# *Solid Edge ST3 Advances the Future of 3D Design*

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*A Product Review White Paper Prepared by*
*Collaborative Product Development Associates, LLC*
*for* ***Siemens PLM Software***

## SUMMARY AND OPINION


The newest release of Siemens PLM Software's mid-range design application, Solid Edge, fulfills the Siemens vision for the future of CAD modeling based on their groundbreaking implementation of SYNCHRONOUS TECHNOLOGY. First introduced in 2008, Siemens promised that synchronous technology would advance geometric design above parametric, history-based modeling, yet co-exist in synergy with it. The Solid Edge ST3 release represents the culmination of those aspirations.

Synchronous technology examines a product model's current geometric conditions in real-time, and combines them with parametric and geometric constraints added by the designer, to evaluate and perform new geometry construction and edits of the model without the need for full history replay. Solid Edge ST3 completes the implementation of synchronous technology for all assembly applications, including tubing, piping, weldments, and frames. In doing so, Siemens has added support for assembly features and family of assemblies.

In the initial releases of synchronous technology, Siemens was careful to provide both their current users and new clients with a smooth path to the adoption of the technology. Existing users were allowed to maintain the more traditional approach of ordered features with history if they chose not to disrupt their current design processes. Solid Edge ST3 now provides a single design environment. Users make the choice to model using the traditional approach while identifying a subset of the model geometry based on synchronous technology, or they can design broadly with synchronous technology and identify a desired subset of geometry with ordered, history-based features.

This flexibility, together with a major advancement in dealing with imported foreign models that allows 2D drawing dimensions to become editable 3D driving dimensions, sets Solid Edge apart from other CAD offerings in the mid-range market. Siemens has broken through the "me too" modeling approaches found in all the most popular brands. End users making their initial moves into 3D will be especially served by the new accommodating design approaches. Solid Edge sets a new higher bar for the future of CAD design.

These modeling advances coupled with enhancements in simulation capabilities that cover extensive real world scenarios offer users a rich product development environment. The flexibility afforded for collaboration, project management, and business reporting with Solid Edge's integration into an Insight™/Microsoft


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SharePoint or Teamcenter Express framework delivers fully scalable tools for small and large companies. Add in an impressive list of thousands of customer requested enhancements and Siemens can tout a solution that will go a long way to strengthen customer loyalty.

# SOLID EDGE ST3

The release caps years of intense focus on completing the original vision of synchronous technology. Solid Edge ST3 delivers to its message of accelerating model creation by eliminating design pre-planning. No longer do users have to ponder which ordered features go first. Synchronous technology manages the geometric dependencies for them. By removing the complications of ordered dependencies and their ripple effect, engineering change orders (ECOs) to the product model can be easily and rapidly executed. Also, because of the edit methods provided by synchronous technology, imported data can be modified just as effectively as native models, extending designers' abilities to reuse customer or supplier data.

## A FULL RANGE OF APPLICATIONS

Solid Edge ST3 now handles the full range of its applications, such as wire harness and piping, at the assembly level with synchronous technology. In order to do so, Siemens implemented advances across the full application to allow users to blend both synchronous and ordered modeling in the same part model as best fits their need. The user can define and control relationships for modifying part position or geometry top-down or bottom-up. Further, a user can add part-to-part relationships before, during, or after design to further reduce the need to plan out how parts interact. This new concept also eliminates the need to remodel imported models when other component parts need to drive their size or shape.

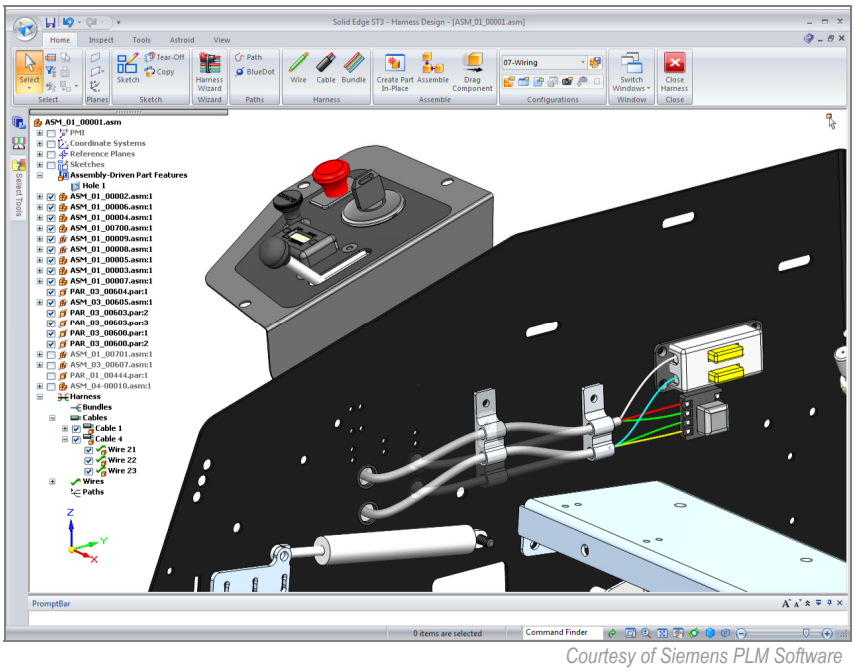

***FIGURE 1***
*Before-and-After Edit of a Wire Harness Design in Synchronous Technology*

*Courtesy of Siemens PLM Software*


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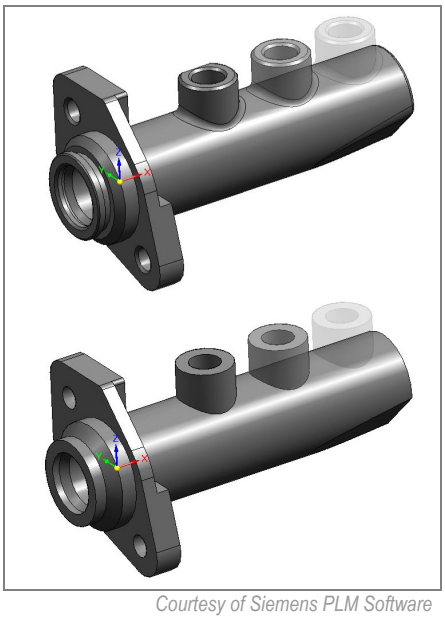
In Figure 1 above, the user models a wiring harness to pass through a standard off-the-shelf retaining clip, and then through a sheet metal plate. The clip, the plate, and the wire harness all reside in separate component parts of the assembly.

Component part models can contain both types of features (synchronous and ordered) and can be used directly in an assembly, providing a designer total flexibility. Synchronous technology can be used for modeling new components and can leverage existing designs of ordered features all in the same file. This integrated scheme also allows edits across different parts. In Figure 1, as the holes in the sheet metal plate and the mounting clip are moved using a simple select and drag, the retaining clips mounted to them move and the wire harness updates to the new route.

## SINGLE DESIGN ENVIRONMENT

An important aspect of the design methodology and its implementation in Solid Edge ST3 is that an existing modeling approach and workflow using ordered features is preserved and can be continued. Existing users of Solid Edge comfortable with their design process using ordered features need not change. In Solid Edge ST3 both synchronous and ordered features can coexist in the same part. Users have the flexibility to choose what type of feature to use and where depending on their need and design intent.

To their advantage, should the geometry require a change outside the construction technique of ordered modeling, any or all of the model's ordered features can be moved to synchronous. Similarly, in a fully synchronous model, the user may determine that specific features are best served as ordered features and add those to the synchronous design directly. The most common cases are for manufacturing process features found in machining and weldments, where order is important. Another case for ordered features is for "simplified" parts where small shape details are removed. This operation is common prior to meshing for finite element analysis.



*Courtesy of Siemens PLM Software*

***FIGURE 2***
*Before-and-After Edit of a Model and its Simplified Model Counterpart*

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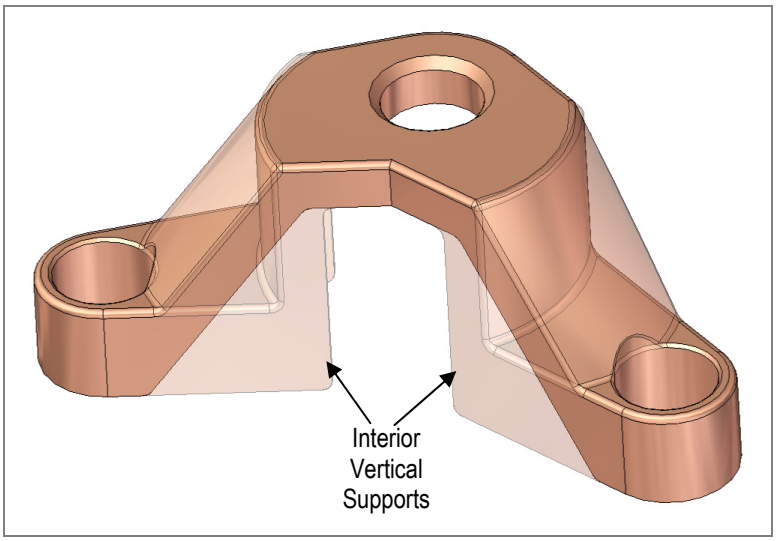
Figure 3 illustrates the benefit of moving ordered features to synchronous. The figure depicts the before-and-after edit of a model. The complex edits indicated would take a bit of work to do with ordered features. The interior vertical supports shown with the lighter representation need to be rotated, but in most cases these were extruded from its planar base. Plane redefinition may be possible but will certainly require feature cleanup.

***FIGURE 3***
*A Model Edit Using Synchronous Features That Were Originally Designed As Orderd Features*




*Courtesy of Siemens PLM Software*

In Solid Edge ST3, however, once those features are moved to synchronous, a simple face rotate does the edit while maintaining symmetry as seen in the darker representation. The remaining ordered features update accordingly.

## UPLOADING 2D INTELLIGENCE INTO 3D

Each year, more users of 2D design technology make the move upward to 3D. Modeling tools such as Solid Edge, positioned to assist in that transition, face major challenges in not only providing needed design functions and ease of use, but also must integrate smoothly into the design processes of their users. The leap to 3D does not happen all at once, especially if a product design incorporates component pieces from a series of supply chain partners. Often a developer must deal with a collection of both 2D and 3D models, usually in different native formats, merging them into a unified 3D product design. The CAD modeling tool that best assists those efforts will find high acceptance in the industry.

In order to work effectively in this environment, the product developer must be able to import both 2D and 3D foreign model data into their product design. They must be able to then work with that data. Unfortunately most tools can only import foreign data as an unintelligent block of geometry, making the user's job of interacting with subsets of that data almost impossible. At worst, it forces the user to re-author the data. For a few slightly more advanced tools, imported 3D data can be manipulated but the user is required to manually adjust its size and dimensions based on a viewing of the geometry's 2D drawing dimensions.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Solid Edge has been a leader in the support of both 2D and 3D foreign data import, and now with the Solid Edge ST3 release allows the mapping of 2D drawing dimensions directly into the 3D model as driving dimensions, speeding up the integration process and bypassing manual interactions that can introduce errors. 2D manufacturing dimensions are more important than sketch dimensions because they define critical parameters such as distance between holes and overall sizes. This new capability turns these 2D dimensions directly into editable 3D dimensions on the imported 3D model. With this new capability, designers can better reuse imported 3D, and design intent defined in 2D can be brought forward.

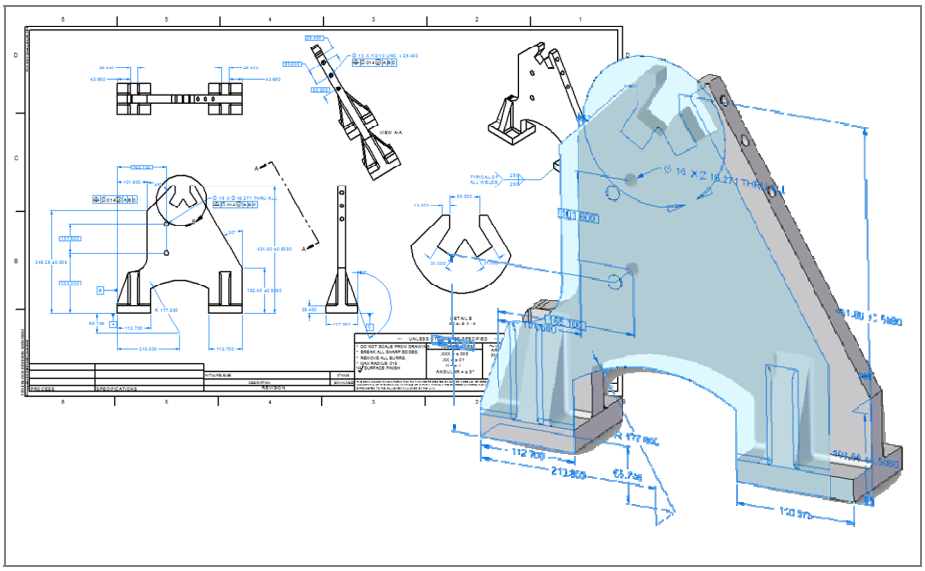

***FIGURE 4***
*Applying a 2D Manufacturing Drawing Dimension Scheme as Editable 3D Driving Model Dimensions*

*Courtesy of Siemens PLM Software*

By allowing manufacturing dimensions from an imported 2D drawing to be captured as 3D driving dimensions of model shape, Solid Edge ST3 takes a leading position in helping users transition to 3D design practices while smoothly supporting their existing design process. In an even stronger statement, those resultant 3D dimensions are now editable and can leverage all the capabilities of synchronous technology.

## SOLID EDGE SIMULATION

The Solid Edge ST3 release continues to enhance simulation technology covering more real-world conditions. Improvements to support torque and bearing loads, as well as bolted connections and user defined constraints, lead to more realistic design scenarios that help reduce the need to construct and test physical prototypes. In addition, the overall design-simulate iteration sequence is accelerated by simplification tools that can remove unnecessary design features, such as small holes and rounds, prior to meshing.

Capabilities to adjust the product model geometry based on simulation results are critical in the design-simulation iteration cycle. The ease and speed with which a user can modify a design and re-run a simulation drives their ability to more

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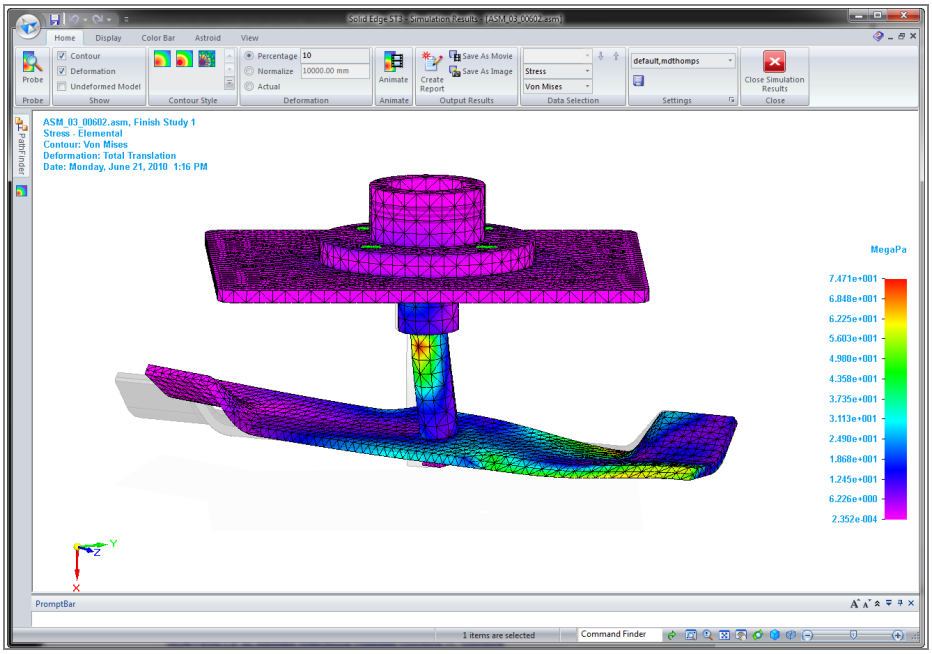
quickly try design alternatives and find an optimum solution. In Solid Edge, the full power of synchronous technology can be brought to bear in performing intelligent model changes. Designers can achieve higher quality given the ability to test more design alternatives in the same amount of time.

***FIGURE 5***
*Complete Simulation Tools from Definition to Refinement*




*Courtesy of Siemens PLM Software*

## SCALABLE PDM

Users must evaluate and select their product design tools using the criteria of both collaboration and business growth. Otherwise, as their company expands and evolves they will discover a need to constantly replace their suite of development tools in order to adjust to those changes. Strong data management capabilities and a framework that seamlessly integrates design, simulation, and manufacturing applications form only a base. That framework must also allow intense collaboration between all product stakeholders, whether internal to the company or across its supply chain. In addition, the framework must allow growth into project management and business reporting.

Solid Edge's scalable data management solutions built upon Insight on Microsoft SharePoint or upon Teamcenter Express offer its users a full range of growth/business options. SharePoint provides a growing industry-wide, recognized solution for collaboration. Solid Edge Insight in ST3 now integrates to SharePoint 2010 and links some of the capabilities in this platform with CAD data. For example, Microsoft Project Server is integrated with SharePoint team Services for project management and task tracking capabilities using Solid Edge data. Business reporting is also available in SharePoint that allows designers roll-up costs or other queries against Solid Edge models. Continued development on SharePoint further links design and business functions.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Those that choose Teamcenter Express gain initial entry into a full collaborative product data management (cPDM) solution easily scalable to the broad Teamcenter portfolio as their needs evolve. New capabilities make better use of CAD data to other parts of the organization. A stand-alone Structure Editor helps CAD and non-CAD users develop initial product configurations, and once complete, detailed assembly design using physical or virtual components can be done.

## USER ENHANCEMENTS

Appropriately, as a product release that is responsive to its users' needs, Solid Edge ST3 contains a wealth of requested enhancements and productivity improvements. Advances range from Family of Parts support for synchronous technology to an etch command that allows writing on a face of the solid model. Another important area of enhancement centers on product manufacturing information (PMI): data included in the 3D model such as geometric dimensions and tolerances; 3D annotation text; surface finish; and material specifications that supersedes the need for 2D drawings. The revision also supports angular dimension-to-hole axis, driving dimensions to silhouette and tangent points, and dimension-to-virtual-edges of cones and cylinders.

## CONCLUSIONS

Collaborative Product Development Associates, LLC (CPDA) has conducted deep technical studies of synchronous technology and its implementation within all versions of Solid Edge. We believe Solid Edge ST3 marks a major milestone in advancing the technology while still catering to customers' specific needs. The strong geometric modeling approaches and their implementation in a user friendly command environment offer a strong pathway for migrating 2D users to 3D. The Siemens approach of continued support and enhancements for existing methods while allowing a smooth transition to a synchronous design strategy bodes well for customers.

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