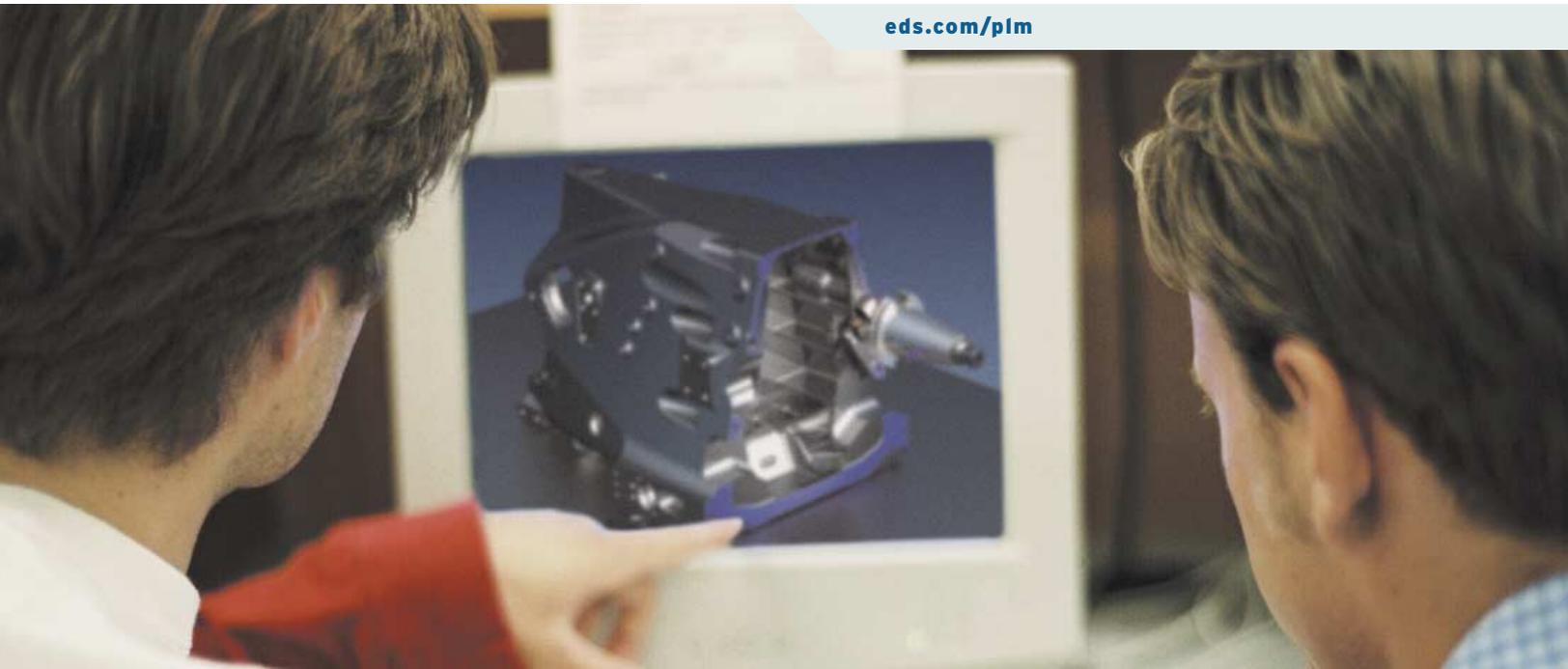


Knowledge-driven digital manufacturing

eds.com/plm



Unigraphics NX CAM

- Unigraphics NX CAM delivers powerful manufacturing process creation that exceeds industry needs. It is a scalable product offering that can be configured to meet specific requirements. Extensive and flexible options provide the highest degree of control, while effective knowledge capture capabilities allow proven processes to be standardized for repeatability.



Reducing costs and increasing production throughput are two of the major challenges facing manufacturing companies today. Bottom line – increasing profitability!

In pursuit of efficiency and profitability, manufacturers make substantial investments in expensive capital equipment, including modern numerical control machinery. This valuable equipment is often employed in critical path applications with wide ranging dependencies. Efficient utilization of these assets is highly reliant on the timely availability of NC tool path optimized for the machining task at hand.

Whether your manufacturing needs represent high-production hole-making and other repetitive operations, fixed-axis contour shape machining for mold and die faces, or multi-axis complex surface cutting, your CAM software must provide the optimal solution for your particular needs. It must also include

the capabilities to handle future manufacturing needs as your organization grows.

Your CAM solution should facilitate, not hinder, the return on investment of the equipment that you rely on. It must be able to instill a standardization of manufacturing methods and resources that are reusable in order to dramatically improve process efficiency and increase profitability.

Introducing Unigraphics NX CAM

Unigraphics NX CAM addresses these problems with a comprehensive, yet easy to use, set of capabilities for NC tool path creation, simulation and verification. Unigraphics NX CAM delivers a single manufacturing solution capable of efficiently machining everything from holes to airfoils.

Although it provides such broad capabilities, Unigraphics NX CAM products are available in various modules enabling scalability to meet customer requirements. Users can easily configure various solutions in order to best fit their specific industry needs, such as:

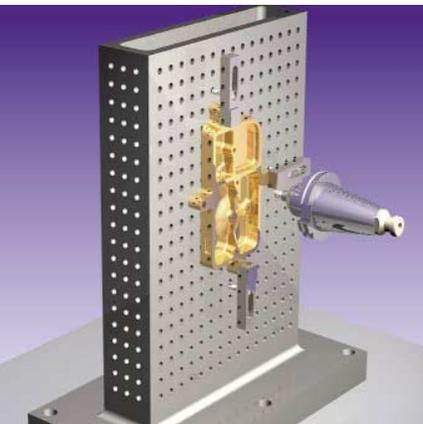
- **Automotive** – The strong milling capabilities in Unigraphics NX CAM are well suited to the machining of molding, casting and stamping tooling, as well as finish machining.
- **Aerospace** – Unigraphics NX CAM answers the needs of the aerospace industry, which requires multi-axis machining capabilities for both airframe machining and turbo-machinery components.
- **Consumer/high-tech products** – Unigraphics NX CAM directly addresses the mold and fabrication requirements of manufacturers developing consumer and high-technology products. Additionally, direct machining of imported faceted geometry (STL) helps to quickly convert prototypes to tooling.
- **Machinery** – Unigraphics NX CAM provides the machinery industry with solutions for efficient planer milling for finish machining of castings and weldments, as well as production machining of milled and turned components. Machining of common product features can be efficiently and easily automated.

In addition, Unigraphics NX CAM provides a proven multi-CAD capability and can accept input geometry from a wide variety of CAD sources. All major CAD applications are supported, including Unigraphics NX, Solid Edge®, Pro/E, I-deas®, CATIA and AutoCAD.

Unigraphics NX CAM fulfills the requirements of those manufacturers needing a CAM-specific solution. Unigraphics NX CAM is also part of the Unigraphics NX suite of EDS' product lifecycle management (PLM) solutions – the world's market-leading technologies and services for performing product lifecycle management on a collaborative basis.

Product lifecycle management is the ability of extended enterprises – consisting of dispersed users and diverse data types – to effectively plan, execute, monitor, and optimize all of the stages in a product life-cycle. You can achieve the best product development solution available by integrating your best practices with advanced CAD/CAM/CAE software. This ultimately provides a solution that can give you an unmatched competitive advantage.

EDS' vision of total product engineering is a virtual product development environment, where you can conceive, engineer, design and analyze digital 3D models of products and the processes required to manufacture, deliver and support them.



❖ The Unigraphics NX difference



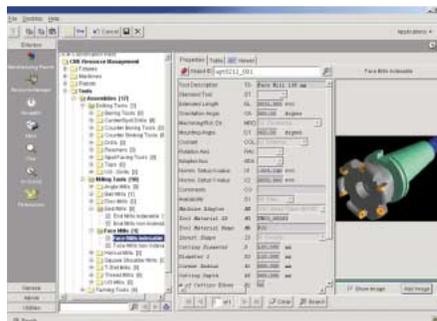
While possessing a very comprehensive set of capabilities, Unigraphics NX CAM is extremely easy to use. Unigraphics NX CAM provides you with process-oriented solutions to optimize speed and production. High-speed machining, multi-axis machining, pre-definable templates and process assistants help you harness all the power of the company's machine assets, without getting stuck in all the options.

Unigraphics NX CAM has a wide range of capabilities that have been developed and packaged to address the needs of all key manufacturing industries, and which focus on process-oriented solutions for industries with requirements that include:

- Planar milling
- 3 axis contour milling
- Multi-axis milling
- Turning and mill/turning applications
- Wire EDM
- Sheet fabrication

Knowledge-driven manufacturing

With Unigraphics NX CAM, you can create templates that can be instantly loaded and automatically executed as a stored process. As an example, a mold manufacturer could capture their best practices for machining core and cavity faces and define that in a template file. They need only load that template, select the geometry, and start the process. Process assistants can be developed to lead a less trained user through the same process in a wizard-like manner. This will satisfy manufacturing managers who desire the ability to capture proven processes so they can be executed repeatedly by even casual users.



High speed machining

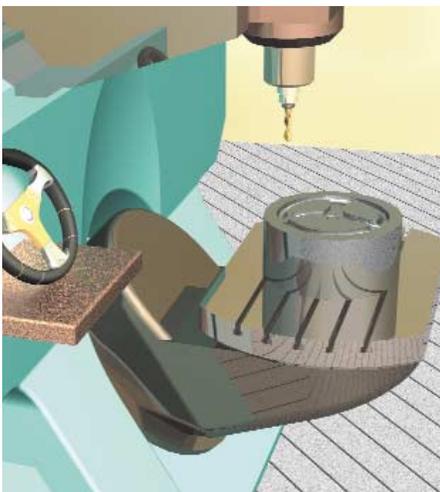
High-speed machining (HSM) technology has been pioneered in Unigraphics NX CAM, working in conjunction with machine tool and controller manufacturers. HSM is becoming crucial technology for limiting EDM and manual polishing process steps, dramatically reducing mold lead time. The CAD/CAM tool path needs to be optimized to fully exploit the capabilities of the HSM equipment. Unigraphics NX CAM develops tool path geometry that maximizes the achieved feedrate, with special HSM features, such as climb cut restriction, rounding corners, helical cutting, circular engages and retracts and feedrate control in corners. Smooth

ramping between z-axis levels maintains tool engagement, reducing retract, reposition and reengagement motion. Finish quality is enhanced in Unigraphics NX CAM through the use of spline-based NURBS (non-uniform rational B-splines) tool path output that machines directly to the desired net shape, eliminating additional processing steps.

Tooling and resource management

Unigraphics NX CAM offers scalable resource management, from integrated libraries that can easily be created and expanded by the user, to the integration of external databases, providing comprehensive tool, machine, and feeds and speeds management. Unigraphics NX CAM enables fast determination of production equipment involved in a product change, saving you time and allowing for more accurate and economic decisions. The resource library can be customer-definable, resulting in powerful search capabilities. Your resource selections can also be validated via integrated 2D and 3D graphics displays. CAM libraries provide an easy access mechanism to retrieve the following data from the Unigraphics NX CAM tooling databases:

- Machine tools
- Cutters
- Holders, fixtures
- Feeds and speeds





Easy manufacturing process navigation

The operation navigator allows you to quickly view and manage manufacturing process relationships within the setup, including operation sequence, geometry selections, machining methods and cutting tools. The operation navigator graphically illustrates these hierarchical relationships and their status in a familiar tree-like interface consistent with Windows and other Unigraphics NX applications, enabling fluid user interaction with key aspects of the process. Operation, geometry, tool or method parameters can be accessed from the operation navigator, enabling quick and easy editing and revisions.

In-process workpiece

At various stages of the machining process Unigraphics NX can create in-process workpiece geometry. This geometry can be used for visual verification or to establish stock shape for subsequent operations for the most efficient machining "and consistent tool loading for increased productivity.

Shop documentation

Creation of process documentation including setup sheets, operations sequence information and tool lists, is often a significant time drain and process bottleneck.

Unigraphics NX CAM can automatically generate shop documentation and output it in various formats, including plain text or HTML Web format.

Feature based hole making

Holes can be automatically selected and machined based on design feature information, significantly reducing tool path creation time and process standardization. Knowledge-based rules can be established to define methods and tooling for automatic generation of optimized tool path. Common or specialized tools are supported for drilling or milling of hole geometry.

Batch processing

CAM processing can be a very intensive computing task. Using Unigraphics NX CAM, you can submit entire programs, individual tool paths, machine code files and shop documentation for background or after-hours processing in three easy steps:

- 1) load a template,
- 2) select the geometry,
- 3) submit for batch processing.

Unigraphics NX CAM automatically generates the program's tool path, machine file and shop documentation, and alerts you via email when it is finished.

Integrated material removal and machine tool simulation

To help you optimize the tool path as well as check for possible errors, you can digitally verify the material removal process and machine tool motion before the program is running on an actual machine. For multi-axis machines, you can view the machine motion to verify both collision avoidance and optimal machine motion. Both of these capabilities are integrated into Unigraphics NX CAM and can be easily accessed during the tool path creation process rather than output for replay at the end of the process.

Extensive mold and die machining functionality



Angle based cutting containment

Unigraphics NX can easily contain the tool path based on user defined surface steepness. Cut pattern, direction and other parameters can be optimized for highest quality based on surface steepness. Geometry is automatically evaluated and tool path is contained during the creation process. Surface machining quality is enhanced without unnecessary creation of boundary geometry and other unproductive user interaction.

Flow cutting with residual material removal

Flow Cut efficiently removes material from corners and valleys and is optimized to generate a single continuous path whenever feasible. Tool path containment can be set to automatically identify residual material from previous operations.

Automatic Z-level motions

Z-Level volume milling provides automatic roughing and finishing in Z-level motions from the simple to the very complex core and cavity topology. This module has a variety of cut patterns that can be applied to wire frame, surface or solid model geometry. Z-level finishing includes cutting pattern options, such as mandating climb cutting or allowing alternate cut directions, that enable the user to choose the best strategy for optimal cycle times.

Scalable market-specific solutions



Advanced machining solution

Unigraphics NX CAM has a well-established reputation as the leading CAM solution of advanced machining software for aerospace, tire manufacturing, and other industries requiring simultaneous, multi-axis machining of complex shapes. The use of Unigraphics NX CAM effectively extends to the supply chain of OEMs with product components that require focus on multi-axis machining, with high degrees of accuracy and extended tool axis control. All of this software has complete upward compatibility for maintaining legacy data, a feature essential to the aerospace industry.

Efficient and accurate multi-axis machining requires extreme flexibility in both parameter setting and cutting sequences. Unigraphics NX CAM supports these requirements with sophisticated NC processors, multiple levels of control and user-defined drive methods. Unigraphics NX Advanced Machining includes additional capabilities of importance to the advanced multi-axis user:

- Fixed and variable axis milling
- Sequential milling (APT like graphical processor)
- Complete suite of data translators: DXF, STEP and IGES
- UG/open – customization of the manufacturing environment
- CAM visualize – integrated digital validation of NC tool path
- Resource manager – advanced manufacturing data management

Unigraphics NX Advanced Machining provides the high-end capabilities required by aerospace and other companies machining complex parts. Precise tool control over multi-axis finishing provide APT like quality, variable axis surface contouring provides full ranges of cutting techniques for wall and floor machining and advanced cutting with helical tool paths provide efficient blade cutting.



Die/mold solution

Unigraphics NX CAM brings a new dimension to the die/mold industry through its process-knowledge approach to machining. Unigraphics NX CAM allows you to predefine, plan and apply complete die and mold machining sequences through templates and process assistants. Unigraphics NX CAM offers a suite of processes for core and cavity machining of molds and dies, including Z-level and zig-zag roughing, semi-finishing, steep and non-steep area milling, uncut material removal, finishing and profiling. Extensive capabilities for efficient die/mold machining include:

- Efficient roughing paths for expedient material removal
- Complex core and cavity machining with minimal user interaction
- In process work piece capture for efficient machining of intermediate shapes
- Steepness containment for optimal cutting of steep and not-steep areas
- Automatic identification and machining of uncut material in corners and valleys
- High speed machining with smooth lifts, corner rounding, helical cutting, and NURBS output
- Extensive user control of cut patterns and techniques
- Capture, automate and reuse best practices in process templates
- Automatically generate shop process documentation
- Batch process tool path generation, shop documentation creation and post-processing machine code

Unigraphics NX CAM provides the process flexibility and process automation required to be competitive in today's aggressive mold market. For machining of mold and die faces, several processors can be used to generate optimal tool path for various geometry shapes. Z-level operations generate planar cuts for minimal scallop height on steep walls. Area milling can apply multiple cut patterns, including zigzag, spiral, and paths biased to the part shape, while compensating for tool holder geometry and tracking uncut material. Flow cut efficiently removes material in corners and valleys with a variety of cut patterns, following corners with single or multiple passes, or containing tool path to areas unreachable by the previous tool. All of the user's best practices and customizations can be saved for re-use using process intelligent manufacturing templates.



Machinery applications solution

The process knowledge capability inherent to Unigraphics NX CAM is highly valuable to companies that produce machinery and machinery-related products consisting of product families or highly customized, made-to-order equipment. The machining variety and demands in this industry include high-production machining of components as well as efficient finish machining of castings and weldments. Productive CAM software for these often-broad applications must be flexible and include the capability for repetitive process steps to be captured and automated. Unigraphics NX CAM is well suited to such applications, with specific capabilities that include:

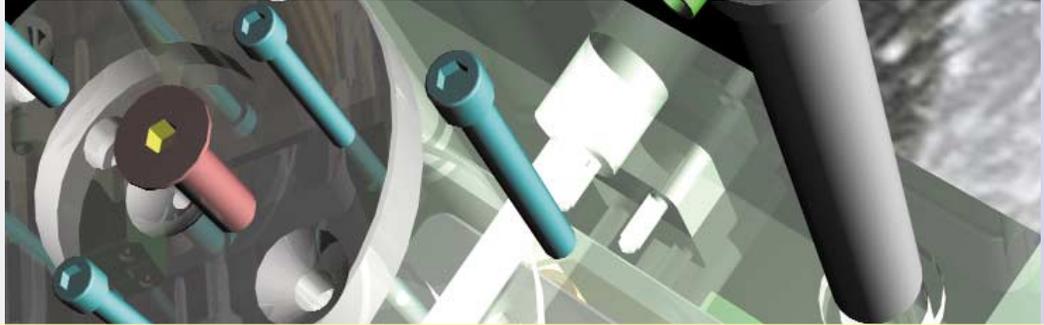
- Broad range of machining processes from automatic roughing to user-controlled finishing
- Excellent control of a wide variety of cut patterns for milling and turning
- Efficient finish machining with multiple cut regions and varying cut patterns in single operation
- Advanced lathe programming for common roughing, facing, grooving, finishing, threading, drilling tasks
- Effective use of the inprocess workpiece for improved machining in milling and turning
- Extensive variety of standardized tooling is supported by the milling, drilling, and turning processors.
- Broad machine tool support including conventional lathes, multiple spindle lathes, mill/turn machines, and VTLs
- Excellent visualization and verification of cutter motion during tool path review for verification of optimal process

Unigraphics NX CAM includes the capability to handle all types of turning applications. In addition to rich functionality for common tasks, a special capability called “teach mode” provides extra user control for fine finishing and special cutting situations. Unigraphics NX CAM is very flexible and allows programming in XY or ZX environments for horizontal, vertical, or inverted vertical orientations.

Unigraphics NX CAM is well suited to the machining application needs of progressive manufacturers of machine tools, presses, automotive engine and power train components and other industrial and heavy equipment.

Feature	Adv	Die/mold	Mach
Planar milling	•	•	•
Multiple axis indexing	•	•	•
Automated shop floor documentation	•	•	•
Integrated tool libraries with speed and feed tables	•	•	•
Embedded post processor	•	•	•
Graphical tool path editing	•	•	•
Integrated material removal and machine motion simulation	•	•	•
Fixed axis contour surface milling	•	•	
High-speed machining optimized cut patterns and NURBS output	•	•	
Uncut material identification and automatic removal	•	•	
Multiple axis sequential surface milling	•		
Wire EDM support		•	
Turning with mill/turn support			•

Unigraphics NX tool design and E-factory products



Unigraphics NX Mold Wizard is a complete, automated mold design application. Unigraphics NX has been working alongside expert mold designers to create the most intuitive design tool the mold industry has ever seen. Unigraphics NX Mold Wizard is fully integrated, allowing users to tap into Unigraphics NX functionality in an environment focused on mold design, where only a basic knowledge of design software and modeling is required to perform advanced tasks, such as being able to split a core and cavity in only a handful of steps.

Unigraphics NX Mold Wizard's intuition is the result of combining expert knowledge with automation and associativity.

Each step in the defined process leverages automation to increase functionality and reduce time-consuming steps. Productivity is further increased by the associative propagation of changes from the part model to the core and cavity and all associated CAM tool paths. Revisions to mold face geometry only require a simple reprocessing to create tool path that adheres to those geometry changes. Unigraphics NX Mold Wizard's associativity also allows changes made to the standard component to be automatically reflected in the mold base. Unigraphics NX Mold Wizard provides comprehensive coverage of mold design, including the most advanced parting capabilities in the industry.

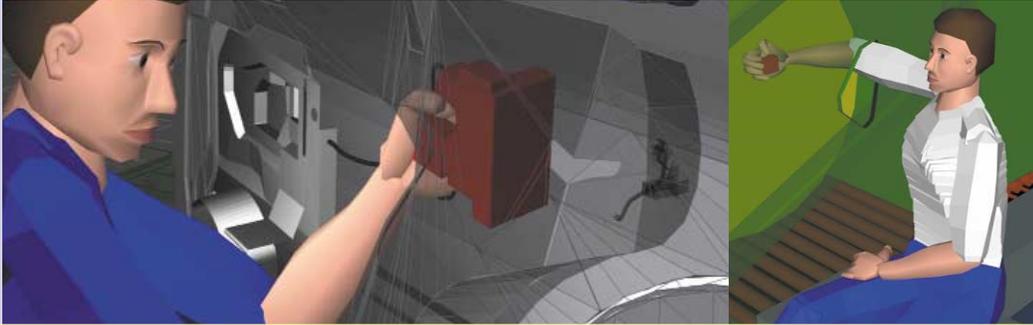
Unigraphics NX Progressive Die Wizard maximizes progressive die design productivity through intelligent automation of industry-specific processes. It provides a complete environment for progressive die design and encapsulates die making expert knowledge, while allowing flexibility to incorporate customer-specific requirements. Its user interface incorporates the

industry's best practices to guide users through the steps required to construct a progressive die. Easy to use blank layout design tools enable designers to efficiently layout process features in numerous operation stations, while minimizing material scrap. 3D strip layout simulations provide immediate feedback to design and process changes. Customizable die base libraries, standard part libraries and insert group libraries expedite the die structure design and ensure the complete process is handled effectively.

Unigraphics NX Progressive Die Wizard embeds knowledge that formerly resided only in the minds of senior die designers, opening the door for more opportunity with greater access to this knowledge. Less experienced users can take advantage of simple guided and intuitive process steps. Experienced designers can quickly achieve a higher level of efficiency.

Teamcenter™ Manufacturing

Provided within EDS Teamcenter Manufacturing is an advanced level of integration that can capture and manage the Unigraphics NX CAM data within a Teamcenter Manufacturing foundation. The solution is unique in providing a direct association with CAM so that operation setups are automatically added to the process plan. Teamcenter Manufacturing includes a full set of tools for data management and configuration, access control, management of distributed databases, integration with a wide set of applications, and in particular, support for collaboration between the many people and processes involved



in planning for manufacture. Interoperability capabilities enable all the different applications to share the common framework to ensure information stays current and consistent across the entire enterprise.

Teamcenter Manufacturing enables you to:

- Reduce time to the start of production
- Reduce the costs of preparing for production
- Reduce the high cost and production delays associated with manufacturing planning errors
- Improve the utilization and efficiency of manufacturing resources
- Make better/faster decisions on product and manufacturing alternatives

Factory CAD, an E-factory product

Factory CAD is a factory layout software tool that allows you to create detailed, intelligent factory models. With Factory CAD you won't waste time drawing a layout because it allows you to design complete 3D factory models faster than drawing 2D layouts. Smart factory objects promote faster layout design. It enables engineers to create optimum layout models which help them discover layout design problems early in the factory design process. Substantial savings can be achieved by launching production sooner with fewer last-minute factory modifications.

Factory Flow, an E-factory product

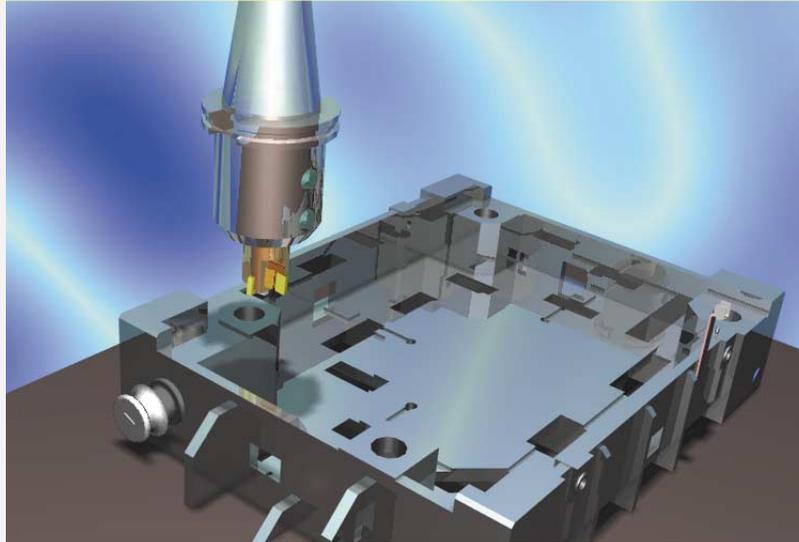
Factory Flow enables you to quickly evaluate material flow and compare alternatives. It uses process routing data and material handling equipment information to help engineers develop layouts that facilitate the manufacturing process. It provides material flow diagrams and quantitative reports so engineers can compare layout options and improve production efficiency. The optimized factory designs produced by Factory Flow bring factories on-line faster, compress time to launch and improve overall production efficiency.

Jack, an E-factory product

Leading manufacturers in the automotive, aerospace and heavy equipment industries are constantly seeking ways to design safer, ergonomically sound workplaces and processes more quickly and for less cost. Jack is a human modeling and simulation software solution that helps organizations in various industries improve the ergonomics of product designs and refine workplace tasks. Jack and its optional toolkits enables manufacturers to integrate human-centered design with a virtual reality application in order to analyze human factors issues for the design of industrial tasks and new products.



❖ Solution of your choice



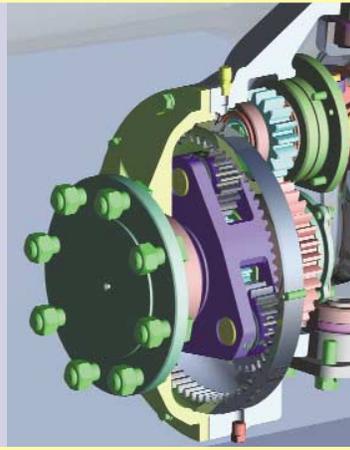
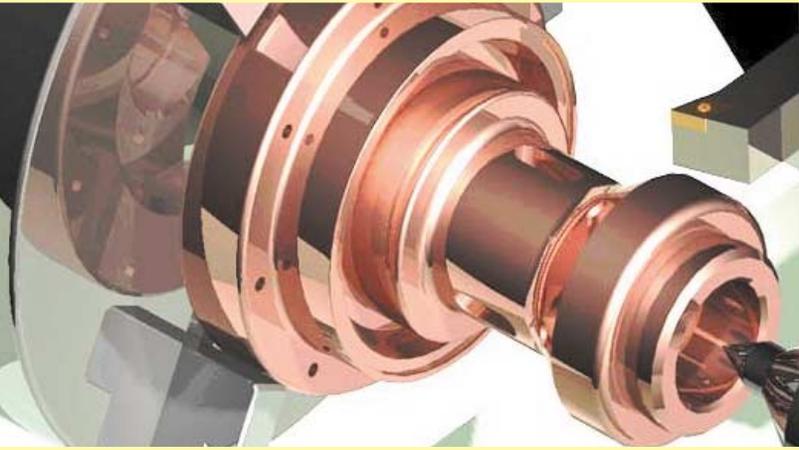
Standalone CAM solution

Unigraphics NX CAM fulfills all the requirements of those manufacturers needing a CAM-specific solution. Unigraphics NX CAM provides benefits both as an element of a standalone Unigraphics NX CAD/CAM solution or in a multi-CAD environment where data may come from a variety of CAD sources. Unigraphics NX CAM offers an unmatched range of capabilities, yet the automation capabilities such as the process templates and process assistants, make the system easy to use. These same automation techniques enable preferred processes to be followed for each type of operation or product, which makes the system more productive, and leads to higher quality and consistent results. The ability to work directly from the features defined in CAD model geometry with a high degree of associativity means that your design information can be efficiently utilized directly in the manufacturing process.

Total product engineering solution

Some organizations may be looking for a solution that addresses their entire product engineering requirements of design, validation and manufacturing. For those organizations, Unigraphics NX CAM is available as part of the Unigraphics NX Total Product Engineering suite. Unigraphics NX unites the teams and systems comprising the complete engineering lifecycle from concept to manufacture, especially in situations with multiple suppliers collaborating in the manufacturing of complex systems and assemblies.

Unigraphics NX delivers digital product modeling and product process validation. Unigraphics NX Total Product Engineering addresses virtual product and process development, delivering proven production value. Unigraphics NX Total Product Engineering achieves the optimal product development solution by integrating customers' best practices with advanced CAID/CAD/CAM/CAE software. This ultimately provides a solution that can help deliver unmatched competitive advantage. Unigraphics NX fosters design creativity, captures knowledge, standardizes processes, powers collaboration and enables version control throughout the product lifecycle.



Complete product lifecycle solution

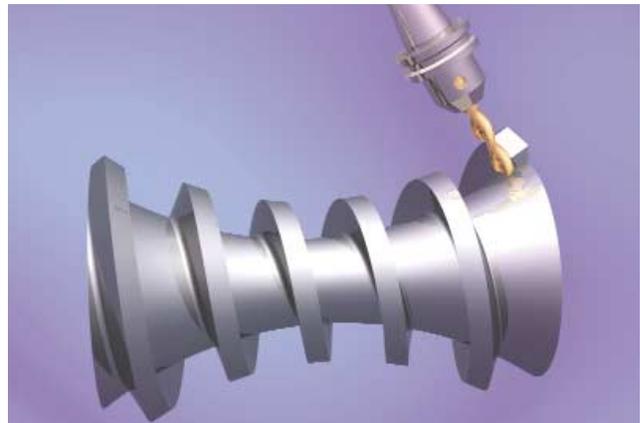
For those users looking for a breakthrough system that addresses the needs of all stages in their product lifecycle – from requirements gathering through in-service support, Unigraphics NX integrated with EDS' Teamcenter is the solution.

Simply put, product lifecycle management is the ability of extended enterprises – consisting of dispersed users and diverse data types – to effectively plan, execute, monitor, and optimize all of the stages in a product lifecycle.

Teamcenter is a breakthrough series of solutions that addresses the collaborative needs of all of the stages in your product lifecycle – from requirements gathering through in-service support.

Worldwide Services

Any of these solutions can be implemented quickly and cost-effectively by EDS' Experteam™. Contact your EDS sales representative today to learn more about these solutions and their ability to turn your company's most strategic e-business initiatives into real-world results.



About EDS

EDS, the leading global services company, provides strategy, implementation and hosting for clients managing the business and technology complexities of the digital economy. EDS brings together the world's best technologies to address critical client business imperatives. It helps clients eliminate boundaries, collaborate in new ways, establish their customers' trust and continuously seek improvement. EDS, with its management consulting subsidiary, A.T. Kearney, serves the world's leading companies and governments in 60 countries. EDS reported revenues of \$21.5 billion in 2001. The company's stock is traded on the New York Stock Exchange (NYSE: EDS) and the London Stock Exchange. Learn more at eds.com.

About product lifecycle management solutions

EDS is the market leader in product lifecycle management (PLM), providing solutions to the global 1000. Product lifecycle management enables all the people who participate in a manufacturer's product lifecycle to work in concert to develop, deliver, and support best-in-class products. As the only single-source provider of PLM software and services, EDS can transform the product lifecycle process into true competitive advantage, delivering leadership improvements in product innovation, quality, time to market, and end-customer value.

Corporate Headquarters

United States
5400 Legacy Drive
Plano, Texas 75024
1972 605 6000

Regions

Americas
13690 Riverport Drive
Maryland Heights, MO 63043
United States
800 498 5351
Fax 314 264 8900

Europe
Norwich House Knoll Road
Camberley, Surrey
GU15 3SY
United Kingdom
44 1276 705170
Fax 44 1276 705150

Asia-Pacific
Suites 3601-2, Citibank Tower
Citibank Plaza, 3 Garden Road
Hong Kong
852 2230 3333
Fax 852 2230 3200



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