



**SIEMENS**

*Ingenuity for life*



Siemens PLM Software

**NX for automotive**

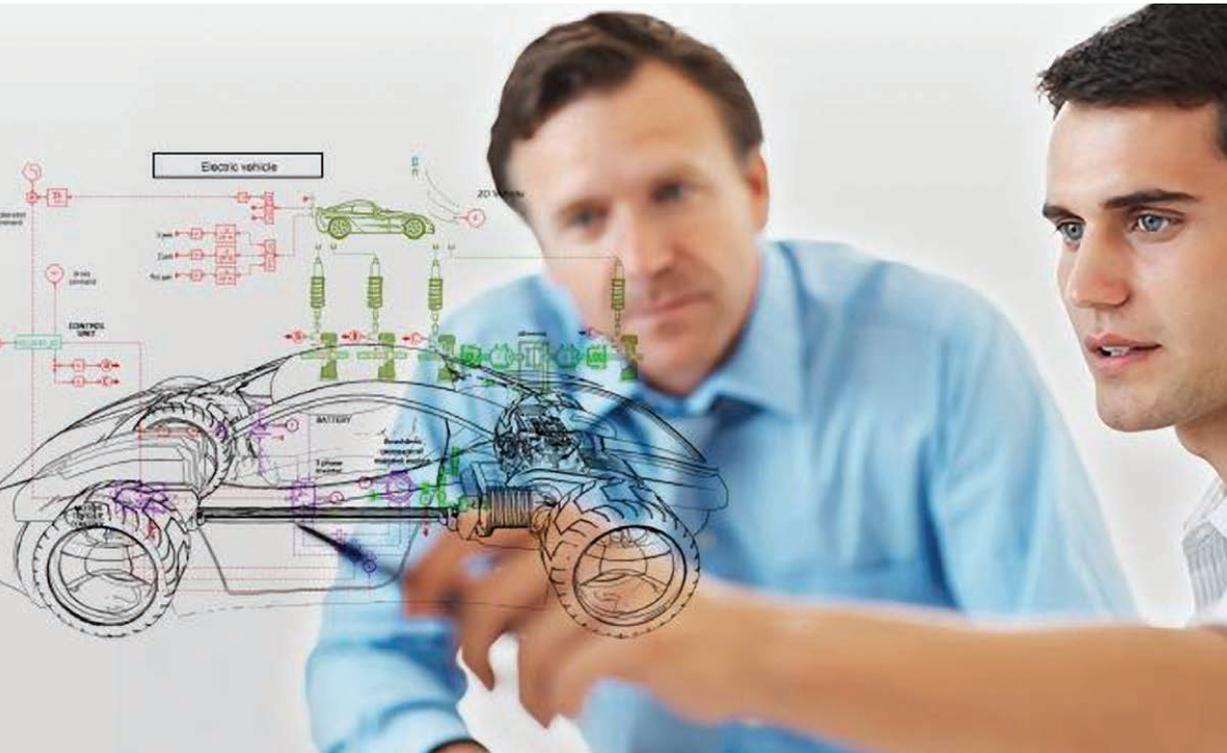
Driving fast and efficient design

[siemens.com/nx](https://www.siemens.com/nx)



*Faster, more efficient design can help automotive companies comply with changing regulatory standards and capitalize on growth in emerging markets.*

# Push your designs to new limits with speed and efficiency



In the automotive industry, achieving reduced emissions, improved fuel economy and reduced weight as well as leveraging alternative technologies requires faster and more efficient innovation. You can't afford to slow development with unproductive design methods and technology. NX™ software, the product development system from Siemens PLM Software, can help you design and deliver improved products, and respond quickly and insightfully to new market opportunities and challenges.

NX with Simcenter 3D is an advanced computer-aided design, engineering and manufacturing (CAD/CAE/CAM) solution that offers power, control and

performance to improve and accelerate the automotive design and manufacturing processes. The CAD tools in NX are tailored to meet the requirements of a broad automotive customer base, and include special-purpose capabilities for automotive engineering.

#### **Proven value for automotive design**

With proven value for automotive original equipment manufacturers (OEMs) and suppliers, NX delivers solutions to nearly every major automaker and many Tier 1 manufacturers. Thirty of the top 50 global automotive suppliers use NX for design.

*“Reduced the time from styling freeze to start of production from 20 months to 10.5 months.”*

*Nissan*

*“...by implementing NX, we have reduced die design costs and time, and have increased productivity.”*

*MUSCO Stamping*

*“More than 70 percent of our top- and bottom-line growth has come from new high-margin products developed using NX solutions.”*

*Vishwas Auto Engineers*

# Speed and efficiency throughout design

With NX you work in one unified environment, using the same model data in each stage of product development, from concept through manufacturing.

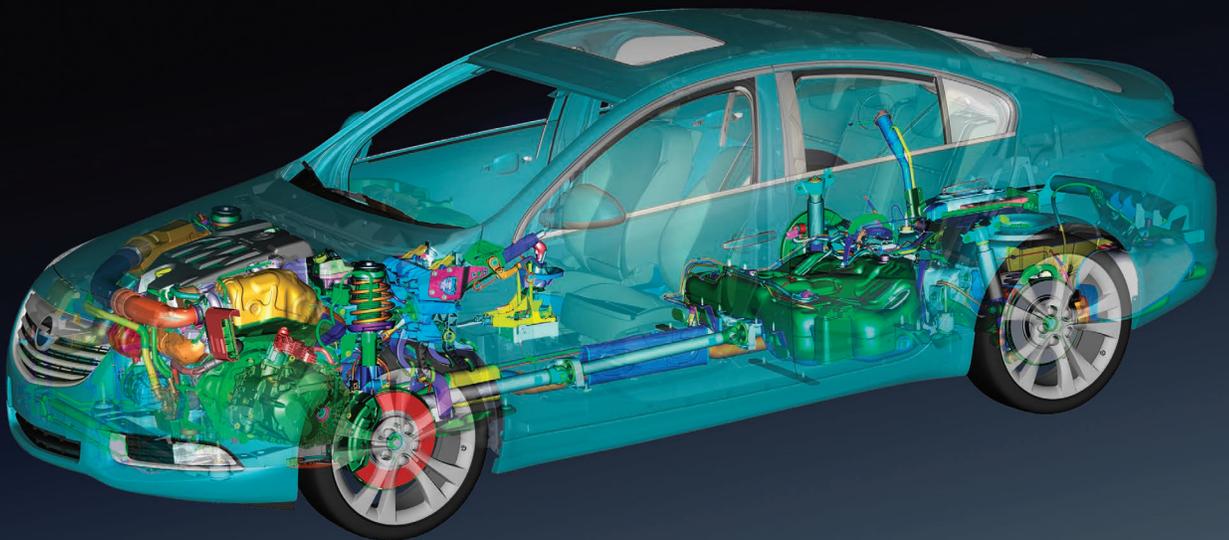
You can improve speed and efficiency throughout the entire automotive design process with NX. Integrated tools in a single system support all areas of automotive design:

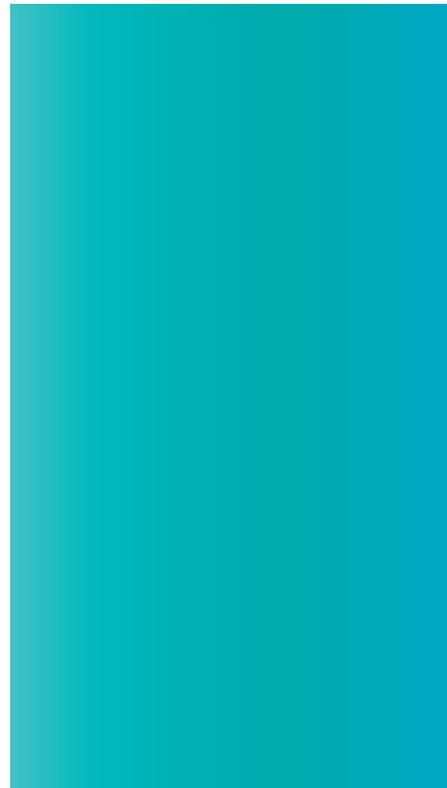
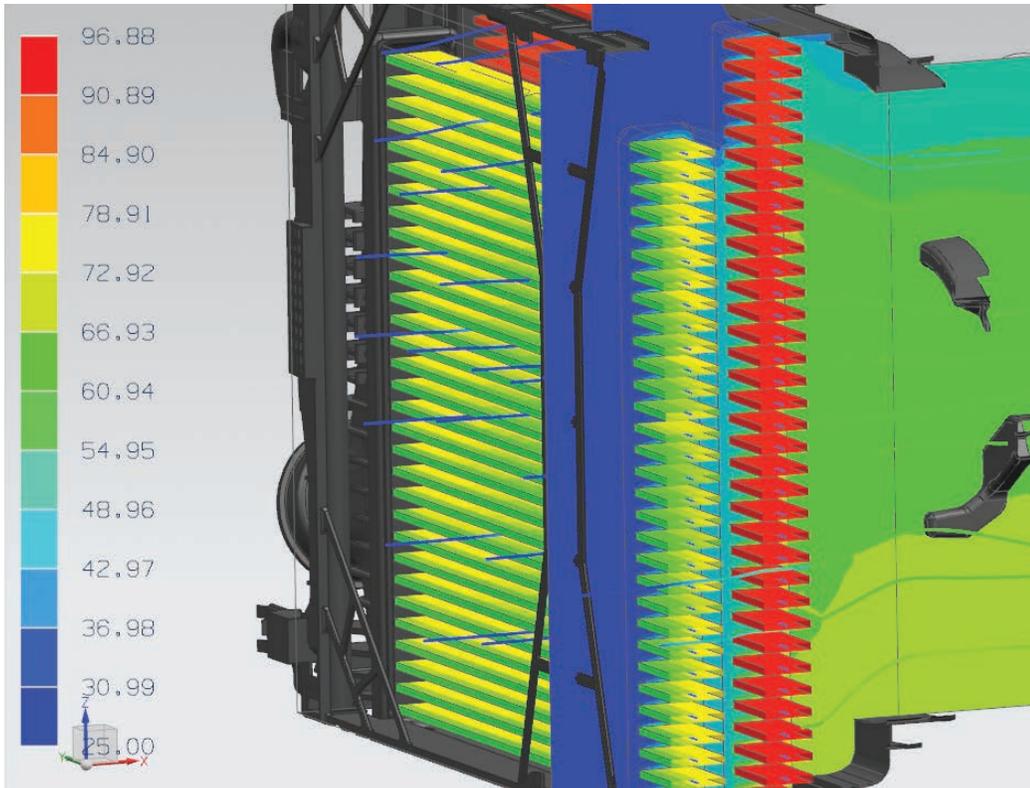
- Concept styling
- Vehicle packaging and interiors design
- Class A surfacing
- Powertrain
- Body design
- Chassis design
- Component and assembly design
- Routed systems design
- Drafting and documentation
- Tool and fixture design
- Design and manufacturing validation
- Digital mockup
- Data collaboration and migration

With NX you work in one unified environment, using the same model data in each stage of product development, from concept through manufacturing. Your teams can communicate and collaborate better with model-based processes to work more efficiently. You can work faster and more flexibly by eliminating delays and data conversions between departments and disparate systems.

## **Integrated simulation and manufacturing**

NX with Simcenter 3D is a complete product development solution, with industry-leading capabilities for simulation/CAE and manufacturing. When you design with NX, you create master models that are used directly in NX engineering and production. Because all applications are dynamically associated with the design, your teams can work concurrently and accelerate change as the design develops.





### Fast, efficient methods and technologies

For complex design challenges, you can rely on the broad and capable toolset of NX to get the job done quickly. You have the flexibility to choose among high-performance design techniques powered by innovative technologies. You can select from 2D and 3D tools, using curves, surfaces and solid geometry modeling in a single design, or work with mixed geometry representations, including nonuniform rational B-spline (NURBS) and faceted geometry. Parametric feature-based design, direct modeling with synchronous technology, subdivision modeling for freeform shapes, template-based design, modular design and assembly modeling are always available as needed by your design team, even when they are working with data from other CAD systems. Work directly with facet data using Convergent Modeling™ technology and easily prepare models for additive manufacturing.

### Design faster by using your unique knowledge and expertise

NX can be used to accelerate design by helping you leverage your unique knowledge, intellectual property, part models, product and process expertise and best practices. Many tools are available to capture and re-use knowledge instead of reinventing it. With an extensive library of knowledge for re-use at your fingertips, including designs, standard parts, design features and product templates, you can quickly locate what you need and use it again. Knowledge-driven automation provides an open environment that includes templates, programming, customization and knowledge-based engineering tools that you can use to extend and tailor NX solution capabilities to your specific needs.

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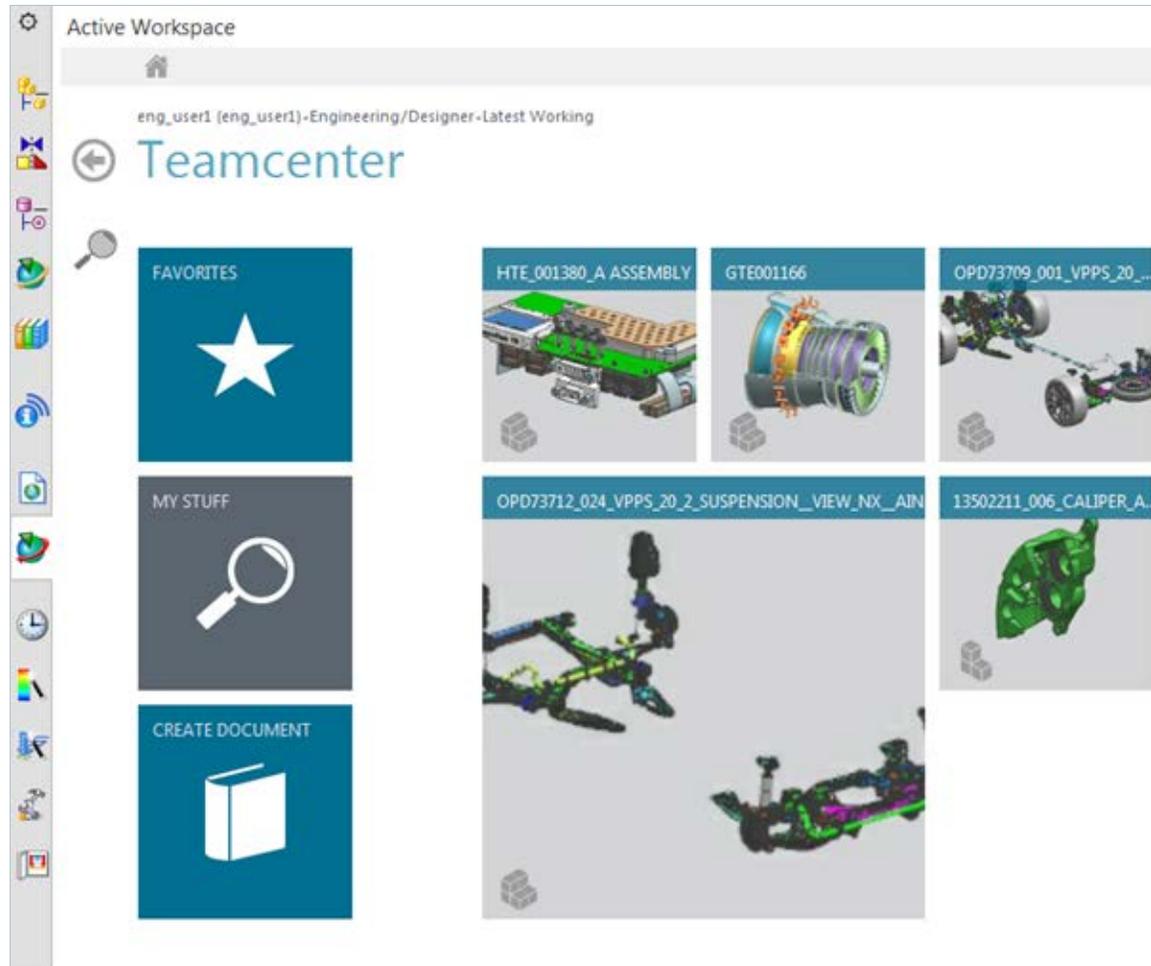
# Faster design with product lifecycle management

With NX, you can use visual tools to gather data, organize information and present it in the context of the 3D product model to better inform and accelerate decision making.

Your company's agility and productivity can be improved with robust organization and management of your product information and design processes. When you design with NX, you can use Teamcenter® software and its leading product lifecycle management (PLM) tools to manage engineering data and processes, materials and requirements. These capabilities are seamlessly integrated within NX; designers can use them quickly and efficiently in a transparent manner while developing your product.

## Speed, efficiency through smarter decisions

Automotive design entails hundreds of decisions that rely on up-to-date information. With NX, you can use visual tools to gather data, organize information and present it in the context of the 3D product model to better inform and accelerate decision making. These visual analytics help you track work-in-process, identify and resolve issues, assess change impacts, monitor costs, manage risk and check for compliance with standards and requirements.



### Collaborate with speed and efficiency

With NX, you can easily communicate and collaborate with other departments, customers, suppliers and partners – even if they are using other CAD systems or no CAD system at all. For collaborative design, NX makes extensive use of the JT™ data format, a CAD-neutral exchange standard for design data that is used widely in the automotive industry. Partners can use this format to integrate other CAD systems with NX for visualization, collaboration, data sharing, assembly mockup and design-in-context applications.

### Move to NX with speed and efficiency

When you move to NX, you can use robust content migration tools, services and training to maximize the return-on-investment (ROI) in legacy product data. Whether you adopt

NX to align with partners and suppliers or improve your product development capability, Siemens PLM Software's content migration reduces the time, effort and risk required to re-use information from other systems. Moving to NX often requires less effort and expense than moving to the next version of your current CAD system.



# Concept design

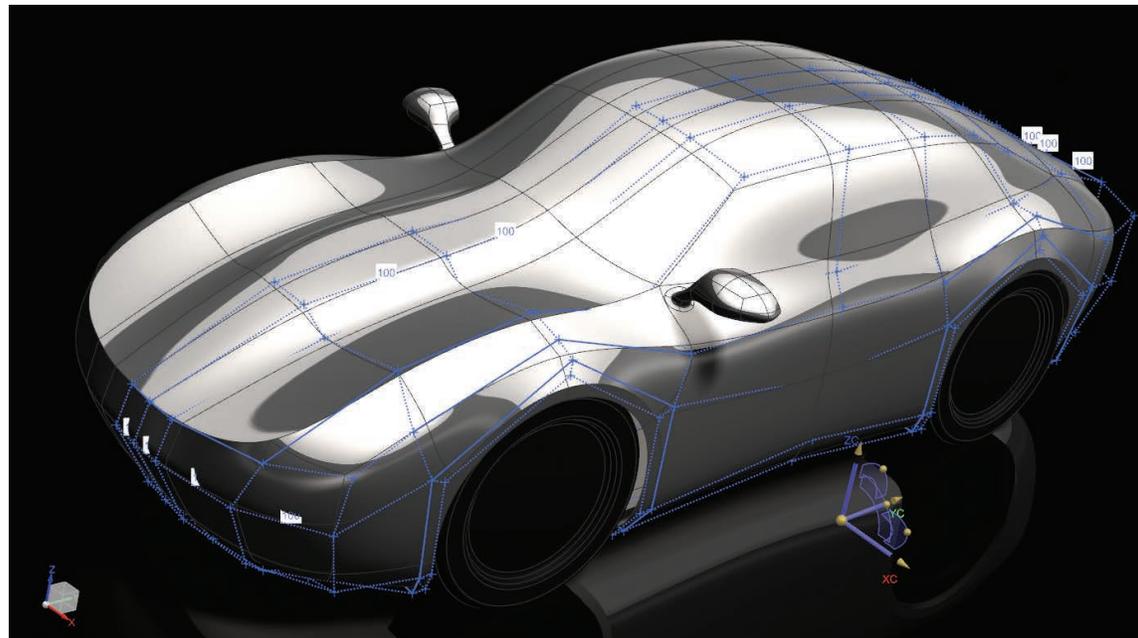
The concept design tools in NX give you the power and freedom to push your creativity, all in one system.

You can quickly capture and refine design concepts – and get them into production faster – with the integrated tools in NX. Your designers have the power and flexibility to explore as many design alternatives as possible so they can quickly and easily change direction and validate that concepts meet design requirements. Initial concepts can be captured digitally in 2D or 3D – from images, physical models, model-based sketching and direct sketching to surface and solid modeling or subdivision sculpting.

For exterior and interior Class A surfaces, NX provides pole manipulation and surface alignment tools while giving you full control and real-time analysis of surface quality. For shape manipulation, you can select freely from global shaping, 3D synchronous modeling or feature-based parametric modeling. To help ensure surface quality and continuity and optimize visual aesthetics, NX includes a broad range of analysis and rendering tools.

Scanned 3D data is used extensively in styling and other areas of automotive design, but it requires extensive manual rework to make it usable. Using Convergent Modeling in NX reduces this rework by bringing scanned data in as facets, so there's no need to map surfaces, create solids, or do any other manual shape creation. You can scan your data and immediately begin building supports for 3D printing, creating molds based on the shape, including it in an assembly, analyzing it, or performing any other operation that you would do with CAD data.

The concept design tools in NX give you the power and freedom to push your creativity, all in one system. The design concepts you develop with NX are fully manufacturable digital models – you can use concept geometry directly in other development departments for detailed engineering, simulation, validation, tooling and manufacturing.



# Accelerate vehicle packaging and interior design

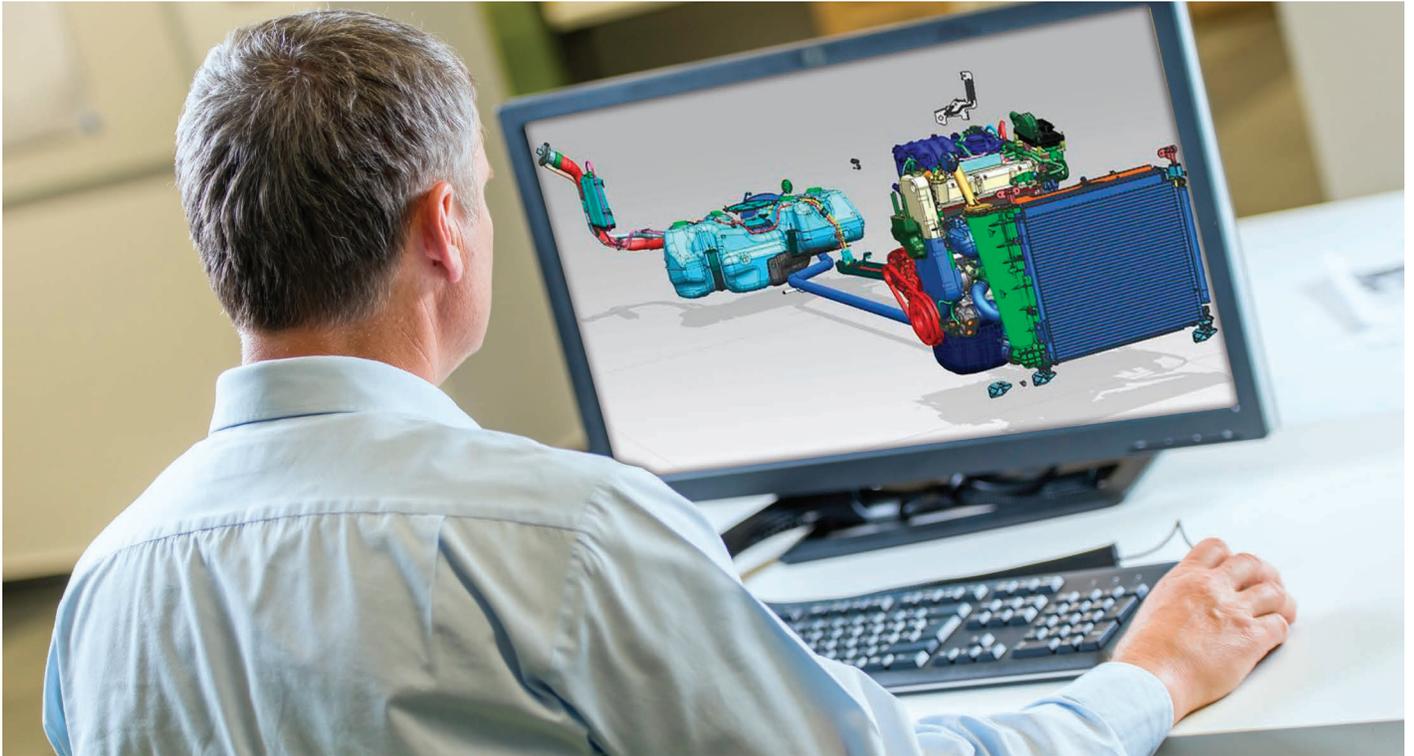
For automotive mechanical and occupancy packaging, NX offers intelligent special-purpose tools that use industry standards and process knowledge to automate packaging tasks. These tools help certify designs for compliance with industry and regulatory standards, offering step-by-step assistance and automated checking. Occupancy packaging and safety compliance capabilities include tools for pedestrian protection, seat placement and travel, seat belt anchorage, controls reach, as well as direct and mirror visibility certification.

NX can be integrated with the Mastertrim™ portfolio to support the entire seat trim and interiors panel development process. This specialized solution for designing and manufacturing seat trim covers and interior

components ensures the product is cost effective and efficiently manufactured by automatically generating all needed documentation and drawings. The addition of this technology complements existing processes that are based on NX, enabling the sharing of design detail, drastically reducing the need for physical prototyping.



# Powertrain



With NX, your powertrain teams can quickly create design studies to evaluate powertrains using digital mockups of the vehicle compartment, subsystems and components.

NX tools can help you achieve key powertrain design objectives for performance, economy, durability and responsiveness. Comprehensive component and assembly modeling in NX accelerates design and increases productivity. As you would expect, NX provides parametric sketch-driven solid modeling features such as extrude and revolve, as well as shape-modifying tools such as form drafting and blending. These tools are integrated into the same design environment with high-end surface and solid creation and manipulation features such as sweep, trim/extend and patching. You can boost speed and efficiency significantly by using product templates that automate complex design processes with embedded best-practice knowledge. Interpart

associativity of geometry and expression and module-based organization of parts allows you to design the most complex cast components and subsystems.

With NX, your powertrain teams can quickly create design studies to evaluate powertrains using digital mockups of the vehicle compartment, subsystems and components. NX gives you all of the modeling and design tools required to maintain and apply engine and transmission configurations in the vehicle.

# Body design

Fast and efficient design can help you achieve critical body design objectives such as distinctive styling, lower weight and structural safety. Using a systems-driven approach, you can readily trace and validate requirements, divide design tasks into manageable subsystems and communicate across domains and throughout the value chain.

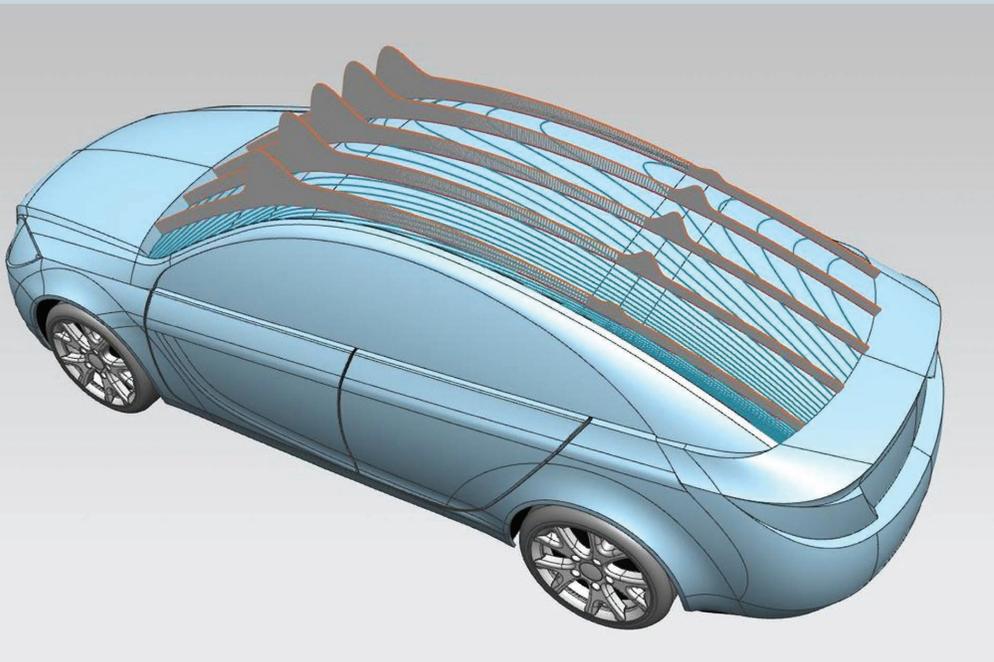
For styled body surfaces, your design team can use powerful curve, surface and freeform modeling tools and reverse engineering techniques to more quickly develop and refine Class A surfaces. NX analysis and rendering tools help ensure surface quality, continuity and aesthetics.

Photorealistic imaging helps you make styling decisions early on when those decisions don't cost much to make. The Lightworks Iray+ rendering engine is fully integrated into NX Ray Traced Studio and boasts a large library of

materials and scenes, and it is multi-threaded to take advantage of modern microprocessors.

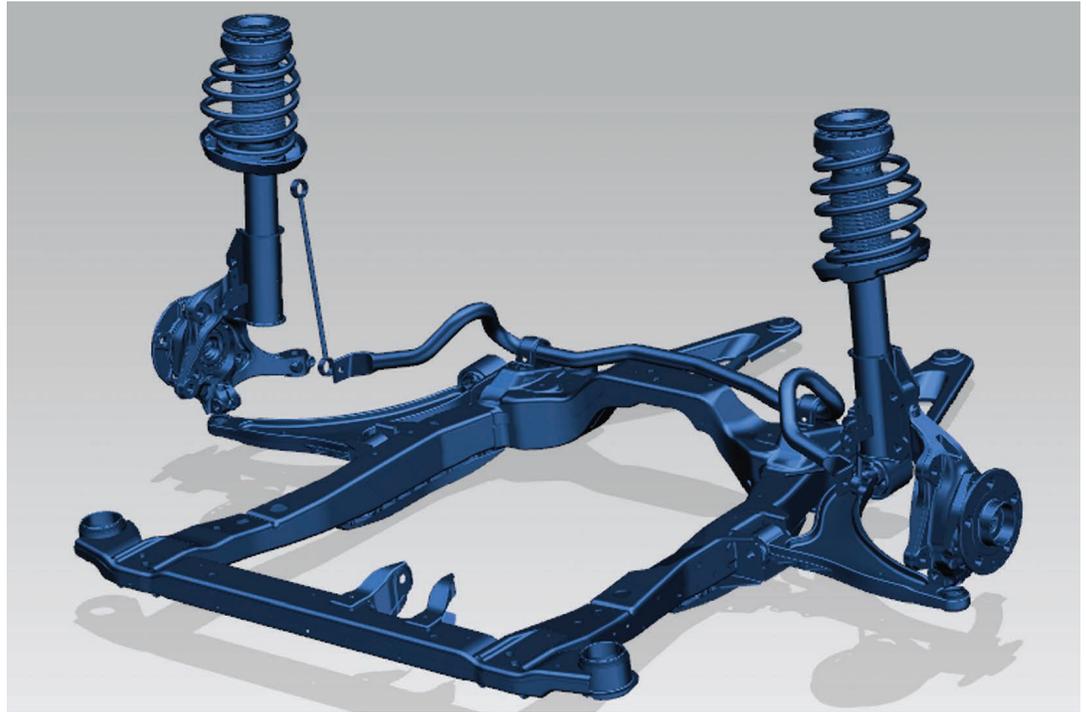
NX helps you accelerate and simplify body-in-white (BIW) design with specialized tools that are based on industry best practices. These reduce design time and enable fast evaluation and validation of alternatives by automating body panel design, side door openings, hinge locations, glass drop and other body design tasks. Modular design in NX enables multiple designers to concurrently develop details of body components while NX WAVE™ feature functionality, which is an interpart modeling technology, provides you with the power and control to create advanced BIW templates. You can optimize body designs for manufacturing with NX functions for weld definition and validation, dimensional engineering and simulation.

When considering alternative materials, such as composites, for chassis and body panel design, you can take advantage of NX integration with the Fibersim™ portfolio of software for composites engineering. The Fibersim portfolio addresses the unique needs of collaborative composite product development. These capabilities facilitate the authoring of composite design data to create fully optimized 3D product definitions and seamlessly export documentation and manufacturing data to production systems. The result is an efficient process for delivering optimized, high-volume composite products.



NX analysis and rendering tools help ensure surface quality, continuity and aesthetics.

# Component and assembly design



NX delivers team-oriented tools for assembly designs that can accommodate many parts, people and locations.

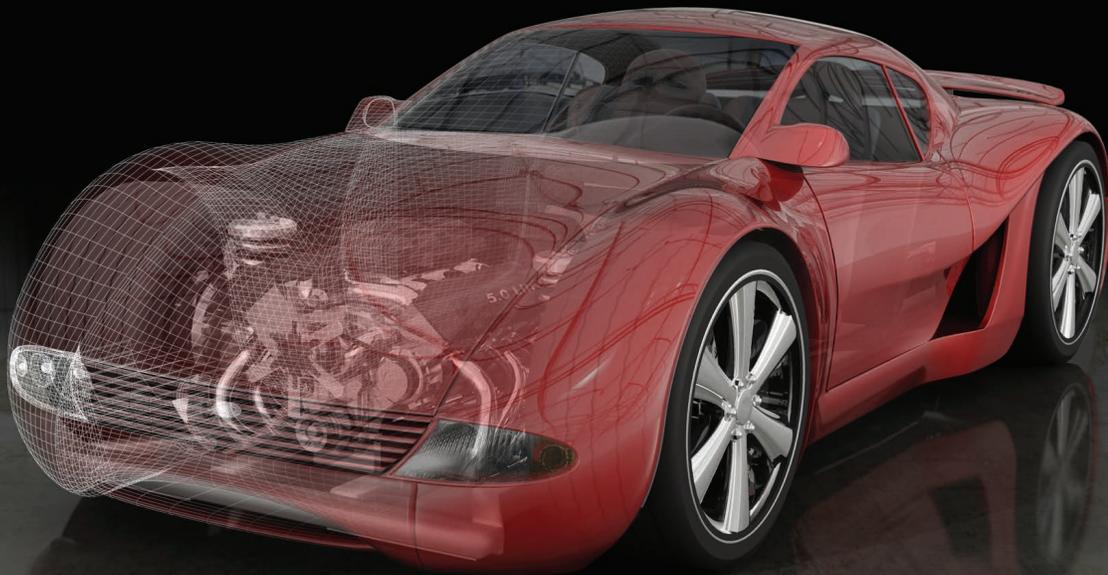
NX includes a comprehensive modeling toolkit with the power and flexibility to improve productivity in component and assembly design. Your designers can select the most appropriate tools and methods for every task, using any combination of 2D and 3D, solid modeling, curve and surface design, parametric feature-based modeling, template-based design, modular design, subdivision modeling and direct modeling functions. For even the most complex designs, NX has the tools to get the job done.

All of the design functions in NX are available through a user interface (UI) that is consistent across all applications and is adaptable to your designers' roles, workflows and skill sets. Using

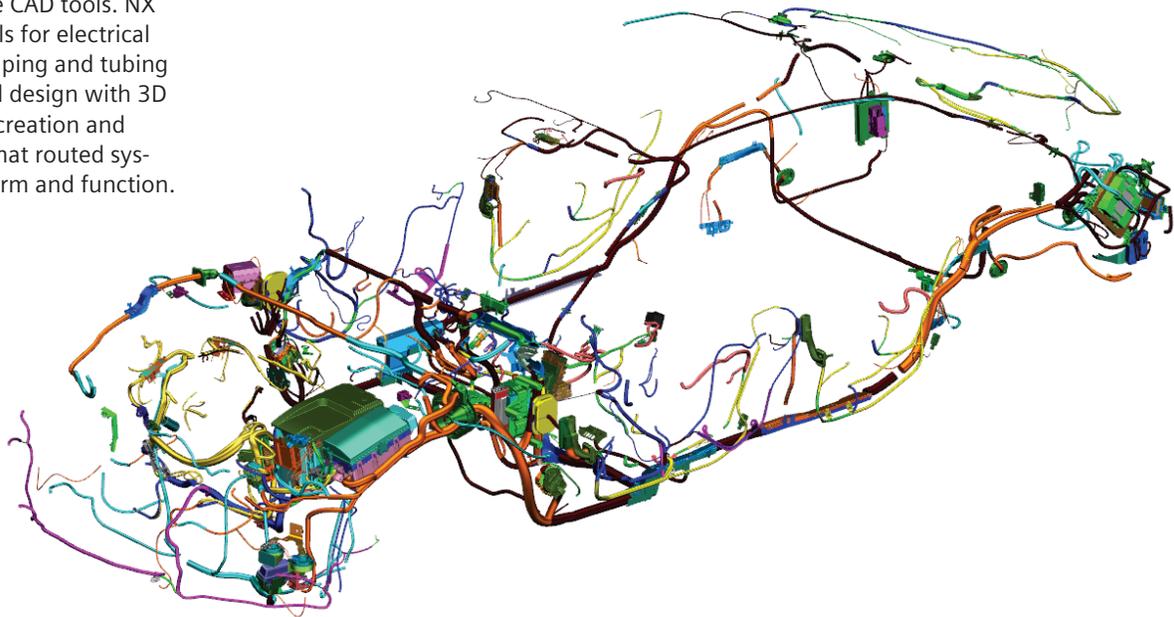
NX is fast, intuitive and efficient, and provides rich visual feedback, real-time diagnostics and in-context validation that helps steer you to successful design solutions.

NX delivers team-oriented tools for assembly designs that can accommodate many parts, people and locations. Optimized for the largest and most complex products, NX assembly modeling enables individual designers to work in the context of the full assembly, with exceptional change control and full multi-CAD digital mockup.

# Routed systems design



With specialized tools for routed systems design, you can develop electrical and hydraulic systems more quickly and easily than with general-purpose CAD tools. NX offers both 2D and 3D tools for electrical cabling, wire harnesses, piping and tubing design. These unite logical design with 3D assembly modeling, path creation and rules checking to ensure that routed systems are accurate in fit, form and function.



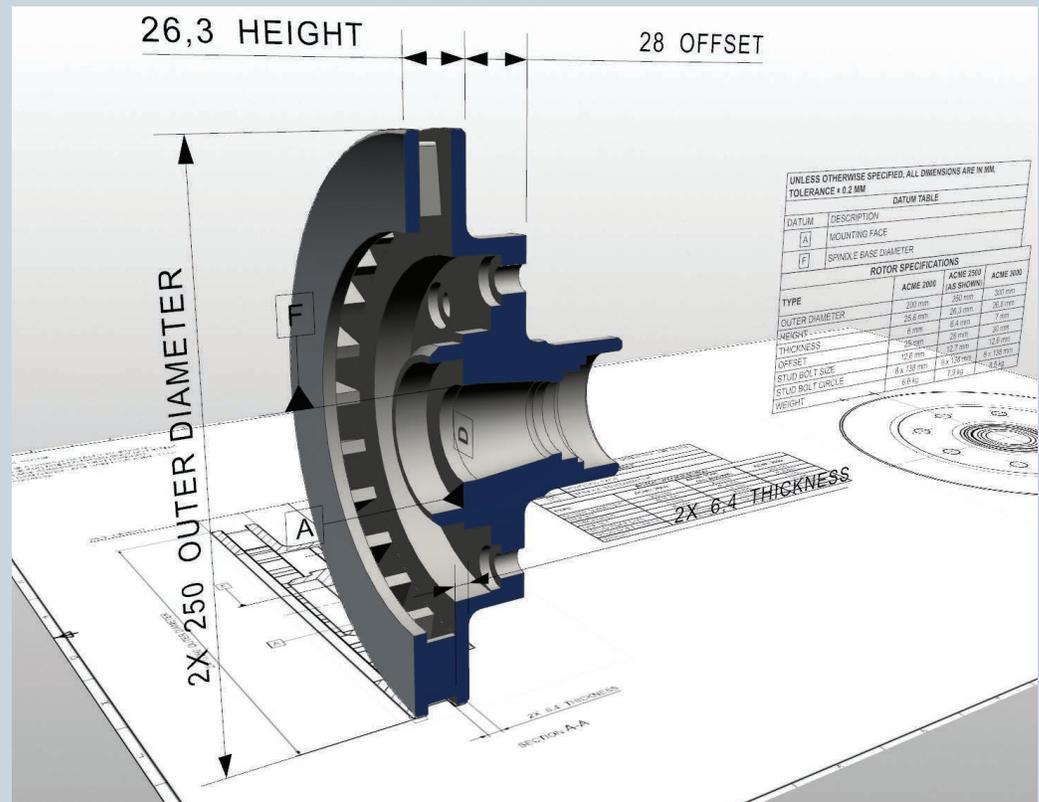
# Drafting and documentation

With NX, you can enhance communication of design and manufacturing intent with 3D annotations directly on the 3D product models.

NX helps improve communication throughout automotive design and development with efficient drafting and documentation. Your team can use a comprehensive suite of tools for engineering drawing creation, with power and productivity for large and complex designs.

Working from the master product definition, you can quickly create drawings of components and assemblies using drawing templates. View creation, dimensioning and detailing in NX comply with industry and international drafting standards to accelerate creation of compliant drawings. Innovative lightweight drawing views deliver superior performance for large assembly drawings.

With NX, you can use model-based definition (MBD) to enhance communication of design and manufacturing intent with 3D annotations directly on the 3D product models. This product and manufacturing information (PMI) – including geometric dimensioning and tolerancing (GD&T), text annotations, surface finish and material specifications – can be re-used in drawings, tolerance stackup validations, manufacturing, inspections of coordinate-measuring machines (CMM) and other applications. It's easy to take advantage of these features by automatically converting drawings to PMI.



# Tool and fixture design

NX delivers expert guidance through all the stages of design with automated workflows based on industry-best practices.



You can help ensure an easy transition to manufacturing with NX tooling and fixture design. Using NX streamlines the entire tool development process, including part design, tool assembly layout and detailed tooling design and validation. By using the productive technologies of NX, step-by-step guidance and associativity with part designs, you can work quickly and efficiently with even the most challenging tooling and fixture designs.

Because your tool designs are dynamically linked to part models, you can easily adapt to model changes and update tooling and fixture designs faster. Validation, analysis and documentation are available to tool designers to verify functional performance and prepare for manufacturing.

For specialized tooling such as molds, progressive dies and automotive stamping dies, NX delivers expert guidance through all the stages of design, with automated workflows based on industry-best practices. By automating tedious tool design tasks and streamlining the most complex processes, NX helps you develop high-quality tools and respond quickly to design revisions.

### **About Siemens PLM Software**

Siemens PLM Software, a business unit of the Siemens Digital Factory Division, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, Siemens PLM Software works with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood. For more information on Siemens PLM Software products and services, visit [www.siemens.com/plm](http://www.siemens.com/plm).

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