High-performance tools in NX™ deliver power, flexibility and control to improve productivity in the design process.
Manufacturing companies are driven by increasing pressure to develop innovative products in shorter time frames, while maintaining high levels of quality. Even with mature, capable 3D CAD technology, many companies have failed to significantly reduce waste or improve product quality in design. The benefits of lower costs and shorter cycle times remain elusive. This poses new challenges for many discrete manufacturers and requires radical re-thinking of processes to gain a competitive advantage.

Transformation of product development begins with the design process. Design fuels the entire development effort. Between the initial concept and the physically realized product, designers create and refine product models that drive the whole process — from simulation and analysis through tooling design and manufacturing.

Reducing waste in design
CAD modeling technology alone does not address significant sources of waste in the design process: the time spent searching for information or waiting for test results, resources spent developing unnecessary documents and prototypes, effort wasted designing products or features that customers don’t need, money spent correcting manufacturability errors or time spent re-inventing the wheel. Companies seeking leaner development processes need design technology that goes far beyond solid modeling to aggressively support their business transformation initiatives.

Designing in quality
Point solutions for design also fall short in the effort to improve product quality. Quality must be “designed in” rather than “inspected in” to yield business benefits of lower cost and faster cycle times. Design teams need tools that help guide the design process toward products that optimally meet customer needs and fulfill performance and manufacturing requirements. Six Sigma and other business process initiatives aimed at quality improvement limit their results with a focus on manufacturing only.
Maximum productivity with next-generation technology

**NX: Transforming the design process**
NX from UGS delivers next-generation design that helps companies transform the product development process. Its leading-edge design tools work in the context of the total development effort, fully integrating design with the other disciplines that bring products to market in a unified, managed environment.

**Productivity and performance**
Much more than conventional CAD, NX enhances mechanical design with unique technologies that help companies improve process efficiency and eliminate wasted time, effort and resources. The NX interactive environment streamlines everyday design work by structuring tools in task-oriented workflow sequences that improve individual designer productivity. With functionally complete, high-performance modeling, NX gives design teams the power and flexibility to handle designs of virtually any size or complexity.

**Knowledge capture and re-use**
NX automates and simplifies design by leveraging the product and process knowledge that companies have gained from experience and from industry best practices. It includes tools that designers can use to capture knowledge in the form of high-level product structures, templates, frequently used design features, engineering rules and formulas. NX continuously applies this knowledge to validate the design and guide the process to yield higher quality products that directly fulfill customer and engineering requirements.

**Design for full-cycle efficiency**
With NX design is the cornerstone of the total product development effort. All development disciplines use the same synchronized product definition, with full associativity that automatically communicates design updates throughout the entire process. A unified and fully managed technology platform for all applications ensures that all participants are working with accurate, up-to-date design information and are focused on a common objective.

**A comprehensive solution for design**
NX Design includes advanced-capability tools for:
- Component design
- Assembly design
- Large assembly management
- Drafting and documentation
- Sheet metal design
- Routed systems design
- Human modeling
- Design validation
- Design optimization
- Knowledge-driven design automation
- Design process management
- Design-through-manufacturing integration

NX Design is a leading-edge solution for creating precise, complete digital product definitions of any size or complexity. High-performance design tools deliver the productivity, flexibility, control and design-through-manufacturing integration that companies need to reduce waste and build in quality.
A world-class experience
NX provides an interactive environment that boosts designers’ productivity and efficiency. A comfortable and intuitive software interface includes smooth color-shaded background, high-quality, scalable icons and toolbars and information windows arranged to keep the focus on the design problem rather than the software. The entire interface can be tailored to the preferences of the designer – from custom toolbars for frequently used functions to the layout of commands and navigation windows. Mouse travel and menu picks for most design modeling operations have been cut in half with context-sensitive, right-button command options and an innovative radial pop-up menu that presents commonly used commands onscreen with a brief mouse movement. In this environment, users can significantly reduce design times and maintain productivity and comfort during extended work sessions.

Flexible modeling approaches
NX delivers the most powerful and flexible solution in the industry, providing a hybrid modeling environment that seamlessly combines solid and surface modeling. All NX modeling tools are built on UGS’ Parasolid® geometry modeling kernel, the world’s most powerful, robust and widely used modeling foundation.

NX’s hybrid modeling includes high-performance tools for feature-based parametric design, as well as traditional, explicit modeling and unique direct modeling that works with any geometric model. There are always multiple methods available for defining a product’s geometric form.

Designers can use direct modeling tools in NX that are unavailable in other systems. NX direct modeling modifies design geometry regardless of the source or the techniques used to create it – whether it is native NX parametric, non-parametric or imported from other CAD systems. By working directly with any geometry, there is no need to rebuild or convert. With NX direct modeling tools, designers can use parametric features without the limitations of a feature history.
High-performance modeling for product design
With NX, designers are using a solution that sets the world standard for mechanical design power and flexibility. With a versatile combination of modeling tools, designers always get the job done without limitations. As a designer, you want to ensure that you can focus on the task on hand, rather than on the tool itself. Design functions are structured so that designers can grasp and easily deploy them. Interactively placing features, dragging them into the desired shape, re-using sketches for the other features — the entire approach to CAD operation embodies the idea of keeping it simple.

The difference is in the details
The power, range and efficiency of NX Design is most evident when adding details that complete designs after the basic shapes are modeled — where lesser systems waste time and manpower. NX’s filleting capabilities allow the user to choose the shape that is desired with the control that is needed to fillet the most complex shape. And how often did you attempt to shell the design that bears the next big innovation for your company. NX is solving this traditional headache with a new approach, allowing you to offset the most demanding shapes.

Applying tools to the task
Conventional CAD systems deliver a set of tools and leave it up to the designer to figure out how to apply them. In contrast, NX logically structures commands into workflows aimed at accomplishing design tasks. Designers need only to follow the steps in the workflow and NX takes care of the details automatically. This approach puts designers in full control of the final shape.

Productivity through change
Change is inevitable at any stage of the design and a fundamental part of the process. Overall design productivity requires a modeling system that can accommodate any kind of change, at any time, no matter how complex the design. NX is leading the way with stability and robustness that give designers confidence that even the most radical changes — in geometry or modeling approach — will update the digital model and all of its downstream deliverables as well.

PROVEN RESULTS
“Before we had NX, we were inhibited in the ways in which we could build and modify our geometry, which greatly cramped our style. With NX, our models are much more flexible and invariably meet the needs of customers much better.”

John Clauson
Indak Manufacturing

NX Design includes edge blending with multiple options to quickly and easily model surface details.

NX gives designers a powerful combination of modeling techniques — parametric, explicit and direct modeling.
With a proven capability for designing massive assemblies in automotive, aerospace, machinery and other industries, NX rightly deserves its reputation for the best assembly design tools available. Extending the technological limits for designing products with tens of thousands of components, NX has the modeling performance and assembly management tools that have made complex assembly design a practical reality.

**Top-down, system-based design**

NX supports collaborative, top-down engineering and system-level design techniques that structure complex assembly design projects into physically and functionally self-contained subsystems or modules. These subsystems have well-defined interfaces that allow them to “plug and play” with a variety of other subsystems. System-based modeling offers unprecedented control for developing complex products, enabling you to manage product complexity, capture high-level product criteria, quickly evaluate design alternatives and maximize re-use of subsystem designs.

Unique WAVE technology in NX uses high-level structured and parametric product layouts, which can be simply driven and controlled by key engineering criteria. These criteria are used to control the position and geometry of the product assembly model and its components. More than associative interpart modeling in conventional CAD systems, WAVE provides a product definition template that captures the system-level design parameters and establishes interfaces between systems. Changes in configuration are simply and easily managed with a host of tools to ensure that every step is clear and obvious. At the component level, it ensures that interacting parts continue to fit and function together properly.

**NX has unparalleled performance for assemblies of any size and complexity. Assembly explosion and animation tools communicate assembly sequencing.**

**NX supports system-based modeling with WAVE technology. High-level product templates enable parametric modeling techniques for complex assemblies.**
With NX, designers can easily navigate large assemblies and select an appropriate environment for detailed work on subassemblies or components. NX has unrivaled capabilities for component simplification, enabling many thousands of components to be loaded and displayed in just seconds. Lightweight representations and enveloping techniques provide the ability to load as much of the product as required to modify and evaluate parts properly. Designers can set the context of a particular task with filtering tools that select relevant components using criteria such as location and function.

**Designing in context**

**Assembly design validation**

NX Design includes validation tools that identify and solve assembly design and process problems in the early stages of development, without physical prototyping. Physical properties analysis helps designers manage product weight and cost. Interactive clearance checking and interference analysis help detect and eliminate fit problems. Designers can interactively simulate assembly motion to check and optimize the functions of moving components.

In addition, designers can record and play back assembly and maintenance motion sequences to eliminate process problems before they reach the shop floor or field service. Simple and accessible to designers, these validation tools can be used to quickly validate changes as the product develops.

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**PROVEN RESULTS**

“NX is essential because it lets us collapse development times while ensuring design integrity, both of which keep costs down. Our entire car, including the engine, bodywork and each nut and bolt, is represented in 3D in NX.”

Geoffrey Willis
Technical Director
B.A.R.
NX is an industry-proven system that provides world-class capabilities for all aspects of the design process. NX tools have a breadth of capability and depth of function that are the direct result of decades of experience in providing practical and productive mechanical design solutions.

**Next-generation drafting and documentation**

Creating detailed drawings can be a tedious, time-consuming process. NX streamlines and simplifies the production of engineering drawings with drag-and-drop drawing templates, simplified view creation with interactive preview and multiple options for model display representation. NX drafting tools support all major national and international standards for engineering drawings.

UGS has led the development of standards for 3D model annotation, such as the ASME Y14.41 and ISO TC10. As a result, NX includes advanced tools for creating a 3D product definition that includes reference geometry, driving and annotation dimensions, GD&T symbols, tolerances, finishes and other product and manufacturing information directly on the model. With these tools NX promotes drawingless design processes using an enriched product definition embodied in the digital solid model.

**Process-specific sheet metal design**

NX includes intelligent tools for designing and managing sheet metal components based on knowledge of material properties and fabrication processes. This includes a suite of tailored modeling features and utilities that incorporate material and process specifications. Designers can develop components using commands that reflect fabrication steps — including bends, flanges, cutouts and other formable features. NX automatically applies defaults and standard values to create sheet metal parts that embody industry best practices or company standards. For example, bend radii values may be fixed within a certain range for a given material thickness based on known manufacturing quality issues.

Folded and unfolded views of sheet metal components can be used in the 3D design and in downstream 2D documentation and manufacturing. Unlike other sheet metal design tools, NX enables full interaction of other parametric modeling operations with sheet metal features within the context of a single part.

For straight-break sheet metal components, NX models part features with streamlined commands that emulate forming and fabrication operations.

With NX, designers can enhance 3D geometric modes with product and manufacturing information, including reference geometry, dimensions, GD&T symbols, tolerances and finishes. This part was modeled from a figure within the ASME Y14.41 standard for digital product definition data.
With accurate human models, NX helps designers optimize ergonomics early in the design process, before costly physical prototypes are developed.

**Human modeling for ergonomic design**

With NX, designers can perform ergonomic studies early in the design process, using accurate human models directly on the digital model to evaluate human interaction. This unique capability is based on UGS’ industry-leading Jack technology, which enables the use of biomechanically accurate digital humans of various sizes throughout all stages of the product design process. With human modeling, designers can improve product quality in terms of reachability, vision zones and posture. Jack and his female counterpart Jill are based on anthropometric databases, kinematically accurate and fully mobile through direct on-screen interaction, while adhering to physiological ranges of motion. Postures and poses can be stored separately, giving easy access to the most commonly used human configurations.

“*My goal is to give the designer solid, reliable and predictable tools. The excellent stability of NX allows the designers to gain trust in the platform and concentrate on design instead of debugging or working around technical issues.*”

Rick Freeman
CAD and IT manager
Sunbeam

**PROVEN RESULTS**

NX delivers special-purpose modeling tools for designing routed electrical and mechanical systems.

With accurate human models, NX helps designers optimize ergonomics early in the design process, before costly physical prototypes are developed.
Knowledge-driven automation for design

NX is built on an advanced knowledge architecture that provides unprecedented capabilities for infusing the design process with knowledge from lessons learned, company best practices or industry know-how.

Applying knowledge in design
Many systems use a parametric approach to define and edit product models with design intent. NX takes design intent to a new level with DesignLogic™, which drives the design by knowledge in the form of functions and formulas, associative measurements and references. Designers can quickly and easily apply engineering rules “on the fly” during the design, with direct access to the embedded knowledge engine in NX that guides the design as it develops. The result is designed-in quality and product models that directly fulfill the engineering intent.

DesignLogic
DesignLogic is a new technology that gives designers easy access to capturing engineering knowledge as part of the digital model. It is a quick way of making traditional parametric designs more intelligent, to contain higher levels of product development decision information. Built upon the Knowledge Fusion rules engine, NX DesignLogic takes the digital design to a completely new level. Ease of use is key: the user can decide at definition time or later in the design process how aspects of the design should be controlled. Whether the design requires simple relationships among features and parameters, a more sophisticated mechanical function, a formula derived from a spreadsheet or a self-explanatory mathematical expression, DesignLogic helps the user capture the intent quickly and easily. All calculations within the model are continuously evaluated based on the geometric configuration of the design.

Corporate handbooks with key product calculations or company best practices can be made available online throughout the entire enterprise, allowing for quick and easy access by anyone involved in the digital product development process.

PROVEN RESULTS

“We selected NX Knowledge Fusion because it has great potential. I think the tight integration between NX CAD and the rule engine is something new and it’s extremely powerful. It can actually revolutionize the way we do engineering using computer-aided design tools.”
Dr. Ola Isaksson
Company Specialist
Engineering Design
Volvo Aero

With NX DesignLogic, designers can readily capture engineering knowledge and design intent to control the design.
Validation

NX supports “right first time” design with knowledge-driven solutions that automatically check designs and data for adherence to engineering criteria, company and customer standards, and downstream process requirements. With these tools companies can quickly build checking and quality processes directly into designs, attaching the checks as model features that persistently monitor the design as it develops. These unique validation applications use both off-the-shelf and company-standard rules to support corporate quality initiatives and can be used to improve the quality of data throughout the customer and supplier chain.

An off-the-shelf molded part validation tool automatically evaluates plastic part manufacturability, identifying undercuts and appropriate draft angles in a color-coded fashion. The component wall thickness can be automatically monitored to ensure that the product complies with the initial design intent.

Design optimization

Companies using NX can take advantage of a unique tool that automates the process of design optimization. The NX Optimization Wizard identifies critical design parameters that affect key product characteristics and performance, then optimizes their values based on real-world engineering and product constraints. This powerful yet easy-to-use design exploration solution helps solve complex engineering problems faster and with more confidence.

Knowledge Fusion: joining knowledge-based engineering with CAD

NX Knowledge Fusion is the unique fusion of knowledge-based engineering (KBE) and mechanical design. With Knowledge Fusion, manufacturers can readily capture product and engineering knowledge and use it in value-added automation that enhances the productivity of the entire product development process.

Knowledge Fusion goes much further than traditional CAD macros or engineering expressions. It offers the advanced capability and expressiveness of KBE programming without its complexities. With Knowledge Fusion, development of advanced automation can begin directly within the design session. As designers develop the digital model, they can use Knowledge Fusion to capture a sequence of interactive operations, while adding engineering intelligence, database queries and process specifications to create custom programmed functions that can be re-used by the entire development team. This approach brings knowledge capture out of specialized programming organizations to the engineering professional’s desktop.

NX improves quality with validation tools that continuously check design data integrity and monitor engineering criteria in real time.

NX Knowledge Fusion joins knowledge-based engineering with the full power of NX Design for advanced process automation. NX vehicle design assistants are specialized applications developed with Knowledge Fusion.
Integrated and managed

**Greater efficiency, less waste**
NX Design tools are fully integrated components of a unified solution that encompasses the entire product development process. NX Design creates a digital product definition that is immediately accessible and dynamically associative to all disciplines and applications – including industrial design and styling, simulation, tooling and machining. With this integrated solution, companies can instantly and automatically communicate product data and design changes to downstream development processes, avoiding delays and errors that result from data re-creation, transfer or translation.

**Integrated design management**
NX Design is delivered with the Managed Development Environment, a data and process management system that is fully integrated with the design tools, intuitive and unobtrusive to the designer and scalable to match the company’s requirements. The NX Managed Development Environment ensures that the entire development team collaborates from a continuously up-to-date and synchronized digital product model.

**Protect and control product data**
Managed Development Environment protects the product definition and provides controlled access with data vaulting and automatic check-in and check-out. The managed environment provides a central repository for all product and process data and provides direct access to the information from the designer’s desktop. With integrated data management, design teams can spend less time looking for information and eliminate the effort that is wasted working with obsolete or out-of-date data.

**Re-use proven designs**
With the Managed Development Environment, NX captures and organizes information so that it can be quickly located and re-used by the entire design team. Product and component design data is structured to help designers locate it easily by visual search or database query to use in the design session.

With the Managed Development environment, companies can quickly and easily create product variants and configurations, while maximizing re-use of design data.

Powerful search and selection functions in the Managed Development Environment help get the right information to the right people at the right time.
Design process management
The NX Managed Development Environment goes beyond conventional CAD data management – it synchronizes disciplines and engineering data with process information to improve collaboration. Within the managed environment, companies can capture their development procedures and task workflows. By joining product data and process knowledge in a fully digital environment, NX enables companies to automate, manage and optimize their engineering processes. Everyone in the value chain works from the same data and processes toward a common objective.

Design configurations and variants
NX product and process management tools help you respond quickly to market opportunities and customer requirements with product variants and configurations. Companies can define new product configurations with particular changes for specific markets, while maximizing the re-use of previous product content. Advanced product configuration applications support variations, alternates and multiple views of BOMs. Revision and variant rules control display of product structure for clarity and control.

PR O V E N  R E S U L T S

“The high-end systems such as NX offered major advantages in their ability to move seamlessly from design into CNC programming of injection molds. We moved to NX because we believe that it provides the most comprehensive capabilities of all the high-end and midrange CAD systems. NX stands out for its superior assembly modeling and design management system that makes it easy to distribute work among our various subsidiaries.”

Anton Isermann
Manager of CAD Technology
HEWI

With the Managed Development Environment, companies can capture engineering workflows to better manage development processes.

The NX Managed Development Environment integrates product design with styling, simulation, tooling and machining. Data created in design is controlled and managed for use throughout the development process.
Open by design

Design is seldom performed in isolation – typical design projects require working with other CAD systems and with data in different formats. NX eliminates the time and effort that companies expend while trying to interpret foreign data, with openness that readily accommodates 2D or 3D product data, as either inputs to or outputs of the design process.

Integration into any environment
At the fundamental level, NX provides data conversion software for neutral format CAD standards, including IGES, STEP, DXF, DWG and STL. But NX goes far beyond traditional data translation for CAD system interoperation.

Via a unique technology, NX can work directly with data created in UGS’ I-deas® NX Series product development tools. Any I-deas model can be opened in NX, which preserves all feature information, parametrics, assembly structure and drawings. NX also opens and saves Catia design data for both V4 and V5, enabling direct translation of assemblies and geometry, including solids and surfaces.

For any other imported geometry, NX Direct Modeling enables designers to work with and change any data, independent of its source. Direct Modeling doesn’t need “history” information to move, offset or replace faces. It also allows the designer to move or even remove holes, delete or resize fillets, rounds, bosses and other features. All new features added to the design with NX direct modeling model are parametric, so they can be changed quickly and easily.

The industry standard for viewing product data
NX includes a high-performance, compact, persistent storage representation for visualization of design data, the JT format established by UGS as the standard for the mechanical design industry. A highly flexible, CAD-neutral format, JT data can be exported directly as a standard feature of most major CAD systems, allowing full representation of relevant model information. JT data can be very lightweight, holding little more than facet data or it can be richer and hold precise model geometry, product structures, attributes and product manufacturing information, including GD&T and annotations.

Ability to work with any data
NX visualization and analysis tools can be used to validate faceted polygonal models. Designers can use the polygon representation to inspect the design, analyze the integrity of the model or do clearance studies in the assembly context, just as with precision geometric models. Faceted data can be used in all disciplines directly, without converting the data to precise geometry.

With direct modeling, NX designers can use parametric, feature modeling techniques on design geometry from other systems.
Throughout its broad product application suite, NX leverages key attributes that help companies achieve business objectives of waste reduction, quality improvement, shorter cycle times and greater product innovation. These unique attributes directly support business process initiatives aimed at transforming product development:

- **Managed development environment**
  NX solutions include fully integrated, synchronized management of all product data and process knowledge to transform product development with a structured collaborative environment.

- **Unified product development solution**
  Seamless integration of NX applications rapidly propagates changes of product and process information, replacing point solutions with a unified development system, from concept to manufacturing.

- **Knowledge-driven automation**
  With NX, companies can apply product and process knowledge across all elements of product development to automate processes and maximize re-use.

- **Simulation, validation and optimization**
  Comprehensive simulation and validation tools in NX automatically check performance and manufacturability at every step of the development process, for closed-loop, continuous, repeatable validation.

- **System-based modeling**
  NX structured conceptual models standardize design practices and allow rapid creation of variants, transforming development from component-based design to a systems engineering approach.
About UGS
UGS is a leading global provider of product lifecycle management (PLM) software and services with nearly 4 million licensed seats and 46,000 customers worldwide. Headquartered in Plano, Texas, UGS’ vision is to enable a world where organizations and their partners collaborate through Global Innovation Networks to deliver world-class products and services while leveraging UGS’ open enterprise solutions, fulfilling the mission of enabling them to transform their process of innovation. For more information on UGS products and services, visit www.ugs.com.

UGS leads to greater innovation
There is no single road to innovation, but there are signs you’re headed in the right direction. Leading innovators get to market faster, manage compliance, optimize resources and achieve globalization. They’re also four times more likely to use PLM software to plan, define, build and support their products. UGS’ family of PLM solutions helps businesses establish Global Innovation Networks that transform their process of innovation. Drive your business to greater innovation and accelerate your growth.