

Integrated solutions for digital product simulation

eds.com/plm



Digital simulation solutions

- Developing exceptional products that meet strict quality and performance criteria cannot be left to chance. PLM Solutions from EDS takes the guesswork and worry out of your product development process with a comprehensive suite of world-class digital simulation solutions.



Total product performance evaluation

EDS provides a comprehensive, yet easy to use, suite of scalable capabilities for total product performance evaluation – from concept design through prototype evaluation. Unigraphics NX and I-deas are part 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 lifecycle via 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.

EDS is in the unique position in the industry of being able to provide you with a single source for a complete range of world-class CAD-integrated digital simulation solutions as well as multi-CAD simulation solutions. All are available within an open and collaborative PLM architecture that provides access to the leading product data management solutions in the industry.

EDS understands the challenges



“During the last decade, the most significant vehicle design changes have been in the truck chassis. We have developed a new and unique ‘king frame’ rear axle suspension system using I-deas® design and simulation. The suspension system enables an increased axle load capacity of 15 tons and eliminates an unfavorable rear wheel camber angle using only a leaf spring design.”

Head of Research & Testing
European producer of
heavy-duty off road trucks

Reducing overall product development costs, compressing product development cycles, and creating innovative, high-quality “category-killer” products are three of the major challenges facing manufacturing companies today. Bottom line benefits – increasing profitability and market share! In pursuit of these business goals, manufacturers have made substantial investments in software tools and IT equipment for computer-aided engineering. However, the majority of this investment to date has often been employed in design and drafting activities that focus primarily on defining the product form and fit in the computer, while the build and evaluation of physical prototypes is still widely used to optimize and validate the functional performance characteristics of new products. Achieving the business benefits of digital prototypes in the place of physical prototypes requires that functional performance simulations achieve the robustness and accuracy of the physical world without the lengthy design/build/change iterations common in many industries today.

Even in those organizations that have effectively deployed digital performance evaluation technology, it is often performed exclusively by experienced simulation specialists as a separate validation initiative downstream from the creative product design activity. As a result, simulation activities often provide design change feedback too late in the overall process to have a significant positive impact on the quality and performance of the final “as-built” product. These digital simulation activities are also often performed on detailed design geometry that is out-of-date due to multiple detailed design revisions. As a result, the product performance characteristics predicted by the digital prototype may not accurately reflect the final “as-delivered” product.

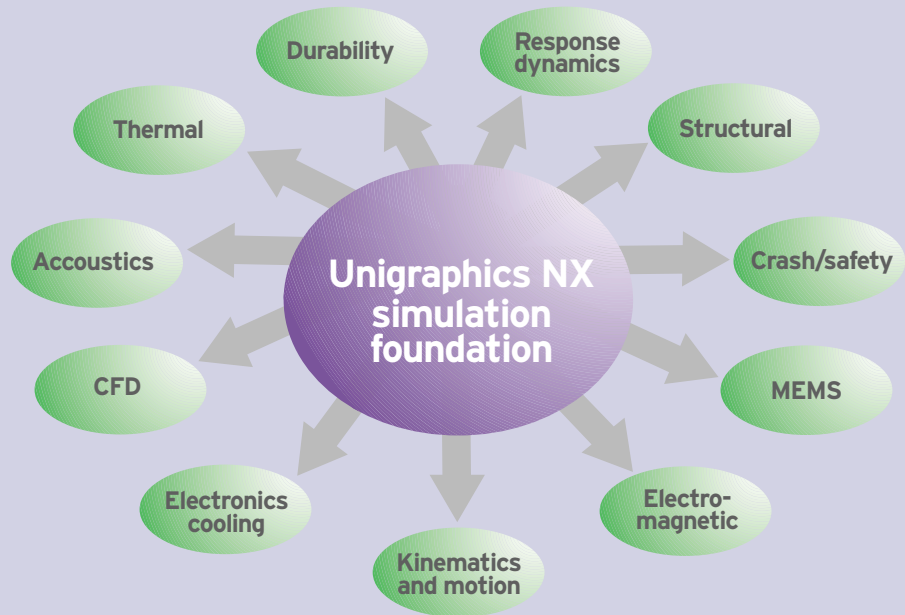
Finally, as manufacturing companies move increasingly towards 24/7 product development and manufacturing with significant outsourcing of key components and/or assemblies, there is an ever-growing need for global virtual engineering teams that include suppliers and partners to collaborate and leverage the results of digital simulation and prototyping efforts. The ability to archive, access, share, and reuse simulation models and performance predictions can save significant calendar time and project resources in a global new product development effort.

Your benefits:

- Develop more innovative products
- Shorten time to customer value
- Reduce product warranty costs
- Eliminate physical prototype iterations
- Reduce engineering change orders

❖ The EDS difference

Unigraphics NX is an open modeling and collaboration engine for a wide-range of best-in-class simulation applications provided by both EDS and EDS' CAE partners.



“Five years ago, the design was an initial placeholder. Now, a design needs to demonstrate it is worth pursuing to be prototyped. Now, show me the proof that what you’ve designed here is going to work.”

Staff Engineering Manager
CAE/CAD/CAM
Development and Design
U.S. Tier 1 Automotive Supplier

Knowledge-driven process automation

Utilizing the Unigraphics NX Knowledge Fusion capabilities, you can create templates that can be instantly loaded and automatically executed as a stored process. As an example, a wheel manufacturer can capture its best practices for designing and analyzing various types of standard wheels and define that process in a template file. They need only load that template, select the geometry, and start the process. Process assistants can be developed by simulation experts who enable the same process to be executed accurately by new simulation employees or even design engineer users in a wizard-like tool. These same automation techniques enable preferred simulation processes to be followed for each type of workflow or product evaluation activity leading to higher staff productivity, higher product quality, and consistency of engineering results. This effectively brings fundamental performance simulation activity into the up-front design process and will support enterprise-wide initiatives to capture in-house knowledge and proven repeatable simulation methods.

Design associativity

Both Unigraphics NX and I-deas digital prototyping models are always up to date with the master model. Once the design process has started, digital simulation users are advised if the master model is changed and can update the simulation model automatically at their discretion. This design associativity is persistent and ensures that the simulation models will stay synchronized with the master model and that the simulation results will be valid. This simulation design associativity is available at both the component and assembly levels.

Production proven scalability

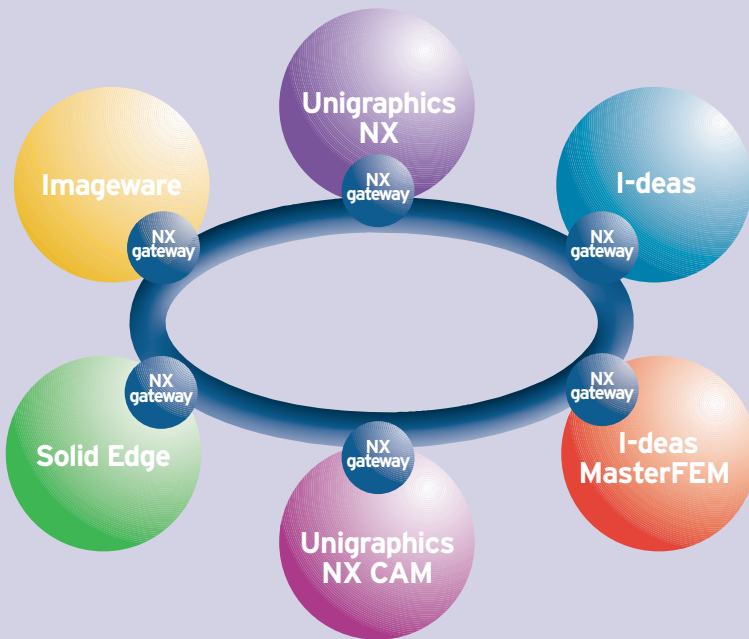


Fig. 1 – Interoperability through the NX Gateway

CAD/CAE data management for global design collaboration

Design/simulation digital prototyping activities create many large data files that need to be managed and shared throughout the enterprise's engineering organization and even with external suppliers or ad hoc program partners. Within the Unigraphics NX, I-deas, and Teamcenter™ collaborative environments, design and simulation models and results files are easily archived, controlled, shared, updated to reflect design changes, and then reused. This data management is enabled by Teamcenter for both Unigraphics NX and I-deas at two levels – within the engineering workgroup and throughout the worldwide virtual enterprise.

Open by design

Unigraphics NX inherently provides interoperability, openness and XML-based collaboration to facilitate data exchange and corporate knowledge re-use. NX fully leverages published formats between EDS products as well as other third-party CAX applications spanning the entire product lifecycle.

Unigraphics NX is built on the widely used Parasolid geometric modeling foundation and leverages PLM XML, a public format for describing product structure and associated product data and visual representations.

NX: the next generation architecture for total product engineering...today

In conjunction with our leading customers, EDS has designed a state-of-the-art architecture that uniquely enables total lifecycle product engineering.

NX delivers a core platform built on industry standards that powers knowledge-enabled applications. This innovative architectural design allows users to move beyond simple process automation, enabling quick and easy development of engineering process-specific applications.

A new user interaction model is specifically designed to support highly productive process-oriented workflows. The intelligence of the software infers the correct action to take giving the user an opportunity to concur or alter the inference.

The NX gateway provides a new level of interoperability for associative integration. Built on the industry-leading Parasolid modeling kernel and PLM XML, the NX gateway provides associative interoperability, enabling organizations using EDS' CAD/CAM/CAE or third-party applications to directly exchange and reuse design information. This interoperability reduces data exchange costs and associated data integrity problems.

NX is a full-scale production ready environment that enables the complete suite of Unigraphics NX CAD/CAM/CAE applications; as well as other best-in-class applications and technologies available within the I-deas environment. NX is based on a foundation of industry standards, including standards and protocols for real-time design collaboration, accurate and open interoperability, visualization and interrogation, network-addressable knowledge services and integration with other industry standard Web services.

Design-integrated simulation process wizards



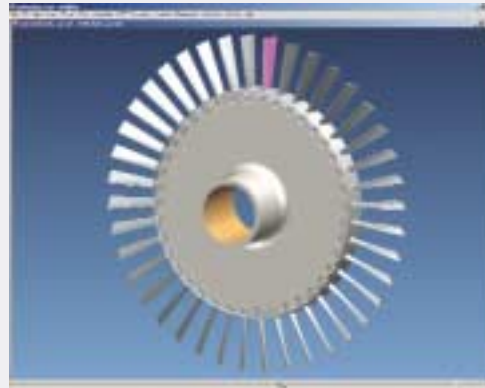
Unigraphics NX Knowledge Fusion enables data re-use and design process productivity.

“You have the first-order set of tools which typically fall into the hands of the designer. Static and linear evaluations, mounting brackets, bending moments, stiffness questions, in my view, ought to be handled now by the designers.”

Staff Engineering Manager
Digital Development and Design
Tier 1 Automotive Supplier

Unigraphics NX provides a series of process wizards cutting across engineering disciplines in the product development process for specific well-defined design activities within multiple industries. Process wizards for activities such as mold design, progressive die design, sheet metal design, and design optimization are complemented by simulation process wizards for structural strength/stress and plastics mold filling/cooling. These wizards are tailored for use by designers and design engineers who may have little training in the use of finite element analysis (FEA) tools and do not normally perform FEA on a regular basis. Wizards allow a designer to make very quick conceptual level trade-offs on component design alternatives within their normal workflow process without relying on a simulation specialist to perform FEA. Unigraphics NX provides fast and accurate graphic feedback to the designer on how well the design performs versus fundamental engineering pass/fail criteria. Weak areas of the design can be corrected early in the design process leading to less downstream engineering change orders.

Unigraphics NX



Unigraphics NX Strength Wizard provides an extremely easy-to-use simulation wizard that sets new standards in fast and simple structural analysis for non-experts in simulation technology. Unigraphics NX Strength Wizard brings a new set of simulation possibilities to all users of the Unigraphics NX product design suite of engineering tools in five quick and simple steps. This even includes the creation of a Web-based report. At every stage through the simulation process the user is provided with clear and concise guidance to help guide them through the analysis of their part. Based on the finite element method of structural analysis, meshing is automatic and completely adaptive to even the most complex model geometry. Accuracy of solution is a prime consideration; therefore, solutions are fully error checked. After the baseline analysis is completed, simulation confidence levels are graphically presented interactively to the users as part of the wizard-based process, and also as part of the Web-based project report.

Fully associative to the design model, Unigraphics NX Strength Wizard ensures that the very latest design information is available for simulation, without the need for any time-consuming geometry translation, or data re-creation. Should the design change, the user can simply hit the re-analyze button. The original solution will then be updated and the simulation rerun.

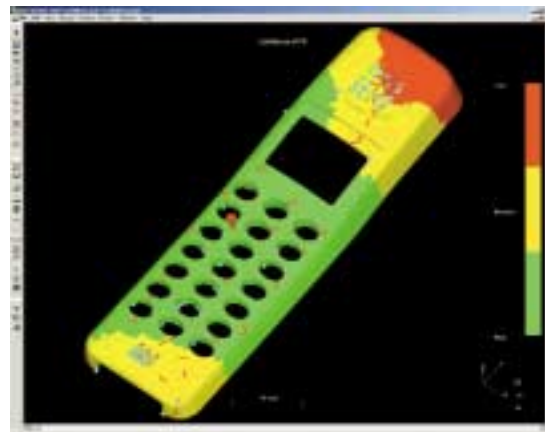
Key features

- Fast, simple, and accurate finite element structural simulation
- Process wizard-based functionality
- Comprehensive simulation process guidance
- Adaptive (error-checked) simulation
- Automatic, Web-based report generation
- Completely scalable for higher order analysis

Unigraphics NX Plastics Part Adviser addresses key manufacturing concerns for injection-molded plastic parts up-front in the preliminary design stage and offers practical advice for identified problems. Designers get rapid feedback on how design modifications to wall thickness, gate locations, materials, or geometric changes can affect the manufacture of their plastic part. Also, Unigraphics NX Part Adviser provides precise information on the location of weld lines and air traps as well as the filling pattern, pressure, and temperature distributions in the part cavity.

Key features

- 3D solids-based analysis
- Practical design advice
- Facilitation of design team communications
- Design integration
- Automatic Web-based report generation



Design-integrated concept optimization



Kinematic and dynamic motion characteristics of complex assemblies can be optimized early in the design process.

“Using motion simulation within Unigraphics NX enabled us to identify design issues before producing physical prototypes. It helped us build a reliable product and meet our time deadlines.”

Project Design Engineer
U.S. Aircraft Manufacturer

Unigraphics NX Scenario for Motion provides an advanced, yet simple-to-use, environment to help designers and engineers understand, evaluate, and optimize the complex motion behavior of their assemblies and products against functional performance design targets. Design engineers can rapidly evaluate multiple design alternatives early in the design process; testing and refining their digital prototype until optimal system performance is achieved. Assembly designs are the foundation for all motion simulations with bi-directional associativity of all design changes between the Unigraphics NX master model and the motion simulation models. Simulation models can always be based on the most current design revisions, and multiple simulation “scenarios” can be evaluated and tracked within the Unigraphics NX/Teamcenter Engineering environment.

Designed specifically for customers with an existing seat of Unigraphics NX design, Unigraphics NX Scenario for Motion includes a complete set of tools specifically for all aspects of advanced, dynamic, static, and kinematics motion simulation. From model definition right through solving and results presentation, Unigraphics NX provides one of the best CAD-integrated motion simulation packages available today. In addition, by sharing the same simulation models and user environment as Unigraphics NX Scenario for Structures, design loads are easily and simply shared for use in structural performance simulations to ensure a more complete evaluation of new product behavior.

Unigraphics NX Scenario



Simulation-driven design of critical components reduces downstream engineering changes, prototype iterations, and tooling costs.

“Rather than storing the whole mesh, especially in multiple versions, the Unigraphics NX Scenario routine is built to drive morphing. Hit update, and the scenario runs the mesh, and then refines it. This is probably one of the best examples of how one of these tools supports multiple iterations on a design for optimization. The savings represent months and months of work, if not a year to two years in time because you aren’t building parts and sending them to the test lab.”

Staff Engineering Manager
Tier 1 Automotive Supplier

Unigraphics NX Scenario for Structures provides design-integrated, knowledge-driven capabilities that enable the design engineer to optimize the structural performance characteristics of a product from the early stages of the design process. Unigraphics NX Scenario for Structures provides a robust, yet simple-to-use, environment for design engineers to understand, evaluate, and optimize the structural, thermal, and vibration behavior of their parts and assemblies. Unigraphics NX Scenario for Structures includes integrated FE solvers for quick turnaround linear structural and thermal evaluations as well as sizing and parametric shape optimization.

Engineers can quickly perform multiple “what-if” simulations of a new product’s structural and thermal performance to choose the most promising and innovative conceptual design alternatives. Geometry-based parametric modeling and automated optimization tools lead to a detailed understanding of a product’s performance characteristics and definition of an “optimal” digital design prototype earlier in the product development process.

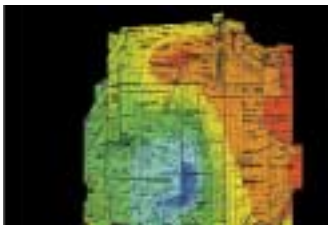
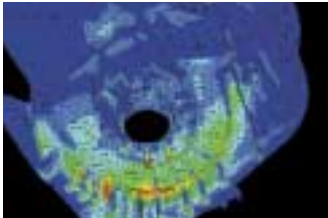
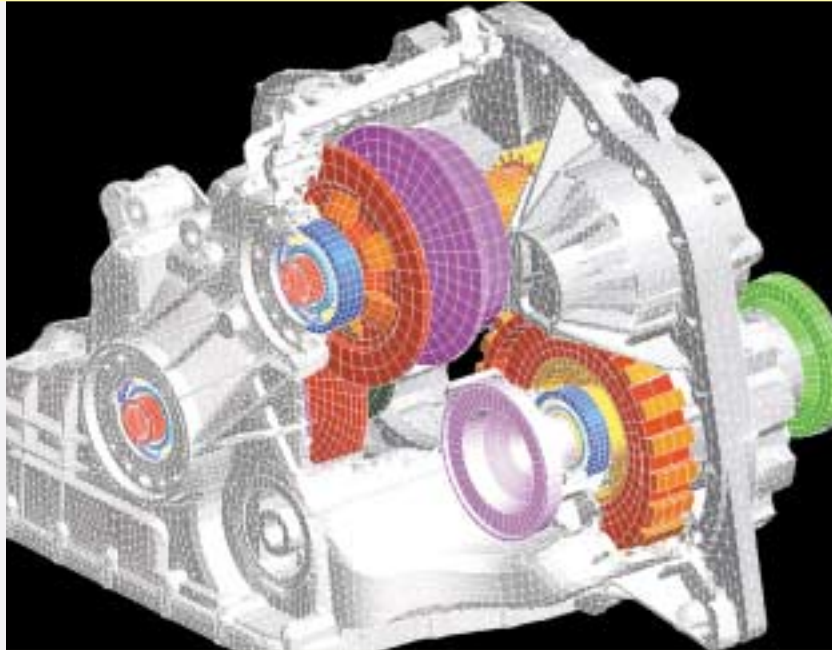
“Within a week and a half of modeling and solve time, we had verified the initial point of failure, evaluated multiple solution paths, and zeroed in on the most favorable structural solution.”

Lead Designer
Heavy Equipment Manufacturer

Multi-CAD FE modeling and visualization

“The recently introduced meshing technology, “section meshing”, considerably reduces the effort of meshing complex 3D geometry preparation for finite element calculation. As a result, product simulation results are available sooner and cheaper than previously.”

ZF Group
Manufacturer of Heavy-Duty
Driveline and Chassis Systems
2001 Annual Report



I-deas MasterFEM

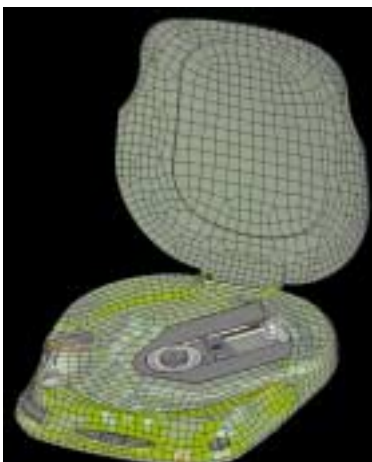
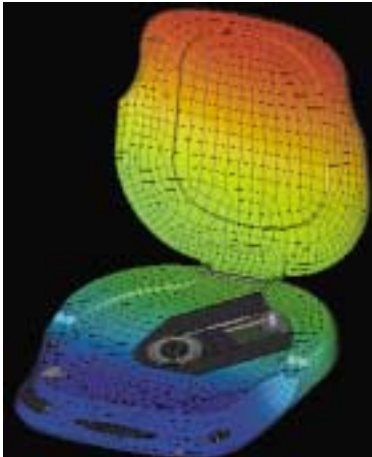
Via the NX gateway, Unigraphics NX provides direct access to the complete suite of I-deas Simulation capabilities which are based on the industry-leading multi-CAD FE modeling and visualization capabilities of the I-deas MasterFEM package. I-deas MasterFEM provides comprehensive capabilities and world-class technology for building finite element models and understanding detailed FE analysis results, including the ability to create and modify 3D geometry and surfaces for the purpose of geometry abstraction and FE modeling. Developed from a 35-year heritage in the simulation industry, and utilized by more than 20,000 advanced simulation engineers worldwide for detailed design evaluation and performance validation, this advanced FE modeling package can accept input from a wide variety of geometry creation sources. All major design applications are supported, including Unigraphics NX, Solid Edge, Pro/E, CATIA, and AutoCAD as well as industry standard data formats such as IGES, STEP, VDA, JAMA-IS, STL and JT. Direct geometry interchange and the ability to update simulation models with associativity to the design model via NX Gateway is available with both Unigraphics NX and Solid Edge. Simulation models and results can be archived, shared, and reused both internally and with suppliers worldwide via direct links to both enterprise-level and workgroup level data management systems.

Direct interfaces to third-party CAD/CAE solutions

Third-party interfaces	Pro/E	CATIA	AutoCAD	Solid Works	ADAMS	ANSYS	NASTRAN	ABAQUS	LS-DYNA
Unigraphics NX Scenario for Motion					•				
Unigraphics NX Scenario for Structures						•	•	•	
I-deas MasterFEM	•	•	•	•	•	•	•	•	•

I-deas Simulation

Archiving, sharing, and reuse of design-associative simulation models and analysis results across globally dispersed virtual engineering teams leads to greater engineering productivity and superior product designs.



Many powerful tools are available in I-deas MasterFEM to automate the process of finite element analysis. Wireframe, surface, and solid geometry can exist in the same data structure and all can be used for product evaluation modeling. Free meshing, mapped meshing, and manual mesh generation techniques are all available in addition to unique surface abstraction and section meshing capabilities. Automated tools for checking the quality of the elements, mesh smoothing, and applying loads and boundary conditions are also included. Comprehensive material and physical property definition capabilities complement the tools to make this software truly a general purpose, multi-physics finite element analysis capability. The user interface can be tailored specifically to the targeted FE solver, making it easy for the users to understand the models' characteristics in the language familiar to the user.

I-deas MasterFEM post-processing functions allow the recovery of analysis results and provide extensive graphical and numerical tools, enhancing the understanding of the analysis. Specialized capabilities for the modeling of beam structures and the design analysis of laminate composite structures are also available.

I-deas Laminate Composites provides an integrated capability uniquely tailored to the productive design and evaluation of laminate composite structures. An extension to the core I-deas MasterFEM package, this software enables the modeling and evaluation of laminate structures consisting of multiple-ply material definitions.

Materials data catalogs

Several materials data catalogs are available: **MDLA catalog** consists of more than 450 records covering thermoplastics, thermo-sets, elastomers, ceramics, composites, metals, wood, and glass. MDLA is developed using the following data sources:

- Manufacturer's technical manuals and data sheets
- Direct contact with manufacturer's technical personnel
- In-house synthesis/interpolation techniques
- Recognized textbook sources
- Trade magazines

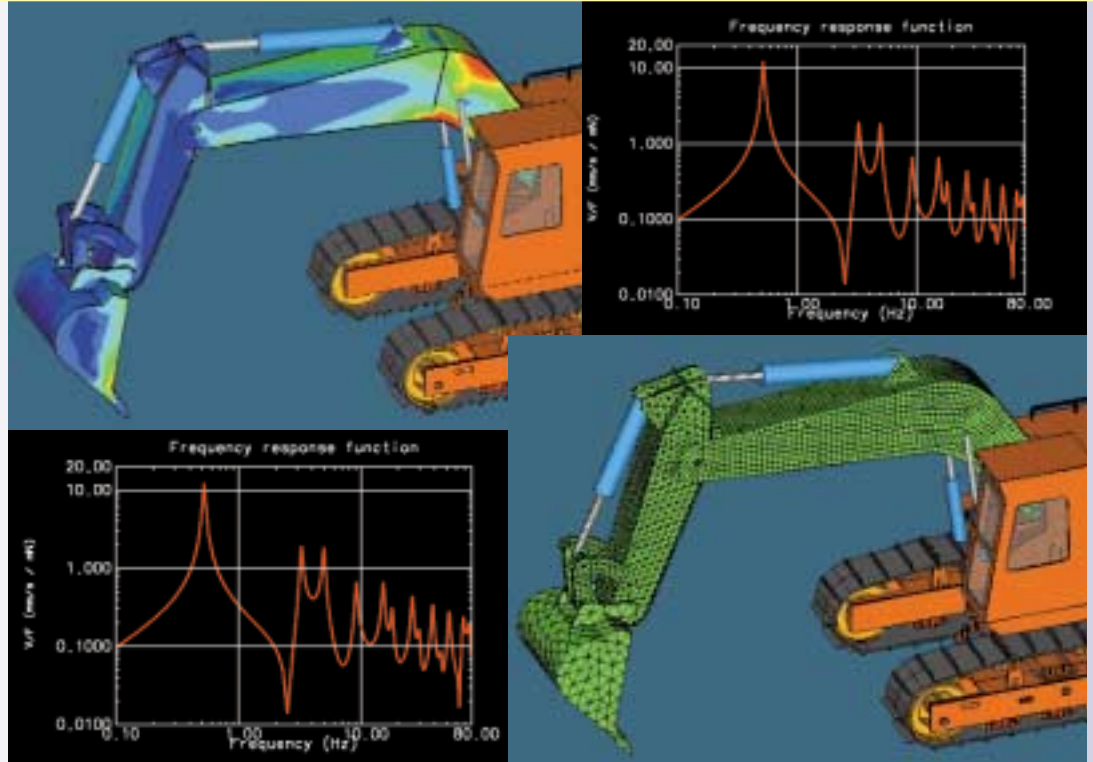
Metals catalog consists of more than 2,640 records covering aluminum, copper, steel, stainless steel, nickel, and reactive alloys. The catalog is compiled and updated from manufacturers' data sheets and industry standards information sources. The data should be used for initial design analysis only and should not be considered design-allowable information.

MIL5 catalog consists of more than 1,370 records covering materials commonly used for aerospace applications including steel, stainless steel, aluminum, magnesium, titanium, heat-resistant alloys, and special purpose alloys. MIL5 is compiled and updated on a regular basis using the U.S. Government MIL-HDBK-5. The data has been approved for use by all departments and agencies of the U.S. Department of Defense and Federal Aviation Administration.

❖ Broad range of integrated simulation solutions

“A key part of our vehicle development process is using I-deas Simulation for design optimization and validation before the first prototype is ever built.”

VP of Research and Development
Producer of heavy-duty
off road equipment



Forced response and durability predictions are used to optimize in-service life and reduce product warranty costs.

“I-deas Electronic System Cooling helps to understand the physics and eliminate ineffective design options before much time and money has been invested. It is a real time saver.”

Mechanical Engineer
Japanese Consumer Electronics
Manufacturer

Extending I-deas MasterFEM

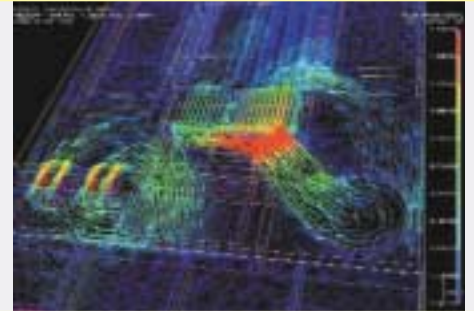
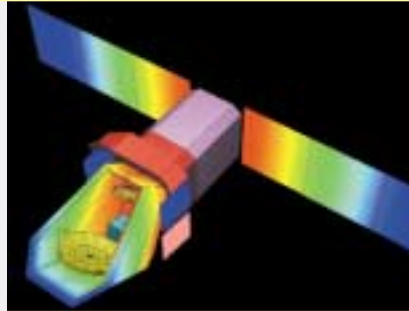
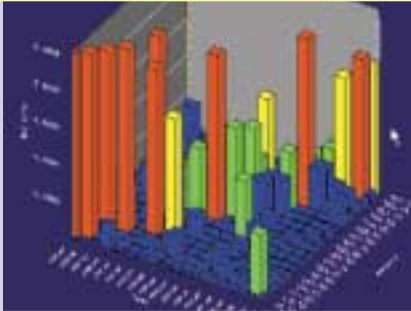
In addition to the core MasterFEM package, I-deas Simulation provides integrated FE solvers that enable simulation models to be analyzed directly within the software without data translation, exporting of model files, and importing of FEA results files. This saves considerable time and bookkeeping effort on the part of the design engineer and/or simulation analyst with more rapid turnaround of results and proposed design changes. I-deas provides fast and proven accurate solvers for a wide range of detailed product performance evaluations including linear structural, variational, nonlinear structural, buckling, steady-state and transient heat transfer (conduction, convection, and radiation), dynamic response, durability, plastics filling/cooling, and electronic systems cooling.

Integrated structural solutions

I-deas Model Solution – Linear performs basic static and dynamic structural analysis, steady-state heat transfer, and flow analysis. Advanced linear analysis capabilities allow you to study: buckling, stress stiffening and spin softening effects in rotating structures; effects of temperature dependent material properties; and node-to-node contact problems, including friction effects.

I-deas Model Solution – Nonlinear enables the analysis of non-linearities encountered in design evaluation by simulating large deformation and rotations, and predicting the effects of plastic material deformation, material hardening, and creep.

I-deas Simulation



I-deas Durability provides a set of analytical tools to predict the strength and fatigue safety of products subjected to prescribed cyclic loading. Both uniaxial and biaxial stress cycles are considered for predicting the durability of a product designed for infinite life. I-deas Durability utilizes linear or non-linear stress results from I-deas Model Solution as well as other external FE solvers such as ABAQUS and ANSYS.

I-deas Advanced Durability provides a set of analytical tools to predict life and fatigue damage of products subjected to prescribed loading histories and duty cycles. The loading histories may be generated from test measurements or analytical methods. The life of the product is calculated using strain or stress from a finite element solution. Both uniaxial and

biaxial loading are considered for various life criteria. You can use I-deas or external solvers (e.g. NASTRAN) to prepare linear or nonlinear strain/stress results for static fatigue analysis.

I-deas Response Analysis provides the ability to interactively evaluate forced responses of a structure when a set of static, transient, frequency (harmonic), random (PSD), or response (shock) spectrum excitations are applied. The dynamic and static modes, which are used to represent the linear model of the structure, can be generated by I-deas Model Solution or other FE solvers, or created from test measurements. These modes are then used to evaluate responses in product performance analysis using a modal approach.

I-deas Variational Analysis is a unique technology which enables the structural evaluation of an FE model across an entire design space based on the results of a single finite element linear solution (one mesh, one solve). By allowing the introduction of dimension variables into the traditional simulation process, I-deas Variational Analysis calculates the relationship between design variable ranges and performance criteria. I-deas Variational Analysis generates all the results for the full range of every set of parameter values and outputs those results in the form of design performance curves. These results can be used to compare alternatives; provide simulation-based guidance to non-experts; gain insight into prototype failures; and determine performance-based tolerances for manufacturing.

I-deas Mechanism Simulation offers additional ADAMS capabilities beyond Unigraphics NX Scenario for Motion that enable the engineering analyst to perform more advanced motion simulations. In addition to offering kinematics and dynamic solvers, you can also:

- Define loads as forces and torques.
- Define bushings and field matrix spring dampers.
- Recover and plot forces and torques.
- Interrogate results directly from I-deas Simulation
- Transfer joint and body loads directly to the I-deas MasterFEM element model.
- Create an .mnf (modal neutral file) from I-deas Model Solution that can be exported for use in the stand-alone ADAMS product.

Integrated thermal solutions

I-deas TMG Thermal performs advanced thermal simulations including coupled nonlinear analysis with conduction, convection, and radiation effects. Steady state and transient response can be predicted. In addition, **I-deas TMG Radiation's** advanced radiation and environmental heating capabilities make it the ideal solution for space applications.

I-deas Electronic System Cooling (ESC) uses computational fluid dynamics to simulate 3D air flow, convection, conduction, and radiation in electronics. It is ideally suited for the thermal engineering of individual component packages, multi-chip modules, heat sinks, PCBs, and complete electronics systems. In addition, I-deas ESC is an ideal solution for automotive cooling and HVAC applications.

"We use I-deas Simulation to get a modal model of a shock absorber in a new elevator design, and do a dynamic response analysis of whether maximum shock and quiver applied by cargo and passenger are absorbed. Using digital simulation, we can know whether or not the elevator will run smoothly. We perform the simulation many times but make only one physical prototype..."

Senior CAE Analyst, PhD.
Elevator Manufacturer
Peoples Republic of China

Integrated partners for digital prototyping solutions

Ground vibration test results acquired and analyzed with I-deas Test software are used to validate digital prototypes and to certify airframe structural adequacy.



Unigraphics NX, I-deas and Teamcenter provide an open architecture environment that allows independent third-parties to integrate their complementary simulation solutions with EDS. More than 30 third-party simulation software providers have integrated their solutions, including the following co-development partners who provide technology that is embedded within Unigraphics NX and/or I-deas:

Maya Heat Transfer Technologies – Integrated software and services solutions for advanced thermal/fluid flow simulation and design optimization. In addition to providing the integrated thermal analysis solutions of TMG Thermal and Electronic Systems Cooling, MAYA provides other specialized software for complex thermal and fluid flow simulation as well as data translators between I-deas MasterFEM and third-party FE solvers (ABAQUS, ANSYS, NASTRAN, DYNA, RADIOSS, PAMCRASH) and for ECAD PCB (printed circuit board) design and simulation. <http://www.mayahtt.com>

Mechanical Dynamics Inc. – Provides a subset of the widely used ADAMS multi-body dynamics simulation software tightly integrated within Unigraphics NX and I-deas. This technology is the core solution within Unigraphics NX Scenario for Motion and I-deas Mechanism Design and I-deas Mechanism Simulation. <http://www.mdi.com>

Moldflow Inc. – Integrated software solutions for simulation and design optimization of injection-molded plastic parts. Moldflow Design Optimization Solutions are scalable for use by part and mold designers who want to check manufacturing feasibility to simulation analysts who need detailed predictions about all phases of part and mold design, manufacturing, and

part quality. Moldflow provides the Plastics Part Adviser as well as advanced plastics manufacturing simulation.

<http://www.moldflow.com>

MTS Systems Inc. – Integrated software and services solutions for test data acquisition, physical prototype evaluation, acoustics, and sound quality evaluation as well as empirical test data management.

I-deas Test applications boost the productivity of your engineering test lab and enable physical test activities to be more integrated and value-added within the overall new product development process. CAE/CAT application integration and data management capabilities facilitate earlier and more effective communication of dynamic test results for use in upstream design and simulation activities such as performance targets, design loads, and failure criteria.

<http://www.mts.com>

More integrated partners

Other leading CAE companies who integrate their products with EDS' digital prototyping solutions include:

- ADINA
- Altair Engineering
- ANSYS
- Blue Ridge Numerics
- ESI
- FEDEM
- Fluent
- HKS
- Mecalog
- Microcosm Technologies
- MSC.Software
- nCode
- The Mathworks



❖ Digital simulation solutions

Multi-CAD standalone simulation solutions

I-deas Simulation fulfills all the requirements of those manufacturers needing a simulation-centric solution. I-deas MasterFEM provides significant simulation process benefits in a multi-CAD environment where geometric design data comes from a variety of external sources and multiple CAD systems.

Integrated total product engineering solutions

Many organizations are looking for a solution that addresses their entire product engineering requirements of design, validation, and manufacturing. EDS digital simulation solutions are available as part of Unigraphics NX Total Product Engineering. This EDS solution 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.

EDS delivers proven production value by addressing both virtual product and process development; thereby validating the product and its production processes digitally in a concurrent process.

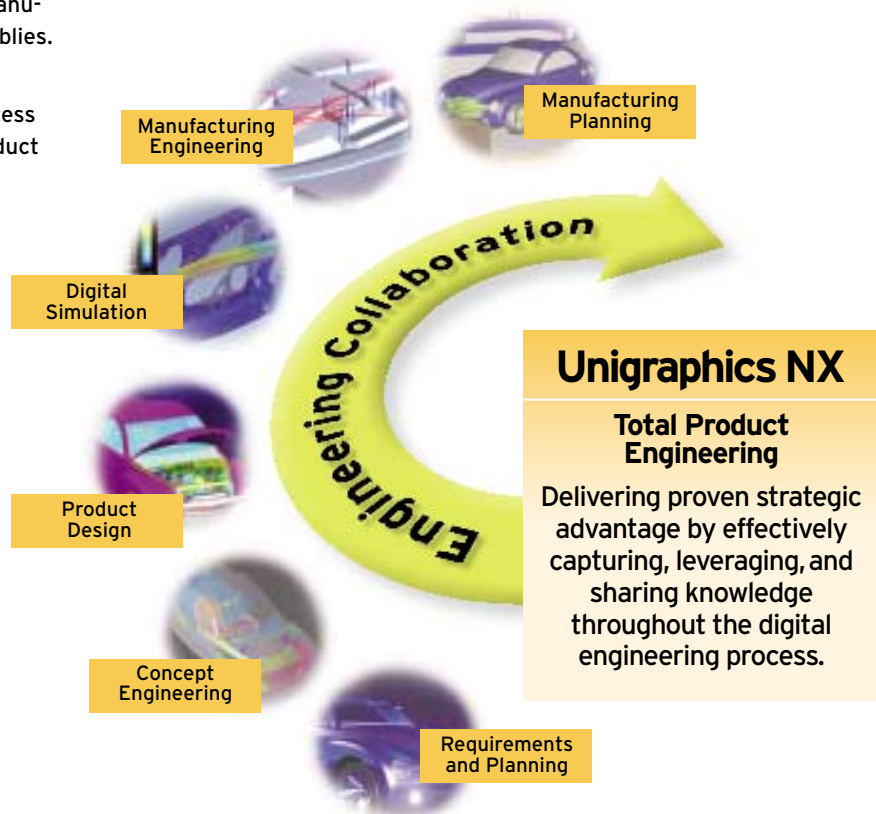
Worldwide implementation services

Any of these digital prototyping and simulation solutions can be implemented quickly and cost effectively by ExperteamSM. Utilizing integrated design/simulation and PDM best practices experience developed in over 30 years of engineering consulting services, Experteam consultants help optimize your product development processes and enable your engineering teams to make the most effective use of today's collaborative digital simulation and prototyping technologies.

Contact your EDS sales representative today to learn more about these solutions and their ability to turn your company's most strategic engineering initiatives into real world financial results.

"In general, management must realize the value of analysis. With some help from EDS, we designed a survey for the design community to identify any lack in skills. That survey helped to develop courses to address shortfalls in the skill sets. I have EDS people on site who are the subject matter experts. They work a lot as one-on-one mentors."

**CAD/CAM/CAE Manager
U.S. Automotive Supplier**



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.

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