated sketch can sometimes take several minutes to resolve. This is time taken away from design. These are CAD system problems, not design engineering problems.

The SWIFT SketchXpert, however, makes it easy for users to quickly resolve any and all conflicts that arise when sketching. When a sketch cannot be solved, the SketchXpert diagnoses the problem and presents the user with a set of solutions that remove unwanted dimensions and unnecessary relationships. With the SketchXpert, the user can quickly solve his sketch problem.

The SketchXpert displays conflicts in sketch dimensions and relationships, and offers solutions for handling and resolving the conflicts. The SketchXpert is especially useful for new SolidWorks software users, because it lets them toggle through a series of possible solutions, and then they just have to select the solution that they like best. But experienced users will also find SketchXpert beneficial because of the time it saves resolving sketch conflicts.

SketchXpert diagnoses the problem and presents the user with a set of solutions that remove unwanted dimensions and unnecessary relationships. With the SketchXpert, the user can quickly solve his sketch problem.


Experienced users will also find SketchXpert beneficial because of the time it saves resolving sketch conflicts.

Automatically resolve assembly conflicts when mating components

SolidWorks software also uses SWIFT technology to tackle the difficulties of mating, that is, how various components in a 3D design come together in an assembly. Mates control not only the position of components, but also how mechanisms comprised of the components move—both individually and together. As mates locate components, they restrict freedom of movement. As parts are added, users often lose track of which components are mated together and how. In this situation, a new mate on a new component will sometimes create a conflict that the system cannot solve.

The SWIFT MateXpert makes it easy for users to understand, resolve, and remove mate conflicts. The MateXpert isolates these problems by focusing only on the components involved with the mate conflict. The user can then force mates to solve through the mating chain until the unintended mate is revealed. With the MateXpert, users can benefit from the power of mates, without having to be experts in how CAD systems solve them.

The SWIFT MateXpert makes it easy for users to understand, resolve, and remove mate conflicts.
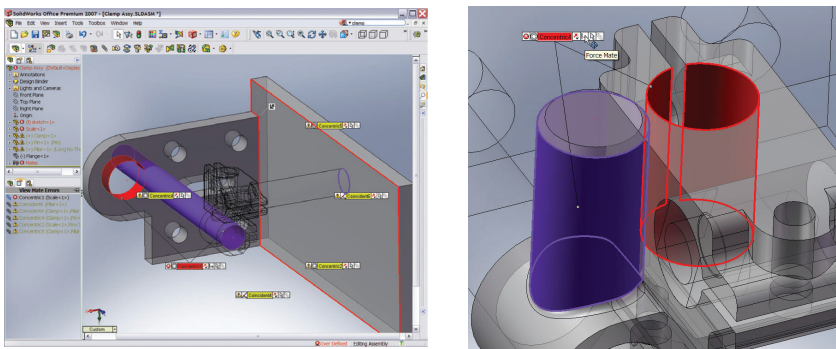
MateXpert provides a heads-up display of a problematic mate—the user can fix the problem directly in the graphics window.

The MateXpert helps users understand mate errors and warnings by providing red and yellow indicator flags in a heads-up display directly in the graphics window that clearly indicates the problematic mate issue. Icons to force or delete a mate are conveniently provided in the indicator flags, so you never have to take your eyes off the screen.

Automatically and intelligently dimension your drawing

With any CAD system, dimensions are relatively easy to apply for manufacturing. The challenge is ensuring that those dimensions are correct and that they provide enough information to manufacture the parts. Traditionally, this capability has been beyond the bounds of CAD systems. Instead, the task typically goes to a design engineer who has extensive training and experience with the practical application of dimensions.

SWIFT, however, has changed all that. The SWIFT DimXpert automatically applies dimensions to features, such as slots, fillets, or patterns, in a 2D drawing. A user selects geometry in a drawing, and DimXpert automatically identifies the geometry selected as a specific type of manufacturing feature (i.e., fillet, slot, hole, pattern) and applies the correct dimensioning scheme. The DimXpert also handles location and spacing of the dimensions, minimizing any manual cleanup by the user.

DimXpert uses the feature recognition feature in SolidWorks software to identify manufacturing features such as holes, slots, fillets, etc. Dimensions are applied based on predefined standards, ensuring the correct dimensioning scheme for a specific type of feature. DimXpert also recognizes multiple instances of a feature, and intelligently groups and dimensions them as a pattern.

DimXpert allows you to automatically dimension parts. DimXpert automatically recognizes features, and automatically applies preset dimensioning schemes. It doesn't matter how the features were created in the part model. In fact the part model could be featureless, and DimXpert will automatically recognize geometry on the part like holes and hole patterns, slots, chamfers, and fillets, and apply an appropriate dimensioning scheme.
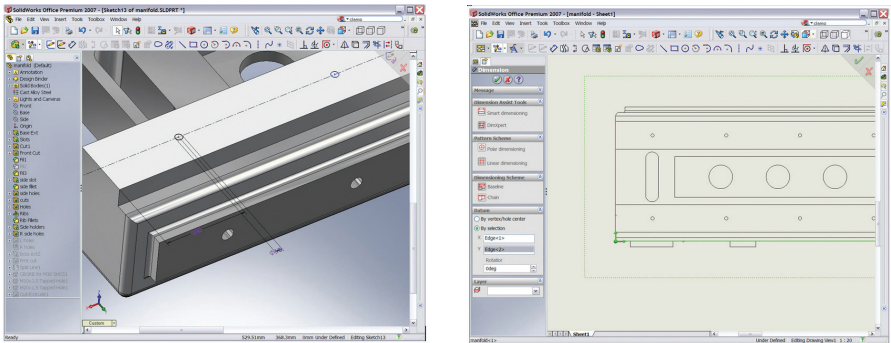
DimXpert automatically recognizes features and automatically applies preset dimensioning schemes. The DimXpert PropertyManager (at right) shows selection baseline dimensioning options.
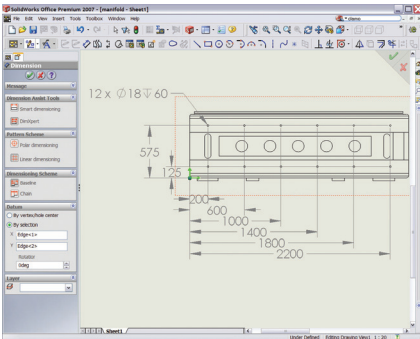
DimXpert automatically recognizes the hole pattern (even though these features were not created as a pattern) and creates an appropriate dimensioning scheme according to options selected.

A DS SolidWorks customer who is reaping the benefits of SWIFT is Tom Cote, CAD manager/design engineer for Morgan Construction in Worcester, Massachusetts, a company that makes large castings for rolling mill equipment that require a lot of fillets and drafts. He said he has saved a considerable amount of time using the FeatureXpert for fillets and drafts, and that it eliminates former trial and error methods. The order and grouping of the fillets and drafts are critical, and often difficult to determine, even for an experienced user like Tom. In many cases it took a significant amount of time to determine the proper order and group sequence for the fillets and drafts. SWIFT's automated FeatureXpert has made these tasks much easier for him, as well as others in his department who no longer have to manually fillet and draft cast parts.

Conclusion

SWIFT technology helps users transcend 3D CAD's power-complexity paradox. A true breakthrough in 3D design engineering technology, SWIFT goes far beyond mere automation of common operations. SWIFT technology addresses several of a design engineer's most tedious, time-consuming, and in some ways, irrelevant tasks. What is left is 3D CAD's power, without the complexity.

While most designers understand how powerful the capabilities of 3D CAD software can be, many of these same users may have felt they were forced to spend a significant amount of time mastering the system to recognize the inherent benefits. In SolidWorks software, SWIFT is just one of the things that lets any SolidWorks software user realize the benefits of 3D CAD without having to learn complicated techniques. In other words, SWIFT lets you focus less on the CAD tool and more on your design.

A true breakthrough in 3D design engineering technology, SWIFT goes far beyond mere automation of common operations.

_3S_ SOLIDWORKS