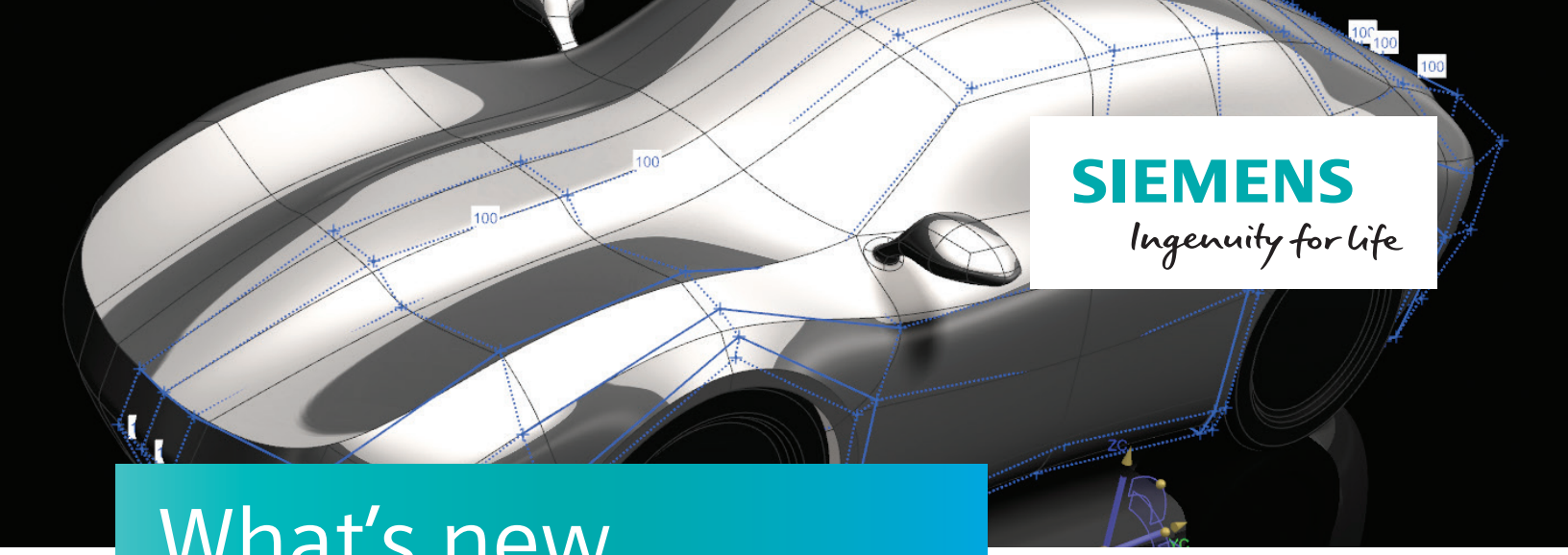


What's new in NX

Breaking down the barriers to innovation

Benefits

- Leading-edge technologies for design, simulation and manufacturing in a unified solution
- Faster delivery of functional enhancements through continuous release
- Faster, more efficient software operation with adaptive UI powered by artificial intelligence and machine learning
- Improved multiple-domain design efficiency across industries
- Leverage convergent geometry for CAE, tooling, CAM and additive manufacturing
- Accelerated design validation
- Improved tooling design, validation and simulation
- Streamlined workflows for additive manufacturing design, simulation, and production
- Better understanding of designs with immersive virtual reality
- Faster, more accurate CAE simulations, expanded solutions
- Enhanced high-speed machining
- New finishing strategies for improved surface quality
- B-axis turning enables higher productivity
- Expanded robotics applications

Introducing NX

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. NX CAD, Simcenter 3D, and NX CAM enable companies to realize the value of the digital twin in the end-to-end process. The challenges of increasingly complex products and ever-decreasing lead times can only be met with truly open, integrated software that unites the best tools in a single platform. The latest capabilities within NX remove barriers to innovation to increase productivity, decrease costs and ultimately get your innovative products to market faster.

NX architecture

Continuous release

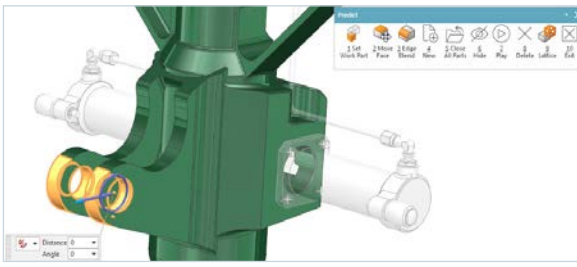
Siemens PLM Software is now delivering NX using a continuous release methodology. This new delivery model will provide faster customer access to new enhancements and quality improvements while reducing the effort needed to effectively deploy NX. Siemens is the first major CAD/CAM/CAE vendor to deliver products through continuous release.

NX is built on a modern software architecture, developed with a business focus on delivering new tools while protecting customer data. Continuous release enables customers to receive functional enhancements faster and have a predictable schedule for updates. It will also allow NX to be more responsive to new ideas and trends.

Adaptive user interface

One of the most noticeable enhancements to NX is the adaptive user interface (UI). Using machine learning (ML) and artificial intelligence (AI) capabilities, the UI can predict next steps and help users drive the software more efficiently by displaying commands for the most likely next steps.

With adaptive UI, the user interface automatically adapts to the needs of different people across multiple departments. The ease of use can result in higher adoption rates, accelerated learning and faster system adoption.



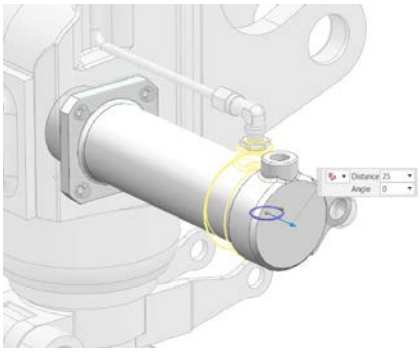
What's new in NX

The Siemens Digital Innovation Platform is continually expanding to enable customers to create the most comprehensive digital twin of the product, of the production environment and of the performance of the product. Integrating ML and AI into NX software offers the benefits of speed, power, efficiency and intelligence through learning, without having to explicitly program these characteristics. This offers many opportunities for customers to realize design process improvements, innovate product offerings and reduce time to market. The NX Command Prediction software is the first machine learning-enabled adaptive user interface on the market, and will be the basis for additional machine learning-driven UI solutions.

NX also delivers a number of architecture enhancements that remove the barriers to innovation and make you more efficient. New icons enable better visualization, improved spreadsheet integration, and user-defined features that are easier to use and more robust.

Most productive modeling environment

Modeling

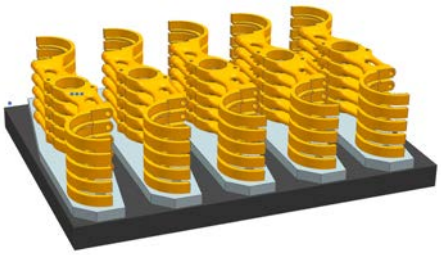


Several new capabilities in NX enable designers to model parts within the assembly context more quickly. NX now automatically changes the work part based on geometry selected by the user, removing the need to explicitly set the work part and eliminating right mouse button interactions. Sketching in the assembly context is streamlined by the capability to section the assembly to the sketch plane, eliminating the clutter of component geometry.

Improvements to out-of-date status indicators for assemblies, WAVE interpart links and features help designers understand out-of-date conditions and their required update actions. Designers can now show and hide geometry through symbols in the part navigator. Dynamic feature snapshots create copies of bodies for side-by-side visual comparison when making design changes, and snapshots can be overlaid on top of the updated geometry in a transparent view that improves understanding of the change impact.

Convergent Modeling

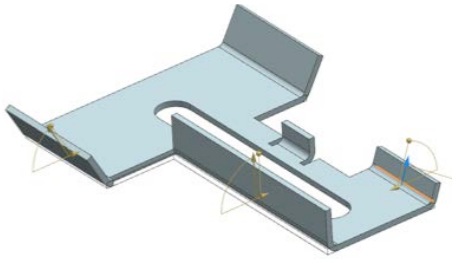
Key enhancements to Convergent Modeling™ include the ability to use facet and mesh geometry, not only in modeling but also in downstream simulation, tooling and manufacturing.



NX supports direct import of the standard 3MF and OBJ mesh data formats, and improves the quality of convergent bodies for downstream use via smoothing and re-meshing. In addition, there is extended support for feature-based modeling directly on convergent data. Facet and mesh selection methods have been expanded to include primitive and tangent facets and facets within curves, enabling designers to create topology for downstream use. With these improvements, convergent models can be leveraged directly in CAE, tooling, CAM and additive manufacturing application workflows. The result is significant acceleration of design and engineering processes.

Sheet metal design

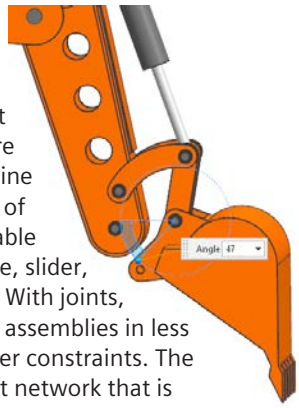
Many NX sheet metal design commands have been enhanced to enable greater design flexibility and improved productivity. When a flange feature is created in a recess or against an edge, the adjacent



material is removed if a relief is applied. There is now an option to include the relief in the flange width so adjacent geometry is not impacted with the new feature. Previously, gussets could be placed only on linear bend faces; now gussets can be placed on nonlinear bends (such as contour flanges and advanced flange features) and also linear blends (such as dimples and drawn cutout features). Dimple features can now be added across disconnected bends.

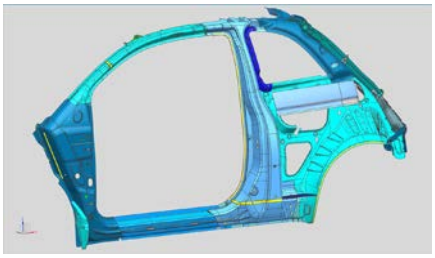
The flat pattern capability now reads and displays hole feature information. Holes added to the sheet metal model are now displayed as a separate category in the flat pattern display and retain their parameters through the flat pattern for downstream usage. The hole center mark now offers the option to display both hole curves and center marks. Sheet metal enhancements enable greater flexibility of design, improved productivity and lower cost.

Assembly joints



Assembly joints are a new type of assembly constraint that provides a more intuitive way to define the relative motion of components. Available joint types are hinge, slider, cylindrical and ball. With joints, users can constrain assemblies in less time and using fewer constraints. The result is a constraint network that is

easier to understand and can be directly leveraged by other motion applications.

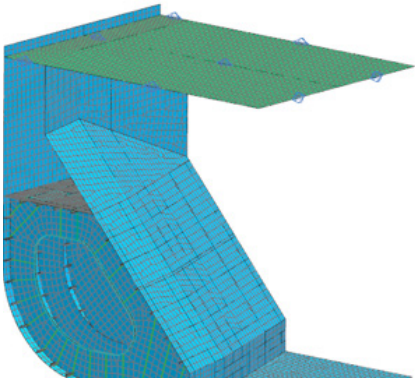


Joining

Improvements to NX Weld Assistant enhance weld design productivity and streamline design changes. Weld bead creation has been enhanced to allow sketching of the bead cross-section using existing geometry. Designers can now sketch bead cross-sections and project them along a path defined by existing geometry.

An enhancement to NX Weld Assistant improves your design experience and streamlines support for weld changes during the iterative design process. In addition, the connected face finder improves efficiency of design changes by identifying component faces that should be associated with existing welds and re-establishes links to parent parts that have been changed. Support for fillet welds, sealer beads, user-defined welds, and groove welds has also been expanded.

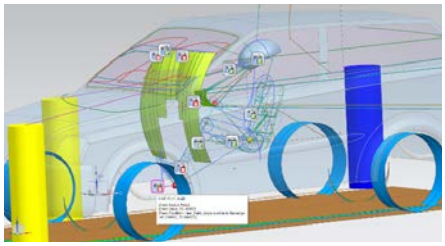
Ship design



NX Ship Structures software has been enhanced in the latest release improve design, validation and manufacturing productivity for steel structures.

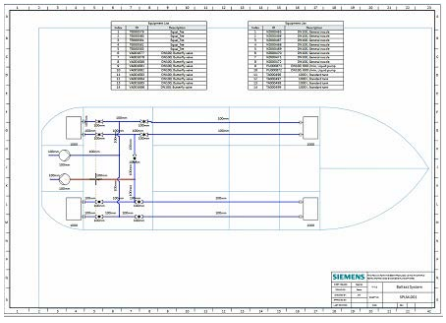
Key enhancements include a streamlined method for creating bounded structure openings, an improved interface to CAE solutions that accelerates design-analysis iterations, and faster, more accurate steel trimming. A new pin-jig calculation method supports curved plate manufacturing.

Vehicle design automation



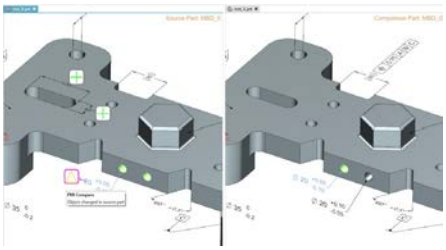
Several enhancements to NX Vehicle Design Automation boost efficiency and save time in vehicle design engineering. NX now provides additional pedestrian protection information (upper leg impact angles, velocity and energy values) that eliminates manual calculations. The 2D manikin tool has been expanded with additional layout geometry to assist in design, and now supports additional design standards. A new capability enables designers to easily reset base data values for eyellipse, hand reach, seat lines, vision zones and other design parameters without manually entering the values.

Process and instrumentation diagraming



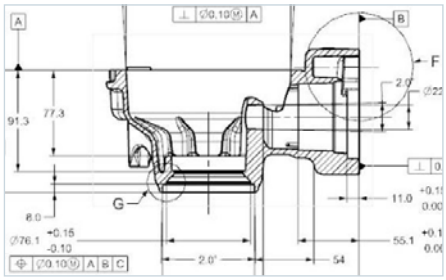
Users of NX P&ID Designer can realize faster and more flexible design and change processes. Active Workspace is now embedded in P&ID Designer, enabling you to spend more time designing and less time managing data and workflows.The latest release includes tables and reference graphics for more complete communication of design intent that can help reduce manufacturing errors. Users can document control systems for entire piping process runs with integrated instrumentation design capabilities.

Product and manufacturing information



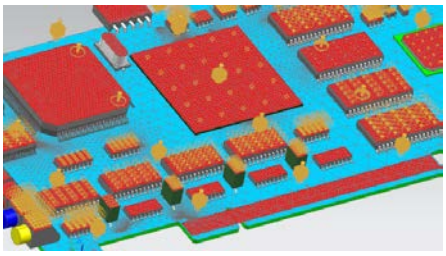
A new enhancement in NX enables you to compare product and manufacturing information (PMI) and model view data between two native NX parts or revisions. The interactive comparison navigator reduces PMI and model view checking time by quickly and easily identifying changes.

Drafting



Various enhancements to NX drafting tools improve user experience and efficiency. Hole callout enhancements include dual-dimension formatting support and added support for holes with relief applied. NX Layout is now a separate application, which will allow the 2D layout capabilities to expand and continually enhance. Balloon settings enhancements enable easier interaction during ballooning workflows. Parts list functional enhancements and updates to drafting help users comply with national and international drafting standards. Along with improvements to the user experience, these enhancements give users more customization and confidence in their drafting and layout tools.

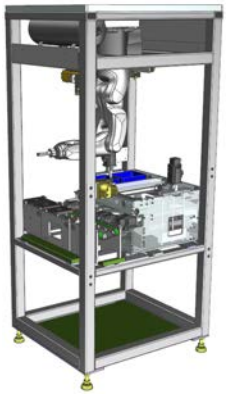
Electromechanical design



NX PCB Exchange has many key enhancements that address the ever-increasing complexity of electronic printed circuit boards (PCBs). The Incremental Design Exchange (IDX) format for sharing data between electrical and mechanical CAD systems now transfers board layer stack-up information from ECAD systems for more precise representation in NX enabling more accurate downstream processes such as thermal analysis. Many additional object types created in the electronics domain are also transferred in the collaboration data to increase the accuracy of board representation in NX.

Mechatronics concept design

Mechatronics Concept Designer™ software now includes numerous enhancements for seamless design integration, interface enhancements, and cam documentation for better communication and maximized results.



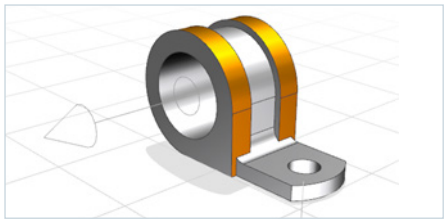
You can take advantage of enhanced features to enable synchronized communication between Mechatronics Concept Designer and the PLCSIM Advanced virtual controller for greater efficiency and reduced development time. A new function has been introduced to document cam profiles as charts and cam profile segment tables in seconds.

The new version provides features for virtual commissioning, design and engineering collaboration.

Collaboration with other tools is important for mechatronic machine design use cases. With the new Collaboration Navigator to Automation Designer, NX provides seamless integration of mechatronic machine design and automation engineering.

The enhancements to Mechatronics Concept Designer provide better integration within NX for greater ease-of-use and quality, and shorter time to market.

Routing



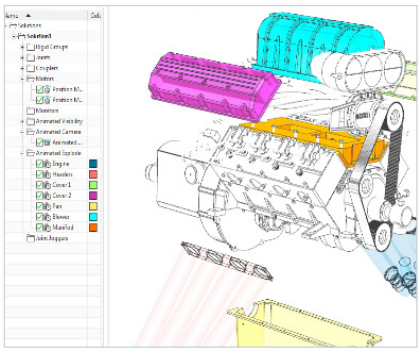
NX Routing includes key new features to improve ease of use, productivity and collaboration for routed systems design. NX now includes a new feature for creating modified end geometry on pipe stock for special fittings.

Spline path enhancements include length and slack control improvements to provide better ease of use and more predictable results. In addition, port creation and editing are more powerful, clearer, and support proper configuration. An updated user interface streamlines modeling of ports for standard parts.

Integrated validation

New visual validation tools in NX enable you to add animated effects such as fade and explode. You can quickly focus attention on a special component or operation by fading surrounding parts; you can specify the start and end time to gradually fade parts until they are invisible. For explosions, designers simply select a component and a vector to create disassembly animations; these can be combined with fading effects for more sophisticated visualizations.

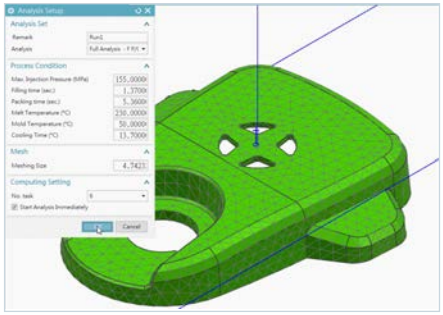
To visualize key components from different points of view, NX now enables you to animate the camera position. The definition process is simple – define the view at various points in time by capturing key frames, and NX automatically creates the transitions between them. You can easily change the start times and durations of effects by dragging event bars in the time line; a handy color override option helps you find the right effects faster.



The results from these tools can be saved as high-definition (HD) video for sharing with colleagues and customers. You can also enhance the presentation using a video editor, adding sound, narration, text and other effects.

For motion validation, a new inverse kinematic option automatically creates motors to drive the positions of your designs. Inverse kinematics determines the best path to move a component from one point to another, then creates the motors to follow that path. The operation is very simple to use: you specify the start and end positions to control location and orientation. Inverse kinematics can create motors based on a wide range of joint types including revolute, cylindrical, and slider. The visual effects capture key motion functionality and enable you to simulate more design alternatives in less time.

NX tooling



With enhancements to NX tooling design, you can improve tool design workflow automation and increase accuracy for validation, simulation and tool optimization. There are also updates to tool design to eliminate many manual modeling processes

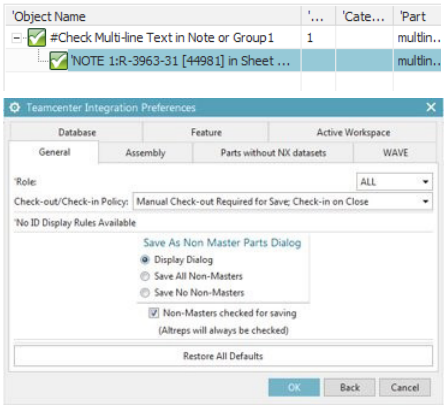
New cooling and warpage analysis tools help validate parts early in product development in the CAD environment, enabling you to address issues earlier in the design process.

In addition, seamless integration of NX and Teamcenter product cost management helps you calculate tool cost for plastic injection molds more accurately, based on the product design.

These user-friendly tools and cutting-edge validation capabilities mean better designs and easier problem solving for your design team.

Collaborative design management

The latest release of NX includes improvements to the Check-Mate validation checking capability. Many of the out-of-the-box checkers and visual reports have been enhanced to aid in identifying and resolving issues to improve the quality of your CAD models.



For teams that prefer manual control of file check-out with automated check-in, enhancements to safeguard shared data in collaborative projects. Check-out and check-in has also been updated with usability improvements and user-requested enhancements.

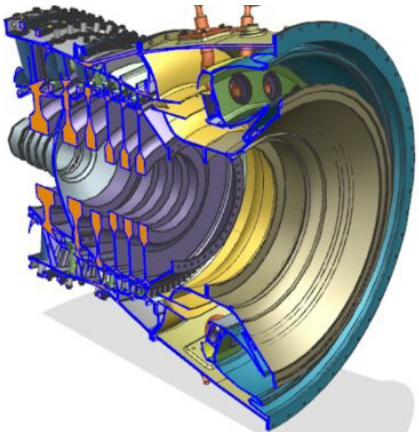
Industrialized additive manufacturing

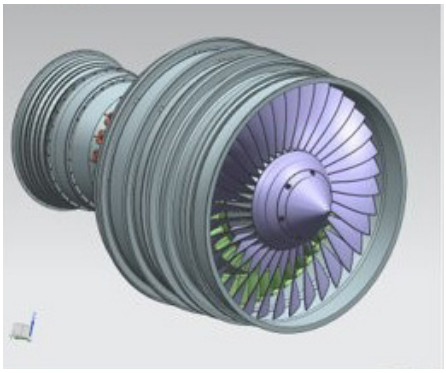
NX continues to develop extensive new capabilities to design, engineer and validate structures suitable for additive manufacturing. New features enable enhanced workflows and checks for components produced with additive manufacturing. These improvements also enable design innovations, including lightweight designs that require less material and efficient finite element analysis through direct conversion of the lattice designs to beam elements. The new internal design for additive manufacturing (DfAM) checks help designers avoid costly redesign by ensuring that designs are accurate and error-free. These capabilities optimize design workflows to quickly and accurately bring designs to market.

Immersive visualization

Enhancements in the latest release include new virtual reality (VR) tools for inspection and design review with capabilities that improve the user experience, especially for new VR users. VR yields a better understanding of aesthetics and spatial relationships, which in turns leads to fewer analysis cycles.

There are new options in Ray Traced Studio for physically-based image generation. Images can be viewed using low-cost VR devices, like Google Cardboard along with your mobile phone.





Improvements to existing Ray Traced Studio options for materials, scenes, and image setup, along with the option to produce stereo or mono spherical images, create an immersive and accessible VR

experience for a variety of hardware. Photorealistic, immersive representations of designs produced early in the product development cycle support better communication of designs and reduce analysis cycles.

New and enhanced navigation capabilities support navigation concurrent with view dynamics and commands in general. Other benefits include reduced visualization setup time providing more time for critical design activities, and an easier-to-use control interface.

Users can fly through rendered designs with game-like keyboard controls. Navigating in this manner makes it easier to review and interact with designs. Improved view clipping behavior, the capability to pan the view to selected geometry and save and restore home controls provide greater ease and less distraction. These enhancements streamline design and review workflows with smoother, better controlled view navigation.

Simcenter: 3D CAE for the Digital Twin

Simcenter™ 3D delivers a unified, scalable, open and extensible environment for 3D computer-aided engineering (CAE) with connections to design, 1D simulation, test, and data management. Simcenter 3D accelerates the simulation process by combining best-in-class geometry editing, associative simulation modeling and multidiscipline solutions embedded with industry expertise. Fast and accurate solvers power structural, acoustics, flow, thermal, motion and composites analyses, as well as design space exploration and multiphysics simulation.

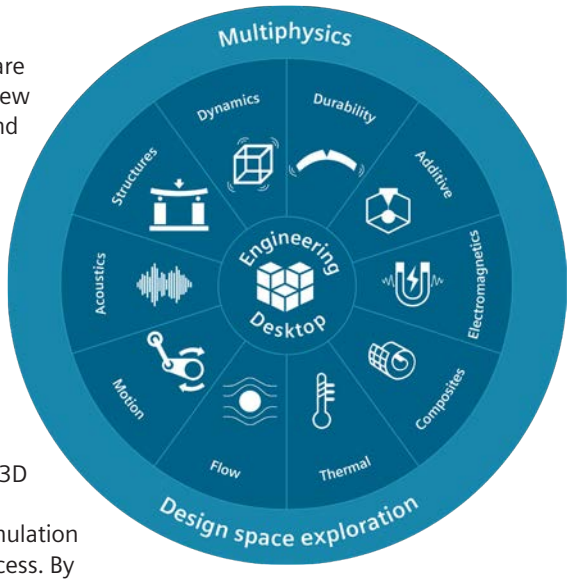
Product development and design are being reinvented to make use of new materials, create lighter shapes, and take advantage of new manufacturing methods. The latest enhancement of Simcenter 3D integrates future technologies for faster modeling, more accurate simulations, and multiphysics integrations to help engineers drive innovation and reduce the effort, cost and time needed to predict product performance.

The new capabilities of Simcenter 3D pioneer simulation for the future through generative design and simulation of the additive manufacturing process. By expanding Simcenter 3D's simulation footprint (to new solutions like transmission simulation) and creating new ties to the digital thread (through synergies with the broader Simcenter portfolio of simulation products), Simcenter 3D forges a new path forward for LMS Virtual.Lab customers.

Simulation for the future

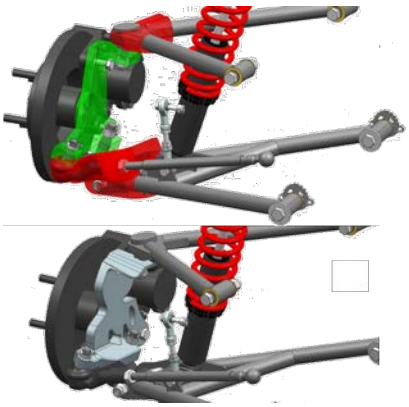
Manufacturing is changing. New materials and production methods are challenging traditional design and manufacturing limits. With the industrialization of additive manufacturing, you can now design and manufacture new shapes that were never possible before. But how do you generate ideas for these new part shapes and how will you know the as-manufactured part will match the as-designed shape? Simcenter 3D will help you solve both problems.

Enhanced topology optimization makes it easier than ever to create designs that are not only fully optimized for their intended purpose, but are also well-suited to be produced via additive manufacturing. Simulation for the additive manufacturing process itself gives you peace of mind knowing that your designs will come out of the production process exactly as you intend them. Now you can design and simulate manufacturing of shapes never before possible.



Enhanced topology optimization

Generative engineering with topology optimization lets you use simulation to drive and optimize the shape of a completely new design.



Now you can add design objectives or constraints for structural integrity, which is crucial when working on parts that are subjected to critical loads including buckling. Additionally, you can now include manufacturing constraints, an optional restriction to guide a design towards your specific production criteria. Using these simulation enhancements allows you to drive and optimize the shape of innovative designs.

Additive manufacturing process simulation

As industrialization of additive manufacturing accelerates, the need to get a first-time-right print also increases. However, the additive manufacturing process fuses layers of metal together with tremendous heat. As the layers build up, residual heat can cause the part to distort inside the printer. Simulation of the printing process has the potential to alleviate many of these problems. The new additive manufacturing process simulation solution of Simcenter 3D can help manufacturers achieve a quality print the first time, saving significant resources, cost, and time. The solution uses a digital twin of the build tray including parts, support structures, and residual powder to simulate the metal deposition process. This allows industrial manufacturers to adjust the printing process, improving the quality of the final print.

You will now be able to leverage a fully integrated NX Additive Manufacturing work suite for a streamlined, design-to-simulation-to-manufacturing process. By simulating the powder bed fusion 3D printing process and pre-distorting the initial geometry to compensate for process-induced distortions, you can prepare for potential recoater collisions and avoid printing issues before you encounter them, achieving a quality print the first time.

Expanded solutions

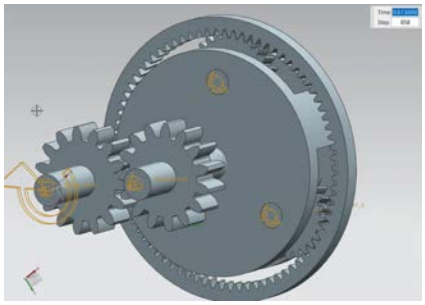
Simcenter 3D expands and deepens the level of simulation technology available within the open and scalable simulation environment. Simcenter 3D's unique simulation environment helps you achieve much faster CAE processes than can be achieved with traditional CAE tools, and this enhancement expands its simulation footprint to help simulate new solutions that would otherwise be too challenging to complete.

3D Motion Transmission Builder

Simulating transmission behavior has traditionally been a tedious and error-prone process requiring multiple simulation tools. The new Simcenter 3D Motion Transmission Builder automates the creation and simulation of transmission motion simulation models entirely within a single, integrated simulation environment.

Additionally, the transmission models can then be seamlessly combined with Simcenter 3D Acoustics to perform gear whine analyses. According to Horim Yang, senior research engineer at Hyundai Motor Company, "Transmission Builder is a useful tool that lets us model the gear train with different levels of fidelity depending on our analysis requirements."

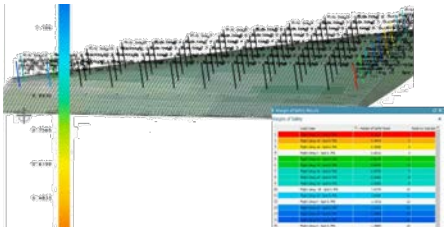
The Transmission Builder automates the creation of multibody models. It is based on industry-standard parameters, and completely eliminates tweaking and tuning of non-physical parameters.



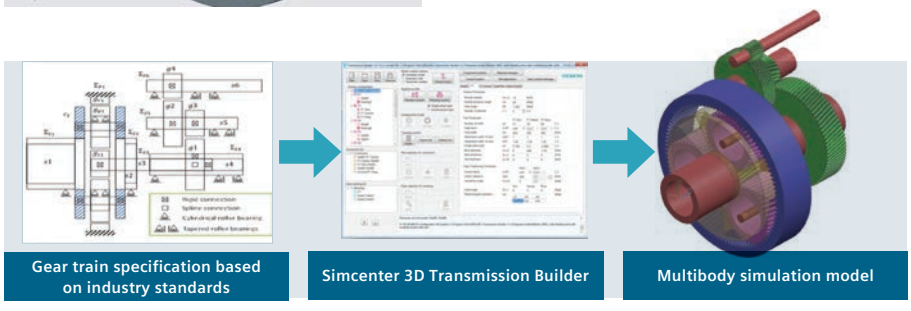
The latest enhancements arm you with efficient and accurate simulation of transmission dynamics. The gear simulation is extremely fast and as accurate as finite element (FE) and enables you to minimize noise and vibration while guaranteeing performance and durability. Accurately simulate faster than ever before without sacrificing design confidence, reducing your transmission simulation effort by 80 percent.

Simcenter 3D Aerostructures with Composites

The latest enhancement introduces Simcenter 3D Aerostructures, which streamlines the aircraft structural analysis process by up to 30 percent – from CAD geometry to finite element simulation and margin-of-safety calculations to reporting and traceability for certification. Modern aircraft are engineered using lighter, yet stronger composite materials instead of aluminum.



Simcenter 3D Aerostructures can now calculate margins of safety on composite structures. This means airframers using composite materials can realize the same margin-of-safety process gains with Simcenter 3D Aerostructures.



Thanks to the new enhancements to Simcenter 3D Aerostructures with Composites, margin-of-safety methods can now associatively link to laminate composite definition in the FE model. This accelerates the overall process of composite design, structural engineering and certification, streamlining your aircraft structural analysis by up to 30 percent.

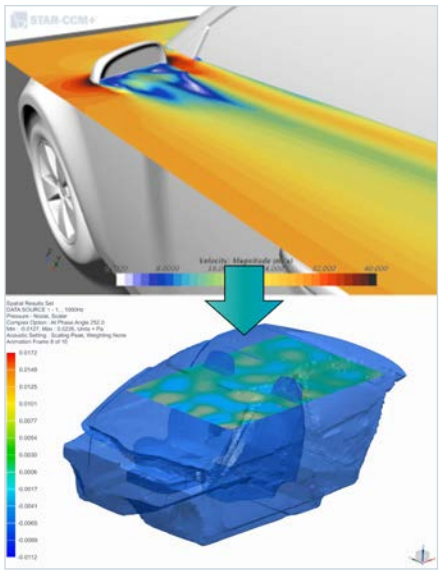
Additional enhancements

New ties to the digital thread

Tie your simulations to the broader digital thread: Simcenter 3D is a part of the Simcenter™ portfolio of solutions that span 3D simulation, 1D simulation, and testing. Simcenter is comprised of many leading solutions including Simcenter™ Nastran®, Simcenter™ STAR-CCM+™, Simcenter Amesim™, Simcenter Test.Lab™, HEEDS™ and many others. The latest release strengthens these ties to help you better predict product performance.

STAR-CCM+ and Simcenter 3D for Aeroacoustics

Efficiently explore and eliminate the source of unwanted noise originating from air passing over the side mirrors in a car, or noise coming from airflow within an HVAC system. Connections between Simcenter 3D and STAR-CCM+ now enable you to turn CFD results from STAR-CCM+ into equivalent acoustic sources for use in Simcenter 3D Acoustics to perform aeroacoustics and aero-vibro-acoustics simulation. With this solution, you can improve cabin comfort for the end users of your products.

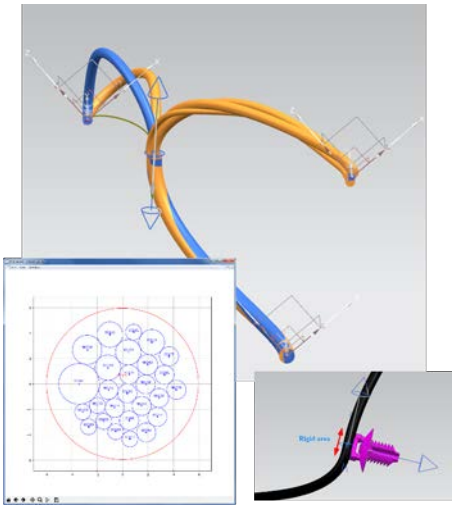


Flow-induced noises originating from side mirrors, air conditioning modules such as HVAC applications and rotating fans can now be analyzed and eliminated efficiently with the new interface developed in Simcenter 3D Acoustics. With Simcenter 3D Acoustics you can turn CFD results coming from STAR-CCM+ into equivalent acoustic sources for aeroacoustics and aero-vibro-acoustics simulations on a coarser mesh with accurate boundary conditions, resulting in accurate and faster computations.

You can now improve cabin comfort in automobiles, aircraft and trains, and reduce industrial noise generated by flow from pumps and fans. The enhancements allow you to efficiently explore and eliminate the source of unwanted noise originating from air flow.

Simcenter 3D Flexible Pipe electrical cable analysis with NX Routing

Electrical wires in moving mechanisms can sometimes get caught up in the machinery, or possibly get bent in a way that causes the harness to fail. Understanding how a wire harness

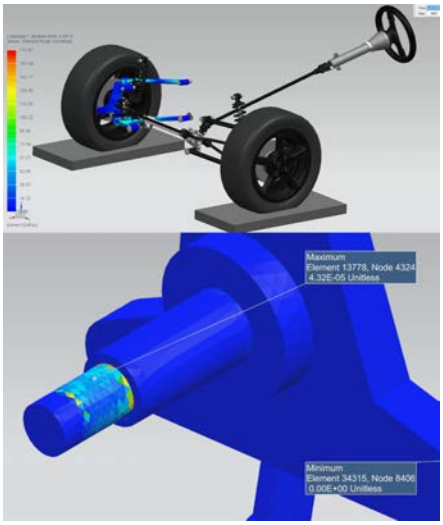


behaves within a mechanism is a challenge because a wire harness is actually constructed out of many different wires that are bundled together with other wires of different sizes and materials like tape. A single, equivalent cable analysis won't be accurate. In the latest release, you can now study how an electrical wire harness (or subharness) will bend and move within your assembly with Simcenter 3D Flexible Pipe. This solution imports stocks from NX Routing and models the interaction between all cables, external taping, contact and possible section distribution changes.

NX enhancements now allow you to study how electrical wire harnesses will bend and move within an assembly with Simcenter 3D Flexible Pipe. This translates into more accurate modeling of electrical cables, including interaction between all cables, external taping, contact and distribution changes. Leveraging these enhancements will allow you to achieve deeper insight into how the wire harness will behave in a moving mechanism.

A new path forward

Simcenter 3D durability specialist

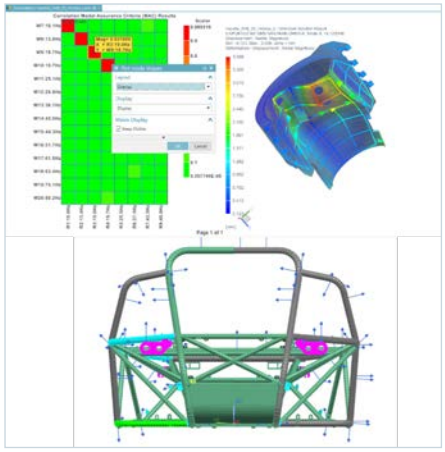


Fatigue specialists are concerned with complex loading events, weldments, new materials like composites as well as with the direct influence of the manufacturing process on local material behavior. The new Simcenter 3D Specialist Durability software provides the functionality of the well-known LMS Virtual.Lab durability solvers, including the analysis of welds and composite materials. Simcenter 3D Specialist Durability migrates this key functionality to the open and scalable Simcenter 3D environment that can use the results of popular third-party finite element solvers as well as Simcenter 3D multibody solvers.

Improvements to auto detection make it easier to detect direct and indirect seam welds coupled with an efficient weld fatigue solver. That, along with the ability to import standard extended master connection (xMCF) files and a durability scenario-based postprocessor to intelligently filter results and failures, makes it easier than ever to handle and manage complex duty cycles including load event-based durability workflow.

Simcenter 3D Model Correlation

Simcenter 3D Model Correlation helps you understand how well your FE model represents reality. The software compares and correlates simulation results with physical modal test results that are captured in Simcenter Test.Lab. Once the correlation establishes the differences between both representations, Simcenter 3D Correlation can update the FE model to more accurately represent reality. Afterwards, the correlated FE model can serve as a basis to provide an optimal comparison to avoid testing errors.



The FE model can serve as a basis to provide optimal comparison positions, and the required number of excitation and response points, avoiding testing errors and redundancy.

Now you can easily define and validate cost-effective modal tests. The latest enhancements make it easier to identify the best sensor and exciter locations for an efficient and effective pre-test analysis. These changes provide a quantitative and qualitative solution to guarantee high-fidelity simulations.

Supporting the digital twin

Development investments in Simcenter 3D are aimed at advancing the state of the art in four areas related to the digital twin. The first is that Simcenter 3D is an integrated environment in which you perform all pre- and postprocessing. Within this environment, Simcenter 3D offers best-in-class geometry editing tools, comprehensive meshing, and a unique ability to associate the analysis model with design data. This capability helps engineers speed the tedious modeling process and keep analysis models in sync with the latest design. The result is a much faster CAE process than can be achieved with traditional CAE tools.

Simcenter 3D then delivers accurate multidiscipline simulation, all from within the centralized engineering desktop. Simcenter's 3D simulation solvers help you predict real-world performance for a large variety of physics domains.

The unified environment of Simcenter 3D is completely open, scalable and extensible. In addition to supporting Siemens solvers, Simcenter 3D can be used as a pre- and postprocessing tool for other common, third-party solvers like ANSYS, Abaqus, MSC Nastran and LS-Dyna. The common environment also gives engineers a scalable platform on which to build automated routines to drive simulation processes.

Finally, Simcenter 3D is tied to the digital thread because it is a part of the Simcenter portfolio of simulation solutions that span 3D simulation, 1D simulation, and testing solutions. Simcenter is comprised of many leading solutions including Simcenter Nastran, Simcenter STAR-CCM+, Simcenter Amesim, Simcenter Test.Lab, HEEDS and much more. Simcenter 3D integrates this simulation portfolio, the broader digital thread of product development and the synergies they can gain as part of the Simcenter ecosystem.

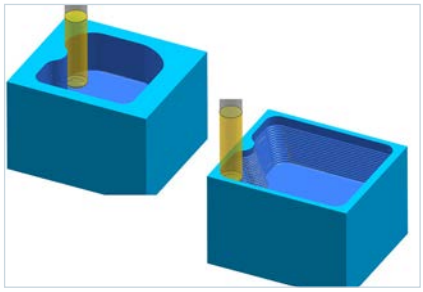
NX for Manufacturing

Automating end-to-end part manufacturing

The latest enhancements to NX for manufacturing introduce new capabilities for a wide range of applications, such as mold and die manufacturing, production machining, and multi-axis milling. Meanwhile, the integrated additive manufacturing functions help you to design, prepare and print breakthrough products that were impossible to manufacture using traditional technologies.

Mold and die machining

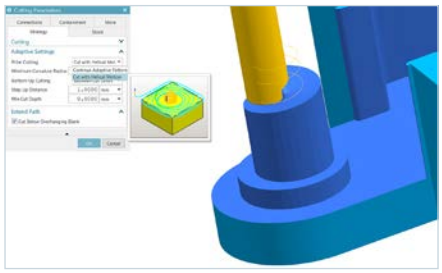
The latest capabilities in NX CAM software enable machining of higher-quality molds at very high speeds that can significantly reduce the machining time and eliminate rework.



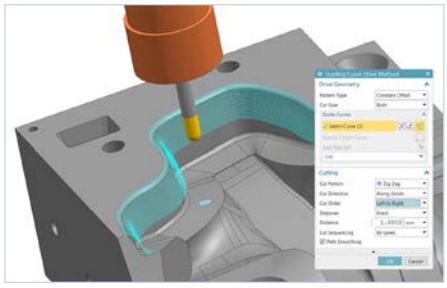
Adaptive milling, an advanced high-speed roughing operation that enables deep cuts and consistent tool load, can shorten machining time by up to 60 percent. The enhancements include a new bottom-to-top rest milling operation that leaves consistent stock on tapered walls for better finishing. NX can automatically recognize and machine uncut pillars using advanced cutting methods, such as a helical toolpath, extending tool life and improving the overall machining process. ning process.

Fixed-axis guiding curves

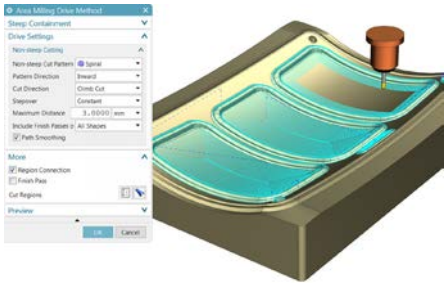
Fixed-axis guiding curves is a new finishing strategy that generates cut passes with consistent stepover, while following the natural part geometry shapes. You can use multiple or single curves or edges to precisely control this smooth toolpath, helping you achieve an excellent finish.



Fixed-axis guiding curves finishing operations can generate a morphing toolpath between two curves with consistent stepover across the machined surfaces, improving surface finish and eliminating rework.

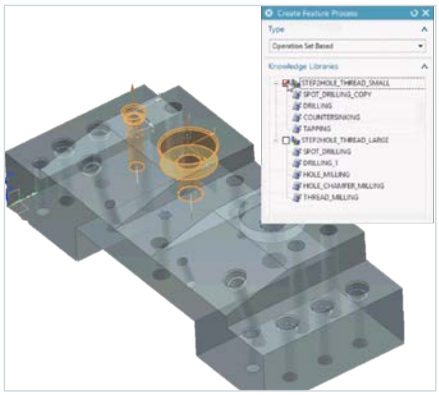


Helical and spiral finishing are new finishing methods designed to generate optimized toolpaths for specific types of cut regions. The helical toolpath that is gradually stepping over is an ideal cutting strategy for machining high-quality parts with steep walls. The spiral milling is ideal for machining shallow symmetrical part regions.

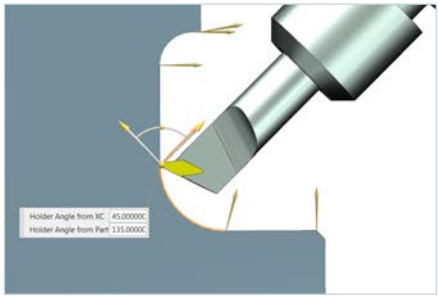


Prismatic parts machining

NX CAM helps you automate programming of prismatic parts, such as those in machinery, automobile and aircraft components, using advanced capabilities for 2.5-axis milling, turning and mill-turn.



Automated feature-based machining enhancements provide more flexibility to leverage your expertise. In addition to the fully automated methods, you can now easily define, organize and re-use your best machining processes, accelerating programming while ensuring repeatability.



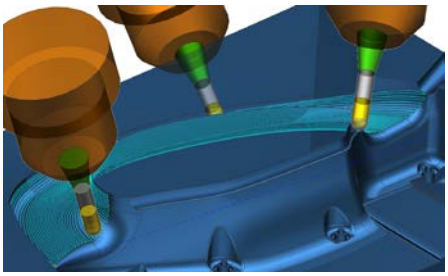
New turning capabilities enable you to take advantage of advanced lathe and mill-turn machines. B-axis continuous turning helps you reduce the number of setups, operations and tools, which can dramatically improve productivity. You can easily define tool variable-axis orientation to tackle complex parts that would require multiple operations and tools if using traditional methods. Additionally, you can take advantage of multi-tools to safely program a wide range of turning operations. With the integrated G-code-driven simulation of NX CAM, you can use a digital twin of your complete setup, including multi-tools to verify material removal and check for collisions, so you can eliminate errors in production.
B-axis continuous turning helps machine complex parts, while reducing the number of setups, operations and tools, ultimately improving your productivity.

Complex parts machining

5-axis machining

5-axis machining enables you to produce complex parts with fewer operations and setups to reduce cost and delivery times. The latest release of NX CAM software introduces advanced capabilities.

Variable-axis guiding curves

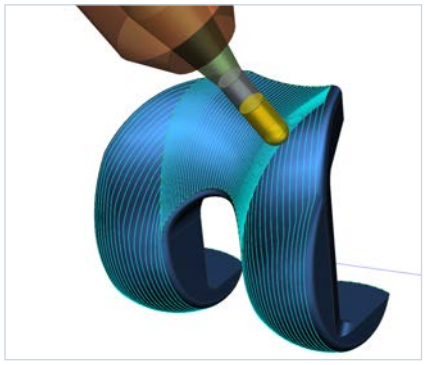


Variable-axis guiding curves is a new finishing operation that simplifies programming of the most challenging part geometries, including undercuts. Morphing toolpaths between multiple guides with a precise control of the tool axis enable you to achieve excellent finish. The automatic tool holder avoidance ensures safe 5-axis machining.

Multi-blade parts machining

Multi-blade parts machining using the specialized turbomachinery milling operations have been further enhanced with powerful capabilities. The custom offset at any location along the toolpath enables you to easily create programs for adaptive machining processes and blade repairs. You can generate smoother cutting patterns when machining blisks with non-rotational hubs. The new multi-stripes blade finishing allows you to machine blades in sections to minimize the cutting forces applied on the blade during machining. Using the enhanced roughing, you can improve slotting, which can reduce tool loads and extend tool life.

Merge operations

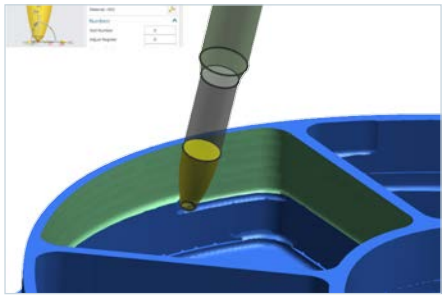


Merge operations gives you more flexibility to machine complex parts with a single operation. Traditionally, parts are machined using multiple operations, which can result in inefficient machining or inferior surface finish. By merging semi-finish and finish operations, you can create a single operation to perform both semi-finish and finish on one level, resulting in improved machining. To achieve higher-quality surface finish, merge two or more finish operations to eliminate marks where the individual operations meet.

With merged operations you can combine two or more operations, to reduce tool changes while achieving a higher-quality surface.

Barrel-shaped Tools

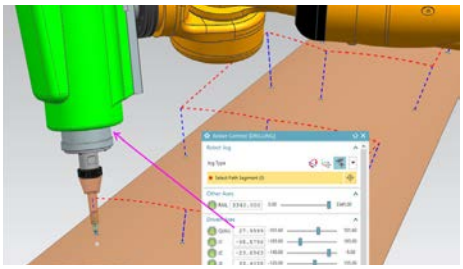
Barrel-shaped tools are more frequently used because of the important advantages that they provide. Specifically designed for five-axis milling, barrel tools allow a large cutting contact with the workpiece. This enables you to achieve the desired finish quality with significantly fewer passes, which significantly improves machining efficiency.



Barrel-shaped tools can boost your 5-axis machining efficiency. The tools' geometry allows a large cutting contact with the workpiece, reducing the number of passes, while achieving the desired finish quality.

Robotic machining

NX CAM Robotics Programming has new capabilities that expand the range of applications for this technology. You can program a robot with a drilling head or "quill," a device used for drilling highly accurate holes. This is beneficial for machining of large parts. By using the digital model of the robot and the entire setup, the NX toolpath-finding capability helps identify possible issues, eliminating errors in production.



In addition, the existing list of supported robotics controllers now includes Yaskawa, Staubli, Nachi and Kawasaki.

Postprocessing and machining simulation

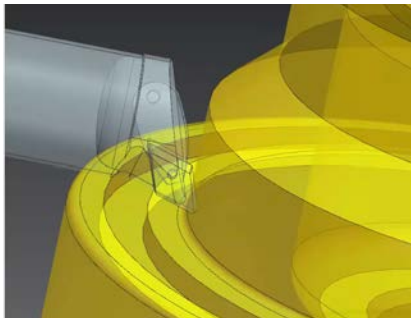
The NX CAM postprocessor helps you generate production-ready CNC programs for machine tools and controls with a postprocessor embedded in your CAM software.

The integrated machining simulation capabilities enable you to accurately validate manufacturing operations to eliminate errors in production, reduce setup time and maximize machine uptime.

Postprocessing

The recently implemented NX CAM Post Configurator provides an easy way to set up your postprocessor in an interactive environment. Post Configurator has been further enhanced to provide support for multi-channel (multi-function) machines, so you can quickly customize the post-processor to output the right CNC program.

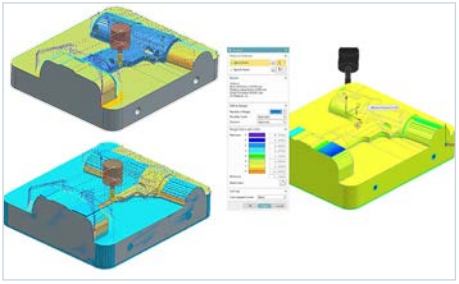
Machining simulation in NX CAM



New simulation and verification capabilities for turning operations help eliminate expensive errors in production, such as collisions between the workpiece and the tool assembly. This capability also extends to multi-tools that can be very challenging to use for CNC programming if the CAM system lacks automated collision and gouge checking. Detailed color coding helps you better understand the machining process when using material removal simulation. NX provides detailed information about tool tip speed, such as acceleration, deceleration and constant speeds, providing more control of the machining process.

Productivity enhancements

Machining process visualization



New visualization capabilities provide additional insights into the machining process as you program the part, without running the full simulation. You can animate tool motion, simulate material removal and analyze remaining material by using the in-process workpiece (IPW) technology to optimize the machining process.

The new toolpath visualization capabilities enable tool motion animation, material removal simulation and analysis of uncut material as you program. This enables you to optimize the machining process early in the CNC programming process.

Streamlined user interface for CNC programmers

The redesigned CAM home ribbon enables quick access to all of the go-to CAM commands for faster programming. For example, the newly added geometry tab has all the CAD functions needed to prepare the part model and define the complete setup for CNC programming.

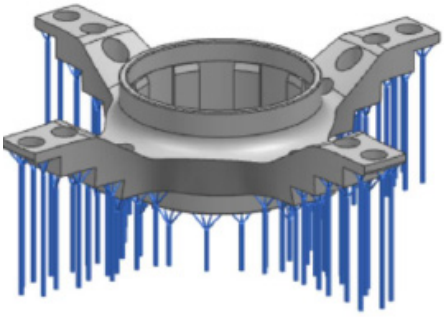
Support for convergent models

You can program convergent models that combine solid and faceted geometry. Now convergent operations are supported by guiding curves (3- and 5-axis milling), area mill, flow cut, Z-level, cavity mill, plunge mill, tube milling, tilt tool axis, and all additive operations.

Additive manufacturing

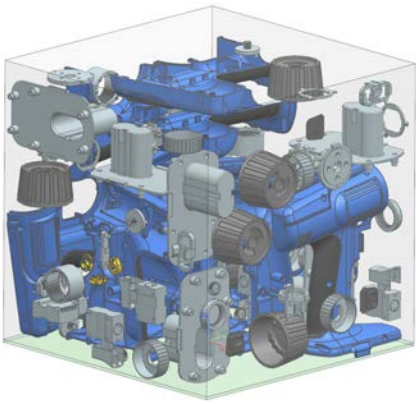
The additive manufacturing capabilities in NX facilitate the process from design model to printed part, with seamless integration that eliminates the need to convert and remodel parts between applications.

New support structure types and improved performance



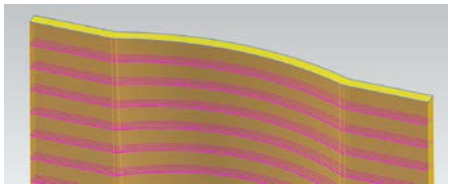
Different materials and printing processes require different support types. In addition to previously existing types, NX now supports tree structure types. Furthermore, users can now combine certain support structure types together. The capability is useful when you want to optimally support a single surface using different support types.

Improved build tray setup



Individual bodies in the same part now have their own individual support structure types and build strategies. This approach gives the user much more granular control over how the various parts and bodies in the build tray are supported and printed. Furthermore, adding parts to the build tray is much easier and more robust with the new add part command.

Multi-axis printing improvements



Multi-axis printing has been improved with several new deposition path types. You can now create smoother 3D output by following a guide surface. The enhancements also allow for stronger thin-walled parts to be constructed with improved start point control,resulting in even higher quality from the world-class output of multi-axis deposition.

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