

# What's new in NX

## Breaking down the barriers to innovation

### Benefits

- Achieve new levels of productivity with the digital twin: the entire design team can instantly assess changes via downstream integration
- Design and engineer complex product forms and features that are not possible with traditional CAD methods
- Model-based definition (MBD) introduces groundbreaking data sharing avenues to connect engineering and production in new ways
- Create innovative electronics with industry-first NX flexible PCD/PCB tools

### Summary

Building on its legacy of best-in-class customer deployment readiness and data preservation, Siemens has enhanced NX™ software to deliver the next generation of design, simulation and manufacturing solutions. In this latest release, NX has introduced many enhancements that remove the barriers to innovation and make you more efficient. These tools empower your organization to meet high demands, innovate your designs and get products to market with exceptional speed. The latest updates allow you to capture ideas naturally as you iterate designs, eliminate errors and challenges early in the design process, collaborate powerfully within and across teams and push your designs beyond what was previously considered possible.

NX is part of the Xcelerator™ portfolio of solutions and services from Siemens Digital Industries Software.

### What's new in NX design

#### Tools to enhance your innovation

##### Sketching

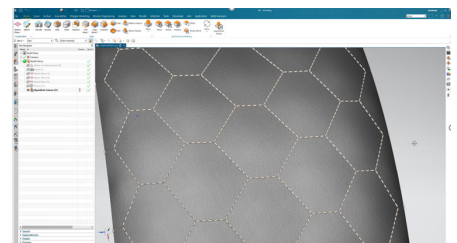
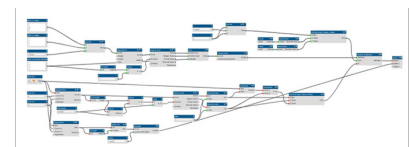
NX sketching tools offer a significant leap forward that can reduce the time you spend capturing design ideas during the preliminary sketching phase by up to 30 percent. In this release, enhancements simplify the process of starting and creating a sketch:

- Fewer selections needed to create a sketch
- Labeled principal planes
- Sketch orientation indicator
- Object/action workflow to create a sketch

The new approach to sketching enables users to capture ideas as they iterate and make changes as needed, instead of approaching CAD after the initial iterations have been sketched out by hand.

##### Algorithmic modeling

NX Algorithmic Modeling is a new add-on application that introduces modeling automation capabilities that can be used by every designer and engineer. The software enables designers and engineers to create complex designs previously only attainable through days of effort or by using advanced programming. The product forms and features created by algorithmic modeling can be saved as templates and easily re-used in similar design workflows. Algorithmic modeling can significantly improve productivity in any industry in which designers frequently make complex, variationally patterned shapes.



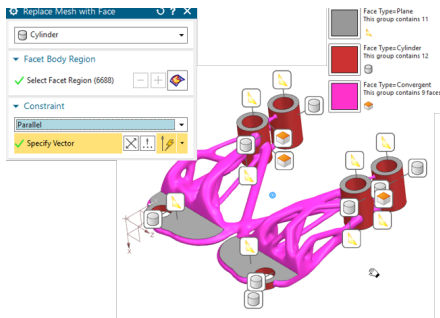
# What's new in NX

- Intuitive, logic-driven approach to building complex, algorithmically driven designs
- Simple creation, storage, and re-use of algorithmic-driven designs as familiar NX features
- Ideal for automation and design templization

## Convergent modeling

Enhancements to Convergent Modeling™ technology in this release increase the value of convergent-generated geometry (via scan or computer-aided engineering) for downstream use without reverse engineering. The updates include:

- Convergent bodies can now be comprised of mesh and analytic faces together
- New command enables users to easily replace portions of a mesh with analytic geometry

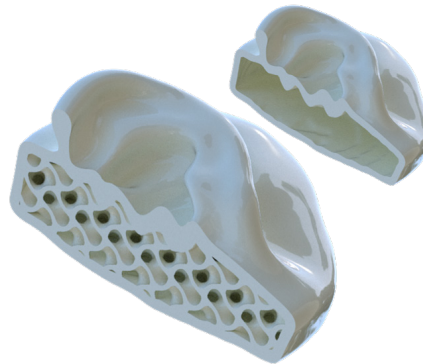
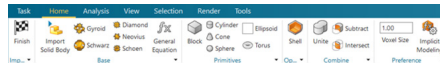


## Implicit modeling

NX Implicit Modeling is a new optional module for creating equation-driven structures and performing robust modeling operations on complex designs. Users can create engineered structures using implicit methods that are not feasible using traditional CAD methods. Key benefits include:

- Dedicated task environment for creating and editing implicit geometry

- Import and operate on existing CAD geometry
- Output convergent geometry for downstream re-use



## Design for additive manufacturing

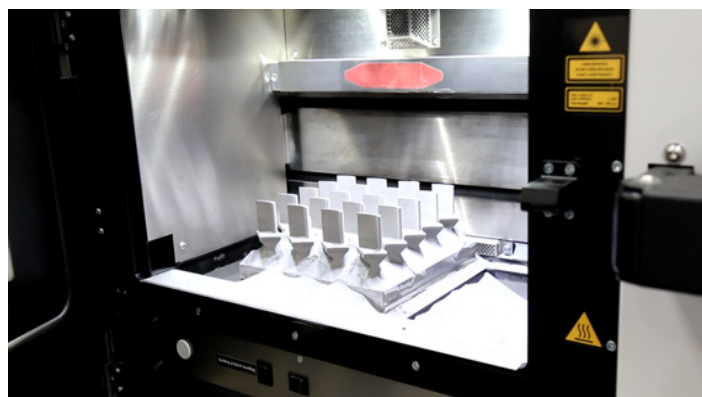
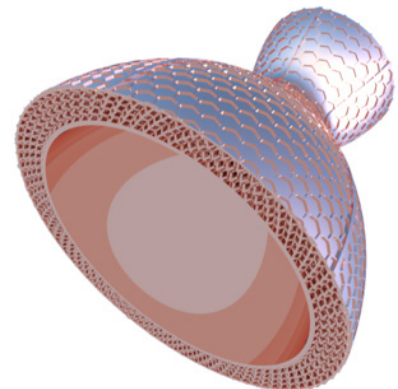
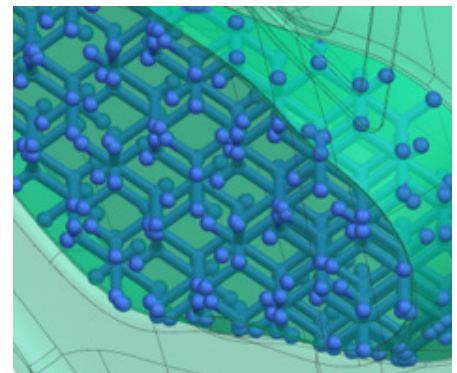
### Overall enhancements

Designs can be created faster, with increased durability and enhanced downstream communication with printers and other CAD software. NX offers an integrated solution throughout user workflows while enabling users to create better designs with extreme speed and precision. The enhancements increase engineering flexibility and speed in the design of performance-optimized structures that are only possible through additive manufacturing.

## Lattice structures

In this release, users have increased flexibility for engineered structures by leveraging the power of NX CAD modeling for the design of the unit cell. Lattice structure updates improve engineering productivity and quality:

- Better faceting quality for a much cleaner result
- Creation time for lattices is blindingly fast with up to 93% time reduction



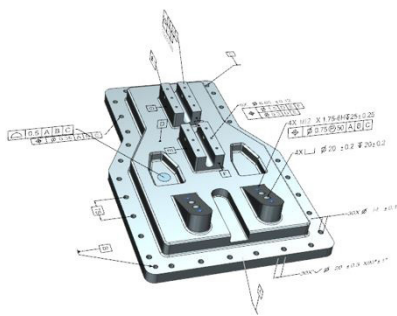
Users can access a new body lattice command that allows for the use of any CAD body as a unit cell, so any analytic or freeform shape is now possible, greatly expanding the engineering potential of lattices. In addition, users can create 2.5D lattices that support various in-fill requirements.

### Model-based definition

Model-based definition (MBD) capabilities of NX offer several workflow and functional improvements focused on improving design and collaboration efficiency, providing key benefits to users:

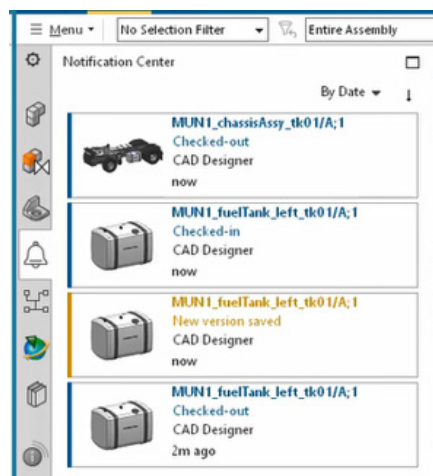
- Eliminating tedious processes
- Capturing business intelligence
- Ensuring that product and manufacturing information (PMI) is compliant with industry and company standards

Automation of MBD accelerates and simplifies tedious manual work, even for users without extensive knowledge or experience. Furthermore, removing dependency on highly trained geometric dimensioning and tolerancing (GD&T) experts allows users to produce higher-quality parts in less time using the PMI advisor capability.



### Assembly design

NX assembly modeling features a brand-new tool, multi-user design, that supports a truly collaborative design environment by proactively notifying users of changes in their design context. Using a check-in/check-out method, each member of a design team can be sure that they are using the most recent version of each design. This capability saves time and eliminates rework by discovering changes as they occur and automatically updating users' design contexts.



### Appearance management

Appearance management is a new tool that has significant application and benefit for many users across industries. For users in automotive, consumer products or any other industry, appearance management is the easiest and best way to show product configuration variety. Appearance management can be managed natively

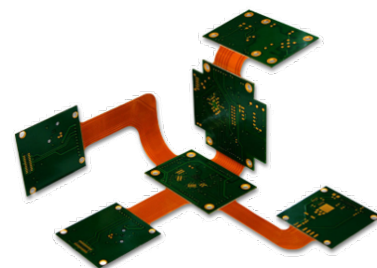


in NX or in Teamcenter® software. It can be used for high-end rendering to display different versions of products or used early in the design process to give users insight into the appearance of various versions of the end-product.

### NX PCB Exchange and NX Flexible Printed Circuit Design

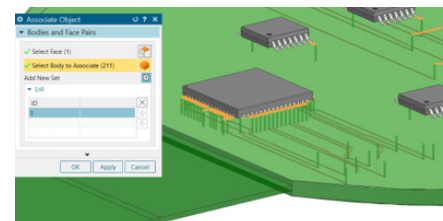
Updates to NX Flexible Printed Circuit Design (PCD) offer users a unique advantage. The new release introduces tools that support the unique constructs and rules of rigid-flex PCB designs:

- Define a range of layer schemes in a library
- Generate rigid-flex features by zones with correct thickness and offset
- Produce a fully flattened model for collaboration and downstream processes



Rigid-flex creation gives users unprecedented control of shape and layout, enabling them to create innovative designs and products. Complete integration for rigid-flex design between NX Flexible PCD, NX PCB Exchange and Xpedition/ECAD enables:

- Creation of rigid-flex from flexible PCD
- Collaboration throughout the entire design team



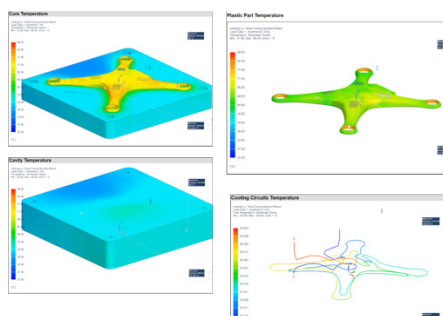


## Mold, tool and die design

New capabilities within the NX mold, tool, and die design solutions enhance users' workflow experiences by consolidating necessary applications and by leveraging automation to accelerate manual processes. These new tools include:

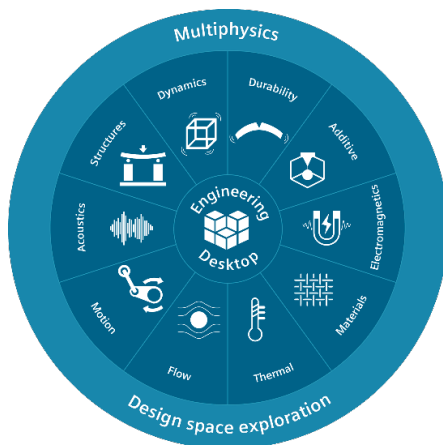
- Mold cooling analysis
- Advanced CAE analysis
- Automation of vent design

These new tools enable designers to remain in a single CAD environment and reduce design time.



## Simcenter 3D

### Meeting complex engineering challenges



Meeting complex engineering challenges requires an efficient and orderly approach. Having the right tools and framework can make a world of difference in how quickly and faultlessly these challenges are met. This is why product engineering teams need a unified and shared platform for all simulation disciplines. Simcenter™ 3D software offers such a platform with leading-edge analysis tools, more productive workflows and demonstrably consistent results. Simcenter 3D makes it much easier to meet these challenges by continuing to enhance on four unique strengths:

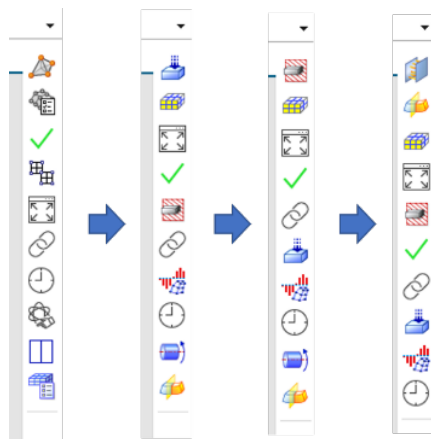
- Faster CAE processes
- Multidiscipline integration
- Ties to the digital thread
- Openness and scalability

## What's New in Simcenter 3D

### Faster CAE processes

#### Adaptive user interface

The Simcenter 3D user interface includes a new predictive command bar that can predict the next command you're most likely to use to help you save time. Simcenter 3D displays the next most-likely commands you will use, ranked based on your past usage over time. As you progress through your workflow, the commands displayed in the predictive command bar will change depending on what Simcenter 3D predicts you will need next. The adaptive



user interface can help you save time, because you don't need to search through the main ribbon to find the next command.

### Superelements for rotor dynamics

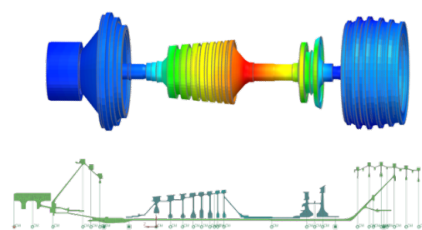
Simcenter 3D has added the ability to reduce model size and computation time through the use of superelements for rotor dynamics simulation.

A superelement is a condensed model comprised of matrices and vectors. Superelements reduce the model size, and thus overall computation time during the solve.

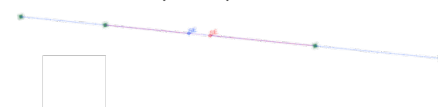
Superelements are useful in rotor dynamics when you need to:

- Model repetitive structures in a rotor
- Include linear parts in a nonlinear model
- Facilitate the exchange of models in a collaborative workflow in which model details and intellectual property need to be protected

Multiple 2D rotors



Multiple Superelements



## Benefits

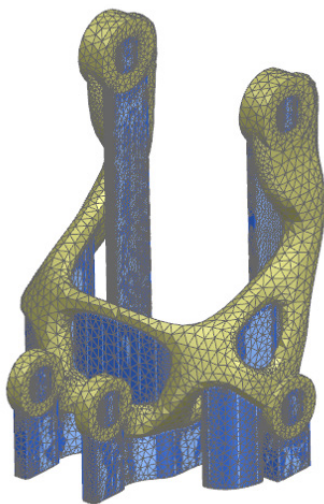
- Achieve faster CAE processes through faster modeling for cracks in material microstructures and advanced meshing for additive manufacturing
- Get results faster without sacrificing accuracy using performance improvements in Simcenter 3D and Simcenter Nastran
- Perform more complex simulations from a single integrated environment such as new simulation solutions for turbomachinery
- Listen to results generated from acoustics simulations
- Tie simulation to the broader development thread through data interaction with Capital™ software for electronics design and external systems for hardware-the-loop (HiL) tests.
- Simulate performance of mold cooling designs directly from NX

## Advanced meshing for additive manufacturing

In Simcenter 3D, the automatic meshing procedure for additive manufacturing has been improved to better deal with model complexity. If for any reason the meshing fails, you can now manually defeature idealized geometry, correct mesh mating conditions, modify CAE geometry and control the mesh settings using advanced meshing.

The new advanced meshing workflow enables you to:

- Break the full automation of the meshing process, allowing you to switch to standard Simcenter 3D pre- and postprocessing and use these functions for the idealized part and mesh file
- Correct mesh failures with manual meshing methods to generate a good quality mesh for complex parts

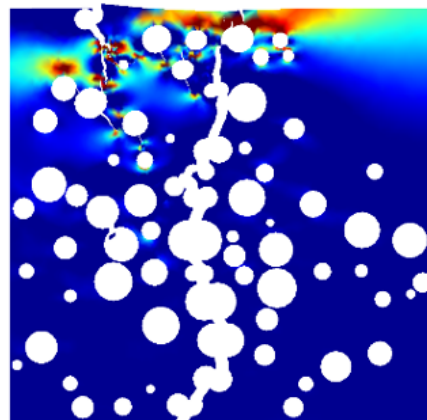


## Faster crack modeling for materials

New materials are being introduced at unprecedented speed. Because cracking is a very important consideration for advanced materials, this release of Simcenter 3D introduces faster crack modeling capabilities. Micro and meso

cracking in advanced materials is difficult to model with the finite element method, and in Simcenter 3D this task made easier by:

- Automatic insertion of cohesive zones between different materials and within a single material
- Allowing for full mesh separation for a crack to propagate completely through a material in microstructural models
- Pre-insertion of advanced cohesive zones with traction-separation laws



## Performance improvements

In every release, Simcenter 3D accelerates CAE processes through general improvements to performance. Key performance improvements in this release include:

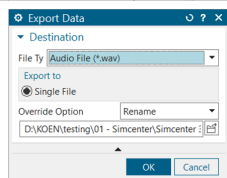
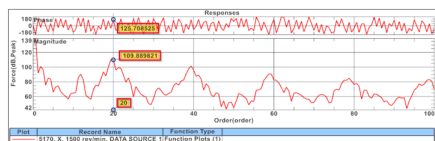
- Simcenter Nastran vibro-acoustic simulations with pre-computed mode sets deliver significant reduction in CPU time, memory usage and file size so you can get the same accurate results up to twice as quickly
- Solve times for Simcenter Nastran dynamics applications with binary mode set are three times faster compared to the previous version of Simcenter 3D and use a smaller memory footprint
- Simcenter Nastran multistep nonlinear solutions performance improvements result in up to 30 percent faster solve times

- Simcenter 3D durability solver is now up to 82 percent faster to make it the fastest durability solver on the market
- For fluid-structure interaction applications, new robust mesh moving methods help accelerate the process of fluid mesh deformation

## Multidiscipline integration

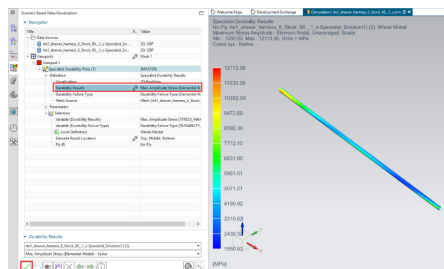
### Auralization of acoustics results

Acoustics engineers use simulation to understand noise that is produced from various vibrating components or products. Much of acoustics analysis is done visually through charts and graphs. The newest release of Simcenter 3D enables acoustics engineers to actually hear the noise that the simulation is predicting. A new auralization postprocessing tool adds another dimension in the analysis and evaluation of the performance of your design that allows you to actually listen to the sound.



### Durability analysis for hoses and cables

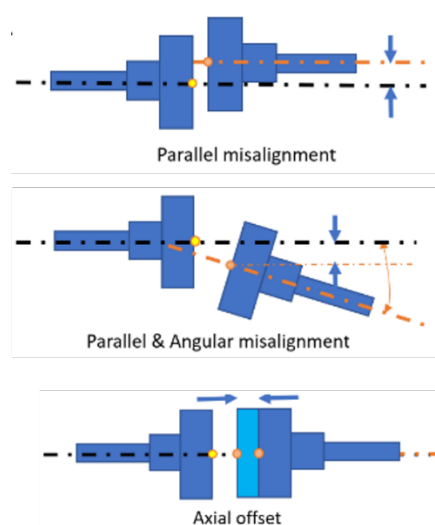
Because hoses are constantly moving and being cycled through various positions, it is important to determine the expected lifespan of hoses or cables



through fatigue analysis. In this release, the stress tensors from the Simcenter 3D Flexible Pipe module are available as input to the Simcenter 3D specialist durability solver in order to predict fatigue and failure. This completes the full design loop as product life is an important criterion to evaluate the best hose and cable designs and avoid product recalls.

### Rotor dynamics misalignment

In the realm of rotor dynamics, sections of a rotor that are even slightly misaligned can create conditions that are detrimental to the overall system performance. In Simcenter 3D, you can now study the effect of rotor misalignment in the structure. Misalignments can be defined between two rotors for parallel, angular and/or axial offset, or even a combination of all of these misalignment types, with the condition that both rotors rotate in the same direction at the same speed.

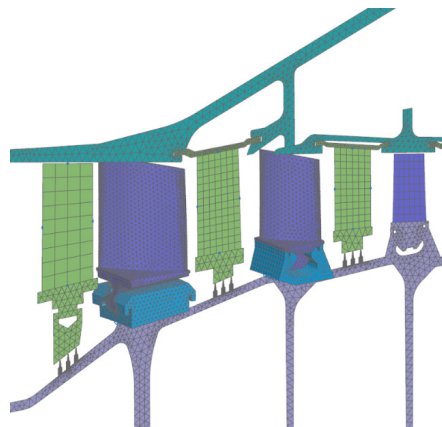


### 2D-3D element coupled modeling

You can now obtain more accurate stresses in turbine engine system models. Simcenter Nastran Multistep Nonlinear now supports models with combined 2D axisymmetric and 3D cyclic symmetric components. This type of model is useful for efficient modeling of turbine engine systems that consist of multiple blade stages.

The same property scaling for 2D-3D coupled models has also been implemented in Simcenter 3D Thermal. It is thus possible to use the 2D-3D coupled model in either:

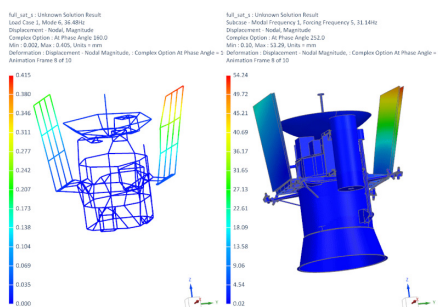
- A structure-only Simcenter Nastran model
- A thermal-only Simcenter 3D Thermal model
- A co-simulation of the Simcenter Nastran and Simcenter 3D Thermal model in the Simcenter 3D Multiphysics environment.



### Correlate operational shapes

Simcenter 3D has long offered the ability to correlate your simulation results with data obtained from physical tests. Correlation helps you gain confidence that what you are simulating is predicting real-world behavior. In the latest release, you can now include operational shapes in a correlation solution process to compare any combination of operational and mode shapes coming from test or analysis:

- Compare test and analysis operational shapes to calibrate an FEA model when mode shapes cannot be obtained
- Compare two sets of operational shapes to shed light on the effect of different loading conditions on key responses of the structure

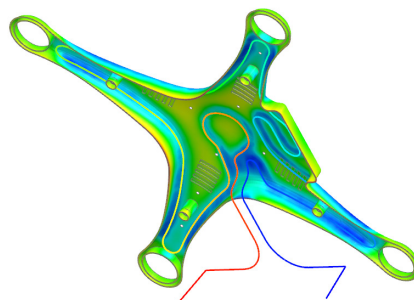


### New thermal-multiphysics software

The new release introduces the Simcenter 3D Thermal Multiphysics module, which brings all Simcenter 3D Thermal and Simcenter 3D Flow-related product modules together into one product offering. The new product module is available to both existing and new customers. Moving to the new Simcenter 3D Thermal Multiphysics product is beneficial because:

- You will be able to access more capabilities from just one software without having to determine whether you have all of the necessary modules for your application

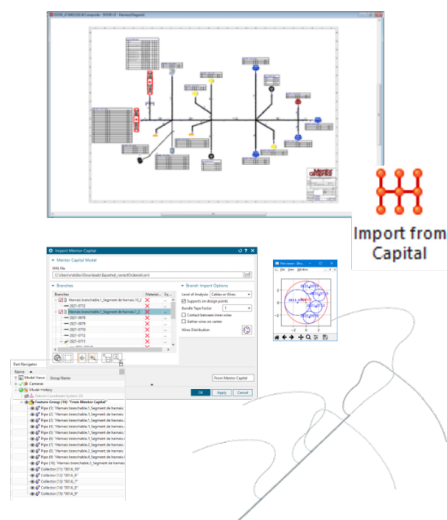
- It results in a simplified software structure and you gain immediate access to the full breadth of advanced thermo-fluid multiphysics simulation capabilities



### Ties to the digital thread

#### Import ECAD models developed in Capital Harness

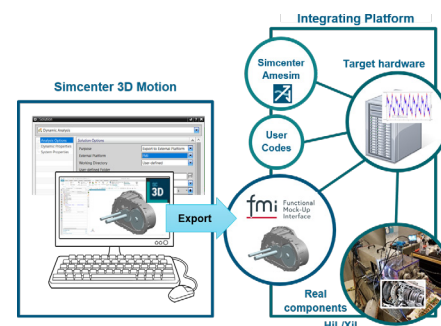
Simcenter 3D Flexible Pipe can now benefit from existing electrical computer-aided design (ECAD) models developed in Capital Harness software to help you understand how electric cables and wire harnesses perform during movement. Simcenter 3D can take the data from Capital to add loads, movements, and material properties to provide an accurate positioning of the wires in the 3D space. After potential enhancements or optimization of the harness model for mechanical purposes,



the harness can then also be used for further analysis such as electromagnetic interference and compatibility (EMI/EMC).

#### Improved motion real-time model export

Simcenter 3D Motion analysis is used for understanding the performance of mechanisms. As part of the digital thread, engineers often connect software models with physical hardware for hardware-in-the-loop simulations. You can use Simcenter 3D Motion models for real-time applications using a new process to export the model to external platforms. This can save you time by using high-fidelity model-based systems models directly in the real-time application, removing the need to reduce the model and available parameters or recreate the model in another program. The new export model workflow walks you through steps to generate the files required to integrate the Simcenter 3D Motion model in other platforms like Simulink or real-time platforms like Procyon, Concurrent or dSPACE.





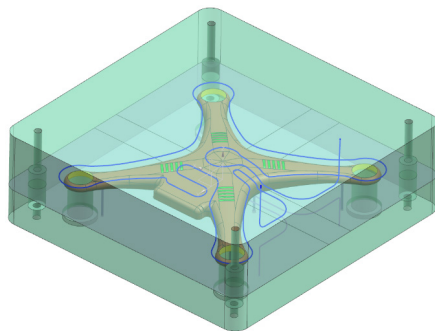
## Benefits

- Reduce CNC programming time by 95 percent with automated deburring
- Shorten machining cycles with pinch turning using two opposing cutting tools
- Accelerate CMM inspection programming of parts with planar and complex geometries
- Easily build multiple plies to improve strength of lightweight parts
- Quickly define 3D printing support structures using improved management of support attributes
- Drag managed manufacturing resources from Teamcenter directly into NX CAM using Active Workspace

## Open and scalable

### New NX Mold Cooling software

Simcenter 3D's thermal analysis capabilities have been scaled into a vertical solution that can be used by mold designers and design engineers using NX for easy and rapid thermal analysis of injection mold designs. This new solution, NX Mold Cooling, enables designers and engineers to rapidly set up and simulate the thermal performance of an injection mold insert directly in NX. The software automatically generates reports for a concise summary of the results so you can identify hot spots and view uneven temperatures on the part. This capability gives you immediate insight so you can quickly make design changes and compare the performance.



## What's New in NX for Manufacturing

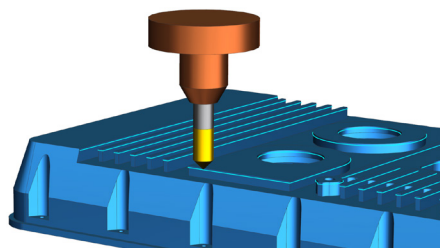
### Tomorrow's part manufacturing, today

New highly automated operations and powerful enhancements for computer-aided manufacturing (CAM) and coordinate measuring machine (CMM) inspection programming, additive manufacturing, and data management help manufacturers accelerate the production of higher-quality precision parts.

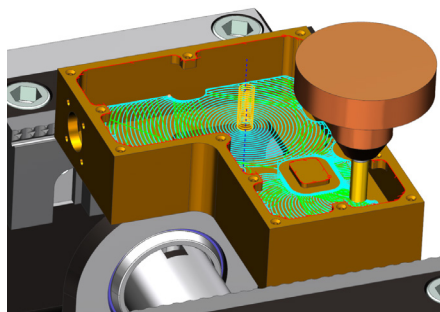
### NX CAM

The new planar deburring machining method helps you automate one of the most-used operations, corner chamfering, slashing programming time by up to 95 percent. NX automatically recognizes part edges (modeled or

unmodeled) and creates optimized toolpaths to machine the required chamfer size. The software also enables you to specify a size range for holes to be skipped for more precise control of the toolpaths. Additionally, planar deburring tracks already chamfered corners, eliminating re-cutting and enabling efficient 3+2 machining.



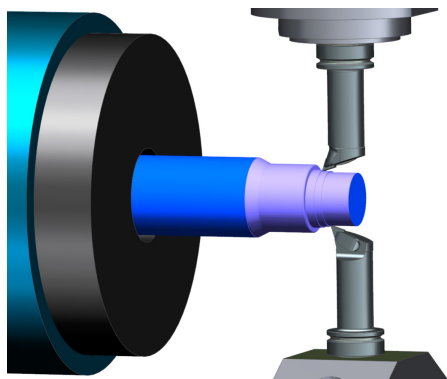
Adaptive milling, the high-speed machining cycle of NX CAM, has been expanded to support boundaries used for programming of prismatic parts. This highly efficient roughing strategy, which enables deep cuts and high cutting speeds, replaces the trochoidal operation for faster machining. The advanced adaptive milling method maintains consistent chip load that extends tool life, while reducing roughing cycle time by up to 60 percent.



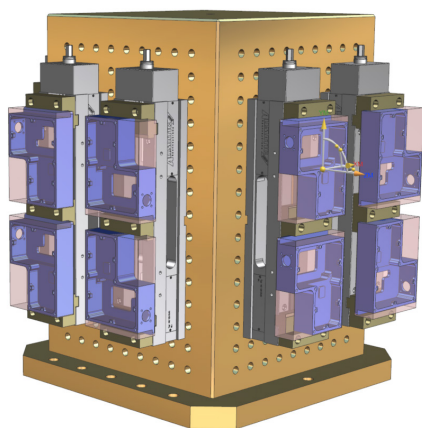
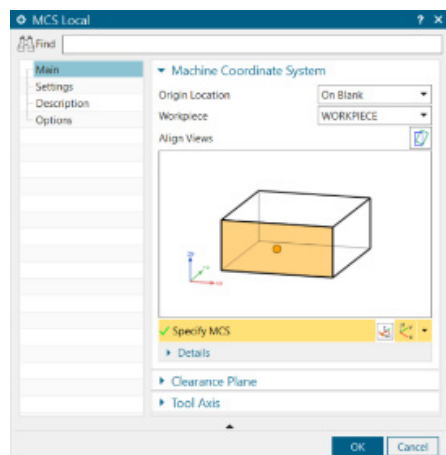
Pinch turning, a new advanced cutting method, enables simultaneous machining by two opposing cutting tools. It balances the cutting forces of two opposing cutting tools and minimizes part deflection, allowing deeper cuts. Additionally, one of the tools can perform a semi-finishing operation



while the other, slightly trailing the opposing tool, performs the finish operation. The new turning operation delivers higher productivity and accuracy.

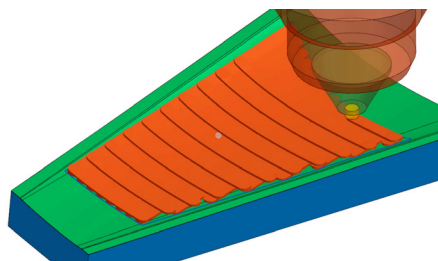


Productivity enhancements help you quickly define the machine setup, allowing you to focus on high-value programming tasks. You can now reduce setup time by quickly creating blanks from solids that can be accurately positioned in reference to the part models. Additionally, the new interactive creation of machining coordinate system (MCS) enables you to quickly define the MCS origin on the blank.



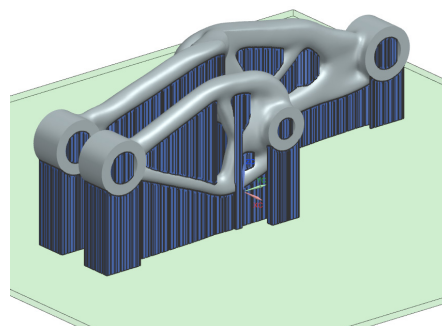
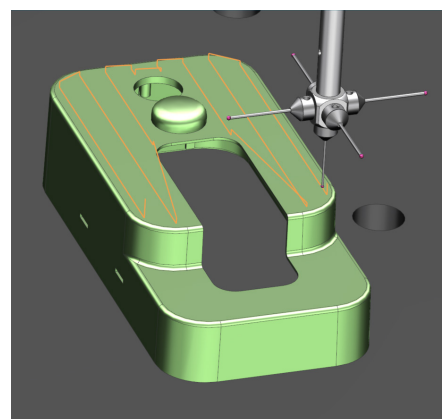
### NX Additive Manufacturing

Continued investment improves the NX Additive Manufacturing solution for multi-axis and planar printing. With new coating, slicing and supports enhancements, it is easier than ever to set up your build tray and to apply coatings to 3D surfaces. New coating capabilities support easier programming of parts with multiple plied layers, while common layer interface (CLI) slicing gives customers support for a wider range of print technologies. Furthermore, new support profiles and traceability save time, ensure compliance with company standards and allow for better management of support attributes.

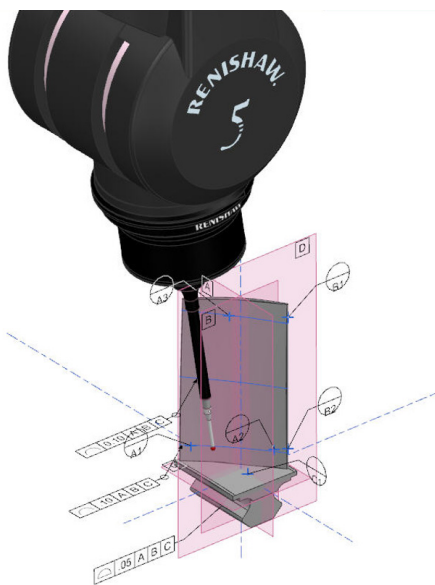


### NX CMM Inspection Programming

Tactile scanning path programming automates the creation of inspection paths on planar sections of parts. NX generates optimized, high-speed inspection paths using only the planar face as input, eliminating the need to create auxiliary geometry to define the inspection path. The new enhancement helps you quickly create tactile scanning paths that are increasingly used to inspect parts with geometric dimensioning and tolerancing (GD&T) data.

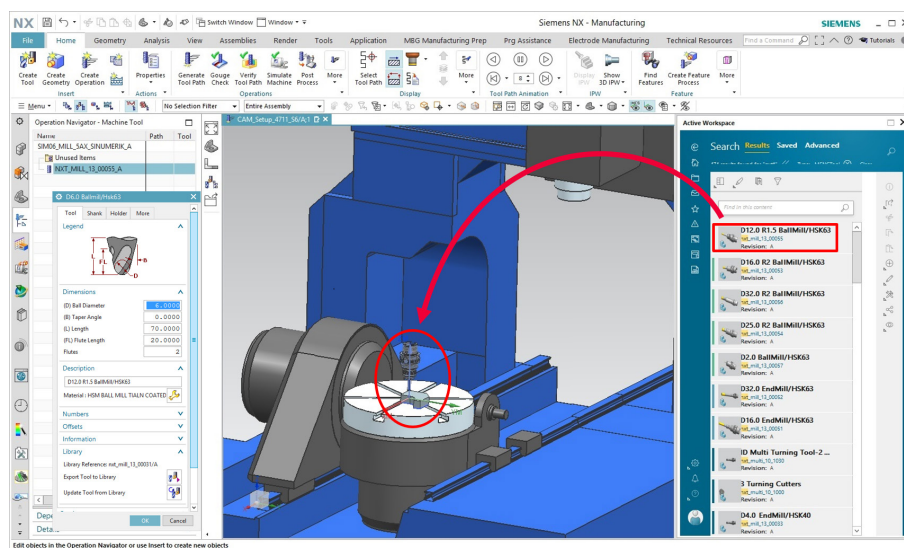


Enhanced 5-axis inspection programming functions for Renishaw Revo enable precise control of the tilt and advance angles of inspection paths. Programming of 5-axis inspection paths can be extremely challenging using traditional methods. The new controls simplify the programming of parts with complex geometries, such as airfoil sections.



## Manufacturing data management

The seamless integration of NX and Teamcenter enables CNC programmers to use components such as cutting tools, fixtures, and machine models managed in the manufacturing resources library (MRL). Using Active Workspace embedded in NX, programmers can now drag resources from the MRL directly into NX CAM. The modern interface allows you to quickly define an accurate digital replica of your machine setup, so you can efficiently program and manufacture high-quality parts for your industry.



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